



## High Speed Steel (HSS)

### Field of Application

Mill Type	Position
Hot Strip Mill	Roughing Stands Work Roll
Hot Strip Mill	Early Finishing Stands Work Roll
Steckel Mill	Work Roll
Plate Mill	Work Roll

### Mechanical Properties

Hardness Range	75-85 ShC
Tensile Strength	> 700 MPa
Bending Strength	> 1200 MPa
Young's Modulus	approx. 225.000 MPa

The microstructure of HSS materials usually consists of a high proportion of MC, M<sub>2</sub>C and M<sub>6</sub>C carbides. The main alloying elements are V, Cr, Mo and W. After a comprehensive heat treatment, the carbides of the vanadium (VC), molybdenum (Mo<sub>2</sub>C), tungsten (W<sub>2</sub>C) and composite carbides (M<sub>6</sub>C) are finely dispersed in the martensitic matrix.

The hardness of the special carbides is significantly higher than the hardness of M<sub>7</sub>C<sub>3</sub> or M<sub>3</sub>C carbides, which results in better wear resistance compared to chromium cast iron rolls.

This type of rolls, having exceptional wear resistance, smooth surface and high resistance to fire crack, work longer campaigns, so reduce the need for roll changes in the mills and increase mill productivity.

### Product Highlights

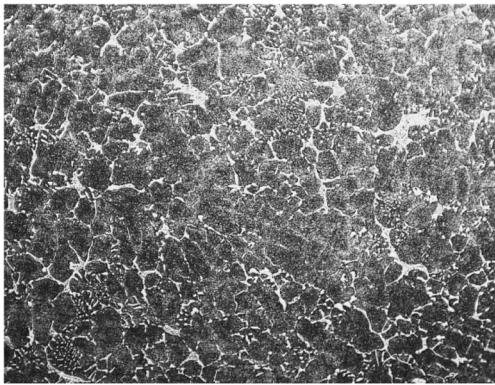
- Excellent wear resistance
- Excellent smooth surface
- Good fire cracking resistance and oxidation resistance
- Constant material properties during service life



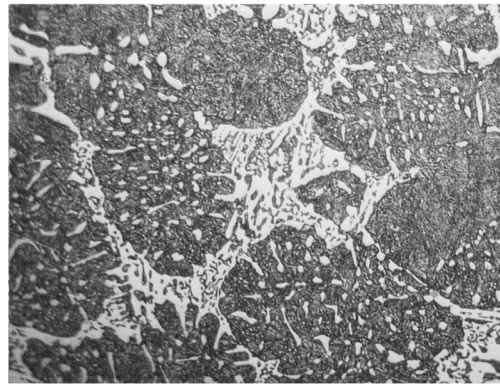
## Chemical Composition:

	C	Mn	Si	P	S	Ni	Cr	Mo	V	W
<b>Min</b>	1.60	0.50	0.40	0	0	0.50	4.00	3.00	4.00	0
<b>Max</b>	2.40	1.50	1.20	0.050	0.050	1.50	6.50	5.00	6.50	3.00

## Microstructure:

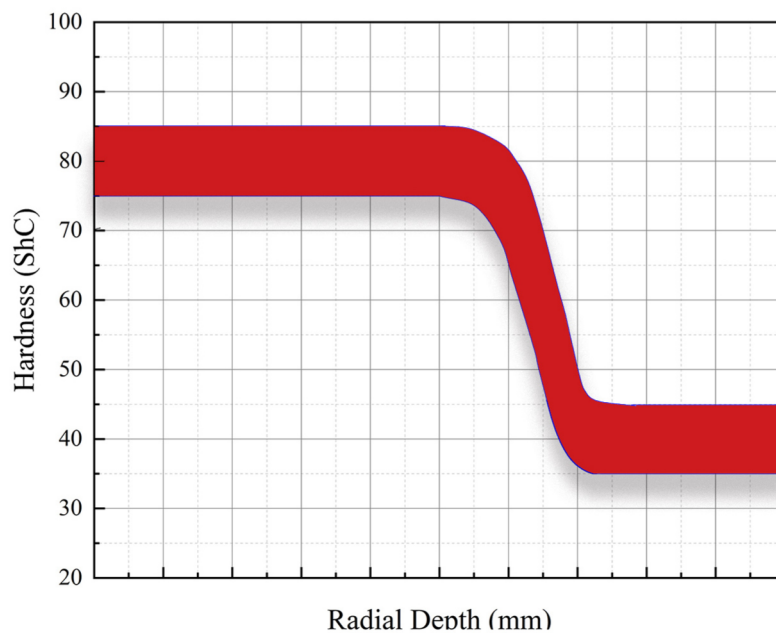


100 X – etched (2Vol. % Nital)



400 X – etched (Nital)

## Hardness Penetration Curve (Shell – Interface – Core):



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