ROLLS FOR HOT STRIP AND HEAVY STEEL PLATE

WALZEN IRLE ROLLS
INCREASE YOUR ROLLING MILL PRODUCTIVITY

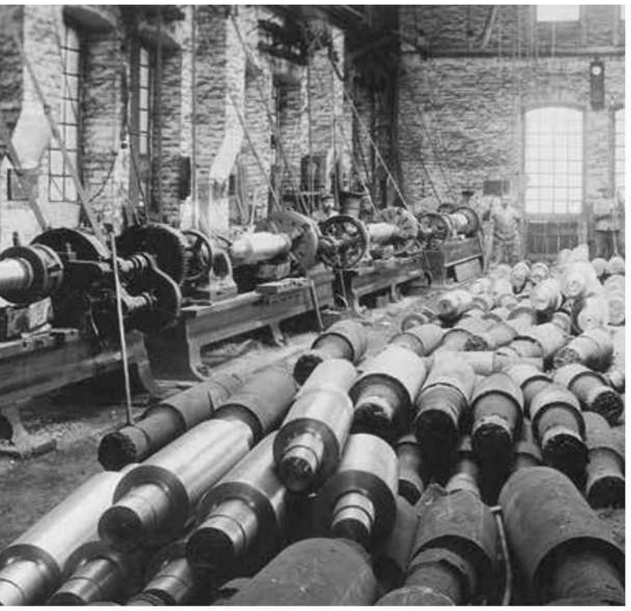
WALZEN IRLE is a worldwide leading company in the production of rolls for various areas of industry. The company stands for over 200 years of experience, technological competence, continuous research and development in the production of rolls.

The traditional and consequently close cooperation with machine builders and operators of constructions has lead to permanent and successful improvements of the WALZEN IRLE technologies and has made them an innovative technology leader.

Today we offer top-technology for the steel industry (plate mills, strip mills, sheet mills and section mills) as well as for the paper, rubber, plastic and food industry.
Our technically orientated sales specialists are always available for our customers, to discuss and develop professional solutions for the various problems in rolling mills.

INCREASE YOUR PROFIT - WITH OUR ROLLING KNOWLEDGE!

MORE THAN 300 YEARS OF FOUNDRY EXPERTISE, 200 YEARS OF ROLL CASTING



Rolls »made in Deuz« are used worldwide and have made a name for themselves for sophisticated technology and highest quality.

Following the most important facts:

1693 start of casting and machining of iron parts by Johannes Irle

1820 founding year of the iron foundry in Marienborn and casting of the first chilled cast iron roll

1906 start of production of heavy rolls

1920 casting of the first cast steel roll

1950 casting of the first nodular iron roll

since 2001 big investments in the production of centrifugally casted work rolls for heavy plate mills and roughing rolls as well as work rolls for hot strip mills. Entrance into the production of spin casted work rolls for heavy plate mills and roughing rolls for hot strip mills (40-75 metric tons) and further expansion of production of work roll for hot strip mills

2006 erection of the large vertical spin casting machine (up to 80 t casting weight)

2007 production start of the new vertical spin casting machine

2007 implementation of a complete new production line for heavy rolls

2009 more than 100 heavy plate mill rolls, produced with the vertical spin casting machine, are already running in customers mills worldwide

2010 WALZEN IRLE celebrates its 190st anniversary as a roll manufacturer

2012 the 300th roll has been casted at the vertical spin casting machine

until today continuous development of different grades for the benefit of the steel industry

ROLLS FOR THE STEEL INDUSTRY

IRLE Rolls for the steel industry are manufactured according to the most modern metallurgical and technical machining standards under the leadership of experienced engineers.

The certified quality management system according to DIN ISO 9001:2008 in connection with modernly equipped laboratories guarantees the precise testing of all production steps and has contributed to the worldwide good reputation for rolls.

The continuous improvement of our product materials results in ever increasing performance enhancements of our rolls. Due to the upgrading of our centrifugal casting capacities we are able to fulfill the increasing demands of the steel industry in the future with regards to numbers and dimensions. Technical sales specialists are always at hand to develop professional solutions for the various challenges our customers come across in their rolling mills.

