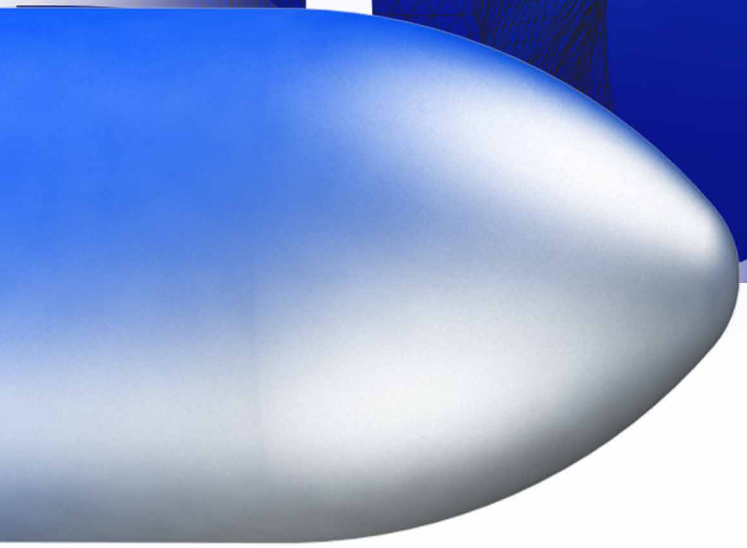
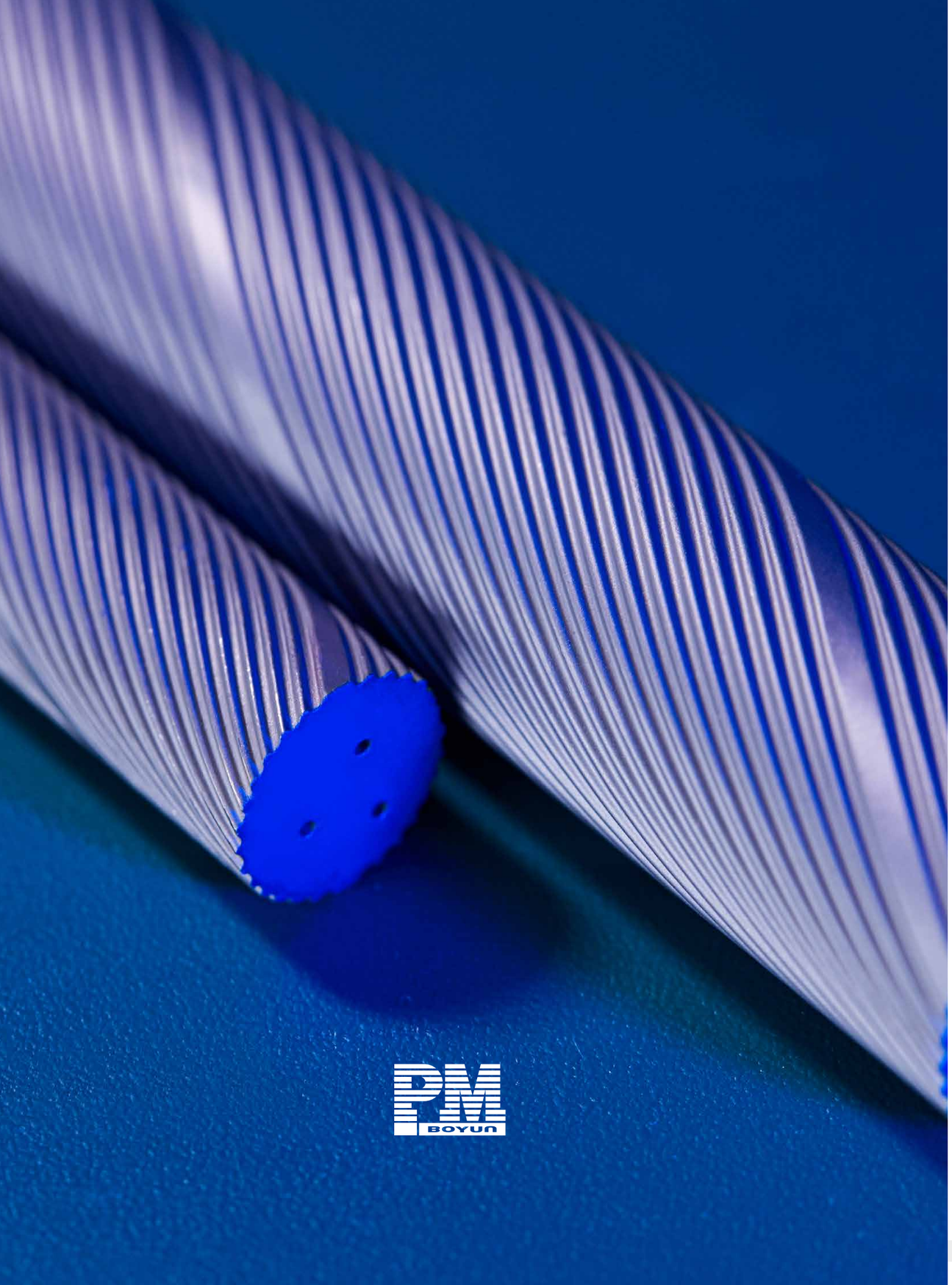
#3 CARBIDE - MINING MATERIAL

BOYUN



CARBIDE
MINING MATERIAL

INNOVATION MAKES DREAMS COME TRUE



CONTENTS

Our Company

Hunan Boyun Dongfang Powder Metallurgy Co., Ltd. was founded in 1994 by the Institute of powder metallurgy of Central South University of Technology (now the research center of powder metallurgy engineering of Central South University) and Hunan Yinzhou Co., Ltd. (now the wholly-owned member company of China Dongfang asset management company, Bangxin Asset Management Co., Ltd.),now it is the holding subsidiary of Hunan Boyun New Material Co., Ltd. (Stock Code: 002297), with a registered capital of 307 million yuan. The company is a national high-tech enterprise with Academician Huang Boyun, the top material scientist in China, as the chief scientist and honorary chairman of the board, integrating domestic and foreign talents and technological advantages, integrating production, learning, research and application, engaged in the research, development, production and sales of high-performance cemented carbide. Company is medium-sized enterprises to become state-level technologically advanced 'little giant' enterprises. The member of China Tungsten Industry Association, China mold industry association, China machinery industry metal cutting tool technology association.

With strong support from Central South University, State Key Laboratory of Powder Metallurgy, National Engineering Research Center of Powder Metallurgy, national key laboratory of light and high strength structural materials, Quality Supervision and Inspection Center of Powder Metallurgy Products of Chinese Nonferrous Material Industry , the Company has played leading role in three projects of "National High Technology Research and Development Program (863 plan)".

Chief Scientist

Academician of Chinese Academy of Engineering
Winner(1st) of China National Technological Invention Award (2005)
Former president of Central South University
Member of Twelfth National People's Congress Standing Committee
Vice-Chairman, Chinese Association for Science

ACADEMICIAN HUANG BOYUN

Honorary Chairman, Chief Scientist

COMPANY INTRODUCTION

Specialty One: Owned complete discipline system on non-ferrous materials while established top classes of non-ferrous metallurgy in the world.
Specialty Two: Conducted over 60 years of high education and R&D in rail transit system and made vital contributions to major projects including Qinghai-Tibet railway, high-speed railway, urban rail and helped to increase speed of all Chinese trains (six times).

1 GEOLOGY

4 METALLURGY

2 MINING

5 MATERIAL

3 ORE DRESSING

6 MECHANICAL

FEATURE SUBJECTS OF CENTRAL SOUTH UNIVERSITY

The University participated in the "Qinghai-Tibet Railway Project"
The series of railway aerodynamics are widely used in the speeding of western railways and the construction of high-speed railways.

INSTITUTE OF POWDER METALLURGY

Among 31 colleges of CSU, the Institute of Powder Metallurgy is a comprehensive base of high education, R&D and industrialization of new materialsvv in China.

P / M Research Institute has established four national level P / M material and technology research and development bases:
State Key Laboratory of Powder Metallurgy
Supervision and Testing Center of Products of Powder Metallurgy of Chinese Nonferrous Metals Industry
National Engineering Research Center of Powder Metallurgy

Company Introduction

GLORIOUS HISTORY OF POWDER METALLURGY RESEARCH INSTITUTE

Established at 1958,

First Powder Metallurgy discipline in China.

In 1989,
Expansion, Solidification of fundamental theory and technology and frontier of PM.

In 1995,
Open up, civil-military integration and innovation-driven strategies to meet major national needs.

In 2003,

EXCELLENT State Key Laboratory

In 2004,

First Prize of National Technology Invention Award.

