

TUNGSTEN CARBIDE

Rods And Bars Catalogue

SPECIALIZED IN PRODUCTION

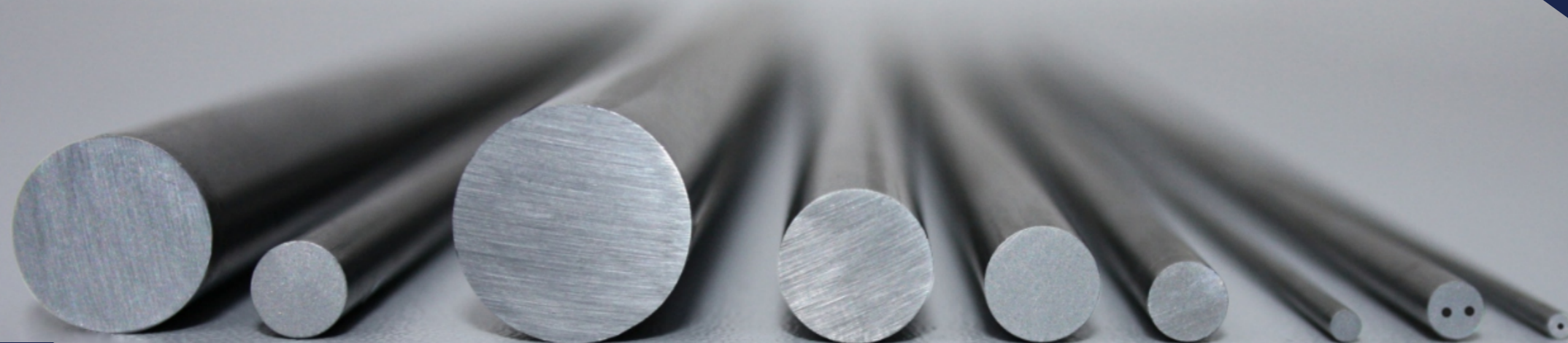
OF TUNGSTEN

CARBIDE RODS AND BARS

OVER 22 YEARS

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Zhuzhou City,Hunan Province,China

Your specialist
for solid carbide rods and flat bars



COMPANY PROFILE

HAO Carbide Co., Ltd. is one of the few modern high-tech enterprises in China dedicated to the research, development, production and sales of "National Standard Class A High-grade Cemented Carbide" series products. Our technical team has highly qualified engineers, technicians and other experts at all levels, and an excellent service team with technical background.

HAO Carbide has been established for more than ten years and has successively obtained "AAA-level company", "AAA-level contract-abiding and trustworthy enterprise", "AAA-level service and trustworthy company", "AAA-level quality and trustworthy company", and "AAA-level quality service integrity company", "AAA-level Integrity Management Demonstration company", "Top Ten Influential Brands in China's Machinery Manufacturing Industry", "Prestigious Promotion Brands in China's Scientific and Technological Innovation", "High-quality assured products of Chinese Quality", "Top 100 New Media Marketing Enterprises", "Enterprise of Credit in Hunan Province" and "National AAA Brand Enterprise of Quality and Integrity" etc. It's highly respected by customers all over the world.

The national standard A-grade high-grade cemented carbide produced by HAO uses high-purity virgin tungsten carbide powder as the raw material, high-precision technical equipment as the basis, and a strict 13-level quality control system as the guarantee. With the technical characteristics of "two highs

and one strict", the cemented carbide products provided by our company have high-quality performance while other similar products do not have. The seven indexes of bending strength, hardness, porosity, graphite inclusions, 302 defects, average grain size of WC, and η are all fully meet the national quality inspection standard "GB/T18376.1-2001, GB/T18376.2-2001", GB/T18376.3-2001" requirements for various indicators.

The development of HAO Carbide is the epitome of the development of China's manufacturing. Facing the new development trend, Our employees uphold the mission of "respect nature and love others, make life better", adhere to the purpose of "responsible for the future, responsible for customers, and responsible for their own conscience", and insist on customers is our main priority, With the values of "honesty, trustworthiness and self-improvement", with the passion in our work, we will do our best to build a century-old foundation.



Your specialist
for solidcarbide rods and flat bars

Completely produce & Quality checking system

10 ADVANTAGES OF HAO CARBIDE RODS AND BARS



1 Raw material

≥99.95 high purity tungsten powder as our main material

2 Customization

Customization is always available

7 Package

Individual packing & carton box

8 Delivery

Various ways of transportation: including door-to-door delivery

3 Process Quality Control Outgoing Quality Assurance

All the products will be arranged mass production only after samples are qualified

4 Pressing

Adopting automatic dry type isostatic press machine

9 Transportation

Short production and delivery time ,the minimum time is only 7 days

10 Payment

T/T,L/C,West-Union,Paypal,Alipay

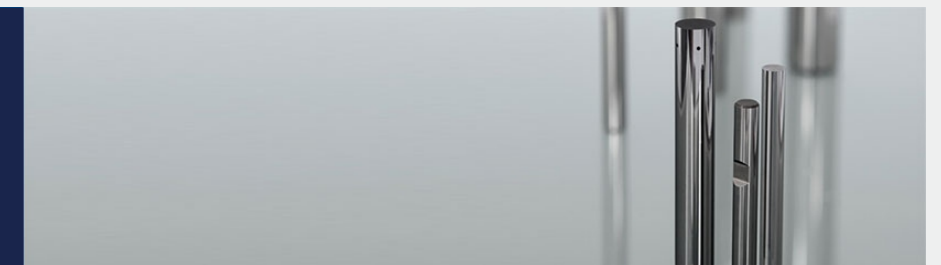
5 Sintering

German low pressure, entire atmosphere sintering furnace as sintering molding equipment

6 Line Quality Control

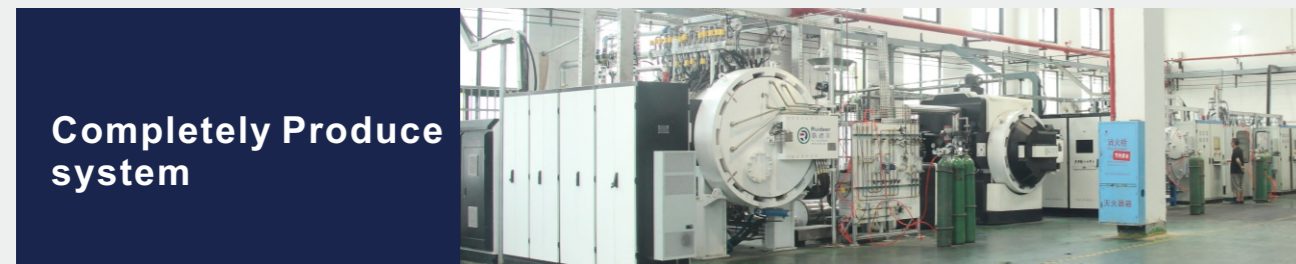
Exclusively with 13-level quality detection system

TUNGSTEN
CARBIDE RODS



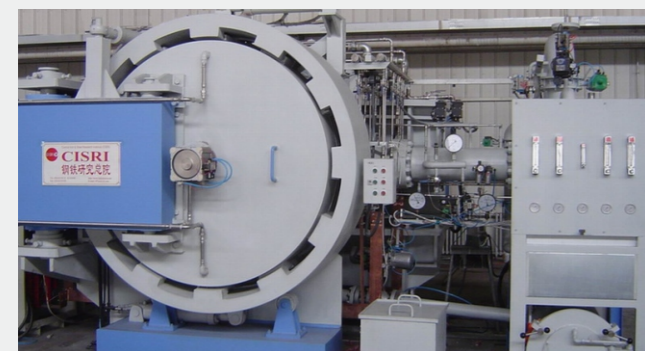
ONLY MANUFACTURE FOR CNS CLASS A HIGH GRADE TC

Complete production & quality control system



Completely Produce system

In the control of product quality, we have always adhered to the spirit of ambiguity. We have never had any quality disputes with our customers for 10 years.



