UHD,
TOUGHER CBN INSERT

System Solution Manufacturer for Superhard Cutting Tools

UHD Ultrahard Tools Co., ltd

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http://www.ultrahard-china.com

UHD Ultrahard Tools Co., ltd

UHD Ultrahard Tools Co., ltd locates in Zhengzhou, where is industrial base for abrasives & grinding in China. As a Hi-tech enterprise, a key enterprise in the superhard material industry , UHD Ultrahard Tools has own technical and R&D center for artificial diamond and CBN , also we participated in drafting the national standard of CBN abrasive and CBN cutting tools.

UHD Ultrahard Tools has been supplying superhard products to various customers in different countries and regions, we had been selected and listed into Toyota Supply System. Our products cover the full range of superhard materials, such as cBN, synthetic diamond, and other innovative superhard cutting tools and grinding tools, like PCBN, CVD, diamond wheels and brazed diamond tools. UHD ultrahard tools are widely used into mining machinery industry, automotive industry, metallurgical roller machining, construction machinery, gear and bearing industry, aerospace industry.

UHD ultrahard tools are produced with refined material and we benchmark our products with the best in the word to optimize performance. We also have a progressive quality management system that ensures our produces are of supreme quality. Our premium tools perform brilliantly in the most severe operating environments and assure excellent comfort, elevated safety and longer lifetime.

UBN

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UBN

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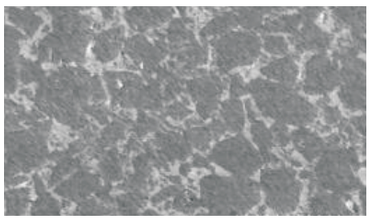
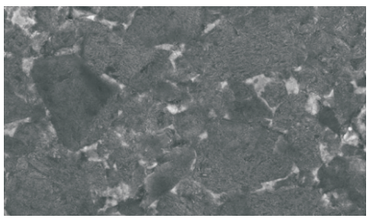
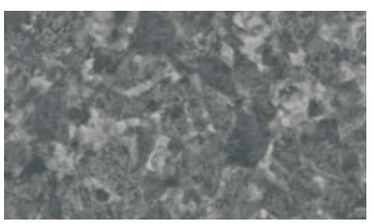
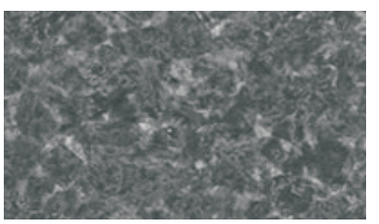
UBN S1

★ **Be Specially Recommended for High Hardness High Speed Steel Roll Machining.**

Organizational Characteristics: binding with similar CBN particles
Microhardness: 4100-4300
Application: With certain impact resistance and higher wear resistance, it is suitable for casting high speed steel, alloy cast iron and hardened steel machining and those whose hardness are above HRC55 with interrupted roughing and semi-finishing.

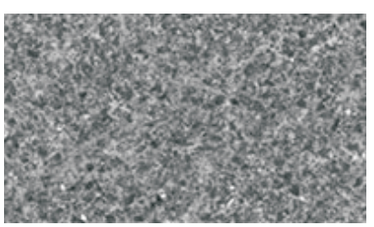
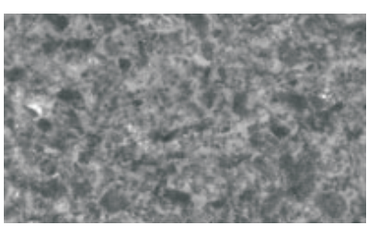
UBN S2

★ **Be Recommended for Surfacing Roll Machining**

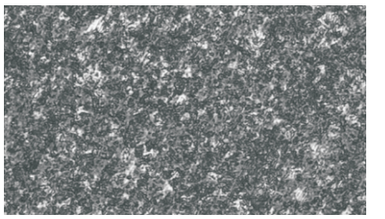
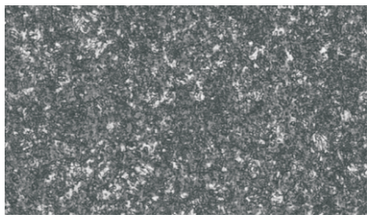
Organizational characteristics: binding with main CBN particles and binders
Microhardness: 4000-4200
Application: With better impact resistance and higher wear resistance, it is suitable for machining hardened steel and those which are hard to machined materials with light interrupted semi-finishing and finishing.

UBN S3

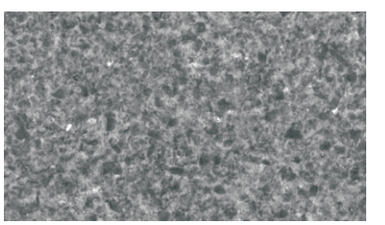
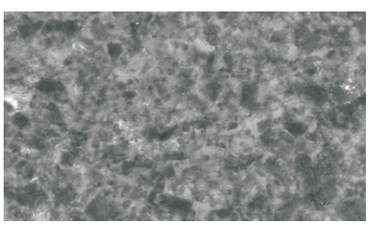
Organizational Characteristics: sintered by special materials which contains CBN
Microhardness: 2700-2900
Application: With higher impact resistance and certain wear resistance, it is suitable for machining hardened steel and those which are hard to machined materials with interrupted roughing and semi-finishing.