In 2008,
EXCELLENT State Key Laboratory.

In 2011,

First Prize of National Science and Technology Progress.

In 2017,
C919 took her maiden flight.

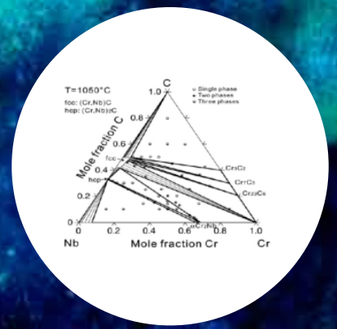
In 2018,
project 2011" Nonferrous Metals Advanced Structural Materials and Manufacturing Cooperative Innovation Center" was passed the acceptance.

2019

Company Introduction

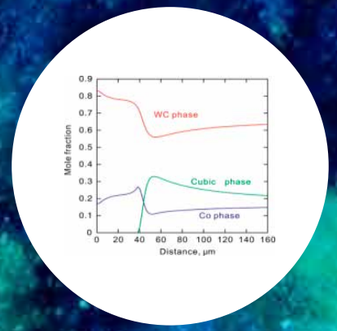
INSTITUTE OF POWDER METALLURGY

Basic research on Application of special PM materials



Thermodynamics database

$$V_{Co} = \frac{u^{S}_{Co} \cdot V^{m}_{Co}}{\left(1-u^{S}_{Co}\right) \cdot V^{m}_{WC} + u^{S}_{Co} \cdot V^{m}_{Co}}$$



Dynamics database

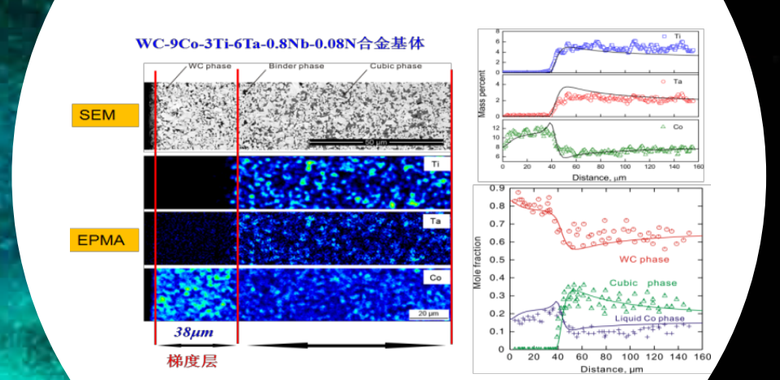
The Institute of powder metallurgy has built the most complete database of thermodynamics and dynamics of muti-component cemented carbide in the world, which can accurately predict the distribution of phases and elements in the gradient layer of cemented carbide. Base on this database, a series of new gradient cemented carbide have been developed by integrated calculation.

Propose the Symplectic Du formula to achieve efficient prediction of liquid phase diffusion coefficient 16-component cemented carbide thermodynamic and dynamics database.

Using the database, quantitative description of Phase and Element Distribution in Cemented Carbide Gradient.

Gradient cemented carbide composition

Comparison of predictions and experimental results



Structure Characterization and Quantitative Description of Element Distribution of Gradient Cemented Carbide

COMPANY BRAND AND MARKET

Protection of Intellectual Property RightsProfessional

Besides registered in China, "PM" trademark has also been registered in the United States and the European Union.

Business Area

The company's business has expanded to many countries and regions around the world.

Company Introduction

CEMENTED CARBIDE

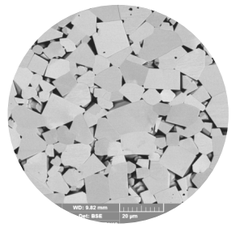
Cemented carbide is a kind of composite material which is made of refractory metal hard compounds (WC, TiC, etc.) and bonding metals (CO, Ni, Fe, etc.) by powder metallurgy. Cemented carbide have high hardness, high wear resistance, high strength, high modulus of elasticity, low coefficient of thermal expansion, high red hardness and stable chemical properties.

Classification of Grain Size of Cemented Carbide (ISO4499-2-2008)

Category	Grain size of WC(μm)
Nano	＜0.2
Ultrafine	0.2～0.5
Submicron	0.5～0.8
Fine	0.8～1.3
Medium	1.3～2.5
Coarse	2.5～6.0
Extra coarse	＞6.0

Nano cemented carbide which means the WC grain size is less than 0.2 μm cemented carbide, nano cemented carbide has higher hardness and strength than normal cemented carbide, at the same time ,effectively solves the problem of ultra-high speed cutting of hard to machine materials such as superalloy, titanium alloy, composite material, hardened steel, etc., greatly improves the machining efficiency, and is the preferred tools material in the aerospace field and high-end equipment manufacturing industry.

Extra coarse-grained cemented carbide is a kind of cemented carbide with WC grain size larger than 6μm, compared with coarse grained cemented carbide, it has better toughness, thermal fatigue resistance and higher wear resistance. It is widely used in shield, mining, stamping die, cold heading die, roll and other industries under extreme working conditions, and the product reliability is greatly improved.



SEM micrograph of extra coarse grained cemented carbide (2000X)

Company Introduction

TECHNICAL ADVANTAGES

R & D Team

Academician Huang Boyun is the chief scientist, relying on the Central South University, and in combination with the premium customer WOLF group in Germany, the largest shield equipment manufacturer in China, China railway construction heavy industry group, and the first industrial Internet in China Brand Foxconn industrial Internet Co., Ltd. consists of a strong interdisciplinary R & D team.

Company Introduction

TECHNICAL ADVANTAGES

Ultrafine / Nano Cemented Carbide

Since 2002, Boyun-Dongfang has been cooperating with Central South University to continuously carry out the research and development and preparation of ultra-fine / nano cemented carbide with the support of the National Innovation Fund for small and medium-sized science and technology enterprises and the national high-tech research and development plan-(863 Program).

Extra Coarse-Grained Cemented Carbide

The company developed the extra coarse-grained cemented carbide with WC grain size greater than 9μm has better toughness, better thermal fatigue resistance and higher wear resistance than the traditional extra coarse-grained cemented carbide. It is widely used in shield, mining, stamping die, cold upsetting die, roll and other industries under extreme working conditions, and the product reliability is greatly improved.

Have independent intellectual property rights and advanced self-activation high temperature reduction high temperature carbonization extra coarse-grained tungsten carbide powder preparation technology.

Company Introduction

DEVELOPMENT HISTORY

Established in 1994

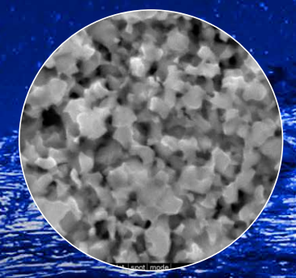
IN 2003
0.4μm

IN 2008
0.3μm

IN 2016
The company developed the grain size less than 0.2μm.

IN 2018

IN 2019



SEM Image of Nano Size Carbide(30000X)

Ultrafine / Nano Cemented Carbide development history

TECHNICAL ADVANTAGES

Coating

Coating technology reaches the international leading level

- Unique droplet suppression
- Unique decorating process
- High Adhesion
- Precise Control of Thickness, With Guaranteed Accuracy
- High Wear Resistance

We are the strategic partner of eifeler and wolf in China

We are eifeler's demonstration plant in China

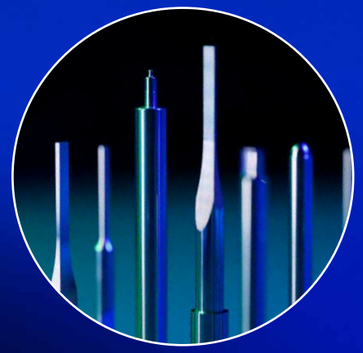
Our coating products have the same performance level as Germany

Company Introduction

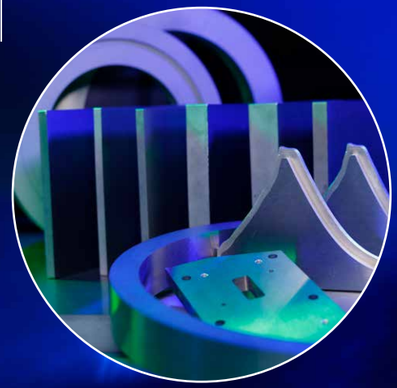
MAIN BUSINESS

The main business is the R & D, producing and sales of high-performance cemented carbide products. The main products are high-performance ultra-fine / nano cemented carbide rods, high-performance cemented carbide mold materials, high-performance extra coarse grain size cemented carbide in engineering and mining, refined and deep processed cemented carbide products (parts / components), etc. Our products are widely used in aerospace, automobile, metallurgy, engineering & mining, microelectronics and other industrial fields, and have been well known by our customers.