Sinter Hip-from Germany

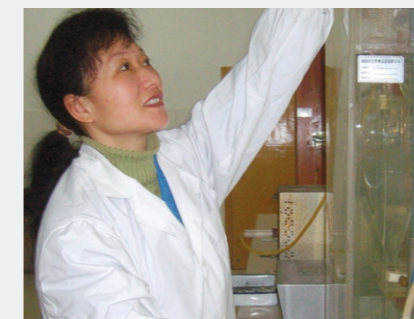


Extrusion machine from Germany

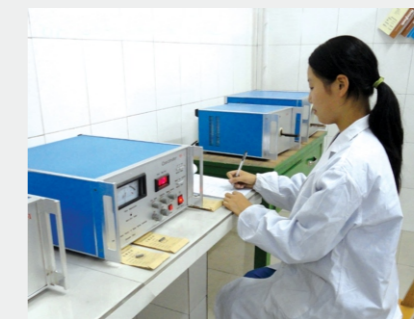


Quality control system

The whole production process are under 13 levels of strict control, to gaurantee that each process can meet the quality request.To provide customers with first-class quality and unparalleled service.



>> Raw Materials Test



>> Coercive force



>> Metallographic Analysis



>> TRS(Mpa)



>> Density



>> Hardness(HRA)

WHY CHOOSE HAO CARBIDE?

- 1** Raw material is different, not only different from selecting the unbeatable material. We also have a cooperation with university's research team. And our technical experts mix two kinds of powder with different grain sizes to guarantee both hardness and bending strength. The maximum hardness can reach to 94 HRA, bending strength up to 4000.
- 2** Different imported production equipments and quality control equipments. We didn't use the method of extrusion to press, but new generation dry isostatic pressing machine. In this way, the inner structure are more compact and well distributed.
- 3** The detection devices are automatic to send the rods. Rather than cutting off one piece of rod, we test the whole rod. To avoid uneven distribution of cobalt magnetic. Good performance of our equipments make our carbide rods show good inner structure in metallographic test.
- 4** Thirteen different strict tests to control the quality from source, and we can trace each step to find out problems easily.
- 5** High accuracy of straightness, reach to 0.02mm. Run-out reach to 0.003, concentricity reach to ± 0.005 . We will test each rod by a precision instrument one by one, to guarantee the accuracy of straightness.

Contents

- 09 The grade List of tungsten carbide rods
- 10 Guide of product selection
- 12 Unground Rod
- 13 Smaller Rod- metric
- 14 Solid Rod -Metric
- 16 Ground Rods with chamfer-Metric
- 18 Ground Rods with chamfer-Inch
- 23 Rods with one Coolant Holes
- 25 Rods with Two Straight Coolant Holes
- 27 Rods With 2 Helical Coolant Holes
- 31 Rods With 3 Helical Coolant Holes



The grade list of tungsten carbide rods

硬质合金牌号		JZ06U	JZ08U	JZ12U	JZ12U-T	JZ10S	JZ10F
WC	%	94	92	88	88	90	90
CO	%	6	8	12	12	10	10
GRAIN SIZE	μm	0.4	0.4	0.4	0.4	0.6	0.8
DENSITY	G/cm ³	14.85	14.65	14.15	14.20	14.40	14.40
HRD	HRA	94.0	93.6	92.5	93.0	92.3	91.8
TRS	N/mm ²	≥4000	≥4000	≥4200	≥3800	≥3900	≥3800

GRADE	The Grade Recommend
JZ06U	This tungsten carbide rod is with 0.4μm ultrafine particles and CO 6%. Be suitable for processing aluminum-magnesium alloy, glass fiber, carbon fiber, wood, hard plastic, etc. Recommend for making micro tools and drills.
JZ08U	This tungsten carbide rod is with 0.4μm ultrafine particles and CO 8%. Be suitable for processing resin, wood, titanium alloy, stainless steel, copper-aluminum alloy, composite material. Recommend making high speed drill, end mill, graver and micro-drill PCB with diameter less than 0.8mm.
JZ12U	This tungsten carbide rod is with 0.4μm ultrafine particles and CO 12%. Be suitable for semi-finishing and finishing process of stainless steel, mold steel and normal titanium alloy, etc. Recommend for making all types of high speed end mills, reamers and gravers.
JZ12U-T	This tungsten carbide rod is with 0.4μm ultrafine particles and CO 12%, higher hardness. Be suitable for finishing process of stainless steel, mold steel and normal titanium alloy, etc. Recommend for making all types of high speed end
JZ10S	This tungsten carbide rod is with 0.6μm Sub-micron particles and CO 10%, which is widely used in cutting tools. Be suitable for rough finishing, semi-finishing and finishing of mold steel, grey cast iron, austenitic stainless steel and heat-resistant alloy. Recommend for making normal drill and end mill.
JZ10F	This tungsten carbide rod is with 0.6μm Sub-micron particles and CO 10%. Be suitable for rough finishing and semi-finishing of normal steel, cast iron and stainless steel. Recommend for making normal drill and end mill.

Guide of product selection

Be processed material	Suitable grand			
	First chioce	Wear-resisting	High toughness	High speed mill
Low-alloy steel(intensity700 < N/mm ²)	JZ10S			JZ08U
Alloy steel(intensity700 < N/mm ²)	JZ10S	JZ08U		JZ08U
Stainless steel	JZ10S	JZ08U		
Csst iron		JZ06U		
Aluminum alloy,Copper,Plastic	JZ06U			JZ08U
Graphite	JZ06U+COATING			
Titanium alloy,Heat-resisting alloy	JZ10S	JZ08U		
Hardened steel(hardness 60HRC)	JZ12U	JZ12U-T		
Reamer	JZ06U			
Flushes the needle,Drift,Mold	JZ10F			
PCB drill bit,Aluminum/copper sheet	JZ06U			
Drill bit	JZ10S		JZ08U	

Blank of rods length ≤1000mm can be produced according to your request



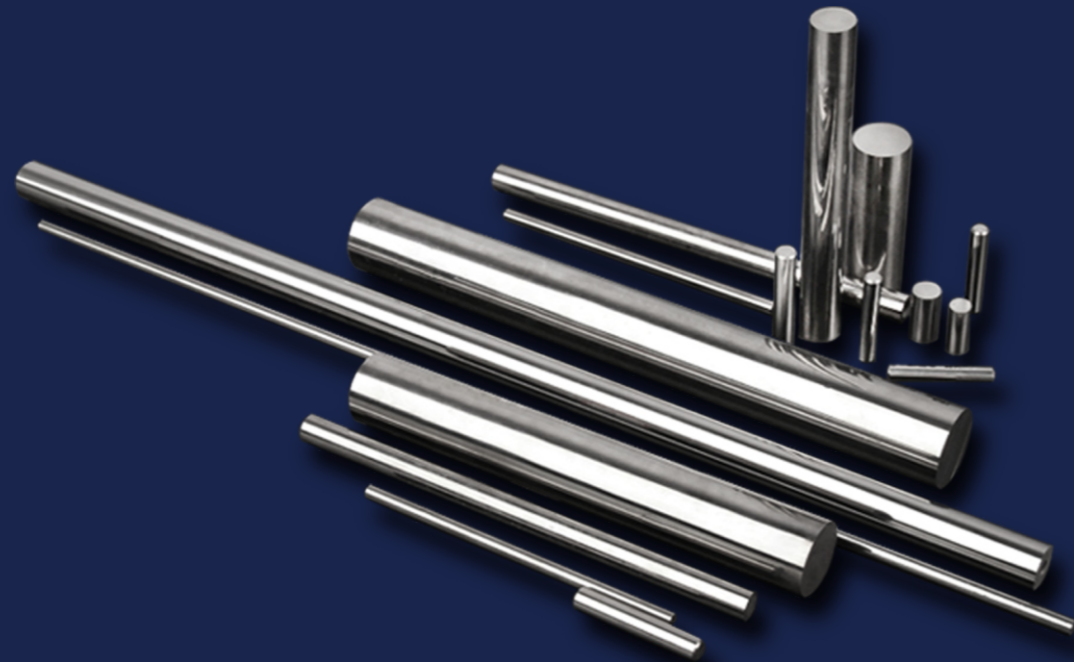
SOLID RODS

Used for making end mills, drills bits or reamers and other abrasion resistance parts etc . Any length are available based your require

