Forged Steel Rolls For Cold Mills

Forged steel rolls include work and back-up rolls for cold rolling. For this purpose, the state-of-art facilities are employed in manufacturing these rolls, of which are steel-making (EAF), refining (ESR or LF/VD) and forging (3150 t hydraulic press) equipment to produce the high quality forged steel blanks. As for heat treatment equipment, the reproducibility of barrel hardness and the depth of hardness are guaranteed by mean of the computer control; As for the heat treatment procedure, we take on the pre-heat-treatment. The specific induction-heating quenching (progressive or integral), the cold treatment and the tempering, so as to provide the rolls with high and homogeneous hardness in the work layer with superior wear-ability, high toughness and sufficient resistance to accident, the depth of hardness layer may be over 30 mm, so when these high quality work rolls are applied on the modern wide cold strip mills at home and abroad, the satisfactory performance have been obtained.

化学成分 Chemical composition(%)

代　号 Symbol	C	Si	Mn	Cr	Ni	Mo	V	
FSC-1	0.85-0.95	0.25-0.45	0.20-0.35	1.70-2.10	≤ 0.25	0.20-0.40	-	
FSC-2	0.80-0.90	0.15-0.45	0.20-0.55	1.80-2.40	≤ 0.25	0.20-0.40	0.05-0.15	
FSC-3	0.80-0.95	0.25-1.00	0.20-0.70	2.40-3.50	≤ 0.25	0.20-1.00	0.05-0.15	
FSC-4	0.75-0.95	0.20-1.00	0.20-0.50	2.80-3.60	≤ 0.80	0.15-0.40	-	
FSC-5	0.60-0.80	0.30-0.80	0.40-0.90	2.50-3.50	≤ 0.80	0.20-0.60	-	
FSC-6	0.70-0.95	0.20-0.90	0.20-0.50	4.00-6.00	≤ 0.80	0.15-1.20	≤ 0.35	
FSC-7	0.80-1.00	0.20-0.90	0.20-0.40	7.50-8.50	≤ 0.80	0.25-1.20	0.10-0.40	
FSC-8	1.35-1.70	≤ 0.40	0.20-0.65	11.0-13.0	-	0.40-1.00	0.15-0.30	(0.30-0.60)(Co)
FSC-9	0.33-0.43	0.80-1.20	0.20-0.50	4.75-5.50	-	1.10-1.60	0.30-0.60	
FSC-10	0.80-0.90	≤ 0.40	≤ 0.40	3.80-4.40	-	4.50-5.50	1.75-2.20	5.50-6.75 (W)

辊身硬度 Barrel hardness (HS):

FSC-1	FSC-2	FSC-3	FSC-4	FSC-5	FSC-6	FSC-7	FSC-8	FSC-9	FSC-10
60-70 90-100	60-80 90-100	76-80 90-100	60-80 90-100	60-70 65-80	65-75 90-100	75-85 90-100	77-85 86-90	65-71 75-82	80-95

推荐轧辊硬度 Hardness recommendation (HS)

部位 Portion	用途 Application	硬度 Hardness
辊　身 Barrel	带、板钢材精轧工作辊 Finishing work rolls for strip and plate mills	90-96
	有色金属薄带、箔材及光亮钢板用冷轧工作辊及平整辊 Cold work rolls and temper rolls for non-ferrous strip, foil and bright sheet	≥ 95
辊　颈 Neck	安装滚针轴承的小直径冷轧工作辊 Small diameter cold work rolls installed with needle roller bearing	≥ 80
	轴承部位有特殊耐磨性要求的冷轧工作辊 Cold work rolls with particular requirement of resistance to wear on bearing portion	50-70
	无特殊要求的冷轧工作辊 Work rolls without special requirement	30-50

注：辊身硬度均匀性一般为≤ 3HS。

Note: Hardness homogeneity of barrel is generally ≤ 3HS.

辊身淬硬层深度 Hardening depth of barrel:

辊身直径 Diameter of barrel (mm)	≥ Φ 300	Φ 301-600	Φ 601-1020
淬硬层深度 Hardening depth (mm)	≥ 8	≥ 10	8-12

代号为FSC-1轧辊按辊身公称直径，分别保证轧辊的最小淬硬层深度如上表，其它代号轧辊淬硬层深度按双方协议制造。

The minimum hardening depth of work rolls symbolized with FSC-1 can be guaranteed respectively according to the nominal diameter as the table above, the hardening depth of work rolls for other symbol will be provide according to bilateral agreement.

锻钢冷轧辊应用一览表

Application of forged steel rolls for cold rolling mills:

轧机类别 Mill type	轧辊类别 Roll type	FSC									
		1	2	3	4	5	6	7	8	9	10
带钢冷轧机轧辊 Rolls for cold plate and strip mills:											
四辊轧机 4-Hi mills	工作辊 Work rolls	●	●	●	●		●				
	支承辊 Back-up rolls		●	●		●					
二辊轧机 2-Hi mills	工作辊 Work rolls	●	●								
HC 轧机 HC mills	工作辊 Work rolls				●		●		●		●
	中间辊 Intermediate rolls		●	●	●	●					
	支承辊 Back-up rolls	●	●			●					
多辊轧机 Multi-roll mills	工作辊 Work rolls										●
	第一中间辊 1st intermediate rolls								●	●	
	第二中间辊（传动辊） 2nd intermediate rolls (drive)							●	●	●	
	第二中间辊（惰辊） 2nd intermediate rolls (idler)								●	●	
	支承辊 Back-up rolls		●								
有色金属轧机轧辊 Non-ferrous mills rolls											
四辊轧机 4-Hi mills	工作辊 Work rolls	●	●	●							
	支承辊 Back-up rolls	●	●		●	●					
二辊轧机 2-Hi mills	工作辊 Work rolls	●	●								
多辊轧机 Multi-roll mills	工作辊 Work rolls		●								●
	第一中间辊 1st intermediate rolls								●	●	
	第二中间辊（传动辊） 2nd intermediate rolls (drive)							●	●	●	
	第二中间辊（惰辊） 2nd intermediate rolls (idler)								●	●	
	支承辊 Back-up rolls		●								

承制范围 The capacity of making:

辊身直径(mm) Diameter of barrel	辊身长度(mm) length of barrel	单重(t) Weight
Φ 1020(max.)	3500(max.)	12(max.)

