

## Section and Rail Mill Rolls

### Indefinite Chill Double Pour Rolls



#### Description

##### Indefinite Chill Double Pour Rolls

AKA: Alloy Indefinite Chilled Cast Iron Rolls has a long working life span. Normally it's applied to intermediate and finishing stands of long products and flat products hot rolling mills. Normally ICDP roll is added with chemical compositions like Cr, Ni, and Mo, which may increase the work layer depth. Thanks to the big qty of carbides existed in matrix structure of roll barrel, thus it has better wear resistance.

Pros for ICDP rolls: high hardness, low hardness drop, good fire crack resistance, easy heat treatment process, that's why it has been widely used all over the world.

Application differs by hardness: For strip mills, the roll hardness normally 75~85HS, For medium and heavy plate mill, hardness is relatively smaller as 70~80HS

##### Chemical Composition %

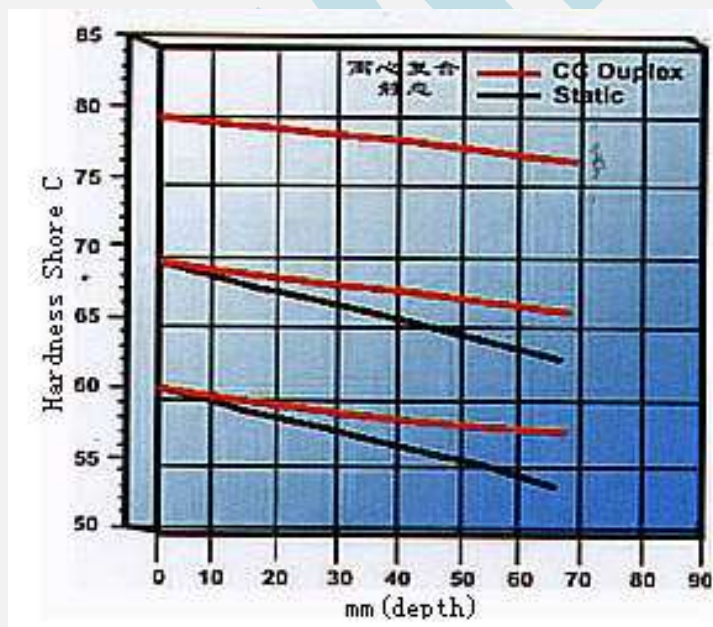
Symbol	C	Si	Mn	Cr	Ni	Mo	v
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## WINHAM

IC	2.90-3.60	0.60-1.20	0.40-1.20	0.60-1.20		0.20-0.60	
IC I	2.90-3.60	0.60-1.20	0.40-1.20	0.70-1.20	0.50-1.00	0.20-0.60	
IC II	2.90-3.60	0.60-1.20	0.40-1.20	0.70-1.20	1.01-2.00	0.20-0.60	
ICIII	2.90-3.60	0.60-1.20	0.40-1.20	0.70-1.20	2.01-3.00	0.20-1.00	
ICIV	2.90-3.60	0.60-1.50	0.40-1.20	1.00-2.00	3.01-4.80	0.20-1.00	
IC V	2.90-3.60	0.60-1.50	0.4.-1.20	1.00-2.00	3.01-4.80	0.20-2.00	0.20-2.00

## Prosperities & Application

Symbol	Hardness HS	Tensile Strength MPa	Dimension MM	Unit N.W KGS	Application
IC	50-70	≥160	Φ300-1000	500-30000	Rolls for intermidiate and finish stands of section mills,bar and rod mills,hot strip mill
IC I	55-72	≥160			
IC II	55-72	≥160			
ICIII	65-78	≥350			
ICIV	70-83	≥350			Work rolls for medium&heavy plate mills, hot strip mills,work rolls,skin pass rolls
IC V	77-85	≥350			



**Cast Iron Chilled Rolls**



**Description**

**Cast Iron Chilled Rolls**

Cast Iron Chilled Rolls are one kind of cast iron rolls, which contain almost no free graphite in the matrix of working layer of the barrel. They have hardness and excellent wearability, are suitable for finish stands of light bar and wire rolling mills and narrow strip mills. Its microstructure is fine pearlite and carbides.

