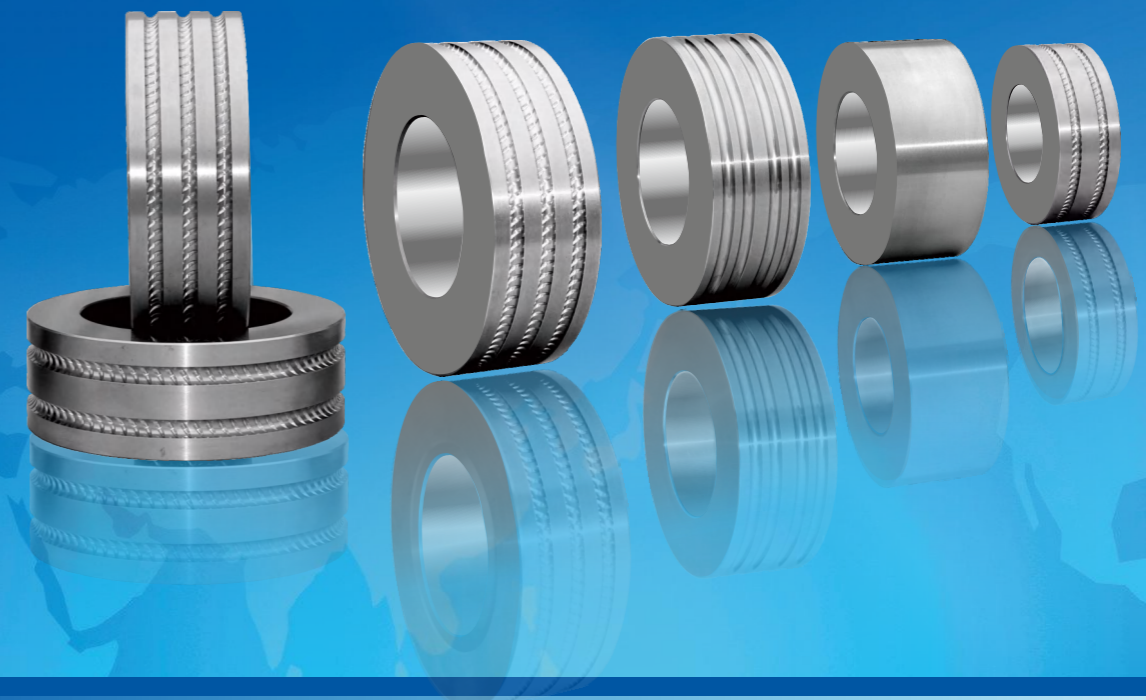




ZGCC

# CEMENTED CARBIDE ROLLS

# GREAT WALL



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**CMT** 自贡硬质合金有限责任公司  
ZIGONG CEMENTED CARBIDE CORP.,LTD



APPLICATION  
SCENARIO



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QUALITY ACCOMPLISHES THE FUTURE



ISO9001:  
CN-CQC08Q10970  
ISO14001:  
CN-CQC08E22096



CNAS C001-Q

### ZIGONG CEMENTED CARBIDE CO., LTD.

- Zigong Cemented Carbide Co.,Ltd(ZGCC) is a core member of China Minmetals which is one of the world 500 top companies.
- It is the first home-designed and built large scale cemented carbide manufacturing enterprise in China.
- It is one of the leading manufacturers of cemented carbides and related tools at home.
- It's a reliable supplier of the surface engineering technology with advanced world levels and their application services.
- It holds the leadership position in the tungsten and molybdenum product manufacture in China.



With more than 40 years production experience,a powerful technical team and efficient marketing system,ZiGong Cemented Carbide Co.,Ltd(ZGCC) offers well-known "Great Wall" brand series of cemented carbides,cutting tools,hard facing materials.Now those products have ready market in more than 40 countries and regions worldwide.It leads the country in complex production capacity in the same field and one of the leading cemented carbide manufacturers in the world.

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Spray dryer for manufacturing high quality materials



Special machine for processing high precision thread roll-rings



Introduced special grinding machine for processing high precision roll-rings

Best equipments

Advanced technology

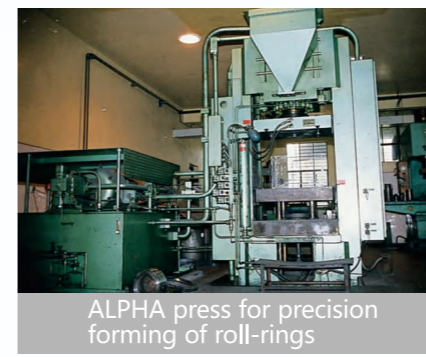
Excellent products

## » "Great wall" cemented carbide rolls

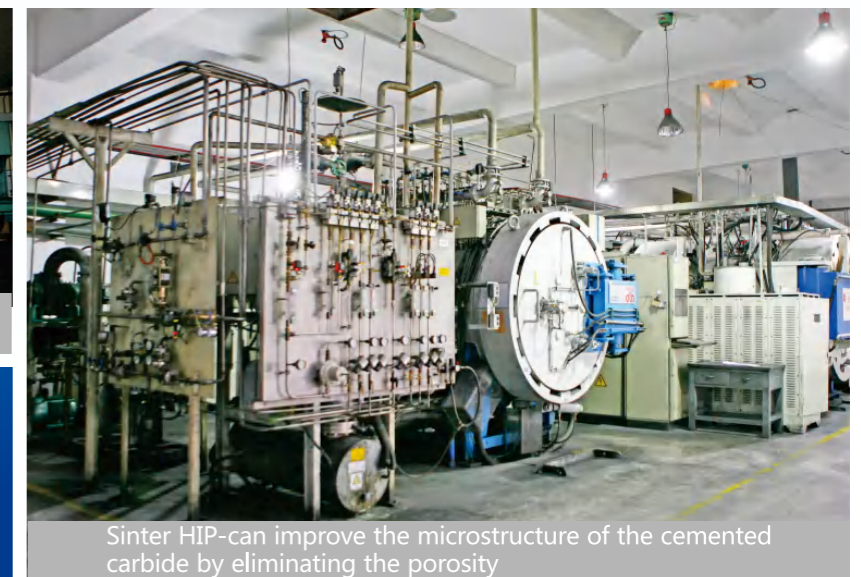
The roll production line in our company has adopted the up-to-date paraffine process combining with the digital mixing-system and spay drying technology to ensure the quality of the grade powder for the cemented carbide rolls. Equipped with the 500-tons and 1000-tons alpha presses imported from USA, Sinter-HIP furnaces from USA and Germany. This line is able to produce all kinds of rolls blanks with improved microstructure and properties. By using Wendt Special Grinding Machines and Groove Grinding Machines from Germany, the dimensional precision of finished rolls thus are guaranteed. Both of our own proprietary technical know-how in manufacturing cemented carbide rolls and effective quality stands ZGCC J341-2021, ZGCC J342.1-2021 and ZGCC K341.1-2023, ensures the top quality of our products.

