

Superabrasive Products Inc

Diamond wheel used for PCD/PCBN grinding



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Here is a process how to make PCD tool, there are 2 steps to make PCD tool

- How to make PCD tool: PCD is sintered with natural diamond or sythetic diamond powder and bond (contain Cobalt, nickel etc.) in fixed percentage under high temperature (1000~2000 °C), high pressure(5~100000 atmospheres). Normally PCD is made in fixed diameter and thickness round shape, besides need do polishing treatment, physics and chemical treatment.
- How to re-produce PCD: include several steps cutting, welding , bit grinding etc.

1. PCD/PCBN' features and grinding features.

- High toughness, it 8-12 times harder than carbide, using life is 50-200 times of carbide tool.
- High thermal conductivity, it 1.5-9 times of carbide, even higher than Cu, so the thermal conductivity of PCD/PCBN tool is fast.
- friction coefficient only 0.1-0.3(carbide is 0.4-1), so PCD/PCBN can reduce cutting load
- thermal expansion value is $0.9 \times 10^{-6} \sim 1.18 \times 10^{-6}$, it is only 1/5 of carbide, so PCD/PCBN has little thermal changing, the tolerance is

2. The differences between PCD and PCBN cutters

PCD: Polycrystalline diamond cutters

Used for nonferrous metal and non-metallic material.

They have good cutting performance and effect for copper, aluminum, manganese, gold, silver, magnesium, titanium, .

Used for machining wear-resistant non-metallic material, such as wood, ceramic, graphite, nylon, plastic etc.

PCBN: Polycrystalline Cubic Boron Nitride cutters

Used for machining ferrous metal

Especially suitable for machining kinds of hardened steel, pearlite green cast iron, chilled cast-iron, superalloy and other materials that not lower than 50HRC.

Grinding features:

Compared to PCBN, PCD has much higher hardness, so it will be more difficult to process, and the grinding time will be 2-5 times than PCBN.

Illustration of common PCD and PCBN tools



3. Common specs and grinders

- 6A2/12A2, used for grinding cutting edge, for inserts, and solid cutters.
- 11A2/2A2/6A2 peripheral grinding wheels, only used for grinding inserts.
- 3A1/14A1 cylindrical grinding wheels, mainly used for machining reamers and milling cutters.

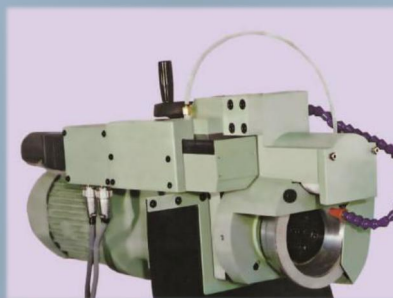
Common machine with 6A2/12A2 edge grinding wheel

- ❖ EWAG(Switzerland)
- ❖ WENDT(Germany)
- ❖ FARMAN(Taiwan)

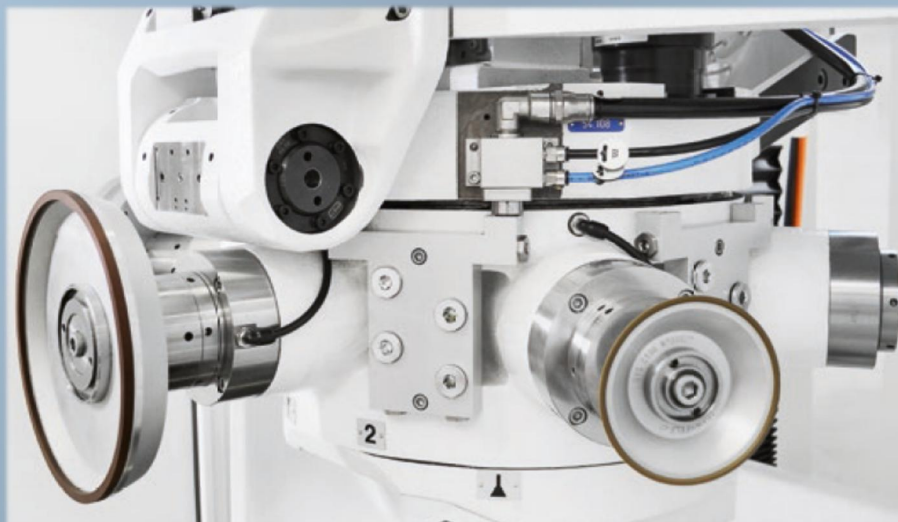
Common wheel specs:

- Diameter: 150mm
- Thickness: 35-55mm
- Abrasive section width: 2-20mm
- Abrasive section depth: 5-15mm

Japanese manual grinder, 12A2 150*52*50.8*5*5



Swiss CNC grinder, 6A2 150*45*40*20*10



Grinders for 11A2 Peripheral grinding wheel

The main equipment manufactures:

- ❖ AGATHON(Switzerland)
- ❖ WENDT(Germany)
- ❖ WAIDA(Japan)

Common wheel specs:

- 400*22*353*12*6
- 400*40*355*15*7
- 350*92*260*10*10

Swiss CNC grinder, 2A2 400*22*353*12*6

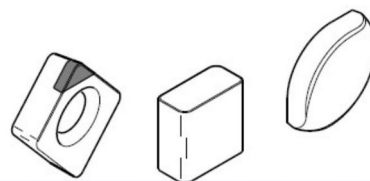


Process range:

ISO standard and customed indexable inserts

Inserts with double side negative chamfered edges

Ball-end milling cutter inserts



4. Customer test report

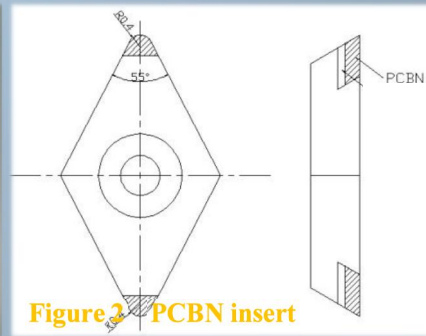


Chart 1 Grinding conditions

Item Name	Technical parameters
Grinder producer	WENDT
Wheel spec	11A2T 400×40×355×15×7
Diamond grit	W16
Coolant type	Grinding oil
Work Material	PCBN
Grinding area	Peripheral grinding

Chart 2 Grinding process parameters

Item name	Grinding parameters
Rotational speed	15 m/s
Feed rate	1.5 mm/min
Swaying frequency	0.7 Hz
Spark out time	3 s
Dressing mode	Continuous
Dressing amount	0.0003 mm/s

Chart 3 Wheel test report

Contrastive parameters	WENDT	Saili
Cutting Edge	0.01mm	0.01mm
Processing efficiency	193 s	198 s
Using life	895 pcs	872 pcs

- Watch Cutting edge under 30 X microscope,
- Use the average processing time of single insert to indicate the processing efficiency,
- Use to total amount of processed inserts to indicate the wheel using life .

Common grits of PCD wheel in domestic market

Grit	Process allowance	Edge size
W40(400#)		30um
W28(600#)		
W20(800#)	50um	20um
W14(1000#)	20um	
W10(2000#)		10um
W7(2500#)	10um	<10um
W5(3000#)		

Our bond system

Bond code	Common Con.	Hardness	Life	Competitors
V85	100%	Low	Short	Domestic plants
	125%			
V7	150%	High	Long	Overseas plants
PV1	125%	Mid	Mid	Domestic and Overseas
	150%			



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