KYOWA

Aiming to Be a Solution-Oriented Tool Manufacturer
Introduction to KYOWA CO.,LTD.

CONTENTS

1 KYOWA Tools

1 . KYOWA Tools

The world of micrometer size
Our products play an important role in precision micromachining of electronic devices, medicines, watches, and jewelry.
We offer a lineup of carbide drills with a minimum flute edge diameter of ϕ0.03 or more and carbide end mills with a minimum flute edge diameter of ϕ0.1 or more, both in 0.01 mm increments.
The flute edge diameter and shank diameter are managed in micrometer order.

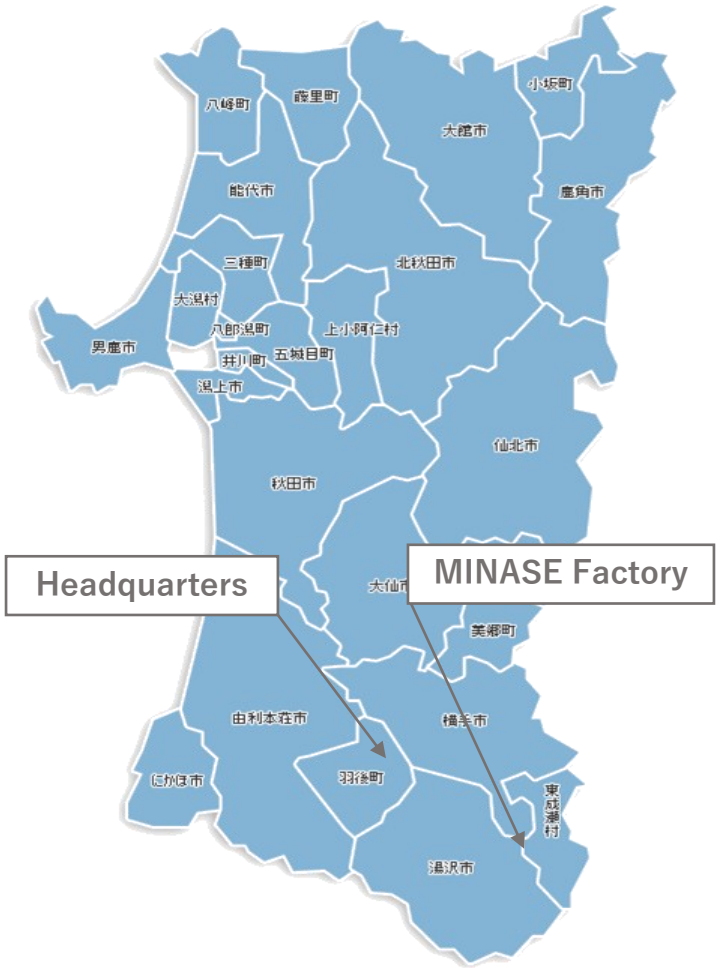
Problems - Solutions
If you don’t have the proper tool to machine workpieces, please contact us.
We specialize in producing made-to-order tools not listed in our catalog.
We strive to help customers reduce costs and increase profits.

Delivering high precision and quality
We offer high-performance tools with cBN (cubic boron nitride) and PCD (polycrystalline diamond) used at the tip.
By selling products using these materials ahead of industry, we achieve highly precise and efficient machining.

60 years since establishment, reliable technology
We have earned high trust from our customers through high-quality products that utilize our accumulated know-how. We also propose solutions to our customers to gain further trust.

2 About Kyowa

2 . About Kyowa　①COMPANY PROFILE



- Corporate name　Kyowa Co., Ltd.
- Established　August 1963
- CEO　Tsuyoshi Suzuki, President
- Capita　10 million yen
- Location
  - Headquarters　Ugo-machi Ogachi-gun, Akita
  - MINASE Factory　Minase, Yuzawa-shi, Akita
  - Kashiwa office　Kashiwa-shi, Chiba
- Employees　70
- Business content
  - Headquarters：　Manufacturing and sales of precision edged tools
  - MINASE Factory：　Manufacturing and sales of wrist watches
- Customer industries　Dies/molds, automobiles, electrical/electronics, jewelry, watches, etc.

2 . About Kyowa ②GREETING

KYOWA strives to maintain the trust of customers by delivering superb value that meets their expectations.

GREETING

As a manufacturer of cutting tools and wrist watches, Kyowa Co., Ltd. has developed its business and refined its technologies with the support and advice of many customers.

Based on the technology and development power built since the corporation's foundation, we will continue to work under the motto of promptly providing customers with reliable and satisfactory products and services.

We have been engaged in the manufacture of cutting tools and wrist watches, two different yet closely related businesses.

Based on the two businesses, we will continue to produce unparalleled unique products.

In addition to the technological and development capabilities built up so far, we will improve our creativity and ingenuity in order to provide customers with even better products.

We would greatly appreciate your further support.

Tsuyoshi Suzuki, President

Company policy	**Humanity:** **Become a person rich in humanity.** **Creativity:** **Motivate yourself to come up with ideas.** **Internationality:** **Learn world-competitive knowledge and technology.**

2 . About Kyowa　③CORE VALUES

Core values of KYOWA.

- **Trust**
  Constantly build the trust and loyalty of customers to KYOWA.
- **Responsibility**
  Complete each task with responsibility.
- **Challenge**
  Embrace change as a source of energy for the future.
- **Speed**
  Handle work promptly to ensure satisfaction and seize new opportunities.
- **Solution**
  Help customers achieve their desires and provide solutions to their problems.
- **Contribution**
  The joy of contributing motivates us.

