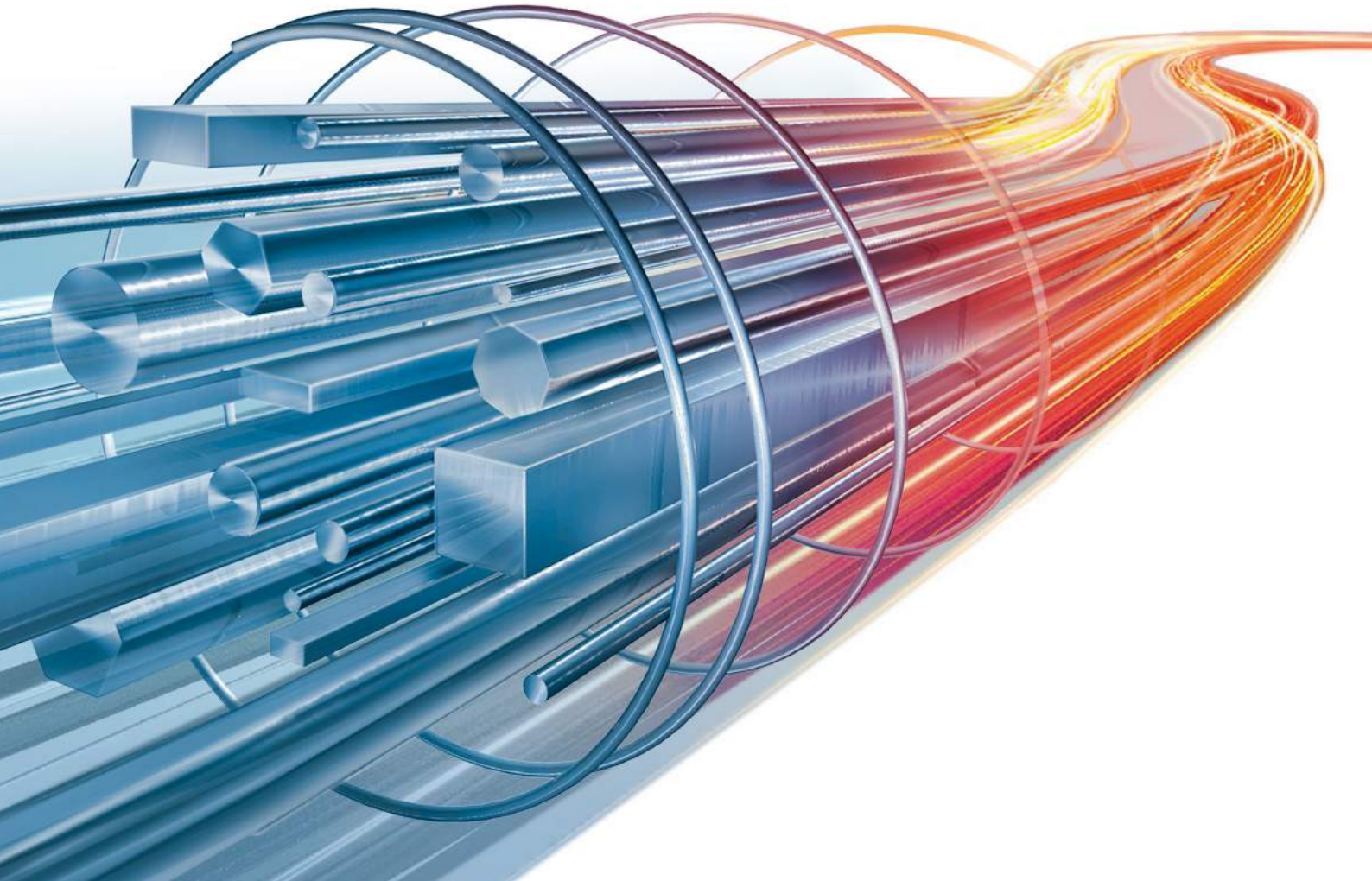
saarstahl

PRODUCT CATALOGUE



Neunkirchen: New wire rod outlet at rolling mill 32

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Saarstahl AG: Highest Standards – All Along the Line!

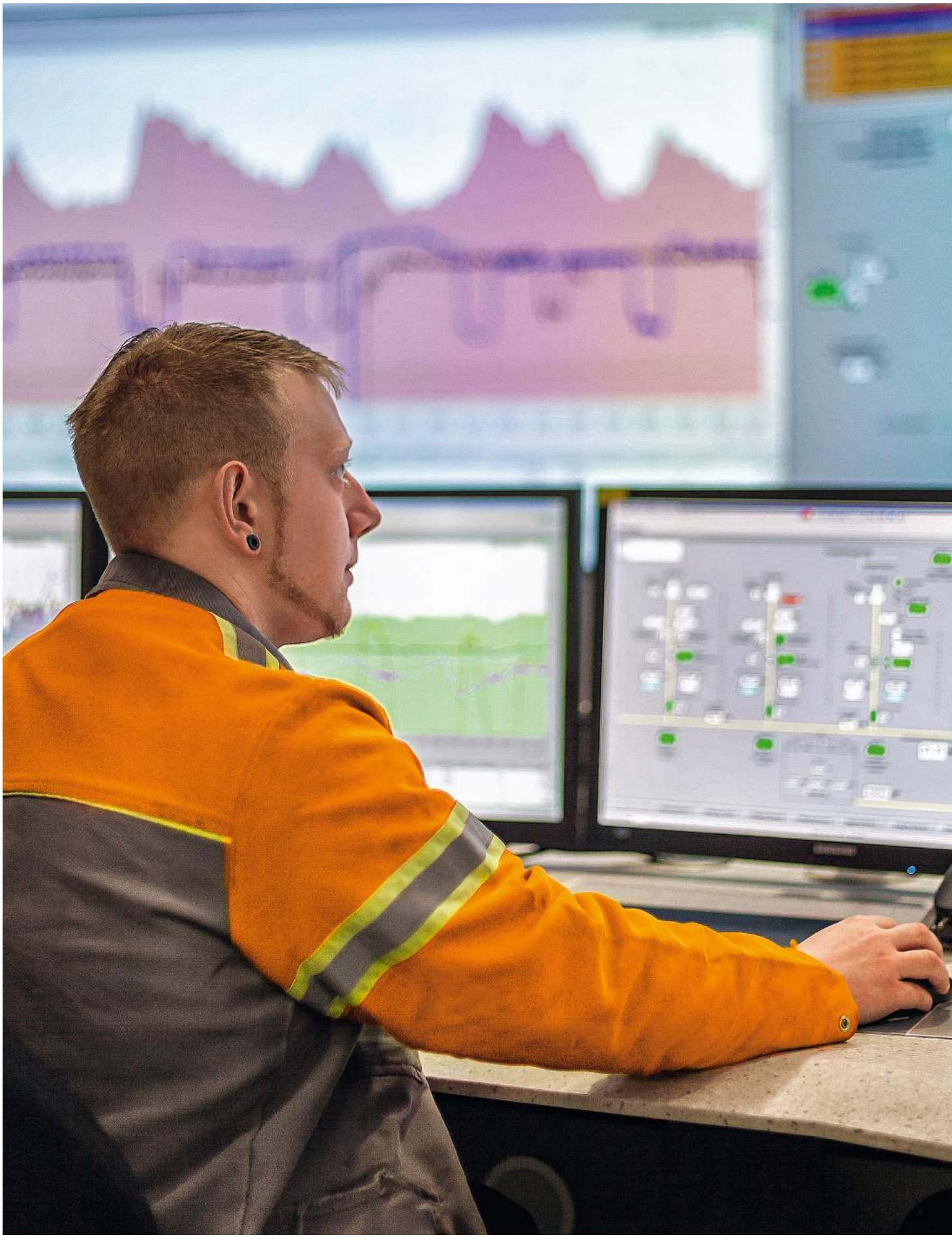
Saarstahl AG is one of Europe's leading manufacturers of long products, demonstrated by an internationally recognised high degree of competence in the field of steel manufacturing and further processing. We specialise in the high-tech production of wire rod, bar steel and semi-finished products in qualities that meet the highest demands at our locations in Völklingen, Burbach and Neunkirchen.

Our products are used in a range of industries, including automotive, oil and gas, mechanical engineering, and construction for applications operating within the most extreme conditions. As a global supplier to the largest automotive manufacturers Saarstahl is represented on all continents.

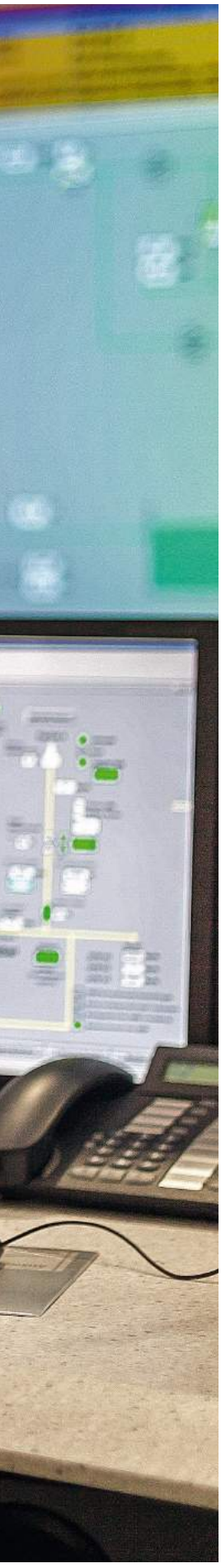
Customer satisfaction is the driving force for us to achieve the highest standards of quality and service. With our comprehensive knowledge in steel making and rolling technology, our products are manufactured to the highest levels to achieve both quality and consistency, which is ensured with the latest testing facilities. This requires continuous further development of our products and processes, a constant high level of investment in our facilities, and our own research and development. Thus, we work on innovative and tailor-made steel solutions together with our customers. Reliable. Unique. Superior quality.

Social responsibility, environmental protection, energy efficiency and work safety are the essential pillars of our company with its global operations. Through regular qualification measures for our employees, we ensure adherence to values such as customer service and quality awareness, as they are laid down in our corporate guidelines.

Saarstahl and its employees are committed to setting the highest standards in quality and service for their customers. All along the line!



Dillingen: "Dispatching stand" for the control of the media supply of ZKS and ROGESA



Technical Facilities

ZENTRALKOKEREI SAAR GMBH

Zentralkokerei Saar GmbH (ZKS) is a mutual subsidiary of Dillinger Hüttenwerke AG and Saarstahl AG. The company produces high-quality coke to supply Roheisengesellschaft Saar mbH (ROGESA), a further subsidiary of the two Saarland-based steelworks. As part of a modernisation programme, with investment exceeding € 220 M, state-of-the-art technologies for emission control were used in revamping coke furnace battery 1 (B1) and the new construction of battery 3 (B3). After the successful completion of this project, ZKS is now one of the most modern coking plants in the world.

Coke Batteries at ZKS:

	Battery 1	Battery 3
Year of construction	1984/2012	2010
Number of coking furnaces	40	50
Furnace type	Horizontal chamber furnace with staged heating and off-gas recirculation	

Annual production (typical):
· Coke: 1.3 M t
· Coke gas: 12 M GJ

ROGESA ROHEISENGESELLSCHAFT SAAR MBH

ROGESA, a subsidiary of the Dillinger Hüttenwerke AG and Saarstahl AG, guarantees a reliable and highly flexible supply of hot metal for the two steelmaking plants in Dillingen and Völklingen. The facilities of these two plants are state-of-the-art thanks to consistent investment, such as the relining of a blast furnace in 2016 and the installation of a high-performance injection unit. Additional measures that look into the future, such as the operation of a blast furnace gas power plant, in which the process gas is converted into electrical energy and used internally in the steelmaking plant, are also an investment in the protection of the environment.

