



辽宁省钺钺矿产有限公司
LIAONING CHENGYUE MINERAL GROUP CO.,LTD

CARBIDE ROLLS



LIAONING CHENGYUE MINERAL GROUP CO.,LTD

ADD: 830, 52A, North Yi West Road, Tiexi District, Shenyang,CHINA.

TEL: +86 024 86876567

POST CODE: 110021

Web:www.cykcgroup.com

Email:cykc@cykcgroup.com.cn



PRODUCTION CAPACITY

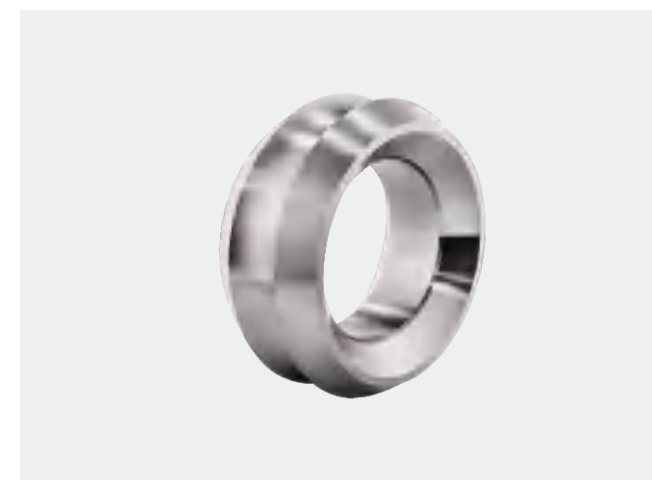
Under CYKC, there are 8 professional production units:
Profile Products Branch, Big Products Business Division, Drill Business Division, Special Products Division, Drilling and Tunneling Division, Powder Division, RTP Plant, and Mold Manufacturing Plant.

There are 2 plants in the Big Products Business Division, provided to our customers annually more than 1800 tons all kinds of cemented carbide big products domestically and overseas.

8 PROFESSIONAL PRODUCT DIVISIONS

1 R&D CENTER

1 ANALYSIS AND TESTING CENTER





HIGH-SPEED WIRE ROLL RINGS & HIGH-SPEED BAR ROLL RINGS

HIGH-SPEED WIRE ROLL RINGS

BRIEF INTRODUCTION OF HIGH WIRE ROLL RINGS OF CEMENTED CARBIDE

Compared with steel rolls, cemented carbide roll rings exhibit longer service life, higher cost effectiveness, higher dimensional precision, and better surface finish, owing to their high hardness, good wear resistance, and high modulus of elasticity. This significantly reduces labor intensity and improves productivity.

With the development of iron and steel industry, cemented carbide roll rings and rolls are widely used in the production of a variety of products such as wire, bar, steel tube, small strip and so on.



HIGH-SPEED WIRE ROLL RINGS

General Roll Rings Series Grades

Grade	Chemical Composition, Wt%		Physical & Mechanical Properties					
	WC (%)	Co+Ni+Cr (%)	Density g/cm³	Hardness HRA	TRS N/mm²	Compressive Strength N/mm²	Young’ s modulus KN/mm²	Thermal Conductivity W/(m·K)
YGR20	90	10	14.45	86.2	3100	3900	560	100
YGR25	87	13	14.2	85.5	2900	3600	550	98
YGR30	85	15	14.03	84.5	2800	3400	540	95
YGR40	82	18	13.73	83	2700	3300	500	92
YGR45	80	20	13.54	82	2650	3200	500	88
YGR50	78	22	13.37	81.5	2630	3100	480	76
YGR55	75	25	13.03	79.5	2600	3100	446	66
YGR60	70	30	12.73	79	2600	3000	425	57

- Note: 1. Typical physical & mechanical properties are listed with the variation range in accordance with the relevant national and industry standards.
2. Relevant parameters are for reference only.

General roll rings series: Co–Ni–Cr is used as the bonding phase, with high wear resistance, corrosion resistance and versatility.	
Grade	Applications
YGR20	High wear resistance and corrosion resistance, used in the last 1–2 stands of finishing mills.
YGR25	High wear resistance and corrosion resistance, used in the last 1–3 stands of finishing mills.
YGR30	Good toughness, wear resistance, corrosion resistance and hot cracking resistance, used in the intermediate stands of finishing mills.
YGR40	Good toughness and hot cracking resistance, high versatility, used in most stands of the finishing mills and in the rear stands of common mills.
YGR45	Good toughness and hot cracking resistance, used in the front stands of finishing mills.
YGR50	Good toughness and hot cracking resistance, used in the front stands of finishing mills.
YGR55	Good impact resistance, used in the stands of pre-finishing rolling mills for hot rolling rebars and they can be machined by turning and milling.
YGR60	Good impact resistance, used for hot rolling rebars and in the first and second stands of Pre-finishing rolling mills.

HIGH-SPEED WIRE ROLL RINGS

General Roll Rings Series Grades

Grade	Chemical Composition, Wt%		Physical & Mechanical Properties					
	WC (%)	Co (%)	Density g/cm³	Hardness HRA	Transverse Rupture Strength Mpa	Compressive Strength N/mm²	Young’ s modulus KN/mm²	Thermal Conductivity W/(m·K)
YGH05	94	6	14.92	88.5	2620	4200	585	110
YGH10	92	8	14.71	88	2870	4000	580	108
YGH20	90	10	14.48	87	3120	3500	560	105
YGH25	87	13	14.25	86	2950	3400	550	102
YGH30	85	15	14.03	85	2870	3300	540	100
YGH40	82	18	13.75	83.5	2720	3200	500	98
YGH45	80	20	13.55	82.8	2680	3100	480	95
YGH55	74	26	13.05	81.5	2660	3100	450	92
YGH60	70	30	12.75	80.0	2700	3000	400	90

- Note: 1. Typical physical & mechanical properties are listed with the variation range in accordance with the relevant national and industry standards.
2. Relevant parameters are for reference only.

General roll rings series: Compared with the Co–Ni–Cr series, the pure Co series have better strength, toughness and wear resistance, but it has certain requirements for working conditions on the site and cooling water quality.	
Grade	Applications
YGH05	High hardness and wear resistance, used in the last 1–2 stands of finishing mills.
YGH10	High hardness and wear resistance, used in the last 1–2 stands of finishing mills.
YGH20	High hardness and wear resistance, used in the last 1–2 stands of finishing mills.
YGH25	High strength, toughness and wear resistance, used in the last 1–3 stands of finishing mills.
YGH30	Good toughness, wear resistance and hot cracking resistance, used in the middle stands of finishing mills.
YGH40	Good toughness and hot cracking resistance, used in most stands of the finishing mills and in the rear stands of common mills.
YGH45	Good toughness and hot cracking resistance, used in the front stands of finishing mills.
YGH55	Good impact resistance,used in the stands of pre-finishing rolling mills for hot rolling rebar and they can be machined by turning and milling.
YGH60	Good impact resistance, used for hot rolling rebar and in the first and second stands of pre-finishing rolling mills.

HIGH-SPEED WIRE ROLL RINGS

Special Roll Rings Series For Special Steel Rolling

Grade	Chemical Composition		Physical & mechanical properties					
	WC wt%	Co+Ni+Cr wt%	Density g/cm³	Hardness HRA	Transverse Rupture Strength Mpa	Compressive Strength N/mm²	Young’ s modulus KN/mm²	Thermal Conductivity W/(m·K)
PA05	92	8	14.42	89	2600	2600	580	108
PA10	90	10	14.55	86	2750	3800	560	105
PA20	85	15	13.95	84.5	2700	3400	540	95
PA30	80	20	13.5	82.5	2500	3200	540	90
PA40A	78	22	13.32	81.5	2700	3300	500	80
PA50A	74.5	25.5	13.00	80.5	2600	3200	460	70
PA60A	70	30	12.60	79.0	2400	3000	430	65

Note: 1. Typical physical & mechanical properties are listed with the variation range in accordance with the relevant national and industry standards.

