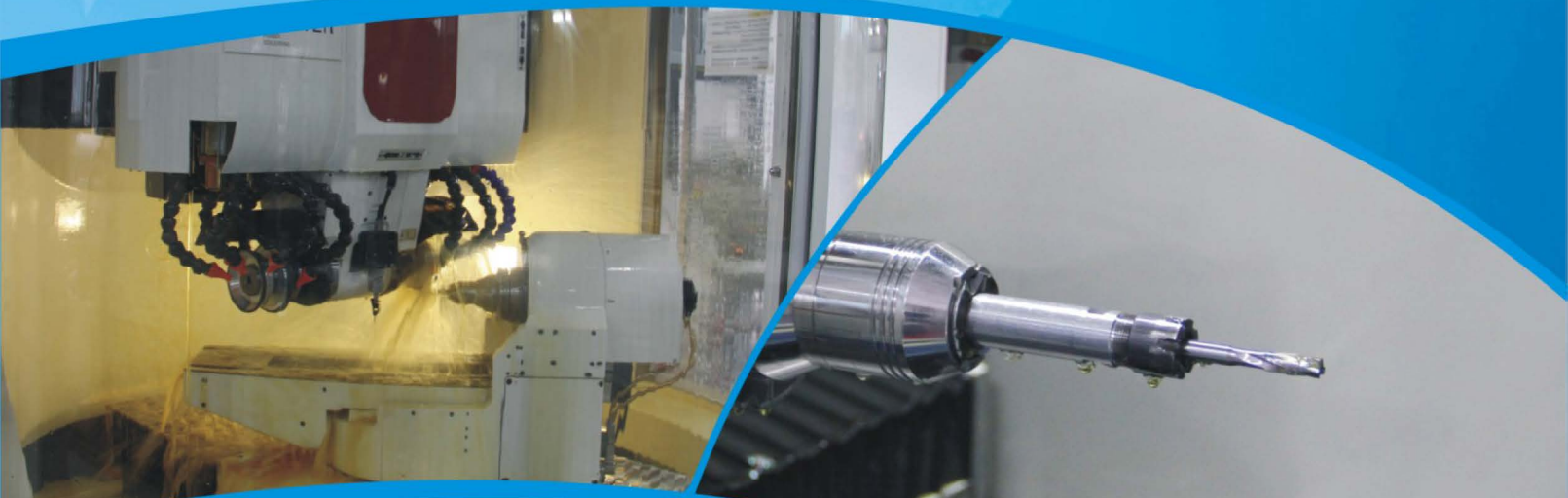
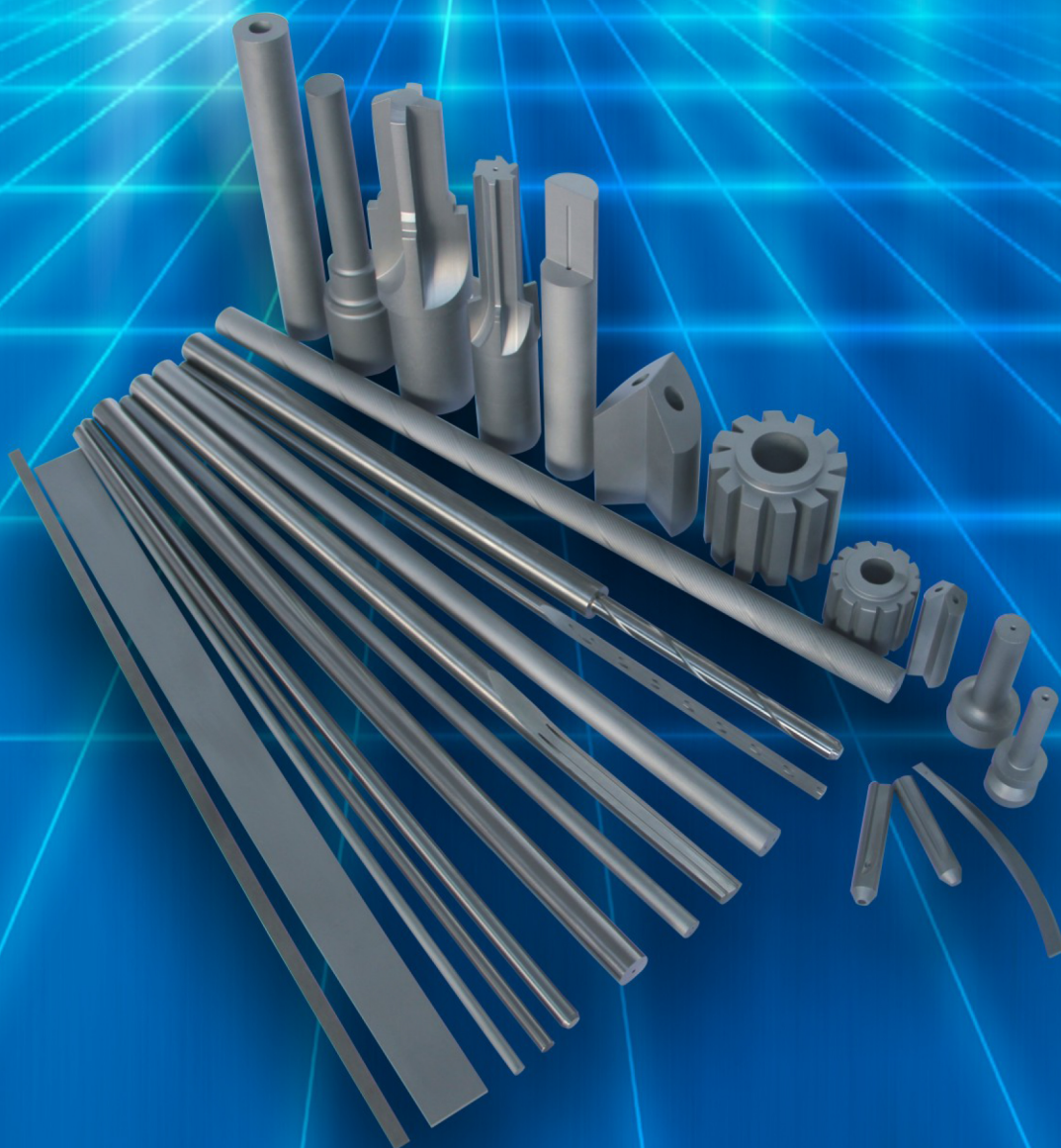