UBN S4

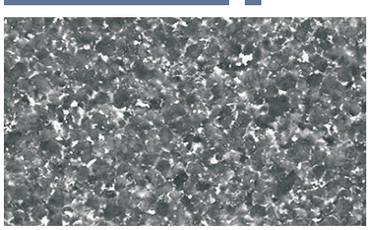
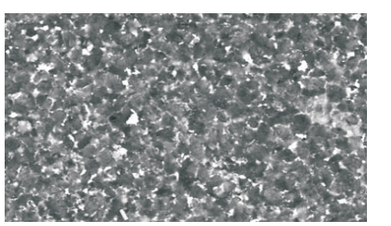
Organizational Characteristics: sintered by special materials which contains CBN
Microhardness: 2900-3000
Application: With better impact resistance and higher wear resistance, it is suitable for machining hardened steel, ductile iron and those which are hard to machined materials with interrupted roughing and semi-finishing.

UBN S5

Organizational Characteristics: binding with main CBN particles and binders
Microhardness: 3300-3500
Application: With higher impact resistance and better wear resistance, it is suitable for machining hardened steel and those which are hard to machined materials with light interrupted semi-finishing and finishing.

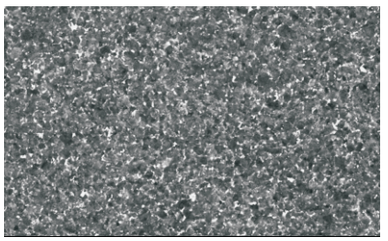
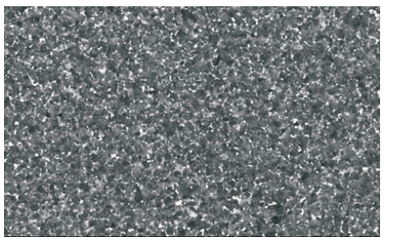
UBN X2

★ **Be Specially Recommended for Milling**

Organizational Characteristics: binding with main CBN particles and binders
Microhardness: 3700-3900
Application: With better impact resistance and higher wear resistance, it is suitable for machining alloy cast iron with high hardness, high-Ni-Cr cast iron and high chromium cast iron with interrupted semi-finishing and finishing.

UBN X3

Organizational Characteristics: binding with main CBN particles and binders
Microhardness: 3900-4100
Application: With better impact resistance and wear resistance, it is suitable for machining grey cast iron with interrupted roughing, semi-finishing and finishing.

UBN X5

★ **Be Specially Recommended for Cylinder Liner Machining**

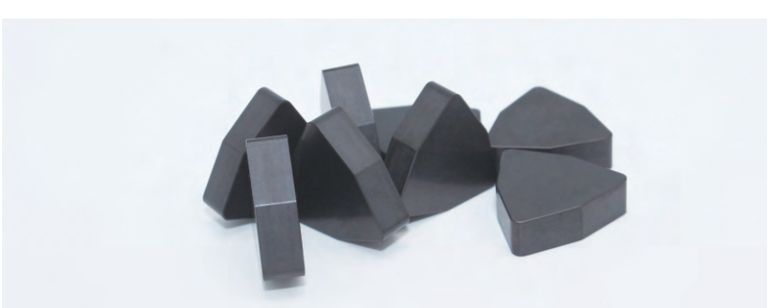
Organizational Characteristics: binding with main CBN particles and binders
Microhardness: 3500-3700
Application: With better impact resistance and wear resistance, it is suitable for machining boron copper cast iron with semi-finishing and finishing.