Blast Furnace at ROGESA:

	BF 4	BF 5
Year of construction	1974	1985
Last relining	2016	2010
Diameter of hearth	11.2 m	12.0 m
Usable volume	2,360 m^3	2,893 m^3

Annual production (typical):
· Hot metal: approx. 4.6 M t
· Slag granulation plant: 1.2 M t

LD steelmaking plant Völklingen, secondary metallurgy: Ladle furnace

STEELMAKING PLANT

The LD steelmaking plant in Völklingen is the largest steelmaking plant within the EU to exclusively manufacture billets and blooms for the production of long products. With around 800 types of steel, Saarstahl offers a wide range of grades.

MELTING OPERATION

Our melting operation is characterised by a high level of automation and a redundant system configuration, which allows a high degree of flexibility and prevents bottlenecks from occurring. The production reliability is further increased by the comprehensive use of process models.

· Pretreatment of hot metal
  - Transfer filling station with 4 rails, 2 wagons and 12 charging ladles
  - Hot metal desulphurisation plant with 3 injection stands for co-injection of Mg, CaO or CaC_2
· 3 x 180-t LD converters (basic oxygen steelmaking process [BOF])
· Slag retaining system during tapping
· Automatic process control
· Annual capacity: 3.0 M t

SECONDARY METALLURGY

With the commissioning of a further secondary metallurgy at the end of 2012, not only all aggregates, such as the degassing plants and ladle furnaces have been redundantly available at all times, but by bundling them in a metallurgical centre, a unique opportunity has been created regarding process control and production logistics for Saarstahl. Through the individually developed systems, we can achieve special alloying concepts such as the addition of lead, bismuth, tellurium and selenium. Saarstahl has taken on a leading position worldwide in the field of lead-alloy steels, thanks to state-of-the-art technology and the implementation of comprehensive environmental protection measures. Furthermore, due to the complete changeover of the ladle park in 2016, which has now been extended to 28 ladles, the average tapping weight could be increased to 180 t.
Due to the investments made in the latest steelmaking plant technology, combined with its unique expertise in the steelmaking process, Saarstahl has laid the foundations for the steel production of the future already today.

· 3 induction furnaces for premelting FeMn and FeCr
· 2 double ladle furnaces
· 2 vacuum facilities (RH process)
· 2 injection stations for solids (Pb, Te, Bi)
· 5 purging and alloying stands
· 4 alloying facilities (a total of 86 bunkers)
· 2 eight-strand and 4 four-strand wire injection facilities
· Automatic process control

LD steelmaking plant Völklingen: Continuous casting plant

CONTINUOUS CASTING PLANTS

The proportion of continuous cast steel at Saarstahl amounts to 100 %, distributed across 23 strands on four continuous casting facilities. Two facilities are currently equipped with MSR technology (Mechanical Soft Reduction). Saarstahl is the world's first long products producer to use MSR technology on a wide scale for thin billet formats – a system which was developed independently by our company. With our investment in the new continuous casting facility S1, we are further improving this leading edge technology and our capabilities, making us now the only steel maker in the world producing the casting format 180 mm x 180 mm with MSR technology.

· 1 five-strand and 3 six-strand continuous casting facilities
· Billet lengths 3.0 – 22.5 m
· Mechanical soft and hard reduction for billets and bloom formats
· 1 double rotating tundish for sequential casting
· Automatic fill level control between tundish and mould
· Automatic casting flux feeder
· Electromagnetic stirring systems
· Early slag detection and retaining system on the ladles
· Computerised process control and quality monitoring

	S0	S1	S2	S3	S4
Commissioning	2004	2019	1981	2009	1982
Type			Bow type		
Formats (mm)	150^2 180^2	180^2	125^2	240^2 265 x 340	150^2
Capacity (thousand t/month)	80	80	70	80	80

MECHANICAL SOFT REDUCTION (MSR)

MSR technology is used in the production of steels to meet the most demanding applications where the aim is to achieve targeted improvement in the internal microstructure. In doing so, the strand is rolled step by step in the final phase of solidification through application of force by the MSR rolls so that local shrinkage during solidification is compensated. As a result, there is a significant reduction in core segregation and core porosities.

Burbach: Rolling mill 11

ROLLING MILL 11 BURBACH

At its Burbach site, Saarstahl operates a four-strand wire rod mill with an annual capacity of 1.2 M t for special products with demanding applications such as welding wires, cold heading, tyre cord, spring and prestressing steels. We are also able to produce diameters from 5.0 mm and manufacture coil weights up to 3 t. Specialties of the Burbach location are its flexibility which, thanks to extremely short rolling cycles, allows us to react to customer requirements ad hoc, as well as the outstanding productivity second to none in the world. The investment in an extended roughing mill (volume of € 16 M) during 2016 underlines our aspiration to retain our position as market leader well into the future.

· Fully continuous, four-strand, high-performance wire mill with 78 stands
· Annual capacity: 1.2 M t
· Three-dimensional warehouse management system
  for semi-finished products with automatic recording of material flows
· Online measurement of dimension and ovality using laser diameter
  in the area of the finishing block and finished material (6 axes, fixed)
· Inline surface inspection devices for securing optimum material surface (eddy current)
· Pressing and strapping of coils with steel straps
· Packing of wire rod coils

ROLLING MILL 32 NEUNKIRCHEN

Rolling mill 32 in Neunkirchen produces at the highest technological level following the comprehensive modernisation measures we have undertaken. Besides a wide range of qualities and dimensions, the wire rod facility is equipped with a thermomechanical rolling loop; in addition, it boasts the latest precision rolling stands (free-sizing) to achieve the tightest dimensional tolerances. For cold heading qualities and spring steels, in particular, rolling mill 32 sets standards worldwide.

· Fully continuous, one-strand wire rod mill with 34 stands
  (incl. 4-stand precision rolling block)
· Annual capacity: 600,000 t
· Continuous, computer-aided material flow tracking and process control
· Diameter testing with laser diameter
· Loop cooling conveyor
· Barcode labelling
· Strapping of wire coils

Nauweiler: 7-stand continuous blooming line

ROLLING MILL 31 NEUNKIRCHEN

The combined mill for wire rod and bar steel in Neunkirchen is characterised by a high degree of flexibility due to the combination of different product shapes and batch sizes. As a producer of special profiles such as square, hexagonal and flat dimensions, the mill is capable of reacting to individual customer requirements, including the manufacture of smaller batches. Thanks to the Kocks block (RSB) and new, flexible rolling technology, all intermediate dimensions can be manufactured in round, flat, square and hexagonal dimensions using infinitely variable rolling – including measurement in inches.

· Fully continuous, one-strand wire and bar steel mill with 21 stands
· 5-stand, drivable reducing sizing block for rolling limited tolerances for round and hexagonal material
· Annual capacity: 600,000 t
· Twist-free H/V-layout of the preliminary, intermediate and finishing mill with integrated loop regulation to achieve the best surface quality
· Continuous and computer-aided material tracking and process control
· Diameter testing using laser diameter
· Barcode labelling
· Strapping of wire rod coils

ROLLING MILL 14/15 NAUWEILER

The Nauweiler site in Völklingen is home to our bar steel centre with its comprehensive production possibilities, which makes us one of the largest suppliers of bar steel for the automotive industry in Europe. Through substantial investments, the rolling mill and downstream further processing of bar steel have been systematically modernised and extended over the last ten years. The new continuous roughing mill (completion at the beginning of 2017) guarantees consistent high quality and efficiency in the rolling mill with greater flexibility regarding input and output cross-sections; the Kocks block (RSB) on mill 14 ensures excellent dimensional accuracy with tight tolerances.

· Joint roughing mill and intermediate mill with 3 duo-horizontal stands and 7-stand V/H-continuous blooming line
· Annual capacity: 600,000 t – 700,000 t
· Continuous, computer-aided material flow tracking and process control
· Diameter testing with laser diameter
· Automatic strapping

FINISHING MILL 14 NAUWEILER

· Bar steel mill
· 6 duo-stands (H/V) as a continuous blooming line with 5-stand, drivable reducing-sizing-block for rolling limited tolerances for round and hexagonal material
· Temperature-controlled rolling
· Rake-type cooling bed
· Finishing line with 3 grinding separation aggregates

FINISHING MILL 15 NAUWEILER

· Mill for bar steel and semi-finished products
· 1 dual stand (H)
· Turnover cooling bed
· Finishing line with 2 grinding separation aggregates

Dimensional Ranges

Besides the standard dimensions listed below, Saarstahl is able to meet the tightest dimensional tolerances according to international standards and customer requirements.

CONTINUOUS CAST BLOOMS

Square format [mm²]	Minimum lengths [mm]	Maximum lengths [mm]	Tolerances [mm]
265 x 340	3,000	12,500	+/-50
240 x 240	3,000	12,500	+/-50
180 x 180	6,000	13,000	+/-100
150 x 150	8,000	17,500	+/-100
125 x 125	16,000	22,000	+/-200

SEMI-FINISHED PRODUCTS

*) Dimension and workstep-related; **) in dimensional ranges

Format	Dimensions [mm]	Bundle Weight [t] *)	Lengths [m] *)
Square with rounded edges	30.00 – 120.00	3.0 – 10.0	3.0 – 20.0
Square with rounded edges **)	120.01 – 205.00	3.0 – 10.0	3.0 – 20.0