# CEMENTED CARBIDE RODS AND BARS







# Our superiority



- We has been concentrating on the specialized fields for 50 years.
- The products are of top quality. Standardized and customized products in various grades andtypes are available.
- We is a state-rank high tech company, having a postdoctoral scientific research workstation
- Sparing no efforts to develop and seek for new materials to improve product quality and new processing methods to maximize machining practice.



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## » Cemented carbide rods and bars

Our cemented carbide rods and bars are available in a huge variety of grades and dimensions and also meet the requirement of customization: all products will be tailor-made to your needs. Our mission is to supply quality products of the highest standards to our customers.

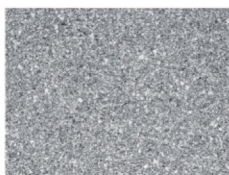
### » Grades of cemented carbide rods and bars

Grades	ISO corresponding	WC %	Co %	Density g/cm <sup>3</sup>	Hardness HRA	TRS N/mm <sup>2</sup>	WC grain size
YG6X	K10	94	6	14.90	92.5	≥3000	Fine grain
ZK10UF	K05-K10	94	6	14.85	93.0	≥3500	Ultra- fine grain
ZK20UF	K20-K30	92	8	14.65	92.6	≥3600	
ZK30UF	K30-K40	90	10	14.45	92.0	≥3800	
ZK31UF	K30-K40	90	10	14.40	91.5	≥4000	
ZK10SF	K05-K10	94	6	14.70	93.5	≥3500	Super-fine grain
ZK20SF	K20-K30	92	8	14.50	93.0	≥3600	
ZK30SF	K30-K40	90	10	14.35	92.5	≥3800	
ZK40SF	K40	88	12	14.15	92.3	≥4300	

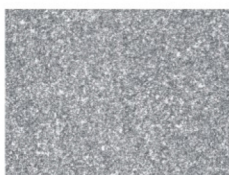
**Note:**

1. The content of tungsten and cobalt is only a nominal value, the density and hardness are average values for your information.  
ZGCC will continuously improve their products, so values of new grades might vary over time.
2. The value of TRS is estimated value of C specimen (3.25x38.7 mm).

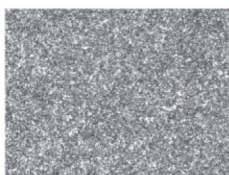
## » Explanation of abbreviations and grades:

**YG6X**

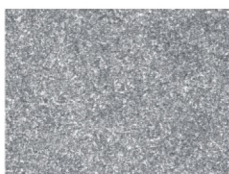
Fine grain size, the ideal matrix for coated diamond solid tools.

**ZK10UF**

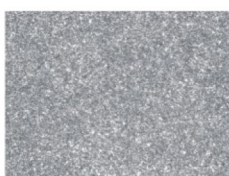
Ultra-Fine grain size. Recommended for making solid cemented carbide drills and reamers, suitable for machining aluminum alloys, nonferrous alloys, various plastics and carbon fibers.

**ZK30UF**

Ultra-Fine grain size, good for general purposes. Recommended for making solid cemented carbide drills and milling cutters, suitable for machining nonferrous metals, die steels, grey cast irons, heat-resistant steels, titanium alloys and stainless steels.

**ZK31UF**

Ultra-Fine grain size with excellent toughness. Recommended for making solid cemented carbide drills and cutters, suitable for machining grey cast irons, stainless steels, die steels, heat-resistant steels and titanium alloys.

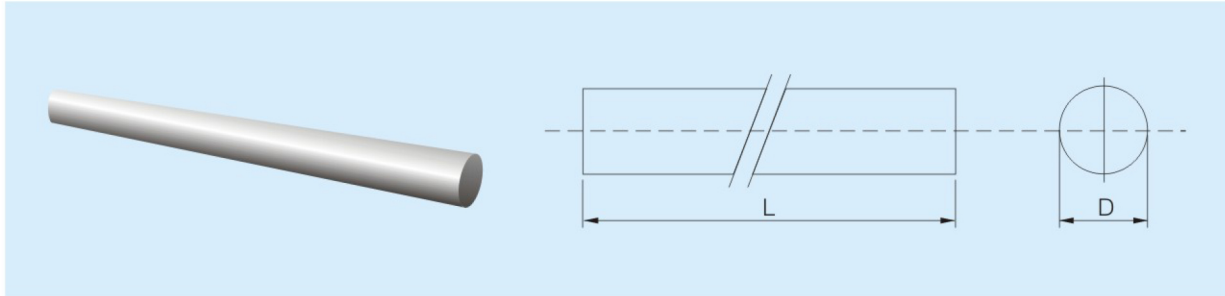
**ZK40SF**

Super-Fine grain size, combining good toughness and wear resistance. Recommended for making high speed milling cutters and drills, suitable for machining stainless steels, hardening steels, alloy steels, aluminum alloys, titanium alloys and high temperature alloys.



