天工国际
TIANGONG INTERNATIONAL

硬质合金棒材
CEMENTED CARBIDE RODS

江苏天工硬质合金科技有限公司
JIANGSU TIANGONG CEMENTED CARBIDE TECHNOLOGY CO., LTD.

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公司简介
About TG

研发 R&D　生产 Production　制造 Manufacture　营销 Marketing　服务 Service

一流团队 专业技术研发团队，完整硬质合金生产链
professional technology R&D team,
a complete cemented carbide production chain.

尖端设备 国内外先进/行业顶尖的研发及生产设备
R&D and production equipments are advanced at home and abroad.

专注于硬质合金棒料 + 整体硬质合金刀具 + 可转位数控刀片的专业制造商
A professional manufacturer focusing on cemented carbide bars + integral cemented carbide tools + indexable CNC blades

江苏天工硬质合金科技有限公司成立于2021年，隶属于天工国际有限公司，是一家专注硬质合金棒料、整体硬质合金刀具及可转位数控刀片的专业制造商。公司具备一支高素质的专业技术研发团队，拥有一条完整的硬质合金生产链，各工序骨干技术人员均有多年岗位工作经验；研发及生产设备均为国内外先进或行业顶尖水平，满足各类硬质合金产品研发生产需求；生产工艺及方法均为数字化，并与生产设备互联，以确保产品品质稳定和生产研发高效运行。

Jiangsu Tiangong Cemented Carbide Technology Co., Ltd. was established in 2021 and is affiliated to Tiangong International Co., Ltd. It is a professional manufacturer focusing on cemented carbide bars, integral cemented carbide tools and indexable CNC blades. The company has a high-quality professional technology research and development team, a complete cemented carbide production chain, and key technicians in each process have many years of work experience; R & D and production equipment are advanced at home and abroad, meeting the R & D and production needs of various cemented carbide products; The production process and methods are digital and interconnected with the production equipment to ensure stable product quality and efficient operation of production research and development.

公司基于多年相关金属材料领域的生产与管理经验，全面掌握了硬质合金产品配料、混合、喷雾、成型、烧结、加工等全套先进生产工艺流程。

Based on many years of production and management experience in the field of related metal materials, the company has comprehensively mastered a complete set of advanced production processes of cemented carbide products such as batching, mixing, spray,molding, sintering and processing.

采用国内外高品质的原材料（碳化钨粉、钴粉），基于智能工厂管理理念，结合先进的设备和工艺制造多牌号、高质量的硬质合金棒材，包含实心圆棒和内冷孔棒材，为整体硬质合金刀具提供优质原料；棒材经过磨削、后处理与涂层等先进工艺加工，获得性能卓越的整硬刀具；同时基于优质原料生产的硬质合金可转位数控刀片毛坯及成品，属于硬质合金高档产品，是企业技术的象征，因该产品具有高效率、低成本、高利用率、节能、环保、可适应高速切削要求而得到迅猛发展。

Using high-quality raw materials (tungsten carbide powder and cobalt powder) at home and abroad, based on the intelligent factory management concept, combined with advanced equipment and technology, we manufacture multi brand and high-quality cemented carbide bars, including solid round bars and inner cold hole bars, to provide high-quality raw materials for the whole cemented carbidetool; The bar is processed by advanced processes such as grinding, post-treatment and coating, and the hardening tool with excellent performance is obtained; At the same time, the carbide indexable CNC blade blanks and finished products produced based on high-quality raw materials are high-grade carbide products, which are the symbol of enterprise technology. Because of their high efficiency, low cost, high utilization rate, energy saving, environmental protection and adaptability to high-speed cutting requirements.

我司致力于在3C电子、模具、通用机械、汽车、航天航空、军工等行业领域为客户提供专业的整体解决方案和完善服务，一切以产品质量及服务质量为先。公司秉承“一切从诚信做起”的经营理念，与客户互利共赢，携手共进。

Our company is committed to providing customers with professional overall solutions and perfect services in the fields of 3C electronics, molds, general machinery, automobile, aerospace, military industry and other industries, all of which are based on product quality and service quality. The company adheres to the business philosophy of "everything starts from integrity", and works together with customers for mutual benefit and win-win results.

