



Empowering High-Tech Industries with Ultra-Precision Machining Solutions:

**Introducing our micro tools for unparalleled precision and
superior microfabrication**

**OSG DIAMOND TOOL
Micro Diamond Department**

Our Vision

We aim for a global leader in the single crystal diamond micro tool marketplace.



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1. What we are doing:

■ **Pioneers in Ultra-Precision Machining Solutions for High-Tech Industries**

- We are a leading company specializing in ultra-precision machining solutions that are applicable across a wide range of high-technology fields.

■ **Cutting-Edge Microtools for Fine, Precision, and High-Grade Machining**

- Our expertise lies in researching, developing, manufacturing, and selling microtools designed for fine, precise, and high-grade machining. Our tools utilize cutting-edge materials such as single-crystal diamond and **poly-crystal diamond (PCD)** for superior performance.

■ **Trusted by Prominent Companies in Automotive, Semiconductor, Medical, and Precision Instrument Manufacturing**

- Our equipment has earned the trust of numerous large-scale companies, who rely on us for their manufacturing processes in the automotive, semiconductor, medical, and precision instrument industries. We are proud to have delivered our cutting-edge solutions to these esteemed partners.



2-1. Proprietary advanced technology

Single crystal diamond

ACC

Both endmills and turning tools are available. They are designed for ultra precision and super-high quality microfabrication. The minimum radius of single flute ball endmill is R5 μ m.

PRIMO

Only endmills are available. They are designed for machining nonferrous metal or plastics.

Poly crystal diamond

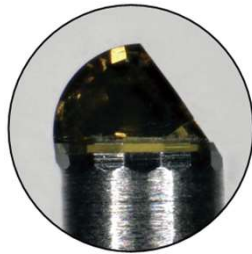
PCD

Various designs are available in order to meet customers' requirements.

2-2. Proprietary advanced technology

Single crystal diamond

ACC



Ball, radius and square endmills with single flute are available. They do not need to screw down the edge made of 2 pieces as the conventional endmills require. Therefore, the effective length can be set in case of diameter or radius size as follows.

Ball : radius $\geq R0.02\text{mm}$ (diameter = 0.04mm)

Radius & Square : diameter $\geq 0.1\text{mm}$

PRIMO



Ball and radius endmills with single flute are available, and each major specification as follows.

Ball : radius \times effective length = $R0.5 \times 3l$,
 $R1 \times 6l$

Radius : diameter \times effective length =
 $1 \times 3l$, $2 \times 6l$

Poly crystal diamond

PCD

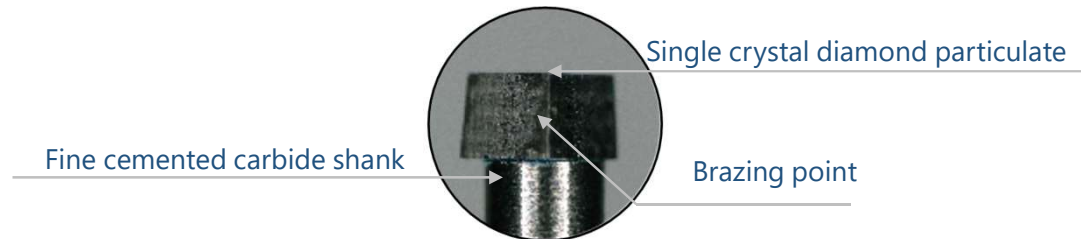


Various designs are available in order to meet customers' requirements.

2-3. Proprietary advanced technology

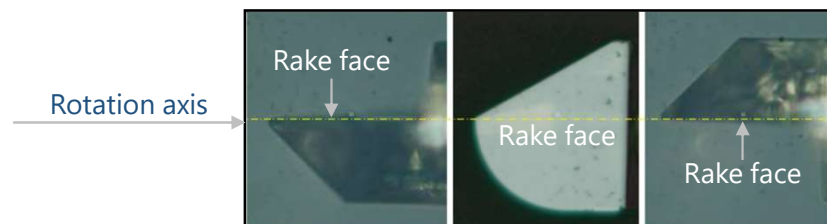
◆ Brazing of micro tools

Technology of brazing single crystal diamond particulates directly on the narrow tip of a fine cemented carbide shank firmly by chemical and physical reaction.



