

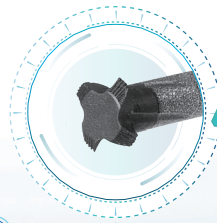
Semiconductor Industry

Conprofe Ultrasonic Machining Solutions

Solid PCD Drill



Solid PCD Thread Mill



Ultrasonic Engraving and Milling Center

Ultrasonic Vertical 5-Axis Machining Center

Vertical DDR Rotary Table

Ultrasonic Graphite Machining Center

Quartz Glass Showerhead Drilling



Challenges

- Low machining efficiency
- Vulnerable to hole edge chipping

Conprofe Solutions

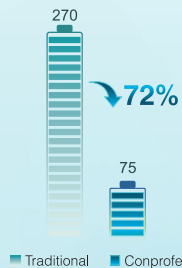
- **Ultrasonic Precision Engraving and Milling Center**

ULM-600

+ **Ultrasonic** Machining System

+ **Solid PCD** Drill

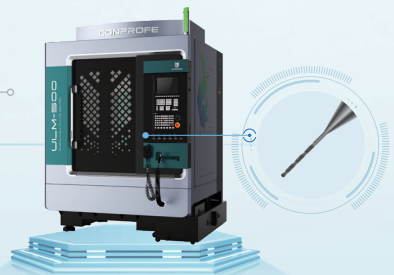
»» Cycle Time (s/hole)



Conprofe Benefits

- Continuous Drilling of **1,200** D0.5x5mm holes
- Cycle time reduced by **72%** from 270s to 75s per hole
- Hole edge chipping decreased by **68%**, from 0.4mm to 0.13mm

Carbon Silicon Showerhead Drilling



Challenges

- High hardness
- Demanding depth-diameter ratio

Conprofe Solutions

- **Ultrasonic Precision Engraving and Milling Center**

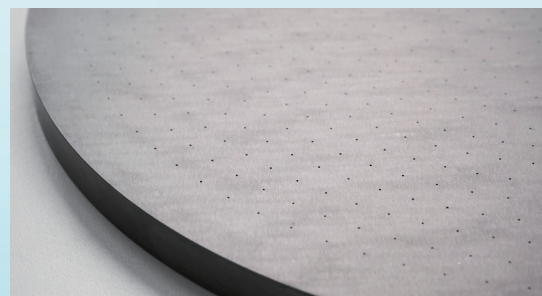
ULM-500

+ **Ultrasonic** Machining System

+ **Solid PCD** Drill

Conprofe Benefits

- Continuously machining over 100 D0.5x6.5mm holes (Depth-Diameter Ratio 13:1)
- Smooth hole wall and good hole quality



>>> Showerhead HV1700<<<

Material: Silicon Carbide

Single Crystal Silicon Showerhead Hole Drilling



Challenges

- Hole wall roughness $\geq Ra\ 6.54\mu m$
- Hole roundness $\geq 0.025mm$

Conprofe Solutions

- Ultrasonic Precision Engraving and Milling Center**

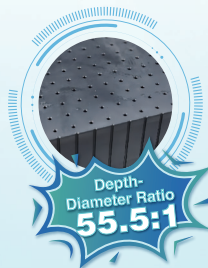
ULM-600

+ **Ultrasonic** Machining System

+ **Solid PCD** Drill

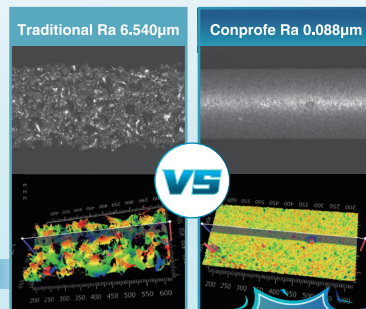
Conprofe Benefits

- Continuous machining of over **2,000** D0.45x23mm ultra-deep holes
- No obvious chipping around hole edges
- Hole roundness **0.003mm**
- Hole wall roughness down by **99%**, from Ra 6.54 μm to Ra **0.088 μm**



