

Rolls for Metallurgical use



Marmacor



Contents...

2

we are Marmacor

4

Rolls for metal industry

6

Cast roll production

10

Roll grades

17

Assembled ring rolls

18

Seamless tube rolls

19

Roll rings and sleeves

25

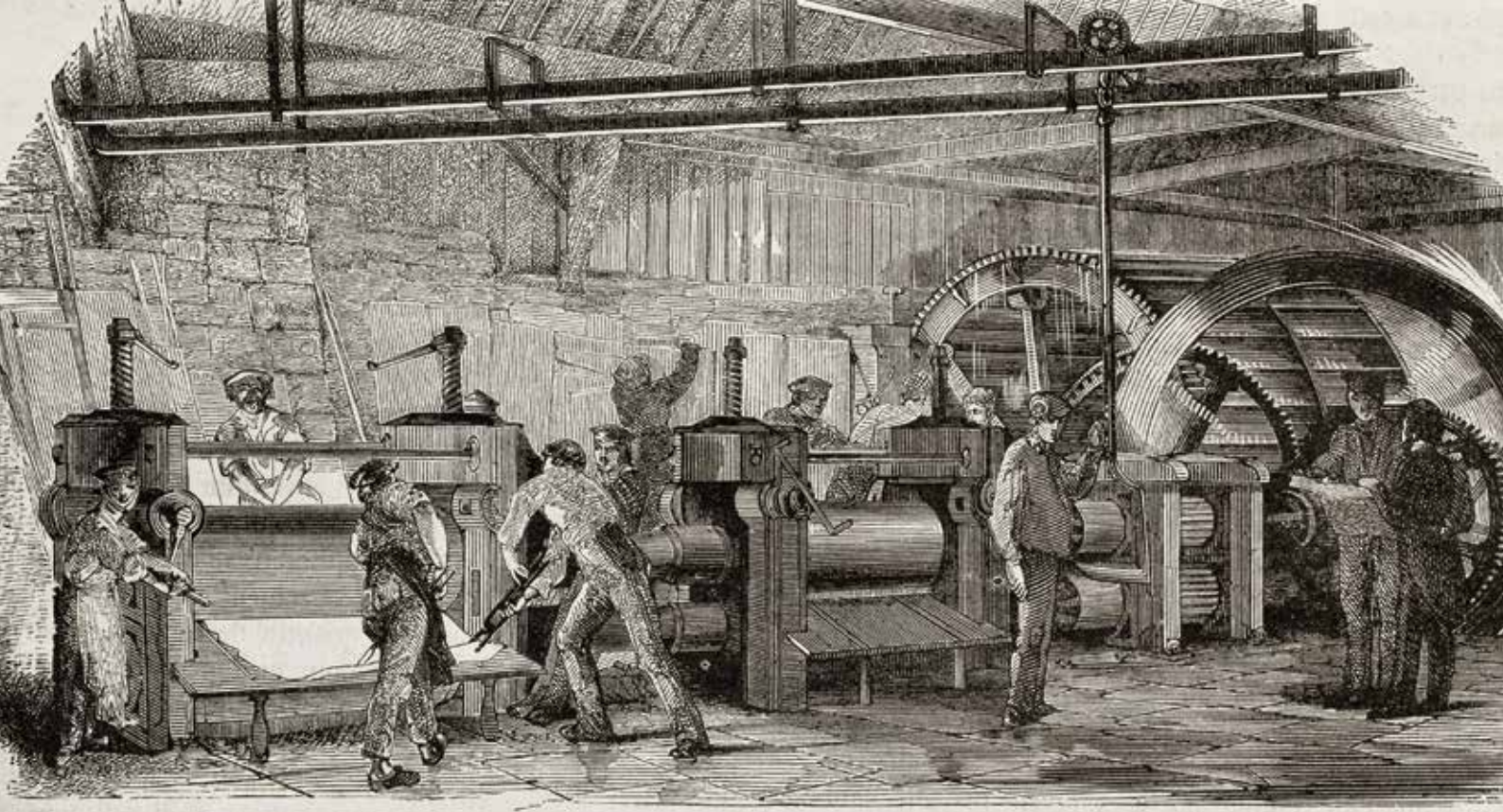
References



We are Marmacor

At Marmacor, we believe in doing right things in new ways for our local as well as international customers.

We know what we are doing,
we stand behind our products,
we rely on repeating business.



We learn from the past, we work for a better future

Our team carries rich experience in manufacture and supply of rolls demanded by our customers.

Being a worldwide supplier of quality rolls, we not only assume responsibility but deliver it too.



Rolls For Metal Industry

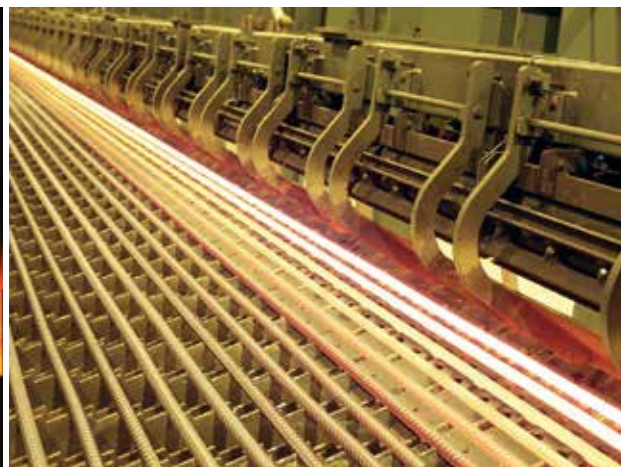
Since established in 1997, Marmacor Inc. have been increasing its presence in the global industry as a reliable and long term business partner.

Marmacor have been specialized in manufacture and supply of rolls demanded by hot and cold rolling mills in ferrous and non ferrous metal industry.

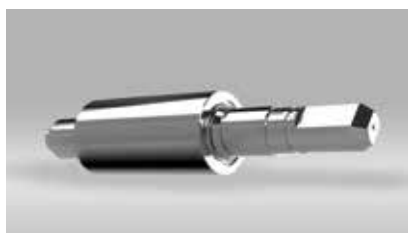
Cast rolls are manufactured with highest standards by using static or centrifugal casting techniques by our partner foundries.

High tech HSS / Tool Steel rolls and assembled ring rolls are recommended for rolling mills wherever expectations are above the limits.

From bar mills to section mills, seamless tube mills to heavy section mills, narrow to wide hot strip mills; for every rolling mill we have something in the form of rolls, rings, sleeves, shafts and mill consumables.



