

#4 CARBIDE - COLD HEADING DIES MATERIAL

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COLD HEADING DIES MATERIAL



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## 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.

## 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



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)".

# 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 materials 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

# 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.

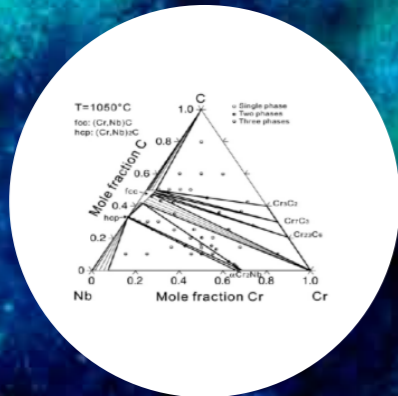
In 2017,  
C919 took her maiden flight.

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

2019

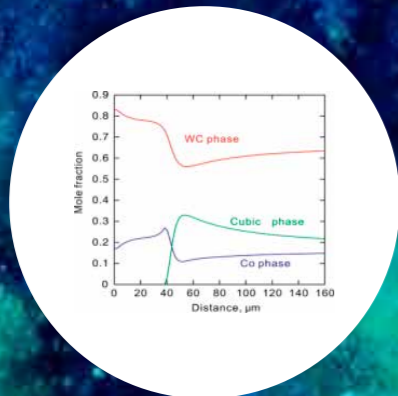
# INSTITUTE OF POWDER METALLURGY

Basic research on Application of special PM materials



Thermodynamics database

$$V_{Co} = \frac{u_{Co}^S \cdot V_{Co}^m}{(1 - u_{Co}^S) \cdot V_{WC}^m + u_{Co}^S \cdot V_{Co}^m}$$

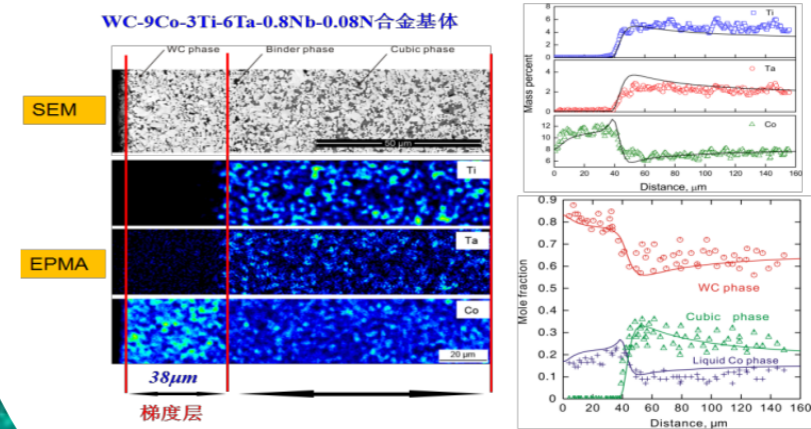


Dynamics database

The Institute of powder metallurgy has built the most complete database of thermodynamics and dynamics of multi-component cemented carbide in the world, which can accurately predict the distribution of phases and elements in the gradient layer of cemented carbide. Based 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

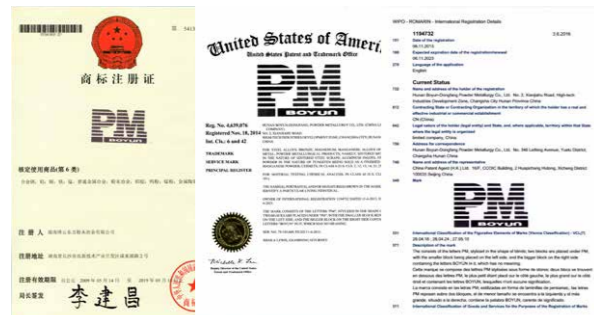
Comparison of predictions and experimental results