## » Sizes and dimensions of cemented carbide rods and bars

### » Normal dimension underground rods



Type	Dimension & Tolerance			
	Diameter mm	Diameter Tolerance mm	Length mm	Length Tolerance mm
XCT0L	0.5	+0.50 +0.20	310/330	+5.0 +0
XC01L	1.0			
XCT1L	1.5			
XC02L	2.0			
XCT2L	2.5			
XC03L	3.0			
XCT3L	3.5			
XC04L	4.0			
XCT4L	4.5			
XC05L	5.0			
XCT5L	5.5			
XC06L	6.0			
XCT6L	6.5			
XC07L	7.0			
XCT7L	7.5			
XC08L	8.0			
XCT8L	8.5			
XC09L	9.0			
XCT9L	9.5			
XC10L	10.0			
XCT10L	10.5			
XC11L	11.0			
XCT11L	11.5			
XC12L	12.0			
XCT12L	12.5			
XC13L	13.0			
XCT13L	13.5			

Type	Dimension & Tolerance			
	Diameter mm	Diameter Tolerance mm	Length mm	Length Tolerance mm
XC14L	14.0	+0.55 +0.25	310/330	+5.0 +0
XCT14L	14.5			
XC15L	15.0			
XCT15L	15.5			
XC16L	16.0			
XCT16L	16.5			
XC17L	17.0			
XC18L	18.0			
XC19L	19.0			
XC20L	20.0			
XC21L	21.0			
XC22L	22.0			
XC23L	23.0			
XC24L	24.0			
XC25L	25.0			
XC26L	26.0			
XC27L	27.0			
XC28L	28.0			
XC29L	29.0			
XC30L	30.0			
XC31L	31.0			
XC32L	32.0			
XC33L	33.0			
XC34L	34.0			
XC35L	35.0			
XC36L	36.0			
XC37L	37.0			
XC38L	38.0			
XC39L	39.0			
XC40L	40.0			

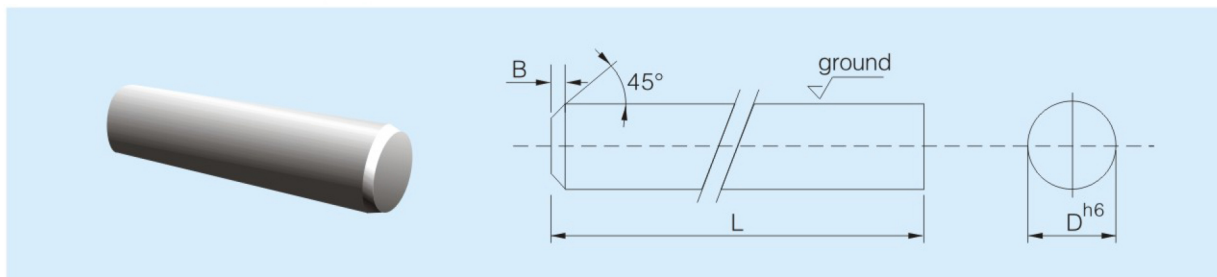
XC T10 L

L: length, expressed in 3 digits. "0" will be added before the digits if the digits are less than 3.

T10: Diameter, (D) is 10.50 mm, expressed with 2 or 3 digits, "0" will be added before the digits if the digits are less than 3.

XC: Rods.

## » Ground short rods (h6)



Diameter		Length		Chamfer		Tolerance code
D Inch	D mm	L Inch	L mm	B Inch	B mm	code
1/8	3.175	1 1/2	38.1	0.015	0.381	S
		2	50.8			S
		3	76.2			T
3/16	4.763	1 1/2	38.1	0.015	0.381	S
		2	50.8			S
		2 1/2	63.5			U
		3	76.2			T
1/4	6.350	1 1/2	38.1	0.025	0.635	S
		2	50.8			S
		2 1/2	63.5			U
		3	76.2			T
		3 1/4	82.6			T
		3 1/2	88.9			T
		4	101.6			T
5/16	7.938	2	50.8	0.025	0.635	S
		2 1/2	63.5			U
5/16	7.938	3	76.2	0.025	0.635	T
		3 1/2	88.9			T
		4	101.6			T
3/8	9.525	2	50.8	0.030	0.762	S
		2 1/2	63.5			U
		3	76.2			T
		3 1/4	82.6			T
		3 1/2	88.9			T
		4	101.6			T
		6	152.4			T

## » Ground short rods (h6)

Diameter		Length		Chamfer		Tolerance code
D inch	D mm	L inch	L mm	B inch	B mm	code
7/16	11.113	21/2	63.5	0.030	0.762	U
		23/4	69.9			U
		4	101.6			T
		41/2	114.3			T
		5	127			T
1/2	12.700	21/2	63.5			U
		3	76.2			T
		31/8	79.4			T
		4	101.6			T
		41/2	114.3			T
		5	127			T
		6	152.4			T
9/16	14.288	3	76.2			T
		31/2	88.9			T
5/8	15.875	3	76.2			T
		31/2	88.9			T
		33/4	95.3			T
		41/8	104.8			T
		5	127			T
		8	203.2			T
3/4	19.050	3	76.2	0.040	1.016	T
		31/2	88.9			T
		4	101.6			T
		41/2	114.3			T
		5	127			T
		6	152.4			T
		61/2	165.1			T
7/8	22.225	4	101.6			T
1	25.400	3	76.2			T
		31/2	88.9			T
		4	101.6			T
		5	127			T
		6	152.4			T
		7	177.8			T
1 1/4	31.750	41/2	114.3			T
		6	152.4			T
		71/2	190.5			T