目录 CONTENT

05-07 基本信息 Basic Information

06 牌号介绍 Grade Introduction

07 牌号推荐 Grade Selection Guide

08-19 硬质合金圆棒 Cemented Carbide Rods

09 公制长棒 Solid Rods-Metric

10 英制长棒 Solid Rods-Inch

11 精磨倒角短棒 Ground Rods with Chamfer-Metric

12 英制精磨倒角短棒 Ground Rods with Chamfer-Inch

14-15 30°双螺旋孔棒材 Rods with 2 Helical Coolant Holes

16 30°三螺旋孔棒材 Rods with 3 Helical Coolant Holes

17 单直孔棒材 Rods with Central Coolant Hole

18-19 双直孔棒材 Rods with 2 Parallel Coolant Holes

20-24 通用技术信息 General Technical Guide

21 公差等级 Tolerances

22 材质项目名词解释 Properties

23-24 尺寸项目名词 Definitions of Geometrical Tolerance

Basic Information
基本信息

A

牌号介绍
Grade Introduction

牌号 Grade	ISO牌号 ISO Grade	晶粒度 Grain Size	钴含量 Cobalt Content	硬度 Hardness		密度 Density	抗弯强度 TRS	牌号应用 Application
		um	%	HRA	HV30	g/cm³	N/mm²	
U062	K05-K10	0.2	9	94.0	2050	14.4	4000	适用于各种高硬材料（HRC大于58）精加工，不锈钢、铝合金等高光表面处理。 Special ultrafine carbide grade for finishing high hardened materials (above HRC58), high light surface treatment of stainless steel, aluminum alloy and so on.
UF06	K05-K10	0.4	6	94.0	2050	14.8	3800	适用于高硬材料、复合材料精加工，PCB刀具，雕刻刀。 Suitable for high hardened materials and finish-machining of compostie material; also application for PCB tools and gravers.
UF08	K10-K20	0.4	8.5	93.5	1940	14.5	3800	适用于高硬材料、复合材料加工，PCB铣刀、钻头。 Suitable for processing high hard materials, composite materials, PCB milling cutter and drills.
UF12	K20-K40	0.4	12	92.6	1750	14.1	4200	超细颗粒,兼容了良好的硬度和韧性适用于精加工以及加工合金刚，铝合金，钛合金等。 Ultrafine grain size, higher Co Content; with excellent hardness and toughness. Suitable for finish machining and steel , Alalloy and Ti alloy cutting.
FX10	K20-K40	0.6	10	92.3	1700	14.4	4200	适用于合金钢、不锈钢、有色金属、高温合金等材料的切削加工。 Suitable for cutting alloy steel, stainless steel, non-ferrous metal, high temperature alloy and so on.
FX12	K20-K40	0.6	12	91.5	1600	14.15	4200	适用于不锈钢、钛合金、镍基合金等材料的切削加工。 Suitable for stainless steel, Ti alloy nickel base alloy and so on.
FS10	K20-K40	0.7	10	91.9	1630	14.4	4000	通用型铣刀、钻头材质，适用于普通合金钢、不锈钢、灰口铸铁、耐热合金等材料的切削加工。 For general use of milling and drilling, suitable for cutting alloy steel, stainless steel, grey cast iron, heat-resistant alloy and so on.
WK05	K15	1.0	6	92.5	1740	14.9	2600	适用于有色金属、高硅铝合金和石墨制品（需涂层）。 Suitable for machining non-ferrous metal, aluminium with a high silicon content and graphite（with coating）.

牌号推荐
Grade Selection Guide

加工材料 Workpiece		刀具种类 Type of Cutting Tools		U062	UF06	UF08	UF12	FX10	FX12	FS10	WK05
P	钢 Steel	立铣刀 Endmill	粗加工 Roughing					●		★	
			精加工 Finishing				★	●		●	
		钻头 Drill						●		★	
M	不锈钢 Stainless steel	立铣刀 Endmill	粗加工 Roughing					●		★	
			精加工 Finishing	●			●	★			
		钻头 Drill						●		★	
K	铸铁 Castlron	立铣刀 Endmill	粗加工 Roughing							★	
			精加工 Finishing					★		●	▲
		钻头 Drill						●		★	
N	有色金属 Nonferrous Material	立铣刀 Endmill	粗加工 Roughing					●		★	
			精加工 Finishing	●			★	●		●	▲
		钻头 Drill								★	
S	耐热合金 Heat Resistance Material	立铣刀 Endmill	粗加工 Roughing			●			★		
			精加工 Finishing				★		●		
		钻头 Drill						●	★		
H	高硬材料 Hardened Material	立铣刀 Endmill	粗加工 Roughing	●		★	●				
			精加工 Finishing	★	●	●					
		钻头 Drill				●		●		★	
其它 Others	石墨 Graphite										▲
	碳纤维增强塑料 CFRP			●	●	●					▲
	印刷电路板 PCB			●	★	●					

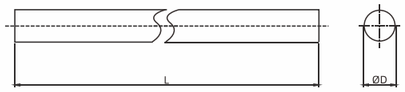
★	优选 First Chioce
●	备选 Second Choice
▲	涂层 Coating

SOLID RODS
实心圆棒

B

公制长棒
Solid Long Rods-Metric

FS10 FX10 UF12



直径 ØD	长度 L	FS10/FX10	UF12
2	310/330	○	○
3	310/330	●	●
4	310/330	●	●
5	310/330	●	●
6	310/330	●	●
7	310/330	●	○
8	310/330	●	●
9	310/330	●	○
10	310/330	●	●
11	310/330	●	●
12	310/330	●	●
13	310/330	●	○
14	310/330	●	●
15	310/330	●	○
16	310/330	●	●
17	310/330	●	○
18	310/330	●	●
19	310/330	●	○
20	310/330	●	●
21	310/330	●	○

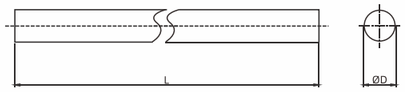
直径 ØD	长度 L	FS10/FX10	UF12
22	310/330	●	○
23	310/330	○	○
24	310/330	●	○
25	310/330	●	○
26	310/330	●	○
27	310/330	●	○
28	310/330	●	○
29	310/330	●	○
30	310/330	●	○
31	310/330	●	○
32	310/330	●	○
33	310/330	●	○
34	310/330	●	○
35	310/330	●	○
36	310/330	●	○
37	310/330	●	○
38	310/330	●	○
39	310/330	●	○
40	310/330	●	○