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

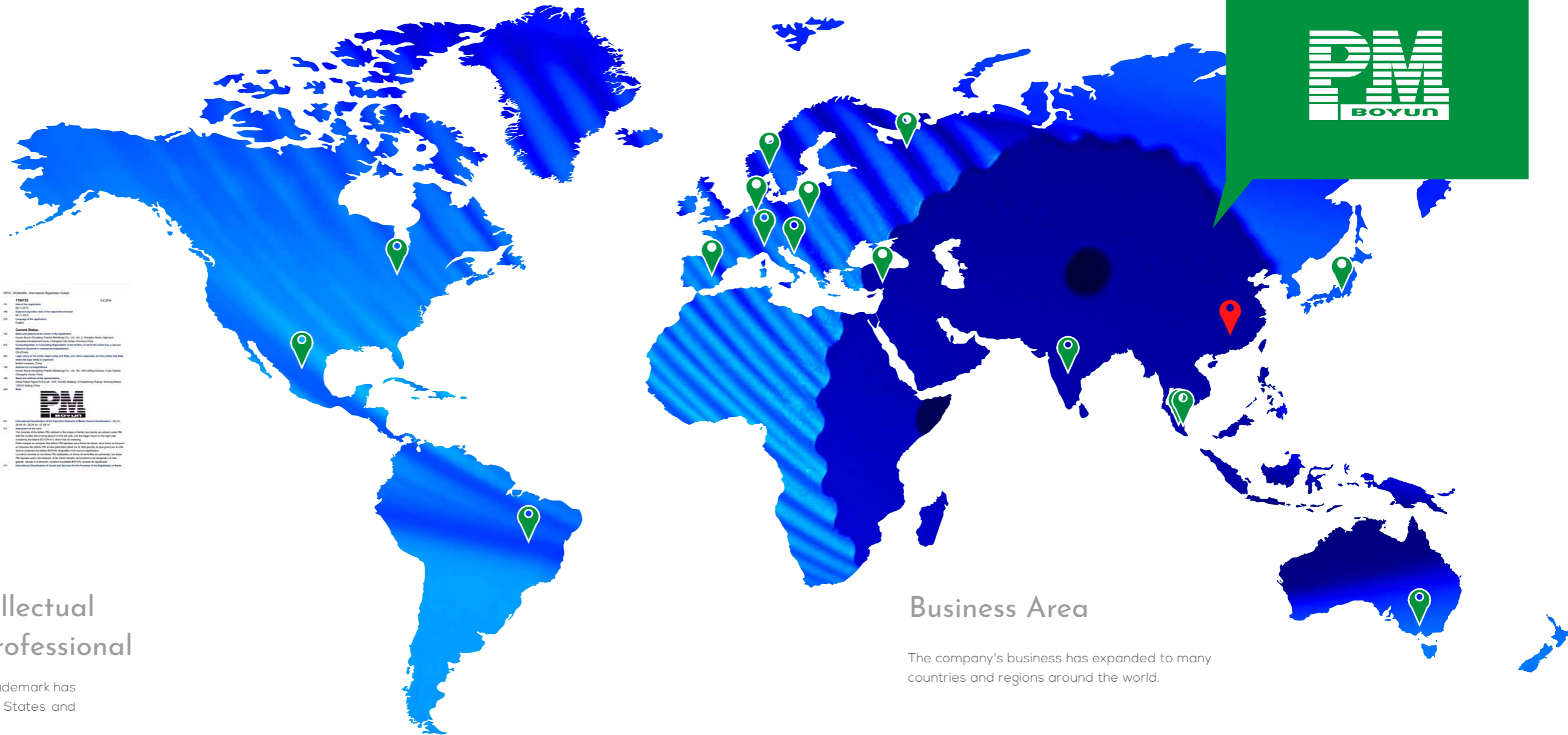


# COMPANY BRAND AND MARKET



## Protection of Intellectual Property Rights Professional

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.

# CEMENTED CARBIDE

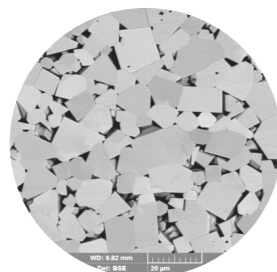
Cemented carbide is a kind of composite material which is made of refractory metal hard compounds (WC, TiC, etc.) and bonding metals (CO, Ni, Fe, etc.) by powder metallurgy. Cemented carbide have high hardness, high wear resistance, high strength, high modulus of elasticity, low coefficient of thermal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

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

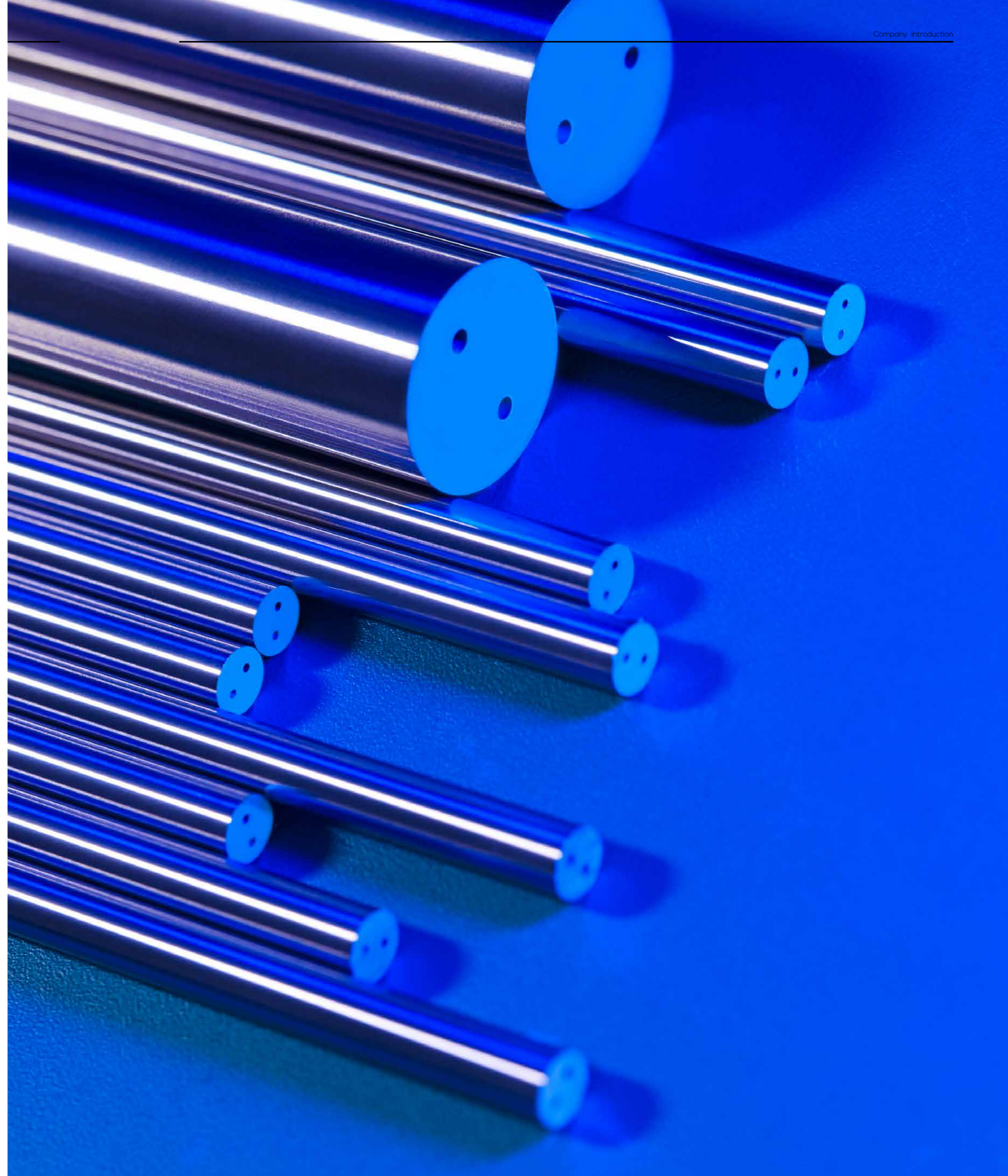
Category	Grain size of WC( $\mu\text{m}$ )
Nano	<0.2
Ultrafine	0.2~0.5
Submicron	0.5~0.8
Fine	0.8~1.3
Medium	1.3~2.5
Coarse	2.5~6.0
Extra coarse	>6.0