Diameter Tolerance: h6

Chamfer of one side: B x 45°

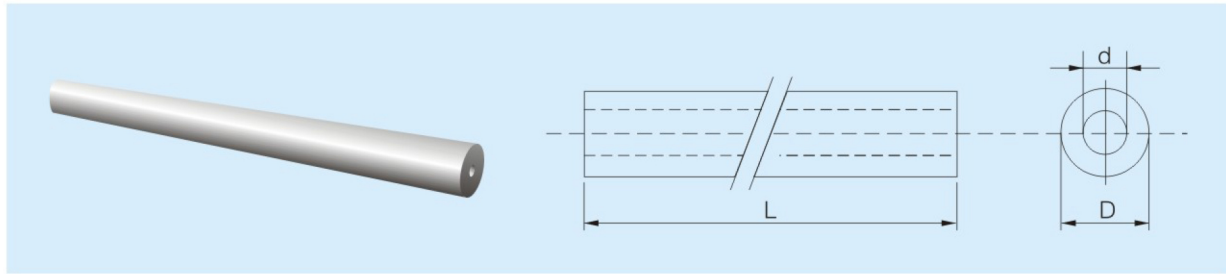
Code of tolerance (L):

S 0/+0.762mm S 0/+0.030inch

U 0/+1.016mm U 0/+0.040inch

T 0/+1.270mm T 0/+0.050inch

# » Uground rods with central coolant hole



mm

D	d	L
4.5	0.6	L ≤ 330
6.0	1.0	
	1.5	
7.0	1.0	
	1.5	
	2.0	
8.0	1.3	
	2.5	
8.5	1.5	
	2.0	
9.0	1.0	
	1.5	
	2.0	
	2.5	
9.5	1.5	
	2.0	
	2.5	
10.0	2.0	
	3.0	
10.5	1.5	
	2.0	
	2.5	

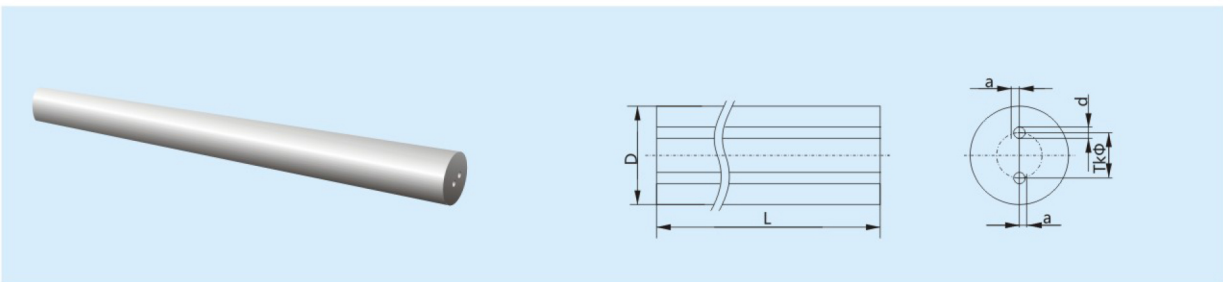
D	d	L
12.3	2.0	L ≤ 330
	3.0	
13.0	2.0	
14.3	2.0	
	3.0	
16.3	2.0	
	2.5	
	4.0	
17.0	2.0	
17.5	2.0	
18.0	3.0	
18.5	3.0	
20.0	3.0	
22.0	3.0	
24.0	4.0	
26.0	4.0	
28.0	4.0	
30.0	5.0	
32.0	5.0	

## Dimension & Tolerance

mm

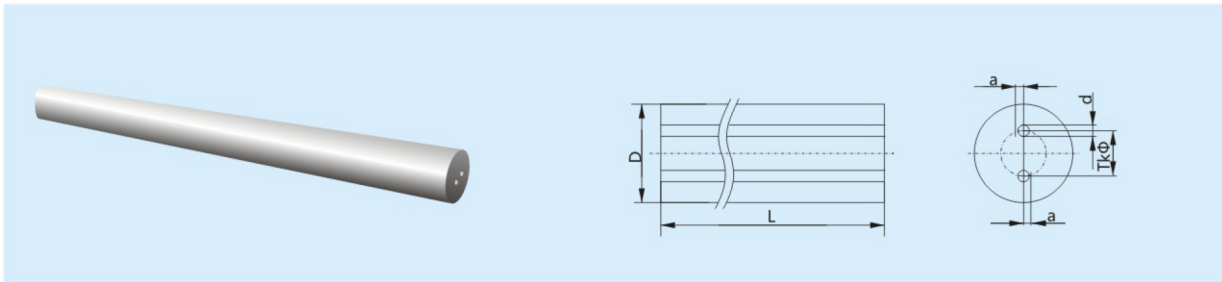
Tol. D		Tol. d		Tol. L	
D < 5.0	+0.70 +0.30	d < 3.0	±0.20	L < 50	+2.0 +0
5.0 ≤ D < 12.0	+1.00 +0.40	3.0 ≤ d < 4.0	±0.25	50 ≤ L < 100	+3.5 +0
12.0 ≤ D < 25.0	+1.10 +0.50	d ≥ 4.0	±0.30	100 ≤ L < 200	+4.5 +0
D ≥ 25.0	+1.20 +0.50			L ≥ 200	+6.0 +0

## » Uground rods with 2 straight coolant holes (standard bolt circle)



mm						
D	Tolerance of D	TKΦ	Tolerance of TKΦ	d	Tolerance of d	a
4.2	+0.3	1.8	-0.15	0.80	±0.10	0.10
5.2		2.0		0.80		0.13
6.3		3.0	-0.20	1.00	±0.15	0.15
7.3		3.5		1.00		
8.3		4.0		1.00		0.20
9.3	+0.4	4.0	-0.30	1.40		
10.3		5.0		1.40		0.28
11.3		5.0		1.40		
12.3		6.0		1.75		0.30
13.3		6.0		1.75		0.34
14.3	+0.5	7.0		1.75	±0.20	0.37
15.3		7.0		2.00		0.40
16.3		8.0		2.00		
17.3		8.0		2.00	±0.25	0.47
18.3		9.0	-0.40	2.00		0.50
19.3		9.0		2.00		
20.4		10.0		2.50		
21.4		10.0	-0.50	2.50		
22.4		11.0		2.50		
23.4		11.0		2.50		
24.4		12.0		3.00		
25.4		12.0		3.00		
26.4		13.0		3.00		
28.4		14.0		3.00		
30.4		14.0		3.00		
32.4		14.0		3.00		
34.4		14.0		3.00		