● 有库存 Stock　　○ 需订货 Order

产品标准 Products Standard	毛坯 Unground ØD(mm)		精磨 Ground ØD(mm)		长度 L (mm)
	范围 (Range)	公差 (Tol.)	范围 (Range)	公差 (Tol.)	公差 (Tol.)
	2≤ØD < 3	+0.15,+0.30	2≤ØD≤40	h5/h6	0,+5
	3≤ØD≤6	+0.30,+0.50			
	6 < ØD≤12	+0.30,+0.60			
	12 < ØD≤16	+0.30,+0.70			
	16 < ØD≤42	+0.30,+0.80			

英制长棒
Solid Long Rods-Inch

FS10 FX10 UF12



直径 ØD	长度 L	FS10/FX10/UF12
0.1250	13-1/8	○
0.1406	13-1/8	○
0.1563	13-1/8	○
0.1719	13-1/8	○
0.1875	13-1/8	○
0.2031	13-1/8	○
0.2188	13-1/8	○
0.2344	13-1/8	○
0.2500	13-1/8	○
0.2813	12-1/8	○
0.2969	12-1/8	○
0.3125	12-1/8	○
0.3281	12-1/8	○
0.3438	12-1/8	○
0.3594	12-1/8	○
0.3750	12-1/8	○
0.3906	12-1/8	○

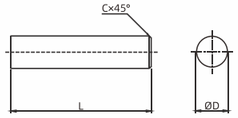
直径 ØD	长度 L	FS10/FX10/UF12
0.4063	12-1/8	○
0.4219	12-1/8	○
0.4375	12-1/8	○
0.4531	12-1/8	○
0.4688	12-1/8	○
0.4844	12-1/8	○
0.5000	12-1/8	○
0.5313	12-1/8	○
0.5625	12-1/8	○
0.6250	12-1/8	○
0.6875	12-1/8	○
0.7500	12-1/8	○
0.8125	12-1/8	○
0.8750	12-1/8	○
0.9375	12-1/8	○
1.0000	12-1/8	○

● 有库存 Stock　　○ 需订货 Order

产品标准 Products Standard	毛坯 Unground ØD(mm)		精磨 Ground ØD(mm)		长度 L (mm)
	范围 (Range)	公差 (Tol.)	范围 (Range)	公差 (Tol.)	公差 (Tol.)
	1/8≤ØD≤1/4	+0.012,+0.020	1/8≤ØD≤1	h5/h6	+1/8,+3/8
	1/4 < ØD≤31/64	+0.012,+0.024			
	31/64 < ØD≤5/8	+0.012,+0.028			
	5/8 < ØD≤1	+0.012,+0.032			
	16 < ØD≤42	+0.30,+0.80			

公制精磨倒角短棒 (h5/h6)
Ground Rods with Chamfer–Metric

FS10 FX10 UF12



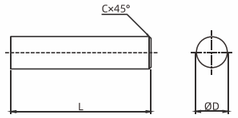
直径 ØD	长度 L	倒角尺寸 C	倒角角度 Angle of chamfer
3	40	0.4	45°
3	50	0.4	45°
3	70	0.4	45°
3	100	0.4	45°
3	150	0.4	45°
4	40	0.4	45°
4	50	0.4	45°
4	75	0.4	45°
4	100	0.4	45°
4	150	0.4	45°
5	50	0.4	45°
5	55	0.5	45°
5	60	0.5	45°
5	70	0.5	45°
5	80	0.5	45°
5	100	0.5	45°
5	150	0.5	45°
6	50	0.5	45°
6	60	0.5	45°
6	75	0.5	45°
6	100	0.5	45°
6	150	0.5	45°
7	55	0.6	45°
7	60	0.6	45°
8	60	0.6	45°
8	75	0.6	45°

直径 ØD	长度 L	倒角尺寸 C	倒角角度 Angle of chamfer
8	80	0.6	45°
8	90	0.6	45°
8	100	0.6	45°
8	150	0.6	45°
10	70	0.6	45°
10	75	0.6	45°
10	90	0.6	45°
10	100	0.6	45°
10	125	0.6	45°
11	110	0.8	45°
12	75	0.8	45°
12	90	0.8	45°
12	100	0.8	45°
12	120	0.8	45°
14	75	0.8	45°
14	110	0.8	45°
14	125	0.8	45°
16	100	0.8	45°
16	125	0.8	45°
18	100	0.8	45°
18	150	0.8	45°
20	100	1.0	45°
20	120	1.0	45°
20	150	1.0	45°
25	100	1.0	45°
25	150	1.0	45°

产品标准 Products Standard	毛坯 Unground ØD(mm)		倒角尺寸 C (mm)	倒角角度 AngleofChamfer (°)	长度 L (mm)
	范围 (Range)	公差 (Tol.)	范围 (Range)	公差 (Tol.)	公差 (Tol.)
	3≤ØD≤25	h5/h6	±0.1	45°±3°	0,+1.0

