

Our actions:

- Global wide sales and service network can provide you with fast product delivery and technical support.
- Perfect agent cooperation mechanism and channel protection measures
- Funik can design, develop and produce the most suitable CBN tools according to your different requirements, such as equipment, products, work material, etc.
- Funik opened 7 * 24-hour service hot-line : 400-878-5556 , one button can complete order, service and complaint! Full time recordings and specified supervision can ensure the quality of

FUNIK COMMITMENT:

COMMITMENT
★ REDUCE YOUR COMPREHENSIVE CUTTING COSTS BY AT LEAST 30% !
★ FREE TRIAL INSERTS AND TOOL HOLDERS ARE PROVIDED !
★ FREE OVERALL SOLUTIONS ARE PROVIDED!

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Excellent quality comes from professional manufacturing

SINCE 1988

FUNIK
Company Honor

Company Brief Introduction

FUNIK CBN superhard cutting tools are made of self-produced nano-CBN after Funik became the biggest and the most advanced technology of CBN manufacturer all over the world. The metal cutting tools are sintered by combining many patents, under high temperature and high pressure of micro crystal technology. It is also the new product that brings a revolutionary change to cutting industry. The CBN products hold the excellent anti-fracture, wear-resistance and chemical stability. It has been the best substitution of ceramic inserts, coating inserts and alloy inserts. It is widely used in ferrous metal work piece machining such as Automotive industry, Metallurgical roll, Railway transportation, Mining machinery, Construction machinery, Wind power, Gears, Bearings industry, etc.

FUNIK CBN superhard cutting tools are widely used in many kinds of metal materials machining in many enterprises. It is fully proved that CBN superhard cutting tools will bring unexpected efficiency and economy for machinery industry processing. Welcome your inquiry and have a test!

Customer service hot-line: 400-878-5556

- 1988 Successfully synthesized the first particle of high-grade CBN abrasive.
- 1991 Amber CBN was successfully developed.
- 1997 High-strength black CBN was successfully developed.
- 1998 FUNIK won the title of "High-tech Enterprise".
- 2002 FUNIK worked out China CBN Standards.
- 2003 PCBN cutting tools were launched.
- 2003 Undertaken the realization of "National Torch Plan".
- 2005 FUNIK CBN products won the title of "Henan Famous-brand Product".
- 2005 FUNIK was awarded the title of "Top Ten Comprehensive Economic Result Enterprises in China Machine Tool Industry".
- 2006 FUNIK became the first company in this field to pass and obtain three certificates including ISO9001, ISO14001 and OHSAS 18001.
- 2006 FUNIK was listed in "50 High-tech High-growth Enterprises" named by the People's Government of Henan Province.
- 2006 High strength and high impact resistance coarse CBN super abrasives won the "State Science and Technology Key New Product Certificate".
- 2007 High wear and impact resistance PCBN cutting tools were successfully launched into the market.
- 2007 High sharp CBN abrasive launched into the market successfully.
- 2008 Super wear resistance PCBN cutting tools used for high speed finish machining launched into the market successfully.
- 2009 FUNIK was awarded the title of "Henan Province Innovative Enterprise".
- 2009 Undertaken the implementation of High-grade CBN and High-speed superhard cutting tools of "High-tech Industrialization Project from National Development and Reform Committee (NDRC)."
- 2010 Soldering CBN cutting tools were launched into the market.
- 2010 "FUNIK trademark won the title of "International Famous Brand".
- 2011 The only Academician Work Station of CBN and Products in China was established.
- 2012 FUNIK CBN Cutting Tools won the title of "Most Potential CBN Cutting Tools Brand".
- 2012 FUNIK CBN Cutting Tools won the title of "Most Potential CBN Cutting Tools Brand".
- 2013 Awarded the title of "Top Ten Comprehensive Economic Result Enterprises in China Machine Tool Industry".
- 2013 The indexable PCBN milling cutting tools were successfully launched into the market.
- 2014 Award the title of "Innovative Enterprise" of China Material Research Association.
- 2014 FUNIK CBN Cutting Tools won the title of "The Best Service Brand" by cutting tools' customers.
- 2014 FUNIK won one hundred and ninety national patents, including seven inventions, two design patents and one hundred and eighty-one utility models.



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What is Cubic Boron Nitride (CBN)

CBN : Cubic Boron Nitride

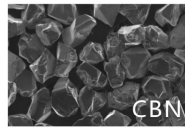
Cubic boron nitride (CBN) is a high hardness, high heat-resistance crystal synthesized by boron and nitrogen under high temperature and high pressure.

The polycrystalline cubic boron nitride (PCBN) is a sintered material synthesized by selecting CBN micro-nano crystal powder and binder under high temperature and high pressure.

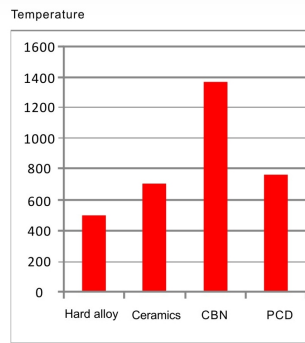
Boron and nitrogen is very rich in the nature: 78% of the air component is nitrogen! The cutting tools made of CBN can replace a large number of cutting tools made of high pollution and high energy consumption mineral resources, such as tungsten carbide and corundum.

China is a country with large amount of tungsten resources, but according to a report .50-100 years later, the world will usher in a shortage of tungsten era!

The PCBN cutting tools have been widely used in the field of machining ferrous metal!



The red hardness contrast of main tool material



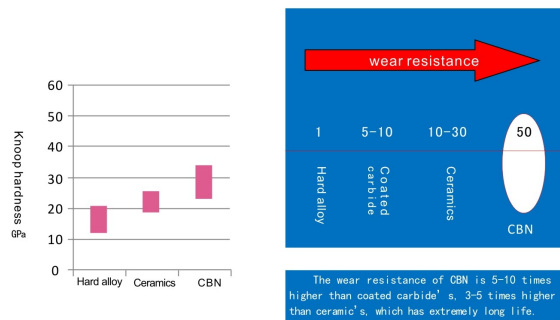
The red hardness of CBN can reach 1370°C, almost twice as high as the red hardness of diamond. The hardness of PCBN is higher than the room-temperature hardness of carbide, ceramics, PCD at 800°C. So the cutting speed of CBN cutting tools can be 2-5 times higher than hard alloy, ceramics cutting tools, and has high cutting efficiency.

Features of Polycrystalline Cubic Boron Nitride (PCBN)

- The best cutting tools material with high hardness and heat-resistance among known material.
- Through twice high-temperature and high-pressure in the manufacturing process.
 - Transform HBN into CBN under high-temperature and high-pressure.
 - Then synthesized into PCBN by mixing CBN micro-nano powder and binder under high-temperature high pressure.
- PCBN has strong chemically inert, so can't occur chemical reaction with ferrous metal under high temperature.
 - Used for machining cast iron.
 - Used for machining high hardness, high wear-resistant alloy cast iron and cast high speed steel.
 - Used for machining hardened steel.
 - Used for machining hard processing material, such as high temperature alloys, tungsten carbide, etc.



The hardness and wear resistance contrast of main tool material



The grades and application industries of Funik innovated CBN superhard cutting tools

Grades	Machining Mode	Work Material	Features Direction	Application industry
FBN FBM FBS	6100 Heavy roughing	Excellent impact and wear resistance ● Be suitable for roughing: high hard alloy cast iron, gray cast iron, nodular cast iron ● Be suitable for roughing and machining hardened steel	↑ wear resistance ↓ impact resistance	metallurgical roll, pump, mining machinery, etc.
	7200 Roughing and semi-finishing	Excellent wear resistance ● Be suitable for roughing and semi-finishing of gray cast iron, etc. ● Be suitable for roughing and semi-finishing of high hard alloy cast iron, etc.		
	9000 Light interrupted roughing	Excellent impact resistance ● Be suitable for roughing hardened steel, etc. ● Be suitable for roughing coated material, etc.		
	9300 Semi-finishing and finishing	● Be suitable for semi-finishing and finishing hardened steel, etc.		

The grades and application industry of Funik innovated FBK superhard cutting tools

Grades	Machining Mode	Work Material	Features Direction	Application industry
FBK7510	High strength, suitable for interval cutting and roughing	● Be suitable for machining gray cast iron, tool steel, die steel, surface hardening high temperature alloy, iron based powder metallurgy metal, nickel and Co based super alloy finishing.	↑ wear resistance ↓ impact resistance	Automotive industry
FBK7520	Excellent impact resistance, suitable for continuous or violent interval cutting	● Be suitable for machining cast iron, tool steel, hardened steel, iron based powder metallurgy metal. (continuous cutting should use wet cutting or dry cutting, interval cutting must be without coolant.)		Automotive, mold, metallurgy, wind power, etc.
FBK7530	Continuous-interval cutting	● Be suitable for machining all kinds of powder metallurgy material.		Powder metallurgy, automotive, mold, etc.
FBK9510	Multipurpose for continuous or medium interval cutting	● Be suitable for machining alloy steel for interval cutting, tool steel, die steel, etc.		Gearing, bearing, mold, etc.
FBK9530	Continuous or medium interval cutting	● Be suitable for finishing the hardened steel with hardness more than 45 HRC (interval cutting).		Automotive, mold, wind power, etc.

The grades and application industry of Funik innovated CBN superhard milling cutting tools

Grades	Application Features	Application Fields	Application Industries
FBN7025	Interrupted cutting	● Be suitable for rough milling, semi-finishing milling, finishing milling of gray cast iron steel, etc. ● Be suitable for rough milling, semi-finishing milling, finishing milling of high hardness alloy cast iron, etc. ● Be suitable for rough milling, semi-finishing milling, finishing milling of hardened steel, etc.	automotive, metallurgical roll, mold, etc.
FBN9325	Interrupted cutting	● Be suitable for rough milling, semi-finishing milling, finishing milling of hardened steel work pieces, eg. bearing steel, tool steel, die steel, high-speed steel, etc.	wind power, engineering machinery, etc.
FBK7520	Continuous and interrupted finishing	● Be suitable for rough milling, semi-finishing milling, finishing milling of hardened steel work pieces, eg. bearing steel, tool steel, die steel, high-speed steel, etc.	mold industry

The main types of Funik innovated CBN superhard cutting tools

Funik FBN series solid cBN tools

- Better impact resistance
- Both sides of the cutting edge can be used for cutting



Funik FBS series soldering cutting tools

- More cutting edges
- Having straight hole and deep hole, can be easily installed onto standard tool holder



Funik FBM series long cutting edge soldering cutting tools

- Longer cutting edges
- Better impact resistance



Funik FBK series super finishing cutting tools

- Used for higher precision and longer tool life cutting
- Diversification of the CBN cutting tools



Common cutting edge types of Funik innovated CBN cutting tools

- S** The negative land and honing cutting edge condition. The strength of this cutting edge and comprehensive performance are the best, which is widely applied in CBN cutting tools. Turning hard alloy cast iron mostly use S10020, turning gray cast iron mostly use S02020, turning hardened steel mostly use S11020.
- T** The negative land cutting edge condition. The negative land helps to improve the impact resistance of the cutting edge. Compared with S cutting edge, chamfers help to improve the quality of the machined surface and ensure stability.
- E** Honing by Er cutting edge condition. Honing can help to reduce micro-chipping and improve the integrity of the cutting edge. The heavier of the honing, the more intact of the cutting edge, the better of the strength, but the cutting resistance and cutting heat would increase. The heavy honing cutting edge is a better choice. If the system rigidity and machine power are satisfied, or in interrupted cutting machining environment.
- F** Sharp cutting edge condition. Sharp cutting edge can help to improve the roughness of the machining surface and difficult to produce chatter marks. Because oversharp can cause worse durability, only choose sharp cutting edge when process general cast iron and require a high roughness. The sharp cutting edge is often used for finishing turning gray cast iron brake discs.

The superiority contrast of Funik innovated CBN superhard cutting tools

- Influenced by early product quality and application technology, CBN leave people with some traditional concepts.
 - The superiority of Funik innovated CBN superhard cutting tool
- 1. hard and fragile, only confined to finishing machining.
 - The impact resistance of Funik innovated CBN superhard cutting tools achieved revolutionary improvement. It can not only achieve high-speed and high-efficient finishing machine in precision machine tools, but also can achieve heavy load, interrupted and numerous rough machining on ordinary machine tools.
- 2. very expensive, it is noble tool
 - Funik are committed to the whole industry chain and large scale self-production from CBN material to cutting tools, making CBN cutting tools take off its aristocratic coat and become a popular industrial product.
- 3. Grades is corresponding to specific processing materials
 - The same grade of Funik innovated CBN superhard cutting tools can process a variety of materials, having good universality.
- 4. can't add cutting coolant
 - Funik innovated CBN superhard cutting tools not only can be applied for dry cutting, but also can be added cutting fluids.