HOT-STRIP ROLLS

HEAVY PLATE ROLLS

BACK-UP ROLLS

EDGER ROLLS

THE PROPERTIES FOR

- work rolls,
- back-up rolls and
- edger rolls

FOR THE PRODUCTION OF

- hot strip,
- heavy plates and
- thin sheets

have to be adapted to the specific demands of the rolling mill.

ROLL CONDITIONS AND ROLL PROPERTIES

The following roll conditions and roll properties have to be taken into consideration:

- stands with deep passes and high thermal and mechanical demands:
  - good thermal conductivity
  - high temperature strength
  - suitable gripping capability
  - sufficient tensile strength in the journal- and core material
- stands in which a true to size band or sheet with good surface quality can be produced:
  - high surface hardness with a low hardness reduction when using a decreasing roll diameter
  - high wear resistance
  - fire-crack resistance
  - dismantling-stability

MATERIAL RECOMMENDATION

Material	Indefinite		Nodular cast iron			High-chrome rolls						Cast steel / Cast steel graphitized				Special steel		
	I	I*plus*	SP	SA	SP/A	CR 5	CR 5 *plus*	CR 15	CR 15 *plus*	CR 25	CR 25 *plus*	**ST 0**	ST 10	STG 20	STG 30	SST	SST mod.	SST-G
Heavy plate																		
Roughing mill	•							•		•						•		
Finishing mill	•	•								•						•		
Edge rolls			•											•				
Hot wide strip																		
Work rolls two-high roughing-mills			•			•		•						•				
Work rolls four-high roughing-mills	(•)	(•)				•	•	•	•	(•)	(•)					•	•	
Work rolls finishing mills	•	•								•	•					•		•
Back-up rolls finishing mills												•						
Edger rolls			•		•									•				
Skin-pass mills																		
Work rolls	•	•								•	•							
Back-up rolls	•	•		•						(•)	(•)							
Steckel mills																		
Work rolls roughing-mills						•	•	•	•							•	•	
Work rolls finishing mill	•	•								•	•					•		•
Edger rolls			•		•									•				

Mechanical properties									
Tensile strength (N/mm²)	350-500	330-700	800-900	700-800	700-800	600-950	350-650	700-1000	400-550
Bending strength (N/mm²)	450-820	545-1150	1320-1480	1150-1320	1150-1320	580-1120	580-1200	1230-1560	500-850
Alternating Bending strength (N/mm²)	-	100-240	260-300	230-270	230-270	110-420	110-230	240-320	-
Modulus of elasticity (kN/mm²)	160-180	160-180	220-230	220-230	210-230	190-210	180-200	200-210	190-200

Hardness shore C									
Shell / Work layer	68-85,5	40-70	60-85	60-85	65-85	30-60	40-60	78-86	75-85
Core material	35-45	35-45	35-45	35-45	35-45	30-50	35-55	35-45	35-45

MECHANICAL PROPERTIES
SHELL MATERIAL

Shell properties	Unit	Roll types						
		CR 5-15 (Hi Cr-Steel)	SST (HSS)	CR 25 (Hi Cr iron)	I (ICDP)	I*plus* (embedded carbides ICDP)	SST mod. (Semi HSS)	SST-G
Hardness	LD	746-796	774-816	746-816	758-808	774-816	774-816	774-816
	SHC	70-80	75-85	70-85	72-83	75-85	75-85	75-85
Tensile strength	N/mm²	> 800	> 750	> 600	> 350	> 350	> 800	> 400
Bending strength	N/mm²	> 1200	> 1200	> 1000	> 450	> 600	> 1200	> 600
Pressure strength	N/mm²	> 2000	> 2500	> 2000	> 1800	> 2000	> 2500	> 2000
Impact effect	10^4J/m²	2 - 2,5	2 - 3	2 - 2,5	2 - 2,5	2 - 2,5	2 - 3	2-2,5
Elasticity module	KN/mm²	200-220	200-220	220-225	160-180	160-180	200-220	190-200
Coeffecient of thermal expansion	1/°C x 10-6	~ 13	~ 13	~ 13	~ 12	~ 12	~13	~13
Thermal condutability	W/m°C at 500°C	15-20	15-20	10-15	15-20	15-20	15-20	15-20
Specific heat	J/g° C at 500° C	0,5-0,6	0,5-0,6	0,5-0,6	0,5-0,6	0,5-0,6	0,5-0,6	0,5-0,6
Poisson coeffeciency		0,25-0,30	0,25-0,30	0,25-0,30	0,25-0,30	0,25-0,30	0,25-0,30	0,15-0,20
Density	g/cm³	~ 7,7	~ 7,7	~ 7,7	~ 7,5	~ 7,5	~ 7,8	~7,5

