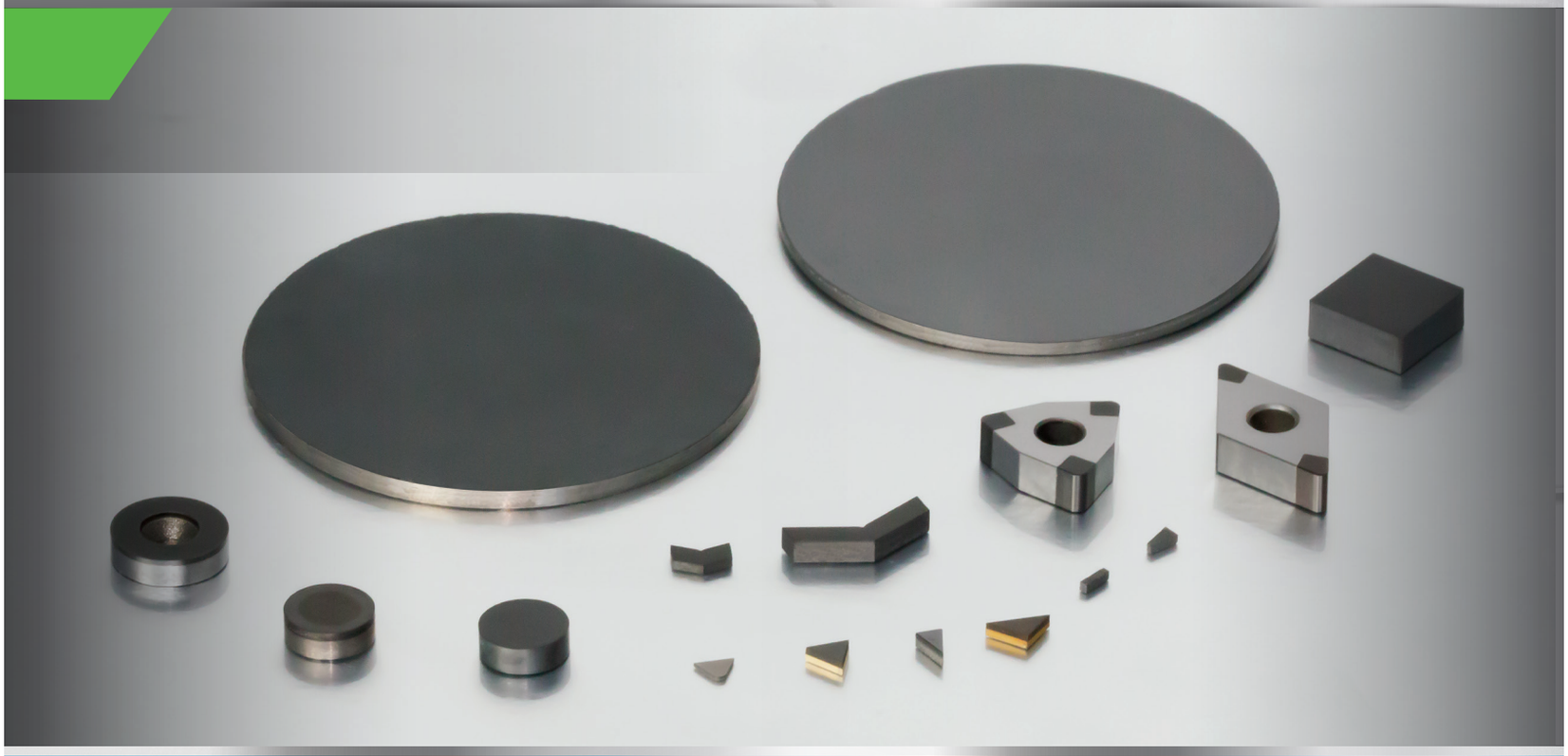
Worldwide SOLIDS

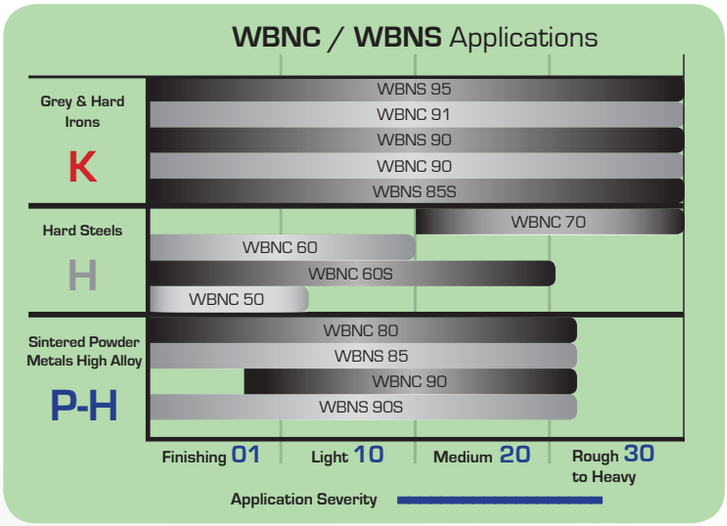
Division of Worldwide Superabrasives, LLC

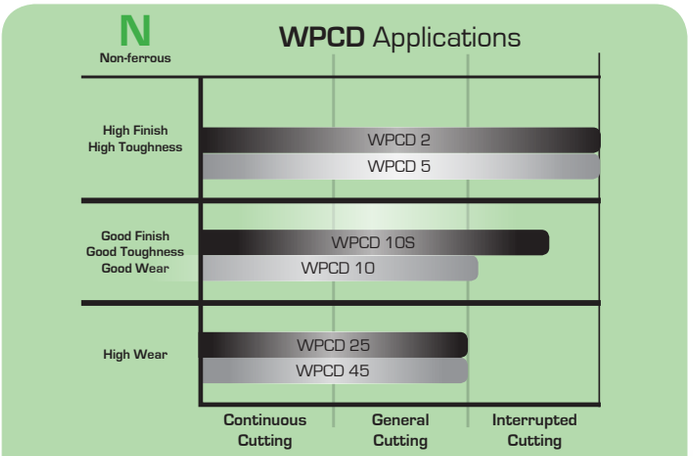


Worldwide Solids, LLC is a division of Worldwide Superabrasives, LLC located in Boynton Beach, Florida. Our world class production facility allows us to engineer new products, improve our current products and produce the highest performance products available for the superabrasives marketplace. WWSA ensures that we provide consistent products with every shipment by utilizing our state-of-the-art quality control laboratory. WWSA's commitment to excellence spreads across all of our High Pressure High Temperature (HPHT) engineered products such as diamond mesh, diamond micron, Cubic Boron Nitride (CBN) mesh, CBN micron, world-class metallic coatings, polycrystalline Cubic Boron Nitride (PCBN) and polycrystalline diamond (PCD).

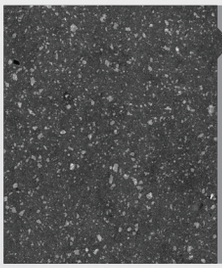
Select your Type

TYPE	DESCRIPTION	APPLICATIONS
WBNS	Solid PCBN	Machining Hardened Steels, Super Alloys, Cast and Nodular Irons