Cemented carbide rolls of various specifications ranged in two materials series of ZY and ZY-A in totally more than 20 grades are available in our company. The maximal outside diameter of our cemented carbide rolls can be reached to 500mm and the maximal thickness to 250mm. Specialized rolls are also available upon customers requests.

Advanced technology, first-class equipment, precision manufacturing, strict quality inspection, leading development and design fully ensure the reliability, stability and high quality of "Great Wall" brand roller ring products.



ALPHA press for precision forming of roll-rings



Sinter HIP-can improve the microstructure of the cemented carbide by eliminating the porosity



## » Cemented carbide roll-rings for high-speed wire rod mill

Cemented carbide roll-rings used on high-speed wire rod mill we produced has excellent wear resistance, high impact resistance and good anti-fatigue toughness. They are distinguished from conventional carbide rolls by the following characteristics;

- ★ Suitable for high speed wire rolling speed higher than 100m/s, without problems such as cracks, broken and peeling-off.
- ★ Suitable for the high-speed wire rolling of both common carbon steel and alloyed steels.
- ★ Longer service life time, Less downtime and regrinding.
- ★ Suitable for high speed, low temperature rolling process.

## » Grades and properties

The materials of ZY and ZY-A serials are able to satisfy customers' different requirements.

The ZY serial grade contain acid corrosion-proof metal elements Ni and Cr in the binder, so that they are suitable for the cooling water of both that  $\text{PH} \geq 7.2$  and  $\text{PH} < 7.2$ .

According to the customers' special requirements and actual working condition, we can offer ZY-A grades, and also develop the special grades for extra use. The grades of ZY-A serials have the properties of high hardness, good toughness and excellent thermal crack resistance, and are suitable for the use in the large force condition, but the cooling water should be alkaline with  $\text{PH} \geq 7.2$ .

Grades	Binder (wt.%)	WC Grain-Size	Physical Properties			Mechanical Properties		
			*Density 20°C g/cm <sup>3</sup>	Thermal Conductivity W/ ( m.K )	Average Thermal Expansion Coefficient 10 <sup>-6</sup> /K	*Hardness 20°C ( HRA )	*Transverse Rupture Strength TRS 20°C Mpa	Compressive Strength ≥Mpa
ZY27T	30	Extra-Coarse	12.73	60	5.8~7.0	79.0	2560	2700
ZY27	30	Medium-Coarse	12.65	60	5.8~7.0	79.0	2626	2800
ZY26	27.5	Medium-Coarse	12.85	65	5.6~6.8	79.8	2653	2800
ZY28T	25	Extra-Coarse	13.00	70	5.5~6.5	80.3	2750	2800
ZY29	22	Coarse	13.36	70	5.5~6.5	81.8	2840	3000
ZY30	20	Coarse	13.48	80	5.2~6.0	82.3	2742	3200
ZY31	18	Coarse	13.68	90	5.0~5.8	83.3	2802	3200
ZY32	16	Coarse	13.77	90	5.0~5.8	83.8	2872	3200
ZY33	15	Coarse	13.98	100	5.0~5.8	84.5	2872	3200
ZY34	13	Coarse	14.17	100	4.8~5.6	85.5	2875	3400
ZY35	10	Coarse	14.43	100	4.8~5.6	86.5	2753	3500
ZY36	8	Extra-Coarse	14.69	110	4.5~5.4	86.8	2406	4000
ZY37	6	Extra-Coarse	14.87	110	4.5~5.4	87.5	2358	4100
ZY27A	30	Medium-Coarse	12.70	60	5.8~7.0	79.5	2780	2900
ZY28A	25	Medium-Coarse	13.15	70	5.5~6.5	81.2	2675	3000
ZY29A	22	Coarse	13.38	70	5.5~6.5	82.2	2750	3000
ZY30A	20	Coarse	13.50	80	5.2~6.0	84.0	2586	3100
ZY31A	18	Coarse	13.65	90	5.0~5.8	84.0	2806	3100
ZY33A	15	Coarse	13.92	90	5.0~5.8	85.5	2790	3200
ZY35A	10	Coarse	14.45	100	4.8~5.6	86.8	2456	3500
ZY36A	8	Extra-Coarse	14.69	110	4.8~5.6	87.0	2460	4000
ZY37A	6	Extra-Coarse	14.87	110	4.5~5.5	88.0	2386	4100