Rolls For Metal Industry



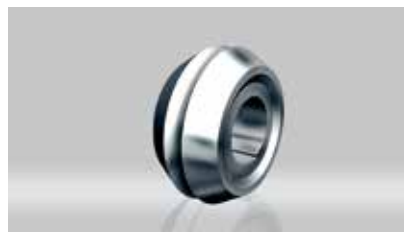
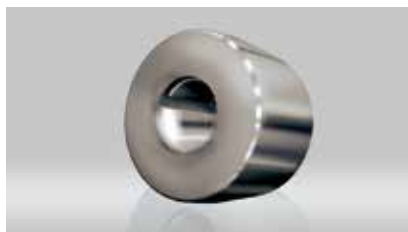
Bar, wire rod and light section mill rolls. Plain and grooved rolls. Cantilever rings.



Medium and heavy section mill rolls. BD, UF, UR, Tandem rolls and sleeves. Straightening rolls.



Hot strip mill rolls. BUR, WR, Edger rolls.



Seamless tube mill rolls. Piercing rolls, sizing rolls, mandrel mill rolls.



Grooved rail rolls.

Production Process Cast Rolls

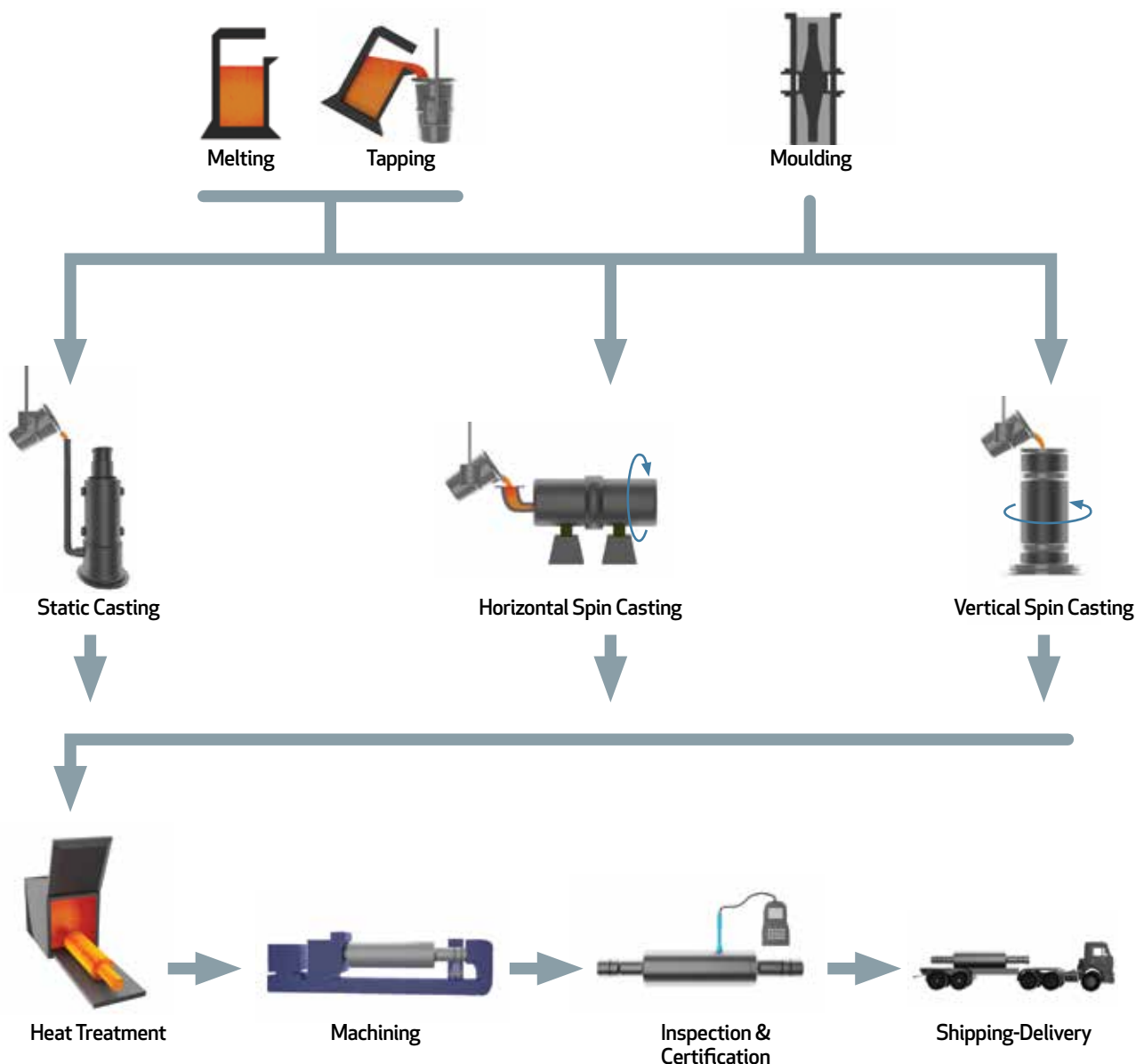
In our foundries, melting is made by EAF or induction melting furnaces.

Casting of rolls by static or horizontal-vertical centrifugal casting process generate solid rolls or duplex rolls with required shell and core material.

Further heat treatment of rolls play a key role in the final mechanical and physical properties of rolls.

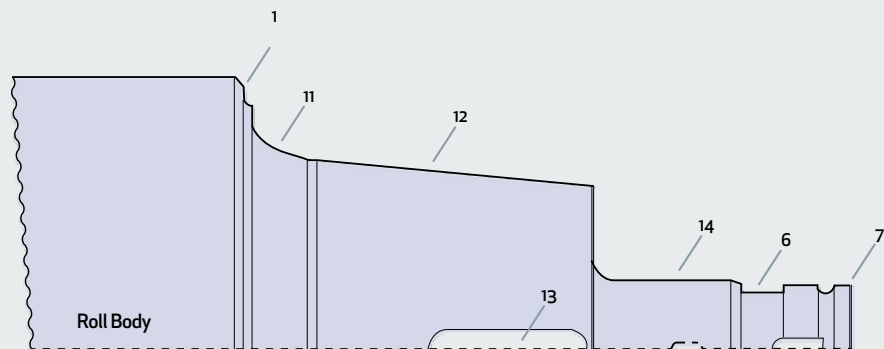
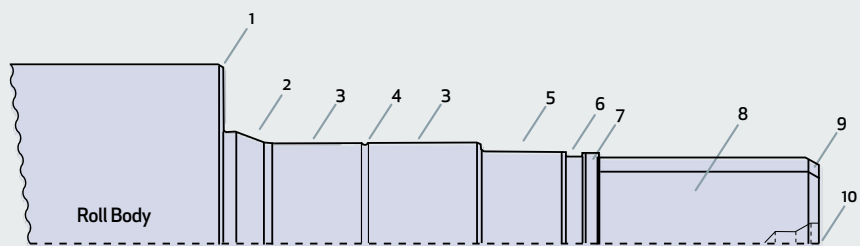
We machine our rolls either in house or in other selected and certified partner work shops.