WBNBS	Brazed Tip PCBN	Light depth of cut and Finishing Hardened Steels, Super Alloys and various Irons
WBNC	Carbide Supported PCBN	Machining Hardened Steels, Super Alloys, Cast and Nodular Irons
WPCD	Polycrystalline Diamond	Machining in non-ferrous and non-alloy applications



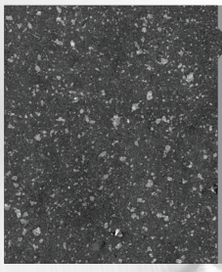


WBNS (Solid PCBN)



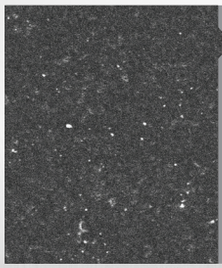
WBNS 60

Used in the machining of hardened steels such as bearing and die steels with medium interruptions at medium to high speeds.



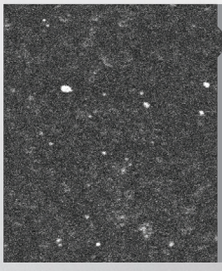
WBNS 85

Rough machining and interrupted cutting of gray cast iron, nodular cast iron, difficult materials such as alloys with high content nickel or steels with high content magnesium.



WBNS 85S

A good general purpose grade for cutting irons, powder metals and alloys with high nickel content or steels with Mg content small cbn crystal structure give high toughness and good finish.



WBNS 85L

Geared towards white iron applications along with proven success in hardened steels as larger crystal content offers longer tool life.