WIRE ROD

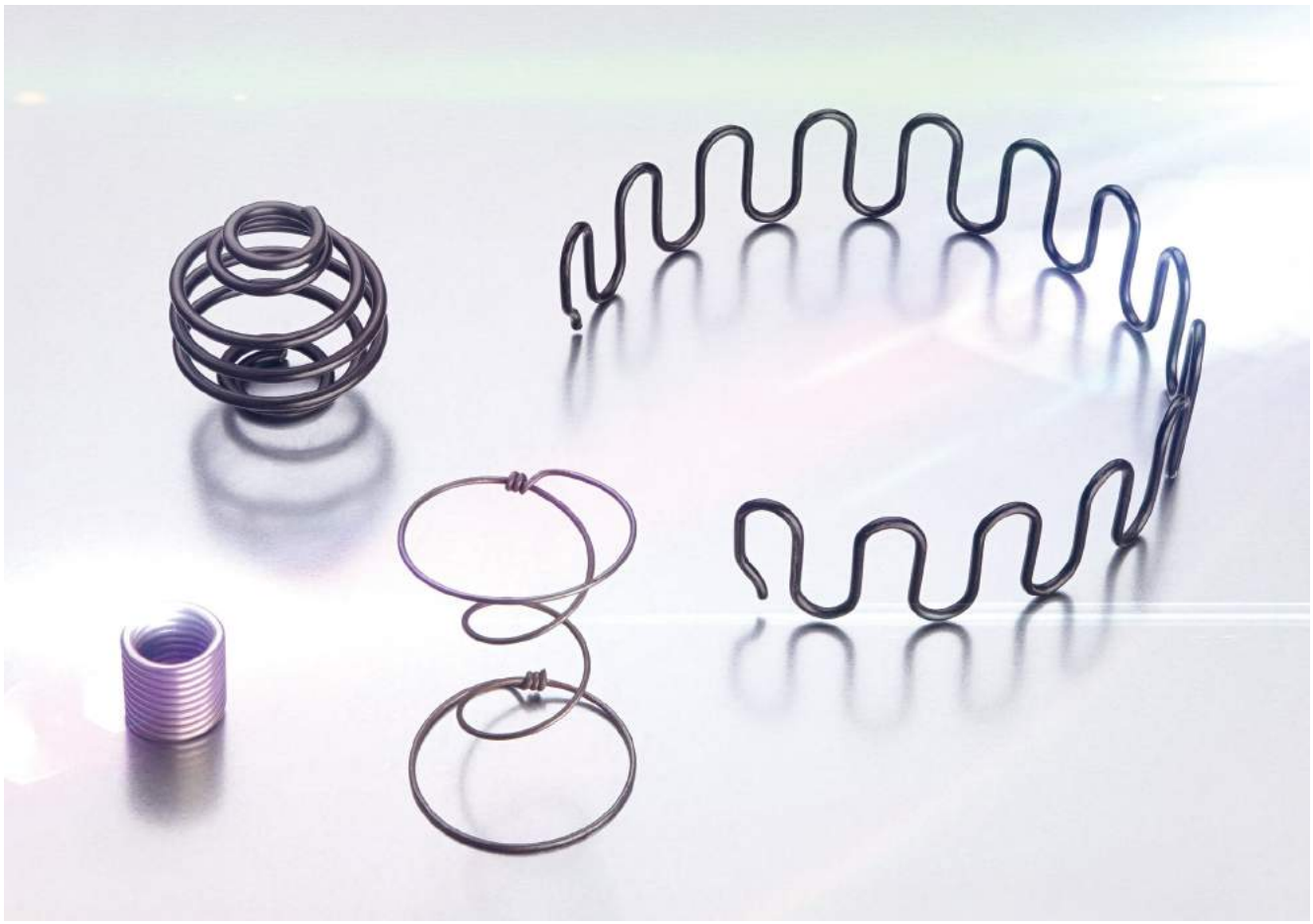
*) Coil weights depend on dimensions

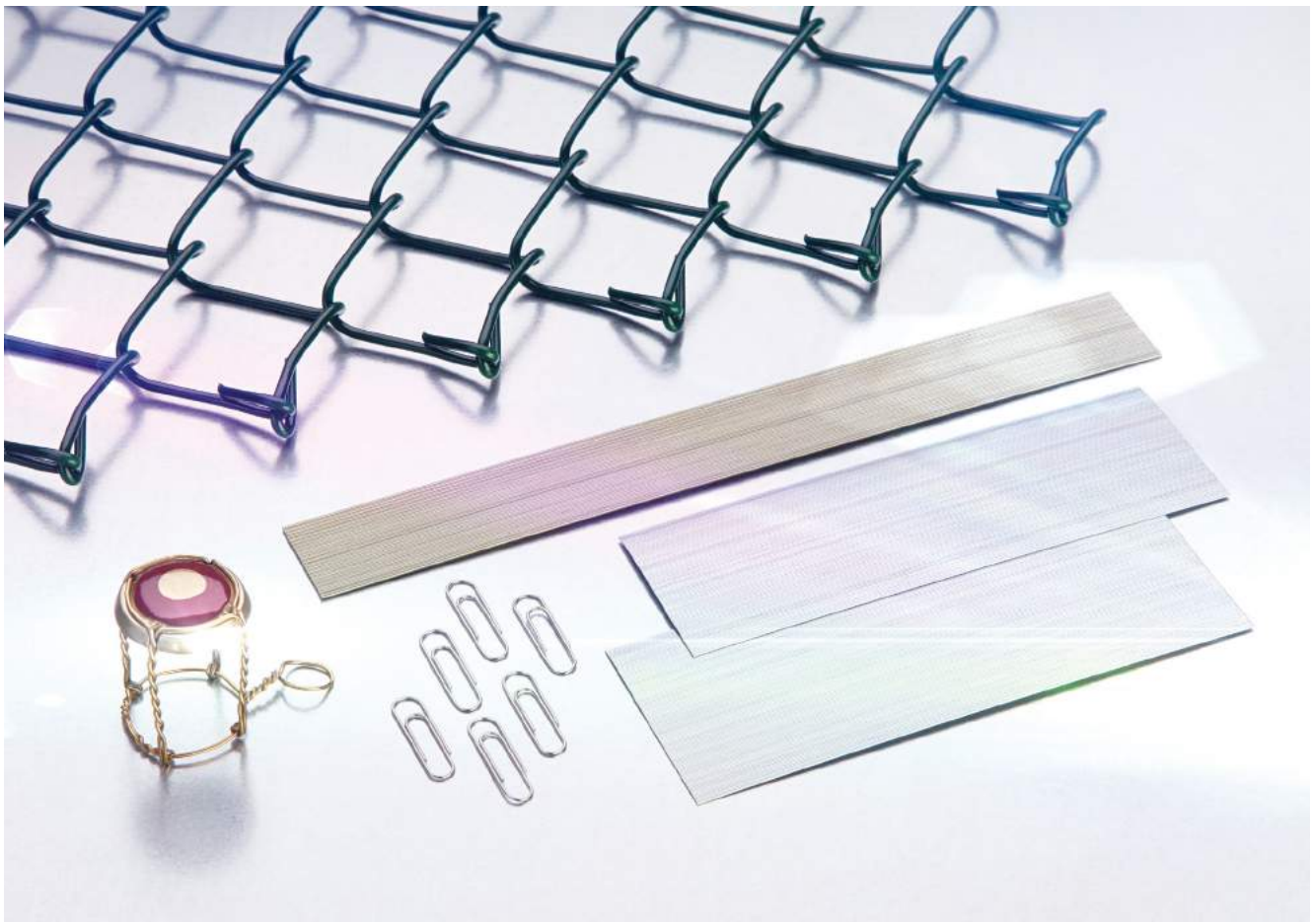
Format	Dimensions [mm]	Coil Weight [t] *)	Tolerances
Round	5.00 – 60.00	1.0 – 3.0	DIN EN 10017 / DIN EN 10108
Square	14.00 – 37.00	1.0 – 3.0	DIN EN 10017
Hexagonal	14.00 – 42.50	1.0 – 3.0	DIN EN 10017
Flat (width x thickness)	16.00 – 35.00 x 8.00 – 35.00	1.0 – 3.0	DIN EN 10017

STEEL BARS

*) Workstep-related

Format	Dimensions [mm]	Bundle Weight [t]	Lengths [m]	Tolerances	Remarks
Round	15.00 – 101.60	3.0 – 10.0	3.0 – 27.0	DIN EN 10060	Infinitely variable rolling
Round	101.60 – 181.20	3.0 – 10.0	3.0 – 27.0	DIN EN 10060	Rollable within dimensional range, 27.0 m bar length on request
Square	14.00 – 72.00 / 80.00 – 100.00	3.0 – 10.0	3.0 – 20.0	DIN EN 10059	
Hexagonal	14.00 – 88.00	3.0 – 10.0	3.0 – 20.0	DIN EN 10061	
Flat (width x thickness)	16.00 – 160.00 x 8.00 – 86.50	3.0 – 5.0 *)	3.0 – 20.0	DIN EN 10058	Special dimensions and lengths on request





Product Range

HIGH CARBON DRAWING QUALITIES

We supply wire rod with medium or high carbon content, which serves as preliminary material in drawing plants, cable plants and cold rolling plants. Typical applications for the products made from our steel include the automotive industry, machinery and bridge construction. After several processing steps, the wire rod is further processed to obtain final products which include the following:

· Technical springs
· Cable armouring wire
· Rope wire
· Upholstery spring wire
· Ski-edge profiles
· Flexible pipes

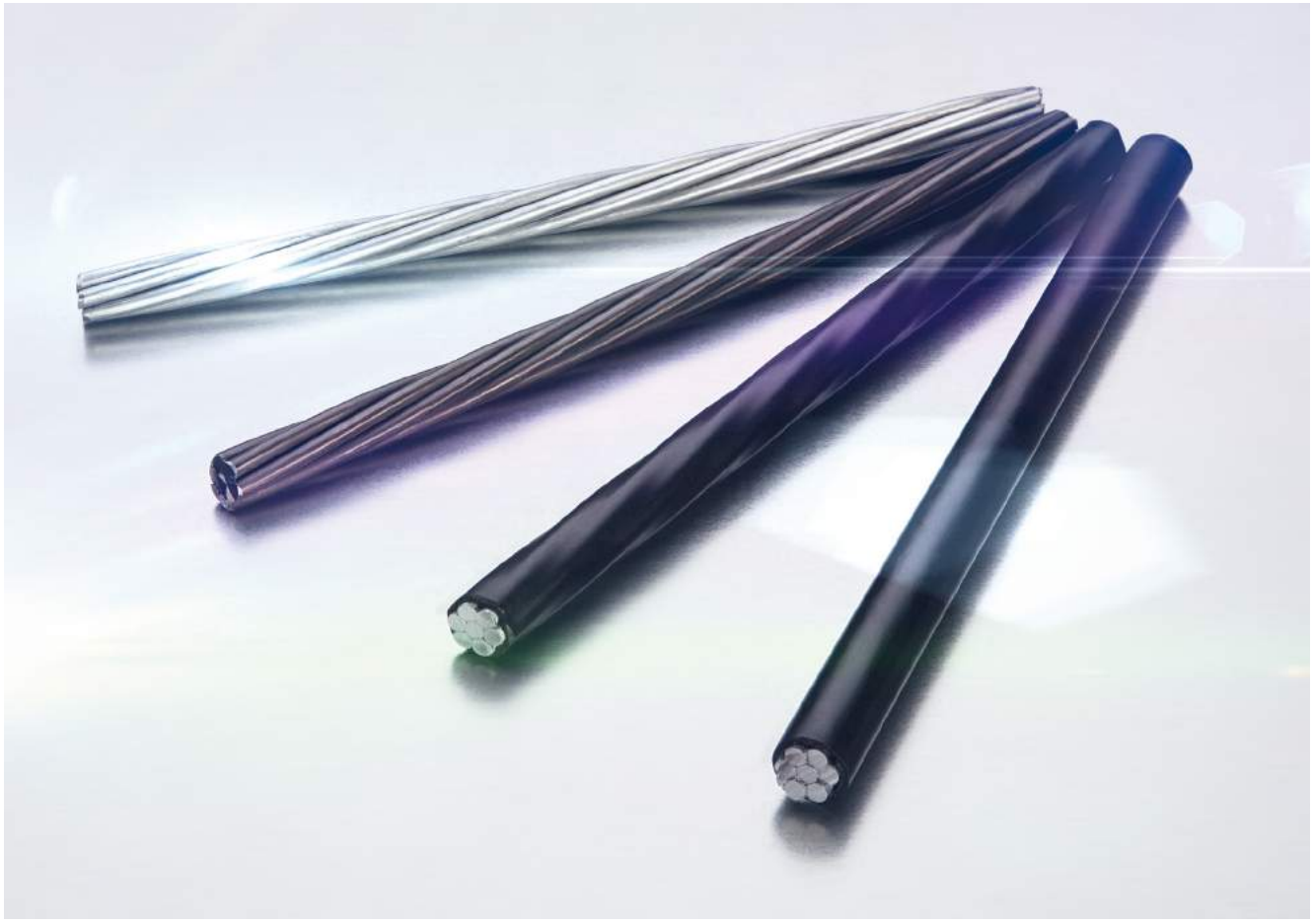
LOW CARBON DRAWING QUALITIES

This product group comprises low carbon wire rod as a preliminary material for drawing mills and cold rolling mills. Our wire rod is thereby further processed to make products for daily use such as:

· Paper clips
· Dish washer racks
· Shopping trolleys
· Fences
· Bucket handles

Low carbon and trace element content, with possible additions of alloys of B, Ti and Al, allow low wire rod tensile strengths with very good drawing and cold rolling properties with high cross-sectional reduction, so that our wire rod is also used in the following products:

· Window and door hinges
· Light bulbs
· Concrete fibres
· Champagne cork wire



WELDING WIRE

Our wire rod serves as a preliminary material in the manufacture of a wide range of welding wires and is used in:

· Shielded arc welding wires
· Electrode core wires
· Submerged arc welding wires
· Gas welding filler rods

Besides the recognised qualities according to ISO 14171 and 14341, AWS A5.18 and other standard qualities, we can also manufacture special variations requested by our customers depending on the particular final application. At our customers' request we also deliver wire rod in a heat-treated and/or surface-treated state.

PRESTRESSING STEELS

Prestressing steels are mainly used in the construction industry and need to withstand the highest mechanical stresses. As a result, there are particularly high demands on the tensile strength of the products. Depending on the required final mechanical-technological properties, we add various micro-alloys to the steel. The main applications for prestressing steel include:

· Bridge construction
· Industrial and residential construction
· Railway construction
· Wind power plant construction

TYRE CORDS

Saarstahl is one of the world's leading suppliers of wire rod as preliminary material for the manufacture of tyre cord. This product sets the highest demands on the manufacturing processes in the steelmaking plant and rolling mill, since the final product is drawn to very fine diameters and therefore even the smallest deviations could lead to significant disruption in further downstream processing. With our optimised production process, we are able to reliably fulfill the high quality requirements of the automotive industry. Our range of products covers wire rod for the manufacture of

· steel cord wire and
· tyre bead wire

with different carbon contents.