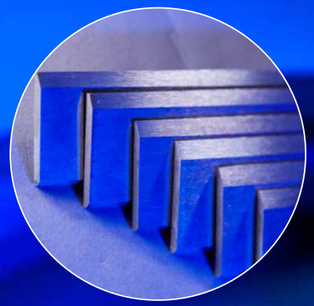
Coating



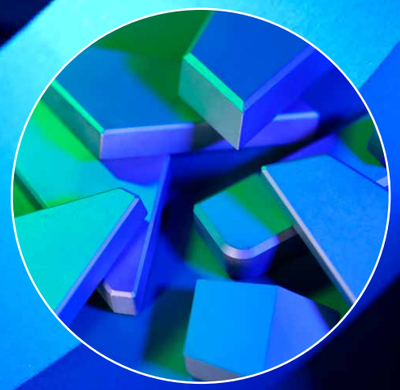
Finished Products



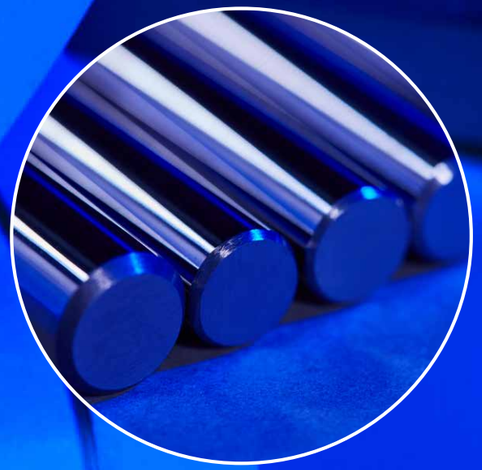
Molds



Special Tools



Shield Cutter



Rods

Grade Introduction of Mineral

Grade Introduction of Mineral									
Grade	Co	Grain Size of WC	Hardness		Density	Flexural Strength	Elastic Modulus	Coefficient of Thermal Expansion	Application
	Co%		HRA	HV_{30}	g/cm^3	MPa	GPa	10^{-6}/°C	
G206	6	Medium	90.5	1460	14.9	3200	530	4.9	Suitable for carbide teeth for spherical buttons for DTH drilling and threaded drill bits. It is suitable for medium-soft and medium-hard rock formations.
G506	6	Coarse	88.0	1200	14.9	2500	530	4.9	Suitable for cement or asphalt pavement milling parabolic bit.
G806	6	Extra Coarse	86.2	1040	14.9	2100	530	4.9	Suitable for hard rock rotary drilling cutter and caol cutters.
G707	7	Extra Coarse	86.3	1050	14.8	2200	520	5.0	Suitable for bit in iron ore and cutter to Leveling the ground.
G208	8	Medium	89.6	1350	14.7	2750	510	5.1	Suitable for shot bit and DTH drill on soft rock formations; Roller-cone core bit and oil field rotary bit on geological exploration.
G308	8	Medium	88.8	1270	14.7	2750	510	5.1	Suitable for tri-cone drill bit, shot bit and DTH drill bit on hard rock.
G608	8	Extra Coarse	86.8	1100	14.7	2400	510	5.1	Suitable for tunnel cutter head, coal bit, shaft and trench rotary cutting picks, agricultural machinery picks.
G510	10	Coarse	86.2	1040	14.5	2700	490	5.4	Suitable for rotary drilling cutter and coal cutters.
G211	11	Medium	88.8	1270	14.4	2800	478	5.6	Suitable for the matrix of diamond composite sheet for oil field and cutting.
G311	11	Medium	88.0	1200	14.4	3200	478	5.6	Suitable for pile-driving rotary picks, cone drills for medium-hard rock formations, oilfield cone drills, and wear-resistant protective teeth for snow shovel buckets.
G411	11	Coarse	87.0	1120	14.4	2900	478	5.6	Suitable for medium-soft and medium-hard rock formations, used in the preparation of cone bits for mines, coal mining, oil fields, coring, rotary picks and reaming bits.
G512	12	Coarse	86.0	1030	14.3	2900	470	5.7	Suitable for tunnel shield machine cutter heads and wear-resistant blocks; Also suitable for the preparation of high-speed and high-pressure tri-cone drill bit on medium and soft rock formations.
G513	13	Coarse	85.6	1000	14.2	2900	460	5.8	Suitable for heavy-duty rock drills, rotary rock drill bits and shield cutter heads for hard rock formations are also suitable for preparing oil field cone drill bit and mining picks.
G215	15	Medium	87.3	1140	14.0	2800	430	6.3	Suitable for engineering rock drilling bit and geological prospecting.
G315	15	Medium	86.5	1080	14.1	3200	430	6.3	Suitable for ore crushing high-pressure roller mill column nails and wear-resistant blocks.
G415	15	Coarse	86.0	1030	14.1	3000	430	6.3	Suitable for ore crushing high pressure roller mill bits.
G515	15	Coarse	84.8	940	14.0	2800	430	6.3	Suitable for TBM or shield machine rollers.
G218	18	Medium	86.5	1080	13.7	2800	410	6.6	Suitable for high-pressure roller mill button for crushing ore in cement production.
G318	18	Medium	85.5	990	13.8	2800	410	6.6	Suitable for cement production ore crushing high-pressure roller mill studs and wear-resistant blocks.
G320	20	Medium	84.5	920	13.6	2800	390	6.8	Suitable for cement production ore crushing high-pressure roller mill studs and wear-resistant blocks.

Main Products

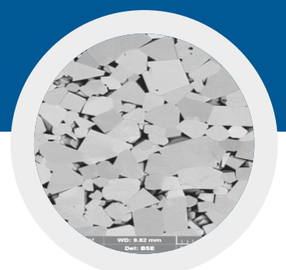
TBM （tunnel-boring machines） cutter，shield cutter， hobbing cutter

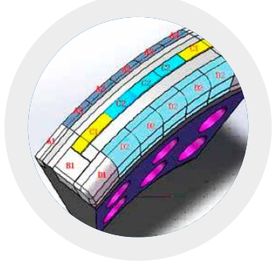
Characteristic

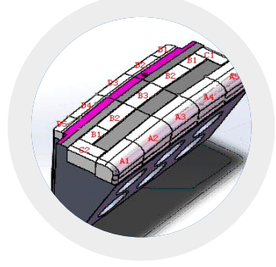
1. Self-made WC Powder with complete crystallization
2. 10MPa pressure furnace
3. Strict quality control system
4. Self Developed Ultra-Coarse Grain Technology
5. Strong Research Ability of Central South University
6. 40Years Experience of Carbide Making

Technical Features

Technical features： high-performace carbides with ultra-coarse grain
PM developed high-performace carbide bit with Extra-Coarse of WC grain size more than 9μm by the first domestic enterprise on 2020, which improved to high performance carbide's toughness and wear resistance.





RULES FOR DESIGNATIONS OF THE TYPES AND GRADE OF BUTT ONS

ZQ 14 × 20 A K P / M

1 2 3 4 5 6 7

1、The shape of the butoon

ZQ:Spherical　ZZ:Cone　ZD:Parabolic

ZP:Flat　ZB:Eccentric wedge　ZX:Wedge

ZS::Spoon　ZJ:Auger tip

2、The diameter of button in mm .Only 2 integers are taken ,if the diameter is only one integer ,then it is preceded by zero

3、The high of button in mm .Only 2 integers are taken ,if the height is only one integer ,then it is preceded by zero

4 、Special button top and it is omitted if there is standard head.

5、It indicates air pocker structuer at bottom ,it is omitted if there is no air pocket .

6、It indicates the botton is flat and there is only one chamfer,if absence,expressed adouble-chamfered buttons.