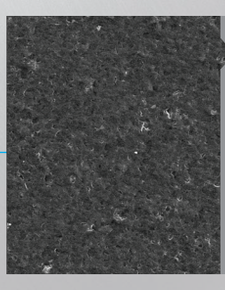
WBNS 90

Recommended for use in gray and chilled cast irons under high speed conditions and high chip resistance.



WBNS 90S

Small micron grain size targeting finishing in high temp alloys along with cast iron applications that require high smooth finishes.



WBNS 95

Machining of wearable alloy cast steels (Brake drums and disks), nodular and vermicular cast irons along with powder metals.

WBNC (Carbide Backed PCBN)



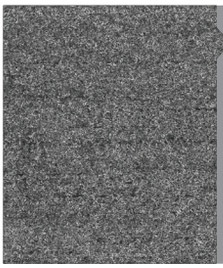
WBNC 50

High speed continuous turning of hardened steels with light depth of cut offers high finish.



WBNC 60S

Precision machining of hardened steel application offers extremely high toughness and excellent finish in continuous to medium interruptions.



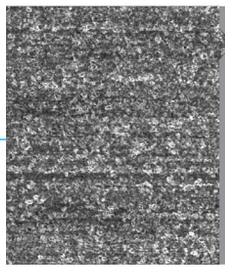
WBNC 70

Precision machining of hardened steel with medium to heavy interruption.



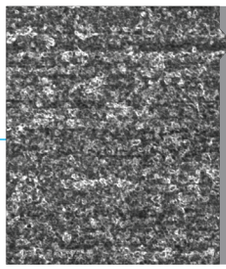
WBNC 80

Roughing and finishing of super alloy materials, and powder metal materials.



WBNC 90

Roughing and finishing of grey and ductile iron; Good thermal stability and chip resistance.



WBNC 91

Roughing and Finishing of grey, white cast irons and valve seat applications: High thermal stability and extreme hardness for long tool life.

WPCD



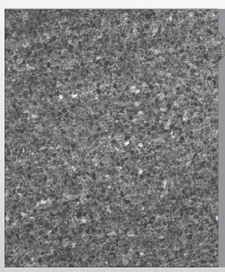
WPCD 2

Sintered with sub-micron diamond particles averaging 2um, making it the toughest diamond grade offered by WWSA. WPCD2 has a unique combination of high toughness while giving extremely high finish, which makes this grade ideal for applications that require tools for high precision machining.



WPCD 5

Has a fine diamond grain particle size allowing excellent tool edge sharpness and ease of tool fabrication. WPCD5 offers high finish with a good balance of wear resistance making this a nice intermediate grade between extremely high finish and extremely high wear.



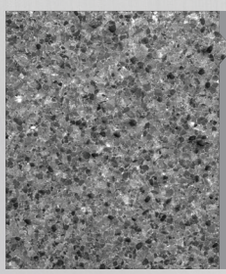
WPCD 5S

A unique multi-modal PCD in the WWSA S series. This 5um (aps) multi-modal grain structure offers excellent sharpness on wire EDM tool edge finishes. WPCD5S offers you sub-micron type high finish with an increased wear resistance much like a coarser PCD. WPCD5S is a great option for an intermediate grade offering high work piece finish with excellent tool life.



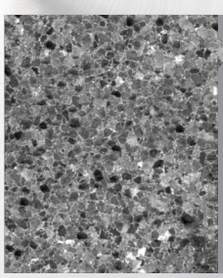
WPCD 10

Is a true workhorse of the WWSA PCD product offering. This grade has an average particle size of 10um, making this ideal for a wide variety of applications where high wear resistance and high toughness is necessary. This multi-purpose grade offers ease of tool fabrication and consistent wire EDM processing.



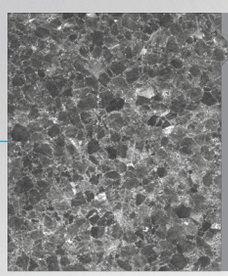
WPCD 10S

A unique multi-modal 10um (aps) diamond mixture that offers the same applications as WPCD10 but with higher diamond toughness for interruptions, higher tool edge quality and CFRP.



WPCD 25

Ideal material for extreme tool life and abrasive applications where a hard PCD diamond is needed. This grade offers excellent diamond to diamond bonding with over 90% diamond content while maintaining 25um (aps). Recommended for <14% silicon aluminum alloys, aluminum, gray iron bi metals, sintered ceramics, graphite, carbides, wood composite applications and CFRP.