Nano cemented carbide which means the WC grain size is less than 0.2  $\mu\text{m}$  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 6 $\mu\text{m}$ , 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)



# 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.



# 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

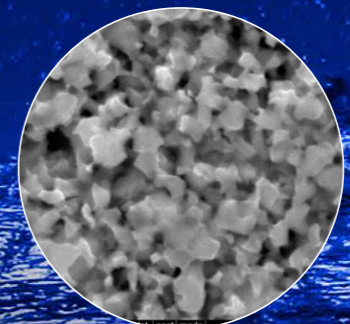
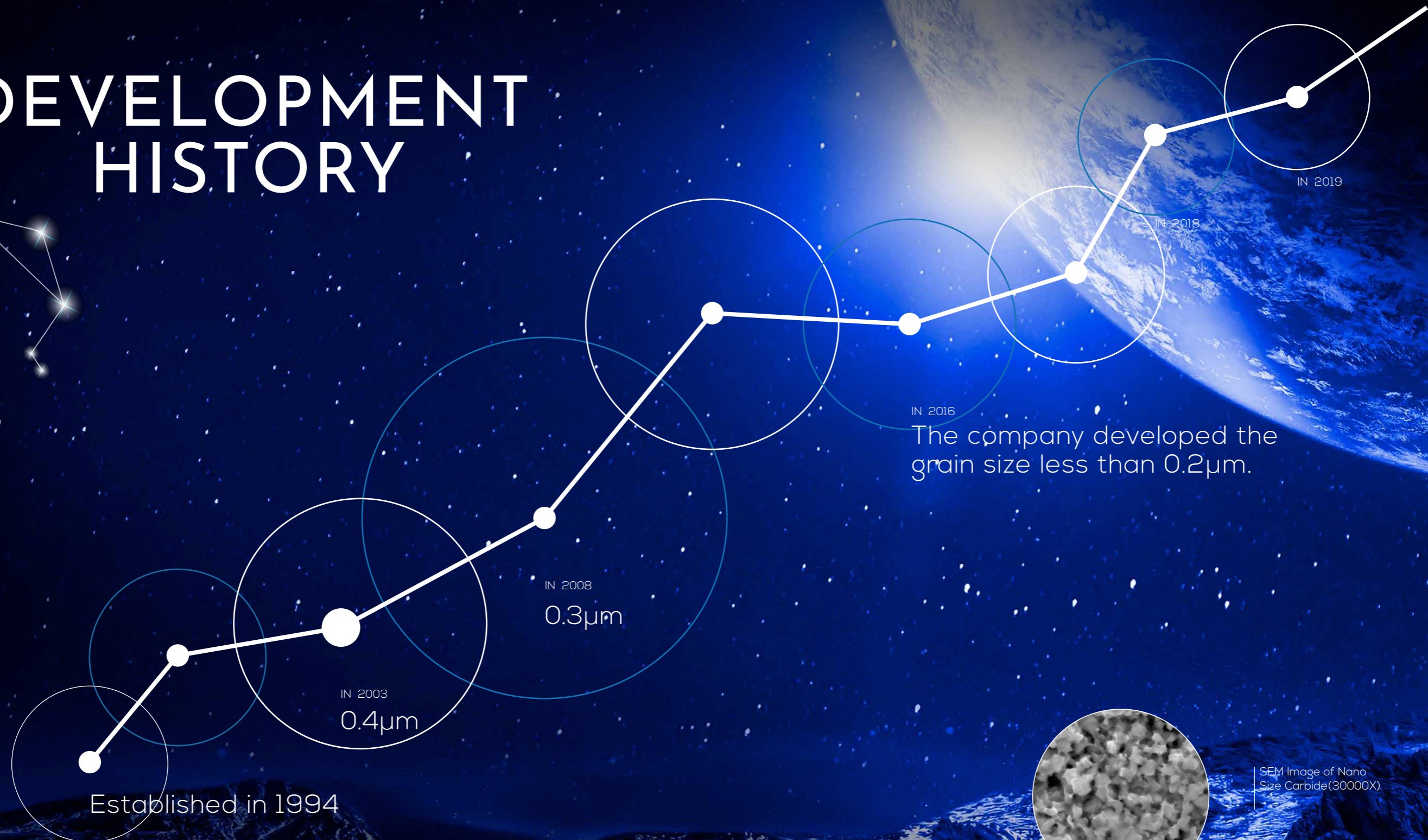
National Innovation Fund for small and medium-sized science and technology enterprises and the national high-tech research and development plan (863 Program).