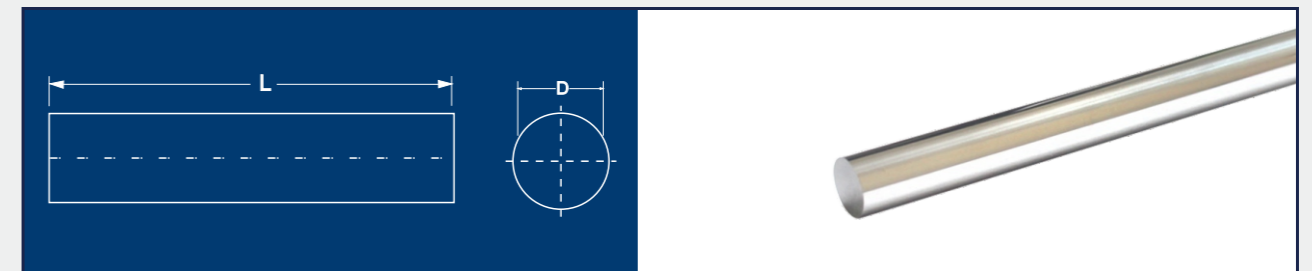
Max diamter can reach to **70mm**

Straightness can reach to **±0.02**

Run-out can reach to **0.03mm**



Unground Rod

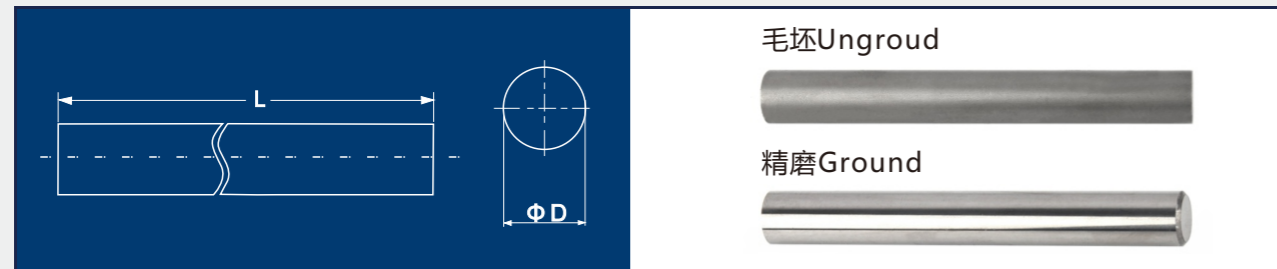


Type sepcifications: $\Phi D \times L$

Specification	Diameter Tolernance(mm)	Tolernance of Length(mm)
$\Phi 1 \sim \Phi 5 \times 330$	+0.3~+0.6	+0.3~+0.8
$\Phi 6 \sim \Phi 10 \times 330$	+0.3~+0.6	+0.3~+1.8
$\Phi 11 \sim \Phi 15 \times 330$	+0.3~+0.8	+0.3~+1.8
$\Phi 16 \sim \Phi 20 \times 330$	+0.3~+0.8	+0.5~+2.5
$\Phi 21 \sim \Phi 30 \times 330$	+0.6~+1.0	+0.5~+2.5
$\Phi 31 \sim \Phi 40 \times 330$	+0.6~+1.2	+0.5~+2.5
$\Phi 31 \sim \Phi 40 \times 330$	+0.6~+1.2	+0.5~+2.5

Blank of rods length $\leq 1000\text{mm}$ can be produced according to your request

Smaller Rod- Metric

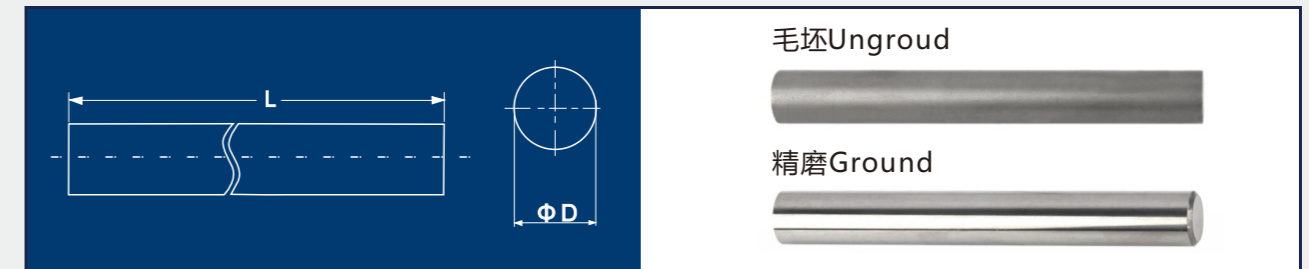


Type sepcifications: $\Phi D \times L$

D (mm)	Tolerance of Diameter (mm)	L (mm)	Tol. of L(mm)
		h6/h5	0~0.3
0.3	100	h6/h5	0~0.3
0.3	120	h6/h5	0~0.3
0.4	100	h6/h5	0~0.3
0.4	120	h6/h5	0~0.3
0.5	330	h6/h5	0~0.3
0.6	330	h6/h5	0~0.3
0.7	330	h6/h5	0~0.3
0.8	330	h6/h5	0~0.3
0.9	330	h6/h5	0~0.3
1.0	330	h6/h5	0~0.3
1.2	330	h6/h5	0~0.3
1.5	330	h6/h5	0~0.3
1.6	330	h6/h5	0~0.3
1.8	330	h6/h5	0~0.3
2.0	330	h6/h5	0~0.3

Length can be produced based your require

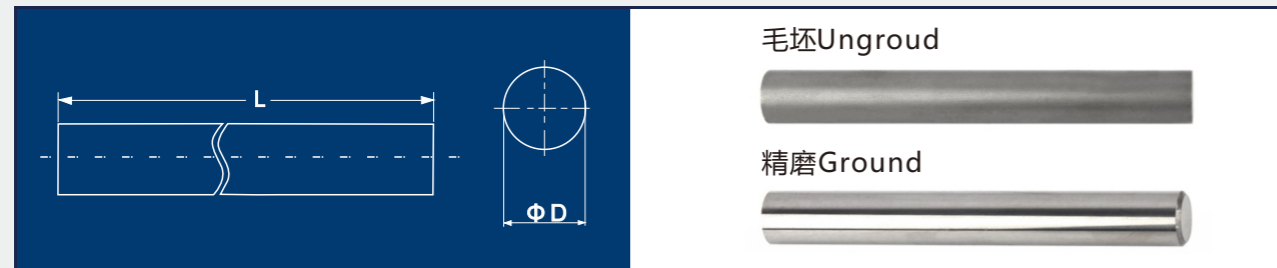
Solid Rod -Metric



D (mm)	L(mm)	ΦD Tol.	Tol. of L(mm)
3.0	330	h6/h5	0~0.3
3.5	330	h6/h5	0~0.3
4.0	330	h6/h5	0~0.3
4.5	330	h6/h5	0~0.3
5.0	330	h6/h5	0~0.3
5.5	330	h6/h5	0~0.3
6.0	330	h6/h5	0~0.3
6.5	330	h6/h5	0~0.3
7.0	330	h6/h5	0~0.3
7.5	330	h6/h5	0~0.3
8.0	330	h6/h5	0~0.3
8.5	330	h6/h5	0~0.3
9.0	330	h6/h5	0~0.3
9.5	330	h6/h5	0~0.3
10.0	330	h6/h5	0~0.3
10.5	330	h6/h5	0~0.3
11.0	330	h6/h5	0~0.3