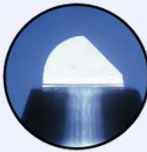
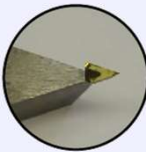
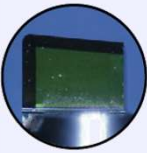

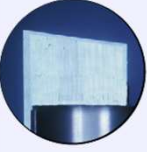
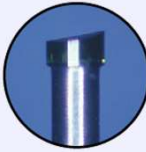
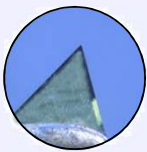

◆ Precision grinding of micro tools

Technology of grinding precisely the rake face or the top of circular arc edge of single flute micro ball endmills within the limit of 3 μm against the rotation axis.



The position of the rake face and the top of arc against the rotation axis. The rake face keeps the same position even if the tool inverted.

2-4. Product aggregate

Overview	Product name	Quality	Overview	Product name	Quality
	Accu ball 【Standard specification】 Radius $0.01 \leq R \leq 3.5$	The cutting edge of Accu ball is formed up to 90° position from the circular arc top in case of radius size $20 \mu\text{m}$ and over, while it is up to 75° position in case of radius size less than $20 \mu\text{m}$. ◇ The effective length can be set in case of radius size of $20 \mu\text{m}$ and over.		Accu bite	Accu bite is a micro turning tool for turning, shaping and fly cutting.
	Accu ball – nano 【Standard specification】 Radius $0.01 \leq R \leq 0.1$	Accu ball-nano is a super high precision single-edged micro ball end mill with the waviness of 100 nm and under. ※ Measurement range of waviness covers within 85° .		Accu bite - nano	◇ Accu bite-nano is a super high precision micro turning tool with the waviness of 100 or 50 nm and under.
Accu radius 【Standard specification】 Diameter $0.035 \leq \phi D \leq 6.0$	◇ The effective length can be set when the diameter of cutting edge is more than $35 \mu\text{m}$. ◇ Available up to the cutting edge diameter of $10 \mu\text{m}$ when the cutting edge angle can be made to more than 15° .	Accu bite - resist		◇ Accu bite resist is a patented long life micro turning tool with the orientations of rake face and flank at $\{111\}$ and $\{113\}$ respectively. $\{111\}$ ◇ Tool life is longer by more than 2 times as compared to conventional ones formed with $\{100\}$ orientations at the both of rake face and flank.	
Accu square 【Standard specification】 Diameter $0.035 \leq \phi D \leq 6.0$	◇ The effective length can be set when the diameter of cutting edge is more than $80 \mu\text{m}$. ◇ Available up to the cutting edge diameter of $10 \mu\text{m}$ when the cutting edge angle can be made to more than 15° .	Accu bite-super groove		◇ Accu bite super groove is a micro grooving tool with the minimal breadth of cutting edge and high-aspect ratio applicable exclusively to square grooving.	
	Accu radius 【Standard specification】 Diameter $0.035 \leq \phi D \leq 6.0$	◇ The effective length can be set when the diameter of cutting edge is more than $35 \mu\text{m}$. ◇ Available up to the cutting edge diameter of $10 \mu\text{m}$ when the cutting edge angle can be made to more than 15° .		Accu drill 【Standard specification】 Diameter $0.1 \leq \phi D \leq 1.0$	◇ Accu drill is designed specifically for machining hard and brittle materials. ◇ The most suitable model can be selected from among 3 kinds of cutting edge shapes according to the purpose of machining. ◇ High grade quality of surface finish to the inner wall of holes is achieved by function of reaming edge equipped with the drill.
	Accu square 【Standard specification】 Diameter $0.035 \leq \phi D \leq 6.0$	◇ The effective length can be set when the diameter of cutting edge is more than $80 \mu\text{m}$. ◇ Available up to the cutting edge diameter of $10 \mu\text{m}$ when the cutting edge angle can be made to more than 15° .		Accu endmill 【Standard specification】 Diameter $0.1 \leq \phi D \leq 1.0$	◇ Accu end mill is designed specifically for machining hard and brittle materials. ◇ Two kinds of cutting edge shapes are available for grooving, surface machining and for counter sinking. ◇ The high grade quality of inner wall of groove is achieved by function of reaming edge equipped with the end mill.
	Accu groove 【Standard specification】 Diameter $\phi D \leq 0.01$	◇ Accu groove is a single-edged micro end mill applicable exclusively to V-shaped grooving. ◇ Available up to the cutting edge diameter of $10 \mu\text{m}$ when the cutting edge angle can be made to more than 15° .		Accu center 【Standard specification】 Nominal diameter $0.5, 1.0$	◇ Accu center is designed specifically for machining hard and brittle materials. ◇ The most suitable type can be chosen from among 3 kinds of cutting edge shapes according to the purpose of machining. ◇ Highly precise pitch of holes can be achieved by using in combination with the Accu drill.