7 、The diameter in the state of accurate grinding

Standard tolerance of D&H

mm

Diameter		Height	
Nominal size	Tolerance	Nominal size	Tolerance
⩽ 10	± 0.15	⩽ 11	± 0.15
⩽ 10	± 0.15	11-18	± 0.20
> 11	± 0.20	18-25	± 0.20
> 11	± 0.20	> 25	± 0.25

G--Cemented carbide for mining

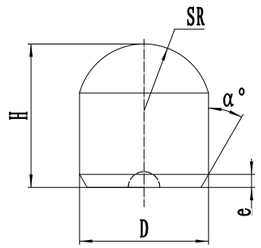
XXX--The main parameter of grade with the grain size of Carbide and the content of cobalt

OUR PRODUCT

C A R B I D E

ALL TYPES AND SPECIFICATIONS OF
CEMENTED CARBIDE PRODUCTS

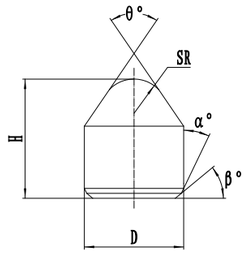
Spherical buttons for tri-cone drill bits



Unit:mm

Spherical buttons for tri-cone drill bits					
Type	Dimension				
	D	H	SR	α°	e
ZQ11.5*12.5KP	11.25	12.5	6.0	18	2.0
ZQ13*13.5KP	13.25	13.5	6.7	18	2.5
ZQ14*14.5KP	14.5	14.5	7.2	18	2.5

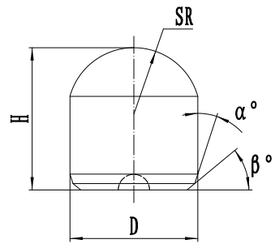
Conical buttons for medium and low pressure DTH drilling



Unit:mm

Conical buttons for medium and low pressure DTH drilling						
Type	Dimension					
	D	H	SR	θ°	α°	β°
SZ12×18A	12.35	18	4.8	55	20	28.0
SZ12*18B	12.35	18	4.0	55	20	27.0
SZ12*18	12.35	18	4.5	53/55	20	20.0
SZ13*18	13.35	18	4.5	53/55	20	20.0
SZ13*19A	13.35	19	4.5	55	20	28.0
SZ13*19B	13.35	19	5.0	55	20	27.0
SZ14*19	14.35	19	5.0	53/55	20	20.0
SZ14*22A	14.35	22	5.0	55	20	14.5

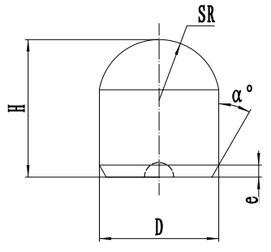
Spherical buttons for high pressure DTH drilling



Unit:mm

Spherical buttons for high pressure DTH drilling					
Type	Dimension				
	D	H	SR	α°	β°
ZQ14*20K(P)	14.2	20	7.2	18	27
ZQ16*22K(P)	16.25	22	9	18	27
ZQ18*25K	18.35	25	9.2	18	30

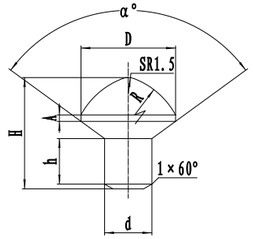
Spherical buttons for shield machine hob



Unit:mm

Spherical buttons for shield machine hob					
Type	Dimension				
	D	H	SR	α°	β°
ZQ16*23KP	16.25	23	9	18	1.8
ZQ16*21KP	16.25	21	9	18	1.8

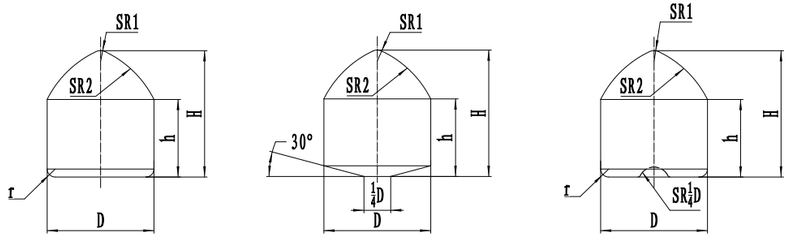
Cemented carbide for coal-mining and iron ore crusher



Unit:mm

Mushroom buttons

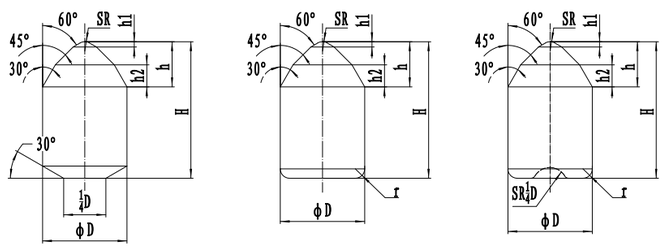
Type	Dimension									
	D		H		d		h	R	A	α°
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.				
ϕ2021	20	±0.2	21	±0.2	12	-0.1 -0.3	8.0	35	2.0	120
Φ2427	24	±0.2	27	±0.2	14	-0.1 -0.3	10.0	45	3.0	120
Φ1822	18	±0.2	22	±0.2	10	-0.1 -0.3	8.0	30	1.5	90
Φ2025	20	±0.2	25	±0.2	12	-0.1 -0.3	10.0	35	1.5	90
Φ2027	20	±0.2	27	±0.2	12	-0.1 -0.3	10.5	35	4.0	90
Φ2228	22	±0.2	28	±0.2	14	-0.1 -0.3	12.0	40	1.5	90



Unit:mm

J type buttons

Type	Dimension					
	D	H	h	SR1	SR2	r
ZJ25×38/P/KP	25	38	25	2	50	3
ZJ25×34/P/KP	25	34	21	2	50	3
ZJ24×30/P/KP	24	30	18	2	48	3
ZJ22×32/P/KP	22	32	21	2	44	2.5
ZJ19×26/P/KP	19	26	16.5	2	38	2.5
ZJ17×23/P/KP	17	23	14.5	2	34	2
ZJ16×25/P/KP	16	25	17	2	32	2

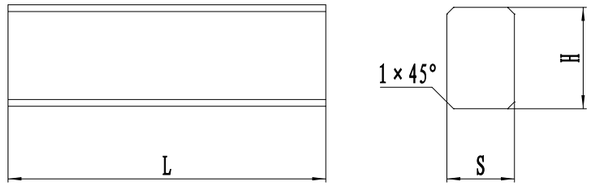


Unit:mm

JN type buttons

Type	Dimension						
	D	H	SR	r	h	h1	h2
JN21×35/P/KP	21	35	2	2.5	10.5	2	4.7
JN18×30/P/KP	18	30	2	2	10	1.4	5
JN18×28/P/KP	18	28	2	2	10	1.4	5
JN16×28/P/KP	16	28	2	2	8	1.7	3.3
JN14×26/P/KP	14	26	2	2	7	1.2	3.8

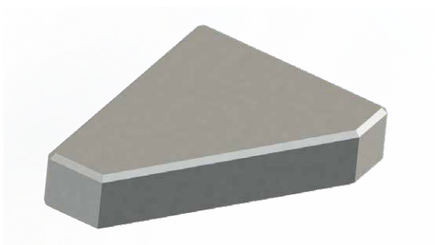
Cemented carbide for Engineering and shield machine

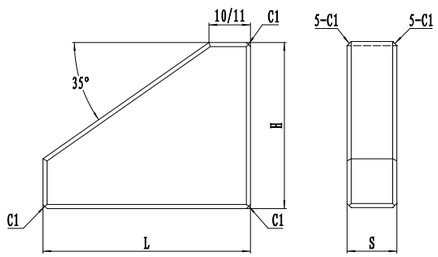


Unit:mm

Strip buttons for crusher

Type	Dimension					
	L		H		S	
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
47×15×10	47	±0.3	15	±0.2	10	0 -0.3
52×23×12	52	±0.1	23	±0.3	12	0 -0.3
52.5×23×12	52.5	±0.3	23	±0.3	12	0 -0.3
55×23×12	55	±0.3	23	±0.3	12	0 -0.3
190×20×12	190	±0.6	20	±0.3	12	0 -0.3
194×20×12	194	±0.6	20	±0.3	12	0 -0.3
210×20×10	210	±0.7	20	±0.3	10	0 -0.3
190×23×13	190	±0.6	23	±0.3	13	0 -0.3
189×23×13	189	±0.6	23	±0.3	13	0 -0.3
52.5×20×10	52.5	±0.05	20	-0.05	10	0 -0.05
105×20×10	105	±0.05	20	-0.05	10	0 -0.05

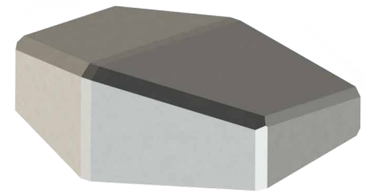


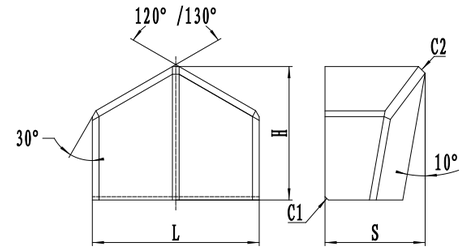


Unit:mm

Shell buttons for shield tunneling machine

Type	Dimension					
	L		H		S	
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
62×50×12	62	±0.50	50	±0.30	12	±0.05
52×40×12	52	±0.40	40	±0.25	12	±0.05
45×35×12	45	±0.40	35	±0.25	12	±0.05
40×40×12	40	±0.35	40	±0.25	12	±0.05
40×25×12	40	±0.35	25	±0.20	12	±0.05
30×31×10	30	±0.30	31	±0.30	10	±0.05