英制精磨倒角短棒 (h5/h6)
Ground Rods with Chamfer-Inch

FS10 FX10 UF12



直径 ØD	长度L (公差Tol./0,+1/16)	倒角尺寸 Chamfer Size	
		C	公差 Tol
1/8	1-1/2	0.015	±0.004
1/8	2	0.015	±0.004
1/8	2-1/2	0.015	±0.004
1/8	3	0.015	±0.004
3/16	2	0.015	±0.004
3/16	3	0.015	±0.004
1/4	2	0.015	±0.004
1/4	2-1/2	0.015	±0.004
1/4	3	0.015	±0.004
1/4	4	0.015	±0.004
5/16	2-1/2	0.015	±0.004
3/8	2-1/2	0.015	±0.004
3/8	3	0.015	±0.004
1/2	2-1/2	0.031	±0.008
1/2	3	0.031	±0.008
1/2	4	0.031	±0.008
5/8	3-1/2	0.031	±0.008
3/4	4	0.031	±0.008
3/4	5	0.031	±0.008
1	4	0.031	±0.008

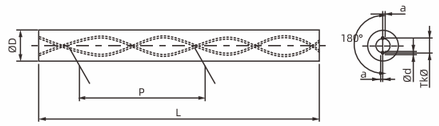
产品标准 Products Standard	精磨 Ground ØD(inch)		倒角角度 AngleofChamfer (°)
	范围 (Range)	公差 (Tol.)	公差 (Tol.)
	0.0125≤ØD≤1.25	h5/h6	45°±3°

RODS WITH COOLENT HOLES
带内冷孔棒材

C

30°双螺旋孔棒材
Rods with 2 Helical Coolant Holes (30°)

FS10 FX10

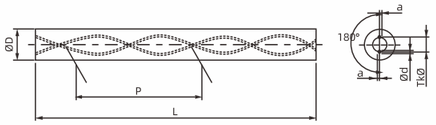


直径 ØD	长度L (公差Tol./0,+5)	内孔直径 Ød	孔间距 Bolt Circle TKØ	螺距 (±0.5°) Pitch			孔中心偏离 Hole Deviation a
				P	Tol.		
3	330	0.40	1.70	16.32	-0.33	+0.33	0.15
4	330	0.60	2.20	21.77	-0.43	+0.45	0.15
5	330	0.70	2.60	27.21	-0.54	+0.56	0.15
6	330	0.70	2.60	32.65	-0.65	+0.67	0.15
7	330	1.00	3.70	38.09	-0.76	+0.78	0.15
8	330	1.00	4.00	43.53	-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	0.37

产品标准 Products Standard	毛坯 Unground ØD(mm)		精磨 Ground ØD(mm)	
	范围 (Range)	公差 (Tol.)	范围 (Range)	公差 (Tol.)
	3≤ØD≤6	+0.60,+1.00	3≤ØD≤25	h5/h6
	6 < ØD≤24	+0.70,+1.10		
	ØD=25	+0.80,+1.20		
	内孔径 Ød(mm)		孔间距 TKØ(mm)	
	范围 (Range)	公差 (Tol.)	范围 (Range)	公差 (Tol.)
	0.40≤Ød≤0.90	±0.10	TKØ≤4.00	+0,-0.40
	0.90 < Ød≤1.70	±0.15	4.00 < TKØ≤5.00	+0,-0.60
	Ød=1.75	±0.20	5.00 < TKØ≤10.10	+0,-0.80
	Ød=2.00	±0.25	10.10 < TKØ≤13.30	+0,-1.00

30°双螺旋孔棒材
Rods with 2 Helical Coolant Holes (30°)

FS10 FX10

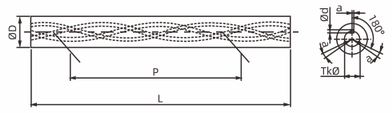


直径 ØD	长度L (公差Tol./0,+5)	内孔直径 Ød	孔间距 Bolt Circle TKØ	螺距 (±0.5°) Pitch			孔中心偏离 Hole Deviation a
				P	Tol.		
14	330	1.75	7.10	76.18	-1.51	+1.56	0.40
14	330	1.90	6.70	76.18	-1.51	+1.56	0.40
15	330	1.75	7.70	81.62	-1.62	+1.67	0.40
16	330	1.75	8.30	87.06	-1.73	+1.78	0.40
16	330	2.10	8.00	87.07	-1.73	+1.78	0.45
16	330	2.50	8.80	87.06	-1.73	+1.78	0.45
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
18	330	2.80	9.90	97.95	-1.95	+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
20	330	2.50	10.00	108.83	-2.16	+2.23	0.50
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

产品标准 Products Standard	毛坯 Unground ØD(mm)		精磨 Ground ØD(mm)	
	范围 (Range)	公差 (Tol.)	范围 (Range)	公差 (Tol.)
	3≤ØD≤6	+0.60,+1.00	3≤ØD≤25	h5/h6
	6 < ØD≤24	+0.70,+1.10		
	ØD=25	+0.80,+1.20		
	内孔径 Ød(mm)		孔间距 TKØ(mm)	
	范围 (Range)	公差 (Tol.)	范围 (Range)	公差 (Tol.)
	0.40≤Ød≤0.90	±0.10	TKØ≤4.00	+0,-0.40
	0.90 < Ød≤1.70	±0.15	4.00 < TKØ≤5.00	+0,-0.60
	Ød=1.75	±0.20	5.00 < TKØ≤10.10	+0,-0.80
	Ød=2.00	±0.25	10.10 < TKØ≤13.30	+0,-1.00