2. Relevant parameters are for reference only.

Special roll rings series for special steel rolling: adopt coarse grain WC, with high hot cracking resistance and toughness. Suitable for rolling all types of high quality steel.	
Grade	Applications
PA05	Good wear resistance, toughness, and hot cracking resistance, used in the last 1-2 stands of finishing mills.
PA10	Good wear resistance, toughness, and hot cracking resistance, used in the last 1-2 stands of finishing mills.
PA20	Good toughness and hot cracking resistance, used in the intermediate stands of finishing mills.
PA30	Good toughness and hot cracking resistance, used in the front stands of finishing mills.
PA40A	Excellent wear resistance and fracture toughness, used in pre-finishing mill or KOCKS three-roll mill for bar Ø12 mm~20.0 mm.
PA50A	Excellent thermal cracking resistance and abrasion resistance, used in pre-finishing mill or KOCKS three-roll mill for bar Ø20 mm~32.0 mm.
PA60A	Excellent thermal cracking resistance and abrasion resistance, used in pre-finishing mill or KOCKS three-roll mill for bar Ø32 mm~40.0 mm.

HIGH-SPEED WIRE ROLL RINGS

"Hot Wheels" Roll Rings Series

Grade	Chemical Composition		Physical & mechanical properties					
	WC wt%	Co+Ni+Cr wt%	Density g/cm³	Hardness HRA	Transverse Rupture Strength Mpa	Compressive Strength N/mm²	Young’ s modulus KN/mm²	Thermal Conductivity W/(m·K)
FHL-011	96	6	14.9	89	2600	4200	580	110
FHL-012	90	10	14.48	87.5	2800	3800	560	100
FHL-013	85	15	14	85	2700	3400	540	95
FHL-014	80	20	13.53	83	2700	2700	540	95
FHL-015	78	22	13.58	82	2700	2700	500	88

Note: 1. Typical physical & mechanical properties are listed with the variation range in accordance with the relevant national and industry standards.

2. Relevant parameters are for reference only.

With the improved wear resistance and fracture toughness through optimizing micro structure, "Hot Wheels" roll rings series are mainly used for the finished product stands of high speed wire mills and before the finished product stands of finishing mills, and post rod, wire metal products processing, suitable for rolling automobile industry cord steel and spring steel. The steel rolling capacity of single pass is 1.5~2 times that of the common grades.	
Grade	Applications
FHL-011	Excellent wear resistance and fracture toughness, used in finished stands.
FHL-012	Excellent wear resistance and fracture toughness, used in the last 1-2 stands of finishing mills.
FHL-013	Good toughness, corrosion resistance, and creep resistance, used in the intermediate stands of finishing mills.
FHL-014	Good impact resistance, used in the stands of pre-finishing rolling mills for hot rolling rebars and they can be machined by turning and milling.
FHL-015	Good impact resistance, used in the stands of pre-finishing rolling mills for hot rolling rebars and they can be machined by turning and milling.

HIGH-SPEED BAR ROLL RINGS

Special Roll Rings Series For Low-temperature High Bar Line Rolling

Grade	Chemical Composition		Physical & mechanical properties					
	WC wt%	Co+Ni+Al wt%	Density g/cm³	Hardness HRA	Transverse Rupture Strength Mpa	Compressive Strength N/mm²	Young’ s modulus KN/mm²	Thermal Conductivity W/(m·K)
YGA06	94	6	14.70	89.0	3100	4200	585	105
YGA10	90	10	14.25	87.5	3100	3900	580	100
YGA20	85	15	13.75	84.5	3200	3500	540	95
YGA30	80	20	13.30	83.5	3100	3400	500	90
YGA40	75	25	12.80	82.0	3100	3100	480	88
YGA50	10	30	12.35	81.0	3100	3000	400	85
YGD05	67	33	12.20	80.0	3000	2950	380	82

Note: 1. Typical physical & mechanical properties are listed with the variation range in accordance with the relevant national and industry standards.

2. Relevant parameters are for reference only.

Special roll rings series for low-temperature high bar line rolling: excellent corrosion resistance and thermal fatigue resistance owing to the reinforced bonding phase and improved creep resistance of the alloy. Used in low temperature (700~850℃) special steel rolling.	
Grade	Applications
YGA06	High wear resistance, corrosion resistance and creep resistance, used in the last 1-2 stands of finishing mills.
YGA10	High wear resistance, corrosion resistance and creep resistance, used in the last 1-3 stands of finishing mills.
YGA20	Good toughness, corrosion resistance,and creep resistance, used in the intermediate stands of finishing mills.
YGA30	Good toughness, corrosion resistance and creep resistance, used in most stands of the finishing mills and in the rear stands of common mills.
YGA40	Good impact resistance, used in the stands of pre-finishing rolling mills for hot rolling rebar and they can be machined by turning and milling.
YGA50	Good impact resistance, used for hot rolling rebar and in the first and second stands of pre-finishing rolling mills.
YGD05	Good impact resistance, used for hot rolling rebar and in the first and second stands of pre-finishing rolling mills.