UDI Q

★ **Be Specially Used for Ductile Iron Machining**

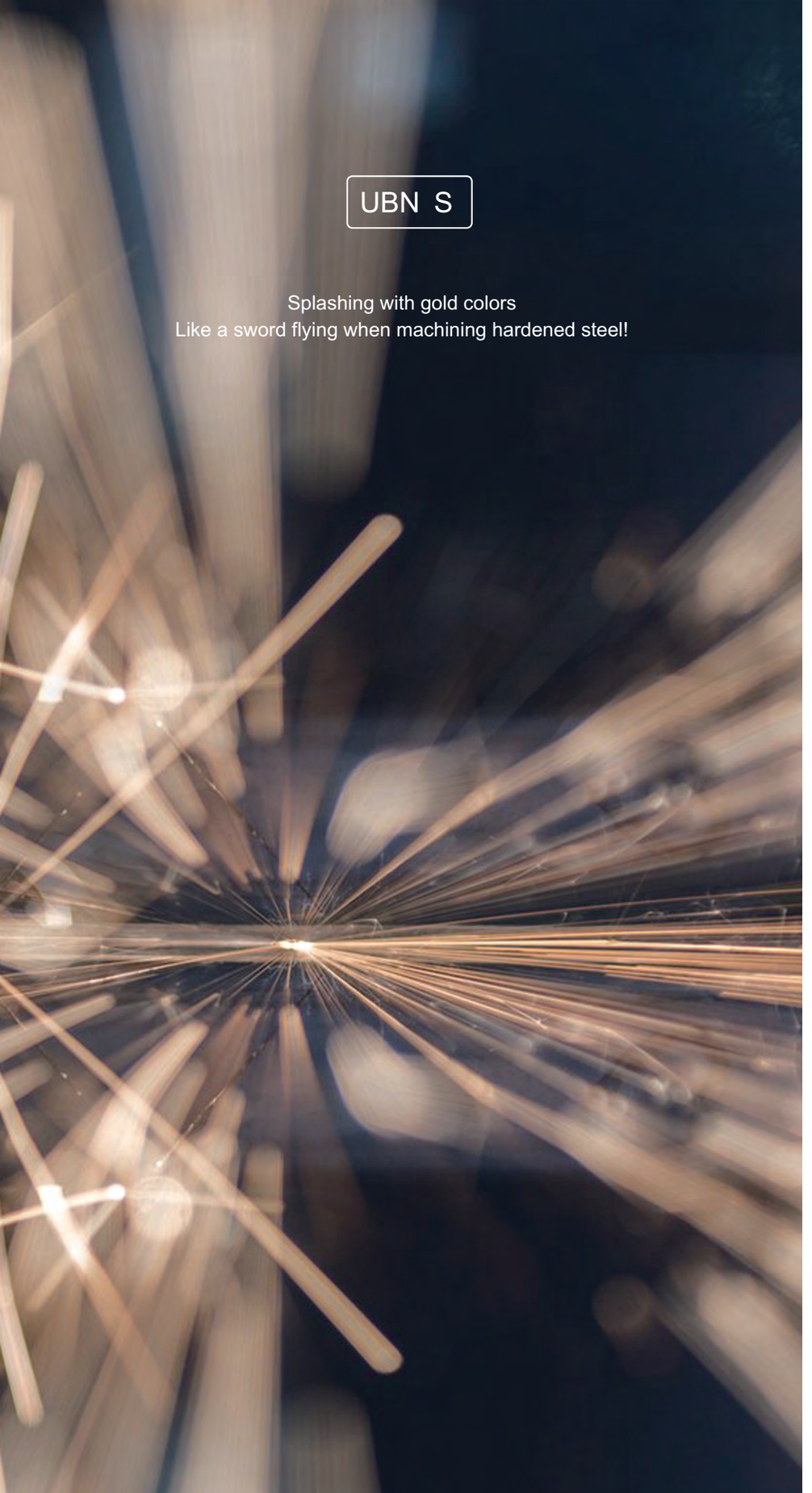
Organizational Characteristics: special ingredients
Microhardness: Above 4200
Application: Be mainly applied for components such as crankshaft, camshaft, cylinder liner and engine case for automobile, tractors, heavy duty machinery, internal combustion engine and etc, mediun-pressure valve for general machinery which are under complex conditions, and have high requirements for strength, toughness and wear resistance at the same time.

Notes: Only providing solutions to end users for now.



UHD UBN Grades

Grades	CBN Content	Machining Mode	Workpiece Material	Application
UBN S1	90%	Interrupted Continuous	Grey cast iron Rough/semi-finish	Roll, surfacing roll repairing, mining machinery, large gear and etc.
UBN S2	70%	Interrupted Continuous	Hardened steel Rough/semi-finish	Wind power bearing, crankshaft, mining machinery, automobile gear and etc.
UBN S3	50%	Interrupted Continuous	Hardened steel Rough/semi-finish	Crankshaft, drive shaft and etc.
UBN S4	60%	Interrupted Continuous	Hardened steel / ductile iron Semi-finish/finish	Gear, shaft and etc.
UBN S5	75%	Interrupted Continuous	Hardened steel Semi-finish/finish	Wind powder bearing, gear for mining machinery , crankshaft, gear for automobile .
UBN X2	85%	Interrupted Continuous	Cast iron/Hardened steel Semi-finish/finish	Automobile brake disc, engine cylinder block, cylinder liner, gear, bear and etc.
UBN X3	92%	Interrupted Continuous	Cast iron	Automobile brake disc, engine cylinder block, cylinder liner, gear, bear and etc.
UBN X5	85%	Continuous	Boron copper cast iron Semi-finish/finish	Cylinder liner
UDI Q	Special ingredients	Continuous	Bane of ductile iron	Be mainly applied for components such as crankshaft, camshaft, cylinder liner and engine case for automobile, tractors, heavy duty machinery, internal combustion engine and etc, mediun-pressure valve for general machinery which are under complex conditions, and have high requirements for strength, toughness and wear resistance at the same time.