The rolls are checked at every stage of production in terms of mechanical, physical properties and dimensional tolerances.





The Nomenclature of Rolls

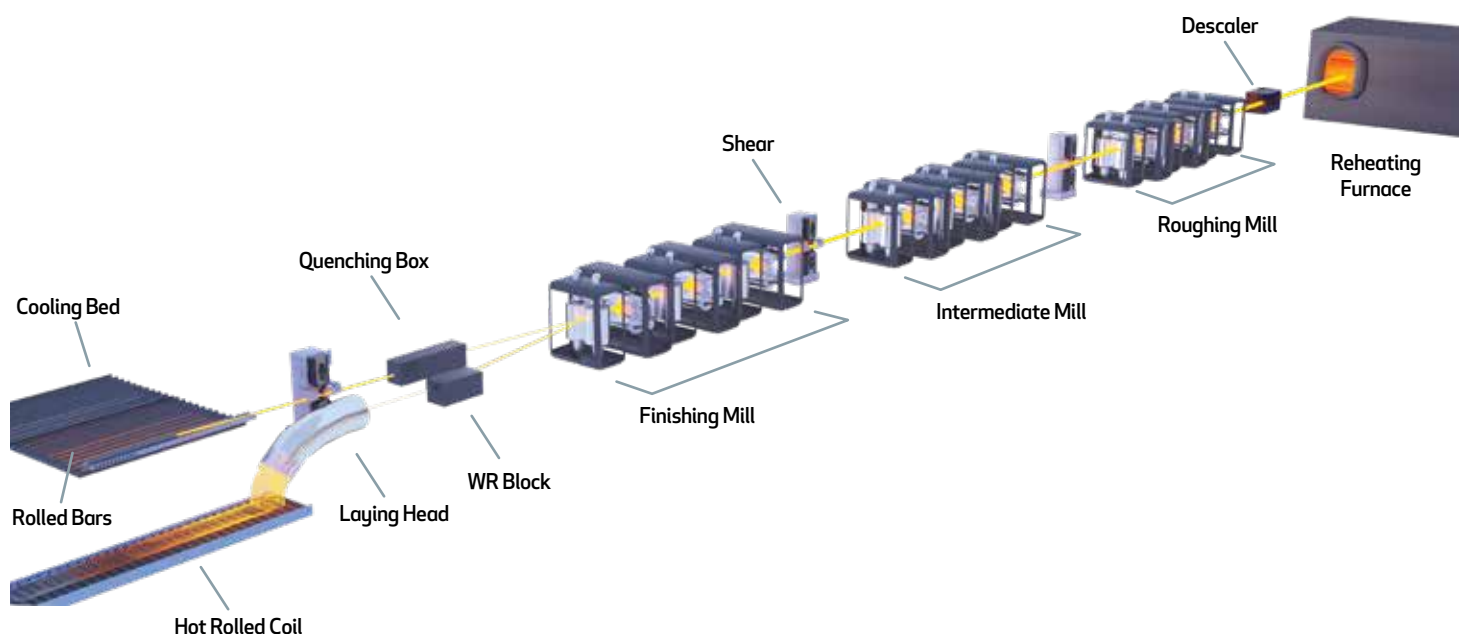


1	Body chamfer
2	Shrinkage fillet ring area
3	Bearing journal
4	Lubrication groove
5	Spot area
6	Locker groove
7	Collar

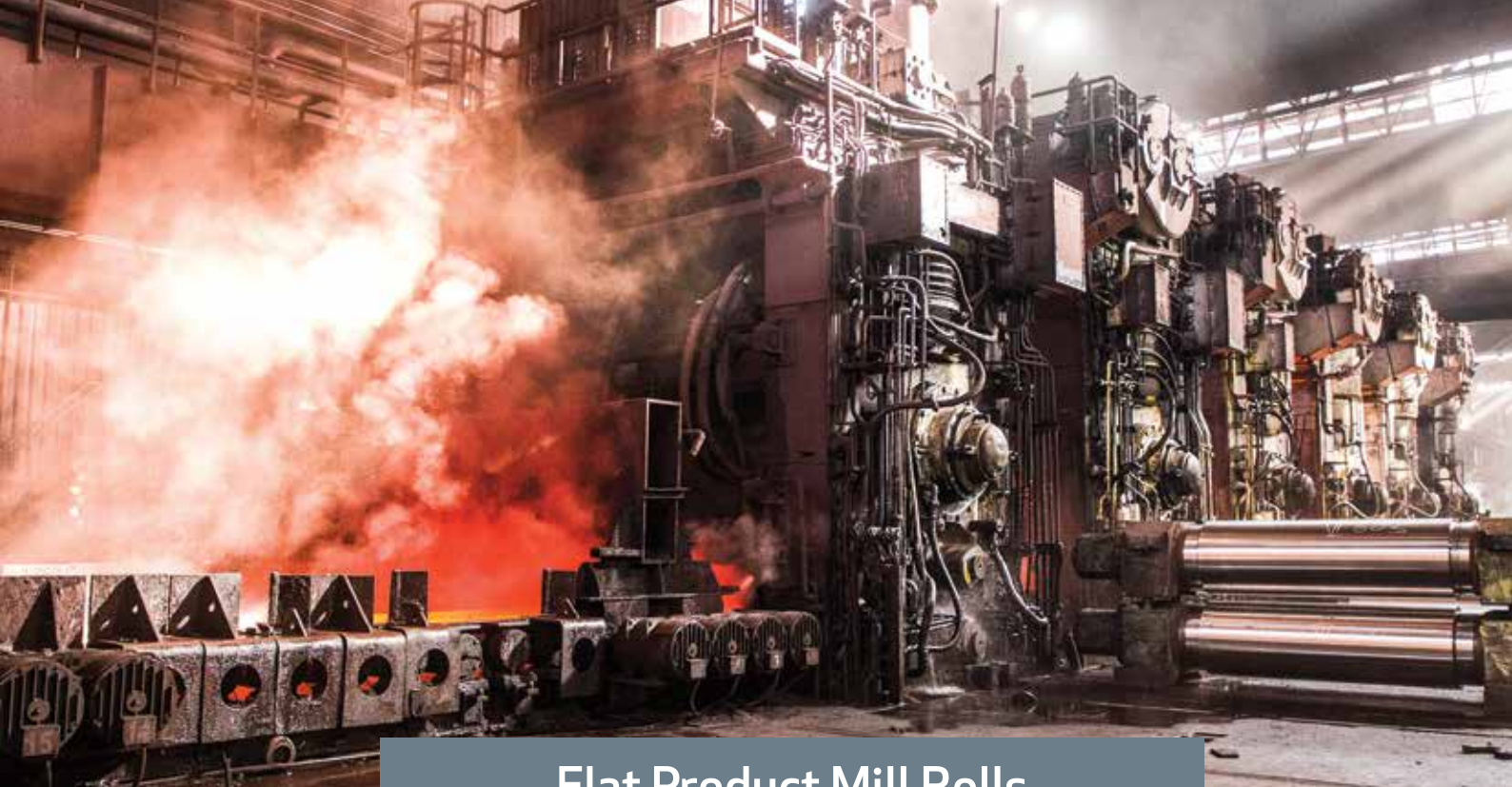
8	Spade driver
9	Coupling entry bevel
10	Roll neck center
11	Form and seal area
12	Oil film taper
13	Keyway
14	Thrust bearing