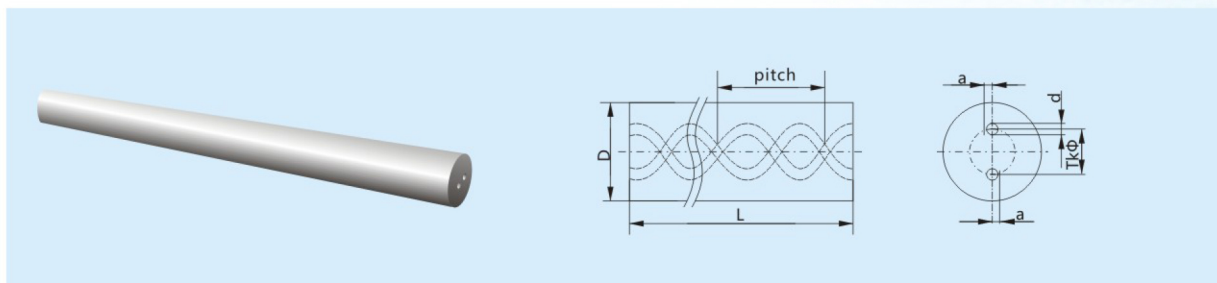
» Unground rods with 2 straight coolant holes (narrow bolt circle)



D	Tolerance of D	TKΦ	Tolerance of TKΦ	d	Tolerance of d	a
6.3	+0.3	1.5	-0.20	0.80	±0.10	0.15
7.3		1.5		0.80		
8.3		2.6		1.00		
8.3		1.5		0.80		
8.3		2.0		0.80		
9.3	+0.4	2.6	-0.30	1.00	±0.15	0.20
10.3		2.6		1.00		
11.3		3.5		1.20		
12.3		3.5		1.20		
13.3		3.5		1.20		
14.3	+0.5	5.0	-0.40	1.50	±0.20	0.37
15.3		5.0		1.50		
16.3		5.0		1.50		
17.3		6.2		2.00		
18.3		6.2		2.00		
19.3	+0.5	6.2	-0.40	2.00	±0.20	0.50
20.4		6.2		2.00		
21.4		6.2		2.00		
22.4		6.2		2.00		
23.4		7.5		2.00		
24.4	+0.5	7.5	-0.40	2.00	±0.20	0.50
25.4		7.5		2.00		
26.4		7.5		2.00		

mm

## » Unground rods with 2 helical coolant holes (30°)

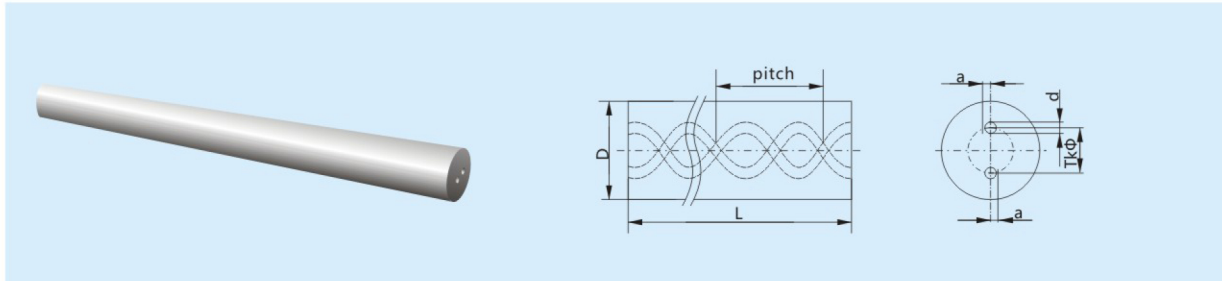


Type	D	Tolerance of D	TKΦ	Tolerance of TKΦ
XC2L060240730330	6.3	+0.3	2.40	±0.20
XC2L070351030330	7.3		3.50	
XC2L080381030330	8.3		3.80	
XC2L090451430330	9.3		4.50	±0.30
XC2L100451430330	10.3		4.50	
XC2L110491430330	11.3	+0.4	4.90	±0.40
XC2L120591430330	12.3		5.85	
XC2L130611830330	13.3		6.10	
XC2L140671830330	14.3		6.70	
XC2L150731830330	15.3		7.30	
XC2L160791830330	16.3		7.90	
XC2L170851830330	17.3	+0.5	8.50	
XC2L180922030330	18.3		9.15	
XC2L190972030330	19.3		9.70	
XC2L200992030330	20.3		9.90	±0.50

mm

d	Tolerance of d	a	L	Tolerance of L	pitch	Tolerance of pitch
0.70	±0.10	0.15	330	+5.0 +0	32.65	+0.67 -0.65
1.00	±0.15	0.15			38.09	+0.78 -0.76
1.00		0.15			43.53	+0.89 -0.86
1.40		0.20			48.97	+1.00 -0.97
1.40		0.20			54.41	+1.11 -1.08
1.40		0.28			59.86	+1.22 -1.19
1.40		0.30			65.30	+1.34 -1.30
1.75		0.34			70.74	+1.45 -1.40
1.75	±0.20	0.37			76.18	+1.56 -1.51
1.75		0.40			81.62	+1.67 -1.62
1.75		0.40			87.06	+1.78 -1.73
		0.47			92.50	+1.89 -1.84
2.00		0.50			97.95	+2.00 -1.94
2.00	±0.25	0.50			103.39	+2.12 -2.05
2.00		0.50			108.83	+2.23 -2.16