**Chemical Composition %**

Symbol	C	Si	Mn	Cr	Ni	Mo
CC I	2.90-3.60	0.25-0.80	0.20-1.00	0.20-0.60	0.50-1.00	0.20-0.60
CC II	2.90-3.60	0.25-0.80	0.20-1.00	0.30-1.20	1.01-2.00	0.20-0.60
CCIII	2.90-3.60	0.25-0.80	0.20-1.00	0.50-1.50	2.01-3.00	0.20-0.60
CCIV	2.90-3.60	0.25-0.80	0.20-1.00	0.50-1.70	3.01-4.50	0.20-0.60

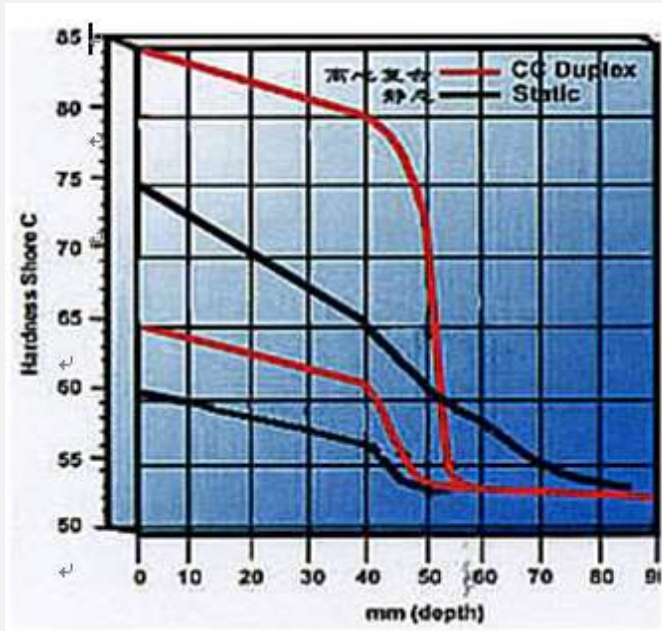
**Prosperities & Application**

Symbol	Hardness HS	Tensile Strength MPa	Bending Strength MPa	Application



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CC I	60-70	≥150	300-400	Rolls for finishing stands of small section mills, bar and wire mills, hot narrow strip mills
CC II	62-75	≥150	300-400	
CCIII	65-80	≥350	500-700	
CCIV	70-85	≥350	500-700	



## Alloy Spheroidal Graphite Iron Rolls



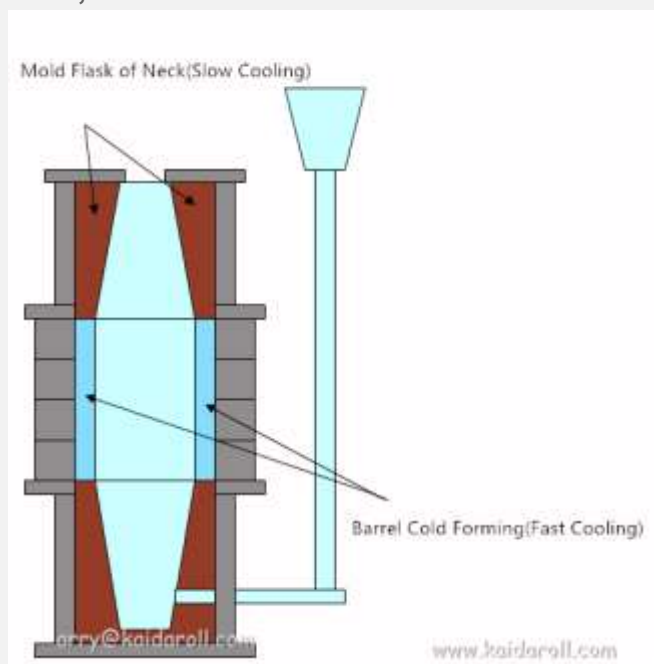
**Description**

**Alloy Nodular Cast Iron Rolls (SG)**

These rolls are characterized by spherical graphite. Its mechanical properties are similar to that of alloy indefinite chilled rolls except that its strength is higher than the latter. They can be produced by static casting.

Speaking of static casting, there're two type of static process

**No.1, Monobloc Static Cast Roll**



**Definition:**

- Single pour casting rolls employ the same chemical content, i.e. Barrel and Neck.
- To achieve the different requirement of hardness, strength, and metallurgy by the means of controlling the freezing rate of molten iron

**Material Application:**

Material:	Stands:	Hardness:
SGP	Roughing	45 – 50 Shore
SGP	Intermediate	50 – 65 Shore
ACS/Steel/Base steel	Roughing	35 – 45 Shore
Base steel/Graphite steel	Intermediate/Finishing	50 – 55 Shore
SGA	Intermediate/Finishing	63 – 68 Shore
SGA/Mo (Heat Treatment)	Intermediate/Finishing	70 Max Shore
NCC (Heat Treatment)	Roughing	45 – 55 Shore