SPRING STEELS

We supply the preliminary material for the manufacture of spring elements, which ensure safety and comfort in vehicles throughout the world. Delivered in the form of wire rod or bar steel, Saarstahl spring steel is primarily used in the manufacture of cold or hot formed springs and stabilisers. For example, our steel is used in:

· Suspension springs
· Clutch springs
· Brake accumulator springs

Furthermore, thanks to our state-of-the-art peeling equipment, we can meet our customers' requirements with regard to both cylindrical and (bi)conically peeled bars. Our product range includes mainly SiCr and Cr steels (each with and without V). In addition, particularly for stabilisers, we offer wire rod based on AFP (precipitation hardening ferritic-pearlitic steels) and carbon steels. For applications in vehicle suspension springs, special qualities with improved corrosion and toughness properties have been developed.

COLD HEADING STEELS

With its high quality cold heading grades, Saarstahl supplies the preliminary material for the manufacture of demanding connecting elements such as

· screws,
· bolts,
· nuts,
· rivets

used in highly mechanised industries, such as the automotive and construction industry, as well as the construction of wind power plants and electronic household appliances. The range of grades here covers:

· Unalloyed quality steels
· Boron-alloyed high-grade steels
· Unalloyed and alloyed special steels

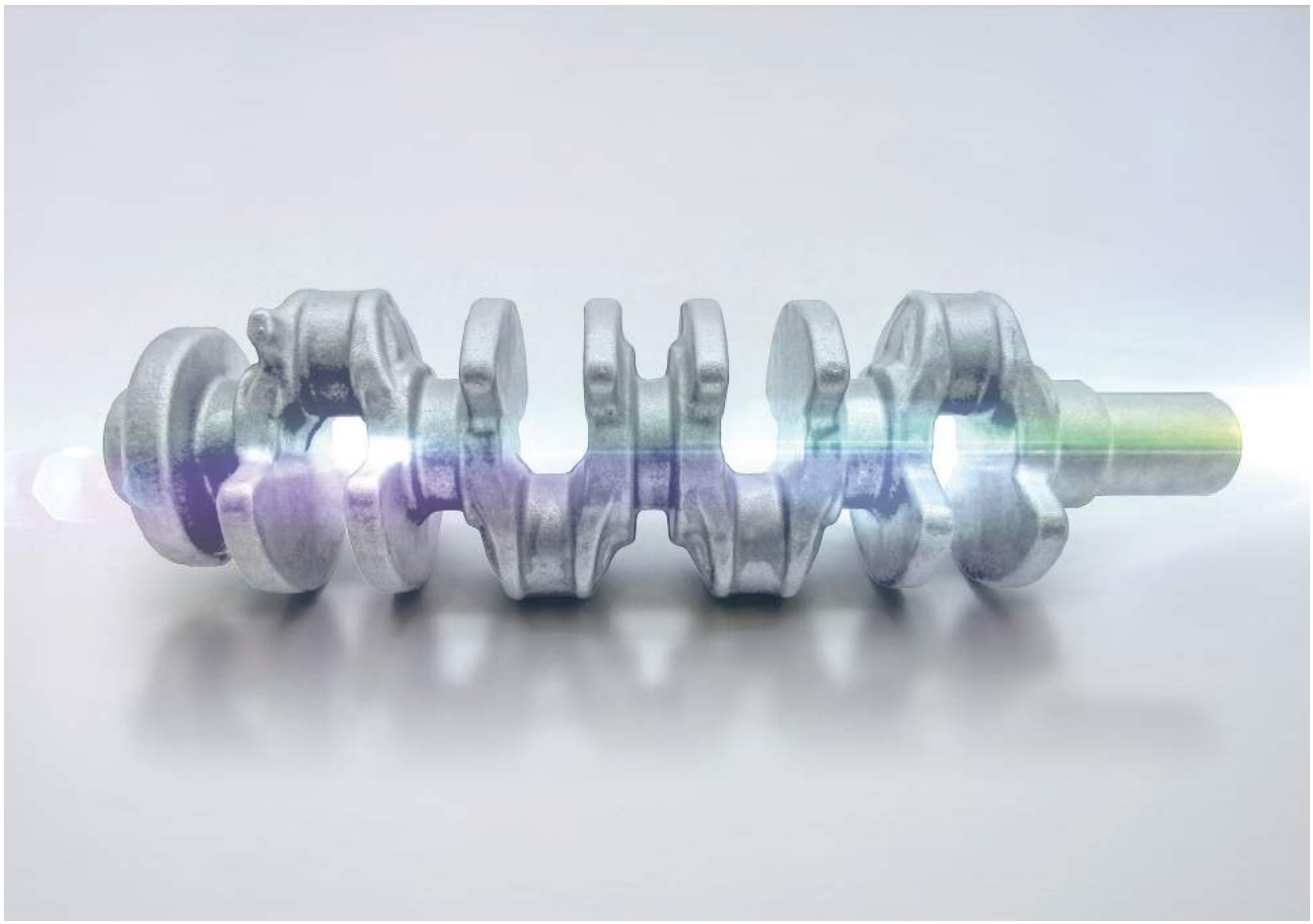
FREE CUTTING STEELS

We produce high quality free cutting steels for discerning customers all over the world as preliminary material for drawing, peeling and machining. Our range of grades here are:

· Free cutting steel
  (not intended for heat treatment)
· Quenched and tempered free cutting steel
· Case-hardened free cutting steel

In particular in the field of lead alloyed steels, Saarstahl is one of the leading suppliers worldwide. Our Pb free-cutting steels demonstrate a homogeneous, finely dispersed distribution of Pb and almost constant Pb content. Both properties are prerequisites for continuous, reliable machinability. We also offer variants of lead-alloyed free cutting steels with the addition of tellurium, bismuth and selenium or a combination of these elements in order to further improve the machining properties of the steel.

For higher demands on leak tightness, such as for common-rail diesel technology and for steels used for hydraulic components, our HD steels ("pressure tight brands") are used, which are manufactured using a specific metallurgical process with the aim of reducing oxidic non-metallic inclusions.



AFP STEELS

With our micro-alloyed AFP steels (precipitation hardening ferritic-pearlitic steels) we offer individual steel solutions, particularly to the automotive industry, with special alloy concepts tailored to their specific requirements.

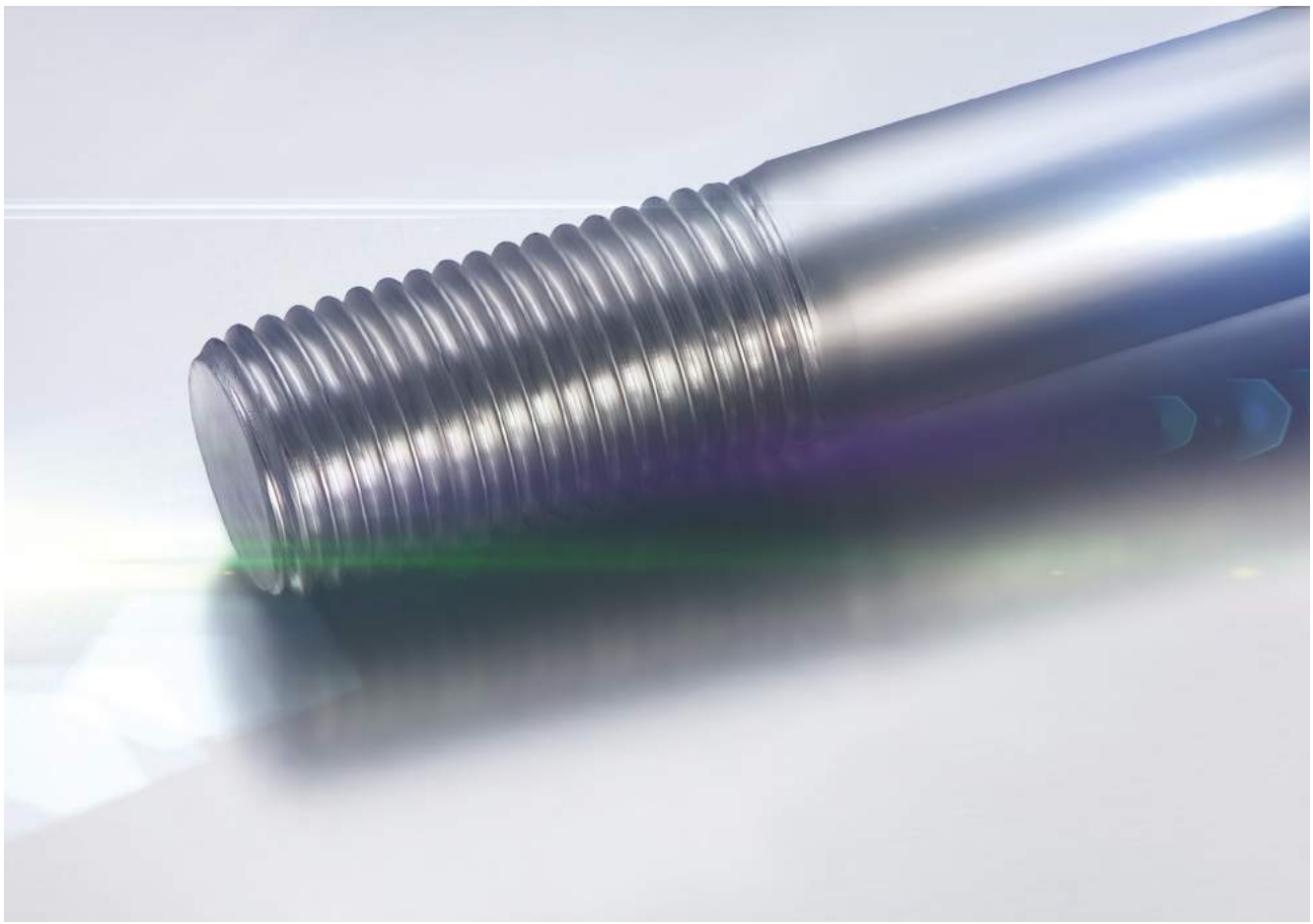
The mechanical properties of the steels are adjusted directly from the forge heat by controlled cooling in air. This way, strengths are achieved in these materials which correspond to those of quenched and tempered steels but without the need for heat treatment that would normally be required. Typical applications for our AFP steels are:

· Crankshafts
· Connecting rods
· Steering knuckles
· Axial carriers (truck)

CASE HARDENING STEELS

Case hardening steels from Saarstahl are used in components which, due to the mechanical stresses to which they are subjected, need to have a surface as resistant to wear as possible. This is attained through subsequent carburisation, which achieves high degrees of hardness, in particular along the steel edges. Our case hardening steels are used in mechanical engineering and especially the automotive industries. Components which are manufactured from our case hardening steels include:

· Cogwheels
· Drive and gear shafts
· Ball hubs
· Tripods



QUENCHED AND TEMPERED STEELS

Quenched and tempered steels are used in machinery and in the automotive industry, in particular where high-load-bearing components are required for special applications. To this end, besides quenched and tempered steels, we offer our customers various options for further processing to achieve high degrees of hardness. Bars are quenched and tempered in our induction quench and tempering line, which enables a deformation-free bar geometry after heat treatment. For wire rod, we offer a unique possibility for quenching and tempering treatment in our coil quenching facility. With this, we are able to achieve a high degree of hardness by quenching and tempering the coil. Thus, the customer eliminates the necessity for final quenching and tempering. Our quenched and tempered steels are primarily used in components such as:

- Vehicle axles (e. g. construction of agricultural machinery)
- Fittings
- Crankshafts subjected to high stresses
- Injection units for diesel
- Screws
- Nuts

CONSTRUCTIONAL STEELS AND FINE-GRAINED CONSTRUCTIONAL STEELS

Saarstahl supplies high quality constructional steels including fine-grained quality steel according to DIN EN 10025 in bar lengths of up to 27 m, specifically to meet the exacting demands of the construction industry. Through temperature-controlled rolling, these steels demonstrate a particularly homogeneous microstructure and a high level of toughness directly from the rolling heat, so that a subsequent normalising process is not necessary. The main applications of this product group are:

- Tie rods for bridge construction, steel hydraulic engineering structures and buildings (e. g. roof construction of stadiums)
- Transportation anchors

CHAIN STEELS

The product group of chain steels includes bar steel, semi-finished products and wire rod for the manufacture of:

· Mining chains and accessories
· Anchor chains
· Chains for offshore applications
· Lifting chains

We are accredited by leading classification societies such as:

· Lloyd's Register of Shipping (U1, U2, U3)
· Germanischer Lloyd (K1, K2, K3)
· Det Norske Veritas (K1, K2, K3, R3)

BEARING STEELS

Bearing steels from Saarstahl have a very high level of purity due to the special metallurgy and aluminium-free melting process. This has a direct effect on the long life cycle of products manufactured from these steels. These products include:

· Roller bearing rings
· Rolling elements (balls, pins, rollers)
· Wheel bearing flanges
· Cams

Due to our MSR technology, Saarstahl is the only steel producer in the world able to produce bearing steel from very thin billet formats in the quality required for ball material. Other steel manufacturers can only achieve this using blooms or large format continuous cast blooms.