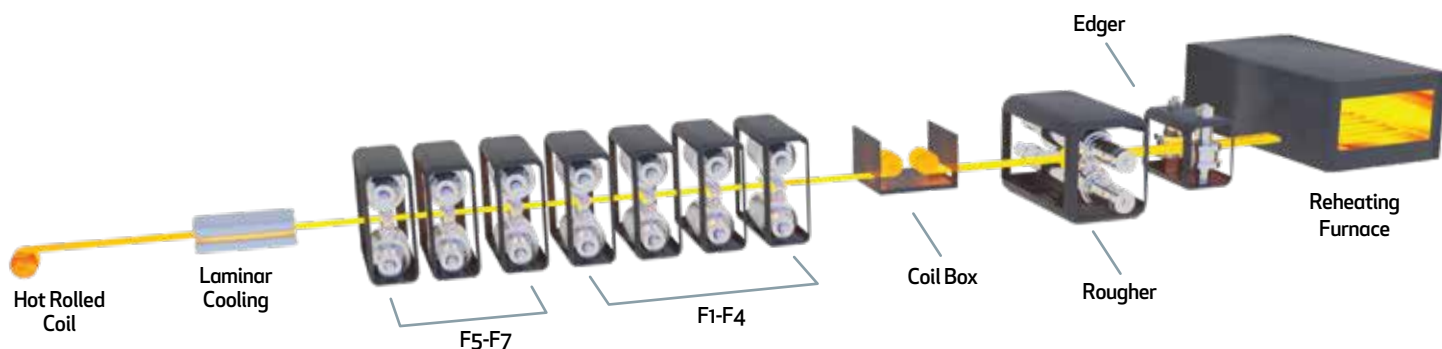
Long Product Mill Rolls



LONG PRODUCT (LP) MILL ROLLS		
MILL TYPE	ROLL TYPE	ROLL GRADE
BAR MILL	Roughing, Intermediate, Finishing	Cast Steel, Adamite Steel, Nodular Iron, HSS, TC in ring roll form
WIRE ROD MILL	Roughing, Intermediate, Finishing, Finishing Block	Cast Steel, Adamite Steel, Nodular Iron, HSS, Cemented Carbide
SECTION MILL	Breakdown, Roughing, Intermediate, Finishing	Cast Steel, Adamite Steel, Graphitic Steel, Nodular Iron
HEAVY SECTION MILL	Breakdown, Roughing, Edger, Tandem, UF, UR, Straightening	Cast Steel, Adamite Steel, Graphitic Steel, HiCr Iron, HiCr Steel, Forged Steel



Flat Product Mill Rolls



FLAT PRODUCT (FP) MILL ROLLS		
MILL TYPE	ROLL TYPE	ROLL GRADE
HSM, Plate	Roughing WR	Special Alloy Cast Steel, Hi Cr Steel, Semi HSS
HSM	Roughing & Finishing BUR	Duplex Cast Steel, Forged Steel
HSM	F1-F4, F5-F7 WR	Hi Cr Iron, ICDP, HSS
CSM	Tandem, Reversible, Sendzimir WR	Cr3, Cr4, Cr5 Forged Steel
CSM	BUR	Cr3, Cr4, Cr5 Forged Steel / Duplex Cast Steel

SGF/SGP/SGPB/SGAC

Nodular Cast Iron Rolls

Nodular irons belong to a group of cast iron in which most of the carbon crystallizes as spherical particles known as graphite nodules. Wide range of properties may be obtained by adjusting the three major alloying elements: Cr, Ni and Mo.

The low nickel grade (**Ferritic Iron**) provides optimal hardness with high strength and toughness. The medium nickel

grade (**Pearlitic Iron**) has higher surface hardness necessary for intermediate and finishing. High nickel and molybdenum grade (**Bainitic/Acicular Iron**) provide excellent mechanical properties at high working temperature in terms of strength, toughness, and hardness.

Nodular cast iron is the most common roll grade in hot rolling of billets, sections, bar and wire

rod, narrow strip and seamless tube. Pearlitic iron rolls with additional Cr content can give better hardness penetration that is suitable for rolling sections with deep grooves.

Rolls from these grades can be produced by static or centrifugal casting.

Chemical Composition %

Grade Symbol	Hardness HSC	C	Si	Mn	Cr	Ni	Mo
SGF	40-55	3.00-3.60	1.4-2.0	0.4-1.0	0.40 max	1.50-1.80	0.2-0.5
SGP/SGPB	50-70	3.00-3.60	1.2-2.0	0.4-1.0	0.30-1.20	1.80-3.00	0.3-0.8
SGAC	65-80	3.00-3.60	1.2-2.2	0.4-1.0	0.40-1.50	2.50-4.00	0.4-1.0

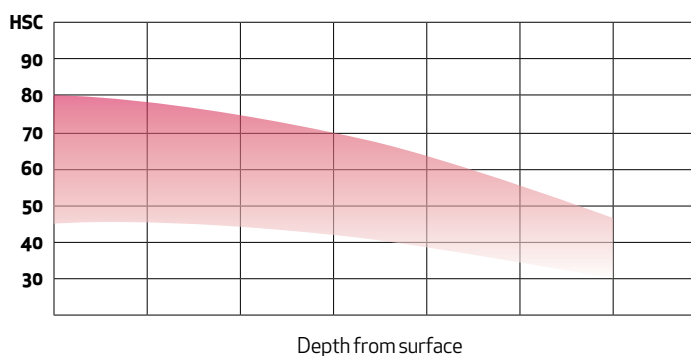
Mechanical Properties

Grade Symbol	Hardness HSC	Tensile Strength MPa	Bending Strength MPa
SGF	40-55	400-500	800-950
SGP/SGPB	50-70	450-550	850-1000
SGAC	65-80	550-700	850-1000

Microstructure



Hardness Profile



AIC

Alloy Indefinite Chilled Rolls

This roll grade uses iron with high nickel content together with chromium and molybdenum to produce a hard, wear resistant surface with combination of tough core which may be produced by static or centrifugal casting.

