

SUMICRYSTAL

M49–M52

M

M

SUMICRYSTAL

SUMIDIA
SUMIDIA Binderless

SUMICRYSTAL

SUMICRYSTAL

SUMICRYSTAL M50
SUMICRYSTAL UP M51
SUMICRYSTALPD / PDX M52

Synthetic Single Crystal Diamond SUMICRYSTAL

General Features

SUMICRYSTAL is a large grained, high-purity single crystal diamond which our company, the first in the world, has succeeded in producing for industrial applications.

SUMICRYSTAL is manufactured under stringent quality control to achieve stable quality and is best suited for industrial use.

Manufacturing Method

Synthetic single crystal diamond SUMICRYSTAL is grown from a seed crystal, using the temperature difference between the carbon raw material and seed crystal, within a super high pressure chamber similar to the one shown in the diagram, at 5~6GPa and 1,300~1,600°C. The crystals are grown under stringent controlled pressures and temperatures to consistently obtain crystals of uniform shape with low impurities.

Characteristics

SUMICRYSTAL has 4 advantages when compared to natural diamond. The first is its shape. Natural diamonds are rounded and its crystal orientation is difficult to determine with the naked eye. SUMICRYSTAL has distinct crystal face which makes identification easier. Second is its uniformity. Consistent quality is obtained by growing the crystals under industrially controlled conditions. The third advantage is that SUMICRYSTAL can be mass produced unlike the limited supply natural diamonds. The fourth advantage is physical properties. SUMICRYSTAL type Ib for cutting tools, contains a small amount of nitrogen impurities but has better mechanical and thermal properties compared to natural diamonds.

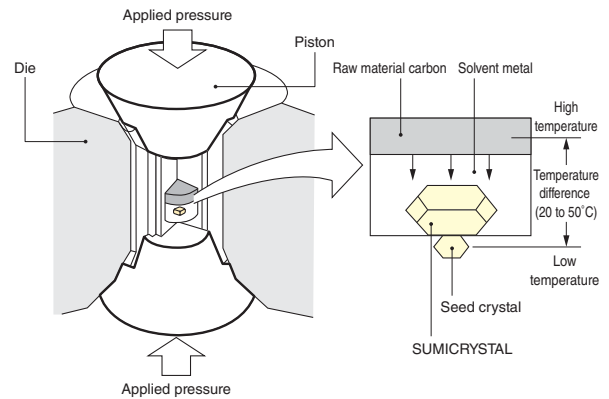


Inside of the super high pressure chamber

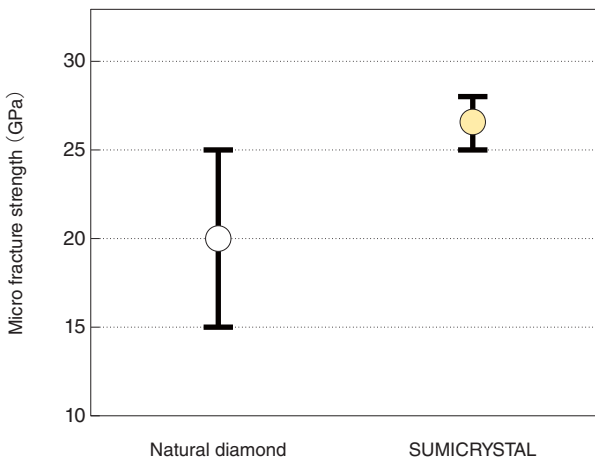
Synthesis conditions

Pressure: 5 to 6 GPa

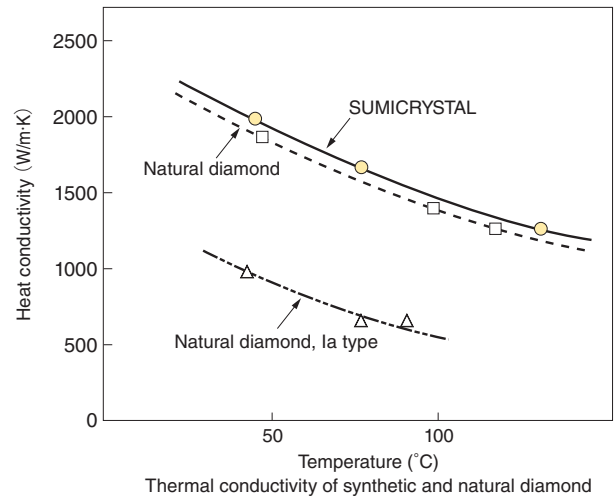
Temperature: 1,300 to 1,600°C

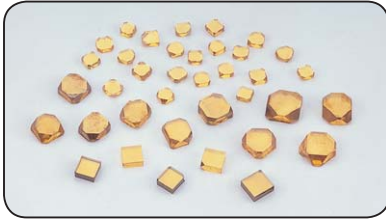


Microfracture strength of synthetic diamond



Diamond thermal conductivity





General Features

The field of ultra-precision machining, which includes machining of magnetic discs and polygon mirrors, are seeing rapid developments in recent years. SUMICRYSTAL UP has the performance and the high reliability that makes it the optimal material for creating cutting tools for these applications.

