CAT.MATERIALG.9/18

SUMITOMO
CARBIDE - CBN - DIAMOND

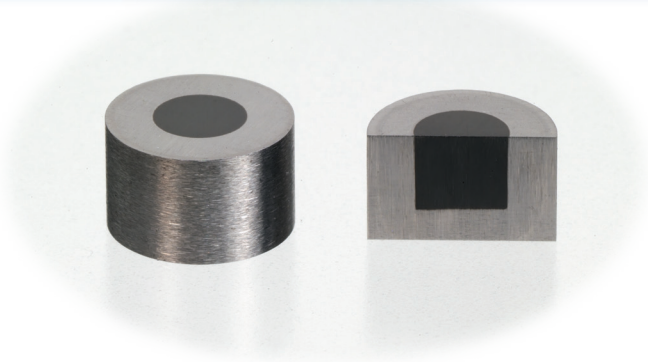
Sumitomo Electric Carbide, Inc.

Materials Group Products

SUMITOMO ELECTRIC GROUP

SUMIDIA WD

"SUMIDIA WD" is firmly bonded polycrystalline diamond developed through the use of our original ultra high-pressure sintering technology, which provides both strong and wear resistant wire drawing material.



• Characteristics

SUMIDIA WD has stable quality superior to natural diamond.

Excellent breakage resistance

Because of its firmly bonded polycrystalline structure, SUMIDIA WD eliminates the cleavage faults found in natural diamond.

Excellent wear-resistance

SUMIDA WD offers superior wear resistance, uniform wear and excellent fracture strength.

High quality polished surface

The homogeneity of sintered body is implemented in our original technology. The diamond content ratio in sintered body is increased and each diamond grain is firmly bonded. SUMIDIA WD has a high quality polished surface like natural diamond.

• Series

SUMIDIA WD has 3 series such as with support ring, and with heat resistance

WD700

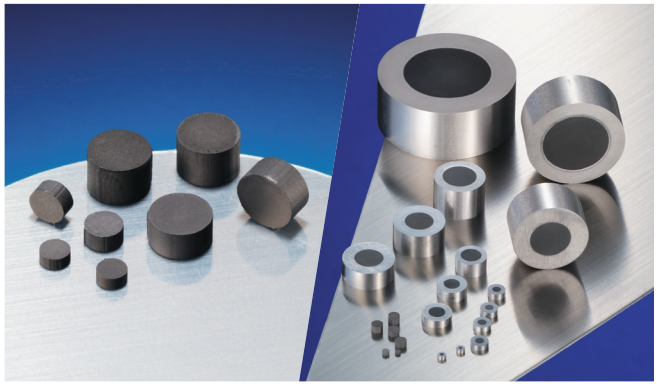
The WD700 series are self-supported die blanks. These blanks are suitable for all types of wiredrawing applications especially where cost-cutting is required.

WD900

The WD900 series are reinforced by a special outer ring. This feature makes it possible to draw not onlycopper and aluminum wire but high tensile steel wire as well.

WD800 (Heat-Resistant type)

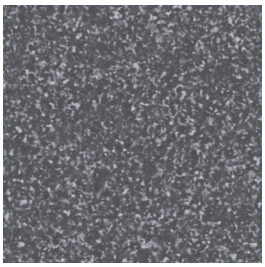
The WD800 series are self-supported thermally stable blanks. These blanks are especially suited for applications which require high temperature in mounting and need high heat resistance in drawing.



• Grades

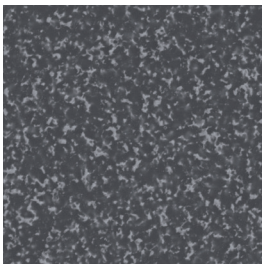
F Grade

The F grade WD has a ultra fine diamond grain size. It is suitable for drawing dies that require a high quality surface finish or high fracture strength.



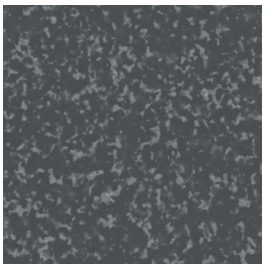
S Grade

The S grade WD has fine diamond grains. It is the standard grade of small diameter die blanks with supprt ring.



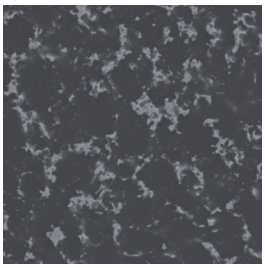
M Grade

The M grade WD is a middle diamond grain size. It is effective for a wide variety of applications offering high finish with good wear resistance



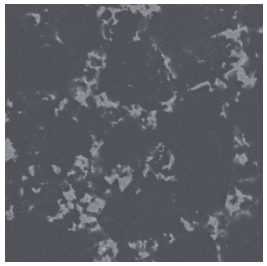
C Grade

The C grade WD is a coarse diamond grain size. It is suitable for drawing dies that require high wear-resistance.



E Grade

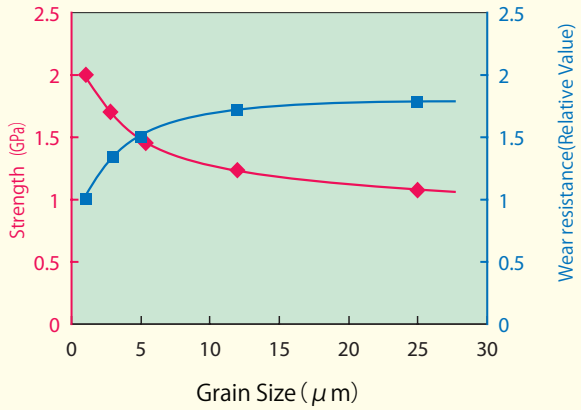
The E grade WD is an extra-coarse diamond grain size.