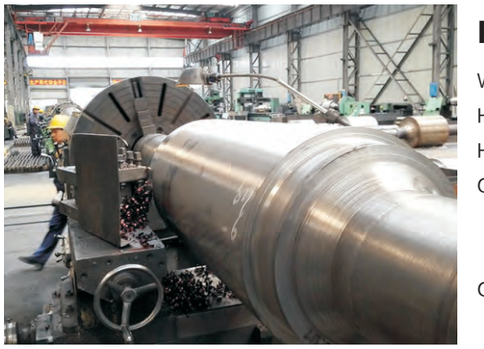
UBN S

Splashing with gold colors
Like a sword flying when machining hardened steel!

For Hardened Steel

Grades	CBN Content	Machining Mode	Workpiece Material	Application
UBN S1	90%	Interrupted Continuous	Grey cast iron Rough/semi-finish	Roll, surfacing roll repairing, mining machinery, large gear and etc.
UBN S2	70%	Interrupted Continuous	Hardened steel Rough/semi-finish	Wind power bearing, crankshaft, mining machinery, automobile gear and etc.
UBN S3	50%	Interrupted Continuous	Hardened steel semi-finish/finish	Crankshaft, drive shaft and etc.
UBN S4	60%	Interrupted Continuous	Hardened steel/ ductile iron/ semi-finish/finish	Gear, shaft and etc.
UBN S5	75%	Interrupted Continuous	Hardened steel semi-finish/finish	Wind powder bearing, gear for mining machinery , crankshaft, gear for automobile .

Inserts can be customized with special ingredients



Roll

Workpiece Material:
High nickel chromium alloy cast iron
Hardness: HSD78
Cutting Parameters: Vc=55m/min,
ap=2mm,
f=0.2mm/r;
Grade: WBN S1

Crankshaft

Workpiece Material：42CrMo
Hardness: HRC42−47
Cutting Parameters:
Vc=150～180m/min,
ap=0.2～0.3mm,
f=0.08～0.12mm/r;
Grades: WBN S3,WBN S4

For Cast Iron

Grades	CBN Content	Machining Mode	Workpiece Material	Application
UBN X2	85%	Interrupted Continuous	Cast iron Hardened steel semi-finish/finish	Automobile brake disc, engine cylinder block, cylinder liner, gear, bear and etc.
UBN X3	92%	Interrupted Continuous	Cast iron	Automobile brake disc, engine cylinder block, cylinder liner, gear, bear and etc.
UBN X5	85%	Continuous	Boron copper cast iron semi-finish/finish	Cylinder liner

Inserts can be customized with special ingredients

Brake Drum

Workpiece Material: HT250
Hardness: HB170−210
Cutting Parameters:
Vc=160m/min,
ap=3mm,
f=0.3mm/r;
Grades: WBN S1

Engine Cylinder Head

Workpiece Material: Grey Cast Iron
Cutting Parameters:
Vc=3000～2500mm/min,
ap=1.5～2.6mm,
f=0.1～0.2mm/r;
Grades: WBN X2

For Ductile Iron

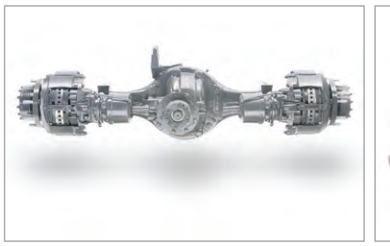
Grades	CBN Content	Machining Mode	Workpiece Material	Application
UDI Q	Special ingredients	Continuous	Bane of ductile iron	Be mainly applied for components such as crankshaft, camshaft, cylinder liner and engine case for automobile, tractors, heavy duty machinery, internal combustion engine and etc, mediun-pressure valve for general machinery which are under complex conditions, and have high requirements for strength, toughness and wear resistance at the same time.

Inserts can be customized with special ingredients

Ductile Iron Cylinder

Workpiece Material: QT400，
500，600，800
Hardness:HB350
Cutting Parameters: Vc=200m/min,
ap=1mm,
f=0.1mm/r;

ADI(Austempering Ductile Iron)Coupling




To Select Proper Solutions

Since the first introduction as cutting tools materials, cubic boron nitride (CBN) has gradually became the preferred solution for those difficult to machined materials. Its application fields include hard steel, cast iron, high temperature alloy and powder metallurgy materials.

With high thermal stability, CBN inserts can resist to the high temperature of 1300℃, and at the same time, it can also maintain its cutting edge performance. This is why CBN inserts can provide long time stable tool life and high machining efficiency, and furthermore, it can ensure to get high surface roughness and this is the reason for replacing grinding by turning.

Choices of Cutter Tip Radius

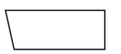
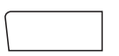
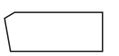
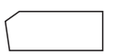
1:Cutting tips are the most difficult working components for all kinds of cutting tools. With poor tip strength and heat dissipation, and for the cutting force and cutting heat are likely to concentrate, and it is also with the quickest cutting speed, so the cutting tips are easily to be broken. Therefore, the durability of these tools depends directly on the abrasion of the tip.

2:Cutting tips directly influence the forming process of machining surface, and affecting the height of the remaining area; In other words, tips have a direct effect on the roughness of the processed surface.Because of above reasons, when choosing the appropriate shape and parameters of the tips, it is necessary to consider the requirements of the tool durability and the processed quality.The cutter tip radius is the main parameter of cutter shape, its size directly affects the roughness of the processed surface, the shape of the cutting layer, the cutting temperature and the durability of the tool.