Technical guidelines

MECHANICAL PROPERTIES
CORE AND JOURNAL MATERIAL

Core and journal properties	Unit	Grey cast iron core	Nodular cast iron core
Tensile strength	N/mm²	150-250	350-450
Bending strength	N/mm²	300-450	400-500
Torsional strength	N/mm²	>250	> 350
Tensile yield point	N/mm²	-	320-420
Impact effect	10^4J/m²	2	3-5
Modulus of elasticity	KN/mm²	120-150	150-180
Coeffecient of thermal expansion	1/° C x 10-6	10-11	12-13
Thermal conductivity	W/m°C at 500°C	40-45	25-30
Density	g/cm³	~7,1-~7,2	~7,2-~7,3

Technical guidelines

CHEMICAL COMPOSITION
SHELL MATERIAL

Material	C (%)	Si (%)	Mn (%)	P (%)	S (%)	Cr (%)	Ni (%)	Mo (%)	SCB* (%)
High-chrome rolls (HICR steel)									
CR 5	1,0-2,0	0,3-0,9	0,3-1,2	max.0,1	max. 0,06	10,0-15,0	0,5-1,5	1,0-3,0	-
CR 15	1,5-2,5	0,3-0,9	0,3-1,2	max.0,1	max. 0,06	12,0-20,0	0,5-1,5	0,8-2,5	-
CR 5 *plus*	1,0-2,0	0,3-0,9	0,3-1,2	max.0,1	max. 0,06	10,0-15,0	0,5-1,5	1,0-3,0	max.0,5
CR 15 *plus*	1,5-2,5	0,3-0,9	0,3-1,2	max.0,1	max. 0,06	12,0-20,0	0,5-1,5	0,8-2,5	max.5,0
High-chrome rolls (HICR iron)									
CR 25	2,0-3,0	0,3-0,9	0,3-1,2	max.0,1	max. 0,06	15,0-25,0	1,0-2,5	0,8-1,2	-
CR 25 *plus*	2,0-3,0	0,3-0,9	0,3-1,2	max.0,1	max. 0,06	15,0-20,0	1,0-2,5	0,8-2,5	max.5,0
Special steel (HSS / HSS Semi)									
SST	1,5-3,0	0,3-0,9	0,3-1,2	max. 0,05	max. 0,05	4,0-6,0	0,5-1,5	4,0-6,0	max. 15,0
SST *mod.*	0,5-1,0	0,3-0,9	0,3-1,2	max.0,1	max. 0,06	6,0-8,0	0,8-2,0	3,0-6,0	max. 10,0
SST-G	3,0-3,5	1,0-2,0	0,3-1,0	max. 0,15	max. 0,02	1,0-2,0	3,0-5,0	1,0-2,5	max. 10,0
Indefinite (ICDP /ICDP *plus*)									
I	3,0-3,5	0,5-1,5	0,3-1,2	max. 0,15	max.0,1	1,0-2,0	3,0-5,0	0,2-0,6	-
I *plus*	3,0-3,5	0,8-2,0	0,3-1,2	max. 0,15	max.0,1	1,0-2,0	3,0-5,0	0,2-0,6	max. 10,0