Analyses

The following standard analyses show an excerpt from the available product range of Saarstahl. We also supply numerous steel grades according to individual customer requirements or other common international standards, such as ASTM, JIS, BS etc.

HIGH CARBON DRAWING QUALITIES

according to ISO 16120-2, ISO 16120-4 – Steels for technical springs and rope wires

Grade		C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	V	N
C38D	min.	0.36	0.15	0.60									
C38D2	max.	0.39	0.25	0.70	0.015	0.020	0.08	0.03	0.10	0.005	0.10	0.01	0.008
C48D	min.	0.45	0.15	0.60									
C46D2	max.	0.48	0.25	0.70	0.015	0.020	0.08	0.03	0.10	0.005	0.10	0.01	0.008
C50D	min.	0.50	0.15	0.60									
C52D2	max.	0.53	0.25	0.70	0.015	0.020	0.08	0.03	0.10	0.005	0.10	0.01	0.008
C56D	min.	0.54	0.15	0.60									
C56D2	max.	0.58	0.25	0.70	0.015	0.020	0.08	0.03	0.10	0.005	0.10	0.01	0.008
C60D	min.	0.60	0.15	0.60									
C62D2	max.	0.63	0.25	0.70	0.015	0.020	0.08	0.03	0.10	0.005	0.10	0.01	0.008
C66D	min.	0.65	0.15	0.60									
C66D2	max.	0.68	0.25	0.70	0.015	0.020	0.08	0.03	0.10	0.005	0.10	0.01	0.008
C70D	min.	0.70	0.15	0.60									
C72D2	max.	0.73	0.25	0.70	0.015	0.020	0.08	0.02	0.10	0.005	0.10	0.01	0.008
C76D	min.	0.75	0.15	0.60									
C76D2	max.	0.78	0.25	0.70	0.015	0.020	0.08	0.02	0.10	0.005	0.10	0.01	0.008
C82D	min.	0.80	0.15	0.60									
C82D2	max.	0.83	0.25	0.70	0.015	0.020	0.08	0.02	0.10	0.005	0.10	0.01	0.008
C86D	min.	0.84	0.15	0.60									
C86D2	max.	0.87	0.25	0.70	0.015	0.020	0.08	0.02	0.10	0.005	0.10	0.01	0.008
C88D	min.	0.86	0.15	0.60									
C88D2	max.	0.89	0.25	0.70	0.015	0.020	0.08	0.02	0.10	0.005	0.10	0.01	0.008

LOW CARBON DRAWING QUALITIES: BASIC DRAWING QUALITIES

according to ISO 16120-2

Grade		C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	N	RM [MPa] 5.5 mm
C4D	min.	0.03		0.30									390 +/- 30
	max.	0.06	0.20	0.60	0.030	0.030	0.15	0.05	0.15	0.010	0.15	0.010	390 +/- 30
C4D Si	min.		0.15	0.40									390 +/- 30
	max.	0.05	0.25	0.60	0.030	0.030	0.15	0.05	0.15	0.010	0.15	0.010	390 +/- 30
C7D	min.	0.05	0.15	0.40									415 +/- 30
	max.	0.09	0.25	0.60	0.030	0.030	0.15	0.05	0.15	0.010	0.15	0.010	415 +/- 30
C9D	min.	0.04		0.30									400 +/- 30
	max.	0.08	0.20	0.60	0.030	0.030	0.15	0.05	0.15	0.010	0.15	0.010	400 +/- 30
C10D	min.	0.09	0.15	0.40									450 +/- 30
	max.	0.13	0.25	0.60	0.025	0.025	0.15	0.05	0.15	0.010	0.15	0.010	450 +/- 30
C12D	min.	0.10	0.15	0.40									460 +/- 30
	max.	0.14	0.25	0.60	0.025	0.025	0.15	0.05	0.15	0.010	0.15	0.010	460 +/- 30
C15D	min.	0.13	0.15	0.40									490 +/- 30
	max.	0.17	0.25	0.60	0.025	0.025	0.15	0.05	0.15	0.010	0.15	0.010	490 +/- 30
C18D	min.	0.15	0.15	0.40									500 +/- 30
	max.	0.19	0.25	0.60	0.025	0.025	0.15	0.05	0.15	0.010	0.15	0.010	500 +/- 30
C20D	min.	0.19	0.15	0.40									540 +/- 30
	max.	0.23	0.25	0.60	0.025	0.025	0.15	0.05	0.15	0.010	0.15	0.010	540 +/- 30

LOW CARBON DRAWING QUALITIES: FINE DRAWING QUALITIES

according to ISO 16120-2 and ISO 16120-3

Grade		C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	B	N	RM [MPa] 5.5 mm
C4D	min.	0.03		0.30										390 +/- 30
	max.	0.06	0.15	0.50	0.025	0.025	0.10	0.05	0.10	0.005	0.10	0.0008	0.010	390 +/- 30
C4D Si	min.		0.15	0.45										390 +/- 30
	max.	0.04	0.25	0.60	0.020	0.020	0.10	0.05	0.10	0.005	0.10	0.0008	0.010	390 +/- 30
C4D B	min.			0.30								0.0025		355 +/- 30
	max.	0.04	0.15	0.50	0.020	0.020	0.10	0.05	0.10	0.005	0.10	0.0070	0.010	355 +/- 30
C4D1	min.	0.02		0.20										360 +/- 30
	max.	0.05	0.10	0.40	0.020	0.020	0.10	0.03	0.10	0.005	0.10	0.0008	0.010	360 +/- 30
C4D1 B	min.	0.02		0.20								0.0025		350 +/- 30
	max.	0.05	0.10	0.40	0.020	0.020	0.10	0.03	0.10	0.005	0.10	0.0070	0.010	350 +/- 30

LOW CARBON DRAWING QUALITIES: FINEST AND SPECIAL DRAWING QUALITIES

according to ISO 16120-3

Grade		C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	B	Ti	N	RM [MPa] 5.5 mm
C3D1	min.			0.20											355 +/- 30
	max.	0.04	0.03	0.40	0.020	0.020	0.08	0.03	0.08	0.005	0.08	0.0008	0.010	0.007	355 +/- 30
C3D1 B	min.			0.20								0.0025			340 +/- 30
	max.	0.04	0.03	0.40	0.020	0.020	0.08	0.03	0.08	0.005	0.08	0.0070	0.010	0.007	340 +/- 30
C3D1 Al	min.			0.20						0.025					360 +/- 30
	max.	0.04	0.03	0.40	0.020	0.020	0.08	0.03	0.08	0.050	0.08	0.0008	0.010	0.007	360 +/- 30
C2D1	min.			0.20											320 +/- 30
	max.	0.01	0.03	0.35	0.020	0.015	0.07	0.02	0.05	0.005	0.05	0.0008	0.010	0.007	320 +/- 30
C2D1 B	min.			0.20								0.0100			310 +/- 30
	max.	0.01	0.03	0.35	0.020	0.015	0.07	0.02	0.05	0.005	0.05	0.0150	0.010	0.007	310 +/- 30
C2D1 AlTi	min.			0.15						0.030			0.120		340 +/- 30
	max.	0.02	0.05	0.25	0.015	0.015	0.07	0.02	0.05	0.060	0.05	0.0008	0.200	0.007	340 +/- 30

In addition, we deliver hard and soft qualities according to international standards such as SAE J403, JIS G3502 and JIS G3506.

WELDING WIRES

Inert welding wires

Grade Standard			Type		C	Si	Mn
2Si	ER70S-3	SG 1	0	min.	0.06	0.50	1.00
ISO 14341	AWS A5.18	DIN 8559		max.	0.10	0.70	1.30
3Si1	ER70S-6	SG 2	0	min.	0.06	0.80	1.40
ISO 14341	AWS A5.18	DIN 8559	basic	max.	0.09	0.90	1.50
			2	min.	0.07	0.80	1.40
				max.	0.09	0.90	1.50
			3	min.	0.06	0.80	1.40
				max.	0.09	0.90	1.50
			6	min.	0.06	0.85	1.40
				max.	0.09	0.95	1.50
			7	min.	0.07	0.80	1.40
				max.	0.10	0.90	1.50
			8	min.	0.06	0.80	1.40
				max.	0.08	0.90	1.50
4Si1	ER70S-6	SG 3	1	min.	0.06	0.85	1.60
ISO 14341	AWS A5.18	DIN 8559		max.	0.09	1.00	1.70
			3	min.	0.06	0.85	1.60
			basic	max.	0.09	1.00	1.70
2M0	MoSi	SG Mo	0	min.	0.09	0.50	1.10
ISO 14341	ISO 21952	DIN 8575		max.	0.11	0.70	1.20

WELDING WIRES

Submerged arc welding wires

Grade Standard			Type		C	Si	Mn
S2	EM12		1	min.	0.08	0.05	0.90
ISO 14171	AWS A5.17			max.	0.12	0.10	1.10
S2Si	EM12K	EM12K	2	min.	0.08	0.20	0.90
ISO 14171	AWS A5.17	AWS A5.23		max.	0.12	0.30	1.10
S3Si			0	min.	0.10	0.20	1.60
ISO 14171			basic	max.	0.13	0.30	1.75
			2	min.	0.10	0.30	1.60
				max.	0.13	0.40	1.75
S2Mo	EA2		0	min.	0.08	0.10	0.95
ISO 14171	AWS A5.23			max.	0.12	0.15	1.10
	EA1		1	min.	0.08	0.15	0.80
	AWS A5.23			max.	0.12	0.20	1.00
S3Ni1Mo	S3Ni1Mo		3	min.	0.10	0.15	1.65
ISO 14171	EN 14295			max.	0.13	0.25	1.80

	P	S	Cr	Mo	Ni	Al	Cu	N	Ti
	0.015	0.015	0.05	0.03	0.05	0.005	0.05	0.008	0.01
	0.015	0.015	0.05	0.03	0.05	0.005	0.05	0.007	0.01
	0.015	0.015	0.05	0.03	0.05	0.005	0.05	0.007	0.01
	0.015	0.010 0.020	0.05	0.03	0.05	0.005	0.05	0.007	0.01
	0.015	0.015	0.05	0.03	0.05	0.005	0.05	0.007	0.01
	0.015	0.015	0.05	0.03	0.05	0.005	0.05	0.008	0.01 0.02
	0.012	0.012	0.05	0.03	0.05	0.005	0.05	0.007	0.01
	0.015	0.010 0.025	0.05	0.03	0.05	0.005	0.05	0.007	0.02
	0.015	0.015	0.05	0.03	0.05	0.005	0.05	0.007	0.02
	0.015	0.015	0.10	0.45 0.55	0.10	0.005	0.10	0.007	0.01