\*typical value

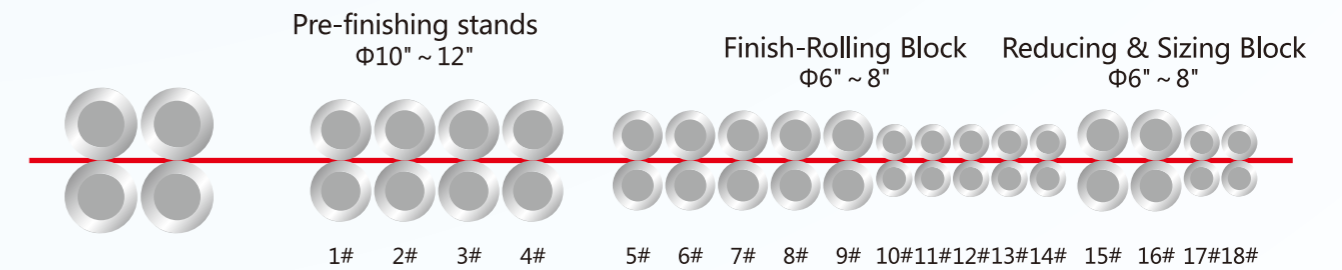


» Recommended applications

Grades	Recommended applications
ZY37 ZY37A	Highest hardness and thermal conductivity, best wear resistance and good thermal fatigue and shock resistance. Used in the last two stands of high-speed finish-rolling block and sizing stands.
ZY36 ZY36A	High hardness, excellent wear resistance, good impact resistance. Used in the last two stands of high-speed finish-rolling block and sizing stands.
ZY35 ZY35A	High hardness, excellent wear resistance, good impact resistance. Used in the last two stands of high-speed finish-rolling block or sizing stands.
ZY34 ZY34A	High hardness, good wear and impact resistance. Used in the last two stands of high-speed finish-rolling block or sizing stands.
ZY33 ZY33A	Moderate wear resistance and impact resistance, good for general purpose use. Used in the rear stands of high-speed wire rod mill.
ZY32	Moderate wear resistance and impact resistance, good for general purpose use. Used in the rear stands of high-speed wire rod mill.
ZY31 ZY31A	Good wear resistance and better impact resistance. Used in the front stands of high-speed wire rod mill. Also used in the rear stands of the finish rolling under unstable operation.
ZY30 ZY30A	Moderate toughness and thermal cracking resistance. Used in the first and second or reducing stands of finish rolling. Also used in the front stands of the finish rolling under unstable operation.
ZY29 ZY29A	Good toughness and thermal cracking resistance. Used in the first and second or reducing stands of finish rolling. And also used for rolling rebar.
ZY28T ZY28A	Good toughness and thermal cracking resistance. Used in the pre-finish rolling stands, and also for rolling rebar.
ZY26	Good toughness and thermal cracking resistance. Used in the pre-finish rolling stands, and also for rolling rebar.
ZY27 ZY27A	Excellent toughness and impact resistance, good thermal cracking resistance. Used in the pre-finish rolling stands, and also for rolling rebar.
ZY27T	Best toughness and impact resistance. Used in the finish rolling stands of wire rod mill and bar mill for rolling deformed bar and rebar. Also used in the intermediate stands of high speed wire rod mill.

» Recommended grades for each stand

Is must be correctly selected according to the actual work condition. We will recommend the proper grades to our customers after detailed studying all of the rolling parameters provided by them, such as equipment type, stability, rolling load, cooling condition, processing temperature and steel grades etc.. Generally, the grade of high binder content with good strength and toughness should be chosen when the mill aggregate shocked heavy and the pressing down amount is very big, contrary, the grade of low binder content with high hardness and good wear resistance should be chosen when the mill aggregate is working stably with small pressing down amount in high rolling speed.



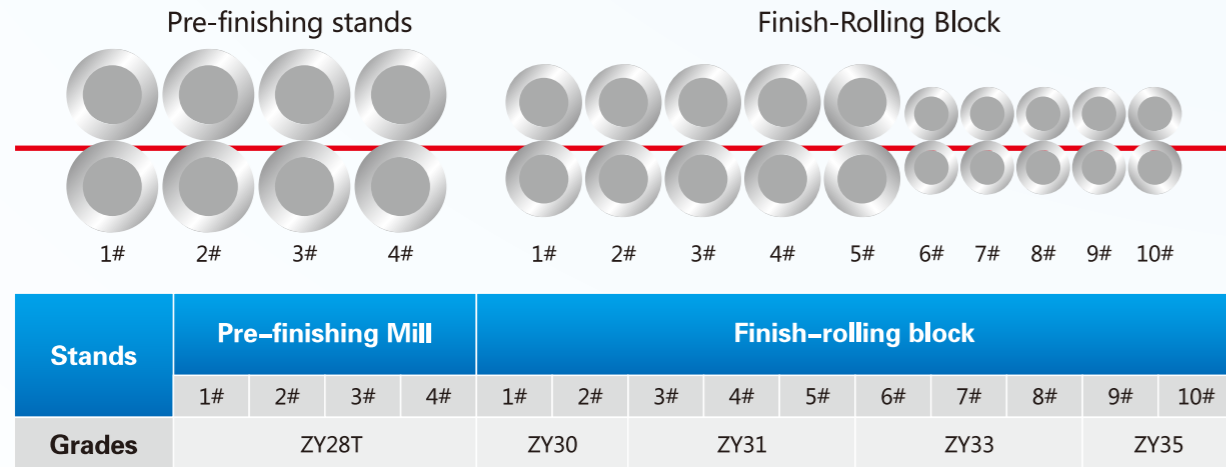
Grades	Pre-finishing stands				Finish-Rolling Block										Reducing&Sizing Block			
	1#	2#	3#	4#	5#	6#	7#	8#	9#	10#	11#	12#	13#	14#	15#	16#	17#	18#
ZY27/ZY27A	■	■	■	■														
ZY26	▲	▲	▲	▲														
ZY28T/ZY28A	●	●	●	●														
ZY29/ZY29A					■	■	■	■										
ZY30/ZY30A					▲	▲	▲	▲							■	■		
ZY31/ZY31A					●	●	●	●							▲	▲		
ZY32									■	■	■	■			●	●		
ZY33/ZY33A									▲	▲	▲	▲	■	■				
ZY34/ZY34A									●	●	●	●	▲	▲				
ZY35/ZY35A													●	●			■	■
ZY36/ZY36A																	▲	▲
ZY37/ZY37A																	●	●

\* Note: ● Recommended when work condition is good ;  
 ▲ Recommended when work condition is comparatively good ;  
 ■ Recommended when work condition is bad.