## Extra Coarse-Grained Cemented Carbide

The company developed the extra coarse-grained cemented carbide with WC grain size greater than  $9\mu\text{m}$  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.

# DEVELOPMENT HISTORY



SEM Image of Nano Size Carbide(30000X)



Ultrafine / Nano Cemented Carbide development history





# TECHNICAL ADVANTAGES

Coating

## Coating technology reaches the international leading level

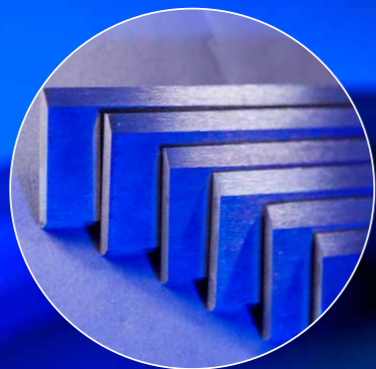


We are the strategic partner of eifeler and wolf in China  
 We are eifeler's demonstration plant in China  
 Our coating products have the same performance level as Germany



# 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.



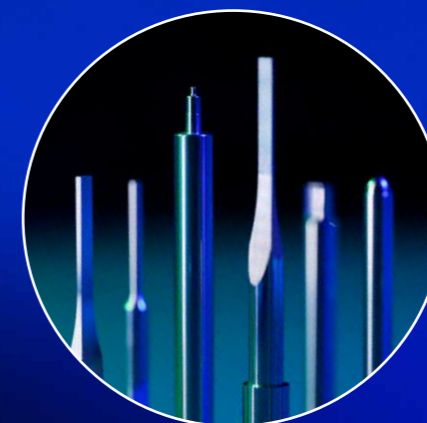
Special Tools



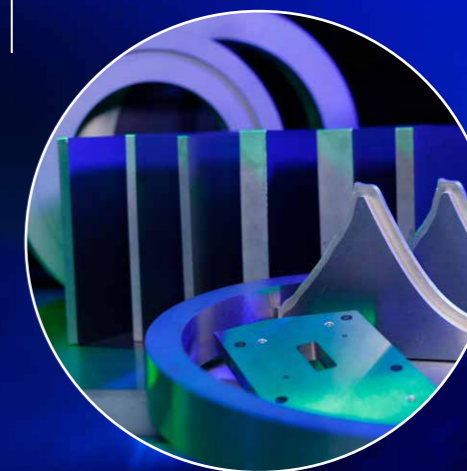
Shield Cutter



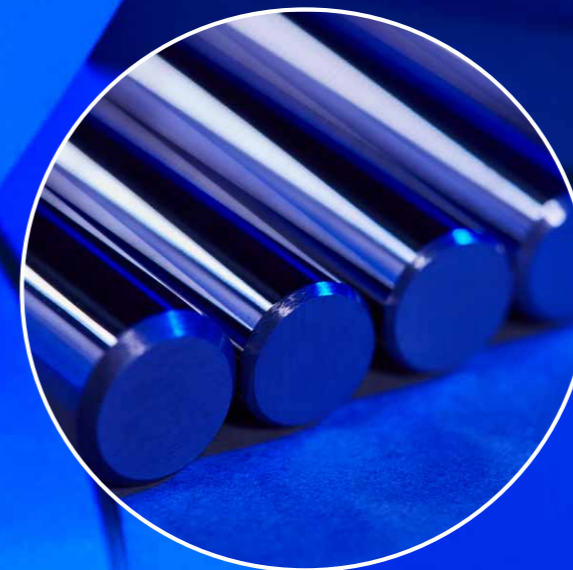
Coating



Finished Products



Molds



Rods

# OUR PRODUCT

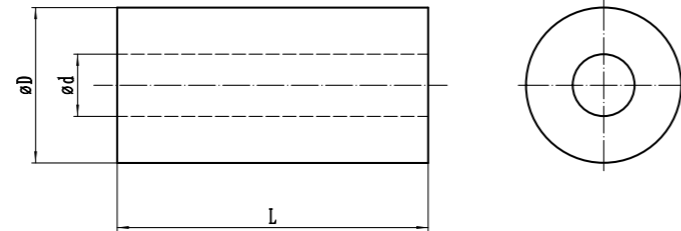
C A R B I D E

CARBIDES FOR HEADING DIES

Grade	Co	Grain Size of WC	Hardness		Density	Flexural Strength	Bending Toughness	Elastic Modulus	Coefficient of Thermal Expansion	Application
	Co%		HRA	HV <sub>30</sub>	g/cm <sup>3</sup>	MPa	J/cm <sup>2</sup>	GPa	10 <sup>-6</sup> /°C	
MD51B	19	Medium	85.0	950	13.5	3100	7.2	400	6.7	Suitable for mould of shrinkage rod with large reduction in diameter
MD50A	20	Medium	85.8	1020	13.4	3300	9.2	390	6.8	Suitable for mould of shrinkage rod with small reduction in diameter
MD60A	20	Coarse	84.0	880	13.6	2900	7.6	390	6.8	Suitable for mould to make straight rod, screws, nut etc
MD61B	22	Medium	84.0	880	13.3	3000	9.6	360	7.1	Suitable for heavy hardness stainless steel
MD62B	22	Medium	83.5	840	13.3	2800	7.6	360	7.1	Suitable for dry wall screw and common stainless steel
MD65A	25	Medium	84.1	890	12.9	3000	10.1	340	7.6	Suitable for heavy loads straight rod moulds
MD70A	25	Coarse	82.5	780	13.1	2800	8.0	340	7.6	Suitable for heavy loads nut moulds