3. Our micro tools

Our endmills are the perfect solution for achieving ultra-fine, precise, and high-quality microfabrication with shrinkage fitting. They enable machines and tools to perform at their maximum potential, delivering exceptional results every time.

Single crystal diamond used for cutting edge



We normally use synthetic crystal diamond. We use natural single crystal diamond only with a few limited items, and only when a customer specifically designate to use them.

Single crystal diamond micro endmills



We've standardized the manufacturing process for single crystal diamond endmills and implemented our proprietary grinding system for micro tool production. This has enabled a rapid delivery system. Our innovation has also unlocked new possibilities for diverse micro cutting edge designs that were previously challenging. As a result, our market reach continues to grow.

PCD (poly crystal diamond) micro rotating tools



We supply PCD micro tools as well in order to meet customers' requirements.

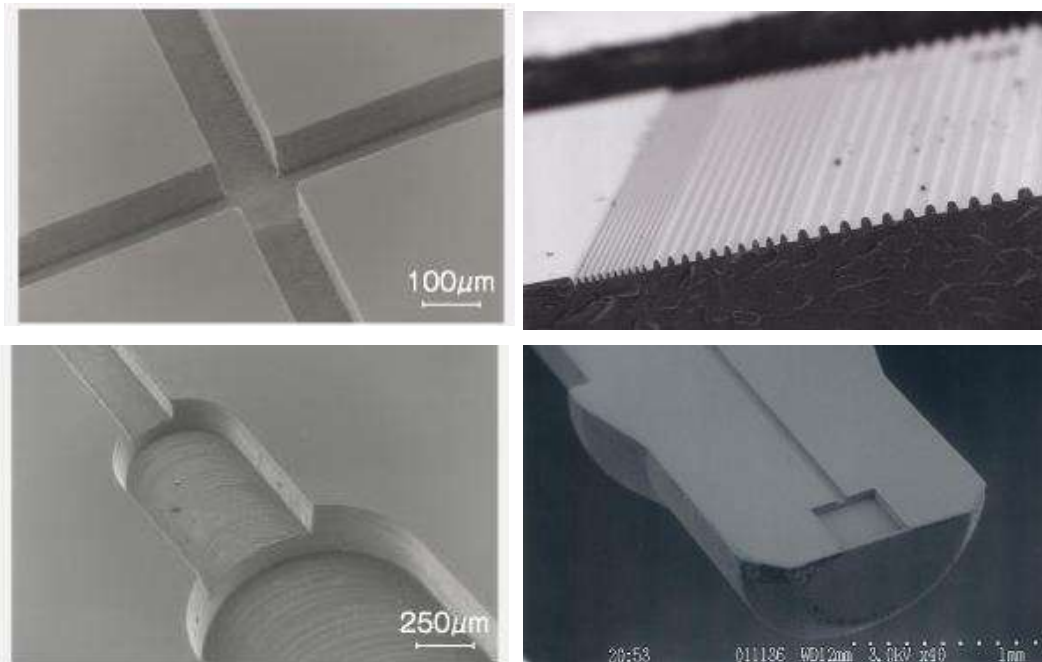
4-1. Micro-Total Analysis System (μ -TAS) Cutting