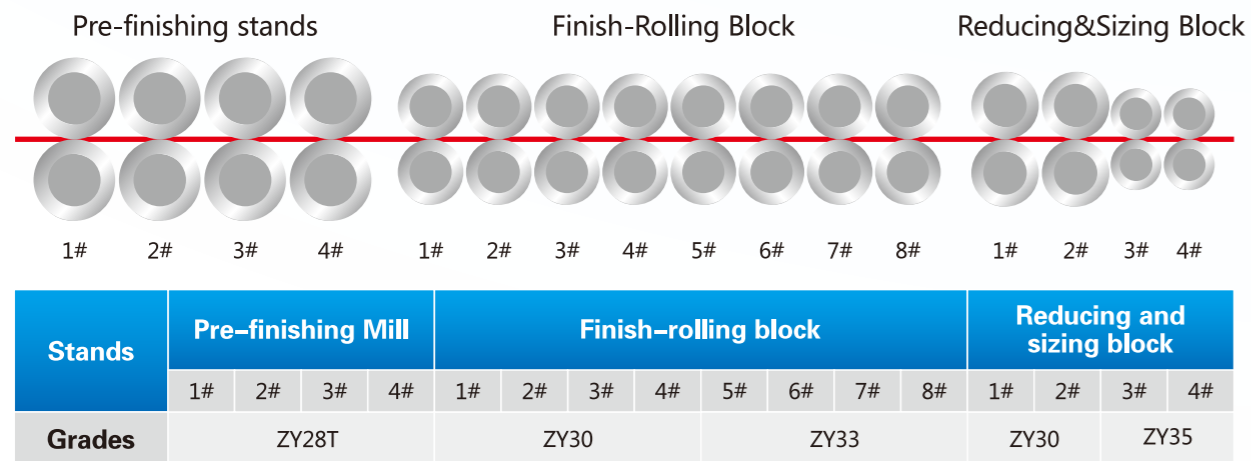


» Examples

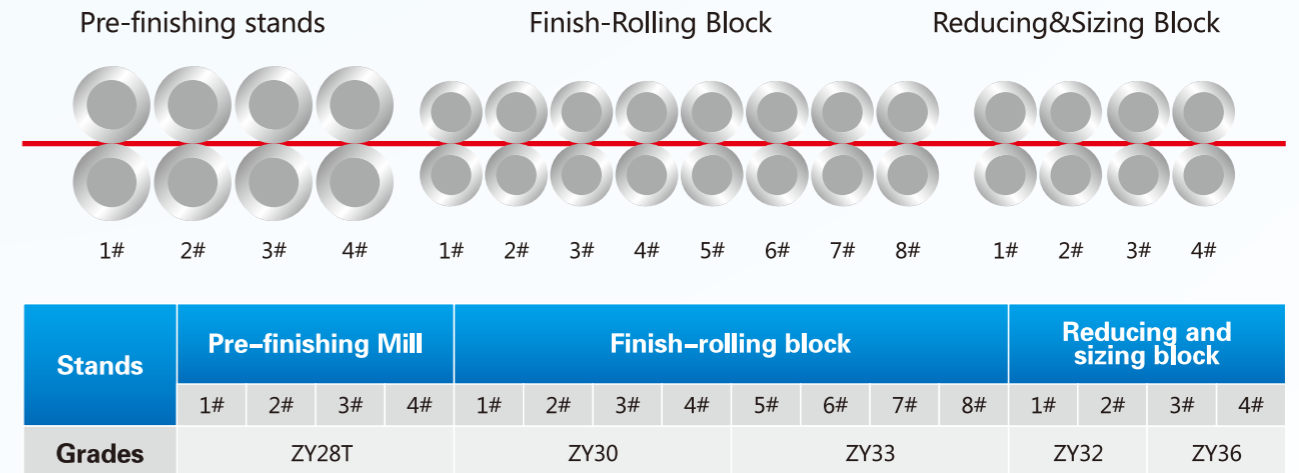
A Chinese steel factory employs Morgan V Mill aggregate consisted of 4 pre-finishing stands and 10 finish rolling stands with final rolling speed in 90~105m/s to roll the common carbon steel in a temperature of 1000~1100°C. The grades of roll-rings should be selected in a chosen as follows;



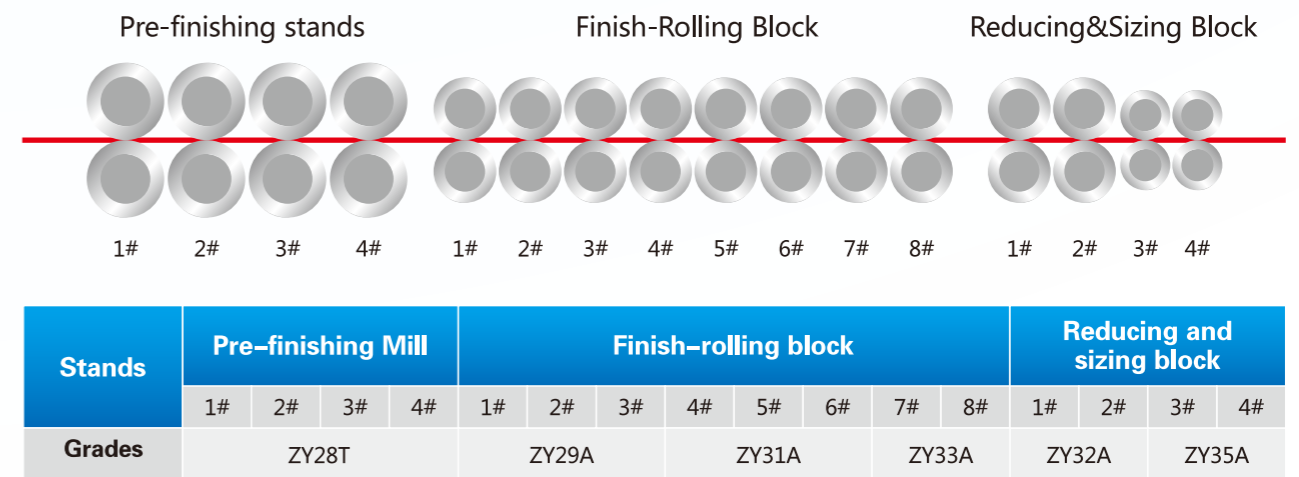
A Chinese steel company employs imported Morgan Mill aggregate consisted of pre-finishing stands and finish rolling stands plus reducing and sizing stands in 4+8+4, final rolling speed: 105 ~ 120m/s, mainly rolling high carbon steel and alloyed steel. The grades may be selected as follows;



A Chinese steel employs imported Danieli Mill aggregate with 4 pre-finishing stands, 8 finishing stands and 4 TMB, final rolling speed 105~120 m/s, mainly rolling high carbon steel and low alloyed steel, final rolling temperature : 800 ~ 850°C, and the grades can be chosen as follows;



A Chinese steel company employs Danieli mill aggregate steel consisted of 4 pre-finishing stands, 8 BGV and 4TMB, mainly rolling stainless steel with the final rolling speed:105 ~ 120m/s, The grades can be chosen as follows;