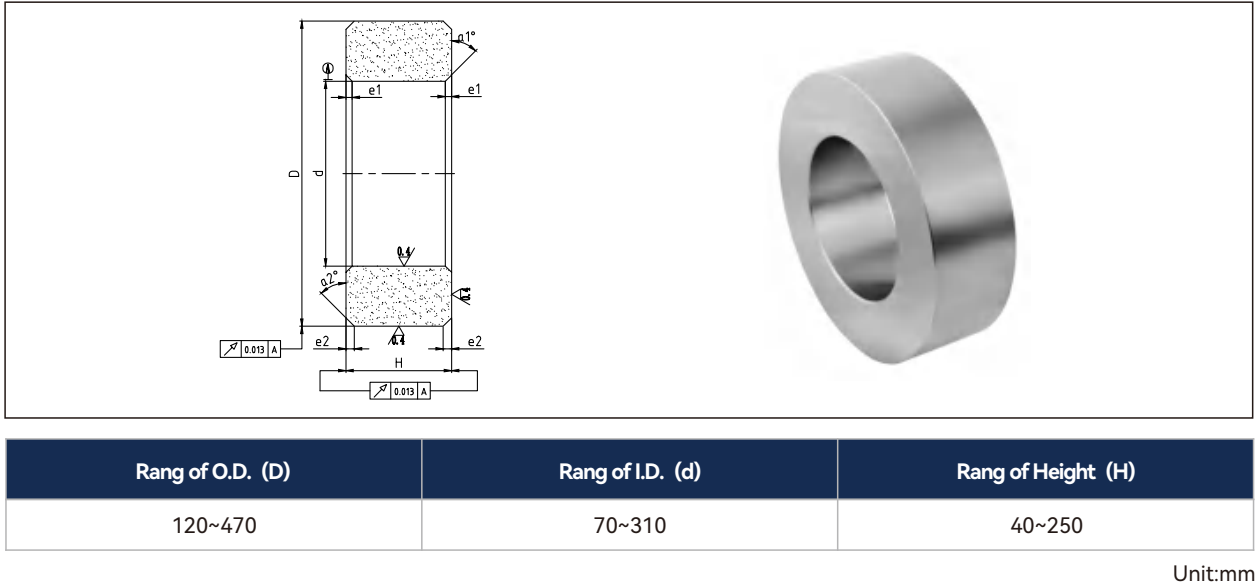
TABLE OF GRADES RECOMMENDED FOR USE IN DIFFERENT STANDS

Mills Stands				A	B	C	A	B	C	A	B	C
Stands of Pre-finishing Mills	1	○	○	YGH55	YGR60	YGR60	YGR60 (PB60)					
	2	○	○	YGH55	YGH55	YGH55	YGR60 (PB60)	YGR60 (PB60)	YGR60 (PB60)			
	3	○	○	YGH50	YGH55	YGH55	YGR55 (PB55)	YGR55 (PB55)	YGR60 (PB60)			
	4	○	○	YGH50	YGH55	YGH55	YGR50	YGR55 (PB55)	YGR55 (PB55)			
Stands of Finishing Mills	1	○	○	YGH45	YGH50	YGH50	YGR40	YGR45	YGR45 (YGR55)	YGA30 PA30		
	2	○	○	YGH45	YGH50	YGH50	YGR40	YGR45	YGR45 (YGR55)	YGA30 PA30		
	3	○	○	YGH40	YGH45	YGH50	YGR40	YGR45	YGR45	YGA30 PA30	YGA30 PA30	
	4	○	○	YGH40	YGH45	YGH50	YGR40	YGR45	YGR45	YGA30 PA30	YGA30 PA30	
	5	○	○	YGH30	YGH40	YGH45	YGR30	YGR40	YGR45	YGA30 FA30 (YGA20) (RA20)	YGA30 DA30	
	6	○	○	YGH30	YGH40	YGH45	YGR30	YGR40	YGR45	YGA30 FA30 (YGA20) (RA20)	YGA30 PA30	
	7	○	○	YGH30	YGH40	YGH45	YGR30	YGR40	YGR40	Pa20 YGA20 (YGA30)	Pa20 YGA20 (YGA30)	YGA30 PA20
	8	○	○	YGH30	YGH40	YGH45	YGR30	YGR40	YGR40	PA20 YGA20 (YGA30)	Pa20 YGA20 (YGA30)	YGA30 PA20
	9	○	○	YGH20 (YGH25)	YGH25 (YGH30)	YGH40	YGR20 (YGR25)	YGR25 (YGR30)	YGR40	PA20 YGA20 (YGA30)	BA20 YGA2 (YGA30)	YGA30 PA20
	10	○	○	YGH20 (YGH25)	YGH25 (YGH30)	YGH40	YGR20 (YGR25)	YGR25 (YGR30)	YGR40	PA20 YGA20 (YGA30)	PA20Y GA20 (YGA30)	YGA30 PA20
Stands for Reducing and Sizing Mills	1	○	○	YGH40	YGH45 (YGH40)	YGH45	YGH40	YGR45 (YGR40)	YGR45	YGA20 PA20 (YGA30) (PA30)	YGA30 PA30 (YGA20) (PA20)	YGA30 PA30
	2	○	○	YGH40	YGH45 (YGH40)	YGH45	YGH40	YGR45 (YGR40)	YGR45	YGA20 PA20 (YGA30) (PA30)	YGA30 PA30 (YGA20) (PA20)	YGA30 PA30
	3	○	○	YGH10 YGH20 (YGH25)	YGH30 (YGH25)	YGH40 (YGH30)	YGR20 (YGR25)	YGR30 (YGR25)	YGR40 (YGR30)	YGA10 PA10 (YGA20) (PA20)	YGA20 PA20 (YGA10) (PA10)	YGA20 PA20
	4	○	○	YGH05 YGH10 YGH20 (YGH25)	YGH30 (YGH25)	YGH40 (YGH30)	YGR20 (YGR25)	YGR30 (YGR25)	YGR40 (YGR30)	YGA10 PA10 (YGA20) (PA20)	YGA20 PA20 (YGA10) (PA10)	YGA20 PA20

Note: Classes A、 B、 C stand for excellent, good, poor working condition of rolling mills respectively. () is the alternate choice.

PICTURE OF CARBIDE ROLL RINGS

Carbide Roll Rings Without Grooves



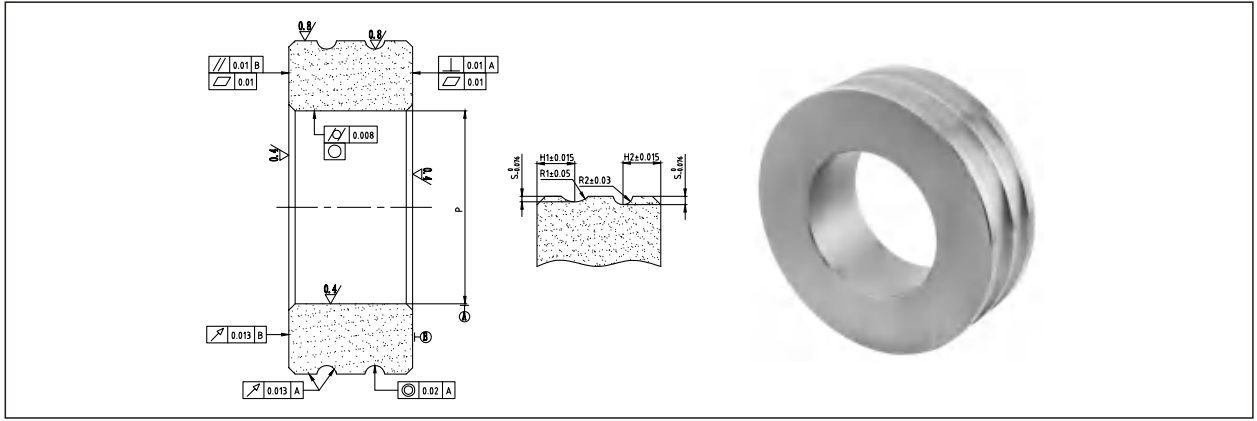
The Allowable Deviation in outsider diameter, inner diameter and Height of Roll Rings

Precision Classes	1	2	3	4	Special Requirements
O.D. (±)	0.02	0.05	0.10	0.15	
I.D. (+)	IT5	IT6	IT7	IT8	
Height(-)	0.03	0.1	0.20	0.5	

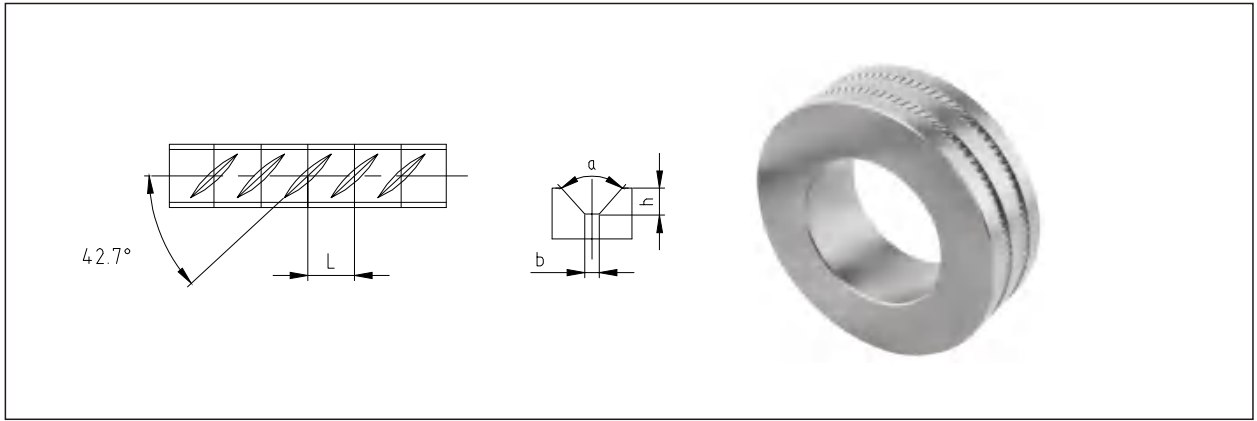
Unit:mm

PICTURE OF CARBIDE ROLL RINGS

Grooved Carbide Roll Rings



Notched Carbide Roll Rings



The Geometrical tolerance of Carbide Roll Rings

Radial run-out of groove	Radial run-out of periphery	End face run-out	End face flatness	End face parallelism	Inner hole cylindricity
≤0.013	≤0.02	≤0.01	≤0.01	≤0.01	≤0.01

Unit:mm

Roughness of carbide rolls

Inner hole roughness	Outer roughness	End face roughness
0.4~0.8	0.8~1.6	0.4~0.8

The allowable deviation in outer diameter, inner diameter and height is to be determined based on customer's needs. Unit:μm