Advantages of cutting with our ultra-precision single crystal diamond tools

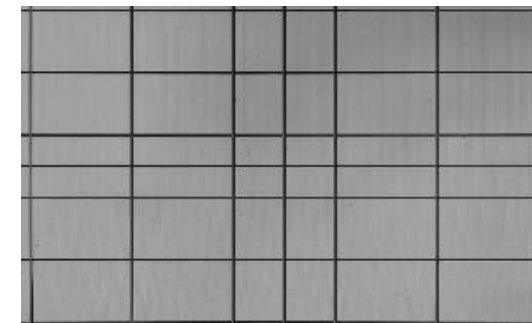
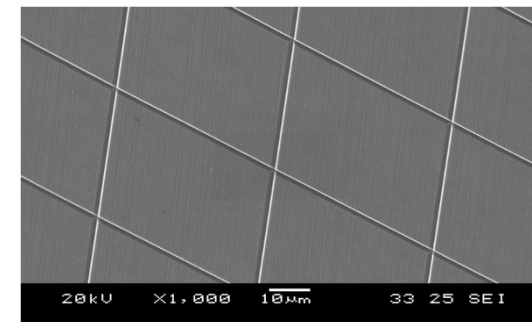
	Cutting process	Electroforming process
Number of processes to molding	2 processes: mold making → molding	More than 4 processes such as inverted mold fabrication process by electroforming
Dimensional Tolerance	$\pm 1\mu\text{m}$	$\pm 5\mu\text{m}$
Delivery timing	Within 1 month	Around 2 months
Error Risk	Low risk due to small number of processes	The number of processes is large, so there is a risk of errors in each process.
Edge sharpness	Superior sharpness	Corners tend to be dull.
Corresponding shapes	Complex shapes can also be accepted.	Limited to simple shapes

4-2. Micro-Total Analysis System (μ -TAS) Cutting

μ -TAS Processing Sample Images

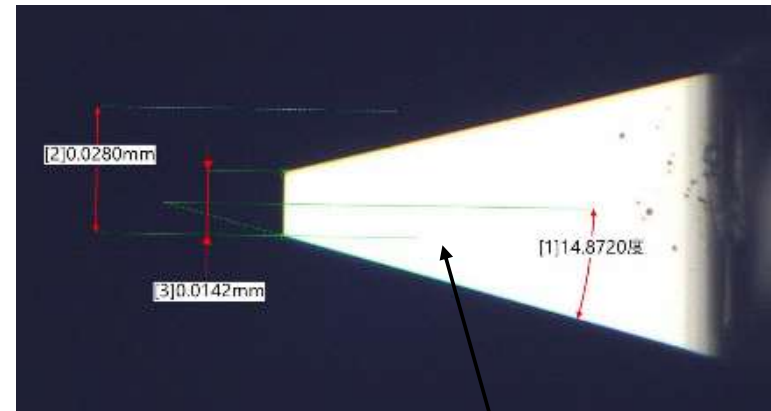
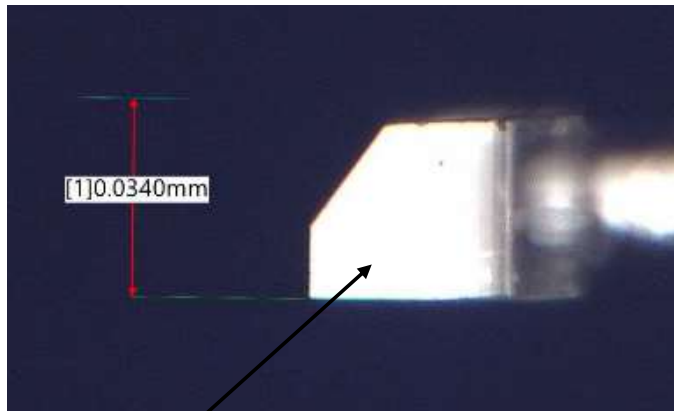