>>> Showerhead <<<

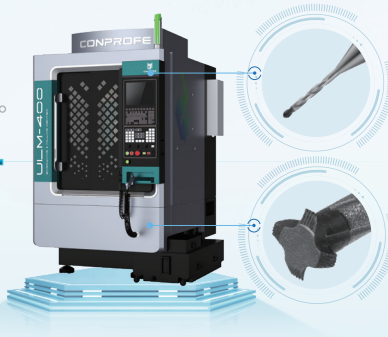
Material: Single-Crystal Silicon



VS

-99%

AlSiC Threaded Hole Machining



Challenges

- Long cycle time with manual tapping: 3,600s+
- High scrap rate from poor thread quality
- 6 taps needed to machine one hole
- Manual operation

Conprofe Solutions

- Ultrasonic Precision Engraving and Milling Center**

ULM-400

+ **Ultrasonic** Machining System

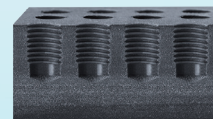
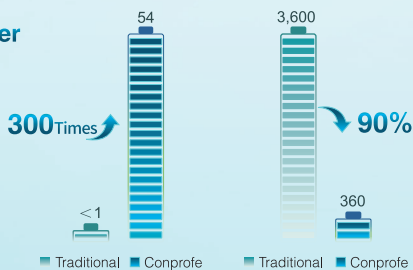
+ **Solid PCD** Drill

+ **Solid PCD** Thread Mill

Conprofe Benefits

- Tool life improved by **300 times** (54 holes/tool)
- Cycle time shortened by **90%**, from 3600s/hole to 360s/hole
- Replacing manual operation to CNC thread milling

>>> Tool Life (Hole) >>> Cycle Time (s/Hole)



Material: AlSiC

Polysilicon Slotted Confinement Ring



Challenges

- Low efficiency
- Recurring cracking issues leading to high scrap rate

Conprofe Solutions

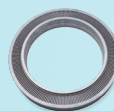
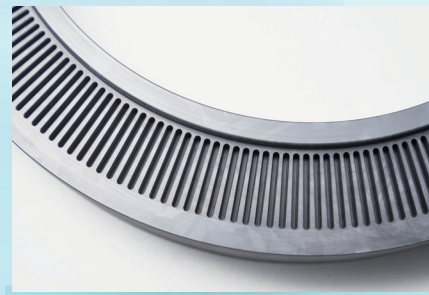
- **Ultrasonic Precision Engraving and Milling Center**

ULM-600

- + **Ultrasonic** Machining System
- + Smartguy Vertical DDR High-Speed Rotary Table

Conprofe Benefits

- Reduced cutting force and improved efficiency with ultrasonic machining
- Lower surface roughness
- Reduced chipping or cracks
- Improved hole roundness



>>> Confinement Ring <<<

Material: Polysilicon

Alumina Ceramic Disc Grinding



Challenges

- Low efficiency
- Poor tool life
- Micro grinding cracks giving rise to scrap of the workpiece

Conprofe Solutions

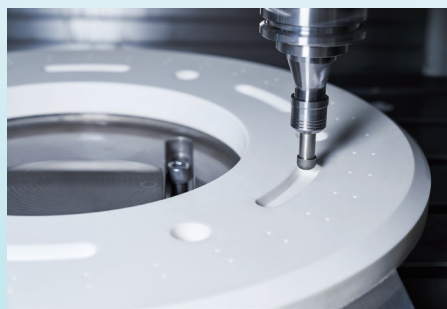
- **Ultrasonic Precision Engraving and Milling Center**

ULM-600

- + **Ultrasonic** Machining System

Conprofe Benefits

- Better chip evacuation
- Improved machining efficiency
- Reduced micro cracks on the surface of hard-brittle material
- **40%** improvement of workpiece surface quality



>>> Ceramic Disc <<<

Material: Alumina Ceramic

Solid PCD Micro Drill

- Suitable for drilling hard-brittle materials, effectively reducing chipping
- Hole quality **up by 3 times** vs. conventional cutters in machining **CFRP**
- Successful breakthrough in machining ultra-deep micro-hole with Depth-to-Diameter **Ratio of 55.5:1** in single crystal silicon workpiece



Solid PCD Thread Mill

- Conprofe Solid PCD Drill - the best fit for threading hard-brittle materials
- Thread milling efficiency **up by 100%** vs. traditional thread milling cutters, with machining cost per hole reduced by more than **2 times**
- Tool life **up by 50-100 times** vs. traditional thread milling cutters
- Customized specifications of micro-diameter thread milling available