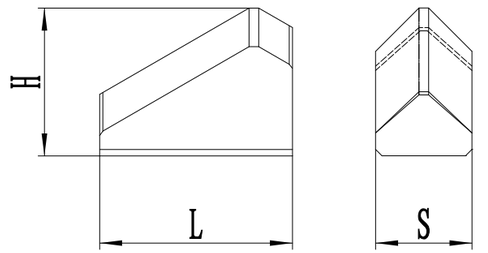




Unit:mm

Cemented carbide for milling cutters

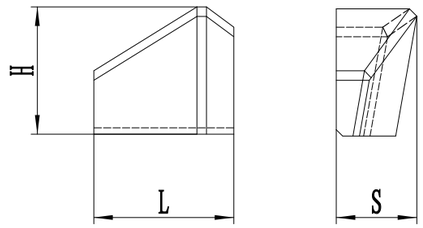
Type	Dimension					
	L		H		S	
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
60×45×30	60	±0.50	45	±0.40	30	±0.3
50×40×30	50	±0.40	40	±0.25	30	±0.3
40×35×25	40	±0.40	35	±0.25	25	±0.3
38×30×20	38	±0.350	30	±0.25	20	±0.3
50×35×25	50	±0.40	35	±0.30	25	±0.3
22×20×13	22	±0.20	20	±0.20	13	±0.3



Unit:mm

Cemented carbide for milling cutters

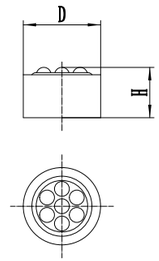
Type	Dimension					
	L		H		S	
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
45×39×25	45	±0.50	39	±0.4	25	-0.3
45×39×23	45	±0.40	39	±0.4	23	-0.3
37×37×19	37	±0.40	37	±0.4	19	-0.3
31×23×15	31	±0.25	23	±0.2	15	-0.3
20×20×15	20	±0.20	20	±0.2	15	-0.3



Unit:mm

Cemented carbide for milling cutters

Type	Dimension					
	L		H		S	
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
40×35×25	40	±0.50	35	±0.4	25	±0.2
39×33×25	39	±0.40	33	±0.4	25	±0.2
45×35×23	45	±0.40	35	±0.4	23	±0.2
22×20×13	22	±0.25	20	±0.2	13	±0.2
20×20×15	20	±0.20	20	±0.2	15	±0.2

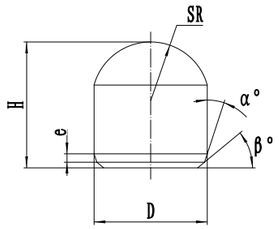


Unit:mm

Cemented carbide for diamond composite matrix

Type	Dimension			
	D		H	
	Dim.	Tol.	Dim.	Tol.
21.5×16.0	21.5	+0.4	16	±0.2
21.5×13.5	21.5	+0.4	13.5	±0.2
21.5×13.0	21.5	+0.4	13	±0.2
21.5×15.5(平)	21.5	+0.4	15.5	±0.2
21.5×7.2(平)	21.5	+0.4	7.2	±0.2
18×9.5(平)	18	+0.3	9.5	±0.2
18×7.2(平)	18	+0.3	7.2	±0.2
15×13.5	15	+0.3	13.5	±0.2
15×9.5	15	+0.3	9.5	±0.2
15×8	15	+0.3	8	±0.2

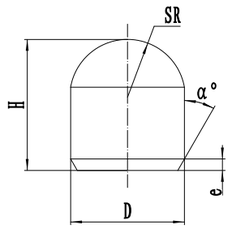
Cemented carbide for mining



Unit:mm

Spherical buttons

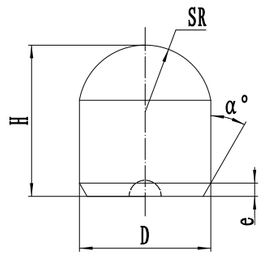
Type	Dimension					
	D	H	SR	α°	β°	e
ZQ12×18	12.25	18	6.2	18	26.5	1.5
ZQ13×19	13.30	19	6.6	18	26.5	1.5
ZQ14×20	14.30	20	7.2	18	27.0	1.8
ZQ14×22	14.30	22	7.2	18	27.0	1.8
ZQ16×25	16.35	25	8.2	18	27.0	2.0
ZQ16×21K	16.35	21	9.0	18	30.0	2.0
ZQ19×30K	19.30	30	9.8	20	30.0	2.5
ZQ21×32K	21.70	32	10.9	20	30.0	2.5



Unit:mm

Spherical buttons

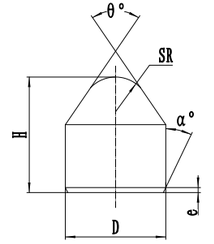
Type	Dimension				
	D	H	SR	α°	e
ZQ08×10P	8.15	10	4.4	18	1
ZQ08×12P	8.15	12	4.4	18	1
ZQ09×14P	9.15	14	4.7	18	1
ZQ9.5×14	9.65	14	5.1	18	2
ZQ10×15P	10.25	15	5.2	18	1.2
ZQ11×15P	11.25	16	6	18	1.5
ZQ12×16P	12.25	16	6.6	18	1.5
ZQ12×17P	12.25	17	6.6	18	1.5
ZQ12×19P	12.25	19	7	18	1.5
ZQ13×18P	13.25	18	7	18	1.8
ZQ14×19P	14.25	19	7.7	18	1.8
ZQ19×30P	19.25	30	10	18	3.5



Unit:mm

Spherical buttons

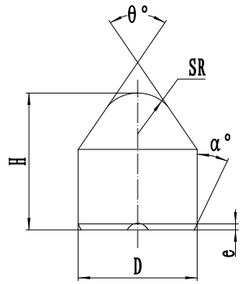
Type	Dimension				
	D	H	SR	α°	e
ZQ11×15KP	11.25	15	6	18	2
ZQ12×17KP	12.25	17	6.6	18	1.8
ZQ13×19KP	13.25	19	7	18	1.8
ZQ14×20KP	14.25	20	7.5	18	1.8
ZQ16×22KP	16.25	22	9	18	1.8
ZQ16×23KP	16.25	23	9	18	1.8
ZQ16.5×23KP	16.75	23	9	18	2
ZQ16.5×25KP	16.75	25	9	18	2
ZQ18×24KP	18.35	24	9.2	18	2
ZQ20×30KP	20.25	30	10.7	18	2.5



Unit:mm

Conical buttons

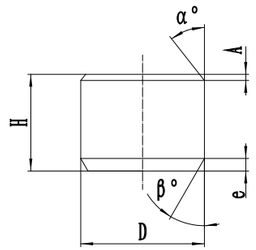
Type	Dimension					
	D	H	SR	α°	β°	e
ZZ07×10P	7.15	10	3.5	18	70	1.0
ZZ08×10P	8.15	10	3.5	18	70	1.5
ZZ08×12P	8.15	12	3.5	18	70	1.5
ZZ08×12P	7.80	12	3.5	18	70	1.5
ZZ09×13P	9.15	13	3.8	18	70	1.5
ZZ09×14P	9.15	14	3.8	18	70	1.5
ZZ10×14P	10.15	14	4.2	18	70	1.5
ZZ10×15P	10.15	15	4.2	18	70	1.5
ZZ11×15P	11.25	15	4.5	18	70	1.8
ZZ12×17P	12.25	17	4.5	18	65	1.8



Unit:mm

Conical buttons

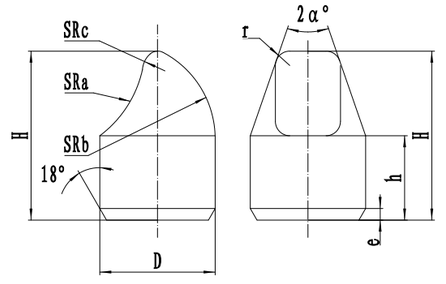
Type	Dimension					
	D	H	SR	α°	β°	e
ZZ10×14KP	10.15	14	4.2	45	70	1.5
ZZ11×15KP	11.2	15	4.5	45	70	1.8
ZZ12×16KP	12.2	16	4.8	45	70	1.8
ZZ12×17KP	12.2	17	4.8	45	70	1.8
ZZ13×19KP	13.2	19	4.8	45	65	1.8
ZZ14×20KP	14.25	20	5	45	65	2
ZZ14×22KP	14.25	22	5	45	65	2
ZZ16×25KP	16.3	25	5.5	45	65	2
ZZ19×24.5KP	19.35	24.5	7	45	55	2
ZZ19×26KP	19.35	26	7	45	42	2