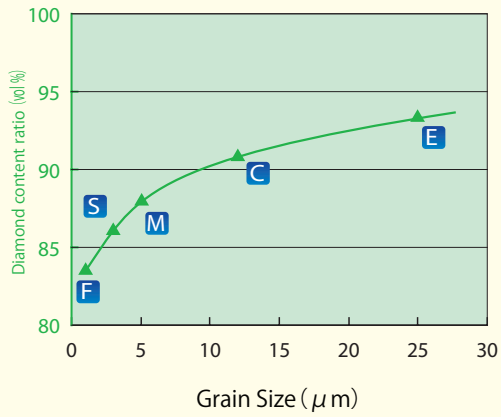
SUMIDIA WD HAS 5 GRADES:
F, S, M, C, and E.

- Available grades are limited by the shape and size

Strength and Wear resistance vs. Grades

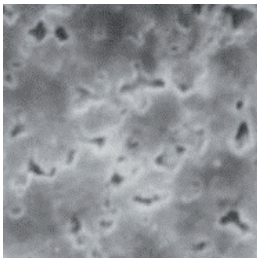


Diamond content ratio vs. Grade



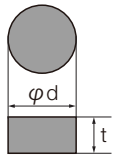
- WD800 Series

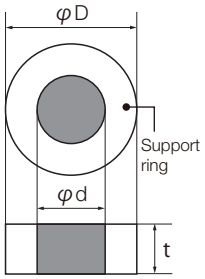
WD800 Series, binder metal removed from WD700 series, is high heat resistant material.



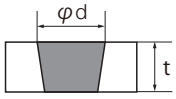
• Items

ADDMA No. ※1	Product No.	Dimensions (mm) φd	Dimensions (mm) φD	Dimensions (mm) t	Concentricity (mm) ※2	Maximum Hole Size (mm) ※3	Available grain size F 1	Available grain size S 3	Available grain size M 5	Available grain size C 12	Available grain size E 25	Shape
Self-supported die blanks												
D6	WD705	2.5	—	1.0	—	0.5	○	—	○	○	—	
D12	WD710	3.2	—	1.5	—	1.0	○	—	○	○	—	
D15	WD715	5.2	—	2.5	—	1.5	○	—	○	○	—	
D18	WD720	5.2	—	3.5	—	2.0	○	—	○	○	○	
Self-Supported die blanks with thermal stability												
D6	WD805	2.5	—	1.0	—	0.5	○	—	○	○	—	
D12	WD810	3.2	—	1.5	—	1.0	○	—	○	○	○	
D15	WD815	5.2	—	2.5	—	1.5	○	—	○	○	—	
D18	WD820	5.2	—	3.5	—	2.0	○	—	○	○	—	
Supported die blanks												
D12	WD910	1.5	4.00	1.5	0.20	0.8	○	○	○	○	—	
D15	WD915	4.0	8.12	2.3	0.25	1.8	○	○	○	○	—	
D18	WD920	4.0	8.12	2.9	0.25	2.3	○	○	○	○	○	
D21	WD925	7.0	13.65	4.0	0.35	3.5	—	○	○	○	○	
D24	WD930	7.0	13.65	5.3	0.40	4.6	—	○	○	○	○	
D27	WD940	9.0	14.50	7.5	0.40	5.4	—	—	○	○	○	
D27	WD945	13.0	24.13	9.0	0.33	5.8	—	—	○	○	○	
D30	WD950	13.0	24.13	12.0	0.33	7.6	—	—	○	○	○	
D33	WD960	16.0※5	24.13	16.0	0.33	10.5	—	—	—	○	○	
D36	WD970	19.0※5	35.00	19.0	0.60	12.7	—	—	—	—	○	
	WD975※6	25.0	42.00	20.0	0.60	15.7	—	—	—	—	○	
	WD980※6	30.0	47.00	22.0	0.60	19.0	—	—	—	—	○	
	WD990※6	40.0	67.00	25.0	0.75	25.7	—	—	—	—	○	
	WD995※6	45.0	67.00	27.0	0.75	29.0	—	—	—	—	○	
Tungsten carbide supported die blanks with back support												
D12	WD910MW	1.5	4.00	3.5※4 (1.5)	0.20	0.8	—	—	○	—	—	
D15	WD915MW	4.0	8.12	4.3※4 (2.3)	0.25	1.8	—	—	○	—	—	
D18	WD920MW	4.0	8.12	4.9※4 (2.9)	0.25	2.3	—	—	○	—	—	

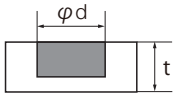




Standard
(WD910～950/975～995)



Press fit design
(WD960/WD970)



Back supported design
(WD910～920MW)

○: Available —: Not available

※1 Die size standard by American Diamond Die Manufaturers Association.

※2 Concentricity shows the difference between the maximum width and the minimum width of the carbide support ring.

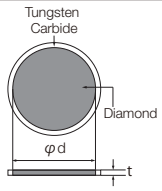
※3 The maximum hole size recommended for soft wire.
In case of hard wire drawing, the maximim hole size should not exeed 70 percent of this diameter.

※4 The number of ( ) shows tentative thickness of diamond.

※5 The upper diameter of diamond is different from the lower diameter.

※6 The blank has the inspection hole (φ5~8mm) in the center.