WPCD 45

Sintered with extremely large diamond crystals that average 45um with an extreme tool life and is wire EDM friendly. Recommended for applications including CFRP, <14% Si Al, graphite, ceramics, carbides and wood laminates.

WWSA's Product Breakdown

PRODUCT	CBN%	BINDER	MICRON SIZE (A.P.S.)	Vickers Hardness (Hv)	TRS (ky./mm²)	Recommended Applications
WBNC						
WBNC50	50	TiN	1.5	2600-2800	105	High Speed, continuous turn of hardened steels
WBNC60S	60	TiN	1.5	2600-2800	105	High Speed continuous cutting/medium interruption of hardened steels
WBNC70	70	TiN	3	3200-3400	95	Continuous to intermittent cutting of quenched carburized, hardened, tempered, and bearing steels
WBNC80	80	TiN	3	3800-4000	85	Heat resistant alloys and cast iron applications, powdered metals
WBNC90	90	Al	MIXED	3900-4000	105	Grey cast iron and ductile iron
WBNC91	91	TiN	MIXED	4000-4200	100	Grey cast iron and white cast iron
WBNS						
WBNS60	60	TiN	3	2800-3000	90	Machining of hardened, bearing, and die steels
WBNS85	85	TiN	25	3800-4000	90	Heat resistant alloys and cast iron applications
WBNS85S	85	TiN	8	3700-3900	90	General purpose grade for machining cast iron, offering multi-modal grain structure
WBNS85L	85	TiN	30	3900-4000	90	Rough Machining/Interrupted cutting of chilled/white irons
WBNS90	90	TiN	10	3900-4000	100	High speed turning of gray cast irons and chilled cast irons
WBNS90S	90	Co Al	2	3800-4000	95	Machining high temperature alloys and aerospace materials like Inconel and Ti, powdered metals
WBNS95	95	Co Al	35	3900-4000	100	High speed turning of carbide, chilled cast iron, and white cast iron
WPCD						
WPCD2			2	9000-10,000	225	Plastics, Al, Cu, high/low SiAl
WPCD5			5	10,000-12,000	200	Cu, fiberglass, carbon, fiberboard, low SiAl
WPCD5S			5*	10,000-12,000	205	Multi-modal grain structure for superior finish and life, low SiAl, wood, composites
WPCD10			10	10,000-12,000	170	High/low SiAl, graphite, fiberboard, gray iron bi metals, ceramics, wood, composites
WPCD10S			10*	10,000-12,001	190	High/low SiAl, graphite, fiberboard, gray iron bi metals, ceramics, CFRP, wood
WPCD25			25	10,000-12,000	140	High/low SiAl, graphite, fiberboard, gray iron bi metals, ceramics, CFRP, wood
WPCD45			45	10,000-12,000	110	Extreme abrasion resistance, high SiAl, ceramics, graphite, tungsten carbide, CFRP

*Indicates multi-modal diamond structure. Thicker PCD layers available upon request.

Recommended Applications

APPLICATIONS RECOMMENDED CONDITIONS					
Work Piece Material	Work Piece condition	SFM	IPR	D.O.C.	WWSA Recommendation
PCD					
Aluminum Alloys 4-8%Si	N/A	3000-10000	0.004-0.025	0.120"	WPCD2/WPCD5/WPCD10
Aluminum Alloys 9-14%Si	N/A	2000-8000	0.004-0.025	0.120"	WPCD10/WPCD5S/WPCD10S
Aluminum Alloys 15-18% Si	N/A	1000-2300	0.004-0.015	0.120"	WPCD10/WPCD25/WPCD10S
Copper Alloy	N/A	2800-3300	0.003-0.011	0.120"	WPCD5/WPCD5S/WPCD10S
Hard Plastics	N/A	2800-3300	0.003-0.014	0.080"	WPCD10/WPCD5S/WPCD10S
Wood/Wood Composites	N/A	12000-13000	0.004-0.015		WPCD10/WPC10S/WPCD25
Tungsten Carbide	N/A	30-70	0.003-0.008	0.030"	WPCD45/WPCD10S/WPCD25
Reinforced Plastics	N/A	2800-3300	0.015	0.080"	WPCD25/WPCD10S/WPCD45
PCBN					
Induction Hardened Steel	Continuous	300-700	0.004-0.006	0.020"	WBNC60S/WBNS60
Induction Hardened Steel	Interrupted (Dry)	300-600	0.004-0.006	0.020"	WBNC70/WBNC60S/WBNS60
Carburized Hardened Steel/Bearing Steel	Continuous	250-600	0.004-0.006	0.020"	WBNC60S/WBNS60
Carburized Hardened Steel/Bearing Steel	Interrupted (Dry)	300-601	0.004-0.006	0.020"	WBNC70/WBNC80/WBNS60
Die Steel/High Speed Steel	Continuous	150-500	0.004-0.006	0.020"	WBNC60S/WBNC50/WBNS85S
Die Steel/High Speed Steel	Interrupted (Dry)	150-350	0.004-0.006	0.020"	WBNC70/WBNC60S/WBNS85S
Gray Cast Iron	Continuous/Interrupted	800-2300	0.004-0.006	0.040"	WBNC91/WBNC90/WBNS90
Nodular Cast Iron	Continuous/Interrupted	500-1500	0.004-0.006	0.040"	WBNC91/WBNS95
Ductile Iron	Continuous/Interrupted	300-900	0.004-0.006	0.040"	WBNC90/WBNC91/WBNS95
Powder Metals	Continuous/Interrupted	400-1000	0.004-0.006	0.040"	WBNC90/WBNC91/WBNS90S
Chilled Cast Iron	Continuous/Interrupted	100-350	0.004-0.009	0.040"	WBNC91/WBNS85L/WBNS85