2 . About Kyowa ④Business Overview

Cutting Tool Business

Material Properties

Tungsten Carbide | cBN | PCD

Shape

Drill | Endmill | Reamer | Cutter

- Specialized in Small Diameter Sizes from ϕ0.1 to ϕ6.0
- In addition to standard products, we also offer customized products

Watch Business

We have our own watch brand (MINASE)

OEM business

- Watch production,
- Watch case production
- Watch bracelet production
- Watch strap production

3 Carbide Tools

3 . Carbide Tools ①Drill

Straight shank

・Flute Diameter：ϕ0.3 to ϕ3.0　0.01Pitch

・Flute Length：10D to 50D

・Feature：Flat-tip 90° with TiAlN coating products available

Micro

・Flute Diameter：ϕ0.03 to ϕ3.0　0.01Pitch

・Flute Length：8D to 10D

・Feature：Long shank flat-tip 90° with DIA and DLC coating products available

Stepped

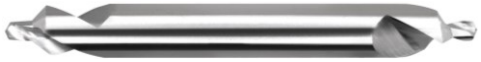
・Flute Diameter：ϕ0.5 to ϕ6.0

・Feature：Both small and large diameters designed for chip evacuation with 30° helix, also drills are available with burr-suppressing feature

Point・Center

・Flute Diameter：ϕ0.5 to ϕ3.0

・Feature：TiAlN-coated products available



・Flute Diameter：ϕ0.3 to ϕ3.0

・Feature： 60° /90° with TiAlN coating available

3 . Carbide Tools ②Endmill

Square

・No.of Flute：1Flute,2Flute,4Flute

・Flute Diameter：ϕ0.1 to ϕ6.0　Minimum 0.01Pitch

・Flute Length：1D to 15D

・ Feature：Rib cutting, OH-type, and long shank available

Radius

・No.of Flute：2Flute,4Flute

・Flute Diameter：ϕ0.5 to ϕ6.0　Minimum 0.1Pitch

・Flute Length：1D to 10D

・Feature：CornerR0.05Pitch,Rib cutting available

Ball

・No.of Flute：2Flute

・ R　：R0.1 to R3.0　Minimum 0.05Pitch

・Flute Length：1D to 12D

・Feature：For rib cutting, with taper and tapered neck available

3 . Carbide Tools ③Endmill

V mill

・Point Angle：30° 45° 60° 70° 80° 90° 120

・Flute Diameter：ϕ0.3 to ϕ6.0 Minimum 0.1Pitch

・Flute Length：2D to 2.5D

・Feature：For chamfering, V-grooving, hole-making, and side milling with R-tipped available

Corner Chamfer

・No.of Flute：2Flute

・Flute Diameter：ϕ1.0 to ϕ12.0 Minimum 0.5Pitch

・Flute Length：2D to 3D

・Feature：C0.1 to C5.0

3 . Carbide Tools ④Cutter,Reamer

Chamfering

・No.of Flute：2Flute,3Flute,4Flute

・Flute Diameter：ϕ0.3 to ϕ10.0

・Feature：Chamfering angles at 45° for regular surface, and others for front and back chamfering, and for back side chamfering available

Key seed

・No.of Flute：4Flute

・Flute Diameter：ϕ0.5 to ϕ12.0

・Feature：In addition to standard shapes, corner radius and external round shapes are available

Marking

・Point Angle：30° 40° 50° 60° 90°

・No.Of Flute：1Flute

・Feature：Flat-tip and radius shapes available. Ideal for engraving and scribing

Reamer

・No.of Flute：4Flute

・Flute Diameter：ϕ0.5 to ϕ12.03 0.01Pitch

・Feature：Bottom-edge designs available for blind holes, and for through holes

4 Tools by Application

4 . Tools by Application

・For Aluminum Processing

Endmill

・No.of Flute：2Flute,3Flute

・Flute Diameter：ϕ0.5 to ϕ16.0

・Feature：With DLC coating, available in square and radius shapes. Supports vertical wall machining, high-strength type, and features right-hand cutting with left-hand helix

・For Resin Processing

Drill

・Flute Diameter： ϕ0.1 to ϕ3.0 Minimum 0.01Pitch

・Feature：Specialized blade shape for resin, excellent cutting performance

Endmill

・No.of Flute：2Flute,3Flute

・Flute Diameter：ϕ0.2 to ϕ12.0

・Feature：Available in square, radius, ball, and rib-specific designs

Cutter

・No.of Flute：3Flute,4Flute

・Flute Diameter：ϕ0.5 to ϕ6.0

・Feature：Available for front and back cutting (straight edge) and back chamfering (right-hand cutting with left-hand helix)

5 cBN Tools

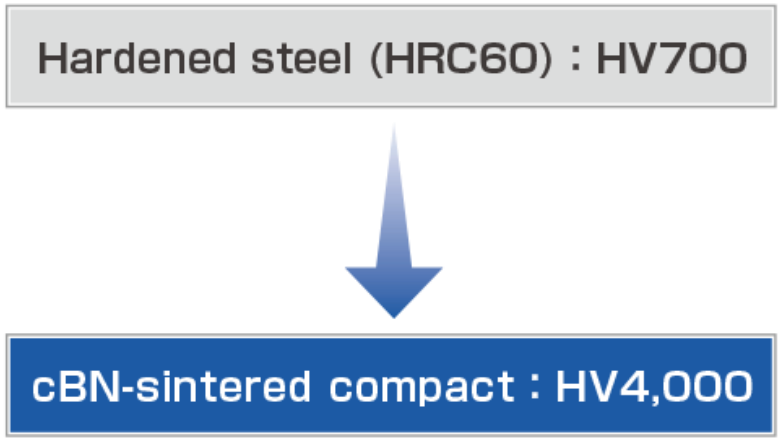
5 . cBN Tools ①About cBN

Cubic Boron Nitride

cBN Tools

Our cBN tools use cubic boron nitride, which has a diamond crystal structure composed of boron and nitrogen. These tools are used for machining iron-based metals and are especially useful for finishing workpieces, such as high-hardened steel, with high efficiency and high precision. When combining them with the polishing method by electric-field abrasive grains (PAT-3595219), machining speed is increased thanks to the excellent machining capability as well as ultra-long service life, high precision, and high quality. The tools are especially useful for direct carving of metal molds.

Proper cutting work requires a tool that is three times harder than the material being cut.