In the working layer of these rolls fine graphite flakes -increasing resistance to spalling and fire cracks- are embedded in the matrix of cementite. The structure changes gradually from white iron (shell) to nearly grey iron (core) with a decrease in hardness.

This roll grade is suitable for rolling flat bars, narrow strip, rebar, wire rod and light sections at prefinishing and finishing stands.

Duplex rolls used for HSM work rolls are called as ICDP.

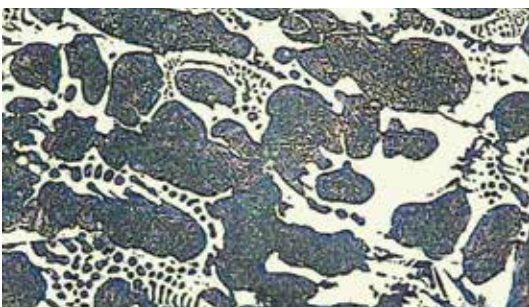
Chemical Composition %

Grade Symbol	Hardness HSC	C	Si	Mn	Cr	Ni	Mo
AIC - I	60-65	3.00-3.60	0.60-1.50	0.40-1.00	0.50-1.20	0.80-1.50	0.20-0.50
AIC - II	65-70	3.00-3.60	0.60-1.50	0.40-1.00	0.70-1.50	1.50-2.50	0.30-0.80
AIC - III	70-80	3.00-3.60	0.60-1.50	0.40-1.00	0.70-1.50	2.50-4.50	0.50-0.80

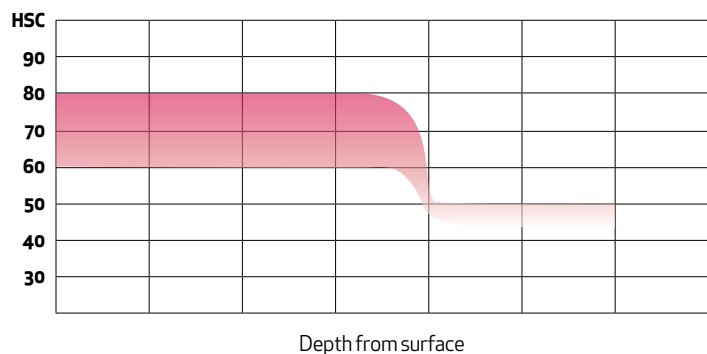
Mechanical Properties

Grade Symbol	Hardness HSC	Tensile Strength MPa	Bending Strength MPa
AIC - I	60-65	180-250	300-400
AIC - II	65-70	200-250	300-400
AIC - III	70-80	250-300	400-550

Microstructure



Hardness Profile



ASB

Alloy Steel Base (Adamite)

This grade is originally developed for roughing and intermediate rolling. Adamite rolls are steel base rolls having properties between those of cast iron rolls and high carbon cast steel rolls.

Carbon content of Adamite rolls varies between 1.2 to 2.2% with Ni, Cr and Mo as other alloying elements. The hardness of Adamite rolls can be controlled between 40 and 65 HSC by adjusting chemical composition and heat treatment process.

Unique characteristics are relatively high hardness while maintaining strength levels and toughness for operation requiring both wear resistance and mechanical strength. By means of forced cooling, this grade can reach up to 65 HSC surface hardness.

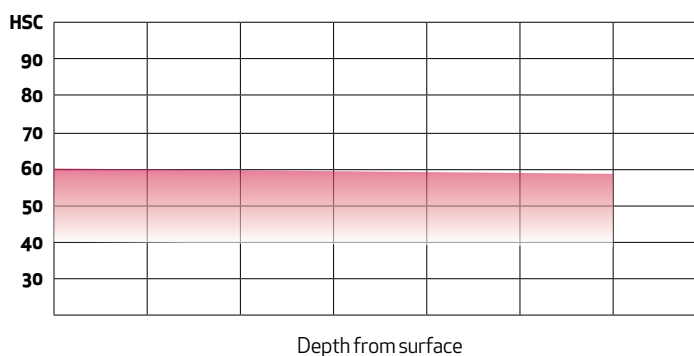
Chemical Composition %							
Grade Symbol	Hardness HSC	C	Si	Mn	Cr	Ni	Mo
ASB - I	40-45	1.20-1.60	0.40-1.0	0.60-1.20	0.60-1.20	0.80 max	0.20-0.40
ASB - II	45-50	1.60-2.00	0.40-1.0	0.60-1.20	0.80-1.50	0.60-1.00	0.30-0.60
ASB - III	50-60	1.80-2.20	0.40-1.0	0.60-1.20	0.80-1.80	0.80-1.60	0.30-0.80

Mechanical Properties			
Grade Symbol	Hardness HSC	Tensile Strength MPa	Bending Strength MPa
ASB - I	40-45	600-800	1100-1400
ASB - II	45-50	550-800	1000-1200
ASB - III	50-60	450-750	900-1100

Microstructure



Hardness Profile



GST

Graphitic Steel Rolls

GST is typical steel base with free graphite nodules in the structure which give them higher thermal stress resistance and ability to absorb large elastic deformation. Graphite nodules are formed by modified chemistry and increased Ni and Si content.

Graphitic steels have higher toughness and ductility than Adamite while the hardness remains in the range that ensures the wear resistance of rolls. They also have good fire crack resistance.

These rolls are suitable for rolling almost any size sections, rails at horizontal stands as well as in the form of sleeves and vertical rolls at universal stands.

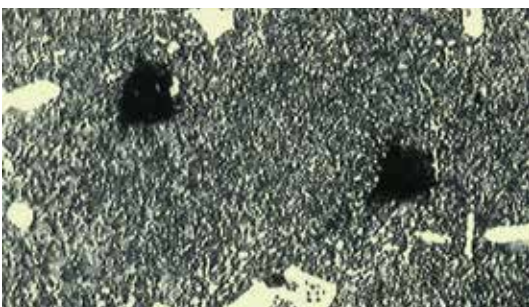
Chemical Composition %

Grade Symbol	Hardness HSC	C	Si	Mn	Cr	Ni	Mo
GST - I	40-45	1.30-1.60	1.10-1.80	0.50-1.10	0.50-1.00	0.50-0.80	0.2-0.5
GST - II	45-50	1.60-1.90	0.80-1.60	0.50-1.10	0.60-1.00	0.50-1.00	0.3-0.7
GST - III	50-55	1.90-2.20	0.80-1.60	0.50-1.10	0.60-1.50	0.80-1.50	0.3-0.7

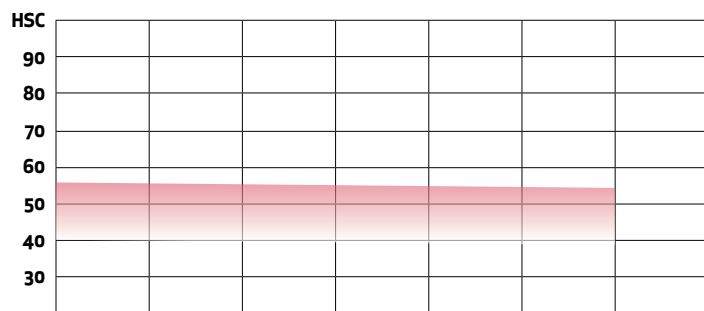
Mechanical Properties

Grade	Hardness HSC	Tensile Strength MPa	Bending Strength MPa
GST - I	40-45	400-650	700-950
GST - II	45-50	350-500	600-750
GST - III	50-55	300-450	550-650

Microstructure



Hardness Profile



Depth from surface

ACS

Alloy Cast Steel Rolls

ACS rolls are high carbon alloy steels with carbon content ranging from 0.6 to 2.0% by weight. The major alloying element is chromium with small amount of molybdenum to improve hardenability. The microstructure consists of carbides in a pearlitic matrix.