30°三螺旋孔棒材
Rods with 3 Helical Coolant Holes (30°)

FS10 FX10

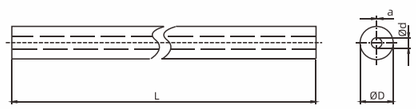


直径 ØD	长度L (公差Tol./0,+5)	内孔直径 Ød	孔间距 Bolt Circle TKØ	螺距 (±0.5°) Pitch			孔中心偏离 Hole Deviation	
				P	Tol.		a	α
6	330	0.70	2.75	32.65	-0.65	+0.67	0.15	±4°
6	330	0.50	2.90	32.65	-0.65	+0.67	0.15	±4°
8	330	1.00	4.00	43.53	-0.86	+0.89	0.15	±4°
8	330	0.70	4.00	43.53	-0.86	+0.89	0.15	±4°
10	330	1.40	5.00	54.41	-1.08	+1.11	0.20	±4°
10	330	0.85	5.10	54.41	-1.08	+1.11	0.20	±4°
12	330	1.40	6.00	65.30	-1.30	+1.34	0.30	±4°
12	330	1.10	6.30	65.30	-1.30	+1.34	0.30	±4°
14	330	1.75	7.00	76.18	-1.51	+1.56	0.40	±4°
14	330	1.40	7.30	76.18	-1.51	+1.56	0.40	±4°
16	330	1.75	8.00	87.06	-1.73	+1.78	0.40	±4°
16	330	1.60	8.30	87.06	-1.73	+1.78	0.40	±4°
18	330	2.00	9.55	97.95	-1.94	+2.00	0.50	±4°
18	330	1.70	9.50	97.95	-1.94	+2.00	0.50	±4°
20	330	2.00	10.00	108.83	-2.16	+2.23	0.50	±4°
20	330	1.90	10.20	108.83	-2.16	+2.23	0.50	±4°

产品标准 Products Standard	毛坯 Unground ØD(mm)		精磨 Ground ØD(mm)	
	范围 (Range)	公差 (Tol.)	范围 (Range)	公差 (Tol.)
	ØD=6	+0.60,+1.00	6≤ØD≤20	h5/h6
	6<ØD≤20	+0.70,+1.10		
	内孔径 Ød(mm)		孔间距 TKØ(mm)	
	范围 (Range)	公差 (Tol.)	范围 (Range)	公差 (Tol.)
	0.40≤Ød≤0.90	±0.10	TKØ≤4.00	+0,-0.40
	0.90 < Ød≤1.70	±0.15	4.00 < TKØ≤6.00	+0,-0.60
	Ød=1.75	±0.20	6.00 < TKØ≤9.55	+0,-0.80
	Ød=2.00	±0.25	TKØ=10.00	+0,-1.00

单直孔棒材
Rods with Central Coolant Hole

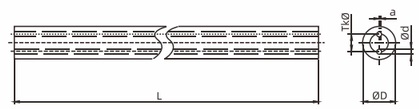
FS10 FX10 UF12



直径 Diameter			长度L (公差Tol./0,+5)	内孔径 Hole Diameter	
ØD	毛坯公差 Tol. of Unground	精品公差 Tol. of Ground		Ød	Tol.
3	+0.30,+0.50	h5/h6	330	0.50	±0.10
4	+0.30,+0.50	h5/h6	330	0.80	±0.10
5	+0.30,+0.50	h5/h6	330	0.80	±0.10
6	+0.30,+0.50	h5/h6	330	1.00	±0.15
7	+0.30,+0.60	h5/h6	330	1.00	±0.15
8	+0.30,+0.60	h5/h6	330	1.00	±0.15
9	+0.30,+0.60	h5/h6	330	1.40	±0.15
10	+0.30,+0.60	h5/h6	330	1.40	±0.15
11	+0.30,+0.60	h5/h6	330	1.40	±0.15
12	+0.30,+0.60	h5/h6	330	1.75	±0.15
13	+0.30,+0.70	h5/h6	330	1.75	±0.15
14	+0.30,+0.70	h5/h6	330	1.75	±0.15
15	+0.30,+0.70	h5/h6	330	2.00	±0.20
16	+0.30,+0.70	h5/h6	330	2.00	±0.20
17	+0.30,+0.80	h5/h6	330	2.00	±0.20
18	+0.30,+0.80	h5/h6	330	2.00	±0.20
19	+0.30,+0.80	h5/h6	330	2.00	±0.20
20	+0.30,+0.80	h5/h6	330	2.50	±0.25
21	+0.30,+0.80	h5/h6	330	2.50	±0.25
22	+0.30,+0.80	h5/h6	330	2.50	±0.25
23	+0.30,+0.80	h5/h6	330	2.50	±0.25
24	+0.30,+0.80	h5/h6	330	3.00	±0.25
25	+0.30,+0.80	h5/h6	330	3.00	±0.25
26	+0.30,+0.80	h5/h6	330	3.00	±0.25
27	+0.30,+0.80	h5/h6	330	3.00	±0.25
28	+0.30,+0.80	h5/h6	330	3.00	±0.25
29	+0.30,+0.80	h5/h6	330	3.00	±0.25
30	+0.30,+0.80	h5/h6	330	3.00	±0.25