COMPOSITE ROLLS

CEMENTED CARBIDE COMPOSITE ROLLS

INTRODUCTION OF CEMENTED CARBIDE COMPOSITE ROLLS

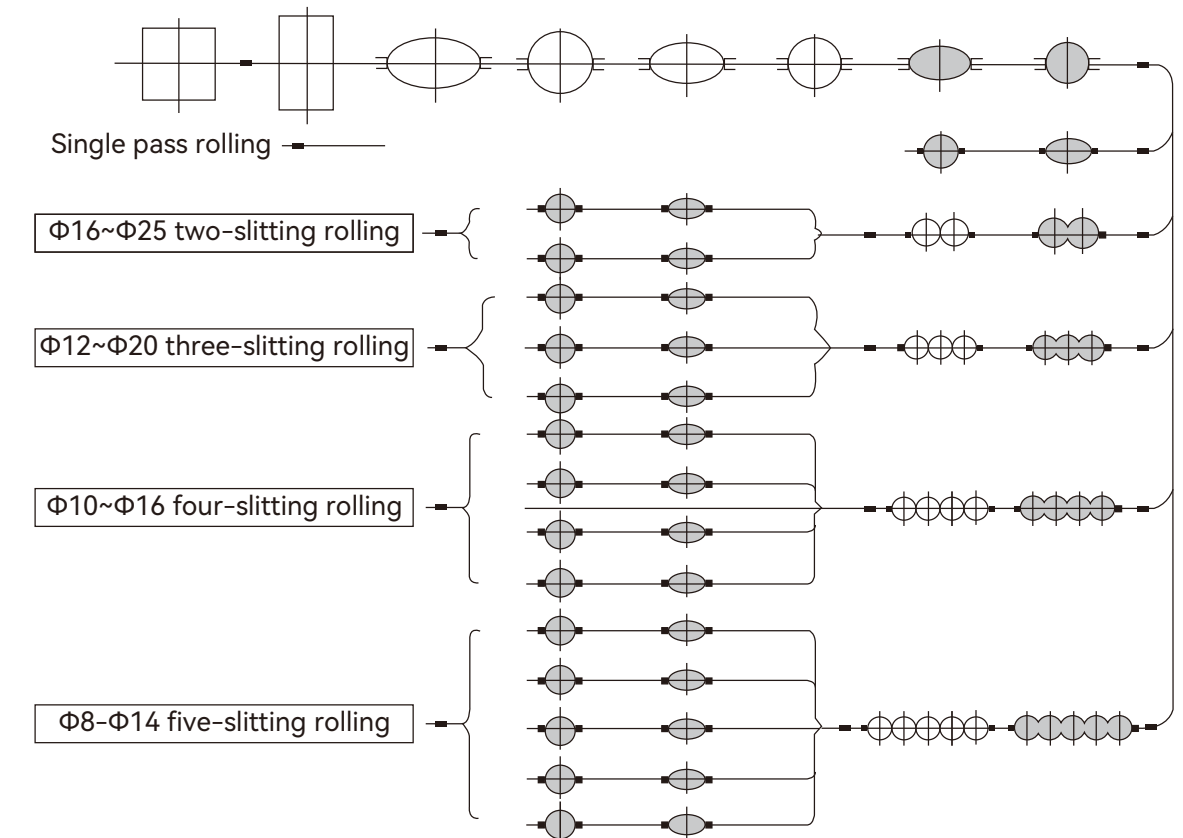
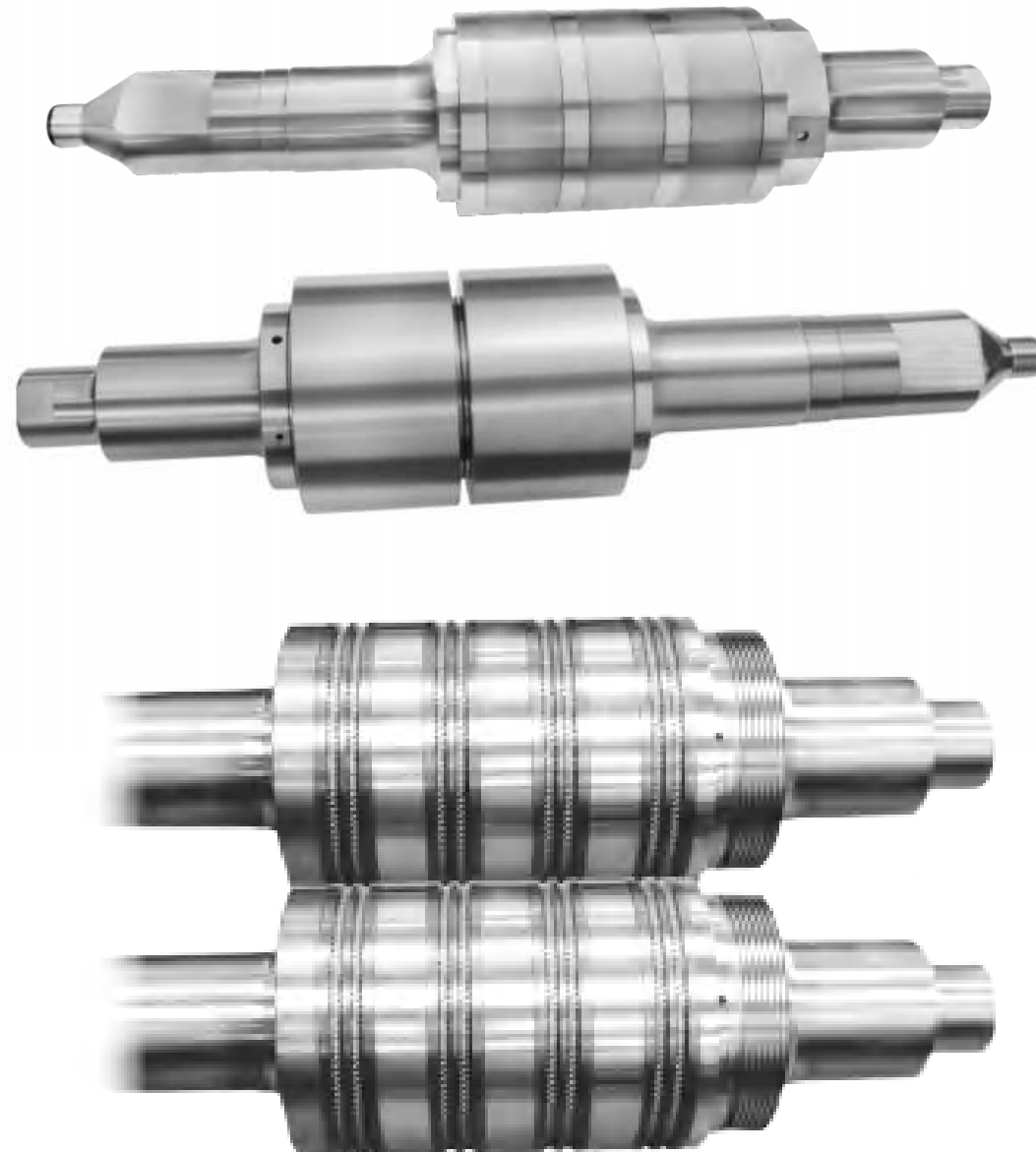
Definition of Cemented Carbide Composite Rolls

Composite roll is specially made by combining the cemented carbide roll rings with steel shaft, which is used for rolling round, rebar, square, flat, angle and other profiles.

Scope Applications of Cemented Carbide Composite Rolls

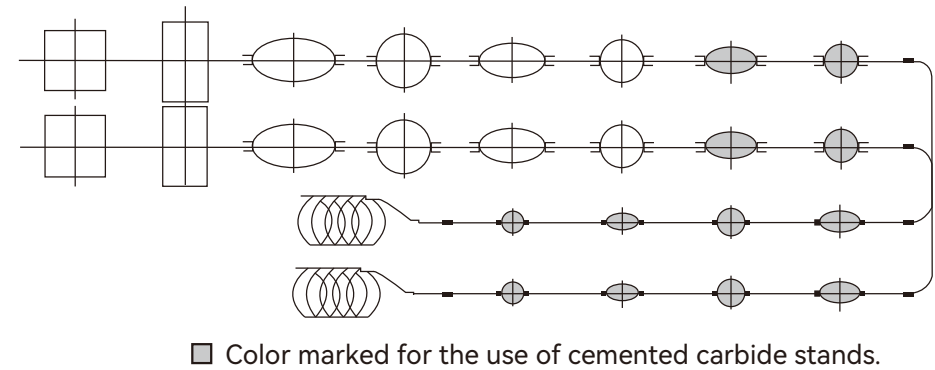
The cemented carbide composite roll is suitable for the intermediate stands of the traditional rod mills, rod and wire mills and high-speed wire mills with rolling speed is 2-50m/s.

(1) Traditional rod mills: It is used for product stands, pre-slitting stands and intermediate stands of traditional rod mills.



■ Color marked for the use of cemented carbide stands.

(2) Wire & Rod mills: used for the stands of finishing mills and intermediate rolling stands of rod and wire mills.

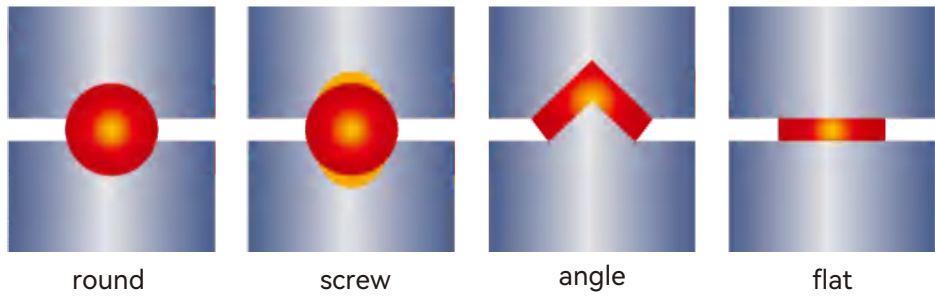


(3) High speed wire rolling mills

Used in Intermediate stands for high speed wire rolling mills.