Funik innovated CBN superhard cutting tools Turning



With the whole industry chain, the advantage of professional technological innovation and focused, meticulous workflow, relying on the international advanced equipment & world-class testing equipment and more than one hundred patents technology throughout all aspects of product manufacturing, Funik can make sure that each cutting tool has unmatched performance and quality.

Funik CBN superhard cutting tools Nomination Standard

Tol. class	Cutting Tool	Figure	Angle
S		square	90
T		regular triangle	60
C		diamond	80
D			55
E			75
M			86
V		chimb triangle	35
W		chimb triangle	80
H		regular hexagon	120
O		regular octagon	135
P		regular pentagon	108
L		rectangle	90
A		parallelogram	85
B			82
N/K		roundness	55
R			-

Tol. class	刀尖高度m公差(mm)	内接圆C公差(mm)	厚度S公差(mm)	Tol. class	刀尖高度m公差(mm)	内接圆C圆公差(mm)	厚度S公差(mm)
A	±0.005	±0.025	±0.025	J	±0.005	±0.05-±0.13	±0.025
F	±0.005	±0.013	±0.025	K	±0.013	±0.05-±0.13	±0.025
C	±0.013	±0.025	±0.025	L	±0.025	±0.05-±0.13	±0.025
H	±0.013	±0.013	±0.025	M	±0.08-±0.18	±0.05-±0.13	±0.13
E	±0.025	±0.025	±0.025	N	±0.08-±0.18	±0.05-±0.13	±0.025
G	±0.025	±0.025	±0.13	U	±0.13-±0.38	±0.08-±0.25	±0.13

Funik CBN superhard cutting tools Nomination Standard

Inscribed circle (mm)	C	D	S	T	V	W	R
3.97				06			03
4.76				08			04
5.0							05
5.56				09	09		05
6.0							06
6.35	06	07	06	11	11	04	06
7.94	08	09					07
8.0							08
9.525	09	11	09	16	16	06	09
10.0							10
12.0							12
12.7	12	15	12	22	22	08	12
15.875	16		15	27			15
16.0		19					16
19.05	19		19	33			19
20.0							20
25.0	25	25					25
25.4			25				25
31.75							31
32							32

Code	Thickness (mm)	Code	Thickness (mm)
01	1.59	06	6.35
T1	1.98	07	7.94
02	2.38	08	8.0
04	3.18	09	9.52
03	3.58	10	10.0
T2	2.58	11	11.11
T3	3.97	12	12.0
04	4.76	12	12.0
05	5.56	12	12.70

Code	Corner radius Arc
00	sharp or round insert
02	0.2
04	0.4
08	0.8
12	1.2
16	1.6
20	2.0
24	2.4
32	3.2
X	其他

C N G A

12 04 08 T 020 20

Code	clearance angle
N	
A	
B	
C	
P	
D	
E	
F	
G	
O	others

Code	With or without hole	chip breaker	示意图
N	without	without	
R	without	just single side with chip breaker	
F	without	both sides with chip breaker	
A	round	without	
M	straight hole	just single side with chip breaker	
G	without	both sides with chip breaker	
W	40°-60° counter bore hole on single side	without	
T	without	just single side with chip breaker	
Q	40°-60° counter bore hole on both sides	without	
U	without	both sides with chip breaker	

Code	With or without hole	chip breaker	示意图
B	with	without	
H	without	just single side with chip breaker	
C	without	without	
J	without	both sides with chip breaker	
O	roundness	roundness	
S	concave	square	
L	without	long strip	


X Other fixing and chip breaker types, the figure or illustrate would be provided.

Code	Cutting edge condition	示意图
F	Sharp	
E	Honing by Er	
T	The negative land	
S	The negative land and honing	


Code	width	Code	width
010	0.10	040	0.40
015	0.15	045	0.45
020	0.20	050	0.50
025	0.25	100	1.00
030	0.30	200	2.00
035	0.35		

Code	angle
05	5°
10	10°
15	15°
20	20°
25	25°
30	30°

Funik FBN series Solid CBN Cutting Tools




Type	Dimensions (mm)					standard cutting edge	Grades			
	ISO	L	Φ i.c.	s	r		FBN6100	FBN7200	FBN9000	FBN9300
SMN 090304	9	9.525	3.18	0.4	T01020	●	●	●	●	
SMN 090306	9	9.525	3.18	0.6	T01025	●	●	●	●	
SMN 090312	9	9.525	3.18	1.2	T02020	●	●	●	●	
SMN 090404	9	9.525	4.76	0.4	T02030	●	●	●	●	
SMN 090408	9	9.525	4.76	0.8	S01020	●	●	●	●	
SMN 090412	9	9.525	4.76	1.2	S01025	●	●	●	●	
SMN 120404	12	12.7	4.76	0.4	S02020	●	●	●	●	
SMN 120408	12	12.7	4.76	0.8	S02030	●	●	●	●	
SMN 120712	12	12.7	7.94	1.2	S05020	●	●	●	●	
SMN 150704	15	15.875	7.94	0.4	S10020	●	●	●	●	
SMN 150708	15	15.875	7.94	0.8		●	●	●	●	
SMN 201020	20	20	10	2.0		●	●	●	●	
SMN 201024	20	20	10	2.4		●	●	●	●	




Type	Dimensions (mm)					standard cutting edge	Grades			
	ISO	L	Φ i.c.	s	r		FBN6100	FBN7200	FBN9000	FBN9300
RNIN 060400	6	6.35	4.76	0	T01020	●	●	●	●	
RNIN 090300	9	9.525	3.18	0	T01025	●	●	●	●	
RNIN 090400	9	9.525	4.76	0	T02020	●	●	●	●	
RNIN 120400	12	12.7	4.76	0	T02030	●	●	●	●	
RNIN 120600	12	12.7	6.35	0	S01020	●	●	●	●	
RNIN 120700	12	12.7	7.94	0	S01025	●	●	●	●	
RNIN 150700	15	15.875	7.94	0	S02020	●	●	●	●	
RNIN 160700	16	16	7.94	0	S02030	●	●	●	●	
RNIN 190700	19	19.05	7.94	0	S05020	●	●	●	●	
RNIN 200700	20	20	7.94	0	S10020	●	●	●	●	
RNIN 201000	20	20	10	0		●	●	●	●	
RNIN 250600	25	25.4	6.35	0		●	●	●	●	
RNIN 250700	25	25.4	7.94	0		●	●	●	●	
RNIN 251000	25	25.4	10	0		●	●	●	●	
RNIN 251200	25	25.4	12	0		●	●	●	●	

Note: ● Preference
Cutting edge condition can be customized

Funik FBN series Solid CBN Cutting Tools




Type	Dimensions (mm)					standard cutting edge	Grades			
	ISO	L	Φ i.c.	s	r		FBN6100	FBN7200	FBN9000	FBN9300
CNMN 090404	9	9.525	4.76	0.4	T01020	●	●	●	●	
CNMN 090408	9	9.525	4.76	0.8	T01025	●	●	●	●	
CNMN 090412	9	9.525	4.76	1.2	T02020	●	●	●	●	
CNMN 120404	12	12.7	4.76	0.4	T02030	●	●	●	●	
CNMN 120408	12	12.7	4.76	0.8	S01020	●	●	●	●	
CNMN 120412	12	12.7	4.76	1.2	S01025	●	●	●	●	
CNMN 120704	12	12.7	7.04	0.4	S02020	●	●	●	●	
CNMN 120708	12	12.7	7.94	0.8	S02030	●	●	●	●	
CNMN 120712	12	12.7	7.94	1.2		●	●	●	●	
CNMN 120804	12	12.7	7.94	0.4		●	●	●	●	
CNMN 120806	12	12.7	7.94	0.6		●	●	●	●	
CNMN 120812	12	12.7	7.94	1.2		●	●	●	●	




Type	Dimensions (mm)					standard cutting edge	Grades			
	ISO	L	Φ i.c.	s	r		FBN6100	FBN7200	FBN9000	FBN9300
TNGN 110304	11	6.35	3.18	0.4	T01020	●	●	●	●	
TNGN 110306	11	6.35	3.18	0.6	T02020	●	●	●	●	
TNGN 110312	11	6.35	3.18	1.2	S01020	●	●	●	●	
TNGN 160404	16	9.25	4.76	0.4	S02020	●	●	●	●	
TNGN 160406	16	9.25	4.76	0.6		●	●	●	●	
TNGN 160412	16	9.25	4.76	1.2		●	●	●	●	

Note: ● Preference
Cutting edge condition can be customized


Funik FBN series Solid CBN Cutting Tools



Type	Dimensions (mm)					standard cutting edge	Grades			
	ISO	L	Φ i.c.	s	r		FBN6100	FBN7200	FBN9000	FBN9300
WNIN 080404	8	12.7	4.76	0.4	T01015	●	●	●	●	
WNIN 080408	8	12.7	4.76	0.8	T01025	●	●	●	●	
WNIN 080412	8	12.7	4.76	1.2	T02025	●	●	●	●	
WNIN 080420	8	12.7	4.76	2.0	S01020	●	●	●	●	




Type	Dimensions (mm)					standard cutting edge	Grades			
	ISO	L	Φ i.c.	s	r		FBN6100	FBN7200	FBN9000	FBN9300
RCMN 060400	6	6.35	4.76	0	T01020	●	●	●	●	
RCMN 090400	9	9.525	4.76	0	T01025	●	●	●	●	
RCMN 090600	9	9.525	6.35	0	T02020	●	●	●	●	
RCMN 120600	12	12.7	6.35	0	S01020	●	●	●	●	
RCMN 120700	12	12.7	7.94	0	S02020	●	●	●	●	
RCMN 150700	15	15.875	7.94	0	S05020	●	●	●	●	
RCMN 190700	19	19.05	7.94	0	S10020	●	●	●	●	




Type	Dimensions (mm)					standard cutting edge	Grades			
	ISO	L	Φ i.c.	s	r		FBN6100	FBN7200	FBN9000	FBN9300
RCMX 060400V	6	6.35	4.76	0.8	T01020	●	●	●	●	
RCMX 060600V	6	6.35	6.35	0.8	T01025	●	●	●	●	
RCMX 090700V	9	9.525	7.94	1	T02020	●	●	●	●	
KCWA 12V/00V	12	12.7	7.94	2	S01020	●	●	●	●	
RCMX 151000V	15	15.875	10.0	2	S02020	●	●	●	●	
RCMX 191000V	19	19.05	10.0	2	S05020	●	●	●	●	
RCMX 201200V	20	20.0	12.0	2	S10020	●	●	●	●	
RCMX 251200V	25	25.4	12.0	2	S20020	●	●	●	●	

Note: ● Preference
Cutting edge condition can be customized


Funik FBN series Solid CBN Cutting Tools



Type	Dimensions (mm)					standard cutting edge	Grades			
	ISO	L	Φ i.c.	s	r		FBN6100	FBN7200	FBN9000	FBN9300
SCGN 090304	9	9.525	3.18	0.4	T01020	●	●	●	●	
SCGN 090308	9	9.525	3.18	0.8	T02020	●	●	●	●	
SCGN 090312	9	9.525	3.18	1.2	S01020	●	●	●	●	
SCGN 090404	9	9.525	4.76	0.4	S02020	●	●	●	●	
SCGN 090408	9	9.525	4.76	0.8		●	●	●	●	
SCGN 090412	9	9.525	4.76	1.2		●	●	●	●	




Type	Dimensions (mm)					standard cutting edge	Grades			
	ISO	L	Φ i.c.	s	r		FBN6100	FBN7200	FBN9000	FBN9300
DNUN 110404	11	9.525	4.76	0.4	T01015	●	●	●	●	
DNUN 110408	11	9.525	4.76	0.8	T01025	●	●	●	●	
DNUN 110412	11	9.525	4.76	1.2	T01025	●	●	●	●	
DNUN 110604	11	9.525	6.35	0.4	T02020	●	●	●	●	
DNUN 110608	11	9.525	6.35	0.8	T02025	●	●	●	●	
DNUN 110612	11	9.525	6.35	1.2	S01015	●	●	●	●	
DNUN 150604	15	12.7	6.35	0.4	S01020	●	●	●	●	
DNUN 150608	15	12.7	6.35	0.8		●	●	●	●	
DNUN 150612	15	12.7	6.35	1.2	S02025	●	●	●	●	




Type	Dimensions (mm)				standard cutting edge	Grades			
	ISO	R	b	L		S	FBN6100	FBN7200	FBN9000
STB10K1	4.6	9.2	17	8.0	T10020	●	●	●	●
BL12K1-B	5.55	11.1	17	8.0	T15020	●	●	●	●
BL14K1-B	6.5	13.0	17	8.0		●	●	●	●

Note: ● Preference
Cutting edge condition can be customized


Funik FBN series Solid CBN Cutting Tools



Type	Dimensions (mm)					standard cutting edge	Grades			
ISO	L	Φ i.c.	s	b	r		FBN6100	FBN7200	FBN9000	FBN9300
RCMX060400Y	6	6.35	4.76	0.6	0.4	T01020	●	●	●	●
RCMX060500Y	6	6.35	5.0	0.6	0.6	T01020 T02020 S01020	●	●	●	●
RCMX060700Y	6	6.35	7.94	0.6	0.6	T02020 S01020	●	●	●	●
RCMX090700Y	9	9.525	7.94	1	0.8	S05020 S10020	●	●	●	●
RCMX120700Y	12	12.7	7.94	1.2	1.2	S20020	●	●	●	●