Comparison of tool steels
(performance of cBN)

5 . cBN Tools ②Product Introduction

Endmill

※Shank Diameterϕ4.0&ϕ6.0

※Shank Diameterϕ4.0&ϕ6.0

- Shape：Radius, Ball, Straight Edge, Spiral etc…
- No.of Flute：1Flute,2Flute,3Flute ,4Flute
- Flute Diameter： ϕ0.1 to ϕ6.0
- CR/R：0.01 to 0.5（CR),0.05 to 3.0（R）

V mill

- Shape：Flat-tip and radius tip
- Point Angle：30° 40° 60° 90°

Reamer

- Shape：Engagement section with radius shape
- Flute Diameter：ϕ1.5 to ϕ6.03

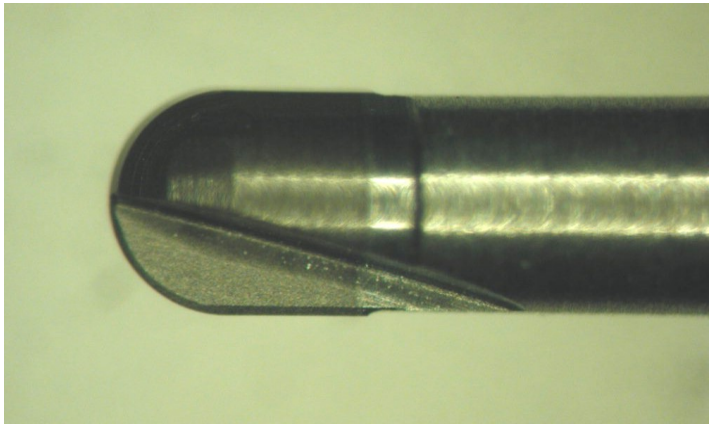
Cutter

- Shape：Straight edge with 3 blades
- Flute Diameter：ϕ0.5 to ϕ6.0

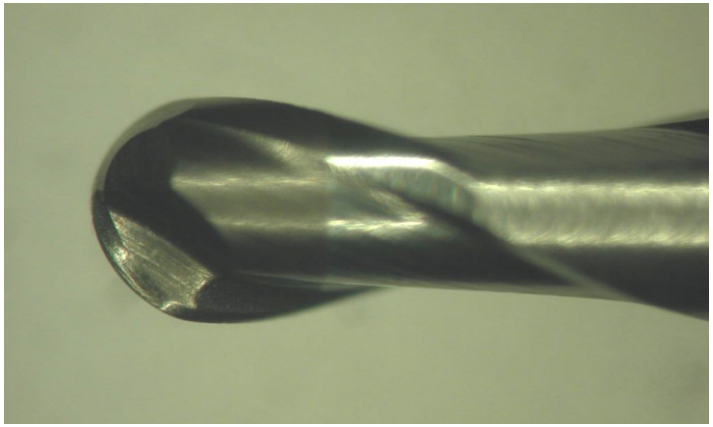
- Shape：45° chamfer angle for front and back chamfering
- Flute Diameter：ϕ1.5 to ϕ6.0

5 . cBN Tools ③Product Features

Straight edge Ball Endmill

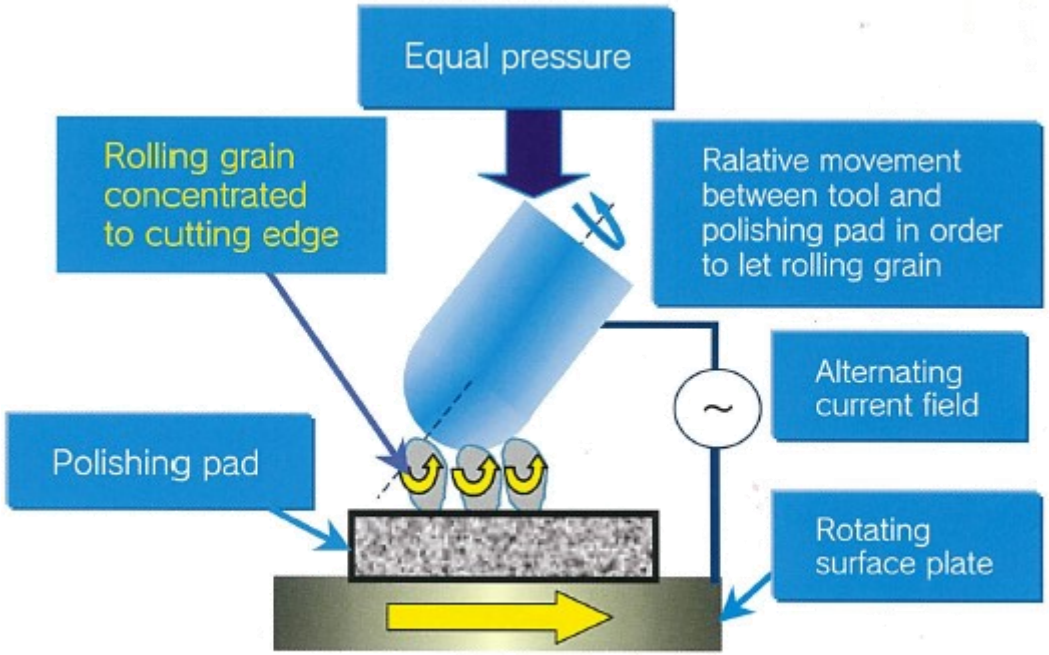


Spiral Ball Endmill



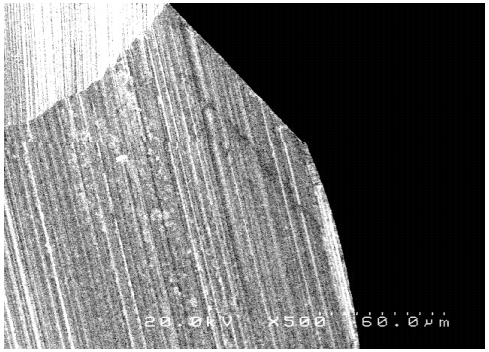
1. Excellent wear resistance and long lifespan	(5 to 10 times that of carbide)
2. Capable of direct engraving on mold materials (HRC60)	(Dry machining capable)
3. Excellent heat resistance enables high-speed cutting	(2 to 4 times that of carbide)
4. Spiral-type tools offer deep cutting due to point contact with workpieces。	(Approximately 3 times compared to straight edge)
5. Straight-flute types are suitable for finishing due to line contact with workpieces	(Final finishing tool)

5 . cBN Tools ④Development of electrostatic abrasive grain control polishing technology



Patent No.3595219

Products made using traditional manufacturing methods



Products made using new manufacturing methods

5 . cBN Tools ⑤Fields of application for our products

Mold

The 'mold' used in mold processing refers to a metal mold for manufacturing products. By pouring and solidifying molten metal or plastic materials into the mold, products with shapes identical to the mold can be created, enabling mass production of the same product.