Unit:mm

Flatto buttons

Type	Dimension					
	D	H	A	α°	e	β°
ZP08×07P	8.15	7	1.0	45	1.5	18
ZP10×08P	10.15	8	1.2	45	1.5	18
ZP10×10P	10.15	10	1.2	45	1.5	18
ZP11×09P	11.20	9	1.2	45	1.8	18
ZP16×15P	16.4	15	-	-	1.8	45
ZP19×17P	19.4	17	-	-	2	45
ZP14×14KP	14.35	14	1.5	45	1.8	18
ZP14×16KP	14.35	16	1.5	45	1.8	18
ZP16×22KP	16.30	22	7.5	35	1.8	18
ZP16×27KP	18.30	27	10	35	1.8	18

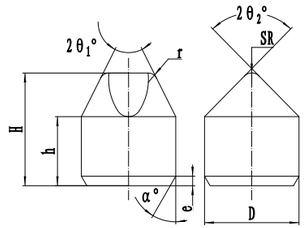


Unit:mm

Spoon buttons

Type	Dimension								
	D	H	h	SRa	SRb	SRc	r	α°	e
ZS14×18P	14.25	18	10	12	20	2.5	2.5	18	2
ZS14×21P	14.25	21	12	12	20	2.5	2.5	18	1.5
ZS16×21P	16.3	21	10	15	23	2.5	2.5	18	2
ZS16×23P	16.3	23	12	15	23	2.5	2.5	18	2
ZS16×26P	16.3	26	14	20	28	2.5	2.5	18	2
ZS17×24P	17.3	24	13	16	25	3	3	20	2
ZS19×30P	19.4	30	17	16	25	3	3	15	2
ZS22×40P	22.4	40	21	20	30	3	3	13	2
ZS25×45P	25.4	45	23	30	35	3.5	3.5	13	2

Wedge buttons

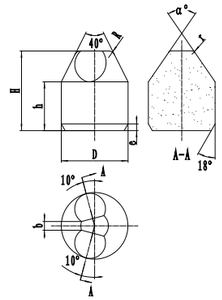


Unit:mm

ZX type

Type	Dimension								
	D	H	h	SR	e	r	θ1°	θ2°	α°
ZX14×21P	14.2	21	11.5	4	1.5	1.5	18	30	18
ZX15×22P	15.2	22	13	4.5	1.5	2	18	30	18
ZX16×23P	16.2	23	14.5	6	2	2	18	32	18
ZX16×24P	16.2	24	14	5	2	2	18	30	18
ZX18×25P	18.3	25	17	7.5	2	2	18	32	18
ZX18×26P	18.3	26	15	6	2	2	18	30	18
ZX19×29P	19.4	29	17	4	2	3	15	30	18

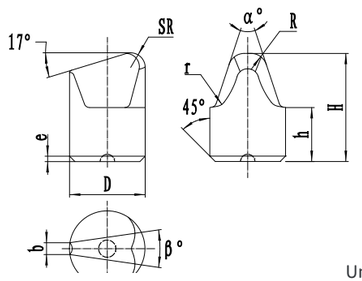
Wedge buttons



Unit:mm

ZB type

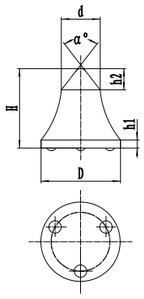
Type	Dimension							
	D	H	h	R	r	e	α°	b
ZB14×17AP	14.25	17	12	3	2.5	1.5	90	3
ZB14×18AP	14.25	18	12	3	2.5	1.5	80	4
ZB14×19AP	14.25	19	12	3	2.5	1.5	75	4
ZB15×19.8AP	15.3	19.8	11.8	2	2.5	1.5	66	3.5
ZB16×21AP	16.3	21	14	3	3	1.5	70	4.5
ZB19×24AP	19.4	24	15	3.5	3	1.5	70	4.5
ZB22×30AP	22.4	30	17	3.5	3	1.5	60	5



Unit:mm

ZB type

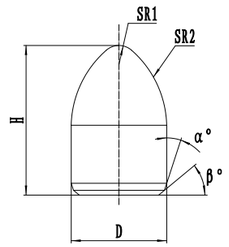
Type	Dimension									
	D	H	h	R	SR	r	e	α°	β°	b
ZB09×14P	9	14	9.5	3.8	5.5	2	1.5	65	20	2
ZB09×14P	9	14	9.0	3.8	5.5	2	1.5	55	30	2
ZB12×17P	12	17	11	4.5	7.5	2	1.5	65	20	3
ZB14×20P	14	20	12.5	5	8.5	2	2.0	65	20	3.5
ZB14×20P	14	20	12	5	8.5	2	2.0	55	30	3.5



Unit:mm

Parabolic buttons

Type	Dimension					
	D	d	H	h1	h2	α°
3T10416T	16.07	8	15.08	3	1.8	92
3T10427T	18.75	8	17.78	3.75	1.5	83
3T10434T	17.86	8	17.13	3.84	1.6	82

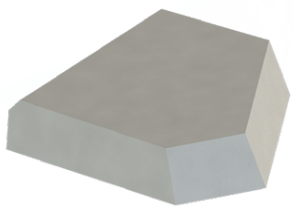


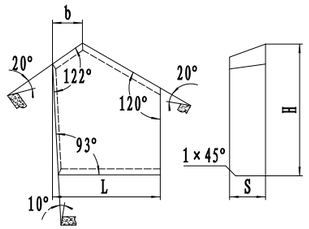
Unit:mm

Parabolic buttons

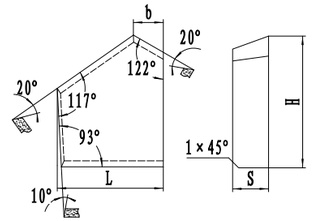
Type	Dimension					
	D	H	SR1	SR2	α°	β°
ZD09×14.5	9.2	14.5	2	12	20	27
ZD10×15	10.2	15	2	13	20	27
ZD12×18	12.35	18	3	16	20	27
ZD12×22	12.35	22	3	16	20	27
ZD12×23A	12.35	22.6	4.6	13.3	25	25
ZD12×23B	12.35	23	3	12	25	25
ZD13×19	13.35	19	3	18	20	27
ZD14×22	14.35	22	3.5	20	20	27
ZD14×27A	14.35	26.7	5.3	15.4	25	25
ZD16×24.3KP	16.35	24.3	5	36	20	-
ZD16×26.3KP	16.35	26.3	5	36	20	-
ZD19×29KP	19.3	29	5	95	20	-

Cemented carbide for coal-mining tools





左

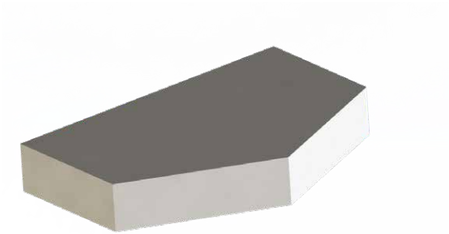


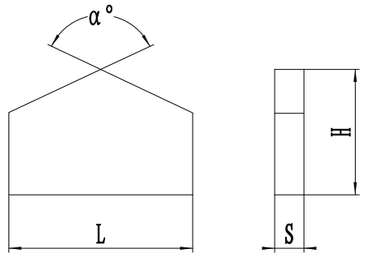
右

Unit:mm

M10 type

Type	Dimension							
	L		H		S		b	
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
M1011R	11	±0.3	12	±0.3	2.5	±0.2	4	±0.3
M1011L	11	±0.3	12	±0.3	2.5	±0.2	4	±0.3
M1014R	14	±0.3	19	±0.4	3.8	±0.2	4	±0.3
M1014L	14	±0.3	19	±0.4	3.8	±0.2	4	±0.3
M1015R	15	±0.4	22	±0.4	3	±0.3	5	±0.3
M1015L	15	±0.4	22	±0.4	3	±0.3	5	±0.3
M1018R	18	±0.4	22	±0.4	6	±0.3	5	±0.3
M1018L	18	±0.4	22	±0.4	6	±0.3	5	±0.3