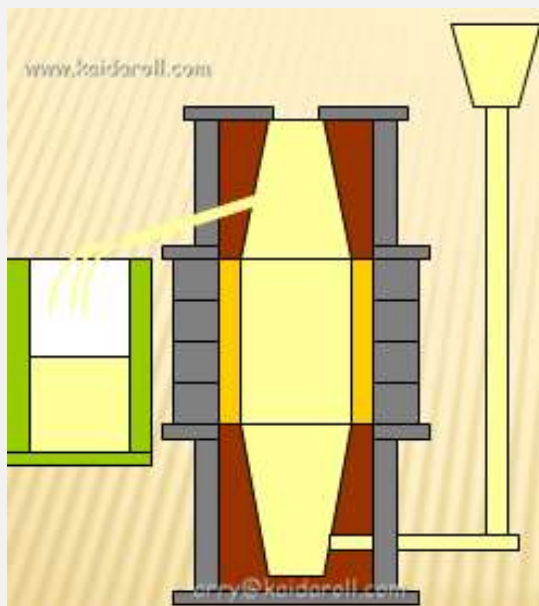
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AIC	Finishing	63 – 68 Shore
Hi Cr	Intermediate/Finishing	55 - 65 Shore

### Pros and Cons:

Pros:	Cons:
Low cost	Max hardness is limited
Easy production	Strength of neck is limited
Material already exists	Hardness drop is large
Common material	
Easy machining	
Large diameter	

### No.2, Composite Static Cast Roll



Step 1, molten iron pours into outer shell

Step 2, after solidification of outer shell molten iron; add molten iron to the core, the overflow molten iron can be reclaimed.

### Definition:

- The chemical content of barrel work layer is different from core and neck
- The properties of this type of rolls depends on chemical content, the cooling rate of both are also critical

### Pros and Cons:

## WINHAM

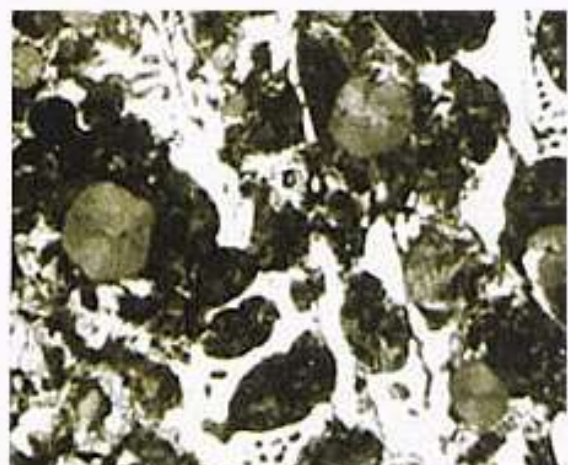
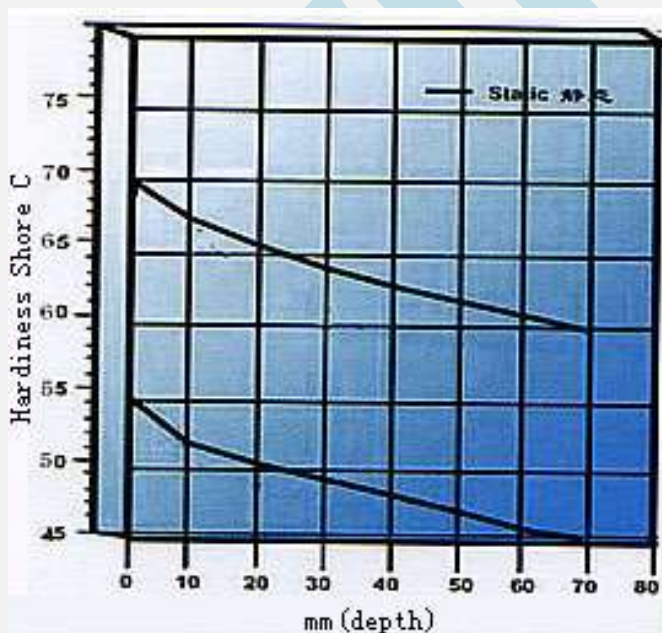
Pros:	Cons:
Common material applicable	Higher cost
Max hardness is higher	Core material selection limited
Hardness drop is smaller	Neck strength is limited

### Chemical Composition %

Symbol	C	Si	Mn	Cr	Ni	Mo	Mg
SG II	2.90-3.60	0.80-2.50	0.40-1.20	0.20-0.60	-	0.20-0.60	≥0.04
SGIV	2.90-3.60	0.80-2.50	0.40-1.20	0.20-0.60	0.50-1.00	0.20-0.80	≥0.04
SG V	2.90-3.60	0.80-2.50	0.40-1.20	0.30-1.20	1.01-2.00	0.20-0.80	≥0.04

### Prosperities & Application

Symbol	Hardness HS	Tensile Strength MPa	Bending Strength MPa	Dimension MM	Unit N.W KGS	Application
SG II	50-70	≥320	500-700	Φ 300-1300	500-35000	Rolls for finish stands of light section mills, bar and wire rod mills, hot narrow strip mills and temper mill.
SGIV	55-70	≥320	500-700			
SG V	60-70	≥320	600-800			





## Spheroidal Graphite Pearlite Rolls



### Description

#### Spheroidal Graphite Pearlite Rolls

Spheroidal Graphite Pearlite Rolls are obtained by adding alloy elements of NiCrMo into the nodular cast iron and following special heat treatment. Pearlitic nodular rolls have high strength, good thermal properties and resistance to emergencies as well as small hardness gradient of working layer.