双直孔棒材
Rods with Two Straight Coolant Holes

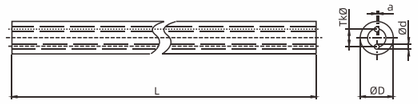
FS10 FX10 UF12



直径 Diameter			长度L (公差Tol./0,+5)	内孔径 Hole Diameter		孔间距 Bolt Circle	
ØD	毛坯公差 Tol. of Unground	精品公差 Tol. of Ground		Ød	Tol.	TKØ	Tol.
4	+0.30,+0.50	h5/h6	330	0.80	±0.10	1.80	+0,-0.15
5	+0.30,+0.50	h5/h6	330	0.80	±0.10	2.00	+0,-0.15
6	+0.30,+0.50	h5/h6	330	1.00	±0.15	3.00	+0,-0.20
7	+0.30,+0.60	h5/h6	330	1.00	±0.15	3.50	+0,-0.20
8	+0.30,+0.60	h5/h6	330	1.00	±0.15	4.00	+0,-0.30
9	+0.30,+0.60	h5/h6	330	1.40	±0.15	4.00	+0,-0.30
10	+0.30,+0.60	h5/h6	330	1.40	±0.15	5.00	+0,-0.30
11	+0.30,+0.60	h5/h6	330	1.40	±0.15	5.00	+0,-0.30
12	+0.30,+0.60	h5/h6	330	1.75	±0.15	6.00	+0,-0.30
13	+0.30,+0.70	h5/h6	330	1.75	±0.15	6.00	+0,-0.30
14	+0.30,+0.70	h5/h6	330	1.75	±0.15	7.00	+0,-0.30
15	+0.30,+0.70	h5/h6	330	2.00	±0.20	7.00	+0,-0.30
16	+0.30,+0.70	h5/h6	330	2.00	±0.20	8.00	+0,-0.30
17	+0.30,+0.80	h5/h6	330	2.00	±0.20	8.00	+0,-0.30
18	+0.30,+0.80	h5/h6	330	2.00	±0.20	9.00	+0,-0.30
19	+0.30,+0.80	h5/h6	330	2.00	±0.20	9.00	+0,-0.30
20	+0.30,+0.80	h5/h6	330	2.50	±0.25	10.00	+0,-0.40
21	+0.30,+0.80	h5/h6	330	2.50	±0.25	10.00	+0,-0.40
22	+0.30,+0.80	h5/h6	330	2.50	±0.25	11.00	+0,-0.40
23	+0.30,+0.80	h5/h6	330	2.50	±0.25	11.00	+0,-0.40
24	+0.30,+0.80	h5/h6	330	3.00	±0.25	12.00	+0,-0.50
25	+0.30,+0.80	h5/h6	330	3.00	±0.25	12.00	+0,-0.50
26	+0.30,+0.80	h5/h6	330	3.00	±0.25	13.00	+0,-0.50

双直孔棒材
Rods with Two Straight Coolant Holes

FS10 FX10 UF12



直径 Diameter			长度L (公差Tol./0,+5)	内孔径 Hole Diameter		孔间距 Bolt Circle	
ØD	毛坯公差 Tol. of Unground	精品公差 Tol. of Ground		Ød	Tol.	TKØ	Tol.
6	+0.30,+0.50	h5/h6	330	0.80	±0.10	1.50	+0,-0.20
7	+0.30,+0.60	h5/h6	330	0.80	±0.10	1.50	+0,-0.20
8	+0.30,+0.60	h5/h6	330	1.00	±0.15	1.50	+0,-0.30
9	+0.30,+0.60	h5/h6	330	1.00	±0.15	2.60	+0,-0.30
10	+0.30,+0.60	h5/h6	330	1.00	±0.15	2.60	+0,-0.30
11	+0.30,+0.60	h5/h6	330	1.20	±0.15	3.60	+0,-0.30
12	+0.30,+0.60	h5/h6	330	1.20	±0.15	3.60	+0,-0.30
13	+0.30,+0.70	h5/h6	330	1.20	±0.15	3.60	+0,-0.30
14	+0.30,+0.70	h5/h6	330	1.50	±0.15	5.00	+0,-0.30
15	+0.30,+0.70	h5/h6	330	1.50	±0.15	5.00	+0,-0.30
16	+0.30,+0.70	h5/h6	330	1.50	±0.15	5.00	+0,-0.30
17	+0.30,+0.80	h5/h6	330	2.00	±0.20	6.20	+0,-0.30
18	+0.30,+0.80	h5/h6	330	2.00	±0.20	6.20	+0,-0.30
19	+0.30,+0.80	h5/h6	330	2.00	±0.20	6.20	+0,-0.30
20	+0.30,+0.80	h5/h6	330	2.00	±0.20	6.20	+0,-0.40
21	+0.30,+0.80	h5/h6	330	2.00	±0.20	6.20	+0,-0.40
22	+0.30,+0.80	h5/h6	330	2.00	±0.20	6.20	+0,-0.40
23	+0.30,+0.80	h5/h6	330	2.00	±0.20	7.50	+0,-0.40
24	+0.30,+0.80	h5/h6	330	2.00	±0.20	7.50	+0,-0.50
25	+0.30,+0.80	h5/h6	330	2.00	±0.20	7.50	+0,-0.50
26	+0.30,+0.80	h5/h6	330	2.00	±0.20	7.50	+0,-0.50
25	+0.30,+0.80	h5/h6	330	3.00	±0.25	12.00	+0,-0.50
26	+0.30,+0.80	h5/h6	330	3.00	±0.25	13.00	+0,-0.50