The rolls with higher carbon content have higher wear resistance. For the applications where the higher strength is paramount, low carbon content grades are the correct choice.

The high temperature normalizing heat treatment followed by softening annealing turns the pearlite into nodular form. Stress relief annealing

has no effect on the hardness and is required to eliminate risk of breakage under cyclic rolling loads.

These rolls are used in every position of blooms, billets and medium to heavy section rolling as well as roughing stands of bar and wire rod mills.

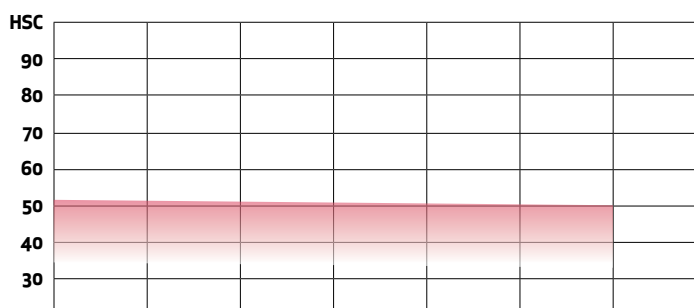
Chemical Composition %							
Grade Symbol	Hardness HSC	C	Si	Mn	Cr	Ni	Mo
ACS - I	35-40	0.60-1.20	0.30-0.80	0.50-1.00	0.50-1.00	1.20 max	0.50 max
ACS - II	40-45	1.00-1.60	0.30-0.80	0.50-1.00	0.80-2.20	1.20 max	0.50 max
ACS - III	45-50	1.40-2.00	0.30-0.80	0.50-1.00	0.80-2.50	1.20 max	0.50 max

Mechanical Properties			
Grade Symbol	Hardness HSC	Tensile Strength MPa	Bending Strength MPa
ACS - I	35-40	750-900	900-1200
ACS - II	40-45	650-800	750-1000
ACS - III	45-50	500-650	650-800

Microstructure



Hardness Profile



Depth from surface

HiCr

High Chrome Rolls

HiCr Iron and HiCr steel rolls are having high Cr carbide content with a tempered martensitic-bainitic matrix in the working shell. Centrifugally cast compound HiCr rolls are made of highly wear and fire crack resistant shell with nodular cast iron core. They provide very high thermal shock resistance, longer pass life and very good surface finish.

HiCr Iron rolls are ideal for roughing work rolls of HSM, plate mill work rolls, skin pass and cold rolling work rolls. Durability during longer run time, resistance to fire cracking and banding are advantages. Hardness property is stable during whole life of these rolls. Hence, re-hardening or reconditioning is not required.

HiCr Steel rolls are used for reversing and continuous HSM roughing rolls, steckel mill rolls and plate mill rolls. Superior mechanical strength of HiCr steel rolls make them ideal for heavy duty rolling conditions.

Heat treatment at high temperatures modify the structure to obtain optimum mechanical and physical properties.

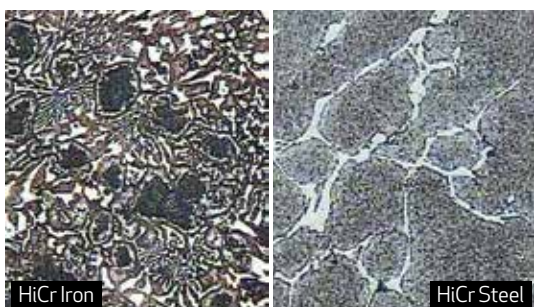
Chemical Composition %

Grade Symbol	Hardness HSC	C	Si	Mn	Cr	Ni	Mo	V
HiCr Iron	65-85	2.5-3.2	0.5-1.8	0.5-1.3	12.0-16.0	0.6-1.6	0.8-1.5	0.2-0.5
HiCr Steel	65-85	1.0-2.0	0.5-1.2	0.5-1.2	10.0-14.0	0.5-1.5	1.0-2.0	0.2-0.5

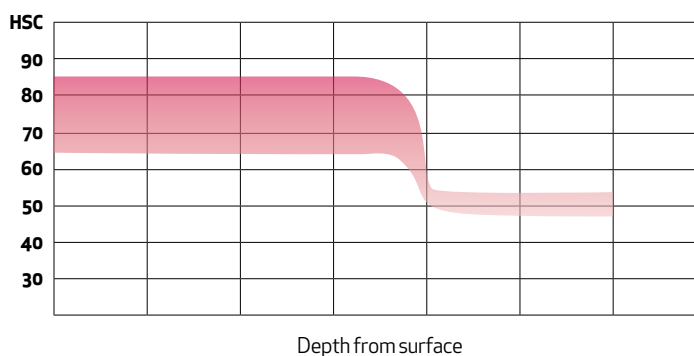
Mechanical Properties

Grade Symbol	Hardness HSC	Tensile Strength MPa	Bending Strength MPa
HiCr Iron	65-85	600-800	900-1100
HiCr Steel	65-85	700-900	1100-1200

Microstructure



Hardness Profile



HSS

Composite Hss / Tool Steel Rolls

HSS rolls are made such that highly alloyed Tool Steel/HSS material is metallurgically bonded onto a forged steel or nodular iron shaft.

In HSS rolls by CPC process, highly alloyed shell metal continuously poured into the mould to create a clad onto the forged steel shaft. The process is called as CPC. The result is a very hard working layer on the forged roll neck (shaft). Considerable amount of carbides in the microstructure make these rolls ideal wherever the very high wear resistance is needed.

In HSS rolls by CC (Centrifugal Casting) process, high alloyed and wear resistant shell material is centrifugally cast and then soft core material is poured into the precast shell.

