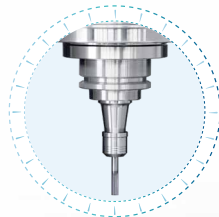


Semiconductor Industry

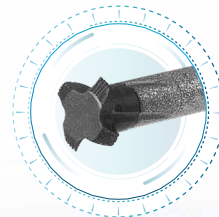
Conprofe Ultrasonic Machining Solutions



Solid PCD Micro Drill



Ultrasonic Machining System



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



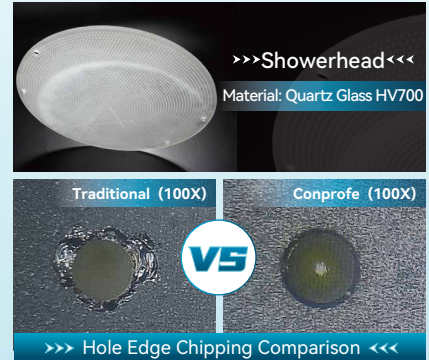
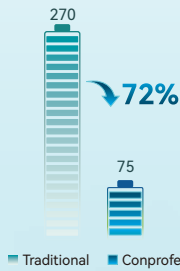
Challenges

- Low machining efficiency
- Vulnerable to hole edge chipping

Conprofe Solution

- **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 Solution

- **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 (Hole chipping size < 0.02mm)



»» Showerhead HV1700 ««

Material: Silicon Carbide

Single Crystal Silicon Curved Electrode Hole Drilling

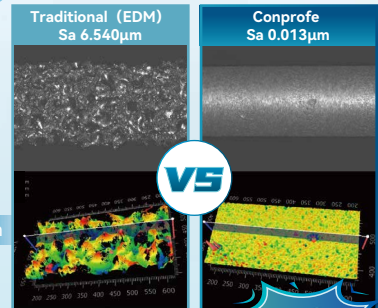


Challenges

- Immature machining solution
- Hard to control hole perpendicularity
- Hole wall roughness $\geq Sa\ 6.54\mu m$
- Hole roundness $\geq 0.025mm$

Conprofe Solution

- **Ultrasonic Precision Engraving and Milling Center**
ULM-600
- + **Ultrasonic** Machining System
- + **Solid PCD** Micro Drill



Conprofe Benefits

- Continuous machining of over **2,000** D0.45x24.75mm ultra-deep holes
- With ultra-deep micro-hole drilling, no obvious chipping around hole edges
- Hole roundness **0.003mm**
- Hole wall roughness down by **99.8%**, from Ra 6.540µm to Ra **0.013µm**

Material: Single-Crystal Silicon

AlSiC Threaded Hole Machining



Challenges

- Cycle time >180s/hole
- Unstable workpiece quality
- Vulnerable to hole edge chipping
- Low precision
- High cost (Tool life <1 hole)

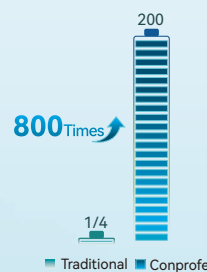
Conprofe Solution

- **Ultrasonic Precision Engraving and Milling Center**
ULM-400
- + **Ultrasonic** Machining System
- + **Solid PCD** Drill + **Solid PCD** Thread Mill

Conprofe Benefits

- Tool life improved by **800 times**, from 1/4 hole to 200 holes
- Wall thickness of 0.5mm, without any cracks or chippings

» Tool Life (Hole)



Material: AlSiC

Polysilicon Slotted Confinement Ring



Challenges

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

Conprofe Solution

- **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 crack
- 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 Solution

- **Ultrasonic Precision Engraving and Milling Center**

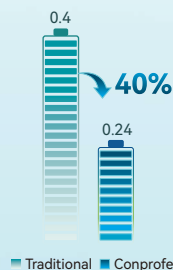
ULM-600

+ **Ultrasonic** Machining System

Conprofe Benefits

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

>>> Workpiece Surface Roughness (μm)



>>> Ceramic Disc <<<

Material: Alumina Ceramic

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
- Full 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 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
- Full 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 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
- Full 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



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-Diameter **Ratio of 55:1** in single crystal silicon workpiece



Solid PCD Thread Mill

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

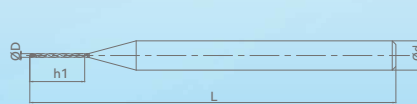


Solid PCD Micro Drill

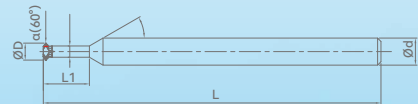
| Cutting Edge Diameter (D) | Cutting Edge Length (h1) | Overall Length (L) | Shank Diameter (d) |
|---------------------------|--------------------------|--------------------|--------------------|
| 0.45 | 7.5 | 40 | 4 |
| 0.5 | 7.5 | 40 | 4 |
| 0.6 | 9 | 40 | 4 |
| 0.8 | 12 | 40 | 4 |
| 1.0 | 15 | 45 | 4 |
| 1.1 | 16.5 | 45 | 4 |
| 1.2 | 18 | 45 | 4 |
| 1.3 | 19.5 | 45 | 4 |
| 1.4 | 21 | 50 | 4 |
| 1.5 | 22.5 | 50 | 4 |
| 1.8 | 27 | 60 | 4 |
| 2.0 | 30 | 60 | 4 |

Solid PCD Thread Mill

| 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) |
|-------|---------------------------|------------------|-----------------|--------------------|------------------|----------------|----------------------|--------------------|--------------------|
| M2.5 | 1.95 | 60° | 0.45 | 1.28 | 6.5 | 15° | 4 | 45 | 4 |
| M3.0 | 2.36 | 60° | 0.5 | 1.63 | 7.5 | 15° | 4 | 45 | 4 |
| M4.0 | 3.19 | 60° | 0.7 | 2.15 | 9.5 | 15° | 4 | 50 | 4 |
| M5.0 | 3.97 | 60° | 0.8 | 2.86 | 10 | 15° | 4 | 50 | 6 |
| M6.0 | 4.9 | 60° | 1.0 | 3.38 | 15 | 15° | 3 | 60 | 6 |
| M8.0 | 6.0 | 60° | 1.75 | 4 | 15 | 15° | 4 | 50 | 8 |
| M10 | 7.95 | 60° | 1.75 | 5.63 | 15 | 15° | 4 | 60 | 10 |
| M12 | 9.95 | 60° | 1.75 | 7.3 | 15 | 15° | 4 | 65 | 10 |



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