GENERAL TECHNICAL GUIDE
通用技术信息

D

公差等级
Carbide Rod Tolerances

■ 精磨外径公差 Tol. of Ground Rods' Diameter

外径 Diameter	h4	h5	h6	h7
0-3.0mm 0-0.1181in.	0.003mm 0.00012in.	0.004mm 0.00015in.	0.006mm 0.00024in.	0.010mm 0.00039in.
3.001-6.0mm 0.1181-0.2362in.	0.004mm 0.00015in.	0.005mm 0.00020in.	0.008mm 0.00031in.	0.012mm 0.00047in.
6.001-10.0mm 0.2363-0.3937in.	0.004mm 0.00015in.	0.006mm 0.00024in.	0.009mm 0.00035in.	0.015mm 0.00059in.
10.001-18.0mm 0.3938-0.7087in.	0.005mm 0.00020in.	0.008mm 0.00031in.	0.011mm 0.00043in.	0.018mm 0.00071in.
18.001-30.0mm 0.7088-1.1811in.	0.006mm 0.00024in.	0.009mm 0.00035in.	0.013mm 0.00051in.	0.021mm 0.00083in.
30.001-50.0mm 1.1812-1.9685in.	0.007mm 0.00028in.	0.011mm 0.00043in.	0.016mm 0.00063in.	0.025mm 0.00098in.

■ 棒材表面粗糙度 Surface Roughness of Rods

类型 Type	精度 Accuracy
镜面棒材 Polished Rods	0.00-0.05μm
精磨棒材 Ground Rods	0.00-0.10μm
亚光洁度 Dull Finished	0.10-0.20μm

■ 圆度 Roundness Tolerance

不论外径、长度，精磨圆棒圆度标准均为0.002mm。 The standard roundness tolerance of the ground rod is 0.002mm.

材质项目名词解释
Definitions of Physical Properties

硬度 / Hardness

金属材料抵抗其它更硬物体压入表面的能力称为硬度，主要采用洛氏或维氏硬度测量法，两种硬度值转换时需要注意换算。

The Hardness of material is defined as the ability to fight against the hard pressed into surface of the object, mainly using measurements of Rockwell and Vickers. As the principles of the Vickers and Rockwell tests are different, care must be taken when converting from one system to the other.

密度 / Density

材料的密度（比重）是材料质量与其体积的比率，使用液体置换法进行测定，硬质合金密度随WC-Co相中钴含量增加而减小。

The Density (specific gravity) of a material is the ratio of its mass to its volume. It is measured using a water displacement technique. Cemented carbide density decreases linearly with increasing Cobalt content for the Wc-Co grades.

矫顽磁力 / Coercive Field Strength

矫顽磁力测量的是合金试样完全去磁化所需的反向磁场大小，它可用来评定合金的组织状况，矫顽力随钴含量降低而增大，当钴含量一定时，碳化钨晶粒越细，钴相分散程度越高，矫顽力也越大。

Coercive Field Strength is a measure of the residual magnetism in the hysteresis loop when the Cobalt (Co) binder in grade of cemented carbide is magnetized and then demagnetized. It can be used to assess the status of alloy organization. The finer the grain size of the carbide phase the higher will be the coercive force value.

磁饱和 / Magnetic Saturation

磁饱和是最大磁化强度与质量的比值，通过测定硬质合金中具有磁性的钴（Co）粘结相的磁饱和，可以评定合金组份。低磁饱和值表示合金含碳量低，或者含有η相碳化物，高磁饱和值表示存在“游离碳或石墨”。

Magnetic Saturation: is the ratio of magnetic intensity to quality. Magnetic Saturation measurements on the Cobalt (Co) binder phase in cemented carbide are used by the industry to evaluate its composition. Low Magnetic Saturation values indicate a low carbon level and/or the presence of Eta-Phase Carbides. High Magnetic Saturation values indicate the presence of 'free-carbon' or Graphite.

金相 / Metallographic Analysis

硬质合金烧结钴相粘结后，过量钴可能在某些结构区域中存在，形成“钴池”；而当粘结相不完全粘结，则将形成一些少量残余孔隙，合金中钴池及孔隙率使用金相显微镜检验得到。

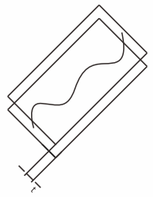
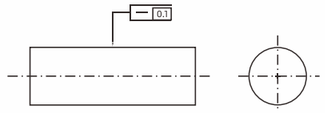
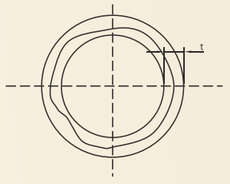
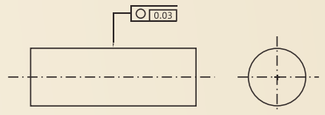
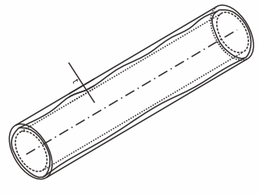
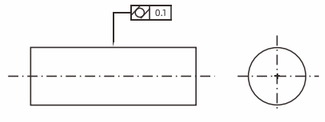
Cobalt Lakes will bond after sintering , excess cobalt may exist in certain area of the structure, forming the cobalt pool; If bonding phase is incompletely adhesive, there will form some residual pores. Cobalt pools and porosity can be detected by using metallographic microscope.