Length can be produced based your require

Solid Rod -Metric



D (mm)	L(mm)	ΦD Tol.	Tol.of L(mm)
11.5	330	h6/h5	0~0.3
12.0	330	h6/h5	0~0.3
12.5	330	h6/h5	0~0.3
14.0	330	h6/h5	0~0.3
16.0	330	h6/h5	0~0.3
17.0	330	h6/h5	0~0.3
18.0	330	h6/h5	0~0.3
19.0	330	h6/h5	0~0.3
20.0	330	h6/h5	0~0.3
22.0	330	h6/h5	0~0.3
24.0	330	h6/h5	0~0.3
25.0	330	h6/h5	0~0.3
26.0	330	h6/h5	0~0.3
28.0	330	h6/h5	0~0.3
30.0	330	h6/h5	0~0.3
32.0	330	h6/h5	0~0.3

Length can be produced based your require

Ground Rods with chamfer-Metric



D (mm)	L(mm)	ΦD Tol.	Tol.of L(mm)	Angle of chamfer
3.0	40	h6/h5	0~0.1	45°
3.0	50	h6/h5	0~0.1	45°
3.0	75	h6/h5	0~0.1	45°
3.0	100	h6/h5	0~0.1	45°
4.0	40	h6/h5	0~0.1	45°
4.0	50	h6/h5	0~0.1	45°
4.0	75	h6/h5	0~0.1	45°
4.0	100	h6/h5	0~0.1	45°
5.0	40	h6/h5	0~0.1	45°
5.0	50	h6/h5	0~0.1	45°
5.0	75	h6/h5	0~0.1	45°
5.0	100	h6/h5	0~0.1	45°
6.0	40	h6/h5	0~0.1	45°
6.0	50	h6/h5	0~0.1	45°
6.0	75	h6/h5	0~0.1	45°
6.0	100	h6/h5	0~0.1	45°
6.0	40	h6/h5	0~0.1	45°
8.0	60	h6/h5	0~0.1	45°
8.0	75	h6/h5	0~0.1	45°

Length can be produced based your require

Ground Rods with chamfer-Metric



D (mm)	L(mm)	ΦD Tol.	Tol.of L(mm)	Angle of chamfer
8.0	100	h6/h5	0~0.1	45°
8.0	150	h6/h5	0~0.1	45°
10.0	75	h6/h5	0~0.1	45°
10.0	100	h6/h5	0~0.1	45°
10.0	125	h6/h5	0~0.1	45°
10.0	150	h6/h5	0~0.1	45°
12.0	75	h6/h5	0~0.1	45°
12.0	100	h6/h5	0~0.1	45°
12.0	125	h6/h5	0~0.1	45°
12.0	150	h6/h5	0~0.1	45°
14.0	100	h6/h5	0~0.1	45°
14.0	125	h6/h5	0~0.1	45°
14.0	150	h6/h5	0~0.1	45°
16.0	100	h6/h5	0~0.1	45°
16.0	125	h6/h5	0~0.1	45°
16.0	150	h6/h5	0~0.1	45°
18.0	100	h6/h5	0~0.1	45°
18.0	125	h6/h5	0~0.1	45°
18.0	150	h6/h5	0~0.1	45°
20.0	125	h6/h5	0~0.1	45°
20.0	150	h6/h5	0~0.1	45°
25.0	125	h6/h5	0~0.1	45°
25.0	150	h6/h5	0~0.1	45°

Ground Rods with chamfer-Inch



D	L	ΦD Tol.	Tol.of L(mm)	Angle of chamfer
1/8	1.5	h6/h5	0~0.1	45°
1/8	2.00	h6/h5	0~0.1	45°
1/8	2.50	h6/h5	0~0.1	45°
1/8	3.00	h6/h5	0~0.1	45°
1/8	4.00	h6/h5	0~0.1	45°
3/16	2.00	h6/h5	0~0.1	45°
3/16	2.00	h6/h5	0~0.1	45°
3/16	3.00	h6/h5	0~0.1	45°
3/16	4.00	h6/h5	0~0.1	45°
1/4	1.50	h6/h5	0~0.1	45°
1/4	2.00	h6/h5	0~0.1	45°
1/4	2.50	h6/h5	0~0.1	45°
1/4	3.00	h6/h5	0~0.1	45°
1/4	3.50	h6/h5	0~0.1	45°
1/4	4.00	h6/h5	0~0.1	45°
1/4	5.00	h6/h5	0~0.1	45°
1/4	6.00	h6/h5	0~0.1	45°
5/16	2.00	h6/h5	0~0.1	45°
5/16	2.50	h6/h5	0~0.1	45°
5/16	3.00	h6/h5	0~0.1	45°

Length can be produced based your require

Ground Rods with chamfer-Inch



D	L	ΦD Tol.	Tol.of L(mm)	Angle of chamfer
5/16	3.50	h6/h5	0~0.1	45°
5/16	4.00	h6/h5	0~0.1	45°
5/16	6.00	h6/h5	0~0.1	45°
3/8	2.00	h6/h5	0~0.1	45°
3/8	2.50	h6/h5	0~0.1	45°
3/8	3.00	h6/h5	0~0.1	45°
3/8	3.50	h6/h5	0~0.1	45°
3/8	4.00	h6/h5	0~0.1	45°
3/8	5.00	h6/h5	0~0.1	45°
3/8	6.00	h6/h5	0~0.1	45°
3/8	8.00	h6/h5	0~0.1	45°
7/16	2.50	h6/h5	0~0.1	45°
7/16	2.75	h6/h5	0~0.1	45°
7/16	3.00	h6/h5	0~0.1	45°
7/16	4.00	h6/h5	0~0.1	45°
7/16	4.50	h6/h5	0~0.1	45°
7/16	6.00	h6/h5	0~0.1	45°
1/2	2.50	h6/h5	0~0.1	45°
1/2	3.00	h6/h5	0~0.1	45°
1/2	3.50	h6/h5	0~0.1	45°

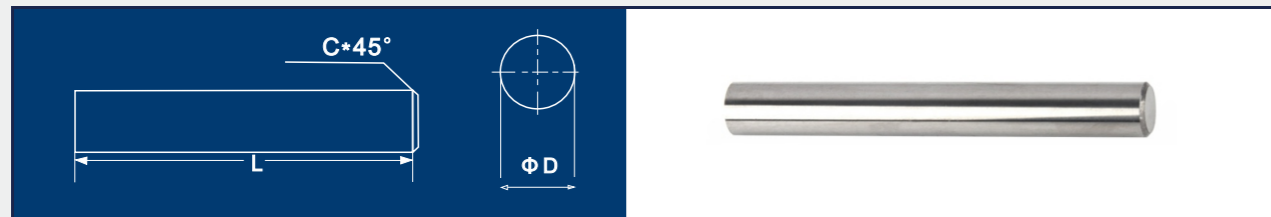
Length can be produced based your require

Ground Rods with chamfer-Inch



D	L	ΦD Tol.	Tol.of L(mm)	Angle of chamfer
1/2	4.00	h6/h5	0~0.1	45°
1/2	4.50	h6/h5	0~0.1	45°
1/2	5.00	h6/h5	0~0.1	45°
1/2	6.00	h6/h5	0~0.1	45°
1/2	7.00	h6/h5	0~0.1	45°
1/2	8.00	h6/h5	0~0.1	45°
9/16	3.50	h6/h5	0~0.1	45°
9/16	4.00	h6/h5	0~0.1	45°
9/16	6.00	h6/h5	0~0.1	45°
9/16	2.00	h6/h5	0~0.1	45°
5/8	2.50	h6/h5	0~0.1	45°
5/8	3.00	h6/h5	0~0.1	45°
5/8	3.50	h6/h5	0~0.1	45°
5/8	4.00	h6/h5	0~0.1	45°
5/8	5.00	h6/h5	0~0.1	45°
5/8	6.00	h6/h5	0~0.1	45°
5/8	8.00	h6/h5	0~0.1	45°
3/4	2.50	h6/h5	0~0.1	45°
3/4	2.75	h6/h5	0~0.1	45°
3/4	3.00	h6/h5	0~0.1	45°
3/4	4.00	h6/h5	0~0.1	45°
3/4	4.50	h6/h5	0~0.1	45°