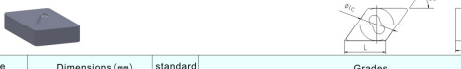
Type	Dimensions (mm)					standard cutting edge	Grades			
ISO	L	Φ i.c.	s	r	r		FBN6100	FBN7200	FBN9000	FBN9300
TNMO160604	16	9.525	6.35	0.4	0.4	T01020	●	●	●	●
TNMO160608	16	9.525	6.35	0.8	0.8	T01020 T02020 S01020	●	●	●	●
TNMO160612	16	9.525	6.35	1.2	1.2	S02020	●	●	●	●



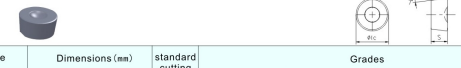
Type	Dimensions (mm)					standard cutting edge	Grades			
ISO	L	Φ i.c.	s	r	r		FBN6100	FBN7200	FBN9000	FBN9300
CNML120604	12	12.7	6.35	0.4	0.4	T01020	●	●	●	●
CNML120608	12	12.7	6.35	0.8	0.8	T01020 T02020 S01020	●	●	●	●
CNML120612	12	12.7	6.35	1.2	1.2	S02020	●	●	●	●

Note: ● Preference
Cutting edge condition can be customized

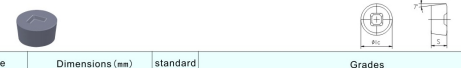
Funik FBN series Solid CBN Cutting Tools



Type	Dimensions (mm)					standard cutting edge	Grades			
ISO	L	Φ i.c.	s	r	r		FBN6100	FBN7200	FBN9000	FBN9300
DNML110604	11	9.525	6.35	0.4	0.4	T01020	●	●	●	●
DNML110608	11	9.525	6.35	0.8	0.8	T01020 S01020	●	●	●	●
DNML110612	11	9.525	6.35	1.2	1.2	S02020	●	●	●	●




Type	Dimensions (mm)					standard cutting edge	Grades			
ISO	L	Φ i.c.	s	r	r		FBN6100	FBN7200	FBN9000	FBN9300
RCM0120600	12	12.7	6.35	0.4	0.4	S02020	●	●	●	●



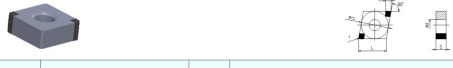
Type	Dimensions (mm)					standard cutting edge	Grades			
ISO	L	Φ i.c.	s	r	r		FBN6100	FBN7200	FBN9000	FBN9300
RCM3120600	12	12.7	6.35	0.4	0.4	S02020	●	●	●	●

Note: ● Preference
Cutting edge condition can be customized


Funik FBS series Soldering Cutting Tools



Type	Dimensions (mm)						standard cutting edge	Grades			
ISO	L	Φ i.c.	s	Φ D1	Φ D2	r		FBS6100	FBS7200	FBS9000	FBS9300
CCGW091304-2S	9	9.525	3.97	4.4	6	0.4	T01020	●	●	●	
CCGW091308-2S	9	9.525	3.97	4.4	6	0.8	T02020	●	●	●	
CCGW091312-2S	9	9.525	3.97	4.4	6	1.2	S01020	●	●	●	
CCGW120404-3S	12	12.7	4.76	5.5	7.5	0.8	S01020	●	●	●	
CCGW120408-2S	12	12.7	4.76	5.5	7.5	0.8	S01020	●	●	●	
CCGW120412-2S	12	12.7	4.76	5.5	7.5	1.2	S02020	●	●	●	



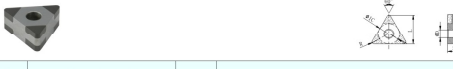
Type	Dimensions (mm)					standard cutting edge	Grades			
ISO	L	Φ i.c.	s	Φ d	r		FBS6100	FBS7200	FBS9000	FBS9300
CNGA120404-4S	12	12.7	4.76	5.16	0.4	T01020	●	●	●	●
CNGA120408-4S	12	12.7	4.76	5.16	0.8	T02020	●	●	●	●
CNGA120412-4S	12	12.7	4.76	5.16	1.2	S02020	●	●	●	●




Type	Dimensions (mm)					standard cutting edge	Grades			
ISO	L	Φ i.c.	s	Φ d	r		FBS6100	FBS7200	FBS9000	FBS9300
DNBA110404-4S	11	9.525	4.76	3.81	0.4	T01020	●	●	●	●
DNBA110408-4S	11	9.525	4.76	3.81	0.8	T02020	●	●	●	●
DNBA110412-4S	11	9.525	4.76	3.81	1.2	S01020	●	●	●	●
DNBA150404-4S	15	12.7	4.76	5.16	0.4	T02020	●	●	●	●
DNBA150408-4S	15	12.7	4.76	5.16	0.8	S01020	●	●	●	●
DNBA150412-4S	15	12.7	4.76	5.16	1.2	S01020	●	●	●	●
DNBA150604-4S	15	12.7	6.35	5.16	0.4	S02020	●	●	●	●
DNBA150608-4S	15	12.7	6.35	5.16	0.8	S02020	●	●	●	●
DNBA150612-4S	15	12.7	6.35	5.16	1.2	S02020	●	●	●	●

Note: ● Preference
Cutting edge condition can be customized


Funik FBM series long cutting edge soldering cutting tools



Type	Dimensions (mm)					standard cutting edge	Grades			
ISO	L	Φ i.c.	s	Φ d	r		FBM6100	FBM7200	FBM9000	FBM9300
TNGA220708	22	12.7	7.91	5.16	0.8	T01020	●	●	●	●
TNGA220712	22	12.7	7.91	5.16	1.2	T02020	●	●	●	●
TNGA220716	22	12.7	7.91	5.16	1.6	S01020 S02020	●	●	●	●




Type	Dimensions (mm)					standard cutting edge	Grades			
ISO	L	Φ i.c.	s	Φ d	r		FBM6100	FBM7200	FBM9000	FBM9300
TNGA160404	16	9.525	4.76	3.81	0.4	T01020	●	●	●	●
TNGA160408	16	9.525	4.76	3.81	0.8	T02020	●	●	●	●
TNGA160412	16	9.525	4.76	3.81	1.2	T02020 S01020 S02020	●	●	●	●
TNGA220404	22	12.7	4.76	5.16	0.4	S02020	●	●	●	●
TNGA220408	22	12.7	4.76	5.16	0.8	S02020	●	●	●	●
TNGA220412	22	12.7	4.76	5.16	1.2	S02020	●	●	●	●




Type	Dimensions (mm)					standard cutting edge	Grades			
ISO	L	Φ i.c.	s	Φ d	r		FBM6100	FBM7200	FBM9000	FBM9300
CNBA120708	12	12.7	7.94	5.15	0.8	T01020	●	●	●	●
CNBA120712	12	12.7	7.94	5.15	1.2	T02020	●	●	●	●
CNBA120716	12	12.7	7.94	5.15	1.6	S01020 S02020	●	●	●	●

Note: ● Preference
Cutting edge condition can be customized

Funik FBM series long cutting edge soldering cutting tools




Type	Dimensions (mm)						standard cutting edge	Grades			
ISO	L	Φ i.c	s	Φ d	r	FBM6100		FBM7200	FBM9000	FBM9300	
CNGA120404	12	12.7	4.76	5.15	0.4	T01020	●	●	●		
CNGA120408	12	12.7	4.76	5.15	0.8	T02020	●	●	●		
CNGA120412	12	12.7	4.76	5.15	1.2	S01020	●	●	●		
						S02020	●	●	●		




Type	Dimensions (mm)						standard cutting edge	Grades			
ISO	L	Φ i.c	s	Φ d	r	FBM6100		FBM7200	FBM9000	FBM9300	
CCGW091302	9	9.525	3.97	4.4	0.2	T01020	●	●	●		
CCGW091304	9	9.525	3.97	4.4	0.4	T02020	●	●	●		
CCGW091308	9	9.525	3.97	4.4	0.8	S01020	●	●	●		
CCGW091312	9	9.525	3.97	4.4	1.2	S02020	●	●	●		
CCGW120404	12	12.7	4.76	5.5	0.4	T01020	●	●	●		
CCGW120408	12	12.7	4.76	5.5	0.8	S01020	●	●	●		
CCGW120412	12	12.7	4.76	5.5	1.2	S02020	●	●	●		

Note: ● Preference
Cutting edge condition can be customized


Funik FBM series long cutting edge soldering cutting tools



Type	Dimensions (mm)						standard cutting edge	Grades			
ISO	L	Φ i.c	s	Φ d	r	FBM6100		FBM7200	FBM9000	FBM9300	
CCGW120408	12	12.7	4.76	5.5	0.8	T01020	●	●	●		
CCGW120412	12	12.7	4.76	5.5	1.2	T02020	●	●	●		
CCGW120416	12	12.7	4.76	5.5	1.6	S01020	●	●	●		
						S02020	●	●	●		




Type	Dimensions (mm)						standard cutting edge	Grades			
ISO	L	Φ i.c	s	Φ d	r	FBM6100		FBM7200	FBM9000	FBM9300	
VCGW160404	16	9.525	4.76	4.4	0.4	T01020	●	●	●		
VCGW160408	16	9.525	4.76	4.4	0.8	T02020	●	●	●		
VCGW160412	16	9.525	4.76	4.4	1.2	S01020	●	●	●		
VCGW160416	16	9.525	4.76	4.4	1.6	S02020	●	●	●		




Type	Dimensions (mm)						standard cutting edge	Grades			
ISO	L	Φ i.c	s	Φ d	r	FBM6100		FBM7200	FBM9000	FBM9300	
VBGW160404	16	9.525	4.76	4.4	0.4	T01020	●	●	●		
VBGW160408	16	9.525	4.76	4.4	0.8	T02020	●	●	●		
VBGW160412	16	9.525	4.76	4.4	1.2	S01020	●	●	●		
VBGW160416	16	9.525	4.76	4.4	1.6	S02020	●	●	●		

Note: ● Preference
Cutting edge condition can be customized

Funik FBK series super finishing Cutting Tools




Type	Dimensions (mm)						standard cutting edge	Grades			
ISO	L	Φ i.c	s	Φ d	r	FBK7510		FBK7520	FBK7530	FBK9510	FBK9530
TNGA160402-3S	16	9.525	4.76	3.81	0.2	T01020	●		●		
TNGA160404-3S	16	9.525	4.76	3.81	0.4	T02020	●		●		
TNGA160408-3S	16	9.525	4.76	3.81	0.8	S01020	●		●		
TNGA160412-3S	16	9.525	4.76	3.81	1.2	S02020	●		●		
TNGA160416-3S	16	9.525	4.76	3.81	1.6		●		●		
TNGA220402-3S	22	12.7	4.76	5.16	0.2	T01020	●		●		
TNGA220404-3S	22	12.7	4.76	5.16	0.4	T02020	●		●		
TNGA220408-3S	22	12.7	4.76	5.16	0.8	S01020	●		●		
TNGA220412-3S	22	12.7	4.76	5.16	1.2	S02020	●		●		
TNGA220416-3S	22	12.7	4.76	5.16	1.6		●		●		




Type	Dimensions (mm)						standard cutting edge	Grades			
ISO	L	Φ i.c	s	Φ D1	Φ D2	r		FBK7510	FBK7520	FBK7530	FBK9510
TGOW090202-3S	9	5.56	2.38	2.5	3.3	0.2	T01020	●		●	
TGOW090204-3S	9	5.56	2.38	2.5	3.3	0.4	T02020	●		●	
TGOW090208-3S	9	5.56	2.38	2.5	3.3	0.8	S01020	●		●	
TGOW110302-3S	11	6.35	3.18	3.4	3.75	0.2	S01020	●		●	
TGOW110304-3S	11	6.35	3.18	3.4	3.75	0.4	S02020	●		●	
TGOW110308-3S	11	6.35	3.18	3.4	3.75	0.8		●		●	
TGOW110312-3S	11	6.35	3.18	3.4	3.75	1.2		●		●	

Note: ● Preference
Cutting edge condition can be customized

Funik FBK series super finishing Cutting Tools




Type	Dimensions (mm)						standard cutting edge	Grades			
ISO	L	Φ i.c	s	Φ d	r	FBK7510		FBK7520	FBK7530	FBK9510	FBK9530
CNGA120402-2S	12	12.7	4.76	5.15	0.2	T01020	●		●		
CNGA120404-2S	12	12.7	4.76	5.15	0.4	T02020	●		●		
CNGA120408-2S	12	12.7	4.76	5.15	0.8	S01020	●		●		
CNGA120412-2S	12	12.7	4.76	5.15	1.2	S02020	●		●		