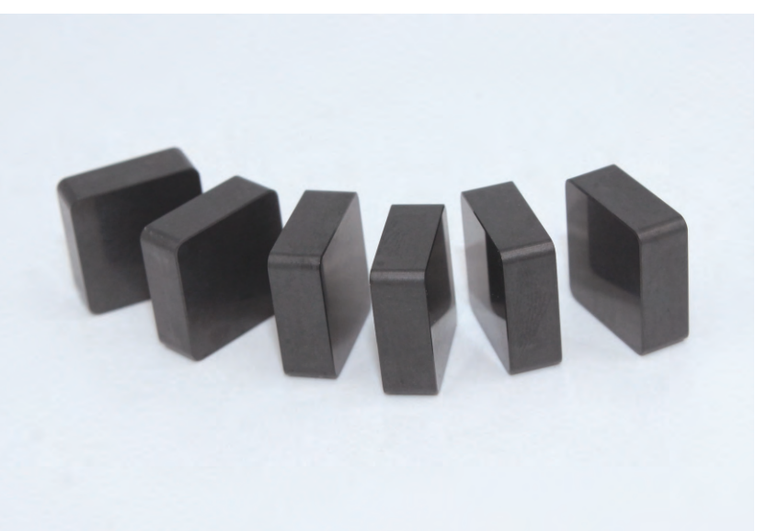
Choices of Cutter Tip Radius	Advantages	Disadvantages
Large Cutter Tip Radius	•Better for roughing, with good tip strength; •Long tool life, with good tip heat dissipation; •Roughness of processed surface can be increased with same cutting parameters.	• Equipment should be with enough rigidity for the radial force is large during cutting
Small Cutter Tip Radius	•Be suitable for finishing and super finishing machining with small cutting depth .	•Poor tip strength, no impact resistance; •Poor tip heat dissipation; •Need to change cutting parameters to improve the roughness of the processed surface;

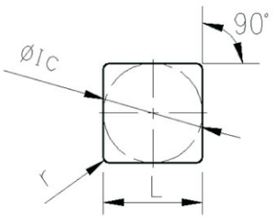
Choices of Cutting edge

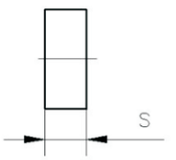
For its high hardness and brittleness of CBN inserts, it is quite important for the cutting edge selecting in order to decrease cutting edge breaking, and increase inserts tool life for its low strength of cutting edge.

Code	Cutting edge form	Drawings	Choice
F	sharp		Be suitable for equipment with good rigidity, for continuous finishing machining.
E	Honing		Can strengthen cutting edge and increase inserts tool life; Be suitable for continuous finishing machining.
T	Chamfering		Higher cutting edge strength, be suitable for interrupted finishing, semi finishing and roughing according to different chamferings.
S	Honing + chamfering		Much higher cutting edge strength, be suitable for interrupted finishing, semi finishing and roughing according to different chamferings.

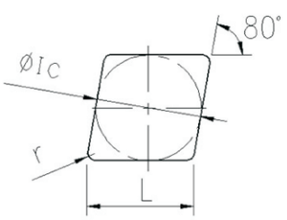
In general, cutting edge honing rε＜feeding depth/3
Chamfering br≈（0.3～0.8）× feeding depth chamfering angle γb1＝-5°～-30°

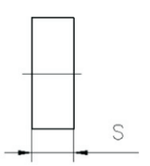




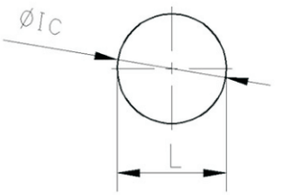


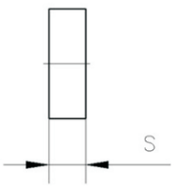
ISO	Dimension				Cutting Edge Form	Grades			
	L	ϕIC	S	r		S1	S2	X1	X2
SNMN090404	9	9.525	4.76	0.4	T01020 T01025 T02020 S01020 S01025 S02020 S05020 S10020				
SNMN090408	9	9.525	4.76	0.8					
SNMN090412	9	9.525	4.76	1.2					
SNMN120404	12	12.7	4.76	0.4					
SNMN120408	12	12.7	4.76	0.8					
SNMN120412	12	12.7	4.76	1.2					
SNMN150712	15	15.875	7.94	1.2					
SNMN150716	15	15.875	7.94	1.6					
SNMN201020	20	20	10	2.0					
SNMN201024	20	20	10	2.4					



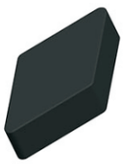


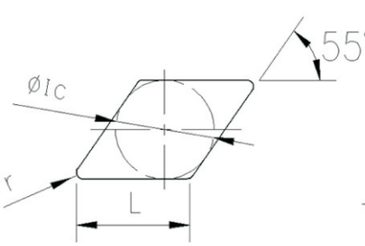
ISO	Dimension				Cutting Edge Form	Grades			
	L	ϕIC	S	r		S1	S2	X1	X2
CNMN090404	9	9.525	4.76	0.4	T01020 T01025 T02020 S02030 S02025 S02030				
CNMN090408	9	9.525	4.76	0.8					
CNMN090412	9	9.525	4.76	1.2					
CNMN120404	12	12.7	4.76	0.4					
CNMN120408	12	12.7	4.76	0.8					
CNMN120412	12	12.7	4.76	1.2					