Characteristics

- SUMICRYSTAL UP is a high quality and uniform material with stable wear resistance. Cutting edges do not chip easily.
- Since the shape is uniform, the amount of allowance removed during formation of the cutting edge is small. Cutting edge formation can be done easily.

Standard Type

A cubic type with 6 faces surrounded by (100) faces.

Standard Items

Standard type		Units: mm			
Shape	Cat. No.	L	W	C ₁ , C ₂	T
<p>The arrows in the diagram indicate the directions in which the crystal can be ground easily. (The crystal face directions are all (100) excluding the corners.)</p>	UP 282512	2.8–3.5	2.5–3.5	up to 0.8	1.2±0.1
	UP 282515	2.8–3.5	2.5–3.5	up to 0.8	1.5±0.1
	UP 303015	3.0–3.5	3.0–3.5	up to 0.3	1.5±0.1
	UP 301415	3.0–3.5	1.4–1.7	up to 0.3	1.5±0.1
	UP 333014	3.3–4.0	3.0–4.0	up to 0.9	1.4±0.1
	UP 333017	3.3–4.0	3.0–4.0	up to 0.9	1.7±0.1
	UP 353514	3.5–4.0	3.5–4.0	up to 0.4	1.4±0.1
	UP 353517	3.5–4.0	3.5–4.0	up to 0.4	1.7±0.1
	UP 351717	3.5–4.0	1.7–2.0	up to 0.4	1.7±0.1

*1 Sizes other than those indicated above can be order made.

*2 The crystals may have fine inclusions or chipping which are within our specifications.

*3 Inclusions and chipping outside the minimum guaranteed dimensions are not covered in our inspections.

Economy Type

The growth faces on the periphery are left as is, resulting in a large volume. The unique characteristic of this type is that it is economic.

Economy Items

Economy type units: mm (Minimum guaranteed dimensions)			
Shape	Cat. No.	D	T
	UP 2010	2.0	1.0
	UP 2012		1.2
	UP 2510	2.5	1.0
	UP 2512		1.2
	UP 2515	1.5	
	UP 3010	3.0	1.0
	UP 3012		1.2
	UP 3015	1.5	
	UP 3510	3.5	1.0
	UP 3512		1.2
	UP 3515	1.5	
	UP 4010	4.0	1.0
	UP 4012		1.2
	UP 4015	1.5	
	UP 4020	2.0	
	UP 4510	4.5	1.0
	UP 4512		1.2
	UP 4515	1.5	
	UP 4520	2.0	
	UP 5010	5.0	1.0
UP 5012	1.2		
UP 5015	1.5		
UP 5020	2.0		

*1 Sizes other than those indicated above can be order made.

*2 The crystals may have fine inclusions or chipping which are within our specifications.

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Cutting tools using SUMICRYSTAL UP

Wiper Inserts For RF Type High Speed Cutter For Aluminum Alloy→ M36



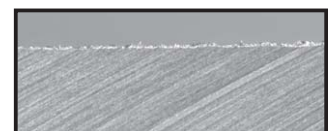
Note: This product was jointly developed with A.L.M.T. Corp.

SUMICRYSTAL SC10 (Wiper insert)

- Utilizing SUMICRYSTAL, a single crystal diamond made using our proprietary super high-pressure technology, as the cutting edge.
- SUMICRYSTAL can maintain its edge sharpness better than polycrystalline diamond, thus greatly reducing burr formation.



SUMICRYSTAL (Single crystal diamond)
SC10 wiper insert machined surface



SUMIDIA (Polycrystalline diamond)
Wiper insert machined surface

SUMICRYSTAL PD/PDX



SUMICRYSTAL PD and PDX are synthetic single crystal diamonds processed into long prism shapes for use as dressers. Compared to natural diamond blanks, SUMICRYSTAL blanks have stable performance and long tool life, making it possible to improve and automate dressing.