Type	Dimensions (mm)						standard cutting edge	Grades			
ISO	L	Φ i.c	s	Φ d	r	FBK7510		FBK7520	FBK7530	FBK9510	FBK9530
CCGW091302-2S	9	9.525	3.97	4.4	0.2	T01020	●		●		
CCGW091304-2S	9	9.525	3.97	4.4	0.4	T02020	●		●		
CCGW091308-2S	9	9.525	3.97	4.4	0.8	S01020	●		●		
CCGW091312-2S	9	9.525	3.97	4.4	1.2	S02020	●		●		
CCGW120402-2S	12	12.7	4.76	5.5	0.2	T01020	●		●		
CCGW120404-2S	12	12.7	4.76	5.5	0.4	T02020	●		●		
CCGW120408-2S	12	12.7	4.76	5.5	0.8	S01020	●		●		
CCGW120412-2S	12	12.7	4.76	5.5	1.2	S02020	●		●		

Note: ● Preference
Cutting edge condition can be customized

Funik FBK series super finishing Cutting Tools




Type	Dimensions (mm)					standard cutting edge	Grades				
ISO	L	Φ i.c	s	Φ d	r		FBK7510	FBK7520	FBK7530	FBK9510	FBK9530
VNGA160402-2S	16	9.525	4.76	3.81	0.2	T01020 T02020 S01020 S02020	●			●	
VNGA160404-2S	16	9.525	4.76	3.81	0.4						
VNGA160408-2S	16	9.525	4.76	3.81	0.8						
VNGA160412-2S	16	9.525	4.76	3.81	1.2						



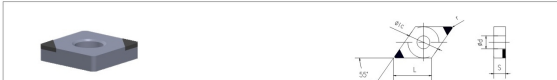
Type	Dimensions (mm)					standard cutting edge	Grades				
ISO	L	Φ i.c	s	Φ d	r		FBK7510	FBK7520	FBK7530	FBK9510	FBK9530
VCGM160402-2S	16	9.525	4.76	4.4	0.2	T01020 T02020 S01020 S02020	●			●	
VCGM160404-2S	16	9.525	4.76	4.4	0.4						
VCGM160408-2S	16	9.525	4.76	4.4	0.8						
VCGM160412-2S	16	9.525	4.76	4.4	1.2						

Note: ● Preference
Cutting edge condition can be customized

Funik FBK series super finishing Cutting Tools




Type	Dimensions (mm)					standard cutting edge	Grades				
ISO	L	Φ i.c	s	Φ d	r		FBK7510	FBK7520	FBK7530	FBK9510	FBK9530
SNGA120402-2S	12	12.7	4.76	5.16	0.2	T01020 T02020 S01020 S02020	●			●	
SNGA120404-2S	12	12.7	4.76	5.16	0.4						
SNGA120408-2S	12	12.7	4.76	5.16	0.8						
SNGA120412-2S	12	12.7	4.76	5.16	1.2						



Type	Dimensions (mm)					standard cutting edge	Grades				
ISO	L	Φ i.c	s	Φ d	r		FBK7510	FBK7520	FBK7530	FBK9510	FBK9530
DNGA150402-2S	15	12.7	4.76	5.16	0.2	T01020 T02020 S01020 S02020	●			●	
DNGA150404-2S	15	12.7	4.76	5.16	0.4						
DNGA150408-2S	15	12.7	4.76	5.16	0.8						
DNGA150412-2S	15	12.7	4.76	5.16	1.2						

Note: ● Preference
Cutting edge condition can be customized

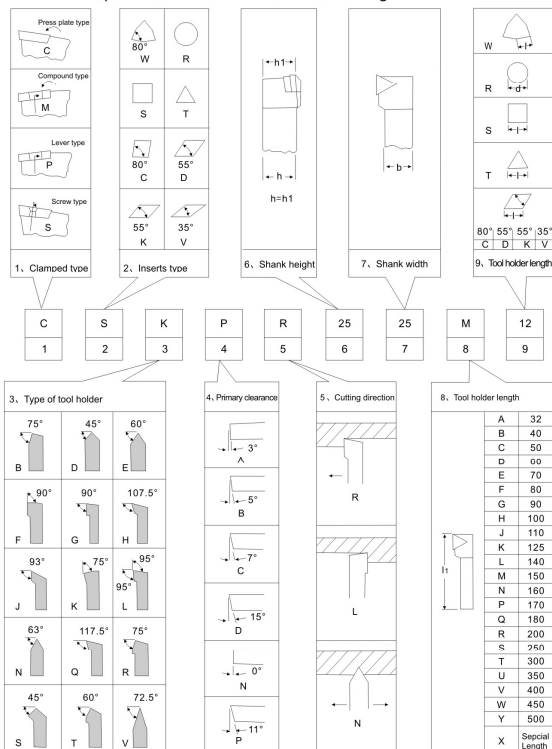


Type	Dimensions (mm)					standard cutting edge	Grades				
ISO	L	Φ i.c	s	Φ d	r		FBK7510	FBK7520	FBK7530	FBK9510	FBK9530
WNGA80402-3S	8	12.7	4.76	5.16	0.2	T01020 T02020 S01020 S02020	●			●	
WNGA80404-3S	8	12.7	4.76	5.16	0.4						
WNGA80408-3S	8	12.7	4.76	5.16	0.8						
WNGA80412-3S	8	12.7	4.76	5.16	1.2						

Note: ● Preference
Cutting edge condition can be customized

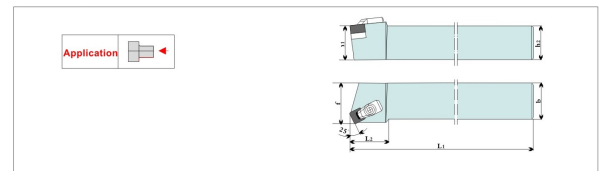
ISO Code expression of Indexable external turning tool holder

ISO Code expression of Indexable external turning tool holder



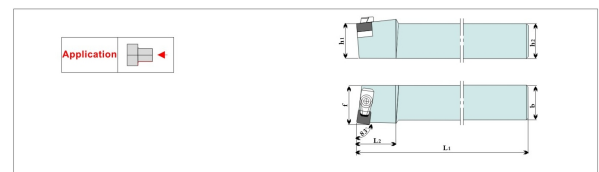
Funik Innovated CBN superhard cutting tools Tool Holder Series

25° Tool Holder



Type specifications	h1=h2	b	L1	L2	f			
CSXNR/L3232P12-25	32	32	170	42	35	YS12M4	S12Y	SNMN1207
CSXNR/L3232P15-25	32	32	170	47	36.2	YS15M4	S15Y	SNMN1507
CSXNR/L3535R12-25	35	35	200	40	40	YS12M4	S12Y	SNMN1207
CSXNR/L3535R15-25	35	35	200	40	40	YS15M4	S15Y	SNMN1507
CSXNR/L4040S12-25	40	40	250	48	45	YS15M4	S15Y	SNMN1507
CSXNR/L4040S20-25	40	40	250	53	45	YS20M4	S20Y	SNMN2010
CSXNR/L5050T15-25	50	50	300	48	55	YS15M4	S15Y	SNMN1507
CSXNR/L5050T20-25	50	50	300	53	55	YS20M4	S20Y	SNMN2010

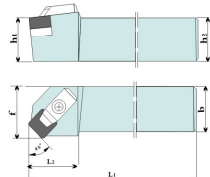
83° Tool Holder



Type specifications	h1=h2	b	L1	L2	f			
CSXNR/L3232P12-83	32	32	170	36	36	YS12M4	S12Y	SNMN1207
CSXNR/L3540R15-83	35	40	200	35	45	YS15M4	S15Y	SNMN1507
CSXNR/L4040S15-83	40	40	250	40	45	YS15M4	S15Y	SNMN1507
CSXNR/L5050T20-83	50	50	300	42	55	YS20M4	S20Y	SNMN2010

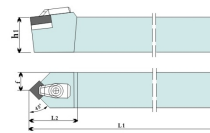
Funik Innovated CBN superhard cutting tools Tool Holder Series

45° Tool Holder



Type specifications	h1=h2	b	L1	L2	f			
CSSNR/L2525P12	25	25	170	32	32	YS12M4	S12Y	SNMN1204
CSSNR/L3232P12	32	32	200	35	36	YS12M4	S12Y	SNMN1207
CSSNR/L3235R15	32	32	200	42	39.2	YS15M4	S15Y	SNMN1207
CSSNR/L4040S12	40	40	250	40	44.3	YS12M4	S12Y	SNMN1507
CSSNR/L4040S15	40	40	250	45	45	YS15M4	S15Y	SNMN1507
CSSNR/L4040S20	40	40	250	48	46	YS20M4	S20Y	SNMN2010
CSSNR/L5050T15	50	50	300	44	55	YS20M4	S15Y	SNMN1507
CSSNR/L5050T20	50	50	300	50	58	YS20M4	S20Y	SNMN2010

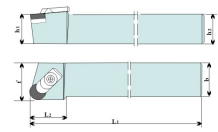
Middle Laying 45° Tool Holder



Type specifications	h1=h2	b	L1	L2	f			
CSDNN3232P12	32	32	170	48	16	YS12M4	S12Y	SNMN1207
CSDNN4040S15	40	40	250	52	20	YS15M4	S15Y	SNMN1507
CSDNN5050T20	50	50	300	58	25	YS20M4	S20Y	SNMN2010

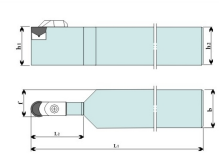
Funik Innovated CBN superhard cutting tools Tool Holder Series

Arc Tool Holder



Type specifications	h1=h2	b	L1	L2	f			
CRGNR/L3232P12	32	32	170	40	37	GR12M4	R12G	RNMN120400
CRGNR/L3232P15	32	32	170	40	37	GR15M4	R15G	RNMN150700
CRGNR/L4040S20	40	40	250	42	45	GR20M4	R20G	RNMN200700
CRGNR/L5050T20	50	50	300	42	55	GR20M4	R20G	RNMN200700
CRGNR/L5050T20	50	50	300	42	55	GR20M4	R20G	RNMN201000
CRGNR/L5050T25	50	50	300	46	55	GR25M4	R25G	RNMN251000

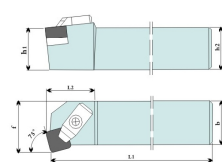
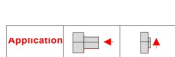
Middle Laying Tool Holder



Type specifications	h1=h2	b	L1	L2	f			
CRDCN3225P09-A	32	25	170	29	17.2	GR09M3	RO9Y	RCGX090700
CRDCN3225P12-A	32	25	170	33	18.8	GR12M3	R12Y	RCGX120700
CRDCN4040S15-ID	40	40	250	38	27.9	GR15M4	R15Y	RCGX151000
CRDCN5040T19-ID	50	40	300	45	29.5	GR19M4	R19Y	RCGX191000
CRDCN5040T20-ID	50	40	300	45	30	GR20M4	R20Y	RCGX201200
CRDCN5040T25-ID	50	40	300	45	30	GR25M4	R25Y	RCGX251200

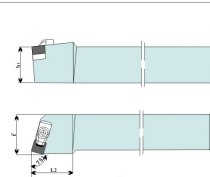
Funik Innovated CBN superhard cutting tools Tool Holder Series

Front 75° Tool Holder



Type specifications	h1=h2	b	L1	L2	f			
CSKMR/L3232P12	32	32	170	40	30	YS12M4	S12Y	SNMN1207
CSKMR/L3232P15	32	32	170	45	40	YS15M4	S15Y	SNMN1507
CSKMR/L4040S15	40	40	250	46	49	YS15M4	S15Y	SNMN1507
CSKMR/L4040S20	40	40	250	50	50	YS20M4	S20Y	SNMN2010
CSKMR/L5050T15	50	50	300	46	60	YS15M4	S15Y	SNMN1507
CSKMR/L5050T20	50	50	300	50	60	YS20M4	S20Y	SNMN2010

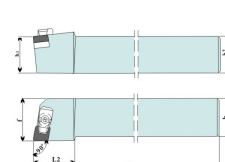
75° Tool Holder



Type specifications	h1=h2	b	L1	L2	f			
CSRNR/L3232P12	32	32	170	36	36	YS12M4	S12Y	SNMN1207
CSRNR/L4040S15	40	40	250	45	45	YS15M4	S15Y	SNMN1507
CSRNR/L5050T20	50	50	300	45	56	YS20M4	S20Y	SNMN2010

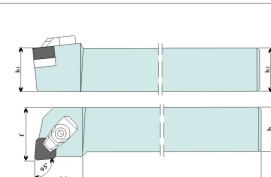
Funik Innovated CBN superhard cutting tools Tool Holder Series

90° Tool Holder



Type specifications	h1=h2	b	L1	L2	f			
CCGNR/L3232P12	32	32	170	35	36	YC12M4	G12Y	CNMN1207
CCGNR/L4040S16	40	40	250	40	45	YC16M4	C16Y	CNMN1207