(4) Small profile mills

Used for angle, square, flat of pre-finished product and finished product stands.



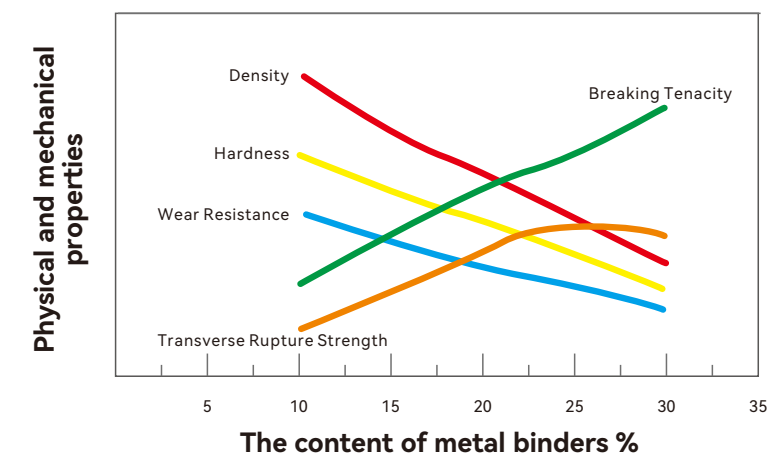
Advantages of Cemented Carbide Composite Rolls

- (1) The quality of steel products is improved, and the surface quality and tolerance of rolled materials improved thoroughly. The negative deviation can be controlled more precisely.
- (2) The change frequency of groove and roll, the downtime and the labor intensity can be reduced in rolling workshop. Increasing productivity and output can create greater economic benefit at the same time.
- (3) Improve the yield of products.
- (4) Greatly reducing the steel rolling cost per ton is an effective way for enterprise to reduce cost and increase benefit.

Composition and Characteristics of Grades for Cemented Carbide Composite Roll Rings

Cemented carbide is mainly made of tungsten carbide particles and metal binder (often cobalt), When needed, nickel, chromium, etc., is added in order to improve its hot cracking resistance and corrosion resistance. Different binder content and corresponding WC particle size can yield different cemented carbide grades. CYKC has a series of cemented carbide roll rings grades to apply different rolling mills and stands.

The relationship between the physical and mechanical properties of cemented carbide grades and the content of metal binders:



COMPOSITE ROLLS

Special Cemented Carbide Roll Rings Series

Grade	Chemical Composition, Wt%		Physical & Mechanical Properties					
	WC (%)	Co+Ni+Cr (%)	Density g/cm³	Hardness HRA	Transverse Rupture Strength N/mm²	Compressive Strength N/mm²	Young’ s modulus KN/mm²	Thermal Conductivity W/(m·K)
PC20	77	23	13.25	83	2950	3100	450	77
PC30	74	26	13	81.6	2920	2900	450	69
PC40	70	30	12.65	80.9	2871	2700	400	61
PC50	68	32	12.48	79.2	2700	2320	400	60

Note: 1. Typical physical & mechanical properties are listed with the variation range in accordance with the relevant national and industry standards.

2. Relevant parameters are for reference only.

Special cemented carbide roll rings series: with optimized structure of WC, good hot cracking resistance and impact resistance, used in the stands of finishing rolling mills for rebar, rods and wire, which can greatly increase the amount of single pass rolling tonnage, reduce the labor intensity, so as to improve the production efficiency and obtain better economic benefits.	
Grade	Applications
PC20	Good impact resistance and hot cracking resistance, used in the front stands of the finishing mills stand.
PC30	Good impact resistance and hot cracking resistance, used in the stands of pre-finishing rolling mills for hot rolling rebar.
PC40	Good impact resistance and hot cracking resistance, used in round bar finished products and rebar stands.
PC50	Good impact resistance and hot cracking resistance, used in round bar finished products and rebar stands.

COMPOSITE ROLLS

General Cemented Carbide Roll Rings Series

Grade	Chemical Composition, Wt%		Physical & Mechanical Properties					
	WC (%)	Co+Ni+Cr (%)	Density g/cm³	Hardness HRA	Transverse Rupture Strength N/mm²	Compressive Strength N/mm²	Young’ s modulus KN/mm²	Thermal Conductivity W/(m·K)
YGR55	75	25	13.03	79.5	2600	3100	446	66
YGR60	70	30	12.73	79	2600	3000	425	57

Note: 1. Typical physical & mechanical properties are listed with the variation range in accordance with the relevant national and industry standards.

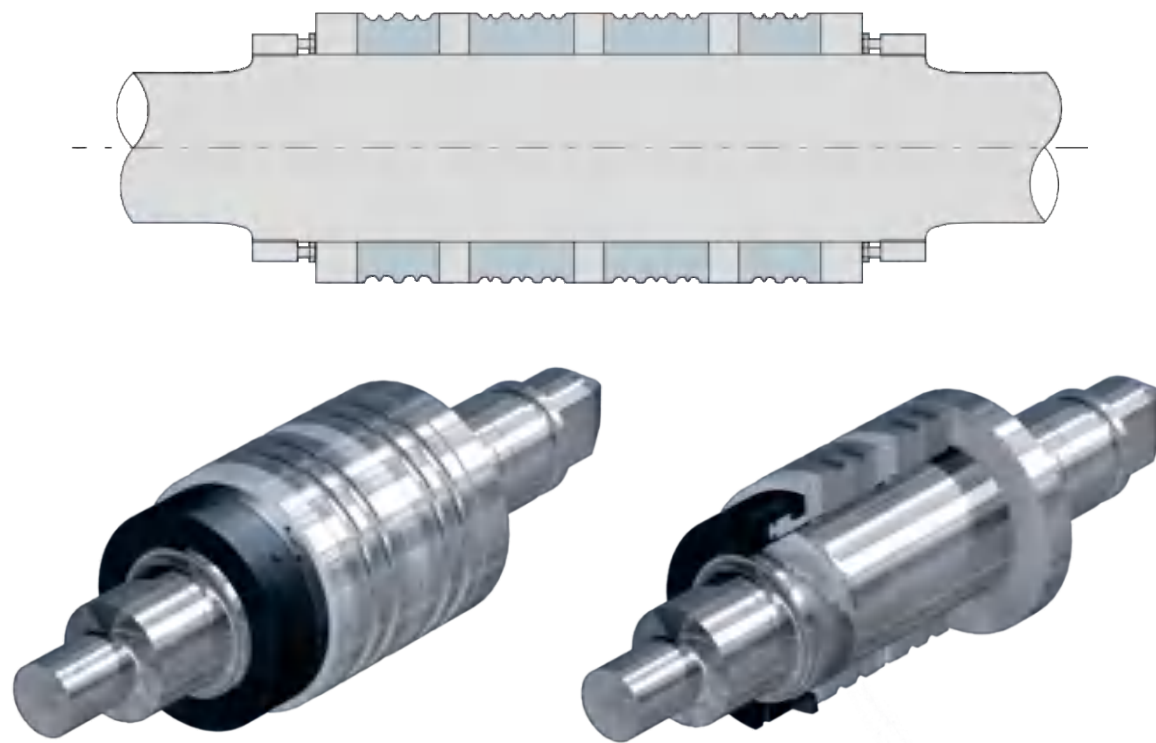
2. Relevant parameters are for reference only.

General cemented carbide roll rings series: utilize Co-Ni-Cr as the binder phase, with high wear resistance and corrosion resistance and versatility.	
Grade	Applications
YGR55	Good impact resistance, used in round bar finished product and before the finished product stands.
YGR60	Good impact resistance, used in round bar finished products, before the finished product and the slitting stands.

KOCKS ROLL RINGS

Structure of Cemented Carbide Composite Rolls

The cemented carbide composite roll is assembled by hydraulic axial compression combination technology with CYKC 's own intellectual property rights. Hydraulic axial compression combination technology is a method to combine the roll ring and the roll shaft by applying a certain compression force in the axial direction of the roll ring. With the screw thread of hydraulic nut, the force generated by the hydraulic system is transformed into the tension force on the roll shaft, which causes the elastic tensile deformation of the shaft and causes the roll ring on the roll shaft to be compressed, and ensure the cemented carbide roll is not loose. Meanwhile, the roll shaft can be reused.