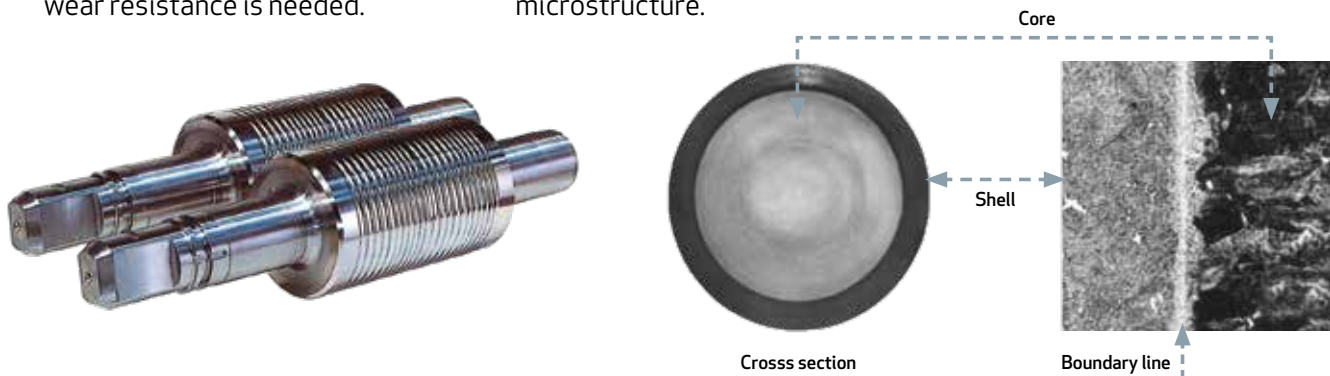
Advantages of HSS Rolls ;

- Highly wear resistant shell material durable at high temperature provides high pass performance and good surface finish.
- No segregation or shrink cavities due to the special casting process. Solid and fine microstructure.

- Required hardness depth is exactly provided due to the manufacturing process.

HSS rolls are designed and produced as per end user's requirement considering product rolled, max/min roll dia and other working conditions.

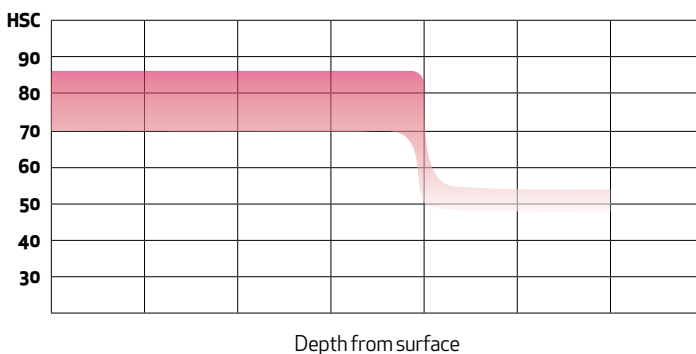
HSS rolls are getting more and more popular in today's high capacity modern mills. These rolls are ideal in bar, wire&rod mills, light section and narrow to wide strip mills at finishing stands.



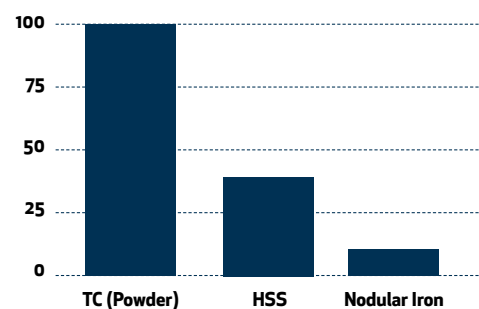
Chemical Composition %

Grade Symbol	Hardness HSC	C	Si	Mn	Ni	Cr	Mo	V	W	Co
HSS (CPC)	70-85	1.5-2.8	0.3-1.2	0.4-1.2	0.0-1.5	2.5-7.0	2.0-8.0	3.0-7.0	2.0-7.0	1.0-4.5
HSS (CC)	70-85	1.5-2.5	0.3-1.2	0.4-1.2	0.0-1.5	2.0-7.0	2.0-8.0	2.0-9.0	0.0-6.0	-

Hardness Profile



Comparative Pass Performance



Assembled Ring Rolls



These rolls are designed by assembling high performance roll rings on a forged shaft and fixing by our patented hydraulic locking system.

Ring rolls are getting more popular in today's modern mills giving much higher pass performances compared to conventional cast iron rolls.

Ring rolls are used in intermediate and finishing trains of wire rod and bar mills, merchant bars and narrow strip mills

Our qualified service engineers can help you in designing assembled ring rolls suitable to your specific needs, which can be used on existing stands without any additional investment.

Advantages of assembled ring rolls are;

- Longer run time
- Up to 10 times higher pass performance over conventional rolls
- Better surface finish of rolled products
- Reusable roll shaft
- Shorter redressing time overall
- Reduced number of roll stock
- Consistent pass life



Seamless Tube Rolls



Marmacor have been very well known brand name also in seamless tube roll and tooling market. Our rolls are approved and regularly demanded by the World's top seamless tube manufacturers. Piercing, PQF/FQM rolls, Extraction, Mandrel, MPM, SM, EM rolls and tooling are manufactured

with highest standards. The rolls are delivered as single or with assembled accessories.

Static cast rolls blank or with near shape grooves and centrifugally cast rolls can be produced as per customer requirement.

Sound casting, special heat treatment and other manufacturing processes make our rolls demanded for manufacturing seamless tubes in strict tolerances and with very good surface finishes.

MILL TYPE	ROLL TYPE	ROLL GRADE
MPM, FQM, PQF	Piercer, Extractive, EM, SM, RSB	Nodular Iron, HSS, Forged steel
RSB, SM, KOCKS, PSM	Solid, Composite, Assembled	Nodular Iron, HSS, TC
PIERCER, CTP, REELER	Roll Ring, Solid Roll	Nodular Iron, Cast Steel, Forged Steel
PLUG MILL	Piercer, Elongator, Reeler	Nodular Iron, Forged steel, HSS



Roll Rings and Sleeves

Roll rings and sleeves are produced by static or centrifugal casting.

Adamite sleeves are further heat treated and quenched to achieve surface hardness of up to 65 HSC.

Bimetallic roll rings are made with a combination of hard working layer and tough and shock absorbent core material.

Cast Iron, Cast Steel or Tool Steel roll rings and sleeves are available up to the diameter of 1500 mm.