## Deviation of the blank and geometrical tolerance standard



Unit:mm

D	L				
	≤15	>15~30	>30~50	>50~80	>80
Deviation					
≤Φ15	±0.20	±0.30	±0.40		
>Φ15~30	±0.30	±0.40	±0.50	±0.60	
>Φ30~50	±0.50	±0.60	±0.70	±0.75	±0.80
>Φ50~80		±0.70	±0.88	±0.90	±1.0

d	L				
	≤18	>18~30	>30~50	>50~80	>80
Deviation					
≤Φ5	-0.40~0	-0.40~0	-0.40~0	-0.50~0	
>Φ5~10	-0.50~0	-0.60~0	-0.70~0	-0.75~0	
>Φ10~20	-0.70~0	-0.75~0	-0.80~0	-0.90~0	-1.00~0
>Φ20~35		-0.90~0	-1.00~0	-1.10~0	-1.20~0

L	D			
	≤Φ15	>Φ15~Φ30	>Φ30~Φ50	>Φ50~Φ80
Deviation				
≤15	+ 0.8	+ 1.0	+ 1.2	
≤15	+ 0.3	+ 0.3	+ 0.3	
>15~30	+ 1.0	+ 1.2	+ 1.5	+ 1.6
>15~30	+ 0.3	+ 0.3	+ 0.3	+ 0.4
>30~50	+ 1.5	+ 1.5	+ 1.8	+ 2.0
>30~50	+ 0.5	+ 0.5	+ 0.5	+ 0.5
>50~80	+ 2.0	+ 2.0	+ 2.2	+ 2.5
>50~80	+ 0.5	+ 0.5	+ 0.5	+ 0.6
>80			+ 3.0	+ 3.0
>80			+ 0.6	+ 0.6

# OUR PRODUCT

C A R B I D E

SPECIFICATIONS

## Specifications (D\*d\*L)

Unit:mm

### Specifications

φ10*20	φ22*15
φ10*φ1*15	φ22*φ2*25
φ10*φ1*20	φ22*φ2*30
φ10*φ1*25	φ22*φ2*35
φ10*φ1*30	φ22*φ2*40
φ10*φ1.2*20	φ22*φ3*10
φ10*φ1.2*25	φ22*φ3*20
φ10*φ1.5*10	φ22*φ3*25
φ10*φ1.5*15	φ22*φ3*30
φ10*φ1.5*20	φ22*φ3*35
φ10*φ1.8*20	φ22*φ3*40
φ10*φ1.8*25	φ22*φ3*45
φ10*φ2*15	φ22*φ3*50
φ10*φ2*20	φ22*φ3.8*20
φ10*φ2.1*25	φ22*φ3.8*25
φ10*φ2.1*30	φ22*φ3.8*30
φ10*φ2.4*20	φ22*φ3.8*35
φ10*φ2.5*15	φ22*φ3.8*40
φ10*φ2.8*20	φ22*φ3.8*45
φ10*φ2.8*25	φ22*φ3.8*50
φ12*φ1*15	φ22*φ4.6*20
φ12*φ1*20	φ22*φ4.6*25
φ12*φ1*25	φ22*φ4.6*30
φ12*φ1*30	φ22*φ4.6*35
φ12*φ1*40	φ22*φ4.6*40
φ12*φ1.5*15	φ22*φ4.6*45
φ12*φ1.5*20	φ22*φ4.6*50
φ12*φ1.5*25	φ22*φ4.6*55
φ12*φ1.5*30	φ22*φ4.6*60
φ12*φ1.8*15	φ22*φ6.4*20
φ12*φ1.8*20	φ22*φ6.4*25
φ12*φ1.8*25	φ22*φ6.4*30
φ12*φ2*20	φ22*φ6.4*35
φ12*φ2*30	φ22*φ6.4*40
φ12*φ2.1*20	φ22*φ6.4*45
φ12*φ2.1*25	φ22*φ6.4*50
φ12*φ2.1*30	φ22*φ6.4*55
φ12*φ2.5*20	φ22*φ6.4*60
φ12*φ2.6*25	φ25*15
φ13*φ1*15	φ25*20
φ13*φ1*20	φ25*25
φ13*φ1*25	φ25*30
φ13*φ1.2*25	φ25*φ3*25
φ13*φ1.2*30	φ25*φ3*30
φ13*φ1.5*20	φ25*φ3*35
φ13*φ1.5*25	φ25*φ3*40