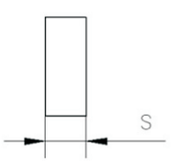




ISO	Dimension				Cutting Edge Form	Grades			
	L	ϕIC	S	r		S1	S2	X1	X2
RNMN090400	9	9.525	4.76	0	T01020 T01025 T02020 S02030 S02025 S02030 S05020				
RNMN120400	12	12.7	4.76	0					
RNMN120700	12	12.7	7.94	0					
RNMN150700	15	15.875	7.94	0					
RNMN200700	20	20	7.94	0					
RNMN201000	20	20	10	0					

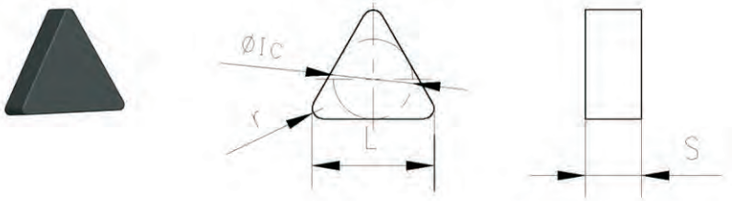






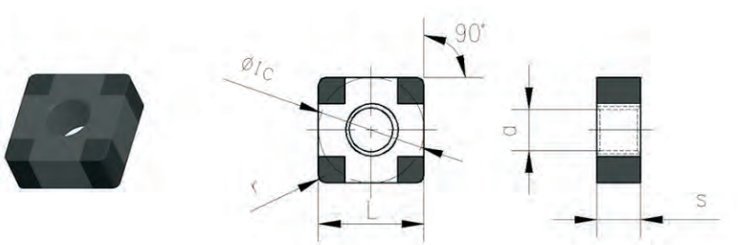
ISO	Dimension				Cutting Edge Form	Grades			
	L	ϕIC	S	r		S1	S2	X1	X2
DNUN110404	11	9.525	4.76	0.4	T01020 T02020 T02025 S01020 S02020 S02030				
DNUN110408	11	9.525	4.76	0.8					
DNUN110412	11	9.525	4.76	1.2					
DNUN150604	15	12.7	6.35	0.4					
DNUN150608	15	12.7	6.35	0.8					
DNUN150612	15	12.7	6.35	1.2					

UBN Series Solid Inserts



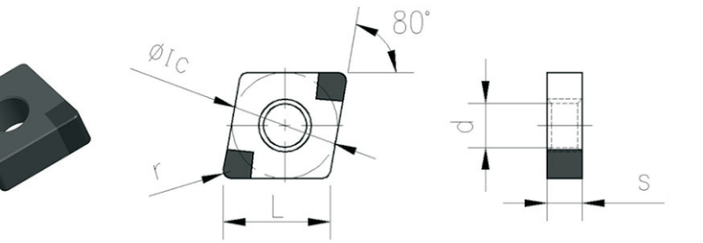
ISO	Dimension				Cutting Edge Form	Grades			
	L	ϕ IC	S	r		S1	S2	X1	X2
TNMN110404	11	6.35	4.76	0.4	T01020 T02020 S01020 S02020				
TNMN110408	11	6.35	4.76	0.8					
TNMN110412	11	6.35	4.76	1.2					
TNMN160404	16	9.525	4.76	0.4					
TNMN160408	16	9.525	4.76	0.8					
TNMN160412	16	9.525	4.76	1.2					

UBN Series Soldering Inserts



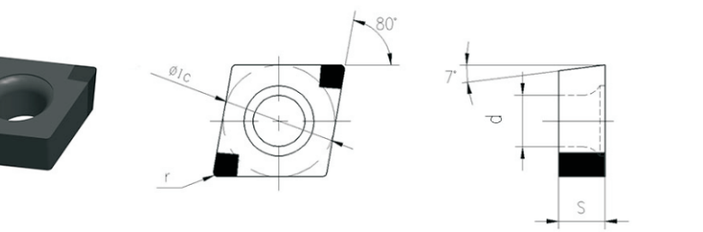
ISO	Dimension					Cutting Edge Form	Grades			
	L	ϕ IC	S	d	r		S1	S2	X1	X2
SNMA090404	9	9.525	4.76	3.81	0.4	T01020 T01025 T02020 S02030 S02025 S02030				
SNMA090408	9	9.525	4.76	3.81	0.8					
SNMA090412	9	9.525	4.76	3.81	1.2					
SNMA120404	12	12.7	4.76	5.16	0.4					
SNMA120408	12	12.7	4.76	5.16	0.8					
SNMA120412	12	12.7	4.76	5.16	1.2					