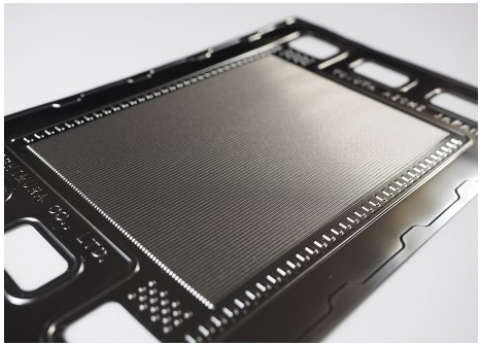
【Micro Channel】

Micro-groove structures used in medical and semiconductor research. Materials include SUS and SKD

https://y-mold.com/technology/micro-channel/

【Separator Mold】

Being used in automotive fuel cells. A separator is a component with fine flow channels designed to carry hydrogen, oxygen, and coolant needed for power generation in fuel cells. The separator also serves as a pathway for the generated electricity, requiring it to be thin, precisely machined with intricate shapes, and manufactured with high dimensional accuracy.



https://www.nishimura-net.co.jp/metal/

6 PCD Tools

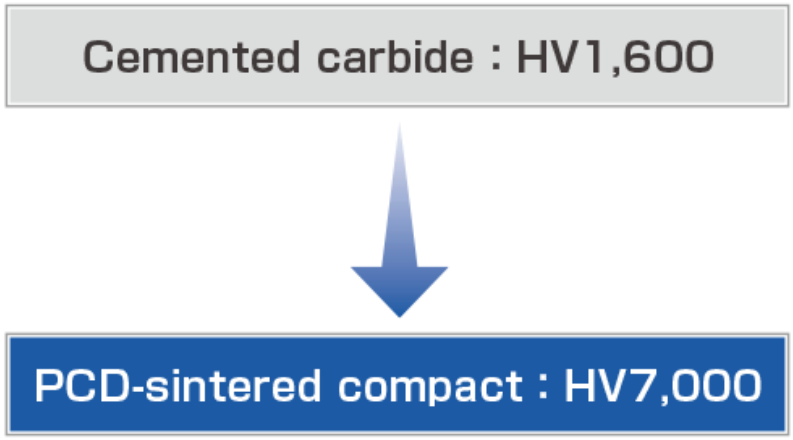
6 . PCD Tools ①About PCD

Poly Crystalline Diamond

PCD Tools

Our PCD tools use polycrystalline and sintered diamonds with hardness second only to natural diamonds and excellent abrasion resistance. Conventional PCD tools are mainly used for finish-cutting of non-ferrous metals such as aluminum, but we have developed machining tools specialized for carbide. We have succeeded in improving the abrasion resistance of the flute edge during carbide machining by two to three times compared to conventional tools.

Proper cutting work requires a tool that is three times harder than the material being cut.



Comparison of tool steels
(performance of PCD)

6 . PCD Tools ②Product Introduction

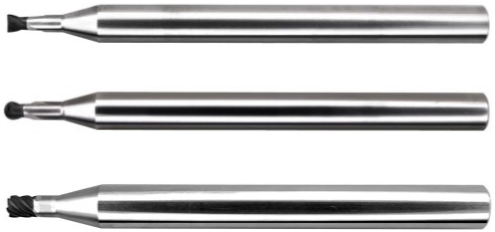
Straight Edge Endmill

・Shape：Radius, Ball

・Flute Diameter：ϕ0.4 to ϕ2.0

・ CR/R：0.05 to 0.2（CR),0.2 to 1.0（R）

Spiral Endmill



・Shape：Square, radius, ball

・Flute Diameter：ϕ0.2 to ϕ6.0

・CR/R：0.05 to 0.1（CR),0.1 to 1.5（R）

・ Feature：In the radius category, we offer a lineup of 4-flute and 6-flute tools with a 45° helix angle

Drill

・No.of Flute：1Flute,2Flute,4Flute

・Flute Diameter ：ϕ0.3 to ϕ3.0

・ Feature：Center drills and point drills available

6 . PCD Tools ③Product Features

・PCD Ball Endmill For Tungsten Carbide

⇒Specialized for finishing in carbide machining

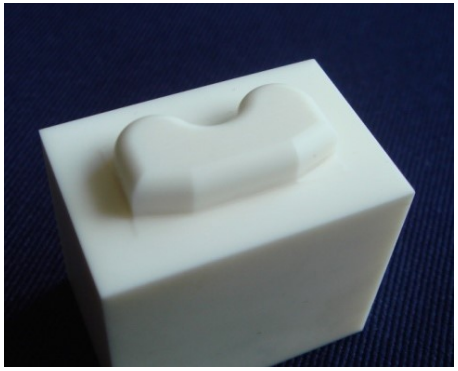
・PCD Spiral Ball Endmill

⇒Applications for machining non-ferrous metals and ceramics.

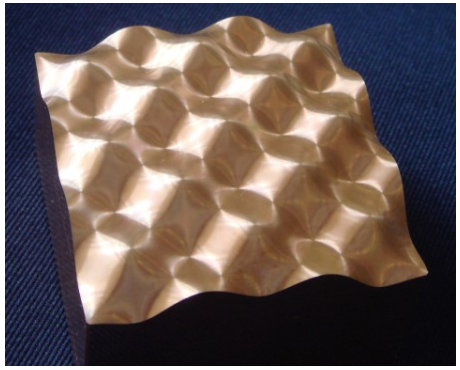
☝ Capable of mirror finishing on carbide, ceramics, aluminum, and copper

Workpiece：Tungsten Carbide

Workpiece：Ceramics



Workpiece：Brass



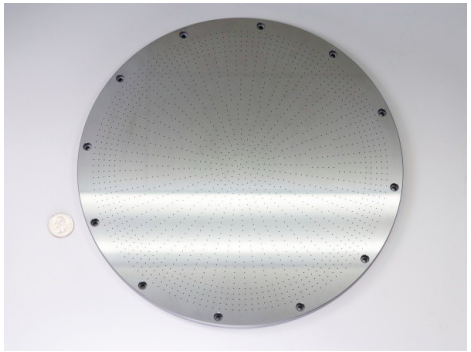
6 . PCD Tools ④Fields of application for our products

Hard-brittle material

Hard-brittle materials refer to substances such as carbide, ceramics, quartz glass, and zirconia, which are extremely hard and brittle. These materials are called hard-brittle due to their hardness and brittleness. They possess excellent properties such as corrosion resistance, wear resistance, and mechanical strength, making them widely used in industrial machinery components.