#### Chemical Composition%

Symbol	C	Si	Mn	Cr	Ni	Mo	Mg
SGP I	3.00-3.50	1.60-2.40	0.40-1.00	0.10-0.40	1.20-2.00	0.20-0.60	≥0.04
SGP II	3.00-3.50	1.40-2.20	0.40-1.00	0.20-1.00	1.50-2.50	0.30-0.80	≥0.04
SGP III	3.00-3.50	1.20-2.00	0.40-1.00	0.20-1.20	2.00-3.00	0.30-0.80	≥0.04

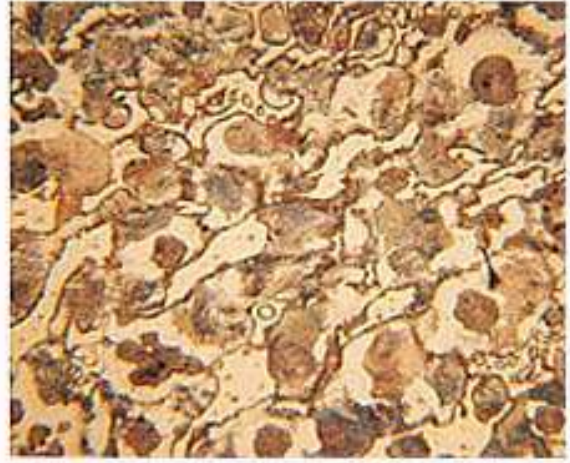
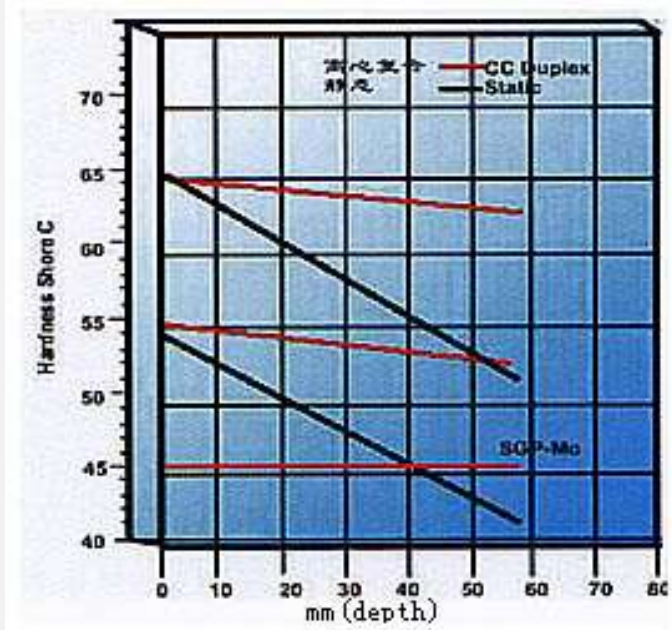
#### Prosperities & Application

Symbol	Hardness	Tensile	Bending	Application
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	HS	Strength MPa	Strength MPa	
SGP I	40-55	≥350	800-1000	Rolls for blooming mills, roughing and intermediate stands of bar, wire and section mills.
SGP II	50-65	≥350	800-1000	
SGP III	60-72	≥350	800-1000	



## Bainitic Spheroidal Graphite Rolls



### Description

#### Bainitic Spheroidal Graphite Rolls

Alloy elements of Ni, Mn, Cr, Mo etc. are added to bainitic spheroidal graphite rolls for obtaining acicular(bainite-martensite)matrix in its microstructure of these rolls. Its strength and toughness is higher than Perlitic Nodular Cast Iron Rolls, wearability is also better than latter. These rolls can be produced by static casting or centrifugal casting.