Unit:mm

### Specifications

φ13*φ1.5*30	φ25*φ4*20
φ13*φ1.5*35	φ25*φ4*25
φ13*φ1.5*40	φ25*φ4*30
φ13*φ1.8*10	φ25*φ4*35
φ13*φ1.8*15	φ25*φ4*40
φ13*φ1.8*20	φ25*φ4*45
φ13*φ1.8*25	φ25*φ4*50
φ13*φ1.8*30	φ25*φ4*60
φ13*φ1.8*35	φ25*φ4.6*20
φ13*φ2*20	φ25*φ4.6*25
φ13*φ2*25	φ25*φ4.6*30
φ13*φ2*30	φ25*φ4.6*35
φ13*φ2*35	φ25*φ4.6*40
φ13*φ2.1*20	φ25*φ4.6*45
φ13*φ2.1*25	φ25*φ4.6*50
φ13*φ2.1*30	φ25*φ4.6*55
φ13*φ2.1*35	φ25*φ4.6*60
φ13*φ2.6*15	φ25*φ5*25
φ13*φ2.6*20	φ25*φ5*30
φ13*φ2.6*25	φ25*φ5*40
φ13*φ2.6*30	φ25*φ5*50
φ13*φ2.6*35	φ25*φ5*60
φ13*φ2.8*20	φ25*φ6*35
φ13*φ2.8*25	φ25*φ6.4*20
φ13*φ2.8*30	φ25*φ6.4*25
φ13*φ2.8*35	φ25*φ6.4*30
φ13*φ3*20	φ25*φ6.4*35
φ13*φ3*25	φ25*φ6.4*40
φ13*φ3*30	φ25*φ6.4*45
φ15*25	φ25*φ6.4*50
φ15*30	φ25*φ6.4*55
φ15*35	φ25*φ6.4*60
φ15*40	φ25*φ8.2*20
φ15*φ1*15	φ25*φ8.2*25
φ15*φ1*20	φ25*φ8.2*30
φ15*φ1*25	φ25*φ8.2*35
φ15*φ1*30	φ25*φ8.2*40
φ15*φ1.5*15	φ25*φ8.2*45
φ15*φ1.5*20	φ25*φ8.2*50
φ15*φ1.5*25	φ25*φ8.2*55
φ15*φ1.5*30	φ25*φ8.2*60
φ15*φ1.5*35	φ30*15
φ15*φ1.5*40	φ30*20
φ15*φ1.5*45	φ30*25
φ15*φ1.8*10	φ30*φ10*20
φ15*φ1.8*25	φ30*φ10*25

## Specifications (D\*d\*L)

Unit:mm

Specifications	
φ15*φ1.8*30	φ30*φ10*30
φ15*φ1.8*40	φ30*φ10*35
φ15*φ2*15	φ30*φ10*40
φ15*φ2*20	φ30*φ10*45
φ15*φ2*25	φ30*φ10*50
φ15*φ2*30	φ30*φ10*55
φ15*φ2*35	φ30*φ10*60
φ15*φ2*40	φ30*φ4*20
φ15*φ2*45	φ30*φ4*30
φ15*φ2.6*20	φ30*φ4*35
φ15*φ2.6*25	φ30*φ4*40
φ15*φ2.6*25	φ30*φ4*45
φ15*φ2.6*30	φ30*φ4*50
φ15*φ2.6*40	φ30*φ4*55
φ15*φ2.8*20	φ30*φ4*60
φ15*φ2.8*25	φ30*φ5*25
φ15*φ2.8*30	φ30*φ5*30
φ15*φ2.8*35	φ30*φ5*35
φ16*20	φ30*φ5*40
φ16*φ1*25	φ30*φ5*45
φ16*φ1*30	φ30*φ5*50
φ16*φ1*35	φ30*φ5*60
φ16*φ1.2*20	φ30*φ6.4*25
φ16*φ1.5*20	φ30*φ6.4*30
φ16*φ1.5*25	φ30*φ6.4*35
φ16*φ1.5*30	φ30*φ6.4*40
φ16*φ1.5*35	φ30*φ6.4*45
φ16*φ1.5*40	φ30*φ6.4*50
φ16*φ1.8*20	φ30*φ6.4*55
φ16*φ1.8*25	φ30*φ6.4*60
φ16*φ1.8*30	φ30*φ8.2*20
φ16*φ1.8*35	φ30*φ8.2*25
φ16*φ1.8*40	φ30*φ8.2*30
φ16*φ1.8*45	φ30*φ8.2*35
φ16*φ2*20	φ30*φ8.2*40
φ16*φ2*25	φ30*φ8.2*45
φ16*φ2*30	φ30*φ8.2*50
φ16*φ2*35	φ30*φ8.2*55
φ16*φ2*40	φ30*φ8.2*60
φ16*φ2.1*20	φ35*17
φ16*φ2.1*25	φ35*20
φ16*φ2.1*30	φ35*25
φ16*φ2.1*35	φ35*φ10*20
φ16*φ2.1*40	φ35*φ10*25
φ16*φ2.1*45	φ35*φ10*30
φ16*φ2.3*20	φ35*φ10*35