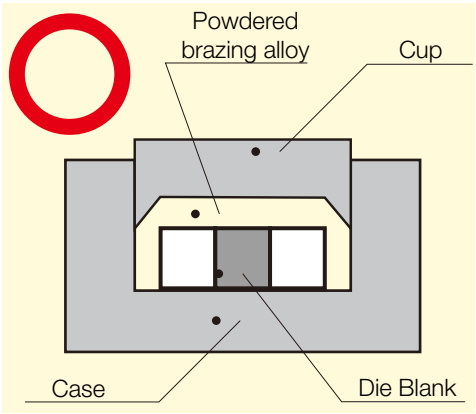
• Items

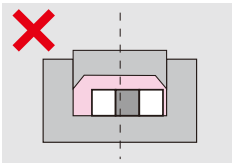
ADDMA No. ※1	Product No.	Diamond Micro Size (A.P.S.) Grain Size 1	5	12	Nominal Dimensions (mm) Diamond Diameter (d)	Diamond Thickness (t)	Shape
SumiDisk (High Density PCD)							
D6	RX55/ 1.0	F	M	C	55.0	1.0	
D12	RX55/ 1.5	F	M	C	55.0	1.5	
D15	RX55/ 2.5	F	M	C	55.0	2.5	
D18	RX55/ 3.5	F	M	C	55.0	3.5	

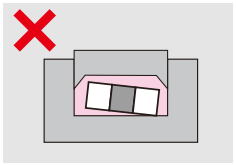
• Notice in Processing

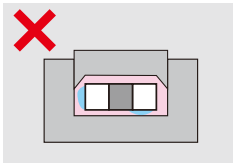
Precaution for mounting process

- Die blanks should be placed at the center of SUS case.
- Die blanks should be set parallel to the case.
- Do not allow space between brazing alloy and blank.
  (It is effective to apply pressure during heating or immediately after heating.)



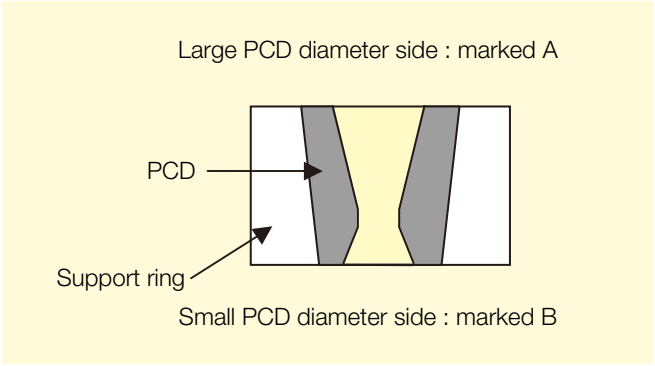

Off-center


Incline


Void

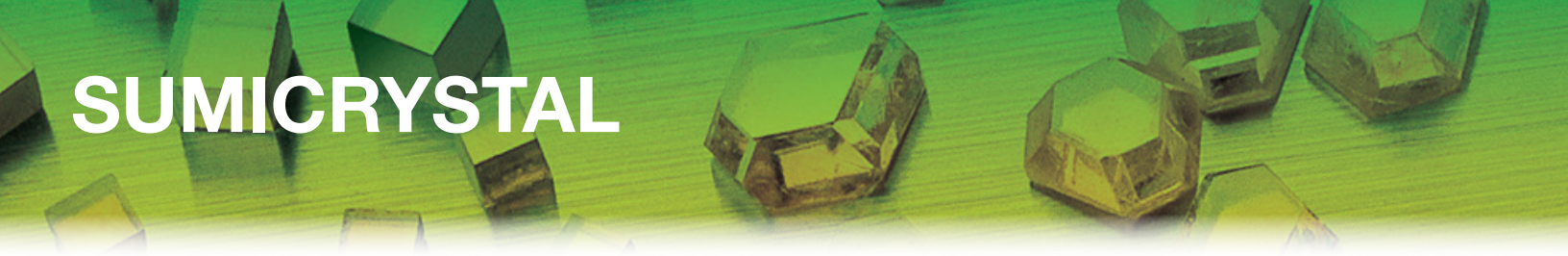
Precaution for use about shrink fit type (WD960, 970).

WD960, 970 type adopt original design which PCD is pressed into support ring after sintering to avoid horizontal crack while machining. PCD diameter is different each side. (about 3%)

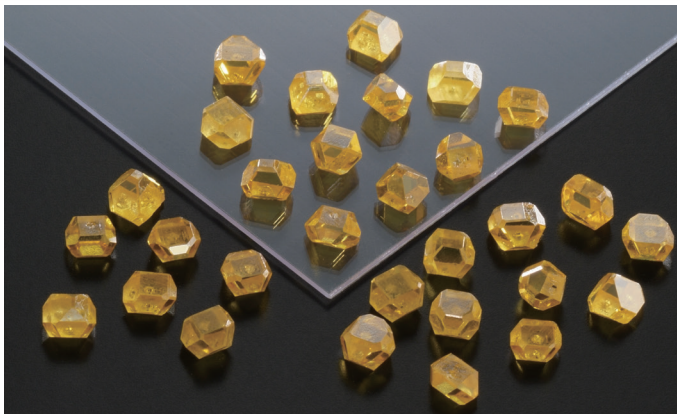


- PCD is pressed into support ring in the direction from side A to side B. Please use as Side A is Bell side, and Side B is Exit side.
- WD960, 970 can use re-insertion to support ring when PCD slip out.
- PCD and support ring are not combined so please keep the radial thickness of PCD more than 1.0mm.