本公司优质锻钢冷轧辊的典型产品－冷连轧工作辊:

Typical high quality product of forged steel roll-cold strip mill rolls

冷连轧机是现代化的新型轧机，带钢产品的质量要求很高，因此，对工作辊提出了很严的要求。本公司制造的这类产品，以武钢一米七冷连轧工作辊为例，供应数量已逾千支，实践证明，轧辊具有一次轧制量高、辊耗低、使用寿命长等优点，深受用户赞誉。

The cold strip mill is a modernistic and new type mills, since the quality requirement of the strip steel products is very high, then the strict demands have been put to the work rolls. This type of roll manufactured by XT, such as the work rolls used on the 1700mm cold strip mill of Wu Han Iron & Steel Corp. more than 1000 pieces have been provide. The practice proved that it appears a high rolling tonnage between roll change, lower roll-consumption and long service life, the reputations have been gained from users.

化学成分 Chemical Composition:

按轧辊代号规定。

In accordance with the stipulation of roll's symbol.

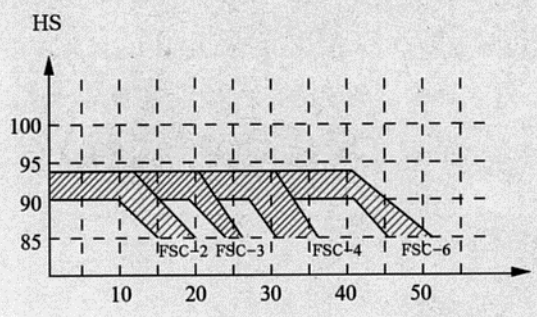
辊身表面硬度 HS Barrel surface hardness	硬度均匀度 HS Homogeneity of hardness
90-96	≤ 3

辊身淬硬层深度 hardening depth of barrel:

轧辊代号 Roll symbol	FSC -2	FSC -3	FSC -4	FSC -6
淬硬层深度(半径) Hardening depth(on radius)	≥ 15	≥ 20	≥ 30	40-50

硬度分布曲线示例:

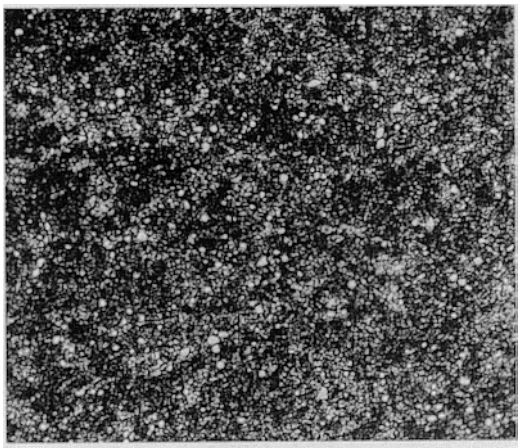
Example of typical hardness profile:



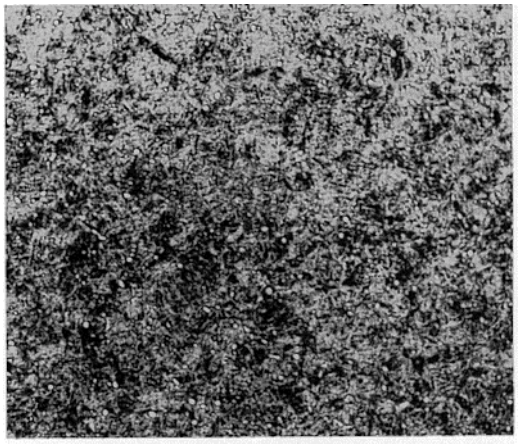
金相组织Microstructure

辊身表面的金相组织，对应于所具有的高而均匀的硬度，为隐晶和细针状的马氏体，细小的均匀分布的碳化物及少量残余奥氏体。

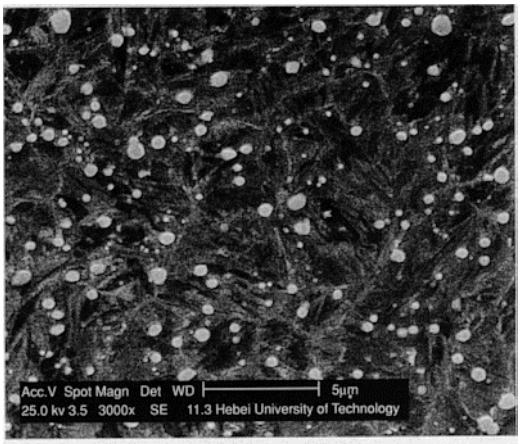
The microstructure of barrel surface corresponding with high and homogeneous hardness, consists of cryptocrystalline and fine acicular martensite, fine and uniform carbide and a little of residual austenite.



FSC-2 500X



FSC-4 500X



FSC-6 3000X