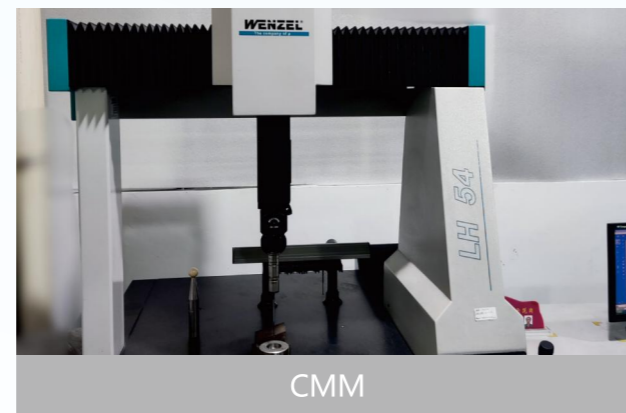
Optics projection apparatus



Microscope for microstructure analyzing



C-S analyzing system



CMM

Advanced R&D  
Precision manufacturing  
Strict quality inspection

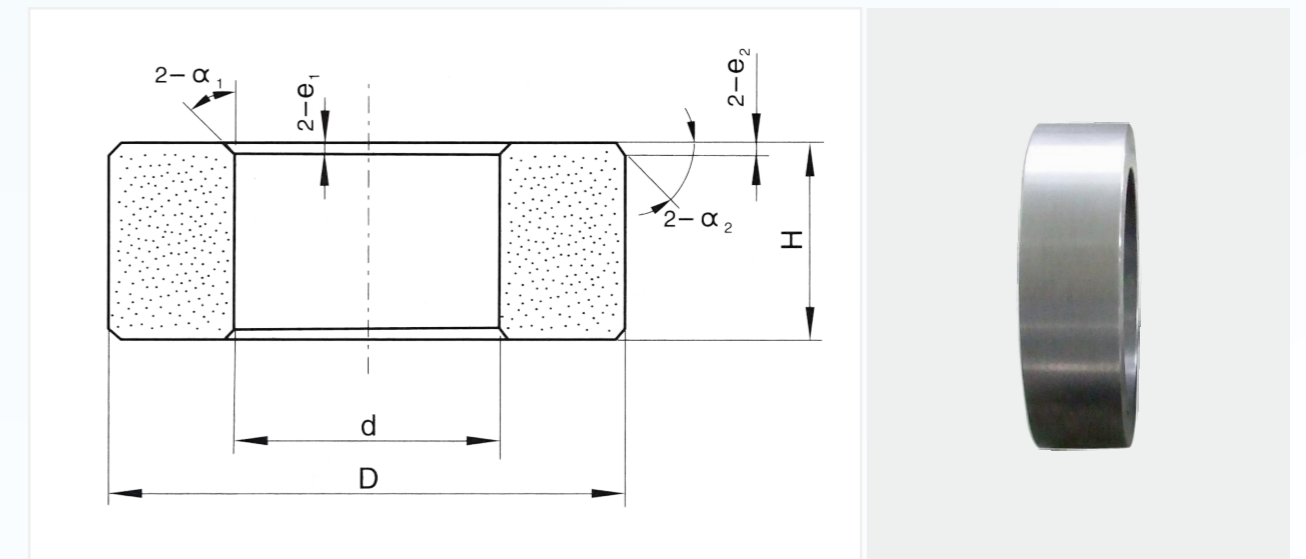


SEM

### » Specification for finish groud roll-rings

#### ◆ Dimensions and accuracy of finished roll rings

Dimensions tolerance of O.D.,I.D.and height according to specifications in 《 Table of dimensions and accuracy of finished rolls》 or as required by contract.



#### ◆ Dimension range of finished roll rings

OD	ID	H
140~500mm	80~300mm	10~250mm

#### ◆ Tolerance permitted for od, id and height of finished roll rings

Grade	D<285		D>285		Special request
	High precision	General	High precision	General	
Outside diameter	±0.010	±0.020	±0.020	±0.050	
Inside diameter	+0.010 0	+0.020 0	+0.015 0	+0.030 0	
Height	±0.010	±0.030	±0.015	±0.050	

\* Note: Specialized products can be manufactured as per the drawing supplied by customers.



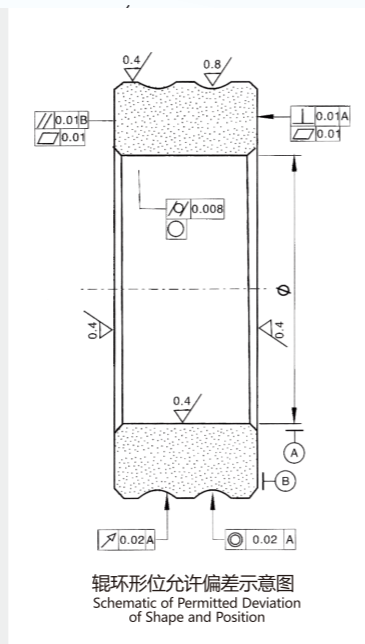
◆ Permitted deviations of finished roll rings

Items	Outside D≤285mm		Outside D>285mm	
	High precision	General	High precision	General
Coaxiality	≤0.013	≤0.020	≤0.015	≤0.020
End face run -out	≤0.005	≤0.010	≤0.010	≤0.015
End face parallelism	≤0.005	≤0.010	≤0.008	≤0.015
Cylindricity and roundness of inner hole	≤0.006	≤0.008	≤0.008	≤0.015

mm

◆ Roughness of finished roll rings

- Roughness of inner hole ≤0.4μm
- Roughness of outer circle ≤0.4μm
- Roughness of end face ≤0.4μm
- Roughness of groove face ≤0.80μm



» How to use

With high strength, high hardness, and good wear and thermal fatigue resistance, cemented carbide rolls (composed of WC, Co, Ni and other rare metals) is developed for high-speed wire rolling. To make the best use of cemented carbide rolls, attentions should be paid to things listed below;



◆ Selection of the grades

Choose the appropriate grades for different stands according to the work condition, such as rolling process, rolling speed and rolling loads.

◆ Installation of roll-rings

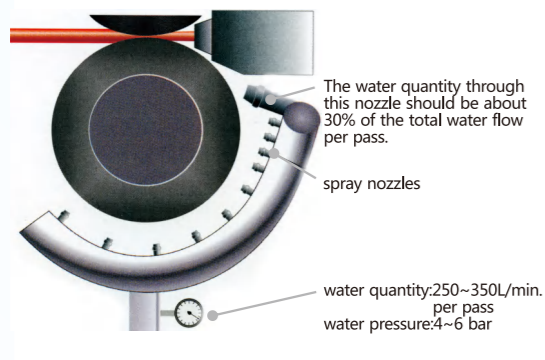
Before installation, check the roll ring, tapered hosing, roller and clean the assembly surface of the ring, tapered hosing and roller. The match between roll ring-roller and tapered hosing should not be too tight or too loose. The same grade is suggested for the same stand.