Supporting Technical Services

1. Service is available for the design, groove and notches machining of cemented carbide composite rolls.
2. Various machining tools can be provided for machining cemented carbide composite rolls.
3. A variety of assembly methods of composite rolls can be offered according to customer requirements.
4. Various cemented carbide roll rings are available with diameters of $\phi 300\text{--}450\text{mm}$ and thicknesses of $30\text{--}250\text{mm}$ for RSB stands of bars and wires.



CEMENTED CARBIDE KOCKS ROLL RINGS

INTRODUCTION OF CEMENTED CARBIDE KOCKS ROLL RINGS

The Kocks roll ring is used in a rolling mill with three roll rings arranged at an angle of 120° to each other. It is also called as a Y-mill because of the center line of the ring pass is like the English letter Y. Its basic features:

- (1) The width margin of the grooving is large, and the rolled piece is not easy to be folded during rolling.
- (2) The rolled pieces are surrounded by pressure on three sides, the deformation is even, the splitting head is significantly reduced, and the accidents of continuous rolling pile caused by splitting head are eliminated.
- (3) The trace extension is even, and the wear of each groove is even.
- (4) A set of grooving drawing can be used in different kinds of steel rolling.
- (5) Compared with the common rolling mill under the condition of the same area, the cutting depth of the roll ring is small, so as to reduce the wear of the hole groove and improve the product quality.

KOCKS ROLL RINGS

Table of Grades and Recommended Applications

Grade	Chemical Composition, Wt%		Physical & Mechanical Properties					
	WC (%)	Co+Ni+Cr (%)	Density g/cm ³	Hardness HRA	Transverse Rupture Strength N/mm ²	Compressive Strength N/mm ²	Young' s modulus KN/mm ²	Thermal Conductivity W/(m·K)
YGR50	78	22	13.37	81.5	2630	3100	480	76
YGR55	75	25	13.03	79.5	2600	3100	446	66
YGR60	70	30	12.73	79	2600	3000	425	57

Note: 1. Typical physical & mechanical properties are listed with the variation range in accordance with the relevant national and industry standards.
2. Relevant parameters are for reference only.

Grade	Applications
YGR50	Good toughness and hot cracking resistance, used in the front stands of finishing mills.
YGR55	Good impact resistance, used in round bar finished product and before the finished product stands.
YGR60	Good impact resistance, used in round bar finished product, before the finished product and slitting stands.

CEMENTED CARBIDE KOCKS ROLL RINGS

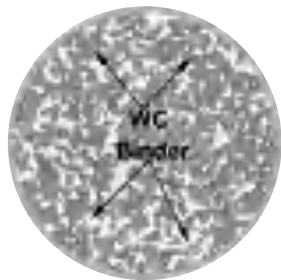
INTRODUCTION OF CEMENTED CARBIDE KOCKS ROLL RINGS FOR SPECIAL STEEL AND BAR ROLLING

Through microstructure control technology , the wear resistance and fracture toughness of the "Hot wheels" series carbide rolls are improved at the same time. The high wear resistance makes the wire products maintain regular shapes and good surface quality. Simultaneously,enhanced fracture toughness enables the carbide rolls to withstand the mechanical stress encountered during the rolling process.

"PA" series Kocks roll rings are mainly used for hot rolling high-quality special steel bar, suitable for bearing steel, spring steel, alloy steel and other special steel.The newly developed grades for Kocks roll rings achieve better wear resistance. Compared to the corresponding grades of other competitors, the rolling tonnage increases more than 30%.

WC Grain Shape Control Technology and Bonded Phase Strengthening Technology

- (1)High wear resistance;
- (2)High fracture toughness;
- (3)High corrosion resistance;
- (4)Good versatility.



The Comparison of Surface Quality of Groove



The surface quality of regular grades
after one shift of rolling



The surface quality of newly developed grades
after one shift of rolling

KOCKS ROLL RINGS

Performances and Characteristics

Grade	Chemical composition, Wt%		Physical & Mechanical Properties					
	WC (%)	Co+Ni+Cr (%)	Density g/cm ³	Hardness HRA	Transverse Rupture Strength N/mm ²	Compressive Strength N/mm ²	Young' s modulus KN/mm ²	Thermal Conductivity W/(m·K)
PA40A	78.0	22.0	13.32	81.5	2700	3300	500	80
PA50A	74.5	25.5	13.00	80.5	2600	3200	460	70
PA60A	70.0	30.0	12.60	79.0	2400	3000	430	65

Programme for matching rollers

	
	
PA40A	PA40A
PA50A	PA50A
PA60A	PA60A
Rolling specifications	
≤φ20mm	
φ20mm~φ32mm	
φ32mm~φ40mm	

STEEL TUBE ROLL RINGS & STEEL ANGLE ROLL RINGS

INTRODUCTION OF CEMENTED CARBIDE ROLL RINGS FOR ROLLING STEEL TUBES AND STEEL ANGLE

The service life of cemented carbide roll rings is 50-80 times of that of conventional cast iron roll rings when they are used at tension tubes reducing machine for hot rolling of seamless steel tubes, and the surface quality and dimensional precision is substantially improved. Based on the condition of tension tube reducing machines (rolling force, speed, tube diameter), the use of either full carbide roll rings or composite roll rings can be recommended, achieving a high performance cost ratio. Optional cemented carbide grades: YGR55, YGR60.

STEEL TUBE ROLL RINGS & STEEL ANGLE ROLL RINGS

Table of Grades and Recommended Applications

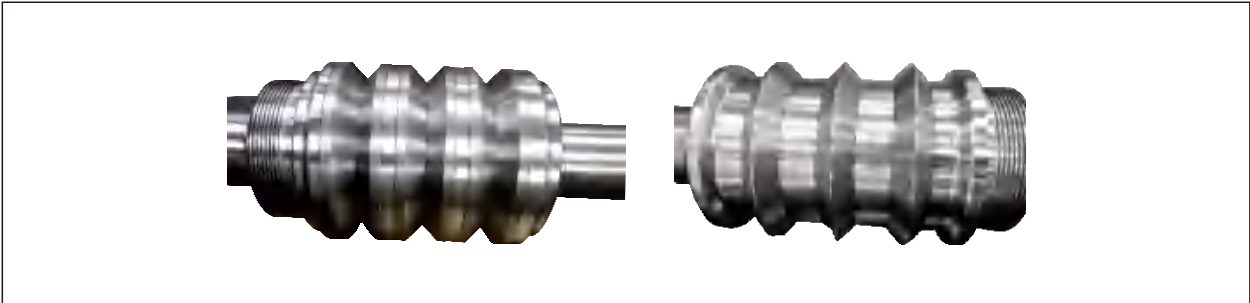
Grade	Chemical Composition, Wt%		Physical & Mechanical Properties					
	WC (%)	Co+Ni+Cr (%)	Density g/cm ³	Hardness HRA	Transverse Rupture Strength N/mm ²	Compressive Strength N/mm ²	Young's modulus KN/mm ²	Thermal Conductivity W/(m·K)
YGR55	75	25	13.03	79.5	2600	3100	446	66
YGR60	70	30	12.73	79	2600	3000	425	57

Note: 1. Typical physical & mechanical properties are listed with the variation range in accordance with the relevant national and industry standards.
2. Relevant parameters are for reference only.

Grade	Applications
YGR55	Good impact resistance, used in rolling steel tubes and steel angle A25~75.
YGR60	Good impact resistance, used in rolling steel tubes and steel angle A25~75.



Picture of Steel Tube Roll Rings



Picture of Steel Angle Roll Rings

CARBIDE ROLLS FOR COLD ROLLING REBARS & TITANIUM CARBIDE GUIDE ROLLERS

CARBIDE ROLLS FOR COLD ROLLING REBARS



Grade	Chemical Composition, Wt%		Physical & Mechanical Properties					
	WC (%)	Co (%)	Density g/cm ³	Hardness HRA	Transverse Rupture Strength N/mm ²	Compressive Strength N/mm ²	Young's modulus KN/mm ²	Thermal Conductivity W/(m·K)
YGH30	85	15	14.03	85	2870	3300	540	100



TITANIUM CARBIDE GUIDE ROLLERS



Grade	Chemical Composition, Wt%	Physical & Mechanical Properties		
	WC (%)	Density g/cm ³	Hardness HRA	Transverse Rupture Strength Mpa
GT35	Fe+TiC	6.43	86.5	1450

APPLICATION AND MAINTENANCE OF CEMENTED CARBIDE ROLL RINGS

Cemented carbide roll rings are tool materials consisting of tungsten carbide and cobalt, characterized by high hardness and wear resistance. To leverage the high wear resistance, longevity, and efficiency of cemented carbide roll rings during high-speed rolling, attention should be paid to the following aspects when purchasing and using these roll rings.