## » Unground rods with 2 helical coolant holes (40°)

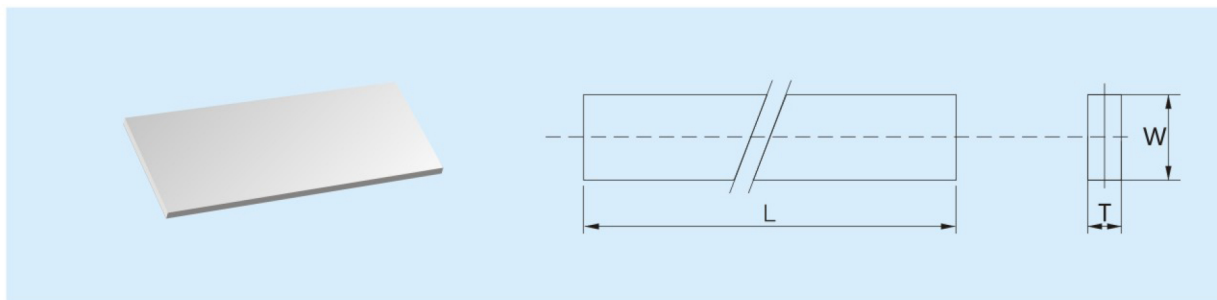


Type	D	Tolerance of D	TKΦ	Tolerance of TKΦ
XC2L060200540330	6.3	+0.3	2.00	±0.20
XC2L070220740330	7.3		2.20	
XC2L080240740330	8.3		2.40	
XC2L090290840330	9.3	+0.4	2.90	±0.30
XC2L100320840330	10.3		3.20	
XC2L110330840330	11.3		3.30	
XC2L120380940330	12.3		3.80	
XC2L130400940330	13.3		4.00	
XC2L140431040330	14.3	+0.5	4.30	±0.40
XC2L150471140330	15.3		4.70	
XC2L160511240330	16.3		5.10	
XC2L170551240330	17.3		5.50	
XC2L180591440330	18.3		5.90	
XC2L190641440330	19.3		6.40	
XC2L200661540330	20.3		6.60	±0.50

mm

d	Tolerance of d	a	L	Tolerance of L	pitch	Tolerance of pitch
0.50	±0.15	0.15	300~310	+5.0 +0	22.46	+0.40 -0.39
0.65					26.21	+0.47 -0.46
0.65					29.95	+0.54 -0.53
0.75		33.70			+0.60 -0.59	
0.80		37.44			+0.67 -0.66	
0.80		41.18			+0.74 -0.72	
0.90	±0.20	0.30			44.93	+0.80 -0.79
0.90		0.34			48.67	+0.87 -0.85
1.00		0.37			52.42	+0.94 -0.92
1.10		0.40			56.16	+1.01 -0.99
1.20					59.90	+1.07 -1.05
1.20					63.65	+1.12 -1.11
1.40	±0.25	0.50			67.39	+1.21 -1.18
1.40					71.14	+1.27 -1.25
1.50					74.88	+1.34 -1.31

## » Cemented carbide bars



mm

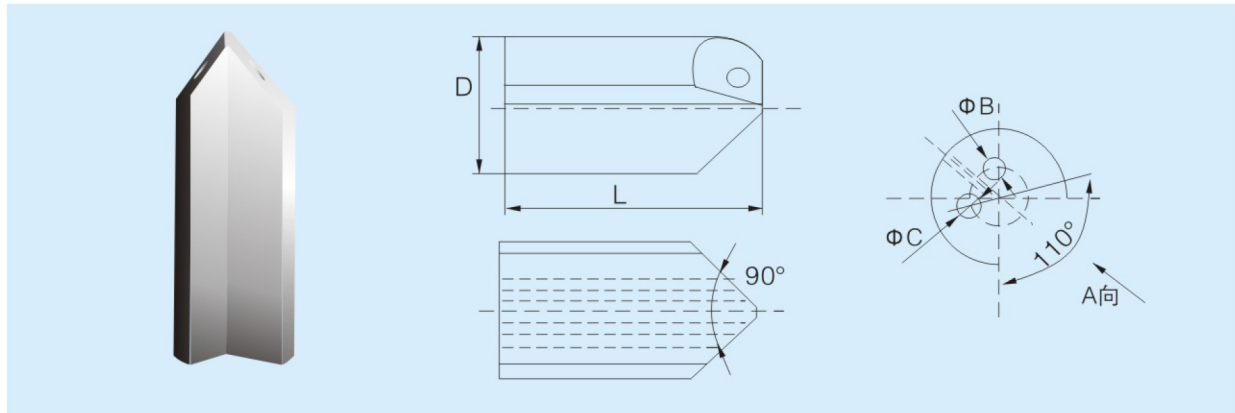
Width	Thickness	Length	Width	Thickness	Length
1.0	1.0~5.0	≤330	11.0	7.0~30.0	≤330
1.5	1.5~6.0		11.5		
2.0	2.0~25.0		12.0		
2.5			12.5		
3.0			13.0		
3.5			13.5		
4.0	4.0~30.0		14.0		
4.5			14.5		
5.0			15.0		
5.5			15.5		
6.0	7.0~30.0		16.0		
6.5			16.5		
7.0			17.0		
7.5			17.5		
8.0			18.0		
8.5			18.5		
9.0			19.0		
9.5			19.5		
10.0			20.0		
10.5					