Ground Rods with chamfer-Inch



D	L	ΦD Tol.	Tol.of L(mm)	Angle of chamfer
3/4	6.00	h6/h5	0~0.1	45°
3/4	2.50	h6/h5	0~0.1	45°
3/4	3.00	h6/h5	0~0.1	45°
7/8	3.50	h6/h5	0~0.1	45°
7/8	4.00	h6/h5	0~0.1	45°
1	3.00	h6/h5	0~0.1	45°
1	4.00	h6/h5	0~0.1	45°
1	5.00	h6/h5	0~0.1	45°
1	6.00	h6/h5	0~0.1	45°
1	7.00	h6/h5	0~0.1	45°
1	8.00	h6/h5	0~0.1	45°
1	9.00	h6/h5	0~0.1	45°
1	10.00	h6/h5	0~0.1	45°
1 1/4	4.00	h6/h5	0~0.1	45°
1 1/4	5.00	h6/h5	0~0.1	45°
1 1/4	6.00	h6/h5	0~0.1	45°
1 1/4	7.00	h6/h5	0~0.1	45°
1 1/4	7.50	h6/h5	0~0.1	45°
1 1/4	8.00	h6/h5	0~0.1	45°
1 1/4	9.00	h6/h5	0~0.1	45°
1 1/4	10.00	h6/h5	0~0.1	45°

Length can be produced based your require

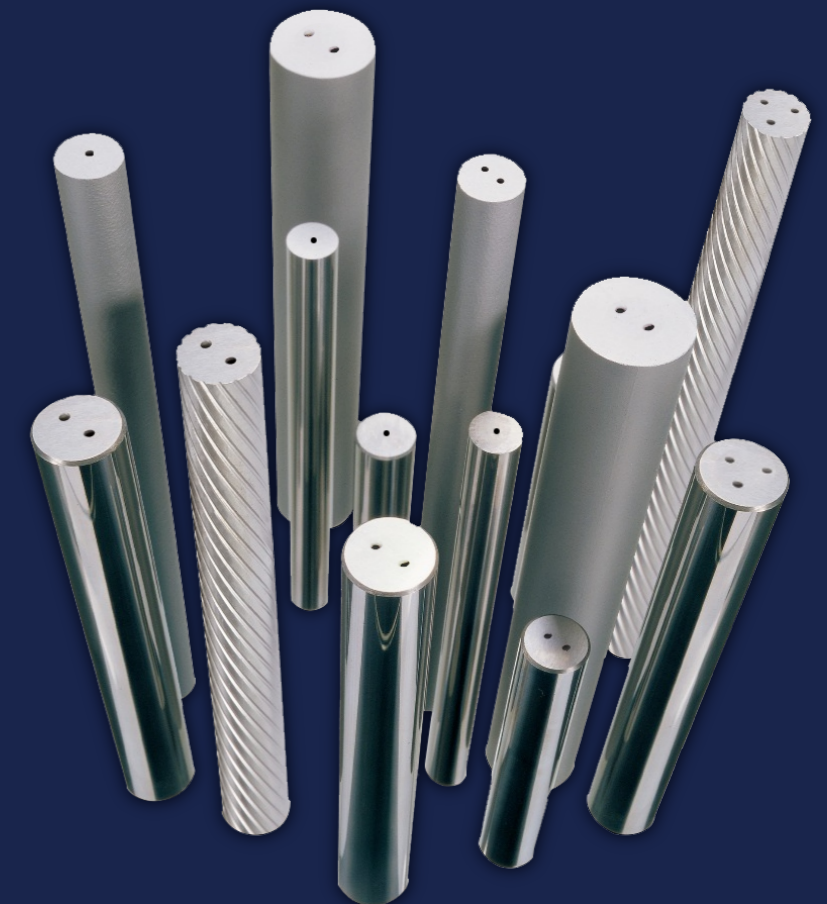
RODS WITH COOLANT HOLES

High-precision rods with coolant hole. Used for making twist drill with coolant holes.

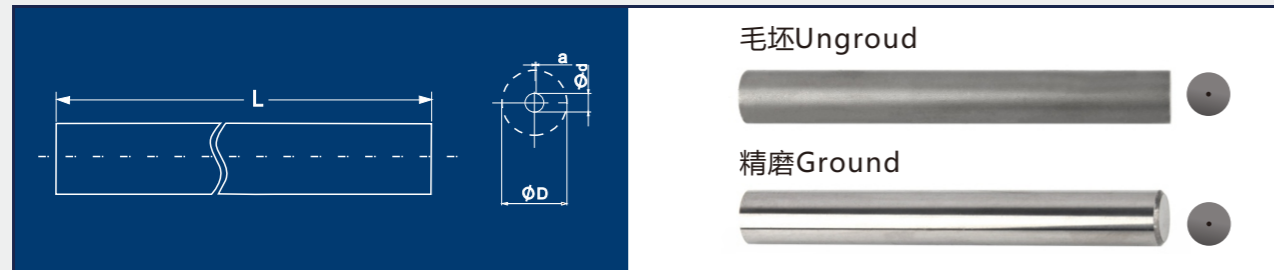
Concentricity could reach to $\pm 0.005mm$

Spiral angle can be customized.

Spiral angle 8° to 60° all accepted.



Rods with one Coolant Holes

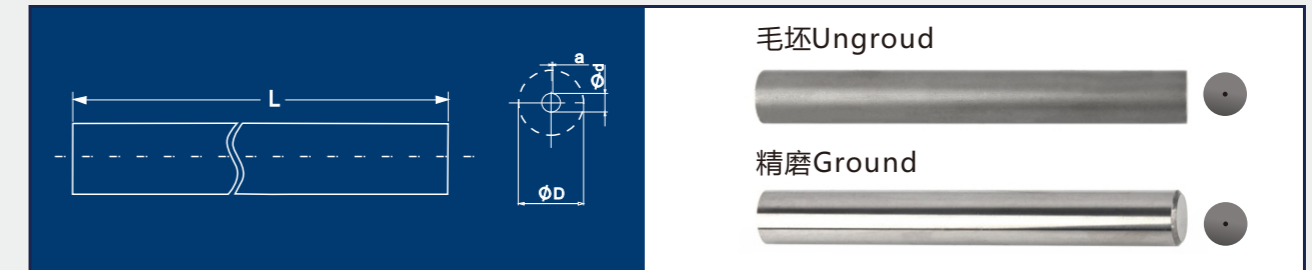


Rods With Central Coolant Hole

Diameter			Length(Tol./o,+5)	Hole Diameter		A
ΦD	Tol.of Ungroud	Tol.of Ground		ΦD	Tol.	
3	+0.3,+0.5	h6/h5	330	0.50	±0.10	0.10
4	+0.3,+0.5	h6/h5	330	0.80	±0.10	0.10
5	+0.3,+0.5	h6/h5	330	0.80	±0.10	0.13
6	+0.3,+0.5	h6/h5	330	1.00	±0.15	0.15
7	+0.3,+0.6	h6/h5	330	1.00	±0.15	0.15
8	+0.3,+0.6	h6/h5	330	1.00	±0.15	0.15
9	+0.3,+0.6	h6/h5	330	1.40	±0.15	0.20
10	+0.3,+0.6	h6/h5	330	1.40	±0.15	0.20
11	+0.3,+0.6	h6/h5	330	1.40	±0.15	0.28
12	+0.3,+0.6	h6/h5	330	1.75	±0.15	0.30
13	+0.3,+0.7	h6/h5	330	1.75	±0.15	0.34
14	+0.3,+0.7	h6/h5	330	1.75	±0.15	0.37
15	+0.3,+0.7	h6/h5	330	2.00	±0.20	0.40
16	+0.3,+0.7	h6/h5	330	2.00	±0.20	0.40
17	+0.3,+0.8	h6/h5	330	2.00	±0.20	0.47
18	+0.3,+0.8	h6/h5	330	2.00	±0.20	0.50