◆ Cooling of roll-rings

Roll-rings must be cooled effectively to prevent thermal fatigue crack and to prolong the service life. 4~6bar cooling water pressure is recommended for finishing stands, and a flow quantity of 250~300L/min per pass (and it is best to satisfy the requirement in the blank below) is required to ensure the surface temperature of the roll-rings surface less than 50°C. The water jet angle and the distribution of nozzles are sketched in the figure below;



Recommended design for water cooling



Stands		Water flow quantity (L/min.pass)
Pre-finishing		480~500
Finishing	1 ~ 2#	480~500
	3 ~ 4#	400~450
	5 ~ 8#	300~350
	9 ~ 10#	250~300
Reducing & Sizing		200~250

The cooling water quality

The quality of cooling water includes three factors as below;

★ The PH value of cooling water. The PH value of cooling water has a large influence of the corrosion on the roll-rings. When the PH<7.2.

the corrosion of cobalt could be dramatically increased , therefore, Co+Ni+Cr based ZY series grades should be selected.

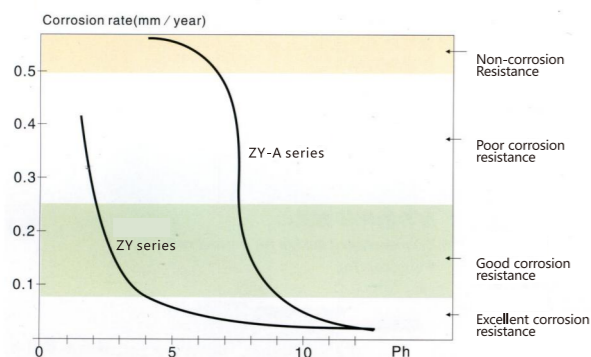
★ Solid particles content in cooling water. The solid particles in cooling water acts as a abrasive during rolling. Therefore sedimentation and

purification of cooling water are required to reduce solid particle content to less than 15mg/L.

★ Cooling effect: when the temperature rises to 600 ° C, the hardness and strength of cemented carbide begin to decrease, and when it reaches 800 ° C, it will decrease by half. At the same time, the temperature difference of the roll ring will also increase significantly. Therefore,

it is necessary to ensure that the roll ring can be fully and effectively cooled in the process of use. The results show that the water temperature of cooling water has a significant effect on the cooling effect. When the water temperature rises to 10 ° C, the cooling effect decreases by 15%. Therefore, in order to ensure effective cooling, the temperature of cooling water should be controlled below 35 ° C.

◆ Corrosion resistance of cemented-carbide-roll grades.



◆ Rolling rate and dressing of roll rings

When the thermal micro-crack extends to certain depth, generally 0.2~0.4mm, the roll needs to be dressed. Normally, the feed rate during routine dressing should be controlled to 0.02~0.03mm/round. The rolling rate is related to the kind of rolling steel, rolling process and rolling condition, It is suggested that for rolling common carbon steels as below;

- ★Pre-finishing stands : 4000~6000 tons
- ★Finishing stands No.1~4 : 2500~4000 tons
- ★Finishing stands No.5~8 : 1500~2500 tons
- ★Finishing stands No.9~10 : 800~2000 tons
- ★RSM : 800~2000 tons

And it is recommended that:

For roll-rings used in the last 1~2 stands of the finishing mill: 0.4~0.8mm;

For roll-rings used in the other 8 stands of the finishing mill: 0.6~1.2mm;

For roll-rings used in the pre-finishing mill: 1.2~2.0mm;

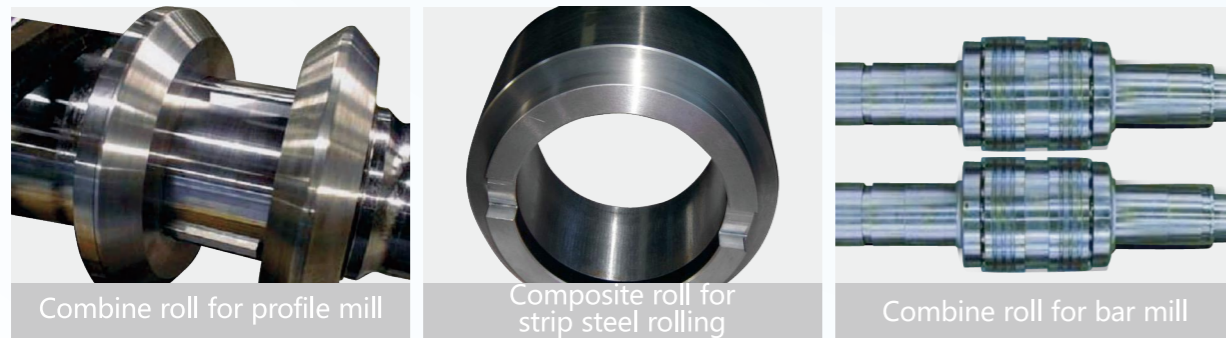
◆ Storage of roll rings

Cemented carbide roll-rings are fragile products and tend to crack easily. Therefore, it should be handled carefully to prevent them from damage.

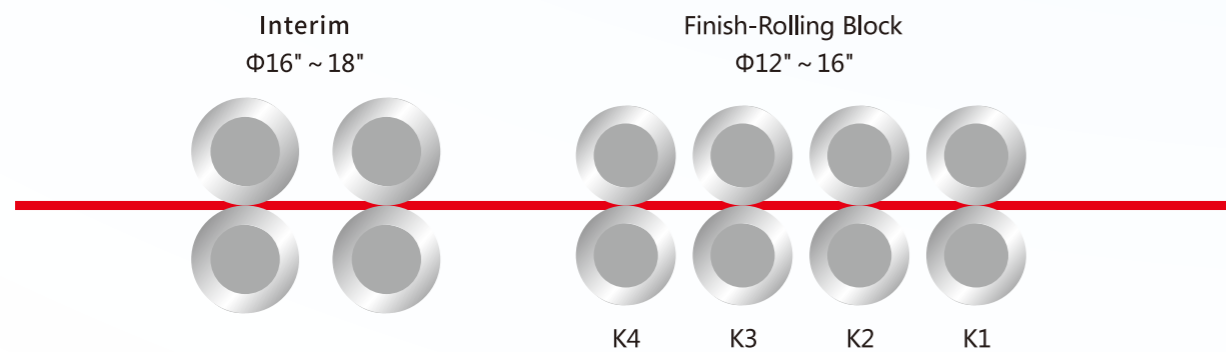


### » Composite rolls and combine roll-rings for bar mill

Composite cemented carbide rolls and roll rings are mainly used for high speed wire rolling mill aggregate in the interim stands and for 250,300,350,400 profile steel rolling mill in the middle and final stands. The lifetime is 20~30 times longer than common cast iron roll for hot rolling steel wire, rebar, round steel rod, narrow strip steel and angle steel with better product quality and dimension precision. Simple turning process can be employed to machine the slots in the carbide roll, using CBN or PCD insert. Grades available are as follows.