SUMICRYSTAL



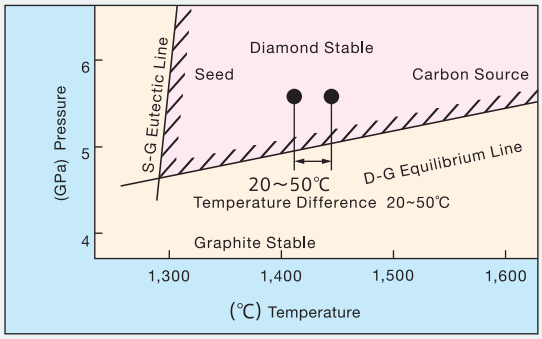
"SUMICRYSTAL" is synthetic single crystal diamond which Sumitomo Electric succeeded in mass production for the first time in the world. "SUMICRYSTAL" is manufactured under severe quality control has stable quality, so it is suitable for industrial materials.



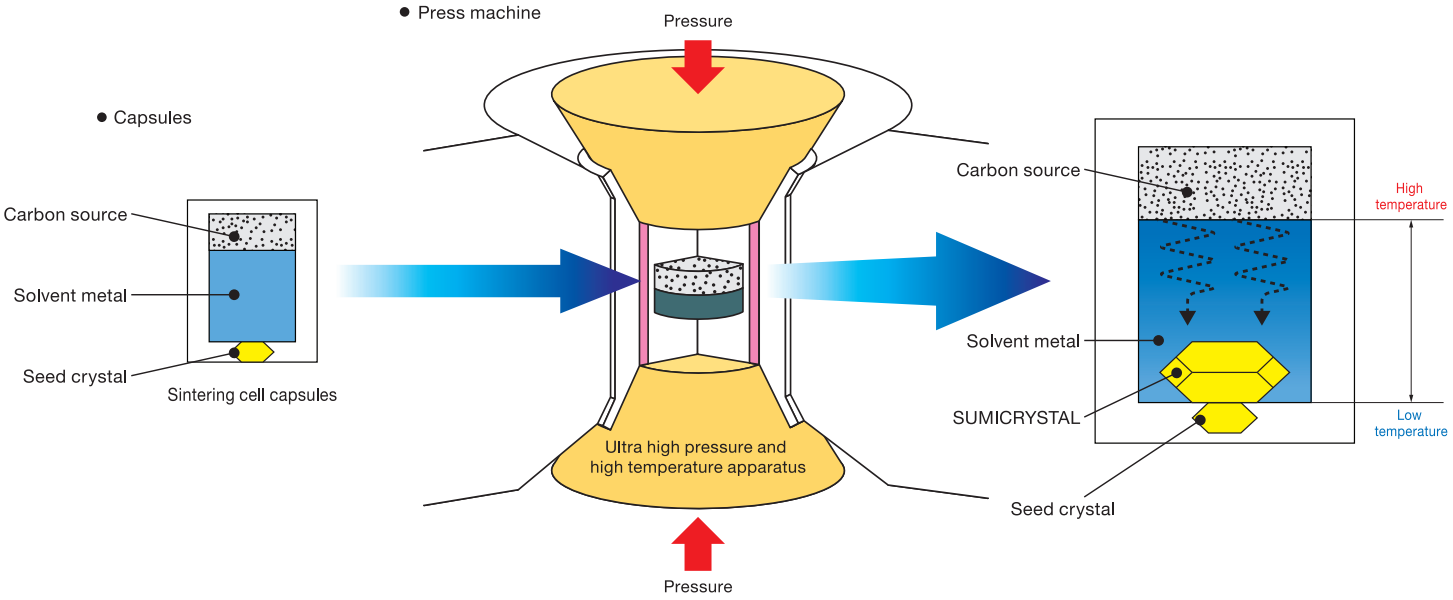
Synthesis of SUMICRYSTAL

Large high quality single crystal diamonds are synthesized under ultra-high pressure (50,000 atmospheres) and high temperature (over 1,300 ℃). The figure to the right shows the inside of an ultra-high pressure apparatus. A temperature gradient is created in the interior of the heater. This gradient is used to melt the carbon source into a molten solvent metal. This process allows the diamond to grow on a seed crystal. In order to accurately synthesize large high quality crystal, it is necessary to have purity materials and advanced technology for maintaining synthesizing conditions constant over a long period of time.

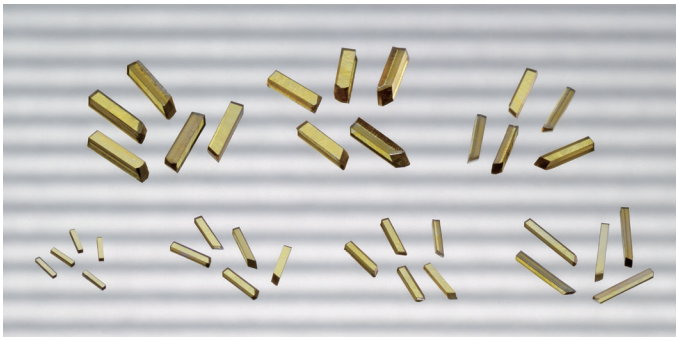
Synthesizing Condition of SUMICRYSTAL



The inside of an ultra-high pressure apparatus.



Sumicrystal PD dresser blanks are single crystal diamonds processed into the shape of a long, thin prism. These Sumicrystals provide high precision dressing through reliable performance and long tool life.



PD

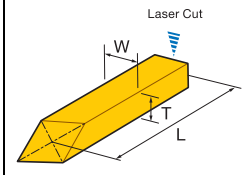
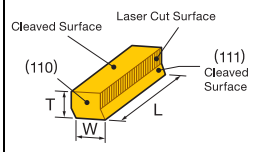
Characteristics

Revolutionary Unique Shape

The unique shape of the PD blanks gives the diamond consistent cross-section. This allows uniform diamond surface throughout the dressing process. The alongated shape also drastically reduces diamond pull-out.