Length can be produced based your require

Rods with one Coolant Holes

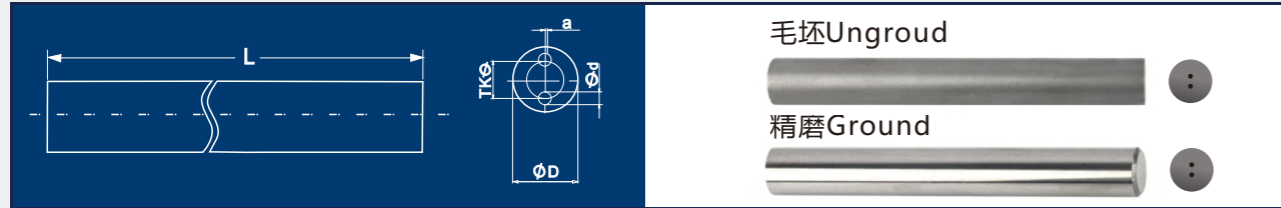


Rods With Central Coolant Hole

Diameter			Length(Tol./o,+5)	Hole Diameter		A
ΦD	Tol.of Ungroud	Tol.of Ground		ΦD	Tol.	
19	+0.3,+0.8	h6/h5	330	2.00	±0.20	0.50
20	+0.3,+0.8	h6/h5	330	2.50	±0.25	0.50
21	+0.3,+0.8	h6/h5	330	2.50	±0.25	0.50
22	+0.3,+0.8	h6/h5	330	2.50	±0.25	0.50
23	+0.3,+0.8	h6/h5	330	2.50	±0.25	0.50
24	+0.3,+0.8	h6/h5	330	3.00	±0.25	0.50
25	+0.3,+0.8	h6/h5	330	3.00	±0.25	0.50
26	+0.3,+0.8	h6/h5	330	3.00	±0.25	0.50
27	+0.3,+0.8	h6/h5	330	3.00	±0.25	0.50
28	+0.3,+0.8	h6/h5	330	3.00	±0.25	0.50
29	+0.3,+0.8	h6/h5	330	3.00	±0.25	0.50
30	+0.3,+0.8	h6/h5	330	3.00	±0.25	0.50

Length can be produced based your require

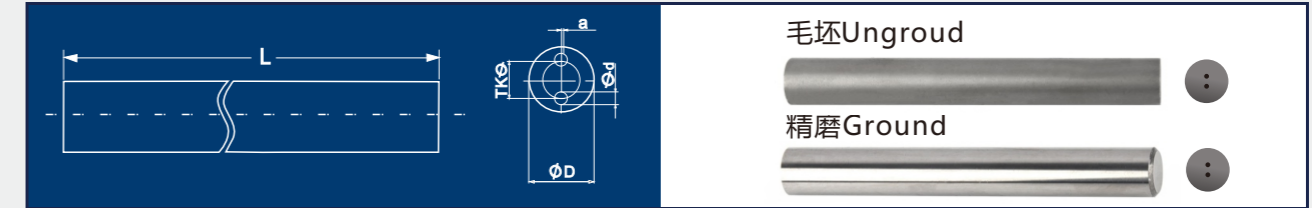
Rods with Two Straight Coolant Holes



Standard Bolt Circle(TK)Series

ΦD	Diameter		Length (Tol./o,+5)	Hole Diameter		Hole Diameter		A
	Tol.of Ungroud	Tol.of Ground		ΦD	To.	TKΦ	ToI.	
4	+0.3,+0.5	h6/h5	330	0.80	±0.10	1.80	+0,-0.15	0.10
5	+0.3,+0.5	h6/h5	330	0.80	±0.10	2.00	+0,-0.15	0.13
6	+0.3,+0.5	h6/h5	330	1.00	±0.15	3.00	+0,-0.20	0.15
7	+0.3,+0.6	h6/h5	330	1.00	±0.15	3.50	+0,-0.20	0.15
8	+0.3,+0.6	h6/h5	330	1.00	±0.15	4.00	+0,-0.30	0.15
9	+0.3,+0.6	h6/h5	330	1.40	±0.15	4.00	+0,-0.30	0.20
10	+0.3,+0.6	h6/h5	330	1.40	±0.15	5.00	+0,-0.30	0.20
11	+0.3,+0.6	h6/h5	330	1.40	±0.15	5.00	+0,-0.30	0.28
12	+0.3,+0.6	h6/h5	330	1.75	±0.15	6.00	+0,-0.30	0.30
13	+0.3,+0.7	h6/h5	330	1.75	±0.15	6.00	+0,-0.30	0.34
14	+0.3,+0.7	h6/h5	330	1.75	±0.15	7.00	+0,-0.30	0.37
15	+0.3,+0.7	h6/h5	330	2.00	±0.20	7.00	+0,-0.30	0.40
16	+0.3,+0.7	h6/h5	330	2.00	±0.20	8.00	+0,-0.30	0.40
17	+0.3,+0.8	h6/h5	330	2.00	±0.20	8.00	+0,-0.30	0.47
18	+0.3,+0.8	h6/h5	330	2.00	±0.20	9.00	+0,-0.30	0.50
19	+0.3,+0.8	h6/h5	330	2.00	±0.20	9.00	+0,-0.30	0.50
20	+0.3,+0.8	h6/h5	330	2.50	±0.25	10.00	+0,-0.40	0.50
21	+0.3,+0.8	h6/h5	330	2.50	±0.25	10.00	+0,-0.40	0.50
22	+0.3,+0.8	h6/h5	330	2.50	±0.25	11.00	+0,-0.40	0.50
23	+0.3,+0.8	h6/h5	330	2.50	±0.25	11.00	+0,-0.40	0.50
24	+0.3,+0.8	h6/h5	330	3.00	±0.25	12.00	+0,-0.50	0.50
25	+0.3,+0.8	h6/h5	330	3.00	±0.25	12.00	+0,-0.50	0.50
26	+0.3,+0.8	h6/h5	330	3.00	±0.25	13.00	+0,-0.50	0.50