W & T	Tolerance of W&T	L	Tolerance of L
$a < 5$	+0.70 +0.30	$L < 50$	+3.00 0
$5 \leq a < 10$	+0.80 +0.40	$50 \leq L < 100$	+3.50 0
$10 \leq a < 15$	+1.00 +0.40	$100 \leq L < 200$	+ ( $L \times 3\%$ ) 0
$15 \leq a < 20$	+1.20 +0.40	$200 \leq L \leq 310$	
$a \geq 20$	+1.40 +0.40	$L > 310$	

<u><b>XB</b></u>	<u><b>W</b></u>	<u><b>T</b></u>	<u><b>L</b></u>	
				L: Length expressed in 3 digits, "0" will be added before the digits if the digits are less than 3. E.g: "080" expressed length is 80 mm; "280" expressed length is 280 mm.
				Thickness: expressed in 2 digits, "0" will be added before the digits if the digits are less than 2; "T" expressed 0.5 mm. E.g. "02" expressed thickness is 2.0 mm; "T2" expressed thickness is 2.5 mm; "12" expressed thickness is 12.0 mm.
				Width expressed in 2 digits, "0" will be added before the digits if the digits are less than 2; "T" expressed 0.5 mm. E.g. "08" expressed width is 8.0 mm, "T8" expressed width is 8.5 mm; "18" expressed width is 18.0 mm.
				XB: Bars.



## » Blanks for manufacturing deep-hole drilling tools



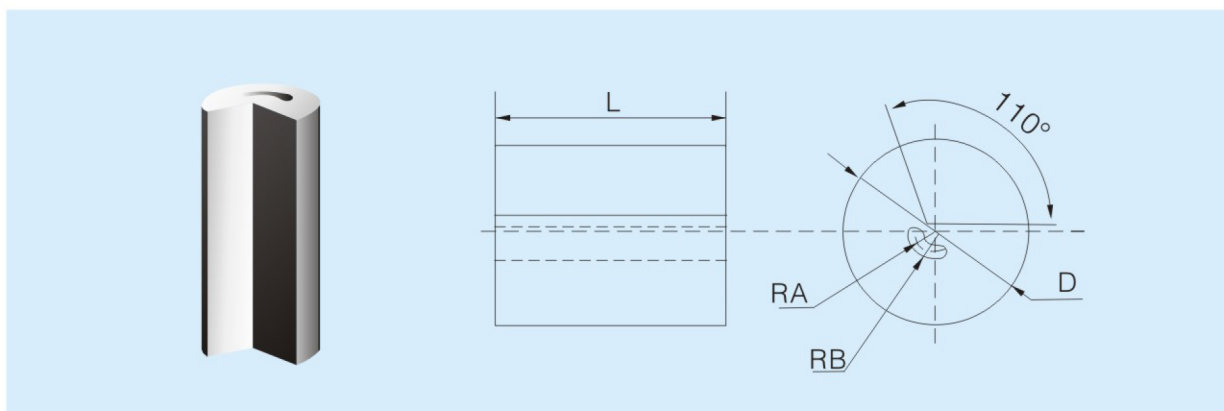
Type	D	Tolerance of D	Φ B	Tolerance of Φ B	Φ C	Tolerance of Φ C	L	Tolerance of L
XQT10036S	10.5	+0.45 -0.10	1.9	±0.20	2.3	±0.20	36.0	+3.0 +0.0
XQ11038S	11.0		2.0		2.4		38.0	
XQ12040S	12.0		2.2		2.5		40.0	
XQ13040S	13.0		2.4		2.7		40.0	
XQ14040S	14.0		2.5		2.8		40.0	
XQ15042S	15.0		2.4		3.3		42.0	
XQ16045S	16.0		2.5		3.5		45.0	
XQ17045S	17.0	+1.0 +0.3	2.6	±0.35	3.7	±0.35	45.0	
XQT17045S	17.0		2.6		3.7		45.0	
XQ18051S	18.0		3.2		3.9		51.0	
XQ19051S	19.0		3.2		3.9		51.0	
XQ20055S	20.0		3.5		4.2		55.0	
XQ21055S	21.0		3.5		4.2		55.0	
XQ22058S	22.0		3.5		4.5		58.0	

XQ 11 L S  
 S: Twin-holes  
 L: Length, expressed in 3 digits. "0" will be added before the digits if the digits are less than 3.  
 11: Diameter, (D) is 11.0 mm, expressed in 2 integers; if with "T"; the "T" means 0.5. For example: T10 means the diameter (D) is 10.5 mm  
 XQ: Gun drill.

Type	D	Tolerance of D	$\phi$ B	Tolerance of $\phi$ B	$\phi$ C	Tolerance of $\phi$ C	L	Tolerance of L
XQ23058S	23.0	+1.0 +0.3	3.5	$\pm 0.35$	4.5	$\pm 0.35$	58.0	+3.0 +0.0
XQ24058S	24.0		4.0		5.5		58.0	
XQ25061S	25.0		4.0		5.5		61.0	
XQ26061S	26.0		4.0		5.0		61.0	
XQ27061S	27.0		4.5		5.5		61.0	
XQ28063S	28.0		4.5		5.5		63.0	
XQ29063S	29.0		4.5		5.5		63.0	
XQ30065S	30.0		5.0		6.0		65.0	
XQ31065S	31.0		5.0		6.0		65.0	
XQ32065S	32.0		5.0		6.0		65.0	
XQ33065S	33.0		5.0		6.0		65.0	
XQ34065S	34.0		5.5		6.5		65.0	
XQ35065S	35.0		5.5		6.5		65.0	
XQ36065S	36.0		6.0		7.0		65.0	
XQ37065S	37.0		6.0		7.0		65.0	
XQ38065S	38.0		6.0		7.0		65.0	
XQ39065S	39.0		6.5		7.5		65.0	
XQ40065S	40.0		6.5		7.5		65.0	



## » Gun drill bits with kidney-shaped hole



Type	mm			
	D +0.4 -0.1	RA ± 0.15	RB ± 0.20	L +3.0 +0
XQ45032Y	6.9	0.7	1.1	32
XQ55032Y	4.5	0.8	1.3	
XQ63032Y	5.5	0.9	1.6	
XQ69032Y	6.3	1.2	1.7	
XQ76034Y	7.6	1.2	1.7	34
XQ80034Y	8.0	1.3	1.8	
XQ86036Y	8.6	1.3	1.9	36
XQ90036Y	9.0	1.4	2.0	
XQ97036Y	9.7	1.4	2.2	
XQ10036Y	10.5	2.4	3.2	

XQ 69 L Y

Y: Kidney-shaped holes

L: Length, expressed in 3 digits. "0" will be added before the digits if the digits are less than 3.