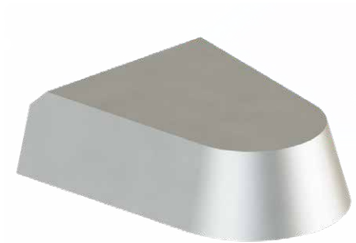


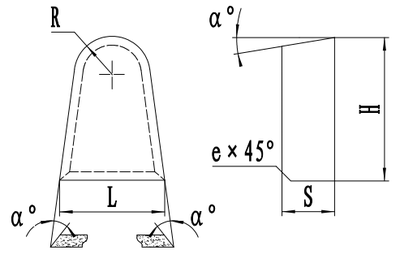


Unit:mm

M13 type

Type	Dimension						
	L		H		S		α°
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.	
M1306	6	±0.2	5	±0.2	1.4	±0.2	130
M1311	11	±0.4	9	±0.3	2	±0.2	130
M1313	13	±0.4	10	±0.4	2.5	±0.3	130
M1315	15	±0.4	10	±0.4	2.5	±0.3	130
M1317	17	±0.4	13	±0.4	3	±0.3	130
M1319	19	±0.4	13	±0.4	3	±0.3	130
M1322	22	±0.5	15	±0.4	3.5	±0.3	130
M1326	26	±0.5	18	±0.4	4.5	±0.3	130
M1333	33	±0.5	22	±0.4	3	±0.3	130
M1345	45	±0.6	27	±0.4	9	±0.3	130

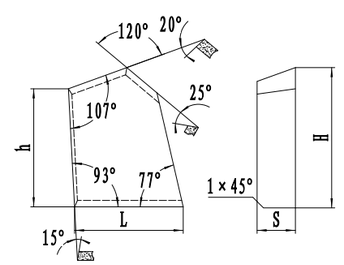




Unit:mm

M12 type

Type	Dimension								
	L		H		S		R	α°	e
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.			
M1216	16	±0.4	22	±0.4	7	±0.3	6	15	1.0
M1220	20	±0.4	27	±0.4	8	±0.3	7	15	1.0
M1222	22	±0.4	22	±0.4	7.5	±0.3	9	10	1.5
M1230	30	±0.4	35	±0.4	12	±0.3	8	8	1.0

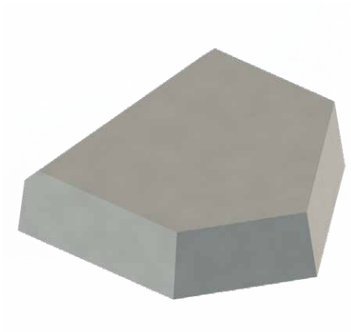


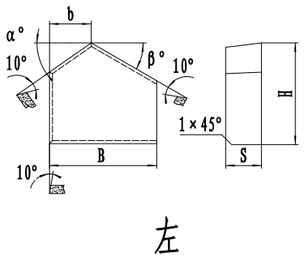
Unit:mm

M11type

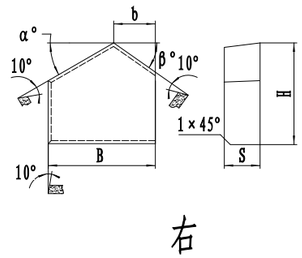
Type	Dimension							
	L		H		h		S	
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
M1112	12	±0.3	18	±0.4	15.8	±0.4	3	±0.3
M1113	13.4	±0.3	26	±0.4	23.8	±0.4	3	±0.3

Cemented carbide for coal-mining tools





左

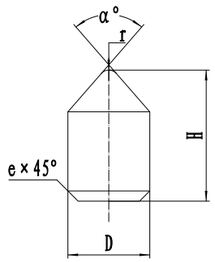


右

Unit:mm

M14 type

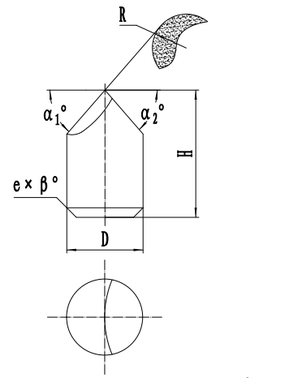
Type	Dimension								
	b		H		S		b	α°	β°
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.			
M1427R	27.5	±0.4	22	±0.4	4.5	±0.3	10	35	30
M1427L	27.5	±0.4	22	±0.4	4.5	±0.3	10	35	30
M1445R	45	±0.5	21	±0.4	9	±0.3	15	31	17
M1445L	45	±0.5	21	±0.4	9	±0.3	15	31	17



Unit:mm

M20 type

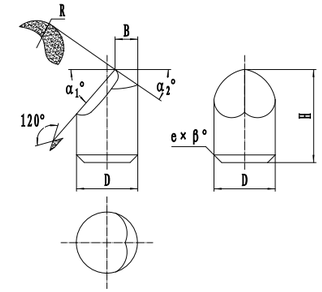
Type	Dimension						
	D		H		r	α°	e
	Dim.	Tol.	Dim.	Tol.			
M2009	9	±0.2	16	±0.4	1	90	1
M2012A	12	±0.2	18	±0.4	1.5	82	1
M2012B	12	±0.2	20	±0.4	1.5	82	1.5
M2018	18	±0.3	32	±0.4	1.5	82	2



Unit:mm

M21 type

Type	Dimension									
	D		H		R		α1°	α2°	e	β°
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.				
M2110A	10	±0.2	18	±0.4	8	±0.3	53	53	1	30
M2110B	10	±0.2	20	±0.4	5.5	±0.3	50	58	1	45
M2112A	12	±0.3	20	±0.4	6.5	±0.3	32	40	1	45
M2112B	12.5	±0.4	25	±0.4	10	±0.35	46	46	1	30
M2115	15	±0.4	25	±0.4	11	±0.35	45	45	2.5	30
M2118	18	±0.4	20	±0.4	14.4	±0.4	37	37	1.5	45

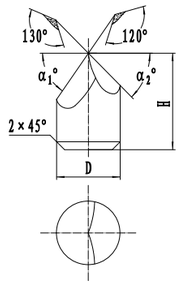


Unit:mm

M22 type

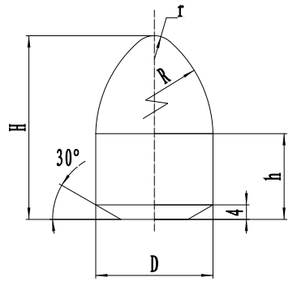
Type	Dimension										
	D		H		R		α1°	α2°	B	e	β°
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.					
M2210A	10	±0.2	18	±0.4	8	±0.3	33	48	-	1	45
M2210B	10	±0.2	20	±0.4	8	±0.3	33	48	-	1	45
M2212A	12	±0.3	22	±0.4	9	±0.3	50	50	4	1	30
M2212B	12.5	±0.4	25	±0.4	9	±0.35	55	45	4	1	30
M2214	14	±0.4	22	±0.4	10	±0.35	49	55	-	2	45
M2216	16	±0.4	28	±0.4	8	±0.3	50	50	5	2	30
M2218	18	±0.4	21.5	±0.4	11	±0.35	52	52	-	2	30

Cemented carbide for coal-mining tools



Unit:mm

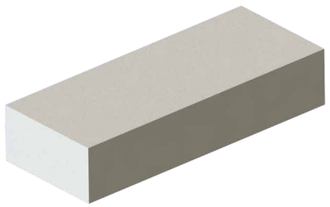
M23 type						
Type	Dimension					
	D		H		α1°	α2°
	Dim.	Tol.	Dim.	Tol.		
M2312A	12	±0.2	22	±0.4	56	48
M2312B	12.5	±0.2	25	±0.4	56	48
M2314A	14	±0.2	22	±0.4	56	48
M2314B	14	±0.3	25	±0.4	56	48

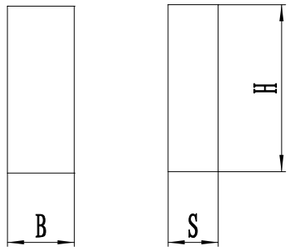


Unit:mm

M24 type							
Type	Dimension						
	D		H		h	R	r
	Dim.	Tol.	Dim.	Tol.			
M2417A	17	±0.4	26.5	±0.4	12	26	1.75
M2417B	17	±0.4	26.5	±0.4	15	26	1.75

Cemented carbide for geological exploration drilling tools

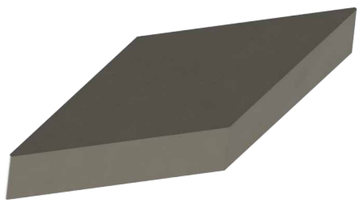


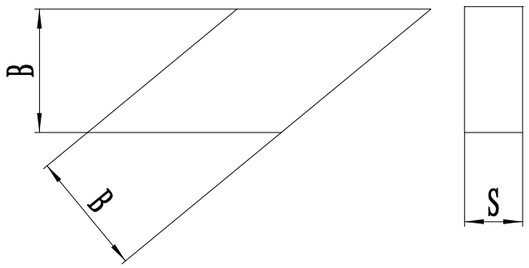


Unit:mm

T1 type

Type	Dimension					
	H		B		S	α2°
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
T1003	15	±0.4	3	±0.30	1.5	±0.2
T1006	20	±0.5	6	±0.35	4	±0.3
T1008	20	±0.5	8	±0.35	6	±0.3