	P	S	Cr	Mo	Ni	Al	Cu	N	Ti
	0.015	0.015	0.07	0.03	0.10	0.005	0.10	0.007	0.01
	0.015	0.015	0.07	0.03	0.10	0.005	0.10	0.007	0.01
	0.015	0.015	0.07	0.03	0.10	0.005	0.10	0.007	0.01
	0.015	0.015	0.07	0.03	0.10	0.005	0.10	0.007	0.01
	0.015	0.012	0.07	0.45 0.55	0.08	0.005	0.07	0.007	0.01
	0.015	0.012	0.07	0.45 0.55	0.08	0.005	0.07	0.007	0.01
	0.015	0.012	0.07	0.45 0.60	0.90 1.10	0.005	0.07	0.007	0.01

WELDING WIRES

Electrode core wires

Grade Standard		Type		C	Si	Mn	P
S1	RSD 7	1	min.	0.06	0.05	0.45	
ISO 14171	DIN 17145	standard	max.	0.09	0.10	0.55	0.012
		2	min.	0.06		0.45	
		SWRY 11	max.	0.09	0.03	0.55	0.012
		3	min.	0.04		0.50	
			max.	0.07	0.05	0.60	0.012
		4	min.	0.06		0.55	
			max.	0.09	0.03	0.70	0.012
		5	min.	0.05	0.05	0.45	
		special	max.	0.08	0.10	0.55	0.010
		6	min.	0.03		0.50	
			max.	0.06	0.04	0.60	0.012
		8	min.	0.02		0.10	
		Al-killed	max.	0.05	0.03	0.20	0.012
		13	min.	0.06	0.05	0.45	
		basic	max.	0.10	0.10	0.60	0.020

WELDING WIRES

Special grades

Grade Standard		Type		C	Si	Mn	P
Mn4Ni1.5CrMo		2	min.	0.07	0.50	1.60	
ISO 16834			max.	0.10	0.65	1.75	0.015
Mn3Ni1CrMo		4	min.	0.09	0.50	1.55	
ISO16834			max.	0.12	0.65	1.70	0.015
		6	min.	0.08	0.50	1.50	
			max.	0.11	0.60	1.65	0.015
CrMo1		2	min.	0.11	0.10	0.70	
EN 12070			max.	0.14	0.20	0.90	0.015
CrMo1Si	CrMo1	3	min.	0.09	0.55	0.90	
ISO 21952	EN 1599		max.	0.12	0.70	1.10	0.015
10MnMo4-5		1	min.	0.06	0.20	1.00	
TiB			max.	0.10	0.30	1.15	0.015
Special analysis		2	min.	0.06	0.20	1.15	
			max.	0.10	0.30	1.25	0.015
10Mn6 TiB		50	min.	0.06	0.20	1.50	
Special analysis			max.	0.10	0.30	1.60	0.015
OIII	GIII	0	min.	0.08	0.10	1.00	
EN 12536	DIN 8554		max.	0.12	0.20	1.20	0.015

S	Cr	Mo	Ni	Al	Cu	N	Ti
0.010	0.05	0.03	0.08	0.005	0.05	0.007	0.01
0.010	0.05	0.03	0.08	0.005	0.05	0.007	0.01
0.010	0.05	0.03	0.08	0.005	0.05	0.007	0.01
0.010	0.05	0.03	0.08	0.005	0.05	0.007	0.01
0.010	0.03	0.02	0.05	0.005	0.05	0.005	0.01
0.010	0.05	0.03	0.08	0.005	0.05	0.007	0.01
0.010	0.07	0.03	0.08	0.025 0.060	0.05	0.007	0.01
0.020	0.10	0.05	0.10	0.005	0.10	0.010	0.01

S	Cr	Mo	Ni	Al	Cu	N	B	Ti	V
0.015	0.15 0.25	0.40 0.55	1.40 1.55	0.010	0.10	0.007	0.0008	0.10	0.01
0.015	0.20 0.30	0.20 0.30	1.30 1.45	0.010	0.10	0.007	0.0008	0.10	0.08 0.11
0.015	0.20 0.30	0.20 0.30	1.30 1.45	0.010	0.10	0.007	0.0008	0.10	0.07 0.10
0.015	1.10 1.25	0.45 0.55	0.10	0.010	0.10	0.007	0.0008	0.01	0.01
0.015	1.10 1.25	0.45 0.55	0.10	0.010	0.10	0.007	0.0008	0.01	0.01
0.005	0.10	0.45 0.55	0.10	0.020	0.07	0.005	0.0120 0.0170	0.10 0.15	0.01
0.005	0.10	0.45 0.55	0.10	0.020	0.07	0.005	0.0100 0.0150	0.12 0.16	0.01
0.005	0.10	0.05	0.10	0.020	0.07	0.003	0.0100 0.0150	0.12 0.16	0.01
0.012	0.10	0.05	0.40 0.50	0.005	0.10	0.007	0.0008	0.02	0.02

PRESTRESSING STEELS

Grade	Type		C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	V	N
C80D VCr	-	min.	0.78	0.15	0.70			0.10					0.04	
		max.	0.82	0.25	0.85	0.015	0.015	0.20	0.03	0.08	0.005	0.10	0.07	0.008
C82D V	1	min.	0.80	0.15	0.60								0.04	
		max.	0.84	0.25	0.70	0.015	0.015	0.08	0.03	0.08	0.005	0.10	0.07	0.008
	2	min.	0.80	0.15	0.70								0.04	
		max.	0.84	0.25	0.85	0.015	0.015	0.08	0.03	0.08	0.005	0.10	0.07	0.008
C82D VCr	1	min.	0.80	0.15	0.70			0.10					0.04	
		max.	0.84	0.25	0.85	0.015	0.015	0.20	0.03	0.08	0.005	0.10	0.07	0.008
	2	min.	0.80	0.15	0.70			0.20					0.04	
		max.	0.84	0.25	0.85	0.015	0.015	0.30	0.03	0.08	0.005	0.10	0.07	0.008
C82D Cr	-	min.	0.80	0.15	0.70			0.20						
		max.	0.84	0.25	0.85	0.015	0.015	0.30	0.03	0.08	0.005	0.10	0.01	0.008

TYRE CORDS

Grade		C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	V	N
SKD 60	min.	0.57	0.15	0.45									
	max.	0.62	0.30	0.55	0.012	0.012	0.05	0.02	0.07	0.005	0.05	0.01	0.007
SKD 70	min.	0.70	0.15	0.45									
	max.	0.74	0.30	0.55	0.012	0.012	0.05	0.02	0.07	0.005	0.05	0.01	0.007
SKD 80	min.	0.80	0.15	0.45									
	max.	0.84	0.30	0.55	0.012	0.012	0.05	0.02	0.07	0.005	0.05	0.01	0.007
SKD 85	min.	0.83	0.15	0.45									
	max.	0.88	0.30	0.55	0.012	0.012	0.05	0.02	0.07	0.005	0.05	0.01	0.007
SKD 90 Cr	min.	0.89	0.15	0.27			0.15						
	max.	0.94	0.30	0.37	0.012	0.012	0.30	0.02	0.07	0.005	0.05	0.01	0.007
SKD 95 Cr	min.	0.94	0.15	0.27			0.15						
	max.	0.99	0.30	0.37	0.012	0.012	0.30	0.02	0.07	0.005	0.05	0.01	0.007
SKD 100 Cr	min.	0.98	0.15	0.27			0.15						
	max.	1.03	0.30	0.37	0.012	0.012	0.30	0.02	0.07	0.005	0.05	0.01	0.007

CABLE ARMOURING WIRES AND WIRES FOR "FLEXIBLE PIPES"

Grade		C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	V	N
C68D2 Al	min.	0.66	0.15	0.60						0.020			
	max.	0.69	0.30	0.70	0.015	0.010	0.07	0.03	0.08	0.050	0.08	0.01	0.007
C72D2 Al	min.	0.71	0.15	0.60						0.020			
	max.	0.74	0.30	0.70	0.015	0.010	0.07	0.03	0.08	0.050	0.08	0.01	0.007
C78D2 Al	min.	0.76	0.15	0.60						0.030			
	max.	0.79	0.30	0.70	0.015	0.010	0.07	0.03	0.08	0.060	0.08	0.01	0.007
C32D2 Al OS*)	min.	0.32	0.15	0.60						0.020			
	max.	0.36	0.30	0.70	0.015	0.005	0.07	0.03	0.08	0.050	0.08	0.01	0.007
C62D2 Al OS*)	min.	0.60	0.15	0.60						0.020			
	max.	0.64	0.30	0.70	0.015	0.005	0.07	0.03	0.08	0.050	0.08	0.01	0.007

*) Offshore

SPRING STEELS

according to EN 10089 – Technical delivery conditions for hot-rolled steels for heat-treatable springs

Grade		C	Si	Mn	P	S	Cr	Ni	Mo	Al	V	Cu
55Cr3	min.	0.55	0.20	0.80			0.75			0.015		
	max.	0.60	0.40	1.00	0.015	0.015	0.90	0.10	0.06	0.035		0.10
51CrV4	min.	0.48	0.20	0.85			0.95			0.015	0.10	
	max.	0.53	0.40	1.05	0.015	0.015	1.15	0.10	0.05	0.035	0.15	0.10
52CrMoV4	min.	0.49	0.20	0.90			1.00		0.20		0.10	
	max.	0.54	0.40	1.10	0.020	0.010	1.20	0.18	0.30	0.008	0.15	0.08
54SiCr6	min.	0.54	1.35	0.60			0.55					
	max.	0.59	1.55	0.80	0.010	0.010	0.75	0.08	0.05	0.004		0.08
61SiCr7	min.	0.59	1.70	0.75			0.25					
	max.	0.64	1.90	0.95	0.010	0.010	0.40	0.08	0.05	0.004		0.08
54SiCrV6	min.	0.54	1.35	0.60			0.55				0.10	
	max.	0.59	1.55	0.80	0.010	0.010	0.75	0.08	0.05	0.004	0.20	0.08
60SiCrV7	min.	0.57	1.40	0.40			0.50				0.10	
	max.	0.62	1.60	0.60	0.010	0.010	0.60	0.08	0.05	0.040	0.20	0.08
54SiCr6 SC*)	min.	0.54	1.35	0.60			0.55					
	max.	0.59	1.55	0.80	0.010	0.010	0.75	0.08	0.05	0.004		0.08
54SiCrV6 SC*)	min.	0.54	1.35	0.60			0.55				0.10	
	max.	0.59	1.55	0.80	0.010	0.010	0.75	0.08	0.05	0.004	0.20	0.08

*) Superclean

SPRING STEELS

Modified Saarstahl grades not aligned to a specific standard

Grade		C	Si	Mn	P	S	Cr	Ni	Mo	Al	V	Cu
38MnV6	min.	0.38	0.60	1.20			0.15				0.10	
	max.	0.42	0.80	1.40	0.012	0.010	0.25	0.10	0.05	0.005	0.15	0.10
C67S	min.	0.65	0.10	0.65			0.20			0.020		
	max.	0.70	0.30	0.85	0.010	0.010	0.25	0.10	0.05	0.040		0.10
CHS2200	min.	0.50	1.35	0.60			0.55	0.50			0.10	
	max.	0.56	1.55	0.80	0.010	0.010	0.75	0.70	0.05	0.004	0.20	0.08
65SiCrV6	min.	0.62	1.40	0.35			0.45				0.15	
	max.	0.66	1.60	0.55	0.010	0.010	0.65	0.08	0.05	0.004	0.20	0.08

COLD HEADING AND COLD EXTRUSION STEELS

according to EN 10263-2: Steels not intended for heat treatment after cold working

Grade		C	Si	Mn	P	S	Al	Cu
C2C	min.			0.20			0.020	
	max.	0.03	0.10	0.40	0.020	0.020	0.060	0.15
C4C	min.	0.02		0.25			0.020	
	max.	0.06	0.10	0.40	0.020	0.020	0.060	0.15
C8C	min.	0.06		0.25			0.020	
	max.	0.10	0.10	0.45	0.020	0.020	0.060	0.15
C10C	min.	0.08		0.30			0.020	
	max.	0.12	0.10	0.50	0.020	0.020	0.060	0.15
C15C	min.	0.13		0.35			0.020	
	max.	0.17	0.10	0.60	0.020	0.020	0.060	0.15
C17C	min.	0.15		0.65			0.020	
	max.	0.19	0.10	0.85	0.020	0.020	0.060	0.15
C20C	min.	0.18		0.70			0.020	
	max.	0.22	0.10	0.90	0.020	0.020	0.060	0.15