Rods with Two Straight Coolant Holes

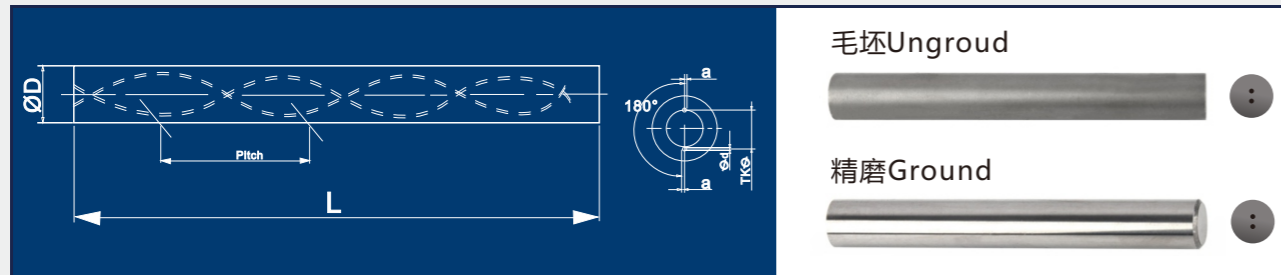


Narrow Bolt Circle(TK)Series

ΦD	Diameter		Length (Tol./o,+5)	Hole Diameter		Hole Diameter		A
	Tol.of Ungroud	Tol.of Ground		ΦD	To.	TKΦ	ToI.	
6	+0.3,+0.5	h6/h5	330	0.80	±0.10	1.50	+0,-0.20	0.15
7	+0.3,+0.6	h6/h5	330	0.80	±0.10	1.50	+0,-0.20	0.15
8	+0.3,+0.6	h6/h5	330	1.00	±0.15	1.50	+0,-0.30	0.15
9	+0.3,+0.6	h6/h5	330	1.00	±0.15	2.60	+0,-0.30	0.20
10	+0.3,+0.6	h6/h5	330	1.00	±0.15	2.60	+0,-0.30	0.20
11	+0.3,+0.6	h6/h5	330	1.20	±0.15	3.60	+0,-0.30	0.28
12	+0.3,+0.6	h6/h5	330	1.20	±0.15	3.60	+0,-0.30	0.30
13	+0.3,+0.7	h6/h5	330	1.20	±0.15	3.60	+0,-0.30	0.34
14	+0.3,+0.7	h6/h5	330	1.50	±0.15	5.00	+0,-0.30	0.37
15	+0.3,+0.7	h6/h5	330	1.50	±0.15	5.00	+0,-0.30	0.40
16	+0.3,+0.7	h6/h5	330	1.50	±0.15	5.00	+0,-0.30	0.40
17	+0.3,+0.8	h6/h5	330	2.00	±0.20	6.20	+0,-0.30	0.47
18	+0.3,+0.8	h6/h5	330	2.00	±0.20	6.20	+0,-0.30	0.50
19	+0.3,+0.8	h6/h5	330	2.00	±0.20	6.20	+0,-0.30	0.50
20	+0.3,+0.8	h6/h5	330	2.00	±0.20	6.20	+0,-0.40	0.50
21	+0.3,+0.8	h6/h5	330	2.00	±0.20	6.20	+0,-0.40	0.50
22	+0.3,+0.8	h6/h5	330	2.00	±0.20	6.20	+0,-0.40	0.50
23	+0.3,+0.8	h6/h5	330	2.00	±0.20	7.50	+0,-0.40	0.50
24	+0.3,+0.8	h6/h5	330	2.00	±0.20	7.50	+0,-0.50	0.50
25	+0.3,+0.8	h6/h5	330	2.00	±0.20	7.50	+0,-0.50	0.50
26	+0.3,+0.8	h6/h5	330	2.00	±0.20	7.50	+0,-0.50	0.50

Length can be produced based your require

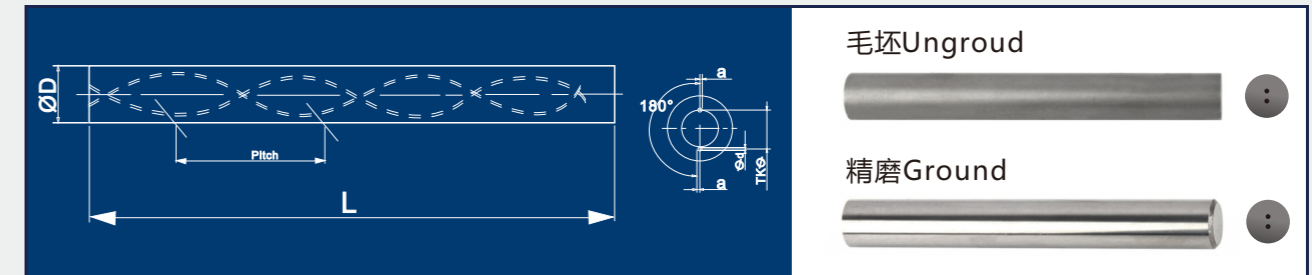
Rods With 2 Helical Coolant Holes(30°)



ΦD	L Tol./0,+5	Φd	TkΦ	Pitch			A
				P	Tol.		
3	330	0.40	1.70	16.32	-0.32	+0.33	0.15
4	330	0.60	2.20	21.77	-0.43	+0.45	0.15
5	330	0.70	2.60	27.21	-0.54	+0.56	0.15
6	330	0.70	2.60	32.65	-0.65	+0.67	0.15
7	330	1.00	3.70	38.09	-0.76	+0.78	0.15
8	330	1.00	4.00	45.53	-0.86	+0.89	0.15
9	330	1.40	4.80	48.97	-0.97	+1.00	0.20
10	330	1.40	4.80	54.41	-1.08	+1.11	0.20
11	330	1.40	5.30	59.86	-1.19	+1.22	0.30
12	330	1.40	6.25	65.30	-1.30	+1.34	0.30
13	330	1.75	6.50	70.74	-1.40	+1.45	0.30
14	330	1.75	7.10	76.18	-1.51	+1.56	0.40
15	330	1.75	7.70	81.62	-1.62	+1.67	0.40
16	330	1.75	8.30	87.06	-1.73	+1.78	0.40
17	330	1.75	8.90	92.50	-1.84	+1.89	0.45
18	330	2.00	9.55	97.95	-1.94	+2.00	0.50
19	330	2.00	10.10	103.39	-2.05	+2.12	0.50
20	330	2.00	10.40	108.83	-2.16	+2.23	0.50

Length can be produced based your require

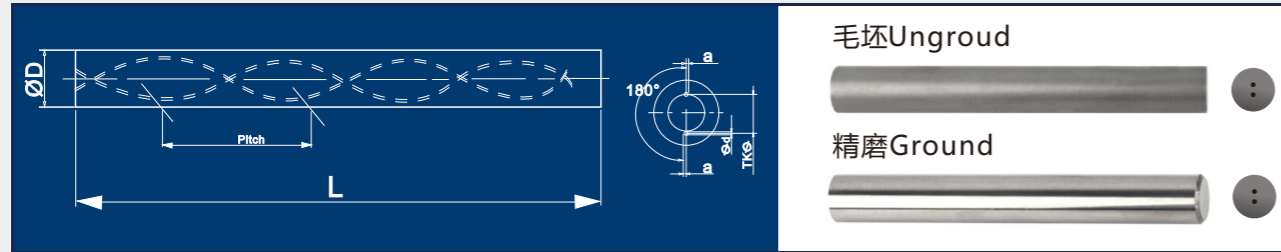
Rods With 2 Helical Coolant Holes(30°)



ΦD	L Tol./0,+5	Φd	TkΦ	Pitch			A
				P	Tol.		
21	330	2.00	11.15	114.27	-2.27	+2.34	0.50
22	330	2.00	11.60	119.71	-2.38	+2.45	0.50
23	330	2.00	12.20	125.15	-2.48	+2.56	0.50
24	330	2.00	12.80	130.59	-2.59	+2.67	0.50
25	330	2.00	13.30	136.03	-2.70	+2.78	0.50
26	330	2.00	13.30	141.48	-2.81	+2.90	0.50
27	330	2.50	13.70	146.92	-2.92	+3.01	0.50
28	330	2.50	14.20	152.36	-3.02	+3.12	0.50
29	330	2.50	14.80	157.8	-3.13	+3.23	0.50
30	330	2.50	15.40	163.24	-3.24	+3.34	0.50
31	330	2.50	16.00	168.68	-3.35	+3.45	0.50
32	330	3.00	16.60	174.12	-3.46	+3.56	0.50
33	330	3.00	17.20	179.57	-3.57	+3.67	0.50
34	330	3.00	17.40	185.01	-3.67	+3.79	0.50
35	330	3.00	17.60	190.45	-3.78	+3.90	0.50

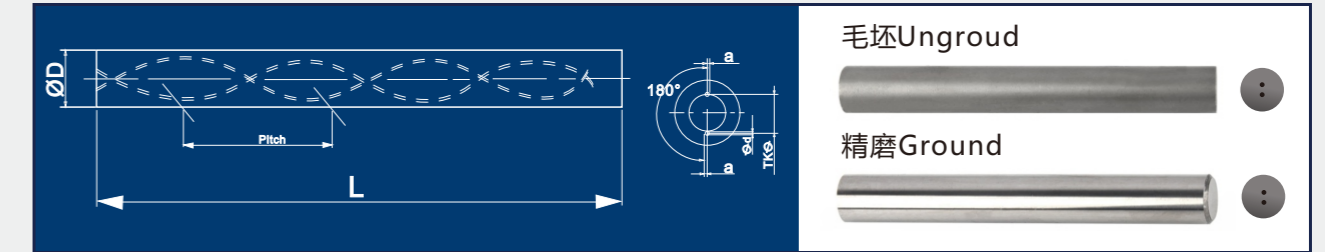
Length can be produced based your require