95° Tool Holder

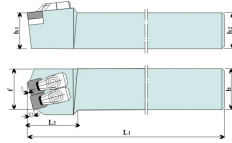


Type specifications	h1=h2	b	L1	L2	f			
CCLNR/L3232P12	32	32	170	34	36	YC12M4	G12Y	CNMN1207
CCLNR/L4040S16	40	40	250	40	45	YC16M4	C16Y	CNMN1207

Funik Innovated CBN superhard cutting tools Tool Holder Series

$\gamma_1 = \gamma_2$ Double Inserts Tool Holder

Application



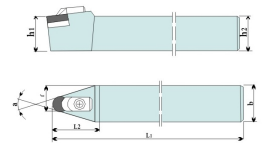
Type specifications	h1=h2	b	L1	L2	f	γ_1	γ_2			
CSXNR/L3235R12-105/105	32	35	200	43	39	15°	15°	YS12M4	S12Y	SNMN1207
CSXNR/L3235R12-110/110	32	35	200	43	39	20°	20°	YS12M4	S12Y	SNMN1207
CSXNR/L3235R12-120/120	32	35	200	43	39	30°	30°	YS12M4	S12Y	SNMN1207
CSXNR/L3535R12-105/105	35	35	200	43	43	15°	15°	YS12M4	S12Y	SNMN1207
CSXNR/L3535R12-110/110	35	35	200	43	43	20°	20°	YS12M4	S12Y	SNMN1207
CSXNR/L3535R12-120/120	35	35	200	43	43	30°	30°	YS12M4	S12Y	SNMN1207
CSXNR/L3535R15-105/105	35	35	200	45	45	15°	15°	YS15M4	S15Y	SNMN1507
CSXNR/L3535R15-110/110	35	35	200	45	45	20°	20°	YS15M4	S15Y	SNMN1507
CSXNR/L3535R15-120/120	35	35	200	45	45	30°	30°	YS15M4	S15Y	SNMN1507
CSXNR/L4040S12-105/105	40	40	250	45	45	15°	15°	YS12M4	S12Y	SNMN1207
CSXNR/L4040S12-110/110	40	40	250	45	45	20°	20°	YS12M4	S12Y	SNMN1207
CSXNR/L4040S12-120/120	40	40	250	45	45	30°	30°	YS12M4	S12Y	SNMN1207
CSXNR/L4040S15-105/105	40	40	250	45	45	15°	15°	YS15M4	S15Y	SNMN1507
CSXNR/L4040S15-110/110	40	40	250	45	45	20°	20°	YS15M4	S15Y	SNMN1507
CSXNR/L4040S15-120/120	40	40	250	45	45	30°	30°	YS15M4	S15Y	SNMN1507
CSXNR/L5050X15-105/105	50	50	320	55	55	15°	15°	YS15M4	S15Y	SNMN1507
CSXNR/L5050X15-110/110	50	50	320	55	55	20°	20°	YS15M4	S15Y	SNMN1507
CSXNR/L5050X15-120/120	50	50	320	55	55	30°	30°	YS15M4	S15Y	SNMN1507
CSXNR/L5050X20-105/105	50	50	320	61	57	15°	15°	YS20M4	S20Y	SNMN2010
CSXNR/L5050X20-110/110	50	50	320	64	57	20°	20°	YS20M4	S20Y	SNMN2010
CSXNR/L5050X20-120/120	50	55	320	63	57	30°	30°	YS20M4	S20Y	SNMN2010
CSXNR/L6060X15-106/106	60	60	320	55	60	16°	16°	YS15M4	S15Y	SNMN1507
CSXNR/L6060X20-106/106	60	60	320	60	65	16°	16°	YS20M4	S20Y	SNMN2010

Note: Patent products owned by Funik company, counterfeiting will be prosecuted.

Funik Innovated CBN superhard cutting tools Tool Holder Series

Middle Laying Arc Tool Holder

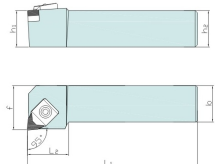
Application



型号规格	h1=h2	b	L1	L2	f	a			
CRDNN3232P12	32	32	170	64	22.35	20°	GR12M4	R12G	RNMN120400
CRDNN4040S15	40	40	250	80	27.93	20°	GR15M4	R15G	RNMN150700
CRDNN5050T20	50	50	300	99	35	20°	GR20M4	R20G	RNMN201000
CRDNN3232P12	32	32	170	46	22.35	30°	GR12M4	R12G	RNMN120400
CRDNN4040S15	40	40	250	57	27.93	30°	GR15M4	R15G	RNMN150700
CRDNN5050T20	50	50	300	70	35	30°	GR20M4	R20G	RNMN201000

95° External Turning Tool Holder

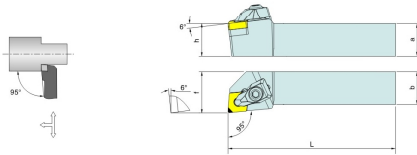
Application



Type specifications	h1=h2	b	L1	L2	f			
CWLNRL/2525M	25	25	150	33	32	GW12M4	W12G	WNMN0604

Funik innovated CBN superhard cutting tools CBN cutting tools with hole common excircle turning tool holder series

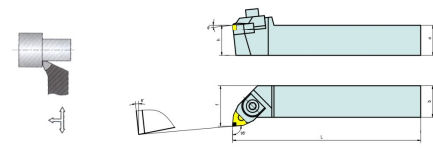
95° TCLNR/L



- Ordering example
- 1PC TCLNR 2525M12
- 1PC TCLNL 2525M12
- *R=Right hand L=Left hand
- Supply doesn't include insert

Type	Dimension					Corner radius	Insert	Shimscrew	Clamp screw	Clamp	Clamp screw	Spring	Wrench
	a	b	L	h	f								
TCLNR/L 2020 K12	20	20	125	20	25	0.8	CN00120400	TC1204	B40100J	TCL04	MS 05020	SP 713	S4L1T15F
TCLNR/L 2525 M12	25	25	150	25	32								
TCLNR/L 3225 P12	32	25	170	32	32								
TCLNR/L 3232 P12	32	32	170	32	40								

95° WWLNR/L

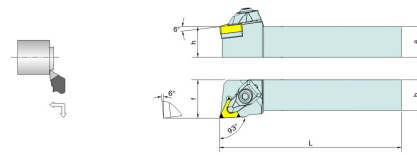


- Ordering example
- 1PC WWLNR 2525M08
- 1PC WWLNL 2525M08
- *R=Right hand L=Left hand
- Supply doesn't include insert

Type	Dimension					Corner radius	Insert	Shimscrew	Locating pin	Clamp	Clamp screw	Wrench
	a	b	L	h	f							
WWLNR/L 2020 K08	20	20	125	20	25	0.8	WN00080400	Mw0804	MSPS619	MCLS2008	MS 06023	S3LS4L
WWLNR/L 2525 M08	25	25	150	25	32							
WWLNR/L 3232 P08	32	32	170	32	40							
WWLNR/L 4040 R08	40	40	200	40	40							

Funik innovated CBN superhard cutting tools CBN cutting tools with hole common excircle turning tool holder series

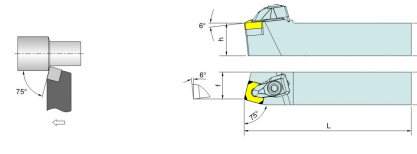
93° TTJNR/L



- Ordering example
- 1PC TTJNR 2525M16
- 1PC TTJNL 2525M16
- *R=Right hand L=Left hand
- Supply doesn't include insert

Type	Dimension					Corner radius	Insert	Shimscrew	Clamp screw	Clamp	Clamp screw	Spring	Wrench
	a	b	L	h	f								
TTJNR/L 2020 K16	20	20	125	20	25	0.8	TN00160400	TT1603	B40100J	TCL03	MS 04017	SP 608	S3L1T15F
TTJNR/L 2525 M16	25	25	150	25	32								
TTJNR/L 3232 P16	32	32	170	32	40								
TTJNR/L 3232 P22	32	32	170	32	40								
TTJNR/L 4040 R22	40	40	200	40	50		TN00220400	TT2204	B40100J	TCL04	MS 05020	SP 713	S4L1T15F

75° TSBNR/L

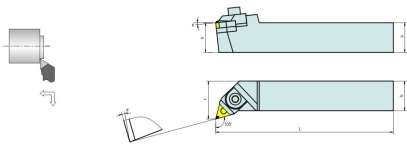


- Ordering example
- 1PC TSBNR 2525M12
- 1PC TSBNL 2525M12
- *R=Right hand L=Left hand
- Supply doesn't include insert

Type	Dimension					Corner radius	Insert	Shimscrew	Clamp screw	Clamp	Clamp screw	Spring	Wrench
	a	b	L	h	f								
TSBNR/L 2020 K12	20	20	125	20	17	0.8	SN00120400	TS1204	B40100J	TCL04	MS 05020	SP 713	S4L1T15F
TSBNR/L 2525 M12	25	25	150	25	22								
TSBNR/L 3232 P12	32	32	170	32	29								

Funik innovated CBN superhard cutting tools
CBN cutting tools with hole common excircle turning tool holder series

105° WTQNR/L

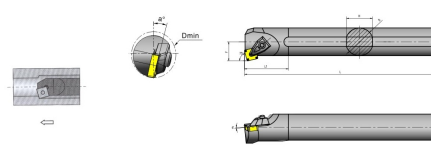


- Ordering example
1PC WTQNR 2525M16
- *R=Right hand L=Left hand
- Supply doesn't include insert

Type	Dimension				Corner radius	Insert	Shimscrew	Locating pin	Lateral screw	Clamp	Clamp screw	Wrench
	a	b	L	h								
WTQNR/L1616 H16	16	16	100	16	20							
WTQNR/L2020 K16	20	20	125	20	25							
WTQNR/L2525 M16	25	25	150	25	32	TN001604	MTS1603	MSPS515	CS 06011	MCL1608	MS 05026	S3L/S4L
WTQNR/L3232 P16	32	32	170	32	40							
WTQNR/L3232 P22	40	32	170	40	40							
WTQNR/L4040 R22	40	40	200	40	40	TN002204	MTS2204	MSPS719	CS 06011	MCL2210	MS 06028	S3L/S4L

Funik innovated CBN superhard cutting tools
Common inner bore turning tool holder series

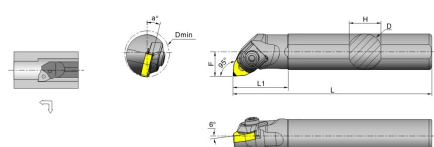
75° TSKNR/L



- Ordering example
1PC S25R-D32-TSKNR/L-12
- *R=Right hand L=Left hand
- Supply doesn't include insert

Type	Dimension						Corner radius	Insert	Shimscrew	Clamp screw	Clamp	Clamp screw	Spring	Wrench
	D	L	L1	F	H	Dmin								
S25R-D32-TSKNR/L-12	25	200	40	17	23	32								
S25R-D40-TSKNR/L-12	32	250	50	22	30	40								
S25R-D50-TSKNR/L-12	40	300	55	25	37	50	0.8	SN001204			TCL04	MS 05020	SP713	S4L/T15F
S25R-D60-TSKNR/L-12	50	350	60	33	47	60								

95° WWLNR/L

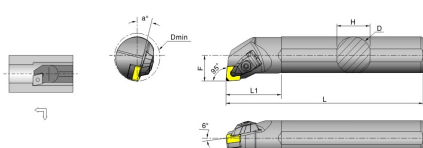


- Ordering example
1PC TSBNR 2525M12
- *R=Right hand L=Left hand
- Supply doesn't include insert

Type	Dimension						Corner radius	Insert	Shimscrew	Locating pin	Clamp	Clamp screw	Spring	Wrench
	D	L	L1	F	H	Dmin								
S25R-D32-WWLNR/L-08	25	200	40	17	23	32								
S32S-D40-WWLNR/L-08	32	250	50	22	30	40	0.8	WN000804						
S40T-D50-WWLNR/L-08	40	300	55	25	37	50			MW0804	MSPS617				
S50U-D60-WWLNR/L-08	50	350	60	33	47	60								

Funik innovated CBN superhard cutting tools
Common inner bore turning tool holder series

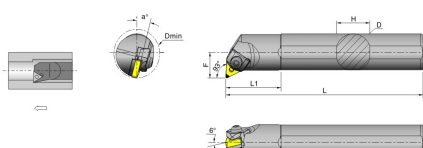
95° TCLNR/L



- Ordering example
1PC S25R-D32-TCLNR-12
- *R=Right hand L=Left hand
- Supply doesn't include insert

Type	Dimension						Corner radius	Insert	Shimscrew	Clamp screw	Clamp	Clamp screw	Spring	Wrench
	D	L	L1	F	H	Dmin								
S25R-D32-TCLNR/L-12	25	200	40	17	23	32								
S32S-D40-TCLNR/L-12	32	250	50	22	30	40								
S40T-D50-TCLNR/L-12	40	300	55	25	37	50	0.8	CN001204			TCL04	MS 05020	SP713	S4L/T15F
S50U-D60-TCLNR/L-12	50	350	60	33	47	60								