COLD HEADING AND COLD EXTRUSION STEELS

according to EN 10263-3: Case hardening steels

Grade		C	Si	Mn	P	S	Cu
C10E2C	min.	0.08		0.30			
	max.	0.12	0.30	0.60	0.020	0.020	0.15
C15E2C	min.	0.13		0.30			
	max.	0.17	0.30	0.60	0.020	0.020	0.15
C17E2C	min.	0.15		0.60			
	max.	0.19	0.30	0.90	0.020	0.020	0.15
C20E2C	min.	0.18		0.30			
	max.	0.22	0.30	0.60	0.020	0.020	0.15

COLD HEADING AND COLD EXTRUSION STEELS

according to EN 10263-4: Steels for quenching and tempering

Grade		C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Cu	N	Ti
17B2	min.	0.16		0.75						0.020	0.0020			0.020
	max.	0.19	0.15	0.90	0.015	0.015	0.20	0.05	0.10	0.040	0.0050	0.10	0.010	0.060
28B2	min.	0.26		0.75			0.20			0.020	0.0020			0.020
	max.	0.29	0.15	0.90	0.015	0.015	0.30	0.05	0.10	0.040	0.0050	0.10	0.010	0.060
33B2	min.	0.31		0.60			0.15			0.020	0.0020			0.020
	max.	0.35	0.15	0.80	0.015	0.015	0.30	0.05	0.10	0.040	0.0050	0.15	0.010	0.060
38B2	min.	0.36		0.70			0.20			0.020	0.0020			0.020
	max.	0.39	0.15	0.85	0.015	0.015	0.30	0.07	0.10	0.040	0.0050	0.15	0.010	0.060
17MnB4	min.	0.17		0.90						0.020	0.0020			0.020
	max.	0.20	0.15	1.05	0.015	0.015	0.20	0.05	0.10	0.040	0.0050	0.15	0.010	0.060
20MnB4	min.	0.19		0.90						0.020	0.0020			0.020
	max.	0.22	0.15	1.05	0.015	0.015	0.20	0.05	0.10	0.040	0.0050	0.15	0.010	0.060
23MnB4	min.	0.21		0.90			0.25			0.020	0.0020			0.020
	max.	0.24	0.15	1.05	0.015	0.015	0.30	0.07	0.10	0.040	0.0050	0.15	0.010	0.060
30MnB4	min.	0.27		0.80			0.15			0.020	0.0020			0.020
	max.	0.32	0.15	1.10	0.015	0.015	0.35	0.05	0.10	0.040	0.0040	0.15	0.010	0.060
37MnB5	min.	0.36		1.20			0.10			0.020	0.0020			0.020
	max.	0.40	0.20	1.40	0.015	0.015	0.25	0.10	0.10	0.040	0.0050	0.15	0.010	0.060
30MoB1	min.	0.28		0.80			0.20	0.08		0.020	0.0020			0.020
	max.	0.32	0.15	1.00	0.015	0.015	0.30	0.12	0.10	0.040	0.0040	0.10	0.010	0.060
32CrB4	min.	0.30		0.70			1.05			0.020	0.0020			0.020
	max.	0.34	0.15	0.85	0.015	0.015	1.20	0.07	0.10	0.040	0.0050	0.10	0.009	0.060
36CrB4	min.	0.34		0.70			1.00			0.020	0.0020			0.020
	max.	0.38	0.15	0.85	0.015	0.015	1.20	0.07	0.10	0.040	0.0050	0.10	0.009	0.060
33MnCrB5-2	min.	0.29		1.40			0.40	0.05	0.20	0.020	0.0020			0.020
	max.	0.33	0.25	1.60	0.015	0.015	0.55	0.12	0.30	0.040	0.0040	0.15	0.010	0.060
34/37Cr4	min.	0.34		0.75			1.05			0.020				
	max.	0.37	0.15	0.90	0.015	0.015	1.20	0.05	0.10	0.040		0.10	0.015	
34CrMo4	min.	0.34		0.70			1.05	0.15		0.020				
	max.	0.37	0.15	0.85	0.015	0.015	1.20	0.30	0.10	0.040		0.15	0.015	
41CrS4	min.	0.40		0.70		0.020	1.05			0.020				
	max.	0.44	0.15	0.85	0.015	0.035	1.20	0.07	0.10	0.040		0.15	0.015	
42CrMo4	min.	0.40		0.70			1.05	0.15		0.020				
	max.	0.44	0.15	0.85	0.015	0.015	1.20	0.30	0.10	0.040		0.15	0.015	
C35EC	min.	0.35		0.60										
	max.	0.39	0.30	0.80	0.020	0.020						0.15		
C45EC/RC	min.	0.42		0.60		0.015								
	max.	0.46	0.15	0.80	0.015	0.025						0.15		

COLD HEADING AND COLD EXTRUSION STEELS

Modified steels for cold heading of high strength screws and bolts of classes 8.8 and 10.9

Grade		C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Cu	N	V
SAARFORM 800	min.	0.07	0.90	1.60										0.01
(8MnSi7)	max.	0.10	1.10	1.80	0.020	0.015	0.10	0.05	0.10	0.02		0.10	0.015	0.06
SAARFORM 850	min.	0.17	0.30	1.30			0.10							0.10
(17MnV7)	max.	0.21	0.50	1.50	0.015	0.015	0.20	0.05	0.10	0.02		0.12	0.015	0.15
SAARFORM 900	min.	0.28	0.50	1.40		0.015	0.10						0.012	0.10
(30MnVS6)	max.	0.31	0.65	1.60	0.015	0.025	0.20	0.05	0.10	0.02		0.10	0.018	0.15
20MnB4 mod.	min.	0.21	0.40	1.20			0.20			0.02	0.002			
	max.	0.24	0.50	1.40	0.015	0.015	0.30	0.07	0.15	0.04	0.005	0.15	0.010	

FREE CUTTING STEELS

according to EN 10087: Free cutting steels – Technical delivery conditions for semi-finished products, hot rolled bars and rods

Grade		C	Si	Mn	P	S	Pb	Te	Bi	Se	HD
11SMn30	min.			0.90		0.270					**)
	max.	0.14	0.05	1.30	0.110	0.330					
11SMnPb30	min.			0.90		0.270	0.20	*)	*)	*)	**)
	max.	0.14	0.05	1.30	0.110	0.330	0.35				
11SMn37	min.			1.00		0.340					**)
	max.	0.14	0.05	1.50	0.110	0.400					
11SMnPb37	min.			1.00		0.340	0.20	*)	*)	*)	**)
	max.	0.14	0.05	1.50	0.110	0.400	0.35				
15SMn13	min.	0.12		0.90		0.080					
	max.	0.18	0.40	1.30	0.060	0.180					
35S20	min.	0.32		0.70		0.150					
	max.	0.39	0.40	1.10	0.060	0.250					
36SMn14	min.	0.32		1.30		0.100					
	max.	0.39	0.40	1.70	0.060	0.180					
36SMnPb14	min.	0.32		1.30		0.100	0.15				
	max.	0.39	0.40	1.70	0.060	0.180	0.35				
38SMn28	min.	0.35		1.20		0.240					
	max.	0.40	0.40	1.50	0.060	0.330					
44SMn28	min.	0.40		1.30		0.240					
	max.	0.48	0.40	1.70	0.060	0.330					
46S20	min.	0.42		0.70		0.150					
	max.	0.50	0.40	1.10	0.060	0.250					

*) Can be delivered as Te, Bi, Se or TeBi/SeBi, in some cases already included in the delivery programme
**) HD-grade included in the delivery programme

FREE CUTTING STEELS

according to ASTM A29/29M

Grade		C	Si	Mn	P	S	Pb	Te	HD
1215	min.			0.75	0.040	0.260			**)
	max.	0.09	0.02	1.05	0.090	0.350			
12L14	min.			0.85	0.040	0.260	0.15	*)	**)
	max.	0.15	0.02	1.15	0.090	0.350	0.35		
1117	min.	0.14		1.00		0.080			
	max.	0.20		1.30	0.040	0.130			
11L17	min.	0.14		1.00		0.080	0.15		
	max.	0.20	0.03	1.30	0.040	0.130	0.35		
1137	min.	0.32	0.15	1.35		0.080			
	max.	0.39	0.35	1.65	0.040	0.130			
11L37	min.	0.32	0.15	1.35		0.080	0.15		
	max.	0.39	0.35	1.65	0.040	0.130	0.35		
1144	min.	0.40	0.15	1.35		0.240			
	max.	0.48	0.35	1.65	0.040	0.330			

*) Can be delivered as Te, Bi, Se or TeBi/SeBi, in some cases already included in the delivery programme
**) HD-grade included in the delivery programme
Other materials or specific analyses available on request

FREE CUTTING STEELS

Modified Saarstahl grades not aligned to a specific standard

Grade		C	Si	Mn	P	S	Pb	Bi
60SPb20	min.	0.57		0.70		0.180	0.15	
	max.	0.65	0.40	1.10	0.060	0.250	0.35	
60SPb20 Bi	min.	0.65		1.00		0.180	0.15	0.05
	max.	0.70	0.40	1.40	0.060	0.250	0.35	0.10

AFP STEELS

according to EN 10267

Grade		C	Si	Mn	P	S	Cr	Mo	V	N
19MnVS6	min.	0.15	0.15	1.20		0.020			0.08	0.01
	max.	0.22	0.80	1.60	0.025	0.060	0.30	0.08	0.20	0.02
30MnVS6	min.	0.26	0.15	1.20		0.020			0.08	0.01
	max.	0.33	0.80	1.60	0.025	0.060	0.30	0.08	0.20	0.02
38MnVS6	min.	0.34	0.15	1.20		0.020			0.08	0.01
	max.	0.41	0.80	1.60	0.025	0.060	0.30	0.08	0.20	0.02
46MnVS3	min.	0.42	0.15	1.20		0.020			0.08	0.01
	max.	0.49	0.80	1.60	0.025	0.060	0.30	0.08	0.20	0.02
46MnVS6	min.	0.42	0.15	0.60		0.020			0.08	0.01
	max.	0.49	0.80	1.00	0.025	0.060	0.30	0.08	0.20	0.02

CASE HARDENING STEELS

according to EN 10084

Grade		C	Si	Mn	P	S	Cr	Mo	Ni	B	Pb *)
C10E	min.	0.07		0.30							0.15
	max.	0.13	0.40	0.60	0.035	0.035					0.35
C10R	min.	0.07		0.30		0.020					0.15
	max.	0.13	0.40	0.60	0.035	0.040					0.35
C15E	min.	0.12		0.30							0.15
	max.	0.18	0.40	0.60	0.035	0.035					0.35
C15R	min.	0.12		0.30		0.020					0.15
	max.	0.18	0.40	0.60	0.035	0.040					0.35
C16E	min.	0.12		0.60							
	max.	0.18	0.40	0.90	0.035	0.035					
C16R	min.	0.12		0.60		0.020					
	max.	0.18	0.40	0.90	0.035	0.040					
17Cr3	min.	0.14		0.60			0.70				
	max.	0.20	0.40	0.90	0.025	0.035	1.00				
17CrS3	min.	0.12		0.60		0.020	0.70				
	max.	0.20	0.40	0.90	0.025	0.040	1.00				
16MnCr5	min.	0.14		1.00			0.80				0.15
	max.	0.19	0.40	1.30	0.025	0.035	1.10				0.35