#### Chemical Composition %

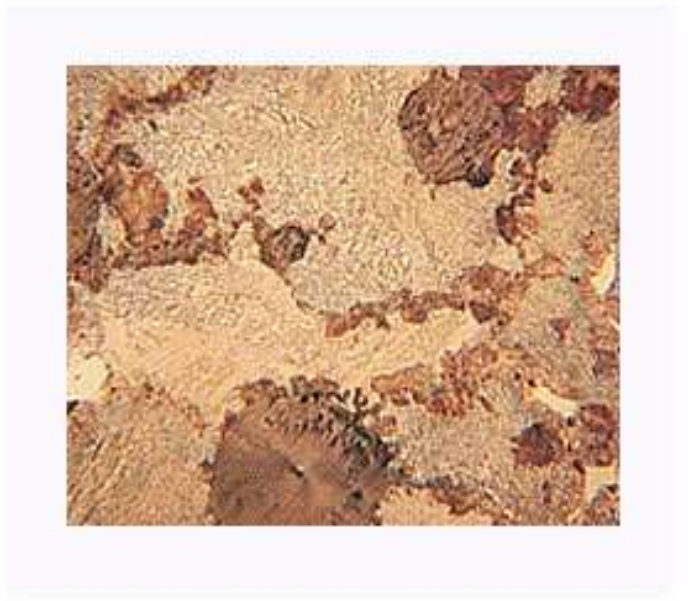
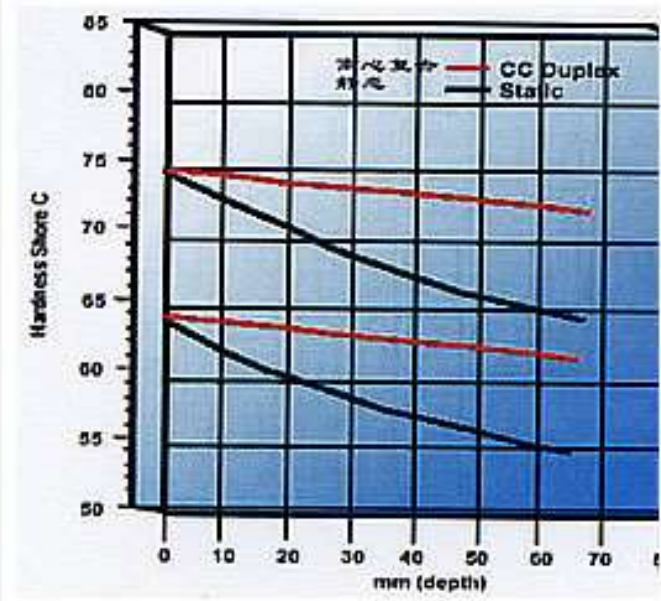
Symbol	C	Si	Mn	Cr	Ni	Mo
SGA I	2.90-3.60	1.20-2.20	0.20-0.80	0.20-1.00	3.01-3.50	0.50-1.00
SGA II	2.90-3.60	1.00-2.00	0.20-0.80	0.30-1.50	3.51-4.50	0.50-1.00

#### Prosperities & Application

Symbol	Hardness HS	Tensile Strength	Bending Strength MPa	Application

# WINHAM

		MPa		
SGA I	55-78	≥350	600-800	Finishing stands of small section mills, bar, rod and hot narrow strip mills, finishing stands of high speed wire mills
SGA II	60-80	≥350	600-800	



WINHAM



**NCC Mill Rolls**



**Description**

NCC rolls aka. Non Continuous Carbide Rolls

Rolls for roughers require a combination of some properties, some of which can be counteracted by the others. These properties include wearability, resistance of fire cracking and impact, hot hardness and hot strength etc. Excessive network carbides will improve wearability and impact resistance but dramatically reduce fracture toughness. Under rough rolling process they can promote fire cracking formation and added to form Bainitic/Martensitec(acicular) matrix, which is more wearable than conventional pearlitic matrix. The Molybdenum can also improve the hot hardness of rolls.

This type of roll is manufactured from high alloy materials with special heat treatment. Carbide content in the matrix is less than 5%, which is satisfactory to the requirement of roughers.

**Chemical Composition %**

Symbol	C	Si	Mn	Cr	Ni	Mo
NCC I	3.00-3.40	2.00-2.50	0.80-1.00	≥0.15	2.50-4.00	0.70-1.00