Solid PCD Micro Drill

Solid PCD Thread Mill

Cutting Edge Diameter (D)	Cutting Edge Length (h1)	Overall Length (L)	Shank Diameter (d)	Spec.	Cutting Edge Diameter (D)	Thread Angle (α)	Reference Pitch	Neck Diameter d2	Neck Length (L1)	Neck Angle (r)	No. of Cutting Edges	Overall Length (L)	Shank Diameter (d)
0.45	7.5	40	4	M2.5	1.95	60°	0.45	1.28	6.5	15°	4	45	4
0.5	7.5	40	4	M3.0	2.36	60°	0.5	1.63	7.5	15°	4	45	4
0.6	9	40	4	M4.0	3.19	60°	0.7	2.15	9.5	15°	4	50	4
0.8	12	40	4	M5.0	3.97	60°	0.8	2.86	10	15°	4	50	6
1.0	15	45	4	M6.0	4.9	60°	1.0	3.38	15	15°	3	60	6
1.1	16.5	45	4	M8.0	6.0	60°	1.75	4	15	15°	4	50	8
1.2	18	45	4	M10	7.95	60°	1.75	5.63	15	15°	4	60	10
1.3	19.5	45	4	M12	9.95	60°	1.75	7.3	15	15°	4	65	10
1.4	21	50	4										
1.5	22.5	50	4										
1.8	27	60	4										
2.0	30	60	4										



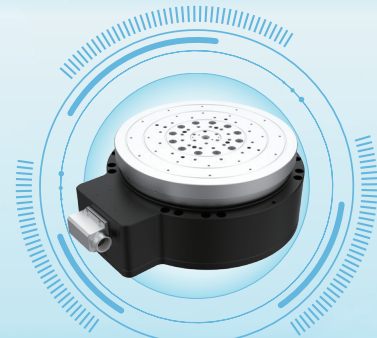
Solid PCD Micro Drill



Solid PCD Thread Mill

Vertical DDR Rotary Table

- **High Speed: Max. 1,500rpm**
- High Precision: **No backlash**, standard 26-bit encoder
- Mill-Turn: for both **milling** and **high-speed turning**
- High Load Capacity: Max. load of **80KG**
- Built-in Air Path: **Built-in positive labyrinth, fixture positive pressure** and **vacuum air paths**, with aesthetic look that avoids tube folding or air holding during high-speed rotation
- Compatible with Fanuc, Siemens, Mitsubishi, Brother and other CNC controllers



Vertical 5-Axis Machining Center

- Intelligent **Ultrasonic Machining System** developed by Conprofe to tackle the challenges in machining hard-to-cut materials
- Bridge gantry structure, low center of gravity, short overhang and super high rigidity for lower thermal strain
- Fully closed loop control with linear encoders
- Equipped with high power, torque and speed ultrasonic spindle
- Various chain-type tool magazine capacity options: 24~120 tools
- Automatic fire suppression system configured to reduce the risk of machining flammable and explosive materials
- Siemens 840D sl and SINUMERIK ONE 5-axis simultaneous control systems available



Ultrasonic Engraving and Milling Center

- Intelligent **Ultrasonic Machining System** developed by Conprofe to tackle the challenges in machining hard-to-cut materials
- Various kinds of screw guide protection available to meet machining needs of hard-brittle materials and metals
- Single tool magazine / extended tool magazine available
- Optional spindle speed with max. speed of 40,000rpm
- Fully closed loop control with high-precision linear encoders, positioning accuracy of **5 μ m**, repeatability of **3 μ m**
- High precision probe for on-machine measurement function
- With centrifugal filtration, bag and other multi-stage filtration system



Ultrasonic Graphite Machining Center

- Intelligent **Ultrasonic Machining System** developed by Conprofe to tackle the challenges in machining hard-to-cut materials
- Multi-layered protection with labyrinth design, positive pressure sealing and special dust collector design
- Superior performance in vibration damping, accuracy retention, dynamic characteristics and thermal stability due to its high-rigidity bed casting and symmetrical gantry structure
- Fully closed loop control with high-precision linear encoders to ensure repeatability accuracy of **2 μ m**
- Equipped with high-volume, high-power stand-alone filter cartridge dust collector
- Optional handheld vacuum cleaner with mobile operation for more thorough vacuuming



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