Insert Shape
Chart 1

Symbol	Insert Shape
V	35° Diamond
D	55° Diamond
T	60° Triangle
C	80° Diamond
W	80° Trigon
S	90° Square
R	Round
A,K,M	Parallelogram

Relief Angle
Chart 2

Symbol	Relief Angle
N	0°
B	5°
C	7°
P	11°
D	15°
E	20°
F	25°

Tolerance
Chart 3

Symbol	Insert I.C.	Thickness	Nose Position
A	±.001	±.001	±.0002
C	±.001	±.001	±.0005
E	±.001	±.001	±.001
F	±.0005	±.001	±.0002
G	±.001	±.005	±.001
J	±.002	±.001	±.002
M			
U			

Type
Chart 4

Symbol	Hole
A	Yes
G	Yes
M	Yes
N	No
R	No

I.C.
Chart 5

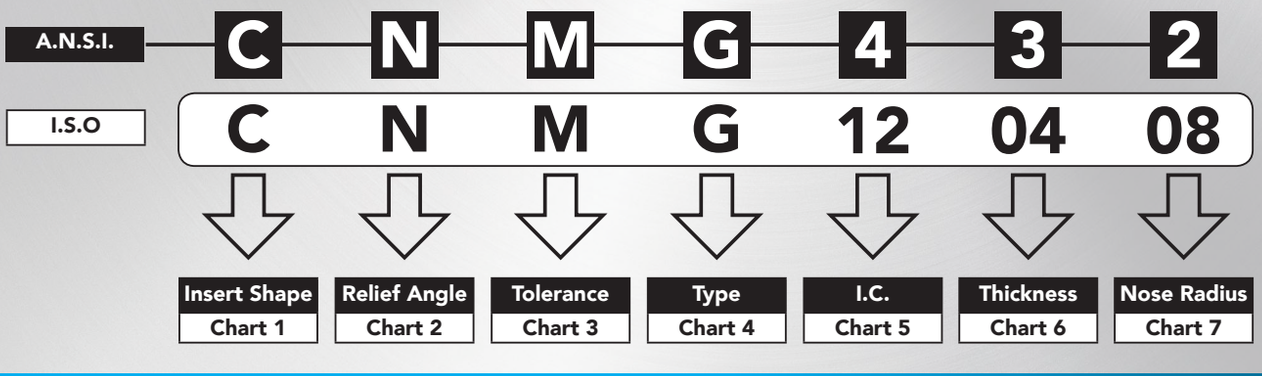
Number	I.S.O. Number							
Shape / Size	R	S	T	C	D	V	W	I.C.
			06				03	5/32"
			08					3/16"
			09					7/32"
	06							(.236)
2		06	11	06	07		04	1/4"
2.5		07		08	09			5/16"
	08							(.315)
3	09	09	16	09	11	16	06	3/8"
	10							(.394)
	12							(.472)
4	12	12	22	12	15	22	08	1/2"
5	15	15	27	16				5/8"
	16							(.630)
6	19	19	33	19				3/4"
	20							(.787)
	25							(.984)
8	25	25						1
	31							1-1/4"
	32							91.260)