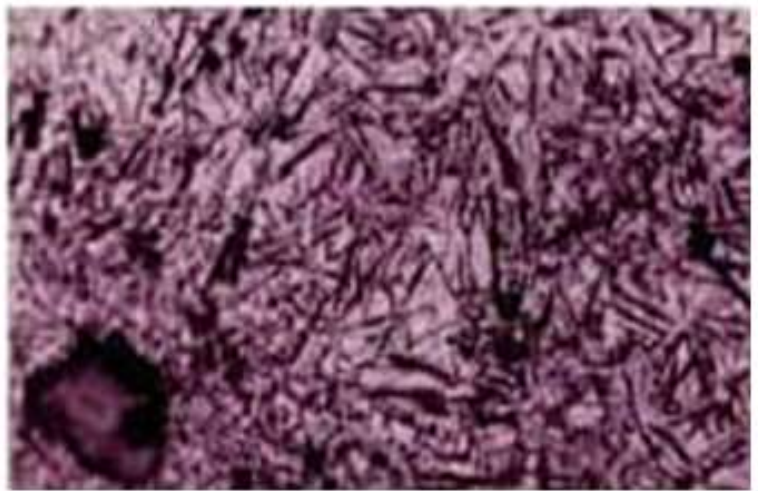
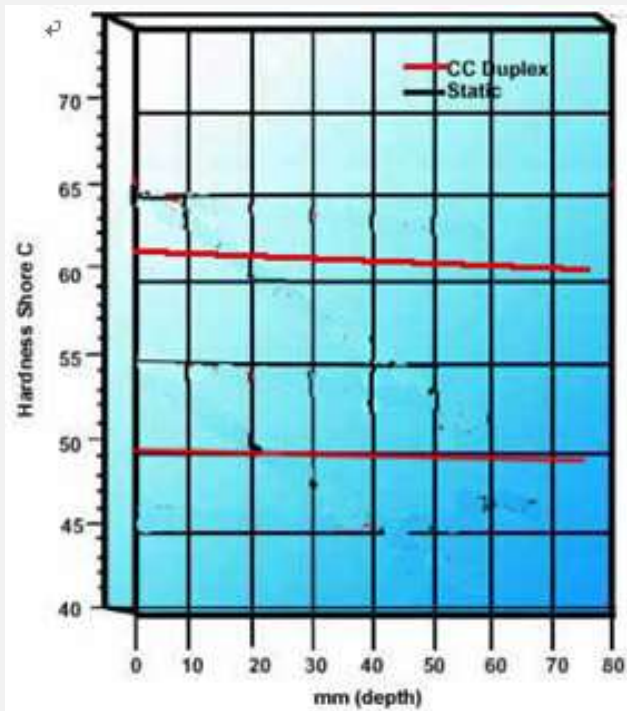


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NCC II	3.00-3.40	1.50-2.00	0.80-1.00	≥0.15	2.50-4.50	0.70-1.00
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## Prosperities&Application

Symbol	Hardness HS	Tensile Strength MPa	Bending Strength MPa	Application
NCC I	40-50	≥520	970-1380	Roughing stands of bar and wire mills, BD2 rolls for large section
NCC II	50-60	≥520	970-1380	



## Spin Cast High Chrome Iron Rolls



### Description

#### Spin Cast High Chrome Iron Rolls

From the name we can tell the casting process: Spin cast or centrifugal cast double poured. For spun casting, there're three types, i.e. horizontal, vertical and slant spun casting.

Compared to static casting, the small qty of high chrome iron outer shell can be fast chilled, result in greater fine dispersed carbides structure.

The core employs high strength nodular iron, thanks to the high chrome content of outer shell, the silicon content and nickel content should be higher than normal rolls, so as to reduce the carbides content of roll, thus enhance core strength.

Generally speaking, to avoid the chrome spread to core when pouring iron to core, the transition layer should be added between core and shell, the material employs medium-chrome iron, adamite, gray iron, etc. The timing, temperature, molten iron qty should be strictly controlled.

The pros of this type of roll:

-Relative cost, good properties, great wear resistance, good thermal fatigue resistance, etc, and that's why it has been widely used.

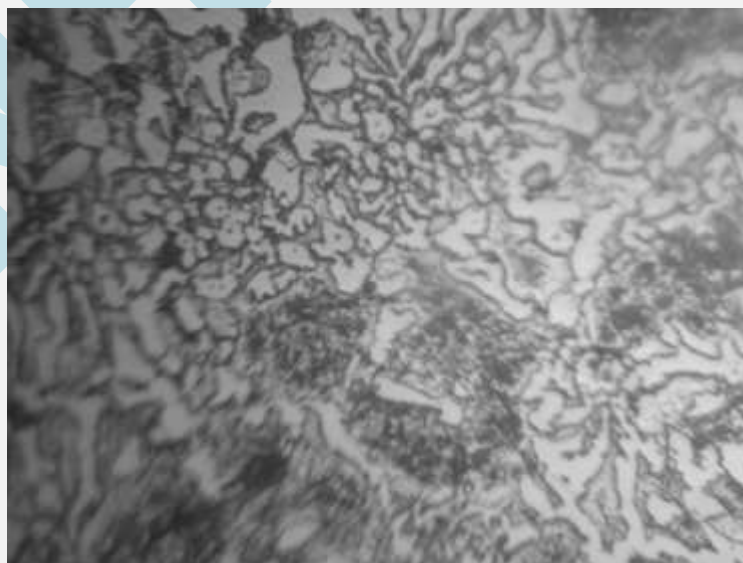
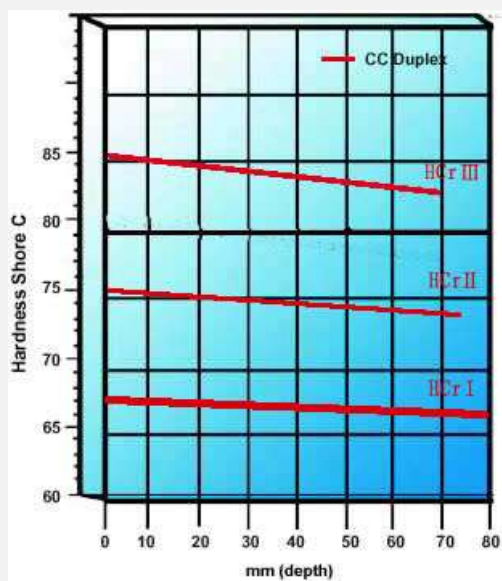
#### Chemical Composition %