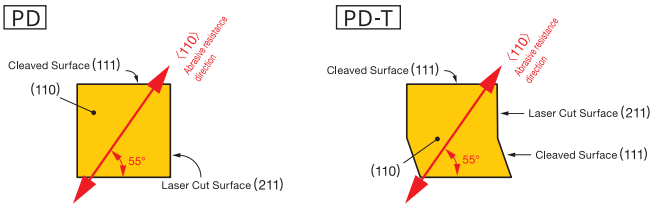
Standard PD Items

(mm)

Shape	Cat.No	Dimensions T	W	L
	PD 0220	0.2±0.05	0.2±0.05	2.0~2.5
	PD 0230K			2.0~2.5
	PD 0420	0.4±0.05	0.4±0.05	2.0~2.5
	PD 0440K			2.0~2.5
	PD 0630K	0.6±0.1	0.6±0.1	3.0~4.0
	PD 0640K			4.0~5.0
	PD 0650K			5.0~
	PD 0830K	0.8±0.1	0.8±0.1	3.0~4.0
	PD 0840K			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
	PD 0630TK	0.6±0.1	0.6±0.1	3.0~4.0
	PD 0640TK			4.0~5.0
	PD 0830TK	0.8±0.1	0.8±0.1	3.0~4.0
	PD 0840TK			4.0~5.0
	PD 1130TK	1.1±0.1	1.1±0.1	3.0~4.0

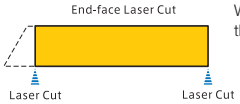
Can be made to order other size

PD crystal orientation



KK Type

All the above standard PD items except PD0220 and PD0420 are available in "KK Type" which both end-face lasr cuts.



When ordering KK Type, please include the type code (="KK") after the product number. (E.g. PD○○○○KK, PD○○○○TKK)

PDX

Characteristics

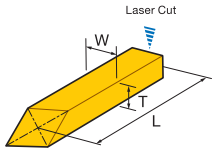
New Product with a Modified Face Orientation

(1) Face orientation is a (211) face which increases life of the product

(2) Abrasive resistance direction runs parallel with (111) face, facilitating setting of a blank when manufacturing dressers.

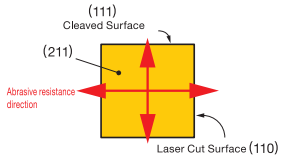
Standard PDX Items

(mm)

Shape	Cat.No	Dimensions T	W	L
	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	0.6±0.1	0.6±0.1	3.0±0.5
	PDX 0640			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

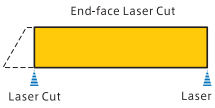
Can be made to order other size

PDX crystal orientation



K Type

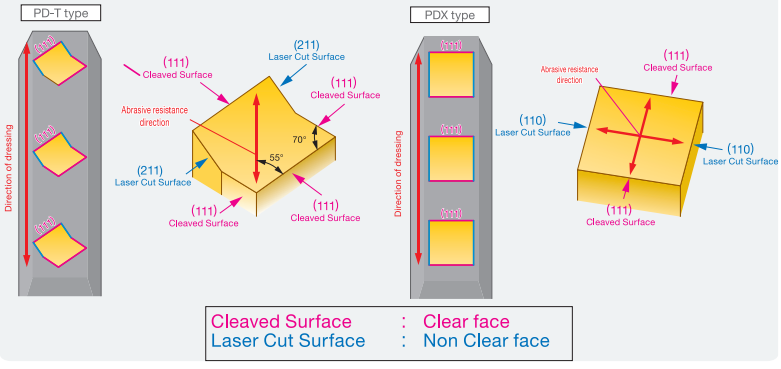
All the above standard PDX items except PD0220, PDX0320, and PDX0420 are available in "KK Type" which both end-face lasr cuts.



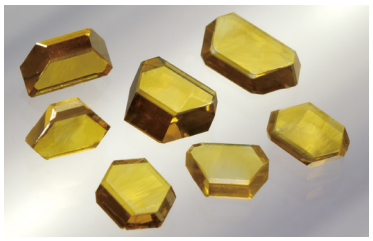
When ordering K Type, please include the type code (="K") after the product number. (E.g. PDX○○○○K)

Method of setting Dresser

The dresser blanks should be set to ware-resistant direction in producing the dressing using PD and PD-T



Sumicrystal PDXC products provide stable performance as forming dresser materials.

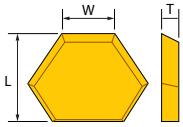


PDXC

Characteristics

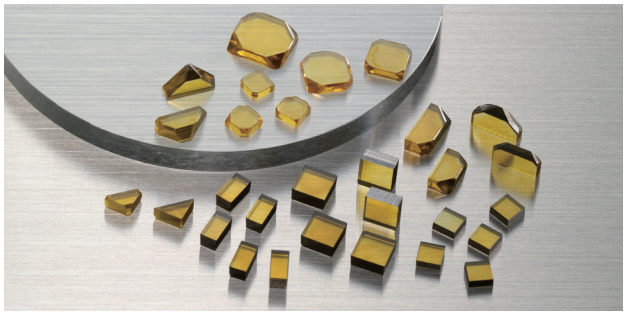
(1) Proximity of highly wear-resistant (211) face to dressing face provides longer tool life.
(2) Unique shape provides stable clamp strength when used as a dresser. This also prevents diamond pull-out during dressing.
(3) Standardized material dimensions ensure easy setting when making dressers.