Unit:mm

Specifications	
φ16*φ2.3*25	φ35*φ10*40
φ16*φ2.3*30	φ35*φ10*45
φ16*φ2.3*35	φ35*φ10*50
φ16*φ2.3*40	φ35*φ10*55
φ16*φ2.6*20	φ35*φ10*60
φ16*φ2.6*25	φ35*φ11.8*20
φ16*φ2.6*30	φ35*φ11.8*25
φ16*φ2.6*35	φ35*φ11.8*30
φ16*φ2.6*40	φ35*φ11.8*33
φ16*φ2.8*20	φ35*φ11.8*35
φ16*φ2.8*25	φ35*φ11.8*37
φ16*φ2.8*30	φ35*φ11.8*38
φ16*φ2.8*35	φ35*φ11.8*40
φ16*φ2.8*40	φ35*φ11.8*45
φ16*φ2.8*45	φ35*φ11.8*50
φ16*φ2.8*50	φ35*φ11.8*55
φ16*φ3*20	φ35*φ11.8*60
φ16*φ3*25	φ35*φ13.8*25
φ16*φ3*30	φ35*φ13.8*30
φ16*φ3.2*20	φ35*φ13.8*33
φ16*φ3.2*25	φ35*φ13.8*35
φ16*φ3.2*30	φ35*φ13.8*36
φ16*φ3.8*15	φ35*φ13.8*37
φ16*φ3.8*20	φ35*φ13.8*40
φ16*φ3.8*25	φ35*φ13.8*45
φ16*φ3.8*30	φ35*φ13.8*50
φ16*φ3.8*35	φ35*φ13.8*55
φ16*φ3.8*40	φ35*φ13.8*60
φ16*φ4.6*15	φ35*φ14.2*30
φ16*φ4.6*20	φ35*φ14.2*35
φ16*φ4.6*25	φ35*φ14.2*40
φ16*φ4.6*30	φ35*φ14.2*45
φ16*φ4.6*35	φ35*φ14.2*50
φ16*φ4.6*40	φ35*φ14.2*55
φ18*15	φ35*φ14.2*60
φ18*20	φ35*φ8.2*25
φ18*φ1.5*15	φ35*φ8.2*30
φ18*φ1.5*20	φ35*φ8.2*35
φ18*φ1.5*30	φ35*φ8.2*36
φ18*φ2*15	φ35*φ8.2*40
φ18*φ2*20	φ35*φ8.2*45
φ18*φ2*25	φ35*φ8.2*50
φ18*φ2*30	φ35*φ8.2*55
φ18*φ2*35	φ35*φ8.2*60
φ18*φ2*40	φ40*20
φ18*φ2*45	φ40*25

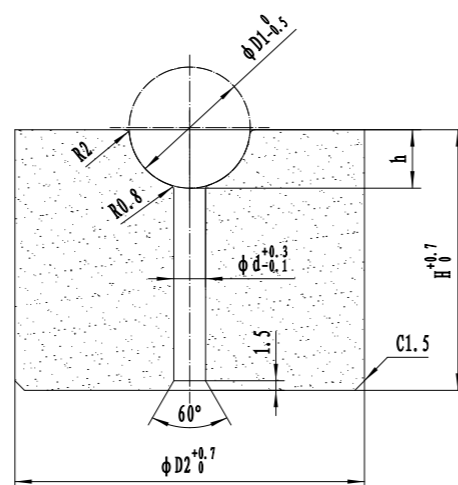
## Specifications

φ18*φ2*50	φ40*30
φ18*φ2.6*25	φ40*φ11.8*25
φ18*φ2.6*30	φ40*φ11.8*30
φ18*φ2.6*35	φ40*φ11.8*35
φ18*φ2.6*40	φ40*φ11.8*40
φ18*φ2.8*20	φ40*φ11.8*45
φ18*φ2.8*25	φ40*φ11.8*50
φ18*φ2.8*30	φ40*φ11.8*55
φ18*φ2.8*35	φ40*φ11.8*60
φ18*φ2.8*40	φ40*φ13.8*25
φ18*φ3*20	φ40*φ13.8*30
φ18*φ3*25	φ40*φ13.8*35
φ18*φ3*30	φ40*φ13.8*38
φ18*φ3*35	φ40*φ13.8*40
φ18*φ3*40	φ40*φ13.8*45
φ18*φ3*45	φ40*φ13.8*50
φ18*φ3*50	φ40*φ13.8*55
φ18*φ3.8*20	φ40*φ13.8*60
φ18*φ3.8*25	φ40*φ15.4*25
φ18*φ3.8*30	φ40*φ15.4*30
φ18*φ3.8*35	φ40*φ15.4*35
φ18*φ3.8*40	φ40*φ15.4*40
φ18*φ3.8*45	φ40*φ15.4*45
φ18*φ5*20	φ40*φ15.4*50
φ18*φ5*25	φ40*φ15.4*55
φ18*φ5*30	φ40*φ15.4*60
φ18*φ5*35	φ40*φ17.4*25
φ18*φ5*40	φ40*φ17.4*30
φ20*15	φ40*φ17.4*35
φ20*20	φ40*φ17.4*40
φ20*30	φ40*φ17.4*45
φ20*35	φ40*φ17.4*50
φ20*φ2*15	φ40*φ17.4*55
φ20*φ2*20	φ40*φ17.4*60
φ20*φ2*25	φ45*φ13.8*25
φ20*φ2*30	φ45*φ13.8*30
φ20*φ2*35	φ45*φ13.8*35
φ20*φ2*40	φ45*φ13.8*40
φ20*φ2*45	φ45*φ13.8*45
φ20*φ2*50	φ45*φ13.8*50
φ20*φ3*20	φ45*φ15.4*20
φ20*φ3*25	φ45*φ15.4*25
φ20*φ3*30	φ45*φ15.4*30
φ20*φ3*35	φ45*φ15.4*35
φ20*φ3*40	φ45*φ15.4*40
φ20*φ3*45	φ45*φ15.4*45
φ20*φ3*50	φ45*φ15.4*50
φ20*φ3.8*25	φ45*φ15.4*55
φ20*φ3.8*30	φ45*φ15.4*60
φ20*φ3.8*35	φ45*φ17.4*25
φ20*φ3.8*40	φ45*φ17.4*30