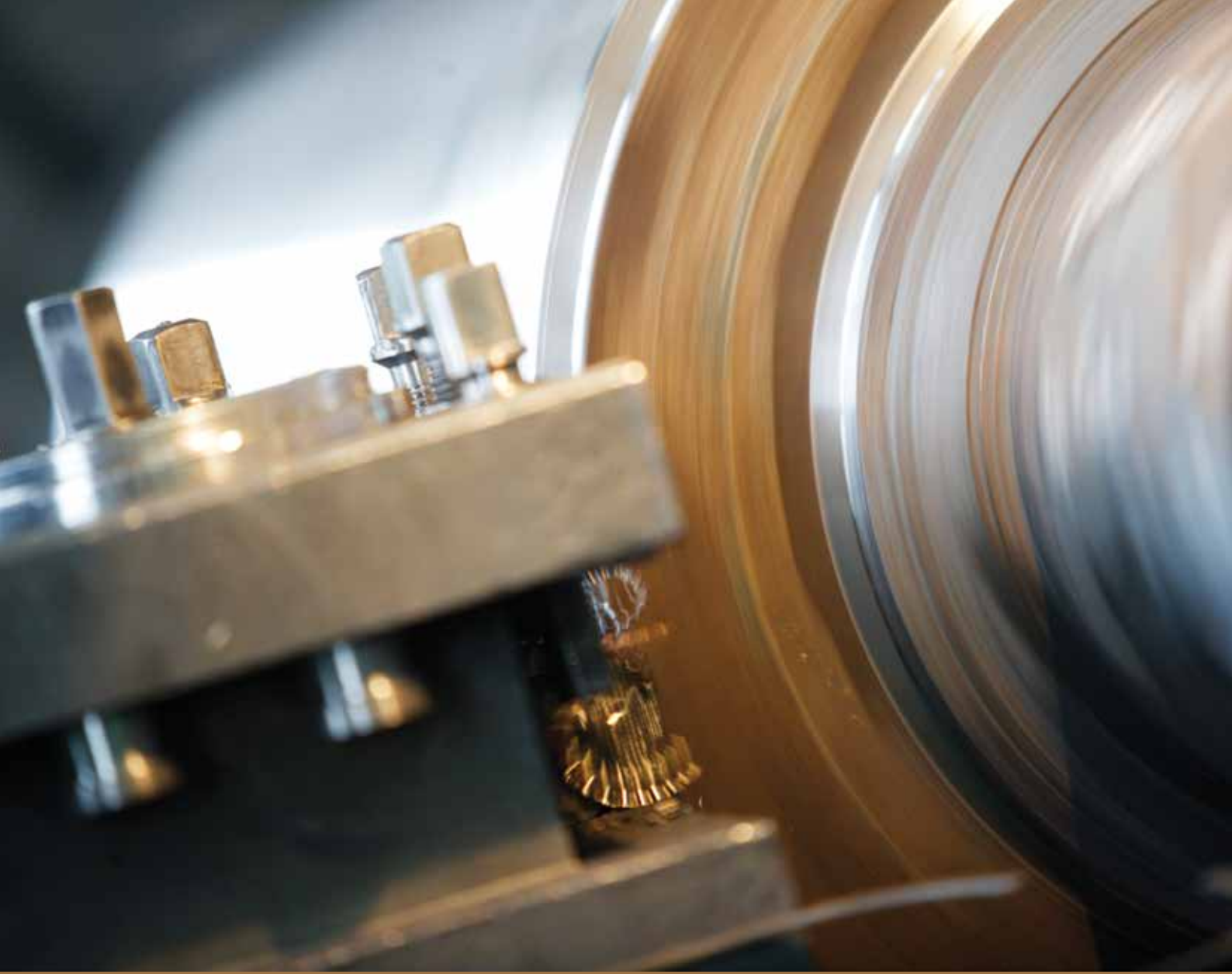




Heat treatment is one of the key factor in the final physical and mechanical properties of rolls.

Heat treatment processes including annealing and tempering, stress relieving, quenching and forced cooling, are applied to achieve the maximum benefits from the rolls.





Roll machining exactly as per customer drawings.
Rolls are provided as finished turned plain, ground or
with finished turned grooves for long product mills.







All delivered rolls have a unique roll number engraved on the roll neck for monitoring and tracing purposes.

All customer inquiries referring to our roll numbers can be easily followed and replied in a very short time.

We keep all production reports and data for a certain time period needed anytime for reference





Service and Mill Spares

As important as the rolling mills are, without use of the proper consumables and support equipment, the rolling project would not be successful.

Our engineers and representatives regularly visit customers to better understand their needs and generate solutions to the specific mill problems.

We manufacture in-house or provide through reputable partners, the necessary roll shop tooling and mill spares to help our clients produce accurate and the most effective rolling results from their mills and to get the job done right.

Those items can be ordered in combination with the roll order or as a separate order.

Standard items include;

- Mechanical mill spares (Roll chocks, couplings, spindles, gears, shafts, etc.)
- PCD, CBN inserts, notching and marking tools
- Roll grinding wheels
- Guide rollers (D2, D3, TiC or TC)
- Straightening rolls and rollers
- Pinch rolls
- Labyrinth and spacer rings

Further service and tooling items available upon request.

Wherever our products are in action, we are there.
We believe in borderless business



Hundreds steel plants from over 30 countries rely on Marmacor rolls to run their mills

GERMANY	SWEDEN	BULGARIA	ITALY	UAE	SPAIN	SAUDI ARABIA	QATAR
CHINA	BOSNIA HERZEGOVINA	UNITED KINGDOM	LIBYA	USA	KUWAIT	MOROCCO	MEXICO
SYRIA	GREECE	INDONESIA	RUSSIA	ISRAEL	IRAQ	NEW ZEALAND	CANADA
JORDAN	EGYPT	JAPAN	ALGERIA	TUNISIA	IRAN	THAILAND	BAHRAIN
ITALY	UAE	SPAIN	SAUDI ARABIA	QATAR	PAKISTAN	INDIA	FRANCE
LIBYA	USA	KUWAIT	MOROCCO	MEXICO	TURKEY	ROMANIA	LUXEMBOURG
RUSSIA	ISRAEL	IRAQ	NEW ZEALAND	CANADA	GERMANY	SWEDEN	BULGARIA
ALGERIA	TUNISIA	IRAN	THAILAND	BAHRAIN	CHINA	BOSNIA HERZEGOVINA	UNITED KINGDOM
SAUDI ARABIA							
SAUDI ARABIA	QATAR	PAKISTAN	INDIA	FRANCE	SYRIA	GREECE	INDONESIA
MOROCCO	MEXICO	TURKEY	ROMANIA	LUXEMBOURG	JORDAN	EGYPT	JAPAN
NEW ZEALAND	CANADA	GERMANY	SWEDEN	BULGARIA	ITALY	UAE	SPAIN
THAILAND	BAHRAIN	CHINA	BOSNIA HERZEGOVINA	UNITED KINGDOM	LIBYA	USA	KUWAIT
INDIA	FRANCE	SYRIA	GREECE	INDONESIA	RUSSIA	ISRAEL	IRAQ
ROMANIA	LUXEMBOURG	JORDAN	EGYPT	JAPAN	ALGERIA	TUNISIA	IRAN