Thickness
Chart 6

Number	I.S.O. Number	Thickness
	01	1/16"
1.5	02	3/32"
2	03	1/8"
2.5	T3	5/32"
3	04	3/16"
–	05	7/32"
4	06	1/4"
5	07	5/16"
5	08	5/16"
6	09	3/8"

Nose Radius
Chart 7

Number	I.S.O. Number	Radius
V	00	.0012"
001	.0039"	
0.5	02	.0079"
1	04	.0156"
–	05	.0197"
2	08	.0312"
–	10	.0394"
3	12	.0469"
–	15	.0591"
4	16	.0625"
6	24	.0938"
4	32	.1250"

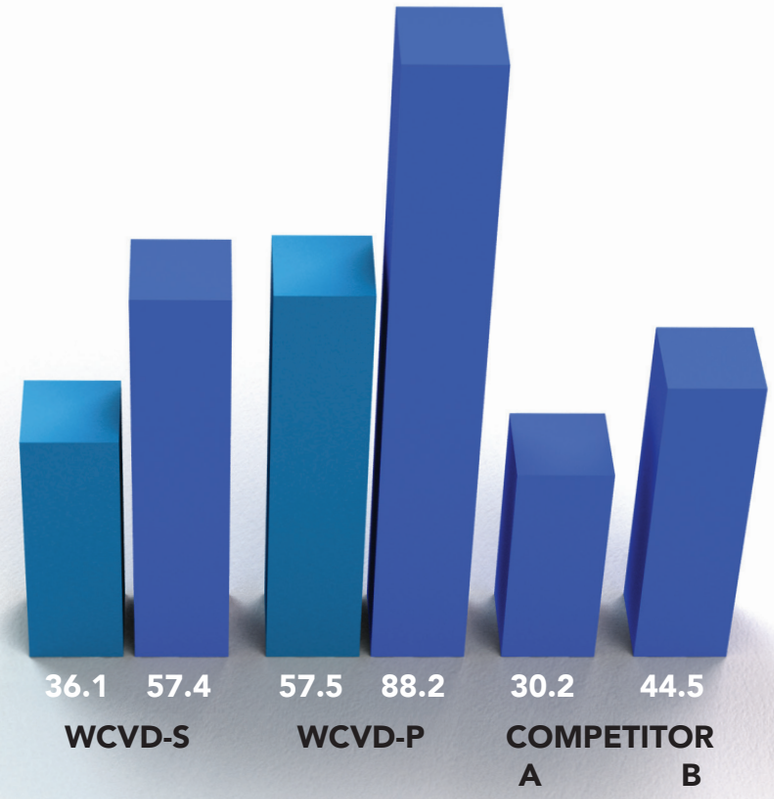


Worldwide Solids WCVD

Worldwide Solids provides its DC arc plasma jet CVD in all custom shapes and sizes. Rectangles, Triangles, Squares, Circles and custom shapes up to 2.0mm thickness. Please send an RFQ for pricing details.

Applications for both S and P grades include multi-point diamond dressing tools, rotary diamond dressing wheels and mini-tip turning tools. Cutting tool applications include hard metal alloys, hard copper and copper alloy, aluminum alloys, other nonferrous materials and plastics.

Testing Performed:
Both S and P grades were tested by removing 1 gram of material from a standard SiC wheel. This test represents the resistance ratio giving the grinding toughness index. WCVD sample size was a 0.8x0.8x4.0mm in both grades. Standard SiC wheel speed was 2200 r/min with a D.O.C. at 0.01mm with a total depth of cut at 2mm. Please reference chart below.