### » Recommended grades selection



Items	K4	K3	K2	K1
For rolling rebar	ZY27T	ZY27T	ZY27T/ZY28T	ZY27T
For rolling bar steel	ZY27T	ZY27T	ZY27T/ZY28T	ZY27T/ZY28T
For rolling profile steel	ZY27T	ZY27T	ZY27T/ZY28T	ZY27T/ZY28T

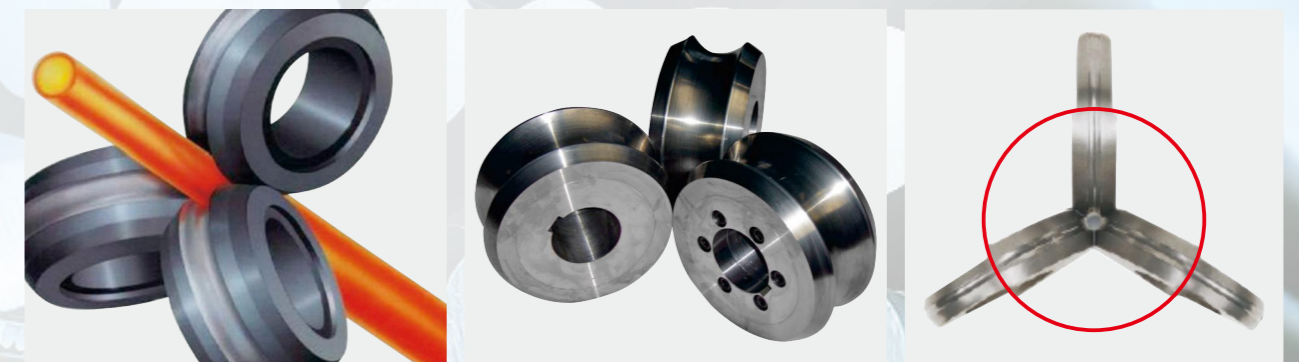
### » Grades properties

Grades	Binder ( wt.% )	WC grain size	Physical Properties			Mechanical Properties			
			* Density g/cm <sup>3</sup>	Thermal Conductivity W/ ( m.K )	Average Expansion Coefficient 10 <sup>-6</sup> /K	* Hardness 20°C ( HRA )	* TRS 20°C Mpa	Compressive strength ≥Mpa	* Fracture toughness K <sub>IC</sub> Mpa.m <sup>1/2</sup>
ZY27T	30	Extra-coarse	12.73	60	5.8~7.0	79.0	2560	2700	28.2
ZY28T	25	Extra-coarse	13.00	70	5.5~6.5	80.3	2750	2800	24.3

\*typical value

### » 3d-carbide rolls for kocks mill

The 3D carbide rolls use in the KOCKS style MILL for rolling bar and seamless-tube we produce features high precision of groove, less downtime and long service time. We are also able to provide solid carbide rolls or cemented-steel combined rolls according to the customers' requirements. Grades available are as follows;

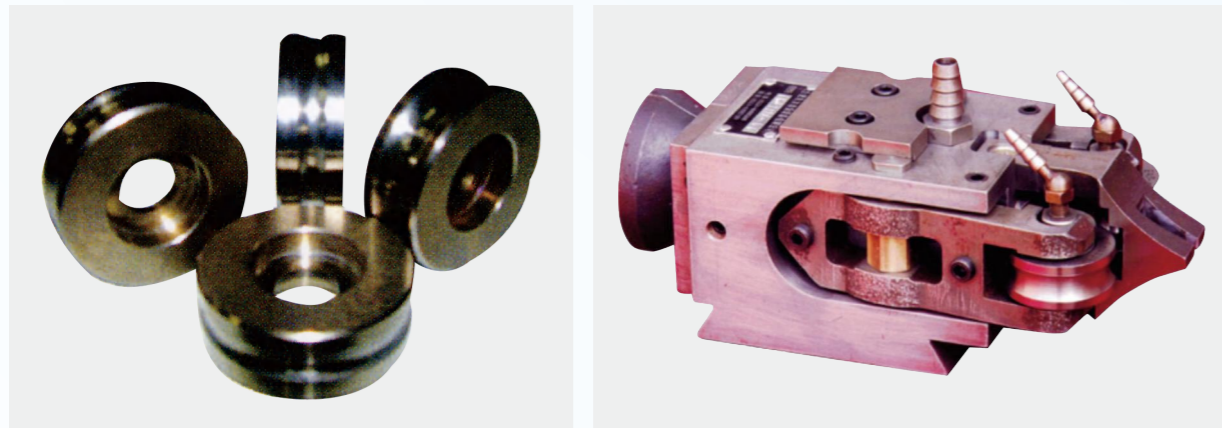


Grades	Binder ( wt.% )	WC grain size	Physical properties			Mechanical properties		
			* Density g/cm <sup>3</sup>	Thermal Conductivity W/ ( m.K )	Average Thermal Expansion Coefficient 10 <sup>-6</sup> /K	* Hardness 20°C ( HRA )	* TRS (B sample) 20Y Mpa	Compressive strength ≥Mpa
ZY27T	30	Extra-coarse	12.73	60	5.8~7.0	79.0	2560	2700
ZY28T	25	Extra-coarse	13.00	70	5.5~6.5	80.3	2750	2800
ZY30	20	coarse	13.48	80	5.2~6.0	82.3	2742	3200

\*typical value



» TiC-based cermet guide roller (new)



» Grades and properties

Grades	* Density g/cm <sup>3</sup>	* Hardness (HRA)	TRS(B * sample) Mpa	E modulus KN/mm <sup>2</sup>	Average Thermal Coefficient 10 <sup>-6</sup> /K
ZYT05	6.50	87.0	1830	380	6.0
ZYT10	8.06	86.8	1750	380	6.0
ZYT40	6.48	85.3	1987	360	6.2

\*typical value

» Features

- ★ Lighter than WC-Co roll; Better acceleration, good for increasing the life time of bearings.
- ★ Better wear resistance than alloy steel, with a service life 20~50 times that of the latter.
- ★ Superior high temperature corrosion resistance(not easily tend to crack).
- ★ Non-magnetic, high chemical stability at high temperature, no affinity to steel. Not easy to be adhered by metal scraps.
- ★ Excellent wear resistance. Can be repeatedly used after dressing, low cost per ton steel.
- ★ Less mill downtime by utilized together with high productivity with cemented carbide rolls.