【Shower plate】

Products used in semiconductor manufacturing equipment. Materials include single-crystal silicon, quartz glass, and aluminum.



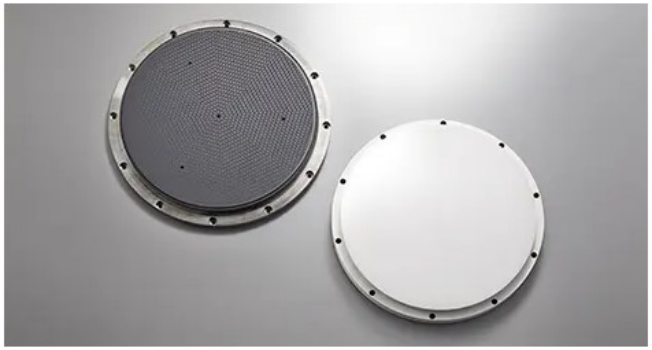
https://search.yahoo.co.jp/image/search?p=%E3%82%B7%E3%83%A3%E3%83%AF%E3%83%BC%E3%83%97%E3%83%AC%E3%83%BC%E3%83%88&ei=UTF-8&aq=-1&oq=#d92102571e23acfc752cfbced7e30012

【Electrostatic chuck】

Products used in semiconductor manufacturing processes. The material is primarily alumina.

【Probe card】

Products used in semiconductor inspection processes. The material includes ceramics and others.



https://jp.toto.com/products/ceramics/elewafer/

7 Improvement Examples

7 . Improvement Examples ①

Tool improvement examples for automotive component machining

Tool	Workpiece	Cutting Conditions			Other Company		Proposal		
		Revolution (rpm)	Cutting Speed (m/min)	Feed (mm/rev)	Life Span	Phenomenon	Summary	Coating	Result
Carbide stepped drill Φ2.0 x Φ7.0	SUS440C	6,000	37.7 (Φ2.0)	0.04	600Hole	Burr	Turbo Drill	TiALN⇒TiSIN	・No burrs ・600Hole→900Hole
Carbide stepped drill Φ7.0 x Φ14	SUS440C	1,700	37.6 (Φ7.04)	0.1 (0.05)	600Hole	Burr and edge defects	Turbo Drill	Cr系⇒TiSIN	・No burrs ・Reduction in edge defects ・600Hole→1.00Hole
Carbide stepped drill Φ4.8 x Φ8.0	S45CF	2,300	34.7 (Φ4.8)	0.15	1.200Hole	-	Turbo Drill	TiCN⇒TiCN	・1,200Hole→1.600Hole
CBN Endmill ϕ0.75	SCM415 HRC57～65	45,000	106.7	0.002	800Hole	-	CBN (他社同等形状)	-	・Approximately 20% reduction in tool costs ・800Hole→1.000Hole
6Flute Reamer Φ5.5	SCM415 HRC57～65	500	9	0.08	-	Hole diameter accuracy and instability	Carbide⇒CBN	-	・Stability of hole diameter accuracy
Carbide Drill ϕ1.0	SCS13A (SUS304 相当)	18,000	56.5	0.017	2.000Hole	Breakage and chipping	Material Change	TiSIN⇒Non-Coat	・2.000Hole→6.000Hole (No breakage)
Carbide Center Drill Φ2.0 x 90°	SCS13A (SUS304 相当)	8,000	30.1	0.038	1.000Hole	Burrs and chatter	Change of tip shape (W Angle Shape)	TiALN⇒TiSIN	・Burr reduction ・Chatter reduction ・1.000Hole→2.000Hole

7 . Improvement Examples ②

Tool improvement examples for automotive component machining

Tool	Workpiece	Cutting Conditions			Other Company		Proposal		
		Revolution (rpm)	Cutting Speed (m/min)	Feed (mm/rev)	Life Span	Phenomenon	Summary	Coating	Result
Special End Mills Φ1.54 xR0.8	A5052	18,000	600	—	400Piece	Burr	Coating Change	DLC⇒DLCACX	・No burrs ・400Piece→750Piece
PCD Endmill Φ2.5 xR0.3	ADC12	12,000	95	0.08	Tungsten Carbide	Surface roughness and short lifespan	Carbide⇒PCD	—	・Good surface roughness ・Improved lifespan
Carbide stepped drill Φ1.54 x Φ3.0	ADC12	7,500	30	0.03	Standard Tools	Two Stage Process	Breakage prevention measures	—	・Improved lifespan
Carbide stepped drill Φ2 .0x Φ4.0	ADC12	8,000	30	0.03	Standard Tools	Two Stage Process	Shortening process	—	・Reduction in processing time
Carbide Drill Φ2.65	ADC12	6,000	50	0.08	Standard Tools	Two Stage Process	Standard tool to specialized tool	—	・Reduction in processing time ・ Improved lifespan

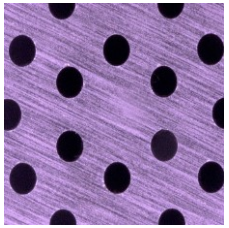
8 Machining Examples

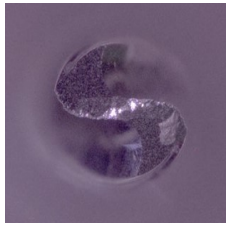
8 . Machining Examples ①Processing of monocrystalline silicon

Brittle material processing

Processing of monocrystalline silicon


workpiece to be processed


Enlarged image of hole


2,742 holes processed

Work Details	:	Monocrystalline silicon　ϕ100xt10
Machine used	:	Sodick JF500L
Processing content	:	Drilling Hole diameter 0.75 mm, depth 7 mm, number of holes 2,742 *Has experience up to 8,000 holes
Use of tools	:	Special PCD Drills ϕ0.75

Cutting conditions

Revolution (min^{-1})	Feed (mm/rev)	Step (mm)	Cutting oil	Machining Time (Hours.)
13,000	0.0007	0.3	Water-soluble	75

POINT

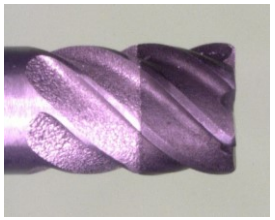
- This drill is specially designed for high-brittle materials with a multi-stage angle at the tool tip.
- The cutting resistance is radially The cutting resistance is radially dispersed and high hole quality can be obtained.
- The cutting resistance is distributed in the radial direction and high hole quality can be obtained.