## Specifications

φ20*φ3.8*45	φ45*φ17.4*35
φ20*φ3.8*50	φ45*φ17.4*40
φ20*φ4.6*25	φ45*φ17.4*45
φ20*φ4.6*30	φ45*φ17.4*50
φ20*φ4.6*35	φ45*φ17.4*55
φ20*φ4.6*40	φ45*φ17.4*60
φ20*φ4.6*45	φ45*φ19.4*30
φ20*φ4.6*50	φ45*φ19.4*35
φ20*φ4.6*55	φ45*φ19.4*40
φ20*φ4.8*20	φ45*φ19.4*45
φ20*φ4.8*25	φ45*φ19.4*50
φ20*φ4.8*30	φ45*φ19.4*55
φ20*φ4.8*35	φ45*φ19.4*60
φ20*φ4.8*40	φ45*φ21.4*30
φ20*φ4.8*45	φ45*φ21.4*35
φ20*φ4.8*50	φ45*φ21.4*40
φ20*φ5*20	φ45*φ21.4*45
φ20*φ5*25	φ45*φ21.4*50
φ20*φ5*30	φ45*φ21.4*55
φ20*φ5*45	φ45*φ21.4*60
φ20*φ5*50	φ50*φ17.4*30
φ20*φ6.4*20	φ50*φ17.4*35
φ20*φ6.4*25	φ50*φ17.4*40
φ20*φ6.4*30	φ50*φ17.4*45
φ20*φ6.4*35	φ50*φ17.4*50
φ20*φ6.4*40	φ50*φ17.4*60
φ20*φ6.4*45	φ50*φ19.4*25
φ20*φ6.4*50	φ50*φ19.4*30
φ20*φ6.8*25	φ50*φ19.4*35
φ20*φ6.8*30	φ50*φ19.4*40
φ20*φ6.8*33	φ50*φ19.4*45
φ20*φ6.8*35	φ50*φ19.4*50
φ20*φ6.8*40	φ50*φ19.4*55
	φ50*φ19.4*60
	φ50*φ21.4*25
	φ50*φ21.4*30
	φ50*φ21.4*35
	φ50*φ21.4*40
	φ50*φ21.4*45
	φ50*φ21.4*50
	φ50*φ21.4*55
	φ50*φ21.4*60
	φ55*25
	φ55*35
	φ55*φ21.4*30
	φ55*φ21.4*35
	φ55*φ21.4*40
	φ55*φ21.4*45
	φ55*φ21.4*50
	φ55*φ21.4*55

## Specifications for steel dies



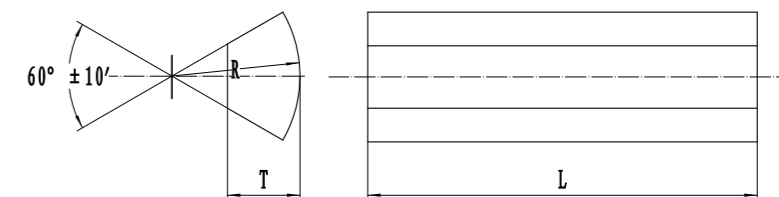
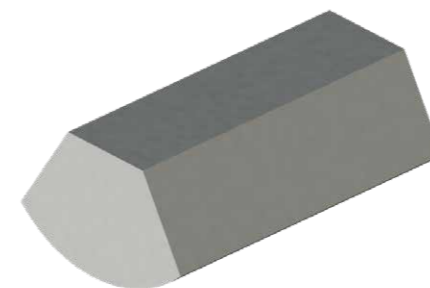
Unit:mm

Specifications for Steel Dies

Size	D1	D2	H	h	d
CG0592019	5.953	20	19	2.80	1.50
CG0632819	6.350	28	19	3.00	1.80
CG0712819	7.144	28	19	3.34	1.80
CG0672819	6.750	28	19	3.18	1.80
CG0872823	8.731	28	23	4.17	2.50
CG1355541	13.494	55	41	6.37	4.50
CG1755541	17.463	55	41	8.00	5.00
CG1435541	14.287	55	41	6.77	4.50
CG1505541	15.081	55	41	7.17	5.00
CG0792819	7.398	28	19	3.74	2.50
CG0952823	9.525	28	23	4.57	3.00
CG1194533	11.906	45	33	5.76	3.50
CG1034533	10.319	45	33	4.96	3.20
CG1114533	11.113	45	33	5.36	3.50
CG1154533	11.509	45	33	5.56	3.50
CG1274533	12.700	45	33	5.98	3.50
CG1595541	15.875	55	41	7.53	5.00
CG1915541	19.050	55	41	9.19	5.00

Note: Other types may be offered by customers' requirement

## Hexagonal dies



Unit:mm

Hexagonal Dies

Type	Size			Type	Size		
	R	T	L		R	T	L
BP1100621	11	6	21	BP2501432	25	14	32
BP1100721	11	7	21	BP2601223	26	12.5	23
BP1300621	13	6.5	21	BP2601237	26	12	37
BP1500820	15	8	20	BP2751436	27.5	14	36
BP1601220	16	12	20	BP2801132	28	11	23
BP1800921	18	9	21	BP2801323	28	13	23
BP1801021	18	10	21	BP2801143	28	11	43
BP1800929	18	9	29	BP2801343	28	13	43
BP1801029	18	10	29	BP2901835	29	18	35
BP2001028	20	10.5	28	BP2331442	30	14	42
BP2001128	20	11.5	28	BP3001542	30	15	42
BP2251328	22.5	13	28	BP3101347	31	13	47
BP2251428	22.5	14	28	BP3251446	32.5	14.5	46
BP2301121	23	11	21	BP3301226	33	12.5	26
BP2301221	23	12.5	21	BP3301251	33	12.5	51
BP2301133	23	11	33	BP3601326	36	13	26
BP2301233	23	12.5	33	BP3601356	36	13	56
BP2501332	25	13	32				

# INTEGRITY COOPERATION INNOVATION

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