Groove width 0.3 to 1.0 mm, depth 0.5 to 0.8 mm

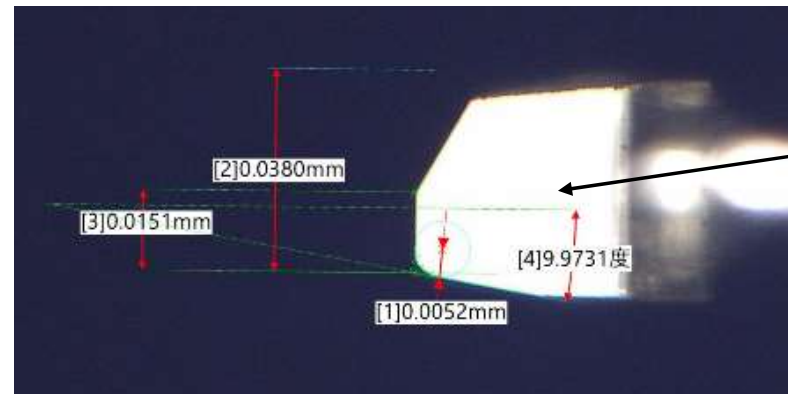


4-3. Micro-Total Analysis System (μ -TAS) Cutting

Single crystal diamond micro tools



Single crystal diamond



Single crystal diamond

5. Our technology is applied in various high-technology fields



Various test workings for end users

Automobile

LED headlights (PES)
Guide Lights
Head-up display



Optical Lense

Camera lenses
Fresnel lenses
DOE

Drilling a huge number of holes in SiC wafer



Medical Lense

Intraocular lenses
Micro-TAS

Finishing hands, dials, bezels and cases



Machine Tools



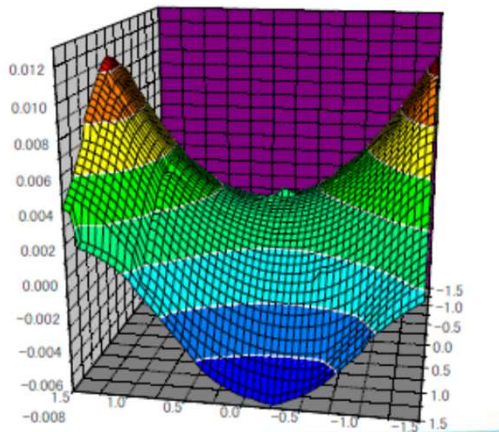
Semiconductor



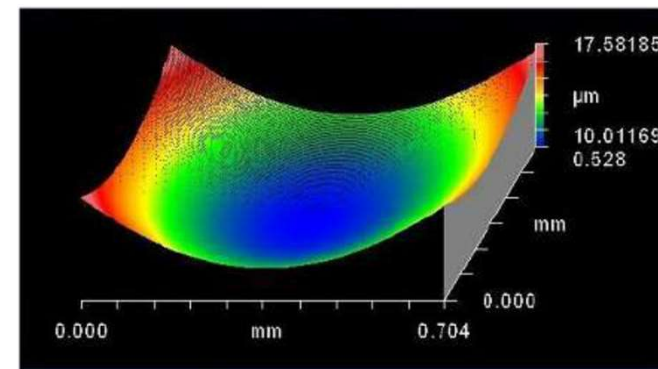
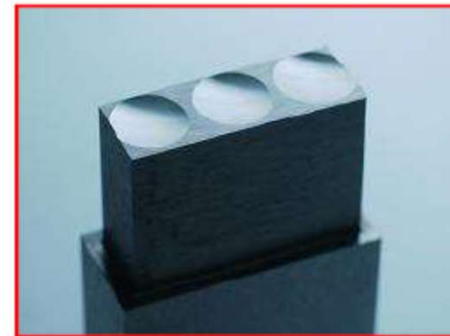
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5-1 Processing examples - Lens