UBN Series Soldering Inserts



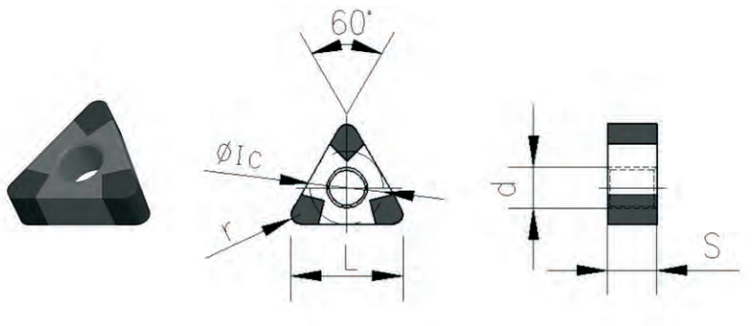
ISO	Dimension					Cutting Edge Form	Grades			
	L	ϕ IC	S	d	r		S1	S2	X1	X2
CNMA120404	12	12.7	4.76	5.16	0.4	T01020 T01025 T02020 S02030 S02025 S02030				
CNMA120408	12	12.7	4.76	5.16	0.8					
CNMA120412	12	12.7	4.76	5.16	1.2					

UBN Series Soldering Inserts

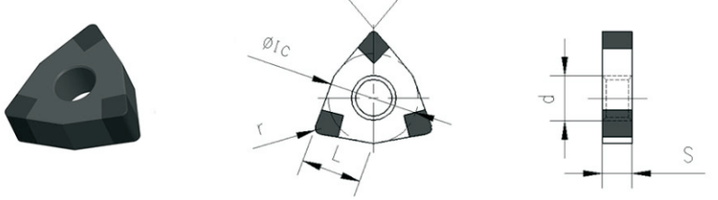


ISO	Dimension					Cutting Edge Form	Grades			
	L	ϕ IC	S	d	r		S1	S2	X1	X2
CCGW09T304	9	9.525	3.97	4.4	0.4	T01020 T01025 T02020 S02030 S02025 S02030				
CCGW09T308	9	9.525	3.97	4.4	0.8					
CCGW120404	12	12.7	4.76	5.56	0.4					
CCGW120408	12	12.7	4.76	5.56	0.8					
CCGW120412	12	12.7	4.76	5.56	1.2					

UBN Series Soldering Inserts

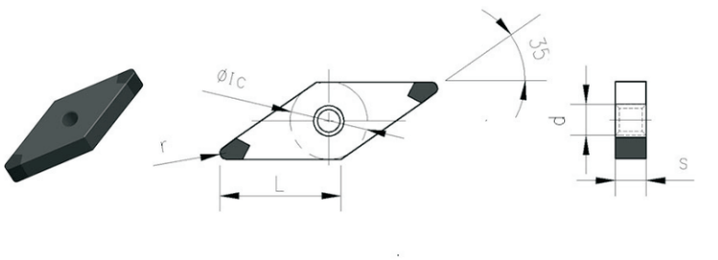


ISO	Dimension					Cutting Edge Form	Grades			
	L	ϕIC	S	d	r		S1	S2	X1	X2
TNMA160404	16	9.525	4.76	3.81	0.4	T01020 T02020 S01020 S02020				
TNMA160408	16	9.525	4.76	3.81	0.8					
TNMA160412	16	9.525	4.76	3.81	1.2					

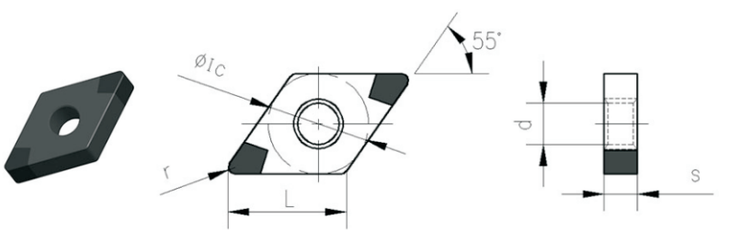


ISO	Dimension					Cutting Edge Form	Grades			
	L	ϕIC	S	d	r		S1	S2	X1	X2
WNMA060404	6	9.525	4.76	3.81	0.4	T01020 T01025 T02020 S02030 S02025 S02030				
WNMA060408	6	9.525	4.76	3.81	0.8					
WNMA060412	6	9.525	4.76	3.81	1.2					
WNMA080404	8	12.7	4.76	5.16	0.4					
WNMA080408	8	12.7	4.76	5.16	0.8					
WNMA080412	8	12.7	4.76	5.16	1.2					

UBN Series Soldering Inserts



ISO	Dimension					Cutting Edge Form	Grades			
	L	ϕIC	S	d	r		S1	S2	X1	X2
VNMA160404	16	9.525	4.76	3.81	0.4	T01020 T02020 S01020 S02020				
VNMA160408	16	9.525	4.76	3.81	0.8					
VNMA160412	16	9.525	4.76	3.81	1.2					