(mm)

Shape	Cat.No	Dimensions		
		T	W	L
	PDXC 08	0.8±0.1	2.0	2.5
	PDXC 11	1.1±0.1		
	PDXC 15	1.5±0.1		
	PDXC 18	1.8±0.1		

Can be made to order other size

With today's ever advancing level of technology, there has been an astounding growth in the demand for ultra-precision machining processes, for machining products such as memory disks and polygon mirrors. To meet this growing need Sumitomo Electric has developed **Sumicrystal UP** blanks to provide the high performance and reliability required for high precision cutting tools.



UP

Characteristics

(1) High Quality and Reliable Performance UP blanks are stable with good wear and chipping resistance.
(2) Reduce Polishing to form the crystal orientation and the size of the blanks are standardized to allow easy shaping of the cutting edge.

Standard Type

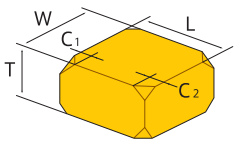
Rectangular parallelopiped type surrounded by (100) faces.

Economy Type

Economy type with which the periphery face remain unchaged. Features include large size and low cost.

Standard Type Items

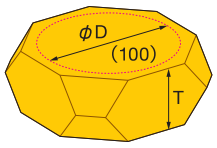
(mm)

Shape	Cat.No	Dimensions			
		L	W	C1,C2	T
	UP 282512	2.8~3.5	2.5~3.5	~0.8	1.2±0.1
	UP 282515				1.2±0.1
	UP 300707	3.0~3.5	0.7~1.0	~0.3	0.7±0.1
	UP 301010		1.0~1.5		1.0±0.1
	UP 301015				1.5±0.1
	UP 301407		1.4~1.7		0.7±0.1
	UP 301415				1.5±0.1
	UP 301512		1.5~1.8		1.2±0.1
	UP 302012		2.0~3.0		
	UP 303015		3.0~4.0		1.5±0.1
	UP 333014	3.3~4.0		~0.9	1.4±0.1
	UP 353510	3.5~4.0	3.5~4.0	~0.4	1.0±0.1
	UP 353514				1.4±0.1
	UP 353517				1.7±0.1
	UP 351717		1.7~2.0		
	UP 401008	3.95~4.05	0.95~1.05	~0.5	0.75±0.1
	UP 401010	4.0~4.5	1.0~1.3	~0.6	0.9±1.1
	UP 452417	4.5~4.8	2.4~2.7	~0.8	1.7±0.2
	UP 454510	4.5~5.0	4.5~5.0		0.9±.11
	UP 454515				1.5±0.2
	UP 501008	5.0~5.5	1.0~1.3	~0.6	0.7±0.2
	UP 501010				0.9±1.1

Can be made to order other size

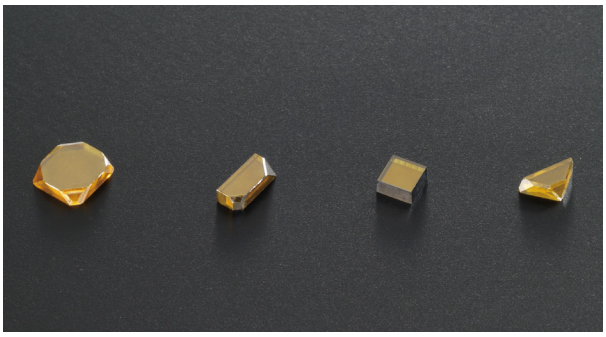
Economy Type Items

(mm)

Shape	Cat.No	Dimensions	
		øD	T
	UP 2010	2	1.0
	UP 2012		1.2
	UP 2510	2.5	1.0
	UP 2512		1.2
	UP 2515		1.5
	UP 3012	3	1.2
	UP 3015		1.5
	UP 3512	3.5	1.2
	UP 3515		1.5
	UP 4012	4	1.2
	UP 4015		1.5
	UP 4020		2.0
	UP 4512	4.5	1.2
	UP 4515		1.5
	UP 4520		2.0
	UP 5012	5	1.2
	UP 5015		1.5
	UP 5020		2.0

Can be made to order other size

Half-cut **Sumicrystal UP** blanks are UP economy type blanks that have been cut in half following the (100) face or (110) face.

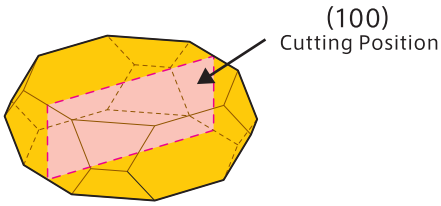


UP (Half cut Type)

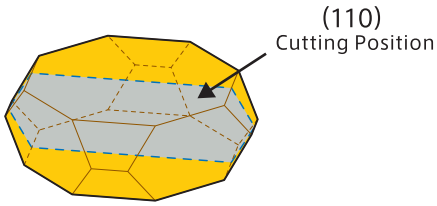
Characteristics

(1) Machining loss is reduced due to the smaller volume of material removed during polishing when making tools.
(2) Blank shape is close to that of a completed tool, allowing material cost savings.
(3) Cut face is a smooth, lasered surface.