8 . Machining Examples ②Quartz glass processing

Brittle material processing

Quartz glass processing

workpiece to be processed


Tool image after machining

Work Details : Quartz glass W100xH50xD10

Use of tools : 1. PCD Drill DRD-2200 ϕ2.0

2. PCD Corner R End Mill DSR Series ϕ2.0xR0.1 6 Flutes

Processing content : Letter engraving: letter width 2 mm, depth 5 mm

Machine used : HASEGAWA PM250

Cutting conditions

No.	Process engineering	Revolution (min-1)	Feed (mm/min)	Depth of cut (mm)	Cutting oil	Machining Time (min)	Cutting length (m)
1	Starting point drilling 9Hole	4,000	4	0.4	Water-soluble	35.3	0.05
2	Letter engraving	18,000	120	0.2	Water-soluble	116.3	8.39

POINT

- Rough to finish machining of hard and brittle materials.
- Direct carving of hard and brittle materials such as hard and brittle materials is possible.

8 . Machining Examples ③Zirconia Processing

Brittle material processing

Zirconia Processing

workpiece to be processed

Work Details	:	Zirconia (white . Black) watch parts
Machine used	:	FANUC ROBODRILL α-D21Mi B5 Plus
Processing content	:	Groove processing
Use of tools	:	PCD Corner R End Mill DSR Series φ2.0xR0.1 6 Flutes

Cutting conditions

Revolution (min^{-1})	Feed (mm/rev)	Depth of cut (mm)	Cutting oil	Machining Time (Hours.)
10,000	30	ae0.2	Water-soluble	70

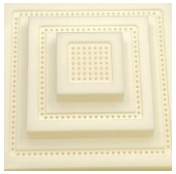
POINT

- Direct carving is available for rough to finish machining of hard and brittle materials.
- The amount of infeed is 4 times greater than that of electroplated tools.

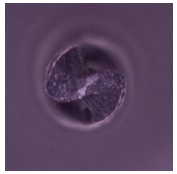
8 . Machining Examples ④Alumina processing

Brittle material processing

Alumina processing

workpiece to be processed

Tool image after machining

Work Details	:	Alumina 99.5%　W50xH30xD50　※Pre-processed shape is stepped
Use of tools	:	1. Special PCD Drills ϕ0.75

2. PCD Corner R End Mill DSR Series ϕ2.0xR0.1 6 Flutes

Processing content	:	Hole diameter ϕ0.75, depth 3mm, number of holes 225 / pocket range □12mm, groove width 2mm, depth 0.5mm
Machine used	:	FANUC ROBODRILL α-D14Mi B5 Plus

Cutting conditions

No.	Process engineering	Revolution (min-1)	Feed (mm/min)	Depth of cut (mm)	Cutting oil	Machining Time (min)	Cutting length (m)
1	Pocket, groove	10,000	100	0.025	Water-soluble	80	7.9
2	Drilling	10,000	100	0.005	Water-soluble	1,575	—

POINT

- End milling section
  Surface roughness＝Ra0.4377～0.6404/R=0.2027 μm
  Flatness＝Wt0.2727～0.4628/R=0.1901 μm
- Drilling section
  ϕ dimension measured value＝0.749～0.755/R=0.006 μm
  Depth wear value＝ 3.003～2.949/R=0.054 μm
- **10 times more processable than electroplated tools in hole drilling**

8 . Machining Examples ⑤Machining of cemented carbides

Brittle material processing

Machining of cemented carbides

workpiece to be processed

Using the Tool Portrait

Work Details	:	Carbide carbide (V30 equivalent) W285㎜xD92㎜xH303㎜ ※Size of Shogi piece
Use of tools	:	(Rough) Diamond-coated end mill R0.5 (special product)
		(Finishing) PCD Ball End Mill DCBE Series R0.5
Processing content	:	Character engraving (Shogi piece, Osho)

Cutting conditions

No.	Process engineering	Revolution (min-1)	Feed (mm/min)	Depth of cut (mm)	Cutting oil	Machining Time (min)	Cutting length (m)
1	Rough	60,000	100	0.01	Semi-dry	—	—
2	Finishing	60,000	20	0.002	Semi-dry	—	—

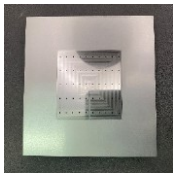
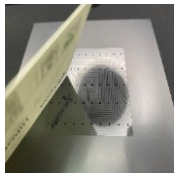
POINT

- Suitable for semi-finish to finish machining with PCD material specifications suitable for machining cemented carbide.
- Smooth cutting edges are realized by special cutting edge finishing technology.
  Surface roughness：Ra0.01μm

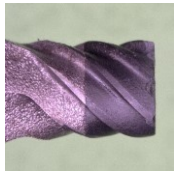
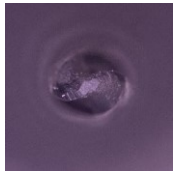
8 . Machining Examples ⑥Silicon carbide processing

Brittle material processing

Silicon carbide processing

workpiece to be processed

Tool image after machining

Work Details	:	Silicon carbide W100xH100xD10
Use of tools	:	1. Special PCD Drills ϕ0.75
		
		2. PCD Corner R End Mill DSR Series ϕ2.0xR0.1 6 Flutes
		
Processing content	:	Hole diameter ϕ0.75, depth 3 mm, number of holes 50/pocket □50 mm, depth 0.05 mm
Machine used	:	FANUC ROBODRILL α-D14Mi B5 Plus