93° WTUNR/L



- Ordering example
1PC S25R-D32-WTUNR-16
- *R=Right hand L=Left hand
- Supply doesn't include insert

Type	Dimension						Corner radius	Insert	Shimscrew	Locating pin	Clamp	Clamp screw	Wrench
	D	L	L1	F	H	Dmin							
S25R-D32-WTUNR/L-16	25	200	40	17	23	32							
S32S-D40-WTUNR/L-16	32	250	50	22	30	40							
S40T-D50-WTUNR/L-16	40	300	55	25	37	50	0.8	TN001604			MCL1608	MS 05026	S3L/S4L
S50U-D60-WTUNR/L-16	50	350	60	33	47	60							

Funik Innovated CBN Superhard Cutting Tools
Milling



Compared with coated carbide and ceramics cutting tools, using Funik CBN superhard cutting tools to milling cast iron and hardened steel has the following obvious advantages:

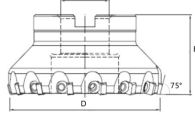
- Faster material removal rate
- Longer life of tools
- Lower comprehensive processing costs



Funik Innovated CBN Superhard Cutting Tools

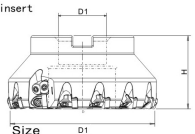
Surface Milling Cutter Series

Indexable CBN efficient surface milling insert



Type specifications	Tooth number	Size				Insert type	Spare parts		
		Φ D	Φ D1	H	Wedge		Dowel screw	Wrench	
FME01-063-A22-SN09-07	7	63	22	40	SNEN0904ENS	FME01-1	FME01-2	FME01-3	
FME01-080-A27-SN09-09	9	80	27	50					
FME01-100-B32-SN09-12	12	100	32	50					
FME01-125-B40-SN09-14	14	125	40	63					
FME01-160-B40-SN09-18	18	160	40	63					
FME01-200-C60-SN09-24	24	200	60	63					
FME01-250-C60-SN09-30	30	250	60	63					
FME01-315-D60-SN09-36	36	315	60	70					

Indexable CBN precision surface milling insert

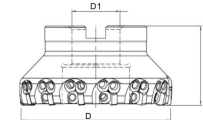


Type specifications	Tooth number		Size				Insert type	Spare parts		
	Milling inserts	Wiper inserts	Φ D	Φ D1	H	Wedge		Adjusting block	Dowel screw	Wrench
FME02-063-A22-SN09-07	6	1	63	22	40	SNEN0904ENS	FME02-1	FME02-2	FME02-3	FME02-4
FME02-080-A27-SN09-09	8	1	80	27	50					
FME02-100-B32-SN09-12	10	2	100	32	50					
FME02-125-B40-SN09-14	12	2	125	40	63					
FME02-160-B40-SN09-18	15	3	160	40	63					
FME02-200-C60-SN09-24	20	4	200	60	63					
FME02-250-C60-SN09-30	25	5	250	60	63					
FME02-315-D60-SN09-36	30	6	315	60	70					

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Funik Innovated CBN Superhard Cutting Tools

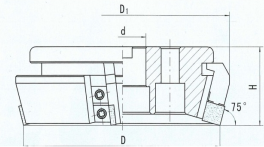
Surface Milling Cutter Series



Type specifications	Tooth number		Size				Insert type	Spare parts			
	Milling inserts	Wiper inserts	Φ D	Φ D1	H	Wedge		Adjusting block	Dowel screw	Wrench	
FME03-063-A22-SN09-07	6	1	63	22	40	SNEN0904ENS	SNEX1204ZZ	FME03-1	FME03-2	FME03-3	FME03-4
FME03-080-A27-SN09-09	8	1	80	27	50						
FME03-100-B32-SN09-12	10	2	100	32	50						
FME03-125-B40-SN09-14	12	2	125	40	63						
FME03-160-B40-SN09-18	15	3	160	40	63						
FME03-200-C60-SN09-24	20	4	200	60	63						
FME03-250-C60-SN09-30	25	5	250	60	63						
FME03-315-D60-SN09-36	30	6	315	60	70						

Surface Milling Cutter Series

Indexable CBN surface milling insert Kr 75°

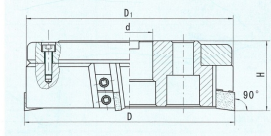


Type specifications	Tooth number	Size				Insert type	Spare parts			
		D	D1	H	d		Clamp	Shim	Dowel screw	Wrench
TSM125R/L	7	125	141	63	40	SNEN120712	TSMR/L-03	TSMR/L-02	GMC125-05 M10X1X22	□5.0
TSM160R/L	9	160	177	63	40					
TSM200R/L	12	200	218	63	60					
TSM250R/L	15	250	268	63	60					
TSM315R/L	18	315	333	80	60					

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Funik Innovated CBN Superhard Cutting Tools

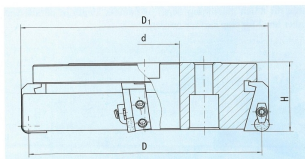
Indexable CBN surface milling insert Kr 90°



Type specifications	Tooth number	Size				Insert type	Spare parts			
		D	D1	H	d		Clamp	Shim	Dowel screw	Wrench
TZM125R/L	7	125	141	63	40	SNEN120712	TZMR/L-03	TZMR/L-02	GMC125-05 M10X1X22	□5.0
TZM160R/L	9	160	177	63	40					
TZM200R/L	12	200	218	63	60					
TZM250R/L	15	250	268	63	60					
TZM315R/L	18	315	333	80	60					

Surface Milling Cutter Series

Indexable CBN surface milling Insert (Round Insert)



Type specifications	Tooth number	Size				Insert type	Spare parts				
		D	D1	H	d		Clamp	Shim	Fasten screw	Fasten screw	Wrench
TRM125R/L	7	125	141	63	40	RNEN120712	TRMR/L-03	TRMR/L-02	TRM04	TRM05	□4.0
TRM160R/L	9	160	177	63	40						
TRM200R/L	12	200	218	63	60						
TRM250R/L	15	250	268	63	60						
TRM315R/L	18	315	333	80	60						

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Funik Innovated CBN Superhard Milling Cutting Tools

Higher CNC grinding precision, more professional milling insert shape design, and more stringent ultra-fine cutting edge grinding created more excellent Funik CBN Milling Inserts.

Milling Insert		Dimensions (mm)				Grades		
Type	L	Φ i.c	s	r	FBN7025	FBN9325	FBK7520	
SNEN0903ENS	9	9.525	3.18	0.8	●	●	●	
SNEN0904ENS	9	9.525	4.76	0.8	●	●	●	
SNEN1207ENS	12	12.7	7.94	1.2	●	●	●	
SNEN120712	12	12.7	7.94	1.2	●	●	●	
SNEN1916ENS	19	19.05	6.8	1.6	●	●	●	

Wiper insert		Dimensions (mm)				Grades		
Type	L	Φ i.c	s	r	FBN7025	FBN9325	FBK7520	
SNEX1203ZZ	12	12.7	3.18	1.2	●	●	●	
SNEX1204ZZ	12	12.7	4.76	1.2	●	●	●	

Milling Insert		Dimensions (mm)				Grades		
Type	L	Φ i.c	s	r	FBN7025	FBN9325	FBK7520	
SNEN0904XGR	9	9.525	4.76	0.8	●	●	●	
SNEN1207XGR	12	12.7	7.94	1.2	●	●	●	

Milling Insert		Dimensions (mm)				Grades		
Type	L	Φ i.c	s	r	FBN7025	FBN9325	FBK7520	
RNEN090300	9	9.525	3.18	0	●	●	●	
RNEN090400	9	9.525	4.76	0	●	●	●	
RNEN120700	12	12.76	7.94	0	●	●	●	

Note: Cutting edge condition can be customized

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Funik Innovated CBN Superhard Milling Cutting Tools

Higher CNC grinding precision, more professional milling insert shape design, and more stringent ultra-fine cutting edge grinding created more excellent Funik CBN Milling Inserts.

Type	Dimensions (mm)				Grades		
ISO	Φ i.c	s			FBN7025	FBN9325	FBK7520
SNEN1204EDE	12.7	4.76			●	●	●

Type	Dimensions (mm)					Grades		
ISO	L	Φ i.c	s	r		FBN7025	FBN9325	FBK7520
SCEN150712	15	15.525	7.94	1.2		●	●	●

Type	Dimensions (mm)				Grades		
ISO	Φ i.c	s			FBN7025	FBN9325	FBK7520
KNK20W	15	5.64			●	●	●

Type	Dimensions (mm)				Grades		
ISO	Φ i.c	s			FBN7025	FBN9325	FBK7520
OPHN0504ZZH-A75	12.7	4.76			●	●	●

Type	Dimensions (mm)				Grades		
ISO	Φ i.c	s			FBN7025	FBN9325	FBK7520
SCGN09040822T	9.525	4.76			●	●	●

Note: Cutting edge condition can be customized

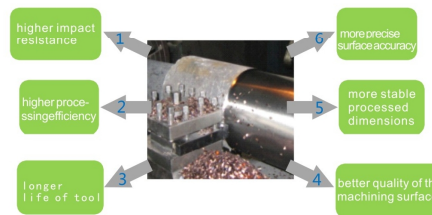
The application of Funik innovated CBN superhard cutting tool in automotive industry



The application cases of Funik innovated CBN superhard cutting tool in automotive industry