Ni-P Aspherical lens mold
【Riken Corp】

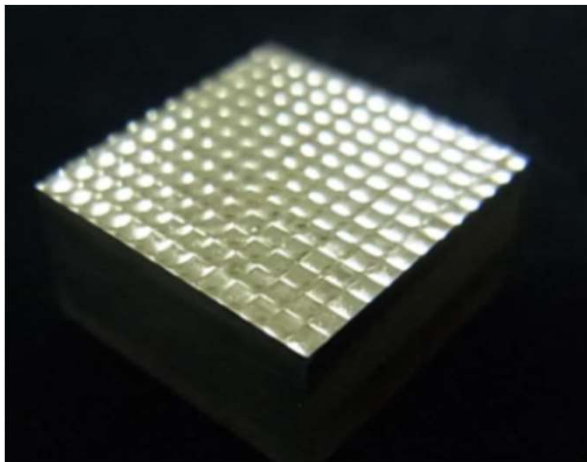


Carbide lens molds
【Fanuc Corp】

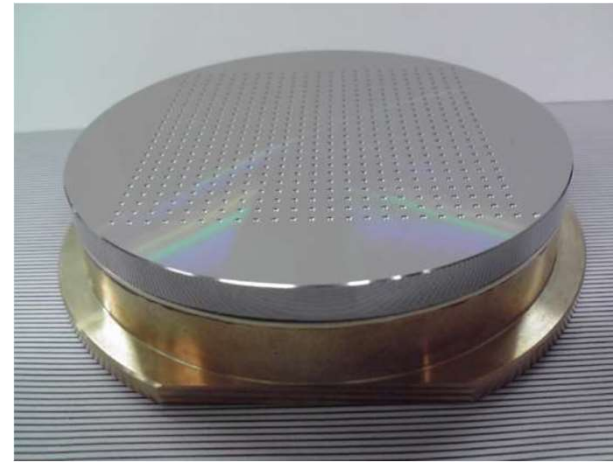


5-2 Processing examples - Lens Array

Ni-P Micro lens array mold
【Kyohei Engineering K.K.】



Ni-P Micro lens array mold
【Chub University】



5-3 Processing examples - Fresnel lens

Ni-P Micro lens array mold
【Kyohei Engineering K.K.】



Acrylic fresnel lens mold
【Ikegami Mold Engineering】

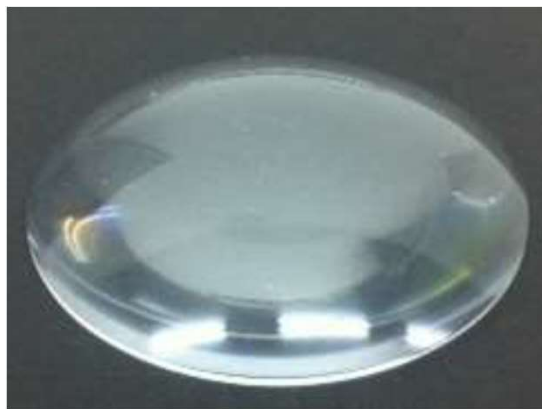


5-4 Processing examples - Resin product processing

Transparent acrylic cutting process
【K.K. S.E.Works】



Transparent acrylic cutting process
【Kyohei Engineering K.K.】