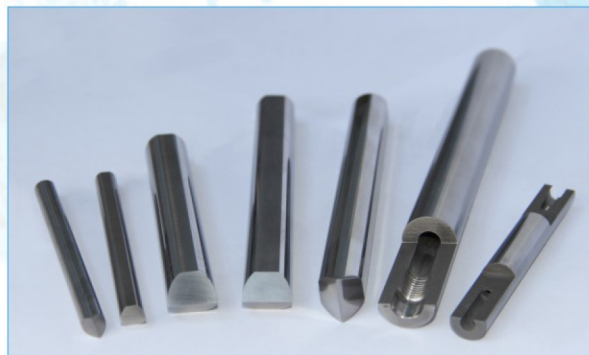
69: Diameter, (D) is 6.9 mm multiplied by 10 and expressed by 2 figures. For example: D is 6.9 mm, and expressed as 69.

XQ: Gun drill

## » Special products



1. Cemented carbide rods in grade EK30U— for making standard milling cutters with highly cost effective.



2. AS40 customized rods for making solid cutting tools which boast high shock resistance.



3. High wear resistance cemented carbide rods for dry cutting conditions, suitable for machining as well as for finishing or semi-finishing high hardness steel and cast iron ( $\leq 45$  HRC)



4. Special dimension blanks —— according to the customer's requirements or drawings.



## » Appendix

### » Physical properties of cemented carbide products

#### ☆ **Density**

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.

#### ☆ **Hardness**

The hardness of material is defined as the ability to resist hard pressure onto the surface of an object, mainly expressed in measurements of Rockwell and Vickers. Since the principles of the Vickers and Rockwell tests are different, care must be taken when converting values from one system to another.

#### ☆ **TRS**

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



## » ISO standard (classified by compositions)

ISO	Classification (USA)	WC	TiC	TaC(NbC)	Co	Ni	Mo	Density (g /m <sup>3</sup> )	Hardness (HV)	TRS (N/mm <sup>2</sup> )
P01	C8	—	80	—	—	10	10	5.8	1900	850
P01	C8	50	35	7	6	—	—	8.5	1900	1100
P05	C7	78	16	—	6	—	—	11.4	1820	1300
P10	C7	69	15	8	8	—	—	11.5	1740	1400
P15	C6	78	12	3	7	—	—	11.7	1660	1500
P20	C6	79	8	5	8	—	—	12.1	1580	1600
P25	C6	82	6	4	8	—	—	12.9	1530	1700
P30	C5	84	5	2	9	—	—	13.3	1490	1850
P40	C5	85	5	—	10	—	—	13.4	1420	1950
P50	—	78	3	3	16	—	—	13.1	1250	2300
M10	—	85	5	4	6	—	—	13.4	1590	1800
M20	—	82	5	5	8	—	—	13.3	1540	1900
M30	—	86	4	—	10	—	—	13.6	1440	2000
M40	—	84	4	2	10	—	—	14.0	1380	2100
K01	C4	97	—	—	3	—	—	15.2	1850	1450
K05	C4	95	—	1	4	—	—	15.0	1780	1550
K10	C3	92	—	2	6	—	—	14.9	1730	1700
K20	C2	94	—	—	6	—	—	14.8	1650	1950
K30	C1	91	—	—	9	—	—	14.4	1400	2250
K40	C1	89	—	—	11	—	—	14.1	1320	2500

## » ISO standards (classified by applications)

Sort of chips removal		Application		Performance advanced			
Sort of alloy	Suitable for machining(general)	ISO No	Suitable for machining	Alloy physical property		Cutting performance	
P	Black metal with long chips	P01	steel and steel casting	↑ Wear resistance	Toughness →	↑ Cutting Speed	Feed Rate →
		P10	steel and steel casting				
		P20	steel, steel casting and malleable cast iron with long chips				
		P30	steel, steel casting and malleable cast iron with long chips				
		P40	steel, steel casting iron with hole and grit.				
		P50	steel, low or medium strength of extension steel casting iron with hole and grit.				
M	Black metals with long and short chips, Nonferrous metals	M10	steel, steel casting, manganese steel, grey cast iron and cast alloy iron	↑ Wear resistance	Toughness →	↑ Cutting Speed	Feed Rate →
		M20	steel, steel casting, Austenite steel or manganese steel and grey cast iron				
		M30	steel, steel casting, Austenite steel, grey cast iron and high temperature resistance alloy				
		M40	free-cutting soft steel, low strength of extension steel, nonferrous metal and light alloy				
K	Black metal with short chips, nonferrous metal and non-metallic materials	K10	grey cast iron with high hardness, chilled cast iron, high-silicon aluminum alloy, quenched steel, high wearproof plastic, hard paperboard and ceramic	↑ Wear resistance	Toughness →	↑ Cutting Speed	Feed Rate →
		K20	grey cast iron of Brinell hardness(BH)>220, nonferrous metal, violet brass and aluminum				
		K30	low Brinell hardness grey cast iron, low strength of extension steel and compressed wood				
		K40	soft and hard wood, nonferrous metal				



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