» Applications

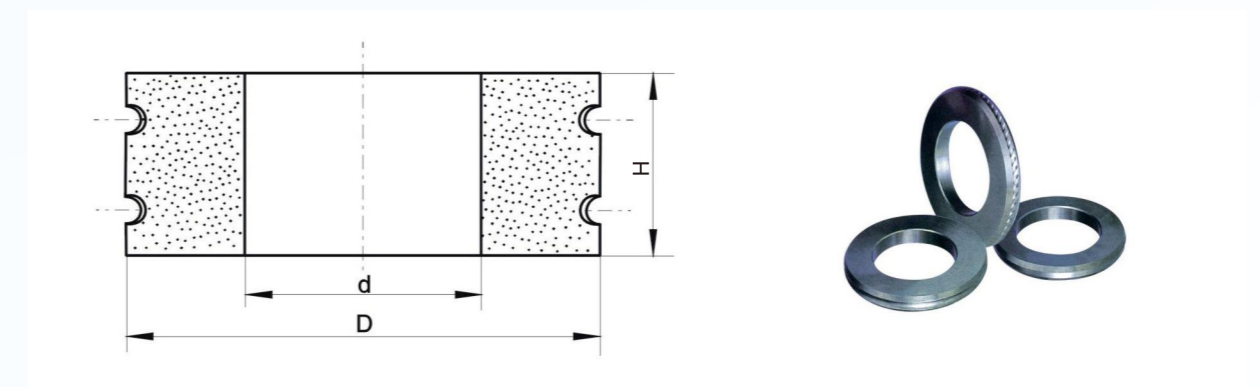
Guide roller is a main wear part on the wire rod and bar rolling mill. It may be utilized with cemented carbide rolls, to ensure the steel to move smoothly into the grooves of the rolls to avoid winding and swing of the steel.

» Cemented carbide roll-rings for cold rolling

Our company is a key enterprise engaged in manufacturing all kinds of rolls for cold rolling.All rolls feature:

- 1.Improved mechanical properties;
- 2.Good surface finish and corrosion-resistance;
- 3.Longer tool life and possible to 600-ton rebar, suitable for repeated use.

» Cold rolling plate for continuous rolling mills



Type	Name	Dimension		
		D	d	H
GL180.*K1	Two-groove rolls	180	110	55
GL180.*K2	Two-groove carved rolls	180	110	55

Rolled product range:Φ8~Φ12 reinforced bars

Type example:GL180.10K2 represents aΦ180 two -groove carved roll for rolling Φ10 reinforced bars.

\*Represents the diameter of rolled reinforced bars.

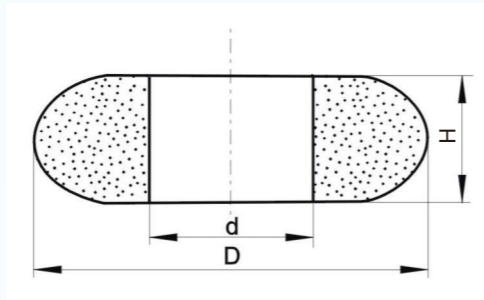


### » Forming roller

Rolled product range:  $\Phi 4 \sim \Phi 10$  cold rolled twisted rebars.

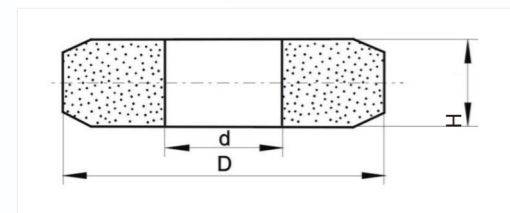
Type example: GL160.082

Shows a  $\Phi 162$  2<sup>#</sup> forming roller for rolling of  $\Phi 8$  cold twisted steel.

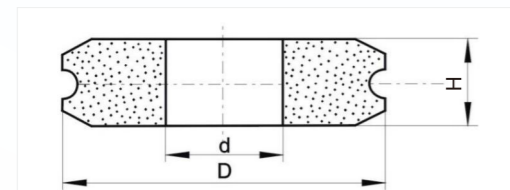


Type	Name	Dimension		
		D	d	H
GL160.***	Two-groove rolls	160	105	20

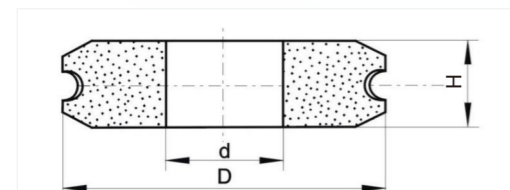
### » Cold rolling plate for continuous rolling mills



Flat roll



Single groove roll



Single groove carved roll

Type	Name	Dimension		
		D	d	H
GL130.*K5 GL145.*K5 GL150.*K5	Flat roll	130 145 150	82 95 96	16 15 15
GL130.*K3 GL145.*K3 GL150.*K5	Single groove roll	130 145 150	82 95 96	16 15 15
GL130.*K6 GL145.*K6 GL150.*K6	Single groove carved roll	130 145 150	82 95 96	16 15 15

Polled product range:  $\Phi 4 \sim \Phi 8$  reinforced bars.

Type example: GL145.4K3

Shows a  $\Phi 145$  3<sup>#</sup> stand single-groove roll for rolling  $\Phi 4$  reinforced bars.

Note: non-standard rolls are available upon request.



### » Inspection, marking and packing of finished rolls

Inspection as specified by ZGCC E442-2022;

Marking: Greatwall brand, specification, type and date of production are engraved on one of the surface by laser or mark as customer's required

Grade, specifications, weight, shape of groove and customer's name are indicated on the wooden package.

### » How to order

- ★ Pls. read this manual carefully to learn the recommended scope of application before ordering;
- ★ Pls. fill in contract according to the requirements when ordering;
- ★ If you have any special requirements, pls. contact our Sales Service Dept. or Technical Dept. for help;
- ★ The specifications is subject to change without notice.

### » Contact us

#### Roll Ring Sales

Address: No. 299, Middle Yidu Road, Longquanyi Distrit, Chengdu City, Sichuan Province, China

P.C: 610100

Tel: 028-84883656 0813-5516339

[http:// www.zgcccabide.com](http://www.zgcccabide.com)

E-mail: [info@ie.zgcc.com](mailto:info@ie.zgcc.com)

#### Roll ring Technical Services

Domestic Sales Tel.: 028-84885430

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