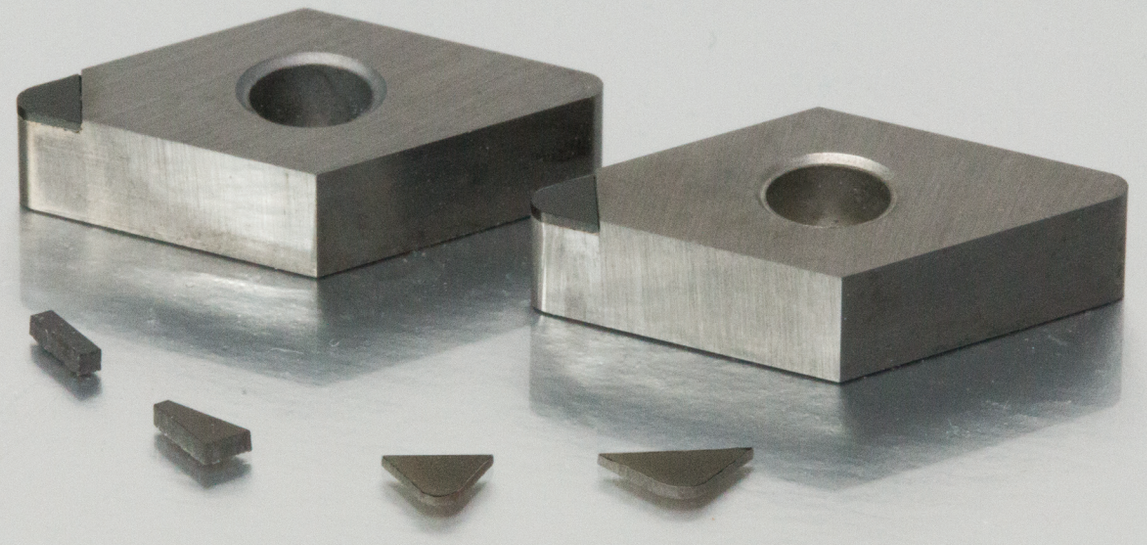


Grade Parameter Comparisons

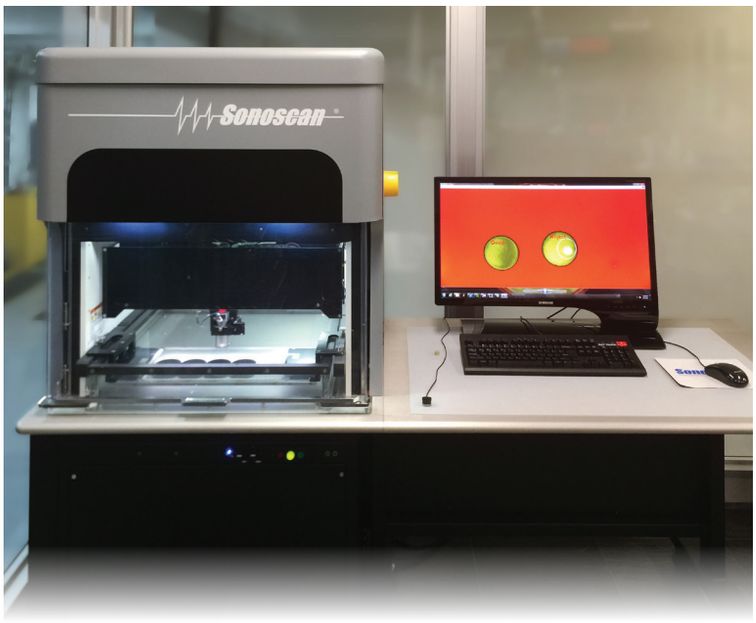
Item	S	P
Vickers-Hardness (kg/mm²)	10000	10000
Density (g/cm³)	3.52	3.52
Young´s Module (GPa)	1100	1100
Thermal Conductivity (w/cm.k)	15	15
Bending Strength (MPa) (0.5mm Thickness)	300-600	300-600
Thermal Stability	800°C	800°C
Wear Resistance Ratio (Ten Thousand)	36.1-57.4	57.5-88.2

WCVD **STANDARD(S)** and **PREMIUM(P)** Grades

Both grades are manufactured by a DC arc plasma jet system, which gives you higher purity polycrystalline diamond structure with no metallic or non-metallic agglomerates. Plasma jet CVD materials are yellowish green in appearance and translucent. WCVD-S offers thermal conductivity and high wear resistance needed for general purpose applications. WCVD-P grade offers, high thermal conductivity, extremely high abrasion resistance and good transmission making it an ideal grade for the most difficult applications.



WWSA Quality Control



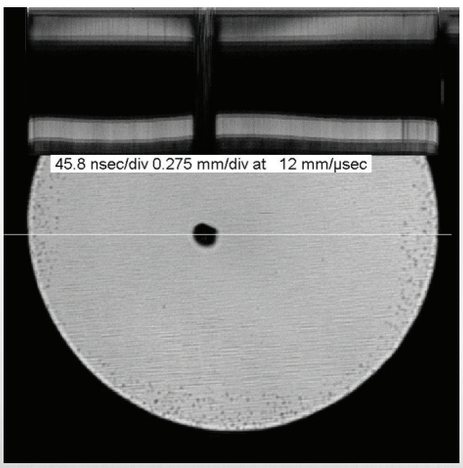
SONOSCAN **D9600**
ACOUSTIC EMISSION MICROSCOPE

At the very forefront of C-SAM acoustic micro imaging systems, the Sonoscan D9600 is the perfect general purpose tool for failure analysis, process development, material characterization and low volume product inspection.