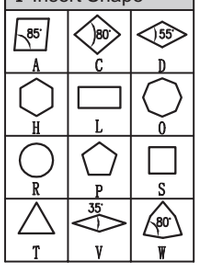


ISO	Dimension					Cutting Edge Form	Grades			
	L	ϕIC	S	d	r		S1	S2	X1	X2
DNMA110404	11	9.525	4.76	3.81	0.4	T01020 T01025 T02020 S02030 S02025 S02030				
DNMA110408	11	9.525	4.76	3.81	0.8					
DNMA110412	11	9.525	4.76	3.81	1.2					
DNMA150404	15	12.7	4.76	5.16	0.4					
DNMA150408	15	12.7	4.76	5.16	0.8					
DNMA150412	15	12.7	4.76	5.16	1.2					

UHD Inserts Naming Standards

S	N	G	N	12	04	08FB	SL	02020
①	②	③	④	⑤	⑥	⑦	⑧	⑨
R	C	M	V	20	10	00	PH	20010
①	②	③	④	⑤	⑥	⑦	⑧	⑨

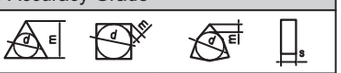
1 Insert Shape



2 Main Cutting Edge Clearance Angle

Code	Clearance Angle
A	3°
B	5°
C	7°
N	0°
P	11°

3 Accuracy Grade



Code	Tolerance (mm)			Code	Tolerance (mm)		
	d	m	s		d	m	s
A	±0.025	±0.006	±0.025	J	±0.05~±0.15	±0.005	±0.025
F	±0.013	±0.006	±0.025	K	±0.05~±0.15	±0.013	±0.025
C	±0.025	±0.013	±0.025	L	±0.05~±0.15	±0.025	±0.025
H	±0.013	±0.013	±0.025	M	±0.05~±0.15	±0.08~±0.2	±0.13
E	±0.025	±0.025	±0.025	N	±0.05~±0.15	±0.08~±0.2	±0.025
G	±0.025	±0.025	±0.13	U	±0.08~±0.25	±0.13~±0.38	±0.013

4 Cutting edge and fixing form

Code	Fixing form	Cutting edge	Drawing
A G M	With hole	Double sided Single side	
N R F	Without hole	Double sided Single side	
W T	40°- 60° counter bore on single side	Single side	
V	Pyramid bottom	Single side	120°
Y	Cone bottom	Single side	120°
X	Special fixing form		

5 Cutting Edge Length

Incircle (mm)	Inserts Shape						
	C	D	R	S	T	V	W
6.35	06	07	06	06	11	11	04
9.525	09	11	09	09	16	16	06
12.7	12	15	12	12	22	22	08
15.875	16	19	15	15	27		
20			20	20			

UHD Inserts Naming Standards

S	N	G	N	12	04	08FB	SL	02020
①	②	③	④	⑤	⑥	⑦	⑧	⑨
R	C	M	V	20	10	00	PH	20010
①	②	③	④	⑤	⑥	⑦	⑧	⑨

6 Inserts Thickness

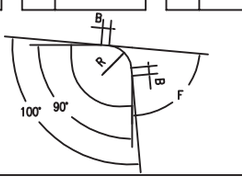
Code	Inserts Thickness (mm)	Code	Inserts Thickness (mm)
03	3.18	06	6.35
T3	3.97	T6	6.8
04	4.76	07	7.94
T4	4.96	10	10
05	5.56	12	12

7 Corner Shape

Corner Arc Code	
Code	Corner Arc Radius
00	No Arc
04	0.4
08	0.8
10	1.0
12	1.2
16	1.6
20	2.0

Main Cutting Edge Angle	
Code	Angle
A	45°
D	60°
E	75°
F	85°
P	90°
Z	Special Angle

Wiper Length	
Code	Length (L)
A	0.2
B	0.4
C	0.6
D	0.8
F	1.0



8 Cutting Edge Shape

Code	Cutting Edge Form		Drawing
F	Sharp Cutting Edge		
EL	Light	Honing	
E	Average	Honing	
EH	Heavy	Honing	
T	Chamfering		
SL	Light	Honing + Chamfering	
S	Average	Honing + Chamfering	
SH	Heavy	Honing + Chamfering	
Q	Double Chamferings		
PL	Light	Double Chamfrings + Honing	
P	Average	Double Chamfrings + Honing	
PH	Heavy	Double Chamfrings + Honing	

9 Chamfering Code

Single Chamfering Code			
Width		Angle	
Code	b_r	Code	γ_{b1}
005	0.05	05	5°
010	0.10	10	10°
015	0.15	15	15°
020	0.20	20	20°
025	0.25	25	25°
030	0.30	30	30°
050	0.50		
070	0.70		
100	1.00		
150	1.50		
200	2.00		

Double Chamferings Code				
Code	Width b_{r1}/mm	Angle γ_{b1}	Width b_{r2}/mm	Angle γ_{b2}
05015	0.50	15°	0.10	30°
07015	0.70	15°	0.15	30°
10015	1.00	15°	0.20	30°
15010	1.50	10°	0.25	30°
20010	2.00	10°	0.25	30°