(100)

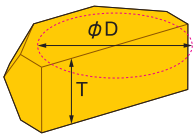


(110)



Standard Items (100) Type

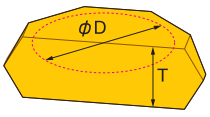
(mm)

Shape	Cat.No	Dimensions	
		øD	T
	UP 2010 (100) 1/2	2.0	1.0
	UP 2012 (100) 1/2		1.2
	UP 2510 (100) 1/2	2.5	1.0
	UP 2512 (100) 1/2		1.2
	UP 2515 (100) 1/2		1.5
	UP 3010 (100) 1/2	3.0	1.0
	UP 3012 (100) 1/2		1.2
	UP 3015 (100) 1/2		1.5
	UP 3510 (100) 1/2	2.5	1.0
	UP 3512 (100) 1/2		1.2
	UP 3515 (100) 1/2		1.5
	UP 4010 (100) 1/2	4.0	1.0
	UP 4012 (100) 1/2		1.2
	UP 4015 (100) 1/2		1.5
	UP 4020 (100) 1/2		2.0
	UP 4510 (100) 1/2	4.5	1.0
	UP 4512 (100) 1/2		1.2
	UP 4515 (100) 1/2		1.5
	UP 4520 (100) 1/2		2.0
	UP 5010 (100) 1/2	5.0	1.0
	UP 5012 (100) 1/2		1.2
	UP 5015 (100) 1/2		1.5
	UP 5020 (100) 1/2		2.0

Can be made to order other size

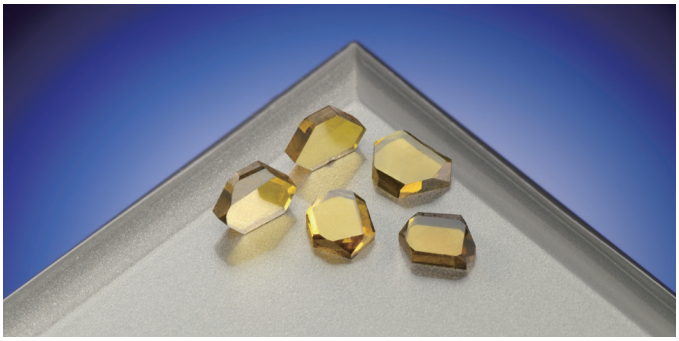
Standard Items (110) Type

(mm)

Shape	Cat.No	Dimensions	
		øD	T
	UP 2010 (110) 1/2	2.0	1.0
	UP 2012 (110) 1/2		1.2
	UP 2510 (110) 1/2	2.5	1.0
	UP 2512 (110) 1/2		1.2
	UP 2515 (110) 1/2		1.5
	UP 3010 (110) 1/2	3.0	1.0
	UP 3012 (110) 1/2		1.2
	UP 3015 (110) 1/2		1.5
	UP 3510 (110) 1/2	2.5	1.0
	UP 3512 (110) 1/2		1.2
	UP 3515 (110) 1/2		1.5
	UP 4010 (110) 1/2	4.0	1.0
	UP 4012 (110) 1/2		1.2
	UP 4015 (110) 1/2		1.5
	UP 4020 (110) 1/2		2.0
	UP 4510 (110) 1/2	4.5	1.0
	UP 4512 (110) 1/2		1.2
	UP 4515 (110) 1/2		1.5
	UP 4520 (110) 1/2		2.0
	UP 5010 (110) 1/2	5.0	1.0
	UP 5012 (110) 1/2		1.2
	UP 5015 (110) 1/2		1.5
	UP 5020 (110) 1/2		2.0

Can be made to order other size

Sumicrystal UPT products are tool materials that have two-point faces ((110) faces) as their main faces.



UPT

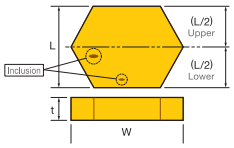
Characteristics

(1) Can be used as is in applications where tools would previously have been made using natural diamonds, thanks to a two-point face ((110) face) that can be used as a table face.

(2) Unique shape only requires the removal of a small volume of material when used as a tool edge making efficient machining possible.

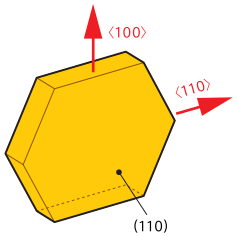
Standard Items

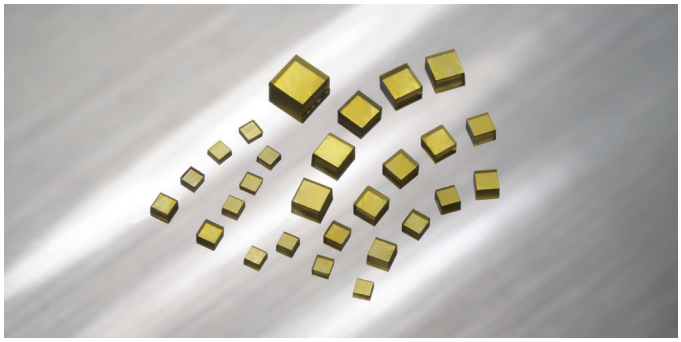
(mm)

Shape	Cat.No	Dimensions		
		T	W	L
	UPT 3010	0.8±0.1	3.0	2.5
	UPT 3012	1.1±0.1		
	UPT 4010	1.5±0.1	4.0	3.0
	UPT 4012	1.8±0.1		

Can be made to order other size

UPT crystal Orientation





Sumicrystal CD blanks are single crystal diamond wire drawing die blanks that feature the optimum shape and crystal orientation for wire die applications. The high quality and reliability of the CD blanks provide excellent productivity.

CD

Characteristics

(1) **High Quality and Reliable Performance**
CD blanks are a pure form of diamond, which is virutally free of impurities, inclusions and cracks that are commonly found in natural diamonds. Furthermore, the process of inspecting and selecting of crystals can be eliminated.