SUMICRYSTAL PD

Characteristics

- Revolutionary prism shape
- (1) Improves clamping strength and prevents the diamond from dropping.
- (2) Consistent cross-section prevents performance deterioration.
- (3) Crystal orientation stabilizes tool life.

Standard Items

	Cat. No.	Stock	T	W	L
<p>L indicates the distance between the centers of the faces on each end. The top and bottom faces are the (111) cleavage plane.</p>	PD 0220	●	0.2±0.05	0.2±0.05	2.0–2.5
	PD 0420	●	0.4±0.05	0.4±0.05	2.0–2.5
	PD 0630K	●			3.0–4.0
	PD 0640K	●	0.6±0.1	0.6±0.1	4.0–5.0
	PD 0650K	●			5.0–
	PD 0830K	●			3.0–4.0
	PD 0840K	●	0.8±0.1	0.8±0.1	4.0–5.0
	PD 0850K	●			5.0–
	PD 1130K	●	1.1±0.1	1.1±0.1	3.0–4.0
	PD 1140K	●			4.0–5.0
<p>In this type, part of the side face is a cleavage plane, making it easy to determine the wear resistance direction.</p>	PD 0630TK	●	0.6±0.1	0.6±0.1	3.0–4.0
	PD 0640TK	●			4.0–5.0
	PD 0830TK	●			3.0–4.0
	PD 0840TK	●	0.8±0.1	0.8±0.1	4.0–5.0
	PD 1130TK	●	1.1±0.1	1.1±0.1	3.0–4.0
	PD 1140TK	●			4.0–5.0

*1 Sizes other than the sizes specified above are also available for order.
*2 The crystals may have inclusions and chips outside of the minimum guaranteed dimensions not covered in our inspections.

SUMICRYSTAL PDX

Characteristics

- A new product, from the conventional (PD) product, with changes to the crystal orientation of its end face.
- (1) The crystal orientation of the end face is (211), resulting in improved tool life compared to the previous product PD.
- (2) Since the wear resistance direction is parallel to the (111) face, it is easy to set the blank during dresser manufacturing.

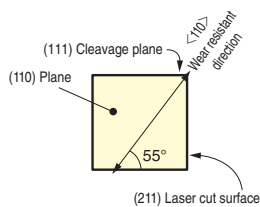
Standard Items

	Cat. No.	Stock	T	W	L
<p>L indicates the distance between the centers of the faces on each end. The top and bottom faces are the (111) cleavage plane.</p>	PDX 0220	●	0.2±0.05	0.2±0.05	2.0±0.1
	PDX 0320	●	0.3±0.05	0.3±0.05	
	PDX 0420	●	0.4±0.05	0.4±0.05	
	PDX 0630	●			3.0±0.5
	PDX 0640	●	0.6±0.1	0.6±0.1	4.0±0.5
	PDX 0830	●			3.0±0.5
	PDX 0840	●	0.8±0.1	0.8±0.1	4.0±0.5
	PDX 1130	●	1.1±0.1	1.1±0.1	3.0±0.5
	PDX 1140	●			4.0±0.5

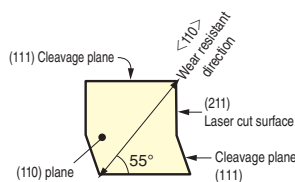
*1 Sizes other than the sizes specified above are also available for order.
*2 The crystals may have inclusions and chips outside of the minimum guaranteed dimensions not covered in our inspections.

PD Crystal Orientation

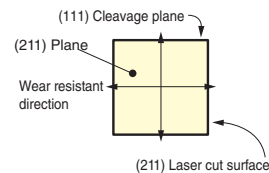
< PD >



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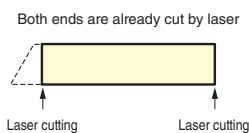


PDX Crystal Orientation



KK Type

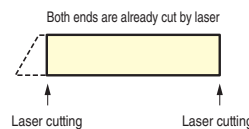
In addition to the standard items listed above, PD is also available in KK type, in which both ends are cut off.



- Specify by adding "K" to the end of the standard item Cat. No.
(Example: PD ○○○○ KK, PD ○○○○ TTK)
- PD0220 and PD0420 already have both ends cut off, so do not have a KK type specification.

K Type

In addition to the standard items listed above, PDX is also available in K type, in which both ends are cut off.



- Specify by adding "K" to the end of the standard item Cat. No.
(Example: PDX ○○○○ K)
- PDX0220, PDX0320, and PDX0420 already have both ends cut off, so do not have a K type specification.