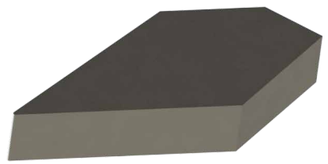


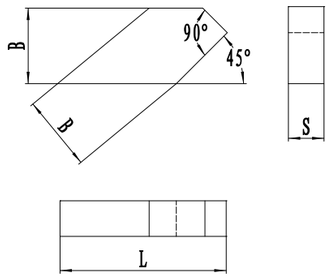


Unit:mm

T11 type

Type	Dimension			
	B		S	
	Dim.	Tol.	Dim.	Tol.
T1108	8.5	±0.35	3	±0.3
T1112	12	±0.5	4	±0.35

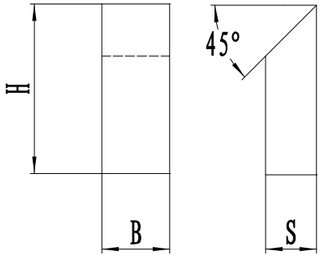




Unit:mm

T12 type

Type	Dimension					
	B		L		S	
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
T1208	8.5	±0.35	17.5	±0.5	3	±0.2
T1212	12	±0.5	24	±0.6	4	±0.3

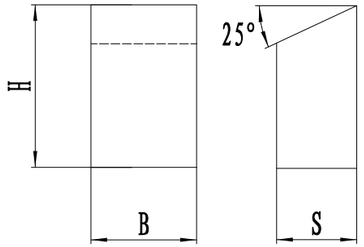


Unit:mm

T2 type

Type	Dimension					
	B		H		S	
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
T2004	4	±0.30	15	±0.5	3.6	±0.30
T2005	5	±0.30	20	±0.6	4	±0.30
T2006	6	±0.35	20	±0.6	6	±0.35
T2008	8	±0.35	20	±0.6	6	±0.35
T2010	10	±0.35	20	±0.6	8	±0.35

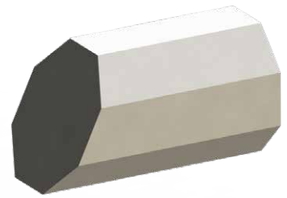
Cemented carbide for geological exploration drilling tools

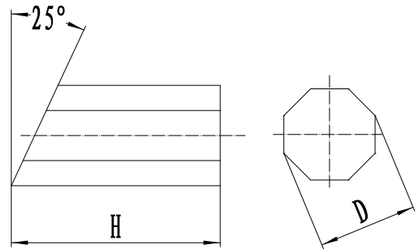


Unit:mm

T21 type

Type	Dimension					
	B		H		S	
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
T2105	5	±0.3	7	±0.35	3	±0.3
T2105A	5	±0.3	8	±0.35	5	±0.3
T2105B	5	±0.3	10	±0.35	5	±0.3
T2105C	5	±0.3	13	±0.5	5	±0.3
T2107	7.5	±0.35	10	±0.35	3	±0.3
T2107A	7	±0.35	20	±0.6	7	±0.35
T2108	8.5	±0.35	8	±0.35	3	±0.3
T2110	10	±0.35	14	±0.5	4	±0.3
T2114	14	±0.5	25	±0.6	12	±0.5

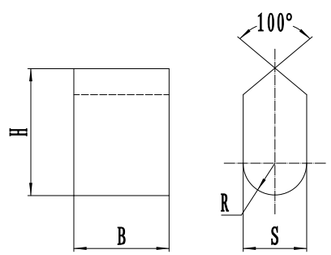




Unit:mm

T30 type

Type	Dimension			
	D		H	
	Dim.	Tol.	Dim.	Tol.
T3005	5	±0.3	10	±0.35
T3007	7	±0.35	10	±0.35
T3007A	7	±0.35	15	±0.6
T3007B	7	±0.35	20	±0.5
T3010	10	±0.35	15	±0.5
T3010B	10	±0.35	16	±0.5
T3010A	10	±0.35	20	±0.6

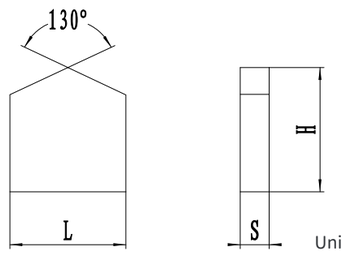


Unit:mm

T40 type

Type	Dimension						
	B		H		S		R
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.	
T4010	10	±0.35	16	±0.5	8	±0.35	4
T4012	12	±0.5	16	±0.5	8	±0.35	4
T4014	14	±0.5	16	±0.5	8	±0.35	4
T4015	15	±0.5	20	±0.5	10	±0.35	5

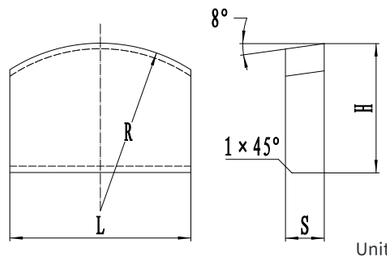
Cemented carbide for construction engineering tools



Unit:mm

J10 type

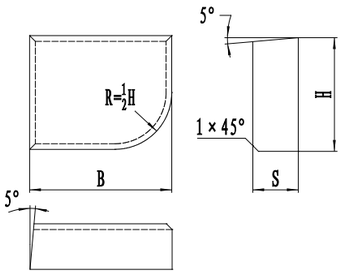
Type	Dimension					
	B		H		S	
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
J1006	6.5	±0.3	6	±0.3	1.9	±0.2
J1008	8.5	±0.3	7.5	±0.3	2.4	±0.2
J1010	10.5	±0.3	9	±0.35	2.5	±0.3
J1012	12.5	±0.3	10	±0.35	2.5	±0.3
J1014	14.5	±0.35	10	±0.35	2.5	±0.3
J1016	16.5	±0.35	13	±0.35	3	±0.3
J1018	18.5	±0.5	12	±0.35	3.5	±0.3
J1020	20.5	±0.5	14	±0.35	3.5	±0.3
J1022	22.5	±0.5	15	±0.35	4	±0.3
J1024	24.5	±0.5	18	±0.5	4.5	±0.3
J1026	26.5	±0.5	17	±0.5	4	±0.3
J1028	28.5	±0.5	22	±0.5	4.5	±0.3
J1030	30.5	±0.5	18.5	±0.5	4.8	±0.3



Unit:mm

J11 type

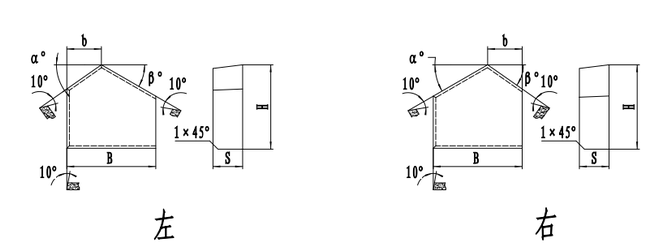
Type	Dimension						
	L		H		S		R
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.	
J1118	18	±0.35	20	±0.5	6	±0.3	12
J1122	22	±0.5	20	±0.5	6	±0.3	17
J1128	28	±0.5	20	±0.5	6	±0.3	22
J1133	33	±0.5	25	±0.5	6	±0.3	26



Unit:mm

J21 type

Type	Dimension					
	B		H		S	
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.
J2114	14	±0.3	16	±0.3	6	±0.3
J2118	18	±0.3	16	±0.3	6	±0.3
J2120	20	±0.35	12	±0.3	7	±0.3
J2115	25	±0.35	16	±0.3	8	±0.3



Unit:mm

J20 type

Type	Dimension								
	B		H		S		b	α°	β°
	Dim.	Tol.	Dim.	Tol.	Dim.	Tol.			
J2034R	34	±0.35	22	±0.4	8	±0.3	14	22	20
J2034L	34	±0.35	22	±0.4	8	±0.3	14	22	20
J2040R	40	±0.5	21	±0.4	9	±0.3	15	20	20
J2040L	40	±0.5	21	±0.4	9	±0.3	15	20	20
J2043R	43	±0.5	22	±0.4	8	±0.3	18	20	20
J2043L	43	±0.5	22	±0.4	8	±0.3	18	20	20
J2044R	44	±0.5	25	±0.4	8	±0.3	18	20	20
J2044L	44	±0.5	25	±0.4	8	±0.3	18	20	20
J2045R	45	±0.5	27	±0.4	9	±0.3	15	20	20
J2045L	45	±0.5	27	±0.4	9	±0.3	15	20	20
J2046R	46	±0.5	30	±0.4	8	±0.3	18	20	20
J2046L	46	±0.5	30	±0.4	8	±0.3	18	20	20

INTEGRITY
COOPERATION
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