## WINHAM

Symbol	C	Si	Mn	Cr	Ni	Mo	V
HCr I	2.30-3.30	0.30-1.00	0.50-1.20	12.00-15.00	0.70-1.70	0.70-1.50	0.00-0.60
HCr II	2.30-3.30	0.30-1.00	0.50-1.20	15.01-18.00	0.70-1.70	0.70-1.50	0.00-0.60
HCrIII	2.30-3.30	0.30-1.00	0.50-1.20	18.01-22.00	0.70-1.70	1.51-3.00	0.00-0.60

### Prosperities&Application

Symbol	Hardness HS	Tensile Strength MPa	Dimension MM	Unit KGS	N.W	Application
HCr I	60-75	≥350	Φ400-1000	800-15000		Vertical rolls and skin pass rolls for hot strip mills, work rolls for medium & heavy plate mills, roll sleeves for universal mills ,work rolls for cold rolled tin plate mills
HCr II	65-80	≥350				
HCrIII	75-90	≥350				



**High Chrome Cast Steel Rolls**



**Description**

**High Chromium Cast Steel Rolls**

The hardness of High Chromium Cast Steel Rolls rolls is as high as 65-80 HSC. Its matrix gives itself excellent wear resistance and good fire-crack resistance. HiCrS rolls have a low carbon content range of about 10%. An important characteristic of HCrS is that the mill is not required to adjust special water cooling conditions. And in the rolling process these rolls can form oxide film to improve surface quality of rolled products. These rolls are suitable for both 2-Hi roughing and early stand of 4-Hi finishing for hot strip mills.

**Chemical Composition %**

Symbol	C	Si	Mn	Cr	Ni	Mo
HCrS	1.00-1.80	0.40-1.00	0.50-1.00	8.00-15.00	0.50-1.50	1.50-4.50

**Prosperities&Application**

Symbol	Hardness HS	Tensile Strength MPa	Application



## WINHAM

HCrS	70-85	≥450 (core)	Roughing work rolls for hot strip mills, vertical rolls; universal section mills
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### Tool Steel Rolls



#### Description

##### Tool Steel Rolls

Tool steel rolls newly developed by our company are manufactured in base of hot working die steel, whose working condition is similar to that of breakdown rolls, even worse. It is formed in the high temperature state and has high thermal strength, high thermal stability, excellent wearability and resistance to thermal fatigue and temper stability. This type of rolls is used for blooming of large section mills to have a much longer service life.

##### Chemical Composition %

Symbol	C	Si	Mn	Cr	Ni	Mo	V
HWD I	0.50-0.60	≤0.40	0.50-0.80	0.50-0.80	1.40-1.80	0.15-0.30	
HWD II	0.40-0.47	0.40-0.70	0.40-0.60	1.50-2.00	0.80-1.20	0.80-1.20	0.30-0.50

## WINHAM

HWDIII	0.32-0.42	0.80-1.20	≤0.40	4.50-5.50	1.60-2.40(W)		0.60-1.00
HWDIV	0.35-0.45	0.8-1.20	0.25-0.70	3.00-3.75		2.00-.00	0.25-0.75

### Prosperities & Application

Symbol	Hardness HS	Tensile Strength MPa	Application
HWD I	55-58	≥1200	Blooming and Roughing stands of large section mills
HWD II	54-56	≥1200	
HWDIII			
HWDIV			

### Alloy Cast Steel Rolls



### Description

#### Alloy Cast Steel Rolls

Alloy Cast Steel Rolls AKA. As rolls belong to eutectoid steel and hypereutectoid steel. Alloy content greater than 0.8%, carbon content 0.4~1.3, Cr, Ni, Mo, V is added, matrix structure goes through heat treatment of normalizing and tempering, becoming sorbite and tempered sorbite.

## WINHAM

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This type of roll has good strength, normally used for blooming and slab mills, rail mill roughing stands, section and bar wire roughing stands, etc.

Alloy steel rolls normally employ monoblock casting process (single pour):

Melting-Casting-Heat treatment-Machining- Flaw detection- Finished products

### Sleeves



#### Description

##### K-metal Sleeves

The sleeve is a white iron alloyed primarily with Cr and Mo. The microstructure consists of a discontinuous network of hard eutectic iron and chrome carbides embedded in a tempered mixed matrix. The uniform hardness across the section allows minimal wear on web and flanges giving; improved product finish better dimensional control and longer campaigns.