Cutting conditions

No.	Process engineering	Revolution (min-1)	Feed (mm/min)	Depth of cut (mm)	Cutting oil	Machining Time (min)	Cutting length (m)
1	Pocket, groove	10,000	50	0.01	Water-soluble	480	23.5
2	Drilling	10,000	50	0.005	Water-soluble	750	—

POINT

・End milling section
Surface roughness＝Ra0.0427～0.0554/R=0.0127 μm
Flatness＝Wt0.9317～03.3159/R=2.3842 μm

・Drilling section
ϕ dimension measured value＝0.743～0.752/R=0.009 μm
Depth wear value＝ 2.921～2.805/R=0.116 μm

・**Comparison with electroplated tools shows that it is possible to machine twice as long in hole drilling and 10 times as long in end milling.**

8 . Machining Examples ⑦Processing of hardened steel

Hardened steel processing

Processing of hardened steel

workpiece to be processed

Using the Tool Portrait

Work Details	：	Stainless steel（HRC57）W260㎜xD82㎜xH290㎜ ※Size of Shogi piece
Use of tools	：	(Rough) cBN spiral ball end millcBN spiral ball end mill SBBEF series R0.5
		(Finishing) cBN ball end mill BBEF series R0.5
Processing content	：	Character engraving (Shogi piece, silver general)

Cutting conditions

No.	Process engineering	Revolution (min-1)	Feed (mm/min)	Depth of cut (mm)	Cutting oil	Machining Time (min)	Cutting length (m)
1	Rough	60,000	200	0.03	Semi-dry	—	—
2	Finishing	60,000	40	0.005	Semi-dry	—	—

POINT

・Enables direct carving of high-hardness materials and hardened steel, and high -efficiencymachining with high feed rate.

・Smooth cutting edges achieved by special cutting edge finishing technology.
Surface roughness：Ra0.05μm

8 . Machining Examples ⑧Titanium alloy processing

Iron processing

Titanium alloy processing

workpiece to be processed

Reference image

Work Details : 64 Titanium watch parts

Use of tools : 1. Carbide Luma type drill with TiAlN coating KDRA series ϕ1.8

2. Carbide Miniature End Mill with TiAlN Coating KMSEA Series ϕ3.0

Processing content : Shape machining of each part

Machine used : FANUC ROBODRILL α-D21Mi B5 Plus

Cutting conditions

No.	Process engineering	Revolution (min-1)	Feed (mm/min)	Depth of cut (mm)		Cutting oil	Machining Time (min)	Cutting length (m)
1	Drilling	8,842	88	0.5		Water-soluble	0.5	43.7
2	Shape processing	4,775	115	ap –	ae –	Water-soluble	22	2,646

POINT

・Both drills and end mills are coated,The lineup ranges from ϕ0.1 to ϕ3.0 in 0.01 increments.

8 . Machining Examples ⑨Titanium alloy processing

Iron processing

Titanium alloy processing

workpiece to be processed

Work Details : 64 Titanium syringe (imitation)

Use of tools :

1. Carbide Miniature End Mill with TiAlN Coating KMSEA Series ϕ0.6

2. Carbide 1-blade engraving cutter (R tip) YTBC series 30° xR0.05

3. Carbide Ball End Mill with TiAlN Coating YSEBDS Series R1.5

Processing content : Company logo, scale, flange

Machine used : FANUC ROBODRILL α-D21Mi B5 Plus

Cutting conditions

No.	Process engineering	Revolution (min-1)	Feed (mm/min)	Depth of cut (mm)		Cutting oil	Machining Time (min)	Cutting length (m)
1	Company logo	22,282	98	ap0.15-0.5	ae0.2-0.1	Water-soluble	38.6	4.1
2	Scale	23,000	115	ap0.025	ae－	Water-soluble	17.6	2.0
3	Flange	10,610	850	ap0.3-0.05	ae0.6-0.05	Water-soluble	35.8	30.4

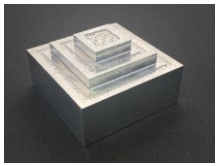
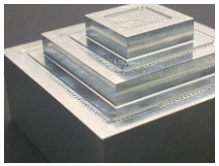
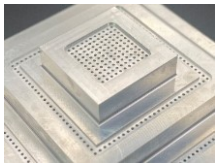
POINT

・A wide range of blade diameters, angles, and tip R sizes are available.

8 . Machining Examples ⑩Aluminum alloy machining

Aluminum processing

Aluminum alloy machining

workpiece to be processed

Work Details	:	Aluminum alloy A7075 W50xH30xD50 ※Pre-processed shape is a square block

Use of tools :

1. Carbide End Mill for Aluminum Machining with DLC Coating ALERT Series ϕ10xR0.5

2. Carbide End Mill for Aluminum Machining with DLC Coating ALES Series ϕ2.0

3. Carbide Luma type drill with DLC coating KDR-DLC series ϕ0.5

Processing content	:	Hole diameter ϕ0.5, depth 3mm, number of holes 393 / pocket range □12mm, groove width 2mm, depth 0.5mm
Machine used	:	OKUMA MB-56V（Endmill）/Sodick UH430L（Drill）

Cutting conditions

No.	Process engineering	Revolution (min-1)	Feed (mm/min)	Depth of cut (mm)		Cutting oil	Machining Time (min)	Cutting length (m)
1	Shape processing	5,000	2,000	ap5.0	ae0.5	Air	3	7
2	Pocket, groove	6,000	1,000	ap0.25	ae－	Air	3	0.7
3	Drilling	7,643	305	0.1		Oil-based	60	—

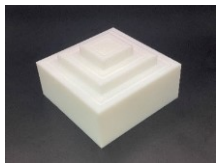
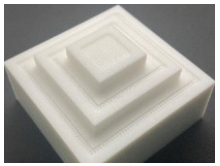
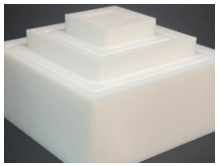
POINT

・Less welding and burring, and can be processed under about twice the conditions of equivalent products from other companies.