Transparent acrylic cutting process
【Kyohei Engineering K.K.】

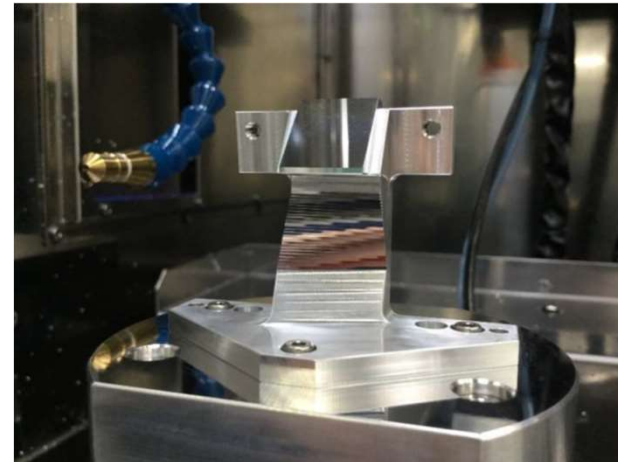


5-5 Processing examples - Non-ferrous metal processing

Aluminum micro cutting (Compact case mold)
【Roku-Roku Sangyo Ltd.】

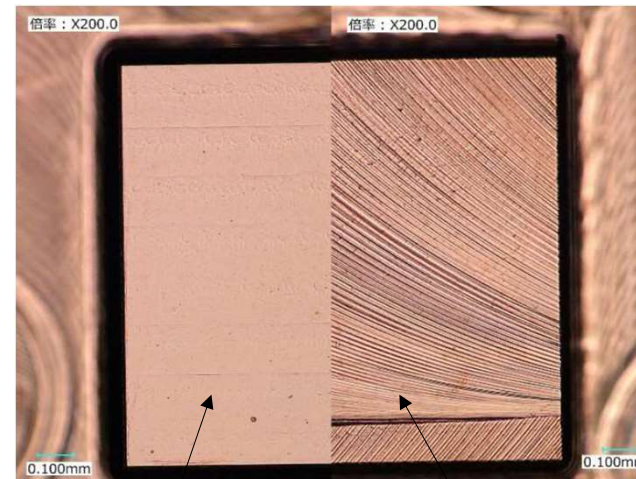
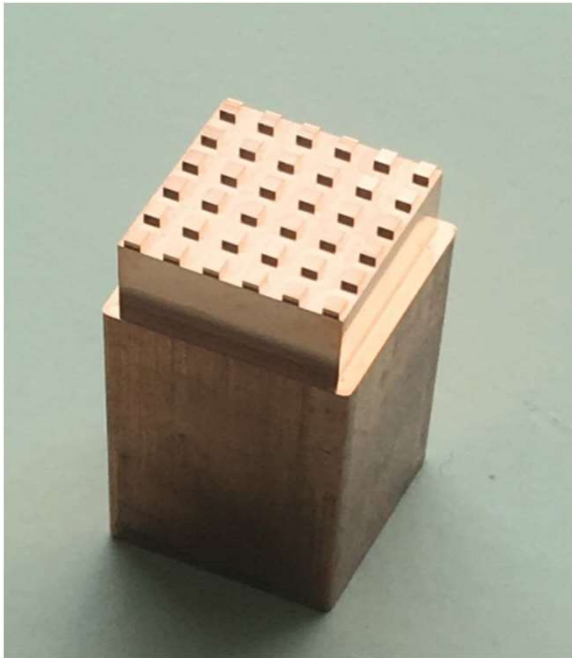


Mirror machined aluminum
【Riken】



5-6 Processing examples - Copper electrode processing

Electrode processing for electrical discharge cutting



Cutting surface with
monocrystalline
diamond tool

Cutting surface with
carbide tools

6. Our Clients

HONDA
The Power of Dreams

KōITō

STANLEY

RICOH



Panasonic

Canon

CASIO

SEIKO

CITIZEN



FANUC



(listed in) no particular order