##### Chemical Composition %

C	Si	Mn	Ni	Cr	Mo	Cu
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## WINHAM

2.5-3.00	0.50-0.70	0.8-1.20	≥ 0.20	10-15	0.50-0.80	1.00-1.50
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### Graphite Cast Steel Rolls



#### Description

##### Graphite Cast Steel Rolls

All our rolls are certified with ISO9001:2008. The characteristics of graphite cast steel rolls are similar to that of adamite rolls, the main character is that it contains a small amount of fine graphite in its microstructure, which will increase its resistance to fire crack and prevent oxidized scales from adhering. They are suitable for blooming and roughing stands.

The properties of graphite steel rolls are similar to adamite rolls, matrix microstructure are also similar to each other. Due to the great thermal conductivity of graphite, thermal stress caused by rolling process can be greatly reduced. In the meantime, thanks to free point graphite, better fire crack resistance can be achieved. Normal hardness of graphite steel is HS 35~60.

##### Chemical Composition %

Symbol	C	Si	Mn	Cr	Ni	Mo
GS140	1.30-1.50	1.20-1.60	0.50-1.00	0.40-1.00	0.50-1.30	0.20-0.60

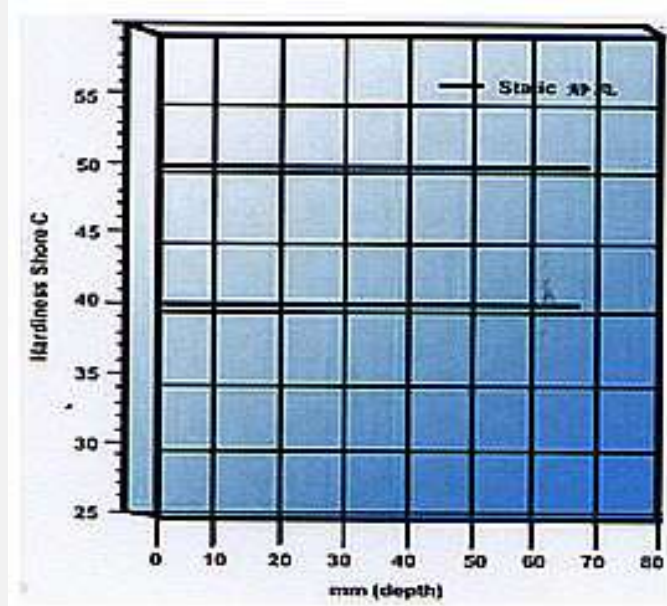


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GS160	1.50-1.70	1.00-1.70	0.60-1.10	0.60-1.00	0.40-1.10	0.20-0.50
GS190	1.80-2.00	0.80-1.50	0.60-1.00	0.50-2.00	0.60-2.20	0.20-0.80

### Prosperities & Application

Symbol	Hardness HS	Tensile Strength MPa	Elongation %	Application
GS140	36-46	≥540	≥1.0	Roughing stands of small and medium section mills, bar and wire mills and hot strip mills, roll sleeves for universal mills
GS160	40-60	≥500	≥1.0	
GS190	55-65	≥450	≥0.4	



## HSS Mill Rolls



**Description**

**HSS Mill Rolls**

HSS rolls have high hardness and good wear resistance at high temperature. These rolls are manufactured by Centrifugal Casting(CC) method and the roll core is filled with spheroidal graphite cast iron. The adequate chemical composition control and proper heat treatment ensures the hardness of roll working layer to reach as high as 80-85HSC. Uniformly distributed complex carbides of Vanadium, Tungsten, Niobium and Molybdenum in the martensitic matrix ensures uniform hardness of working layer and uniform wear out in the roll passes. These types of rolls are used for finishing stands to increase productivity and improve surface quality of rolled piece.

**Chemical Composition %**

Symbol	C	Si	Mn	W	V	Cr	Ni	Mo
HSS	1.50-2.20	0.30-1.0	0.40-1.20	0.00-8.00	2.00-9.00	3.00-8.00	0.00-1.50	2.00-8.00
S-HSS	0.60-1.20	0.80-1.50	0.50-1.00	0.00-3.00	0.40-3.00	3.00-9.00	0.20-1.20	2.00-5.00

**Prosperities & Application**

# WINHAM

Symbol	Barrel Hardness HS	Neck Hardness HS	Application
HSS	75-95	30-45	Finishing work rolls for hot strip mills and bar mills; universal section mills; pre-finishing rolls for high speed wire mills
S-HSS	75-98	30-45	Roughing work rolls for hot strip mills; work rolls and intermediate rolls for cold strip mills