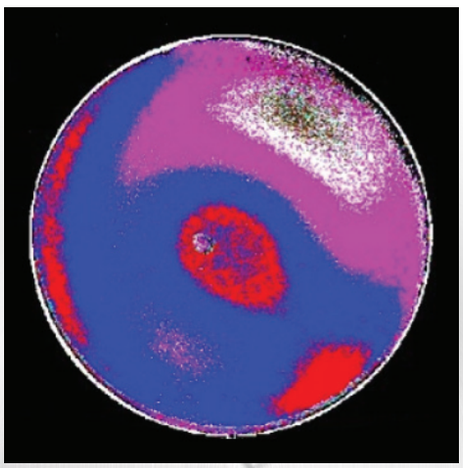
Using high-frequency, non-destructive sound waves, we can utilize the Sonoscan D9600 to produce an accurate image of solid and porous samples. The performance levels of the D9600 are truly unrivaled on the market.

With incredible accuracy and an extremely robust design, the Sonoscan D9600 includes enhances electronics and software technology that puts it at the top of the performance level list for laboratory acoustic microscopes. Its innovative capabilities are the reason it has earned a place in our high-tech Materials Characterization Laboratory.

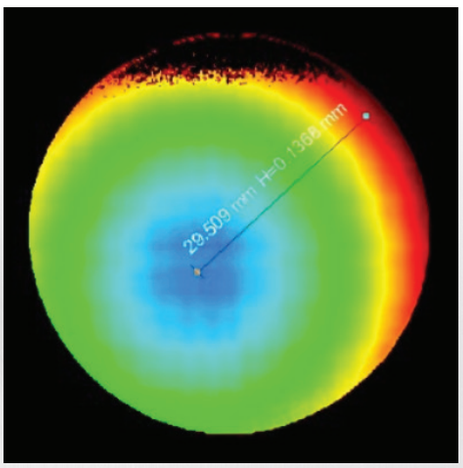
LAYER THICKNESS



BOND INTERFACE SCAN



DISK SURFACE FLATNESS



EXAMPLES OF REJECTED DISKS
FOR VOIDS AND DELAMINATION



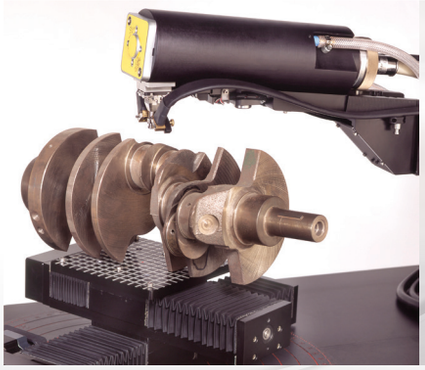
Each disk received is inspected for the following:

- Carbide grind uniformity
- Layer thickness
- Edge chips
- Sonoscan for surface flatness, internal voids, delamination, uneven layers, pooling, pitting and bond interface uniformity.



KEYENCE **3D IMAGING**

The ability to generate in-process color images of the tool's bond/crystal wear characteristics down to 1 micron which is a powerful analytical tool to identify the optimal bond/crystal combinations.



XRD X-RAY **DIFFRACTION**

Quantification of surface and subsurface residual stresses in metal alloy components and processes, such as turning, grinding, milling and induction hardening.

Measurements can be made in a wide variety of alloys, including carbon steels, ferritic and austenitic stainless steels, nickel base alloys, aluminums, and titanium based alloys.



SEM **with EDS**

An analytical, low vacuum Scanning Electron Microscope (SEM), which features integrated Energy Dispersive Spectroscopy (EDS) with the latest Silicon Drift Detector (SDD) technology.

Worldwide SOLIDS
Division of Worldwide Superabrasives, LLC

Worldwide Solids, LLC
Sales Office
470 Olde Worthington Road, Suite 200
Westerville, OH 43082
PHONE 614.410.6695 I FAX 614.410.6723
sales@worldwidesolids.com
worldwidesolids.com

Worldwide Superabrasives, LLC
Headquarters
2921 NW Commerce Park Drive
Boynton Beach, FL 33426
PHONE 954.828.9650 I 888.410.1631
FAX 954.828.9651 I 888.410.1630
sales@wwsa.com
wwsa.com

ISO International Organization for Standardization
ISO 9001:2008 CERTIFIED

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