<p>finishing front and rear face of the engine cylinder, D125, Z12-Z2 milling insert: FBN7025, SNEN090412ENS-M08 super insert: FBN9325, SNEN120412ZZ Δi H0.04, dry cutting. ap=0.5mm, fz=0.1, v=2500rpm, fz=0.10 Ra1.2</p> <table border="1"> <tr><th>Tool comparison</th><th>feed rate</th><th>efficiency</th><th>life</th></tr> <tr><td>European series CBN</td><td>2142m/min</td><td>40%</td><td>12000edges</td></tr> <tr><td>Funik FBN</td><td>3270m/min</td><td>42%</td><td>14000edges</td></tr> </table>	Tool comparison	feed rate	efficiency	life	European series CBN	2142m/min	40%	12000edges	Funik FBN	3270m/min	42%	14000edges	<p>rough milling top and bottom surface of the engine cylinder, D125, Z12-Z2 刀具: FBN7025, SNEN090412ENS-M08 ap=0.6mm, fz=0.1, dry cutting. Ra3.2, F=0</p> <table border="1"> <tr><th>Tool comparison</th><th>feed rate</th><th>efficiency</th><th>life</th></tr> <tr><td>European series CBN</td><td>400m/min</td><td>80%</td><td>2000edges</td></tr> <tr><td>Funik FBN</td><td>520m/min</td><td>80%</td><td>4000edges</td></tr> </table>	Tool comparison	feed rate	efficiency	life	European series CBN	400m/min	80%	2000edges	Funik FBN	520m/min	80%	4000edges
Tool comparison	feed rate	efficiency	life																						
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Tool comparison	feed rate	efficiency	life																						
European series CBN	400m/min	80%	2000edges																						
Funik FBN	520m/min	80%	4000edges																						
<p>spare part: finish milling heavy truck material: HT200, HB180-220 insert: FBN7025, SNEN120412; Machined surface roughness: Ra1.6</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>life</th></tr> <tr><td>European series CBN</td><td>1799m/min</td><td>80%edges</td></tr> <tr><td>Funik FBN</td><td>1799m/min</td><td>100%edges</td></tr> </table>	Tool comparison	cutting speed	life	European series CBN	1799m/min	80%edges	Funik FBN	1799m/min	100%edges	<p>milling the top and bottom surface of the differential case, D80, Z=9 insert: FBN7025, SNEN090412ENS-M08 ap=2.5mm, fz=0.1, dry cutting.</p> <table border="1"> <tr><th>Tool comparison</th><th>feed rate</th><th>efficiency</th><th>life</th></tr> <tr><td>European series CBN</td><td>220m/min</td><td>15m/min</td><td>40%edges</td></tr> <tr><td>Funik FBN</td><td>420m/min</td><td>3m/min</td><td>110%edges</td></tr> </table>	Tool comparison	feed rate	efficiency	life	European series CBN	220m/min	15m/min	40%edges	Funik FBN	420m/min	3m/min	110%edges			
Tool comparison	cutting speed	life																							
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Tool comparison	feed rate	efficiency	life																						
European series CBN	220m/min	15m/min	40%edges																						
Funik FBN	420m/min	3m/min	110%edges																						
<p>rough turning automobile brake disc material: HT200, HB170-210, insert: FBN7200 TNGA220712 ap=1mm, fz=0.35mm/r, Ra3.2</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>European series CBN</td><td>450m/min</td><td>30%</td><td>45%edges</td></tr> <tr><td>Funik FBN</td><td>450m/min</td><td>20%</td><td>120%edges</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	European series CBN	450m/min	30%	45%edges	Funik FBN	450m/min	20%	120%edges	<p>turning automobile hub material: HT200, HB170-210, insert: FBN7200 CNMN150720 ap=3mm, fz=0.5mm/r, warm cutting, Ra3.2um</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>European series CBN</td><td>150m/min</td><td>90%</td><td>45%edges</td></tr> <tr><td>Funik FBN</td><td>320m/min</td><td>40%</td><td>120%edges</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	European series CBN	150m/min	90%	45%edges	Funik FBN	320m/min	40%	120%edges
Tool comparison	cutting speed	efficiency	life																						
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European series CBN	150m/min	90%	45%edges																						
Funik FBN	320m/min	40%	120%edges																						
<p>finish turning automobile brake disc material: HT200, HB170-210, insert: FBN7200 WNGA080412 S02020 ap=0.5mm, fz=0.25mm/r, dry cutting</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>other CBN</td><td>800m/min</td><td>75%</td><td>30%edges</td></tr> <tr><td>Funik FBN</td><td>800m/min</td><td>100%</td><td>30%edges</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	other CBN	800m/min	75%	30%edges	Funik FBN	800m/min	100%	30%edges	<p>finish turning automobile engine cylinder liner material: Boron cast iron, HB270-300 Z=9, F=0.2mm, SNGA120412 S02020 ap=0.3mm, fz=0.2mm/r, dry cutting</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>European series CBN</td><td>430m/min</td><td>35%</td><td>28%edges</td></tr> <tr><td>Funik FBN</td><td>830m/min</td><td>21%</td><td>100%edges</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	European series CBN	430m/min	35%	28%edges	Funik FBN	830m/min	21%	100%edges
Tool comparison	cutting speed	efficiency	life																						
other CBN	800m/min	75%	30%edges																						
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Tool comparison	cutting speed	efficiency	life																						
European series CBN	430m/min	35%	28%edges																						
Funik FBN	830m/min	21%	100%edges																						
<p>turning automotive engine damper pulley material: HT250, HB220-260 insert: FBN7200 CNGA120412 S02020 ap=0.5mm, fz=0.25mm/r, dry cutting</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>European series CBN</td><td>230m/min</td><td>35%</td><td>55%edges</td></tr> <tr><td>Funik FBN</td><td>320m/min</td><td>30%</td><td>220%edges</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	European series CBN	230m/min	35%	55%edges	Funik FBN	320m/min	30%	220%edges	<p>finish turning engine crankshaft material: 42CrMo, HRC42-47 insert: FBN9320 DNGA104008 S02030 ap=0.3mm, fz=0.1mm/r, wet drying</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>European series CBN</td><td>170m/min</td><td>25%</td><td>25%edges</td></tr> <tr><td>Funik FBN</td><td>170m/min</td><td>35%</td><td>35%edges</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	European series CBN	170m/min	25%	25%edges	Funik FBN	170m/min	35%	35%edges
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Tool comparison	cutting speed	efficiency	life																						
European series CBN	170m/min	25%	25%edges																						
Funik FBN	170m/min	35%	35%edges																						
<p>finish turning automotive drive shaft universal inner ball surface material: alloy steel, HRC62 insert: FBK9510 TNGA160420 S02025 ap=0.3mm, fz=0.1mm/r, dry cutting</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>European series CBN</td><td>120m/min</td><td>35%</td><td>30%edges</td></tr> <tr><td>Funik FBN</td><td>720m/min</td><td>35%</td><td>30%edges</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	European series CBN	120m/min	35%	30%edges	Funik FBN	720m/min	35%	30%edges	<p>Material: High nickel chromium alloy cast iron, hardness HSD78 Machining position: bore insert: FBN6100 SNMN201020 S20020 ap=6mm, fz=0.5mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>speed</th><th>efficiency</th><th>life</th></tr> <tr><td>hard alloy</td><td>5m/min</td><td>20hour/pc</td><td>1/Assesedge</td></tr> <tr><td>Funik FBN</td><td>20m/min</td><td>2hour/pc</td><td>1/Assesedge</td></tr> </table>	Tool comparison	speed	efficiency	life	hard alloy	5m/min	20hour/pc	1/Assesedge	Funik FBN	20m/min	2hour/pc	1/Assesedge
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<p>Material: High carbon semi-steel, hardness HSD72 Machining position: excircle, face insert: FBN6100 SNMN150720 S20020 ap=5mm, fz=0.4mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>speed</th><th>efficiency</th><th>life</th></tr> <tr><td>other PCBN</td><td>35m/min</td><td>1.5hour/pc</td><td>1/Assesedge</td></tr> <tr><td>Funik FBN</td><td>52m/min</td><td>1.5hour/pc</td><td>1/Assesedge</td></tr> </table>	Tool comparison	speed	efficiency	life	other PCBN	35m/min	1.5hour/pc	1/Assesedge	Funik FBN	52m/min	1.5hour/pc	1/Assesedge	<p>Material: High nickel chromium alloy cast iron, hardness HSD88 Machining position: bore repair insert: FBN6100 RCMA120700 S10020 ap=6mm, fz=0.2mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>speed</th><th>efficiency</th><th>life</th></tr> <tr><td>hard alloy</td><td>1.5</td><td>24hour/pc</td><td>3/Assesedge</td></tr> <tr><td>Funik FBN</td><td>20m/min</td><td>1.5hour/pc</td><td>3/Assesedge</td></tr> </table>	Tool comparison	speed	efficiency	life	hard alloy	1.5	24hour/pc	3/Assesedge	Funik FBN	20m/min	1.5hour/pc	3/Assesedge
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hard alloy	1.5	24hour/pc	3/Assesedge																						
Funik FBN	20m/min	1.5hour/pc	3/Assesedge																						
<p>Material: High chromium alloy cast iron, hardness HSD75 Machining position: excircle insert: FBN6100 SNMN201020 S20020 ap=3mm, fz=0.3mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>hard alloy</td><td>5m/min</td><td>2hour/pc</td><td>3/Assesedge</td></tr> <tr><td>Funik FBN</td><td>35m/min</td><td>1.5hour/pc</td><td>1/Assesedge</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	hard alloy	5m/min	2hour/pc	3/Assesedge	Funik FBN	35m/min	1.5hour/pc	1/Assesedge	<p>Material: cast high speed steel, hardness HSD88 Machining position: bore repair insert: FBN6100 RCMA120700 S10020 ap=6mm, fz=0.2mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>other CRN</td><td>25m/min</td><td>1.5hour/pc</td><td>3/Assesedge</td></tr> <tr><td>Funik FBN</td><td>30m/min</td><td>1.5hour/pc</td><td>3/Assesedge</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	other CRN	25m/min	1.5hour/pc	3/Assesedge	Funik FBN	30m/min	1.5hour/pc	3/Assesedge
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Funik FBN	30m/min	1.5hour/pc	3/Assesedge																						
<p>Material: WC Roll ring, hardness HRAB8 Machining position: excircle insert: FBN6100 SNMN120720 S05025 ap=0.5mm, fz=0.3mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>hard alloy</td><td>5m/min</td><td>20hour/pc</td><td>1/Assesedge</td></tr> <tr><td>Funik FBN</td><td>52m/min</td><td>2hour/pc</td><td>1/Assesedge</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	hard alloy	5m/min	20hour/pc	1/Assesedge	Funik FBN	52m/min	2hour/pc	1/Assesedge	<p>Material: WC Roll ring, hardness HRAB8 Machining position: excircle insert: FBN6100 SNMN120720 S05025 ap=0.5mm, fz=0.3mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>hard alloy</td><td>5m/min</td><td>20hour/pc</td><td>1/Assesedge</td></tr> <tr><td>Funik FBN</td><td>52m/min</td><td>2hour/pc</td><td>1/Assesedge</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	hard alloy	5m/min	20hour/pc	1/Assesedge	Funik FBN	52m/min	2hour/pc	1/Assesedge
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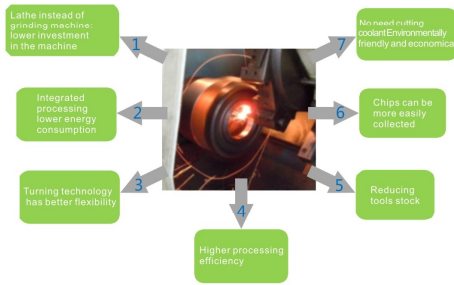
Advantages of turning high carbide cast iron by using Funik innovated CBN superhard cutting tools



Advantages of turning high carbide cast iron by using Funik innovated CBN superhard cutting tools

<p>Material: High nickel chromium alloy cast iron, hardness HSD78 Machining position: bore insert: FBN6100 SNMN201020 S20020 ap=6mm, fz=0.5mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>speed</th><th>efficiency</th><th>life</th></tr> <tr><td>hard alloy</td><td>5m/min</td><td>20hour/pc</td><td>1/Assesedge</td></tr> <tr><td>Funik FBN</td><td>20m/min</td><td>2hour/pc</td><td>1/Assesedge</td></tr> </table>	Tool comparison	speed	efficiency	life	hard alloy	5m/min	20hour/pc	1/Assesedge	Funik FBN	20m/min	2hour/pc	1/Assesedge	<p>Material: High carbon semi-steel, hardness HSD72 Machining position: excircle, face insert: FBN6100 SNMN150720 S20020 ap=5mm, fz=0.4mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>speed</th><th>efficiency</th><th>life</th></tr> <tr><td>other PCBN</td><td>35m/min</td><td>1.5hour/pc</td><td>1/Assesedge</td></tr> <tr><td>Funik FBN</td><td>52m/min</td><td>1.5hour/pc</td><td>1/Assesedge</td></tr> </table>	Tool comparison	speed	efficiency	life	other PCBN	35m/min	1.5hour/pc	1/Assesedge	Funik FBN	52m/min	1.5hour/pc	1/Assesedge
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Funik FBN	52m/min	1.5hour/pc	1/Assesedge																						
<p>Material: High nickel chromium alloy cast iron, hardness HSD88 Machining position: bore repair insert: FBN6100 RCMA120700 S10020 ap=6mm, fz=0.2mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>speed</th><th>efficiency</th><th>life</th></tr> <tr><td>hard alloy</td><td>1.5</td><td>24hour/pc</td><td>3/Assesedge</td></tr> <tr><td>Funik FBN</td><td>20m/min</td><td>1.5hour/pc</td><td>3/Assesedge</td></tr> </table>	Tool comparison	speed	efficiency	life	hard alloy	1.5	24hour/pc	3/Assesedge	Funik FBN	20m/min	1.5hour/pc	3/Assesedge	<p>Material: High chromium alloy cast iron, hardness HSD75 Machining position: excircle insert: FBN6100 SNMN201020 S20020 ap=3mm, fz=0.3mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>hard alloy</td><td>5m/min</td><td>2hour/pc</td><td>3/Assesedge</td></tr> <tr><td>Funik FBN</td><td>35m/min</td><td>1.5hour/pc</td><td>1/Assesedge</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	hard alloy	5m/min	2hour/pc	3/Assesedge	Funik FBN	35m/min	1.5hour/pc	1/Assesedge
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<p>Material: cast high speed steel, hardness HSD88 Machining position: bore repair insert: FBN6100 RCMA120700 S10020 ap=6mm, fz=0.2mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>other CRN</td><td>25m/min</td><td>1.5hour/pc</td><td>3/Assesedge</td></tr> <tr><td>Funik FBN</td><td>30m/min</td><td>1.5hour/pc</td><td>3/Assesedge</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	other CRN	25m/min	1.5hour/pc	3/Assesedge	Funik FBN	30m/min	1.5hour/pc	3/Assesedge	<p>Material: WC Roll ring, hardness HRAB8 Machining position: excircle insert: FBN6100 SNMN120720 S05025 ap=0.5mm, fz=0.3mm/r</p> <table border="1"> <tr><th>Tool comparison</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>hard alloy</td><td>5m/min</td><td>20hour/pc</td><td>1/Assesedge</td></tr> <tr><td>Funik FBN</td><td>52m/min</td><td>2hour/pc</td><td>1/Assesedge</td></tr> </table>	Tool comparison	cutting speed	efficiency	life	hard alloy	5m/min	20hour/pc	1/Assesedge	Funik FBN	52m/min	2hour/pc	1/Assesedge
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Funik innovated CBN superhard cutting tools The advantages of "turning instead of grinding machine" finishing process hardened steel



The application cases of Funik innovated CBN superhard cutting tools in gear and bearing industry