Rods With 2 Helical Coolant Holes(40°)



ΦD	L Tol./0,+5	Φd	TkΦ	Pitch			A
				P	Tol.		
6	330	0.50	2.00	22.46	-0.39	+0.40	0.15
7	330	0.65	2.20	26.21	-0.46	+0.47	0.15
8	330	0.65	2.40	29.95	-0.53	+0.54	0.15
9	330	0.75	2.90	33.70	-0.59	+0.60	0.20
10	330	0.80	3.20	37.44	-0.66	+0.67	0.20
11	330	0.80	3.30	41.18	-0.72	+0.74	0.30
12	330	0.80	3.80	44.93	-0.79	+0.80	0.30
13	330	0.90	4.00	48.67	-0.85	+0.87	0.30
14	330	0.90	4.30	52.42	-0.92	+0.94	0.40
15	330	0.20	4.70	56.16	-0.99	+1.01	0.40
16	330	0.20	5.10	59.90	-1.05	+1.07	0.40
17	330	0.20	5.50	63.65	-1.11	+1.12	0.45
18	330	0.25	5.90	67.39	-1.18	+1.21	0.50
19	330	1.40	6.40	71.14	-1.25	+1.27	0.50
20	330	1.50	6.60	74.88	-1.31	+1.34	0.50
21	330	1.50	6.90	78.62	-1.38	+1.14	0.50
22	330	1.70	7.20	82.37	-1.44	+1.48	0.50
23	330	1.75	7.40	85.78	-1.48	+1.53	0.50
24	330	1.75	7.50	89.86	-1.58	+1.61	0.50
25	330	1.75	7.60	9.60	-1.64	+1.68	0.50
26	330	1.75	7.70	97.34	-1.71	+1.74	0.50
28	330	2.00	8.40	104.83	-1.84	+0.88	0.50
30	330	2.00	9.40	112.32	-1.97	+2.01	0.50
32	330	2.00	10.40	119.81	-2.10	+2.15	0.50

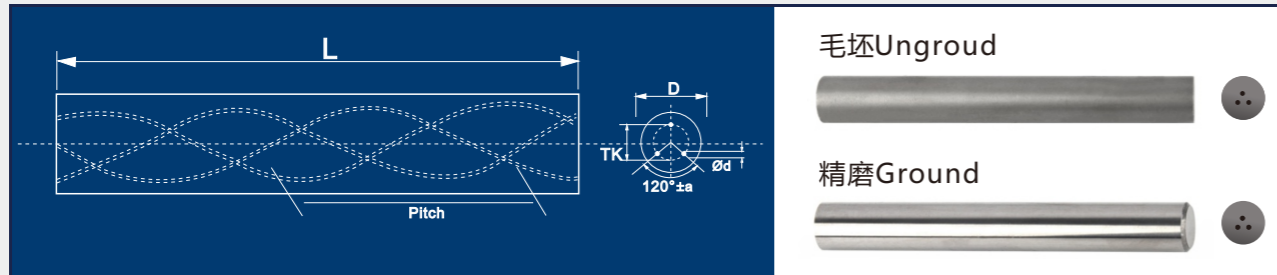
Rods With 3 Helical Coolant Holes(30°)



ΦD	L Tol./0,+5	Φd	TkΦ	Pitch			A
				P	Tol.		
6	330	0.70	2.30	32.65	-0.65	+0.5	0.15
8	330	1.00	4.00	45.53	-1.08	+0.54	0.15
10	330	1.40	4.90	54.41	-1.08	+0.67	0.20
12	330	1.40	6.00	65.30	-1.3	+0.80	0.30
14	330	1.75	7.10	76.18	-1.51	+0.94	0.40
16	330	1.75	8.30	87.06	-1.73	+1.07	0.40
18	330	2.00	9.70	97.95	-1.94	+1.21	0.50
20	330	2.00	10.40	108.83	-2.16	+1.34	0.50

Length can be produced based your require

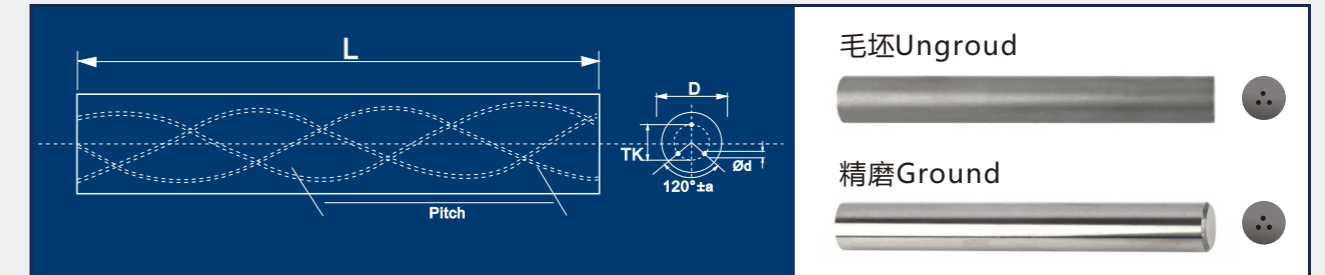
Rods With 3 Helical Coolant Holes(40°)



ΦD	L Tol./0,+5	Φd	TkΦ	Pitch		A
				P	Tol.	
6	330	0.50	2.05	22.46	-0.39 +0.40	0.15
7	330	0.65	2.25	26.21	-0.46 +0.47	0.15
8	330	0.65	2.45	29.95	-0.53 +0.54	0.15
9	330	0.75	3.05	33.70	-0.59 +0.60	0.20
10	330	0.80	3.35	37.44	-0.66 +0.67	0.20
11	330	0.80	3.45	41.18	-0.72 +0.74	0.28
12	330	0.90	3.95	44.93	-0.79 +0.80	0.30
13	330	0.90	4.15	48.67	-0.85 +0.87	0.34
14	330	1.00	4.45	52.42	-0.92 +0.94	0.37
15	330	1.10	1.85	56.16	-0.99 +1.01	0.40
16	330	1.20	5.25	59.90	-1.05 +1.07	0.40
17	330	1.20	5.65	63.65	-1.12 +0.14	0.47
18	330	1.40	6.05	67.39	-1.18 +1.21	0.50
19	330	1.40	6.35	71.14	-1.25 +1.27	0.50
20	330	1.50	6.75	74.88	-1.31 +1.34	0.50

Length can be produced based your require

Rods With 3 Helical Coolant Holes(40°)



ΦD	L Tol./0,+5	Φd	TkΦ	Pitch		A
				P	Tol.	
21	330	1.50	7.05	78.62	-1.38 +2.41	0.50
22	330	1.75	7.35	82.37	-1.44 +1.48	0.50
23	330	1.75	7.45	85.48	-1.49 +1.55	0.50
24	330	1.75	7.55	89.86	-1.58 +1.61	0.50
25	330	1.75	7.65	93.60	-1.64 +1.68	0.50
26	330	1.75	7.75	97.34	-1.71 +1.74	0.50
27	330	2.00	8.15	100.53	-1.74 +1.82	0.50
28	330	2.00	8.55	104.83	-1.84 +1.88	0.50
29	330	2.00	9.05	108.68	-1.88 +1.98	0.50
30	330	2.00	9.45	112.32	-1.97 +2.01	0.50
31	330	2.00	9.95	115.68	-2.03 +2.08	0.50
32	330	2.00	10.45	119.81	-2.10 +2.15	0.50

Length can be produced based your require