Grade Selection

An overall understanding of the properties of cemented carbide grades is a basis for correctly selecting the grades for roll rings used in the stands of rolling mills and an optimal combination of grades for the various stands of rolling mills.

Cemented Carbide Roll Rings Installation

Sleeve mounting and assembly of roll rings must be performed strictly according to the precision required by the design process. Proper fitting of the roll rings, shafts for stands, and conical sleeves is crucial; they cannot be overly tight or loose. When too tight, the roll rings endure tensile load and become susceptible to cracking upon significant fluctuations in rolling force. When too loose, it leads to relative sliding during rolling between the roll rings, shaft, and conical sleeve, causing scratches on conical sleeves and shafts, and potentially resulting in cracks. Before running the mill, ensure the roll ring meets all requirements, and the assembled faces of the conical sleeve and shaft are clean. It is essential to avoid striking the roll rings with a hammer or other hard materials during mounting, and to prevent impacts between them during transportation and installation to avoid damage to the roll rings.

The installation reference specification is as follows:

- (1) The installation pressure is suggested to be 300–500 bar.
- (2) The installation process temperature is about 28°C.

Cooling of Cemented Carbide Roll Rings

Cooling is intended to reduce the impact of thermal corrosion, fatigue and stress to roll rings during

milling. It can prevent the roll rings from cracking and slow down the crack propagation, prolonging the life time of groove. It plays an important role in optimizing the performances of roll rings. The reference specifications for cooling are as follows:

- (1) The temperature of cooling water shall be less than 35°C.
- (2) Sufficient pressure of cooling water is needed to take away heat quickly, wash away the black skin sticking to the surface of the roll rings and reduce roll rings wear, and ensure the rolling tonnage. The pressure of cooling water is requested in 0.4–0.6MPa.

(3) Water volume

- Common high speed wire rolling line

Content of binder metal, %	6	10	15	20	25	30
Water volume L/(Groove width mm × min)	56	48	40	32	24	16

- Cemented Carbide Composite Rolls

Volume of Cooling Water (m³/h)	12~15	15~17	17~19	18~20
Application Situation	Single slot for bars under Φ12mm	Single slot for bars under Φ14-Φ16mm	Single slot for bars under Φ18-Φ20mm	Single slot for bars under Φ22-Φ25mm

- (4) The optimal arrangement for cooling water extends from the mill exit to approximately one-third of the roll ring's circumference. The cooling water volume should decrease progressively as the distance from the mill exit increases, underscoring the critical nature of cooling at the mill exit. Near the mill exit, the water flow from the nozzle should constitute 30% of the total volume, and the water column emanating from the nozzle must be positioned as close to the roll rings as feasible.

Water is jetted radially, with the jet making an angle of 15–30 degrees to the roll rings' rotation direction. The water column's width should be twice that of the groove, and the jetting should aim directly into the grooves without scattering or forming mist. By controlling water pressure, volume, and nozzle angle, the ultimate cooling effect must ensure the roll surface temperature remains below 50°C.

(5) Water quality requirements

- ①The PH level of the water suitable for the cemented carbide roll rings: 7.5≤pH≤7.8.

In weak alkali environment of pH≥7.2, carbide roll rings with pure cobalt binder phase should be used, such as YGH series.

In the weak acid environment of pH<7.2, the corrosion to cobalt is intensified, and carbide roll rings containing cobalt NI-Cr binder phase should be adopted, such as YGR series and PA series.

- ②The content of solid particles in the cooling water should be less than 15 mg/L, and the largest particles should be less than 40μm.

- ③The chemical composition of cooling water is as follows:

Composition	Chloride	Calcium ions	Sulfate
Content, mg/L	≤40	≤200	≤75

The Rolled Tons of Cemented Carbide Roll Rings

During rolling, microcracks in groove can not be avoided, and they need to be reground when they are at a certain depth(normally controlled at 0.2mm). Excessive rolling causes the microcracks to grow rapidly and risks of crushed rolls increase, which should be prevented. For rolling common materials, the normal rolled tonnage after each regrinding is as follows:

Mill stands	Rolled tons
Stands of pre-finishing mil	6000~10000
1~2 stands of finishing mill	3000~4000
3~4 stands of finishing mill	3000~4000
5~6 stands of finishing mill	2500~3000
7~8 stands of finishing mill	1500~2500
9~10 stands of finishing mil	800~1500
Stands for reducing and sizing diameters mill	1000~2000

The Machining of Cemented Carbide Roll Rings

During rolling, microcracks in groove can not be avoided, and they need to be reground when they are at a certain depth(normally controlled at 0.2mm). Excessive rolling causes the microcracks to grow rapidly and risks of crushed rolls increase, which should be prevented. For rolling common materials, the normal rolled tonnage after each regrinding is as follows:

CNC machines can be used for the turning of cementer carbide with high binder phase	
Tool material	Cubic boron carbide (CBN), Polycrystalline diamond (PCD)
Rotating speed in turning	15~25rpm
Feed rate	0.2~0.4mm/r
Depth of turning	0.2~0.5mm
Cooling	cooling is required for turning with PCD.Coolant should be applied before turning operations.

The Regrinding of Cemented Carbide Roll Rings

Regrinding allowance of roll rings

Microcracks will occur after the rolling groove for some time and when the microcracks extend to 0.2mm, the roll ring has to be reground. Microcracks must be reground thoroughly when regrinding, otherwise the unground microcracks will make the microcracks extend more rapidly during the next rolling and probably bring the roll ring to crack. The recommended amount of regrinding after normal rolling is as follows:

Mill stands	Regrinding allowance of roll rings, mm
Pre-finishing	1.2~1.5
1-8 Stands of finishing rolling mill	0.6~1.2
9-10 Stands of finishing rolling mill	0.4~0.6

Selection of Grinding Wheel

Recommended grinding wheel for roll rings outer round

Process	Types of grinding wheel	Particle size	Concentration
Coarse grinding outer round	Resin wheel	120#	75%
Fine grinding outer round	Resin wheel	150#	75%

Recommended grinding wheel for roll rings grooving

Process	Types of grinding wheel	Particle size	Concentration
Coarse grinding outer round	Resin wheel	120#	75%
Fine grinding outer round	Resin wheel	150#	75%

Application and Maintenance of Cemented Carbide Roll Rings

(1) After installing the cemented carbide roll rings on line, carefully check the cooling water pipe and the roll rings' position. Then, connect the inlet hose to the special water pipe. Ensure the inlet is securely fastened after connection to prevent it from detaching. This precaution is vital to avoid serious consequences, such as roll ring blast due to inadequate cooling.

(2) Water cooling of cemented carbide rolls is a very important in the process of rolling, the better cooling condition will bring the higher rolling tonnage, otherwise the roll rings groove will tend to crack. Therefore, check whether the cooling water is normal before rolling test. In the rolling process, the production shift should stop every 4 hours to check whether the position of the special cooling water pipe is moved, whether the water pipe nozzle is blocked, and then start rolling.

(3) In order to ensure the roll rings cooling water volume, water quality and water pressure, it is recommended that the water pipe of the mills be connected from the control cooling water pipe, and

the water pressure gauge and water pressure alarm device be installed. In case of alarm, stop rolling immediately and start rolling after the water pressure is adjusted to normal range. Operators should ensure that the pressure of the special cooling water pipe for finished rolling mills is within the range of 0.4–0.6Mpa.If beyond the range, adjust the water pressure to the above range as required.

(4) During the rolling process, it is necessary to pay close attention to the running state of the bearing seat and stop rolling immediately if any abnormality is found.

(5) During the shift, the operator should carefully check the wear of the rolling rings groove to see whether there are microcracks. If so, report shall be made to the dispatcher and quality inspector, and then replace the rolling rings groove after confirmation.