**SCB (%) - Sum of elements W, V, Nb, C, Ti - Special Carbide Buildner*

Technical guidelines

PRODUCTION CAPACITY

Casting facilities:

- static single poured and compound casts - single pieces up to a maximum cast weight of 130 tons, over a diameter of over 1,700 mm and 13 m length
- horizontal/vertical centrifugal casting machines for single poured and compound cast pieces up to a barrel length of 6 meters
- vertical spin casting machine for rolls up to 11,5 m length and 75 tons finish weight

Machining:

- CNC-controlled turning-, milling-, grinding-, drilling-, and balancing machines in 12 processing halls, for finished size:
  - max. barrel length up to 13 meters,
  - Ø over 1,700 mm,
  - 120 tons finished weight
- approx. 1.500 tons finished products per month

Melting facilities:

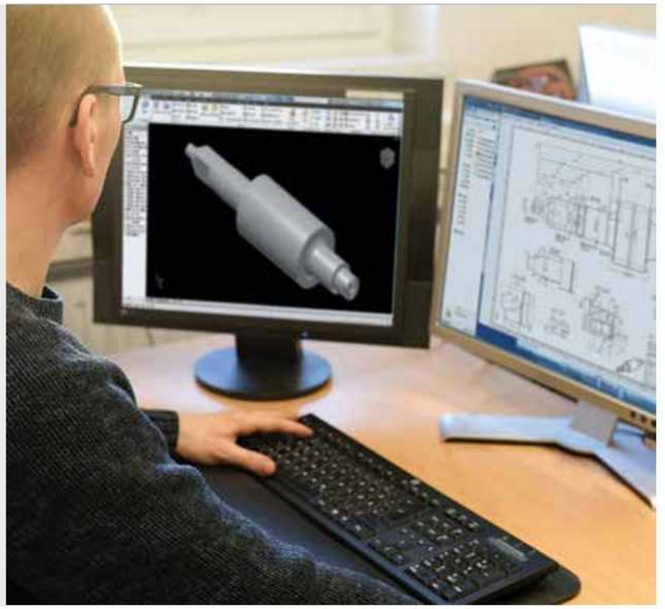
- 8 electrical melting furnaces (induction), from 3 to 30 tons capacity

Heat treating facilities:

- 17 gas-fired heat treatment furnaces

ENGINEERING

WALZEN IRLE has its own engineering- and calculating department (amongst others, according to FEM- Methods of Finite Elements). Thereby the customers get supported effectively by the construction of new plants or major rebuilding of existing rolling mills.



Apart from the preparation of drawings- and order documents the following areas are also covered:

- **on-going technical support of the customer regarding our products**
- **planning of the technical documents for our products**
- **research and development especially in the area of heated calender rolls in cooperation with the metallurgic laboratory**
- **Patent monitoring**

Technical consultation and constructional support

- technical sales support
- dimensioning of components according to customers demands
- load-carrying capacity of the components- and fatigue strength analysis
- optimising of the components according to the customer's requirements

QUALITY MANAGEMENT

The high requirements of our customer in the material properties of our products are fulfilled by the specialists in our materials laboratory.
The standard tasks are continuous chemical analyses during the melting- and casting processes, permanent quality controls during all production steps and description of the metallurgic criteria for the manufactured products.

The following essential operations are carried out in the laboratory:

- sales support in the area of application specific material recommendations
- chemical analysis using spectrometer
- measuring the bending and tensile strength
- testing the surface hardness with all, in the industry, accredited measurement- methods
- non-destructive measurements with ultra sonic devices
- non-destructive measurements with eddy-current gauge
- magnetic powder testing
- material tension testing
- surface testing with perthometers
- research and development especially in the area of production methods

TÜV NORD CERT GmbH ISO 9001 ISO 14001 ISO 50001

The high qualification of our staff in combination with our experience enables us to realise tailor made solutions and customer specific improvements. We are continuously optimising our work process according to the ISO 9001:2015 Quality Management, the ISO 14001:2015 Environment Management and the ISO 50001:2018 Energy Management Systems.

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