<p>spare part: gear, 20CrMnTi, HRC58-63. Machining position: inner bore, face insert: FBNS10 CGC098204S01020 ap=0.1mm, fz=0.07mm/r, dry cutting</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>grinding</td><td>35m/min</td><td>5min/pc</td><td>0.3year</td></tr> <tr><td>Funik FBN</td><td>120m/min</td><td>0.5min/pc</td><td>0.1year</td></tr> </table>	Tool	cutting speed	efficiency	life	grinding	35m/min	5min/pc	0.3year	Funik FBN	120m/min	0.5min/pc	0.1year	<p>spare part: bearing, G15, HRC55-61. Machining position: inner bore, face insert: FBNS300 CNGA120408 S01020 ap=0.12mm, fz=0.07mm/r, dry cutting</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>other PCBN</td><td>110m/r/min</td><td>1min/pc</td><td>30pc/edge</td></tr> <tr><td>Funik FBN</td><td>110m/r/min</td><td>1min/pc</td><td>30pc/edge</td></tr> </table>	Tool	cutting speed	efficiency	life	other PCBN	110m/r/min	1min/pc	30pc/edge	Funik FBN	110m/r/min	1min/pc	30pc/edge
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<p>spare part: gear shaft, 40Cr, HRC48-55. Machining position: excircle, end face insert: FBNS300 CNGA120408 S01020 ap=0.15mm, fz=0.07mm/r, dry cutting</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>Japanese series coating alloy</td><td>120m/min</td><td>50pc/edge</td><td></td></tr> <tr><td>Funik FBN</td><td>120m/min</td><td>50pc/edge</td><td></td></tr> </table>	Tool	cutting speed	efficiency	life	Japanese series coating alloy	120m/min	50pc/edge		Funik FBN	120m/min	50pc/edge		<p>spare part: bearing, G15, HRC55-62. Machining position: excircle, end face insert: FBNS300 SNMN150720 S05020 ap=0.5mm, fz=0.1mm/r, dry cutting</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>European series coating alloy</td><td>120m/r/min</td><td>2pc/edge</td><td></td></tr> <tr><td>Funik FBN</td><td>120m/r/min</td><td>30pc/edge</td><td></td></tr> </table>	Tool	cutting speed	efficiency	life	European series coating alloy	120m/r/min	2pc/edge		Funik FBN	120m/r/min	30pc/edge	
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European series coating alloy	120m/r/min	2pc/edge																							
Funik FBN	120m/r/min	30pc/edge																							
<p>Outside diameter of gear: D1200mm, 296 teeth one circle material: 40CrMo, HB280-360. Machining position: the top excircle of gear insert: FBNS900 SNMN201020 S03020 roughing: ap=4mm, fz=0.7mm/r finishing: ap=0.5mm, fz=0.6mm/r</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>European series coating alloy</td><td>20m/r/min</td><td>20hour/pc</td><td>1.4year/edge</td></tr> <tr><td>Funik FBN</td><td>50m/r/min</td><td>2hour/pc</td><td>3pc/edge</td></tr> </table>	Tool	cutting speed	efficiency	life	European series coating alloy	20m/r/min	20hour/pc	1.4year/edge	Funik FBN	50m/r/min	2hour/pc	3pc/edge	<p>spare part: metallurgical bearing: oily powder metallurgy Machining position: inner bore, face, excircle insert: FBNS300 RMMN150700 S10020 ap=2mm, fz=0.5mm/r, dry cutting</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>Japanese series coating alloy</td><td>100m/r/min</td><td>2hour/pc</td><td>1pc/edge</td></tr> <tr><td>Funik FBN</td><td>150m/r/min</td><td>1.5hour/pc</td><td>2pc/edge</td></tr> </table>	Tool	cutting speed	efficiency	life	Japanese series coating alloy	100m/r/min	2hour/pc	1pc/edge	Funik FBN	150m/r/min	1.5hour/pc	2pc/edge
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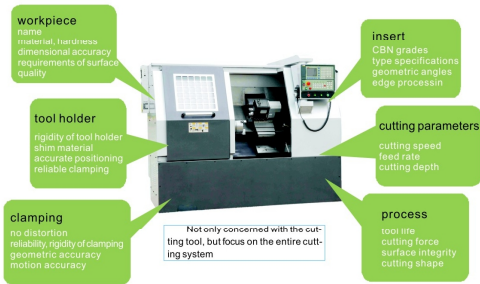
The application cases of Funik innovated CBN superhard cutting tools in air condition compressor industry

<p>spare part: upper bearing material: HT200, HB170-210 insert: FBST200 WNGA080408 S02020 ap=2.5mm, fz=0.25mm/r, wet cutting</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>Japanese series coating alloy</td><td>380m/min</td><td>7hour/pc</td><td>100pc/edge</td></tr> <tr><td>Funik FBS</td><td>570m/min</td><td>6hour/pc</td><td>100pc/edge</td></tr> </table>	Tool	cutting speed	efficiency	life	Japanese series coating alloy	380m/min	7hour/pc	100pc/edge	Funik FBS	570m/min	6hour/pc	100pc/edge	<p>spare part: cylinder material: HT200, HB170-210 insert: FBST200 WNGA080408 S02020 ap=2mm, fz=0.2mm/r, wet cutting</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>Japanese series coating alloy</td><td>260m/r/min</td><td>2hour/pc</td><td>23pc/edge</td></tr> <tr><td>Funik FBS</td><td>460m/r/min</td><td>1.5hour/pc</td><td>35pc/edge</td></tr> </table>	Tool	cutting speed	efficiency	life	Japanese series coating alloy	260m/r/min	2hour/pc	23pc/edge	Funik FBS	460m/r/min	1.5hour/pc	35pc/edge
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<p>spare part: crankshaft material: HT200, HB170-210 insert: FBST200 TNGA16040 S02020 ap=2mm, fz=0.2mm/r, wet cutting</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>Japanese series coating alloy</td><td>260m/r/min</td><td>4hour/pc</td><td>42pc/edge</td></tr> <tr><td>Funik FBS</td><td>360m/r/min</td><td>3hour/pc</td><td>22pc/edge</td></tr> </table>	Tool	cutting speed	efficiency	life	Japanese series coating alloy	260m/r/min	4hour/pc	42pc/edge	Funik FBS	360m/r/min	3hour/pc	22pc/edge													
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The application cases of Funik innovated CBN superhard cutting tools in Machine tools, mining and construction machinery industry

<p>spare part: Machine tool workbench: HT250, HB220-270 insert: FBNT025 SNEN1207ENS-M08 S02020 ap=6mm, fz=0.3mm/r, dry milling</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>alloy</td><td>80m/min</td><td>4hour/pc</td><td>0.5pc/edge</td></tr> <tr><td>Funik FBN</td><td>300m/min</td><td>0.5hour/pc</td><td>2pc/edge</td></tr> </table>	Tool	cutting speed	efficiency	life	alloy	80m/min	4hour/pc	0.5pc/edge	Funik FBN	300m/min	0.5hour/pc	2pc/edge	<p>spare part: rotary support, 42CrMo, HRC47-55, High manganese steel insert: FBNS900 RCMX090700 S05020 ap=0.5mm, fz=0.5mm/r</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>Japanese series coating alloy</td><td>50m/r/min</td><td>2hour/pc</td><td>1pc/edge</td></tr> <tr><td>Funik FBN</td><td>50m/r/min</td><td>1hour/pc</td><td>4pc/edge</td></tr> </table>	Tool	cutting speed	efficiency	life	Japanese series coating alloy	50m/r/min	2hour/pc	1pc/edge	Funik FBN	50m/r/min	1hour/pc	4pc/edge
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Funik FBN	50m/r/min	1hour/pc	4pc/edge																						
<p>spare part: sliding plate, surfacing, HRC52-62; insert: FBNT025 RMMN120700 S01020 ap=0.5mm, fz=0.1mm, dry milling</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>USA series coating alloy</td><td>180m/r/min</td><td>1pc/edge</td><td></td></tr> <tr><td>Funik FBN</td><td>180m/r/min</td><td>1.5pc/edge</td><td></td></tr> </table>	Tool	cutting speed	efficiency	life	USA series coating alloy	180m/r/min	1pc/edge		Funik FBN	180m/r/min	1.5pc/edge		<p>spare part: Rolling mill wall: High manganese steel insert: FBNS100 SNMN150720 S05025 ap=3mm, fz=0.5mm/r</p> <table border="1"> <tr><th>Tool</th><th>cutting speed</th><th>efficiency</th><th>life</th></tr> <tr><td>other CBN</td><td>60m/r/min</td><td>70hour/pc</td><td>1pc/edge</td></tr> <tr><td>Funik FBN</td><td>50m/r/min</td><td>20hour/pc</td><td>3pc/edge</td></tr> </table>	Tool	cutting speed	efficiency	life	other CBN	60m/r/min	70hour/pc	1pc/edge	Funik FBN	50m/r/min	20hour/pc	3pc/edge
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Precautions of using Funik innovated CBN superhard cutting tools



conventional cutting parameter formula

turning

$$V_c = \frac{\pi \cdot D \cdot n}{1000} \quad (m/min)$$

$$f = \frac{V_r}{n} \quad (mm/rev)$$

formula: V_c : cutting speed (m/min)
 n : spindle speed (rev/min)
 D : workpiece diameter (mm)
 V_r : feed rate (mm/min)
 f : feed amount per revolution (mm/rev)

milling

$$V_c = \frac{\pi \cdot D_c \cdot n}{1000} \quad (m/min)$$

$$f_z = \frac{V_r}{n \cdot Z} \quad (mm/z)$$

formula: V_c : cutting speed (m/min)
 n : spindle speed (rev/min)
 D_c : nominal diameter of milling cutter (mm)
 V_r : feed rate (mm/min)
 Z : tooth number
 f_z : feed amount per tooth (mm/z)

Precautions of installation and change insert

- thoroughly clean the insert and insert slot
- check the soundness and abrasion of shim
- check the fastening reliability of the shim
- check whether the clamping surface of the platen is flat or not
- ensure the insert and the positioning slot closely bonded
- periodically replace shim, platen and all the locking screw
- avoid using the worn cutter body of the insert slot
- maintain minimum overhang of the tool holder
- don't suddenly stop when the tool tip is not cut out during the process

Recommended cutting parameters of Funik innovated CBN superhard cutting tools

Conventional cutting parameters of Funik CBN Cutting Tools					
Material	Hardness of workpiece	Tool cutting edge angle Kr	Cutting speed (m/min)	Cutting depth (mm)	Feed rate (mm/r)
Gr15	HRC60	45~95°	70~200	0.50~3.00	0.10~0.30
High chromium	HSD80	10~45°	15~200	0.50~10.00	0.30~3.00
QT450	HB220	45~95°	80~500	0.50~5.00	0.30~1.50
HT200	HB180	45~95°	100~800	0.50~2.00	0.50~1.00
40Cr	HRC58	45~95°	60~120	0.30~3.00	0.10~0.50
Gr15	HRC55	45~95°	80~120	0.50~8.00	0.10~0.30
High nickel chromium	HSD78	10~45°	15~50	1.00~8.00	0.50~1.5
High chromium	HSD75	10~45°	15~45	1.00~10.00	0.50~1.5
High chromium steel	HSD75	10~45°	20~60	1.00~10.00	0.50~1.5
High speed steel	HSD88	10~45°	10~30	1.00~10.00	0.50~1.5
High carbon semi steel	HSD70	10~45°	25~80	1.00~10.00	0.50~1.5
Chilled iron	HSD67	10~45°	20~50	1.00~10.00	0.50~1.5
High chromium steel	HRC58	45~95°	60~90	1.00~10.00	0.10~0.50
High chromium steel	HRC60	45~95°	50~90	0.50~4.00	0.10~0.50
High chromium steel	HSD55	45~95°	60~90	0.50~4.00	0.10~0.50
QT450	HB220	45~95°	80~200	0.50~4.00	0.30~1.50
HT200	HB190	45~95°	80~500	0.50~4.00	0.50~1.00
HT250	HB200	45~95°	100~180	0.50~4.00	0.50~0.80
HT220	HB200	45~95°	80~150	0.50~4.00	0.10~1.00
HT200	HB200	45~95°	100~180	0.50~4.00	0.10~1.00

Conventional cutting parameters of Funik Milling CBN Cutting Tools						
Material	Hardness of workpiece	Tool cutting edge angle Kr	Cutting speed/m/min	Cutting depth/mm	Feed rate/(mm/min)	Cutting coolant
Gray cast iron	HB200	75°	500~2000	0.50~5.0	0.1~0.2	dry cutting
Hardened steel	HRC60	90°	80~200	0.2~0.5	0.05~0.1	dry cutting

- Regarding cutting parameters:
- (1) Cutting parameters is related with the features of CBN inserts and the hardness, toughness, cutting characteristics of workpiece material, etc.
 - (2) Cutting parameters is related with the stability of machine tool power, capability of cutting, the way of finishing as well as the stress state of inserts, etc.
 - (3) Option of feed rates is related with the tool cutting edge angle, cutting depth, size, thickness, shape of insert.
 - (4) Option of cutting depth, choosing the big of cutting depth under the possible condition, but should pay attention on the load of tools.
 - (5) Option of cutting speed is related with shape of workpiece, texture of workpiece, path of tools, hardness of material, toughness, the life of the designed inserts, etc.

The formulation of cutting parameters is related with rigidity of machine tools, shape of workpiece, material of workpiece, structure of inserts, angle of inserts, durability of inserts as well as many factors. Choose the proper parameter can make full use of efficiency of tool machine and inserts.