(6) The adjustment of rolling rings gap shall not be seamless in the rolling process, that is, can not stick rolls rolling.

(7) Once abnormal rolling products are found in the sampling room, stop the rolling machine immediately to check it. If the screw is loose, the groove has microcracks and other phenomena, the groove and roll rings need to be replaced.

(8) When the rolling material surface is abnormal (such as the rolling material surface trace caused by microcracks in the rolling groove), the groove or roll rings shall be changed in time.

(9) During the rolling process, it is necessary to prevent the axial fracture of cemented carbide roll rings caused by bearing overheating.

(10) In the process of using the roll, if the water is stopped or the position of the water pipe is shifted, stop the rolling machine immediately to avoid burning out of the roll groove, cracking and dropping blocks, etc.

(11) The rolling tonnage of single groove is determined according to the actual situation (the reasonable rolling tonnage varies with the different rolling conditions), and it shall be strictly followed according to the rated tonnage. Excessive rolling is strictly prohibited to avoid cracking in the roll.

(12) In the case of stuck steel and piled steel, the roll rings should continue to be cooled and the upper roll shall be quickly lift. The water can not be cut off until the temperature of the rolled piece decreases.

(13) It must be stopped immediately to remove the roll and allow it to cool slowly (naturally) if the roll runs for a period of time without cooling water due to accidents, and it can be put into use after cooling or regrinding. Note that pouring cooling water directly onto the roll will cause the carbide roll rings to burst.

The Maintenance of Carbide Composite Roll

(1) Please carefully check the related contents of the Guidelines for the Use of Composite Rolls before use, and the relevant operators should be familiar with the requirements and matters needing

attention of the corresponding posts.

(2) The upper and lower rolls should be distinguished according to the Guidelines for the Use of Composite Rolls and marked conspicuously before the composite roll is installed to the rolling mill. (it is recommended to use sample punching to mark the shaft end or paint to mark conspicuously).

(3) Before use, it is necessary to check the cooling water pressure (recommended 0.4–0.6Mpa), water volume and arrangement of water pipes in accordance with the Guidelines for the Use of Composite Rolls. Ensure that the water pipes is aligned with the rolling groove and the water nozzle is not blocked, The machine can only be started after meeting the requirements are met. It is recommended to check for pipe displacement or nozzle blockage every 4 hours .

(4) During the rolling process, it is necessary to pay close attention to the running state of the bearing seat and stop the rolling immediately if any abnormality is found.

(5) The rolling tons of single groove is carried out in strict accordance with the rolling system without excessive rolling. If the surface quality of the rolling rings groove is found to be abnormal (such as hair filaments), stop the rolling machine to check. If there are small short cracks in the rolling groove, the groove should be replaced in time or remove the composite rolls off the line.

(6) In instances of stuck steel and piled steel, the upper roll should be lifted immediately. The cooling water should not be stopped until the temperature of the rolled part has been sufficiently lowered. Similarly, after rolling the last steel piece normally, it's advisable to continue cooling with water for approximately 5 minutes. Only after ensuring the composite rolls have been adequately cooled should they be changed.

(7) Product up (down) rolling mills, transfer process to avoid collision, storage needs to be fixed and protected.

(8) Every time up (down) rolling mills, it is necessary to check whether all parts are in good condition and tightened in place. If there is any abnormality, report needs to be made ensure safety before continuing use.

(9)Regularly (it is suggested that every month) Check the parts condition of bolts, threads, hydraulic nut oil inlet plug and other parts to ensure the fastening safety and the anti-rust surface treatment.

(10)It is recommended to protect the exposed bolts, threads, plugs and core holes with butter (or similar substances) if the product is not used for a long time.

(11)During the storage period, the overall appearance of the product is suggested to be protected by oil coating. Corrosive substances shall not be contacted to avoid damaging the product.

(12)If the bolts or spacers are seriously corroded due to long-term unused, it is necessary to check whether the parts are safe and reliable, and then use them after maintenance or replacement according to the actual situation.

R&D



CYKC is in possession of the only national key laboratory of cemented carbide industry, one of the first batch of certified state-level enterprise technology centers, state-level analysis and testing center, and quality-control and technology-evaluation laboratory of industrial products (cemented carbides and other tungsten products). CYKC undertakes many of the the national "863" and "973" programs, national innovation capacity building programs, the national key technology R&D program, and national strategic innovative products and key new products project. The company has won the first and second prizes of national sci-tech progress, and the second prize of national invention.

BIG PRODUCTS BUSINESS DIVISION

LIAONING CHENGYUE MINERAL GROUP CO.,LTD successfully developed China's first cemented carbide roll ring in the 1970s and provided a series of cemented carbide rolls for the first

high-speed wire rod mill introduced in our country in the 1980s. After more than 40 years of development, we have continuously updated our technology and equipment to improve product quality. Currently, our company has become a professional manufacturer of highend cemented carbide rolls in China, producing various specifications of cemented carbide flat rolls, grooved rolls, rebar rolls, special-shaped rolls, composite rolls, Kocks rolls, and large-shaped products, etc., which can meet the processing needs of various materials and working conditions. Through continuous technological updates, we have ensured product quality that has led our product market share to take the lead in both domestic and foreign markets.

Guided by technology leadership in product development and based on the hard material research and development center and the national analysis and testing center, it has established a State Key Laboratory. This laboratory focuses on the basic theoretical research of cemented carbide and the basic application research of new cemented carbide technologies and materials. Leveraging the technology platform of the State Key Laboratory, the research group for large carbide products has developed six series of roll rings, such as R series, H series, FHL series, PA series, YGA series, and PC series. The project results have received high recognition, leading to the declaration of 48 patents and 32 technical secrets.

The cemented carbide roll ring, developed based on the national "973" plan project "Tungsten Carbide Intermetallic Compound New Cemented Carbide Preparation and Organization Control Foundation," can improve hardness and strength in two ways, adapting to the market's trend of adopting low-temperature rolling to enhance steel quality. In terms of special steel rolling, it has reached or exceeded the international level, and its service life has increased by more than 20%. Additionally, another project, "Cemented Carbide Roll Rings for Finished Stands of High-Wire Rolling Mills and Their Preparation Methods," won the gold medal at the 12th China Invention Exhibition.

At present, the Big Products Business Division is divided into two factories: the blank plant and the machining plant. The blank plant started construction in 1996 and was fully operational by 1997, encompassing two processes: pressing and sintering. The machining plant began construction in 2006 and became operational in 2007. It specializes in 6 main processes: plane grinding, internal grinding, external grinding, turning, grooving and notching, and composite assembly. The main product categories include rolls, anvils, and large special-shaped products. The current comprehensive production capacity has reached 1,800 tons.



SOCIAL RESPONSIBILITY

Focusing on carbon peaking, carbon neutrality, and dual circulation, China Minmetals actively expands new standards, new technology, green energy, and digital intelligence, and continuously promotes intelligent, efficient, green and low-carbon development. It creates a more optimized lifestyle, and contributes to China's high-quality and sustainable development.

CYKC Group has been once again recognized as an environmental credit and integrity enterprise in Hunan Province. In accordance with staff-centered management, CYKC empowers the staff, provides quality service for customers and makes contributions to building a harmonious society. CYKC is dedicated to the development of staff, enterprise and society.

Taking building green environmental protection enterprise as its own duty, CYKC has eliminated its high energy consumption production lines, introduced new technologies, new processes and new energies, implemented clean production, heightened environmental protection level.

In 2023, the new CYKC factory has installed a solar photovoltaic power station on its roof, the photovoltaic capacity reaches 26 megawatts. It is anticipated to generate around 1.5 million kilowatt-hours of electricity annually, resulting in a reduction of approximately 800 tons of carbon dioxide emissions.

WORLDWIDE SALES NETWORK



CYKC has global ambitions. sales branches in Germany, the US, and HK China were successively set up.

Products of CYKC are exported to more than 70 countries and regions around the world.

Adhering to the core values "Sincerity, Professionalism, Innovation, Efficiency", CYKC has become a reliable business partner of many world-renowned enterprises, through business cooperation and technology development.

CYKC constantly strengthens itself by increasing brand influence, and fully integrates multiple resources including technology, service and culture.

Looking ahead, CYKC is committed to global strategic development goal. Bearing in mind the spirit of "pursuing excellence with relentless efforts", CYKC will create a cemented carbide

group that is "First in China, First-class in the world" by constantly improving its technological innovation capacity and playing a leading role in the industry.