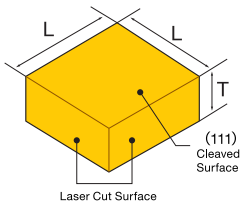
(2) **Excellent Fracture Resistance**
Cracking and fracturing of the diamond during wire drawing is greatly reduced.

(3) **Precise Crystal Orientation**
The top and bottom faces are in the (111) orientation and the degree of divergence in the orientation is less than 1°. This is a major determinate of die life.

(4) **Grinding is Not Necessary**
Because the top and bottom faces are made parallel by cleavage, further grinding is eliminated.

Standard Items

(mm)

Shape	Cat.No	Dimensions	
		L	T
	CD 1006(111)	1.0±0.1	0.6±0.1
	CD 1008(111)	1.0±0.1	0.8±0.1
	CD 1210(111)	1.2±0.1	1.0±0.1
	CD 1411(111)	1.4±0.1	1.1±0.1
	CD 1512(111)	1.5±0.1	1.2±0.1
	CD 1514(111)	1.5±0.1	1.4±0.1
	CD 1814(111)	1.8±0.1	1.4±0.1
	CD 2016(111)	2.0±0.1	1.6±0.1
	CD 2318(111)	2.3±0.1	1.8±0.1
	CD 2520(111)	2.5±0.1	2.0±0.1
	CD 1006R	1.0±0.1	0.6±0.1
	CD 1008R	1.0±0.1	1.8±0.1
	CD 1210R	1.2±0.1	1.0±0.1
	CD 1411R	1.4±0.1	1.1±0.1
	CD 2520R	2.5±0.1	2.0±0.1
	CD 14S	1.4±0.1	1.1±0.1
	CD 16S	1.6±0.1	1.2±0.1
	CD 18S	1.8±0.1	1.4±0.1
	CD 20S	2.0±0.1	1.6±0.1
	CD 25S	2.5±0.1	2.0±0.1

Can be made to order other size

SumiBoron is a polycrystalline cubic boron nitride cutting tool material that is comprised of a PCBN layer and cemented tungsten carbide substrate. Unlike diamond, CBN is stable under conditions of high temperature up to 1000°C normally seen when machining hardened ferrous, superalloy or nodular iron materials.

*Ask us about our economy type blanks

SumiBORON® PCBN Blanks

Grade	BNX10	BN250	BN305	BNX20	BN500	BNX25	BN700
CBN Content %	50	60	60	60	65	65	90-95
CBN Crystal Size (Microns A.P.S.)	4	1	1	3	4	3	2
Primary Binder Material	Titanium Nitride	Titanium Nitride	Titanium Nitride	Titanium Nitride	Titanium Nitride	Titanium Nitride	Co based alloy
Vickers Hardness (Hv)	2800-3000	3200-3400	3300	3200-3400	3500-3800	2900-3100	4000-4300
TRS Value (kg. / mm²)	85	105	125	105	105	105	125
Recommended for machining	•High speed continuous hardened steel finish	•Light & medium interrupted hardened steel	•Severely interrupted hardened steel	•High speed machining of bearing steel (ex. 8620)	•Nodular iron •Gray cast iron •Alloyed iron	•High speed continuous and interrupted •Wet/dry hardened steel	•Powdered metal •Ni/Co based superalloy •Ni-hard iron

SumiDIA® DA Blanks

Grade	DA2200	DA150	DA90
Average Diamond	0.5	5	50
Vickers Hardness	9,000-10,000	10,000-12,000	10,000-12,000
T.R.S. (kg./mm²)	250	200	110
Product Description	**High Density Ultra-Fine Grain Diamond** · High degree of toughness and superior wear resistance	**Fine Grain Diamond** · High abrasion resistance · Excellent tool edge sharpness	**Coarse Grain Diamond** · Ultra high abrasion resistance
Machining Applications · Turning · Milling · Boring · Drilling · Sawing	**Recommended for Cutting:** · Plastics · Wood · Aluminum and copper · High and low silicon aluminum	**Recommended for Cutting:** · Low and medium silicon aluminum · Copper · Fiberglass · Carbon · Wood - plywood fliberboard and hardwoods	**Recommended for Cutting:** · High silicon aluminum · Graphite · Aluminum/gray iron bimetal · Ceramics · Tungsten carbide · Kevlar

Recommended Running Conditions

Material	Application	SFM	IPR	D.O.C	First Choice	Second Choice
Induction Hardened Steel	Continuous	300-700	0.004-0.006	0.020"	BNX10	BNX20
Induction Hardened Steel	Interuption (Dry)	300-700	0.004-0.006	0.020"	BN250	BNX25/BN305
Carburized Hardened Steel/ Bearing Steel	Continuous	250-600	0.004-0.006	0.020"	BNX10	BNX20
Carburized Hardened Steel/ Bearing Steel	Interuption (Dry)	300-600	0.004-0.006	0.020"	BN250	BNX25/BN305
Die Steel High Speed Steel	Continuous	150-500	0.004-0.006	0.020"	BNX20	BNX10
Die Steel High Speed Steel	Interuption (Dry)	150-350	0.004-0.006	0.020"	BN250	BNX25/BN305
Gray Cast Iron	Continuous & Interupted	800-2300	0.004-0.006	0.040"	BN500	BN700
Nodular Cast Iron	Continuous & Interupted	500-1500	0.004-0.006	0.040"	BN500	BN700
Ductile Iron	Continuous & Interupted	300-900	0.004-0.006	0.040"	BN500	BN700
Powdered Metals	Continuous & Interupted	400-1000	0.004-0.006	0.040"	BN700	-
Chilled Cast Iron	Continuous & Interupted	100-300	0.004-0.006	0.040"	BN250	BN700

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