抗弯强度 / Transverse Rupture Strength

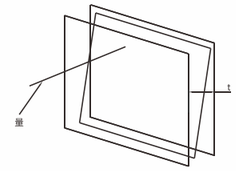
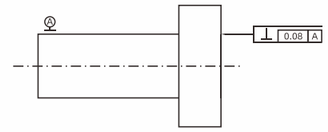
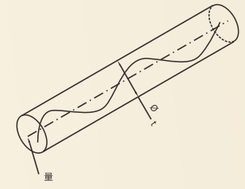
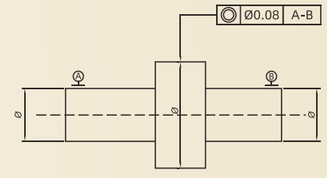
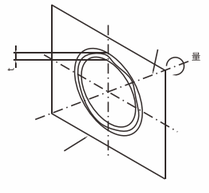
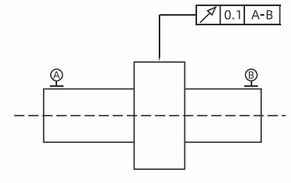
抗弯强度是表征材料抵抗弯曲不断裂的能力，即试样跨距中点加载负荷至断裂时，单位面积上所受的力大小。

Transverse Rupture Strength (TRS) is the ability of material to resist bending , measured at t he breaking point of a material in a standard three point bend test.

尺寸项目名词
Definitions of Geometrical Tolerance

	公差带定义 Definition of Tolerance Zone	标注和解释 Indication and Explanation
直线度 Straightness Tolerance	 在给定方向上公差带是距离为公差值t的两平行平面之间的区域。 The tolerance zone, in the considered plane, is limited by two parallel straight lines a distance t apart and in the specified direction only.	 被测圆柱面的任一素线必须位于距离为公差值0.1的两平行平面之内。 Any extracted (actual) line on the upper surface, parallel to the plane of projection in which the indication is shown, shall be contained between two parallel straight lines 0.1 apart.
圆度 Roundness Tolerance	 是在同一正截面上，半径值差为公差值t的两同心圆之间的区域。 The tolerance zone, in the considered cross- section, is limited by twoconcentric circles with a difference in radii of t.	 被测圆柱面任一正截面的圆周必须位于半径差为公差值0.03的两同心圆之间。 The extracted (actual) circumferential line, in any cross-section of the cylindrical and conical surfaces, shall be contained between two co-planar concentric circles, with a difference in radii of 0.03.
圆柱度 Cylindricity	 是半径差为公差值t的两同轴圆柱面之间的区域。 The tolerance zone is limited by two coaxial cylinders with a difference in radii of t.	 是在同一正截面上，半径值差为公差值t的两同心圆之间的区域。 The tolerance zone, in the considered cross-section, is limited by twoconcentric circles with a difference in radii of t.

尺寸项目名词
Definitions of Geometrical Tolerance

	公差带定义 Definition of Tolerance Zone	标注和解释 Indication and Explanation
垂直度 Perpendicularity Tolerance of a Surface	 是距离为公差值t且垂直于基准线的两平行平面之间的区域。 The tolerance zone is limited by two parallel planes a distance apart and perpendicular to the datum.	 被测面必须位于距离为公差值0.08且垂直于基准线A（基准轴线）的两平行平面之间。 The extracted (actual) surface shall be contained between two parallel planes 0.08 apart that is perpendicular to datum axis A.
同轴度 Concentricity Tolerance of a Point	 是直径为公差值Øt的圆柱面内区域，该圆柱面的轴线与基准轴线同轴。 The tolerance zone is limited by a circle of diameter t; the tolerance value shall be preceded by the symbol Ø. The centre of the circular tolerance zone coincides with the datum point.	 大圆柱面的轴线必须位于直径为公差值Ø0.08且与公共基准线A-B（公共基准轴线）同轴的圆柱面内。 The extracted (actual) median line of the tolerance cylinder shall be within a cylindrical zone of diameter 0.08 the axis of which is the common datum straight line A-B.
圆跳动 Circular run-out Tolerance	 是在垂直于基准轴线的任一半径位置的测量平面内、半径差为公差值t且圆心在基准轴线上的两同心圆之间的区域。 The tolerance zone is limited within any cross-section perpendicular to the datum axis by two concentric circles with a difference in radii of t , the centers of which coincide with the datum.	 当被测要素围绕公共基准线A-B（公共基准轴线）旋转一周时，在任一测量平面内的径向圆跳动均不得大于0.1。 The extracted (actual) line in any cross- section plane perpendicular to common datum straight line A-B shall be contained between two coplanar concentric circles with a difference in radii of 0.1.

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