8 . Machining Examples ⑪Processing of fluoroplastic

Resin processing

Processing of fluoroplastic

workpiece to be processed

Work Details	:	Fluoroplastic W50xH30xD50 ※Pre-processed shape is a square block
Use of tools	:	1. Carbide End Mill for Resin Machining CR-LS-YSPS Series φ10xR0.2
		2. Carbide end mill for resin machining YSPS series φ2.0
		3. Carbide Luma type drill for resin processing YSPDR series φ0.5
Processing content	:	Hole diameter φ0.5, depth 3mm, number of holes 393 / pocket range □12mm, groove width 2mm, depth 0.5mm
Machine used	:	OKUMA MU400VA

Cutting conditions

No.	Process engineering	Revolution (min-1)	Feed (mm/min)	Depth of cut (mm)		Cutting oil	Machining Time (min)	Cutting length (m)
1	Shape processing	6,000	2,000	ap5.0	ae0.5	Air	2	7
2	Pocket, groove	6,000	800	ap0.5	ae –	Air	2	0.3
3	Drilling	10,000	50	–		Water-soluble	20	—

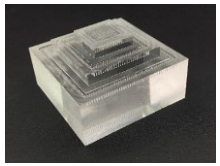
POINT

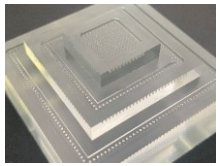
・The blade shape is specially designed for resin, which results in less burrs and better machined surfaces.

8 . Machining Examples ⑫Processing of acrylic resin

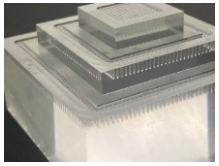
Resin processing

Processing of acrylic resin





workpiece to be processed



Work Details	:	Acrylic resin W50xH30xD50 ※Pre-processed shape is a square block
Use of tools	:	1. Carbide End Mill for Resin Machining CR-LS-YSPS Series ϕ10xR0.2
		2. Carbide end mill for resin machining YSPS series ϕ2.0
		3. Carbide Luma type drill for resin processing YSPDR series ϕ0.5
Processing content	:	Hole diameter ϕ0.5, depth 3mm, number of holes 393 / pocket range □12mm, groove width 2mm, depth 0.5mm
Machine used	:	OKUMA MU400VA

Cutting conditions

No.	Process engineering	Revolution (min-1)	Feed (mm/min)	Depth of cut (mm)		Cutting oil	Machining Time (min)	Cutting length (m)
1	Shape processing	6,000	2,000	ap5.0	ae0.5	Air	2	7
2	Pocket, groove	6,000	800	ap0.5	ae –	Air	2	0.3
3	Drilling	10,000	50	–		Water-soluble	20	—

POINT

・The blade shape is specially designed for resin, which results in less burrs and better machined surfaces.

9 Special Tools

9 . Examples of specialized tool manufacturing range①Tungsten Carbide

◆Step Drill

Tip Diameter	Shank Diameter	Total Length	Taper	With chamfering edge	Corner R	No.of Flute
φ0.3～	φ3.0～φ16	～200mm	—	○	—	2～3

◆Burnishing Drill

Tip Diameter	Shank Diameter	Total Length	Taper	With chamfering edge	Corner R	No.of Flute
φ0.5～	φ3.0～φ16	～200mm	—	○	—	2

◆Half-moon Drill/Cutter

Tip Diameter	Shank Diameter	Total Length	Taper	With chamfering edge	Corner R	No.of Flute
φ0.3～	φ3.0～φ16	～200mm	○	○	○	1

◆Bite

Tip Diameter	Shank Diameter	Total Length	Taper	With chamfering edge	Corner R	No.of Flute
—	φ3.0～φ16	～200mm	○	—	○	1

◆Taper Endmill

Tip Diameter	Shank Diameter	Total Length	Taper	With chamfering edge	Corner R	No.of Flute
φ0.1～	φ3.0～φ16	～200mm	○	—	○	2～4

◆Reamer

Tip Diameter	Shank Diameter	Total Length	Taper	With chamfering edge	Corner R	No.of Flute
φ0.5～	φ3.0～φ16	～200mm	○	○	○	2～6

◆T type Cutter

Tip Diameter	Shank Diameter	Total Length	Taper	With chamfering edge	Corner R	No.of Flute
φ1.0～	φ3.0～φ16	～200mm	—	—	○	2～10

◆Special Cutter

Tip Diameter	Shank Diameter	Total Length	Taper	With chamfering edge	Corner R	No.of Flute
φ1.0～	φ3.0～φ16	～200mm	—	—	—	2

※Coating：We accept such requests and ordersTiN,TiCN,TiAlN,TiSiN,CrN,DIA.

※The minimum order quantity is 2 pieces. (For spiral end mills, the minimum is 5 pieces.)

9.特殊工具 製作範囲例　②PCD/cBN

NEWS! 従来、「超硬」のみ特殊形状対応をいたしておりましたが、「PCD」「cBN」についても特殊形状対応が可能となりました！
You can also order special shapes of PCD and CBN.

cBN エンドミル CBN ENDMILL Series

・焼き入れ鋼 Hardend Material (HRC40~HRC65)
≪STAVAX・NAK80・SKD11・SKH etc.≫

Ball type ネジレ型、直刃型 Spiral flutes & Straight flutes
- Size : R0.1~R3.0
- 2Flutes~3Flutes

Corner R type ネジレ型、直刃型 Spiral flutes & Straight flutes
- Size : Φ0.3~Φ6.0
- Size : R0.02~R0.5

V type 直刃型 Straight flutes
- Edge angle : 30°~90°

Reamer type ネジレ型 Spiral flutes
- Size : Φ1.5~Φ6.03

Cutter type 直刃型 Straight flutes
- Size : R0.1~R3.0
- 2Flutes~3Flutes

PCD エンドミル PCD ENDMILL Series

・非鉄金属（アルミ合金、グラファイト、セラミック etc.)
Non-ferrous metal material (Alminum, Brass, Glass, Graphite etc.)

Special for solid carbide 直刃型 Straight flutes
- Size : Φ0.5~Φ2.0
- Size : R0.2~R1.0

Drill type ネジレ型 Spiral flutes
- Size : Φ0.3~Φ3.0

Ball type ネジレ型 Spiral flutes
- Size : R0.1~R3.0
- R tolerance ±0.003

Square type ネジレ型 Spiral flutes
- Size : Φ0.1~Φ6.0

Thank you for your attention.