CASE HARDENING STEELS

according to EN 10084

Grade		C	Si	Mn	P	S	Cr	Mo	Ni	B	Pb *)
16MnCrS5	min.	0.14		1.00		0.020	0.80				0.15
	max.	0.19	0.40	1.30	0.025	0.040	1.10				0.35
16MnCrB5	min.	0.14		1.00			0.80			0.0008	
	max.	0.19	0.40	1.30	0.025	0.035	1.10			0.0050	
20MnCr5	min.	0.17		1.10			1.00				
	max.	0.22	0.40	1.40	0.025	0.035	1.30				
20MnCrS5	min.	0.17		1.10		0.020	1.00				
	max.	0.22	0.40	1.40	0.025	0.040	1.30				
18CrMo4	min.	0.15		0.60			0.90	0.15			
	max.	0.21	0.40	0.90	0.025	0.035	1.20	0.25			
18CrMoS4	min.	0.15		0.60		0.020	0.90	0.15			
	max.	0.21	0.40	0.90	0.025	0.040	1.20	0.25			
16NiCr4	min.	0.13		0.70			0.60		0.80		0.15
	max.	0.19	0.40	1.00	0.025	0.035	1.00		1.10		0.35
16NiCrS4	min.	0.13		0.70		0.020	0.60		0.80		0.15
	max.	0.19	0.40	1.00	0.025	0.040	1.00		1.10		0.35
17CrNi6-6	min.	0.14		0.50			1.40		1.40		
	max.	0.20	0.40	0.90	0.025	0.035	1.70		1.70		
20NiCrMo2-2	min.	0.17		0.65			0.35	0.15	0.40		0.15
	max.	0.23	0.40	0.95	0.025	0.035	0.70	0.25	0.70		0.35
20NiCrMoS2-2	min.	0.17		0.65		0.020	0.35	0.15	0.40		0.15
	max.	0.23	0.40	0.95	0.025	0.040	0.70	0.25	0.70		0.35
17NiCrMo6-4	min.	0.14		0.60			0.80	0.15	1.20		0.15
	max.	0.20	0.40	0.90	0.025	0.035	1.10	0.25	1.50		0.35
17NiCrMoS6-4	min.	0.14		0.60		0.020	0.80	0.15	1.20		0.15
	max.	0.20	0.40	0.90	0.025	0.040	1.10	0.25	1.50		0.35
20NiCrMoS6-4	min.	0.16		0.50		0.020	0.60	0.25	1.40		
	max.	0.23	0.40	0.90	0.025	0.040	0.90	0.35	1.70		
18CrNiMo7-6	min.	0.15		0.50			1.50	0.25	1.40		
	max.	0.21	0.40	0.90	0.025	0.035	1.80	0.35	1.70		
22CrMoS3-5	min.	0.19		0.70		0.020	0.70	0.40			
	max.	0.24	0.40	1.00	0.025	0.040	1.00	0.50			
20MoCrS4	min.	0.17		0.70		0.020	0.30	0.40			
	max.	0.23	0.40	1.00	0.025	0.040	0.60	0.50			

*) Also available with regulated Pb

Other materials or specific analyses available on request

QUENCHED AND TEMPERED STEELS

Grade		C	Si	Mn	P	S	Cr	Mo	Ni	V	B	Pb *)	Standard
34Cr4	min.	0.30		0.60			0.90						EN 10083
	max.	0.37	0.40	0.90	0.025	0.035	1.20						
37Cr4	min.	0.34		0.60			0.90						EN 10083
	max.	0.41	0.40	0.90	0.025	0.035	1.20						
41Cr4	min.	0.38		0.60			0.90						EN 10083
	max.	0.45	0.40	0.90	0.025	0.035	1.20						
41CrS4	min.	0.38		0.60			0.90						EN 10083
	max.	0.45	0.40	0.90	0.025	0.040	1.20						
25CrMo4	min.	0.22		0.60			0.90	0.15					EN 10083
	max.	0.29	0.40	0.90	0.025	0.035	1.20	0.30					
25CrMoS4	min.	0.22		0.60		0.020	0.90	0.15					EN 10083
	max.	0.29	0.40	0.90	0.025	0.040	1.20	0.30					
34CrMo4	min.	0.30		0.60			0.90	0.15					EN 10083
	max.	0.37	0.40	0.90	0.025	0.035	1.20	0.30					
42CrMo4	min.	0.38		0.60			0.90	0.15				0.15	EN 10083
	max.	0.45	0.40	0.90	0.025	0.035	1.20	0.30				0.35	
42CrMoS4	min.	0.38		1.00		0.020	0.90	0.15				0.15	EN 10083
	max.	0.45	0.40	1.30	0.025	0.040	1.20	0.30				0.35	
34CrNiMo6	min.	0.30		0.50			1.30	0.15	1.30				EN 10083
	max.	0.38	0.40	0.80	0.025	0.035	1.70	0.30	1.70				
30CrNiMo8	min.	0.26		0.50			1.80	0.30	1.80				EN 10083
	max.	0.34	0.40	0.80	0.025	0.035	2.20	0.50	2.20				
39NiCrMo3	min.	0.35		0.50			0.60	0.15	0.70			0.15	EN 10083
	max.	0.43	0.40	0.80	0.025	0.035	1.00	0.25	1.00			0.35	
51CrV4	min.	0.47		0.70			0.90			0.10			EN 10083
	max.	0.55	0.40	1.10	0.025	0.025	1.20			0.25			
20MnB5	min.	0.17		1.10							0.0008		EN 10083
	max.	0.23	0.40	1.40	0.025	0.035					0.0050		
30MnB5	min.	0.27		1.15							0.0008		EN 10083
	max.	0.33	0.40	1.45	0.025	0.035					0.0050		
38MnB5	min.	0.36		1.15							0.0008		EN 10083
	max.	0.42	0.40	1.45	0.025	0.035					0.0050		
27MnCrB5-2	min.	0.24		1.10			0.30				0.0008		EN 10083
	max.	0.30	0.40	1.40	0.025	0.035	0.60				0.0050		
33MnCrB5-2	min.	0.30		1.20			0.30				0.0008		EN 10083
	max.	0.36	0.40	1.50	0.025	0.035	0.60				0.0050		
4130	min.	0.28	0.15	0.40			0.80	0.15					ASTM A29
	max.	0.33	0.35	0.60	0.030	0.040	1.10	0.25					SAE J404
4140	min.	0.38					0.80	0.15					ASTM A29
	max.	0.43			0.030	0.040	1.10	0.25					SAE J404
5140	min.	0.38	0.15	0.70			0.70						ASTM A29
	max.	0.43	0.35	0.90	0.030	0.040	0.90	0.06					SAE J404
5160	min.	0.56	0.15	0.75			0.70						ASTM A29
	max.	0.64	0.35	1.00	0.030	0.040	0.90	0.06					SAE J404

*) Also available with regulated Pb

CONSTRUCTIONAL STEELS AND FINE-GRAINED CONSTRUCTIONAL STEELS

Grade		C *)	Si	Mn	P	S	Nb	Cu	N	Standard
S235JR	max.	0.17		1.40	0.035	0.035		0.55	0.012	EN 10025-2
S235J0	max.	0.17		1.40	0.030	0.030		0.55	0.012	EN 10025-2
S235J2	max.	0.17		1.40	0.025	0.025		0.55		EN 10025-2
S275JR	max.	0.21		1.50	0.035	0.035		0.55	0.012	EN 10025-2
S275J0	max.	0.18		1.50	0.030	0.030		0.55	0.012	EN 10025-2
S275J2	max.	0.18		1.50	0.025	0.025		0.55		EN 10025-2
S355JR	max.	0.24	0.55	1.60	0.035	0.035		0.55	0.012	EN 10025-2
S355J0	max.	0.20	0.55	1.60	0.030	0.030		0.55	0.012	EN 10025-2
S355J2	max.	0.20	0.55	1.60	0.025	0.025		0.55		EN 10025-2
S355K2	max.	0.20	0.55	1.60	0.025	0.025		0.55		EN 10025-2
S355N	min.			0.90						EN 10025-3
	max.	0.20	0.60	1.65	0.030	0.025	0.050	0.55	0.015	
S460N	min.			1.00						EN 10025-3
	max.	0.20	0.60	1.70	0.030	0.025	0.050	0.55	0.025	
Grade A	min.		0.15							ASTM A738
	max.	0.23	0.50	1.50	0.025	0.025	0.040			
Type 1	min.						0.005			ASTM A572
	max.	0.23	0.40	1.65	0.040	0.050	0.050			
A105	min.		0.10	0.60						ASTM A105
	max.	0.35	0.35	1.05	0.035	0.040		0.40		
A350	min.		0.15	0.60						ASTM A350
LF1 / LF2	max.	0.30	0.30	1.35	0.035	0.040	0.020	0.40		

*) Maximum content depending on dimension according to EN 10025-2
Other materials or specific analyses available on request

BEARING STEELS

according to ISO 683-17

Grade		C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu
C56E2	min.	0.52		0.60							
	max.	0.60	0.40	0.90	0.025	0.015				0.05	0.30
100Cr6	min.	0.93	0.15	0.25			1.35				
	max.	1.05	0.35	0.45	0.025	0.250	1.60	0.06	0.25	0.05	0.30
100CrMnSi6-4	min.	0.93	0.45	1.00			1.40				
	max.	1.05	0.75	1.20	0.025	0.015	1.65			0.05	0.30

DIRECT HARDENING STEELS

Bainitic steels with a high degree of hardness and good toughness properties due to controlled cooling in air directly after the forging process

Grade		C	Si	Mn	P	S	Cr
32MnCrMo6-4-3	min.	0.28		1.40			0.80
	max.	0.36	0.50	1.80	0.025	0.040	1.20
20MnCrB5 mod	min.	0.17		1.20			0.30
	max.	0.22	0.80	1.80	0.020	0.020	0.70
40CrMoV4-6	min.	0.36		0.45			0.90
	max.	0.44	0.40	0.85	0.025	0.030	1.20

C-STEELS

Grade		C	Si	Mn	P	S	Pb *)
C10R	min.	0.07		0.30		0.020	0.15
	max.	0.13	0.40	0.60	0.035	0.040	0.30
C15R	min.	0.12		0.30		0.020	0.15
	max.	0.18	0.40	0.60	0.035	0.040	0.30
C35R	min.	0.32		0.50		0.020	0.15
	max.	0.39	0.40	0.80	0.035	0.040	0.30
C45R	min.	0.42		0.50		0.020	0.15
	max.	0.50	0.40	0.80	0.035	0.040	0.30
C60R	min.	0.57		0.60		0.020	0.15
	max.	0.65	0.40	0.90	0.025	0.040	0.30
C55E	min.	0.52		0.60			
	max.	0.60	0.40	0.90	0.030	0.035	
C70S6	min.	0.65		0.45		0.050	
	max.	0.75	0.40	0.65	0.010	0.080	
1045	min.	0.43		0.60			
	max.	0.50		0.90	0.030	0.050	
1055	min.	0.50		0.60			
	max.	0.60		0.90	0.030	0.050	
1536	min.	0.30	0.15	1.00			
	max.	0.37	0.35	1.50	0.040	0.050	

Mo	Ni	Al	Cu	N	B	Ti	V
0.25							
0.40							
0.10	0.10				0.001		
0.50	0.50	0.040	0.10	0.01	0.008	0.06	
0.50							0.25
0.65		0.020					0.35

Cr	Mo	V	N	HD	Standard
					DIN EN 10084
					DIN EN 10084
				**)	DIN EN 10083
				**)	DIN EN 10083
					DIN EN 10083
0.40	0.10				DIN EN 10083
0.05		0.01	0.01		Not standardised
0.20	0.08	0.05	0.02		
					ASTM A29
0.20	0.06				SAE J403
					ASTM A29
0.20	0.06				SAE J403
					SAE J403

*) Available with or without Pb
**) HD grade included in the delivery programme
Other materials or specific analyses available on request

Völklingen: Chemical laboratory

Quality Testing

We are continuously improving the quality of our products and processes at all levels following a zero-defect strategy. For us, quality assurance starts even before the production process with the analysis of the raw materials used and it accompanies the production process right through to the final inspection of the product before shipping. Numerous state-of-the-art testing facilities guarantee a consistently high level of product quality to our customers.

SURFACE TESTING

· Magnetic leakage flux test
· Dry magnetic particle inspection (Mecana system)
· Wet magnetic particle inspection

TESTING FOR INTERIOR DEFECTS

· Ultrasonic testing
· Automatic and manual testing

DIMENSIONAL CHECKS

· Laser diameter

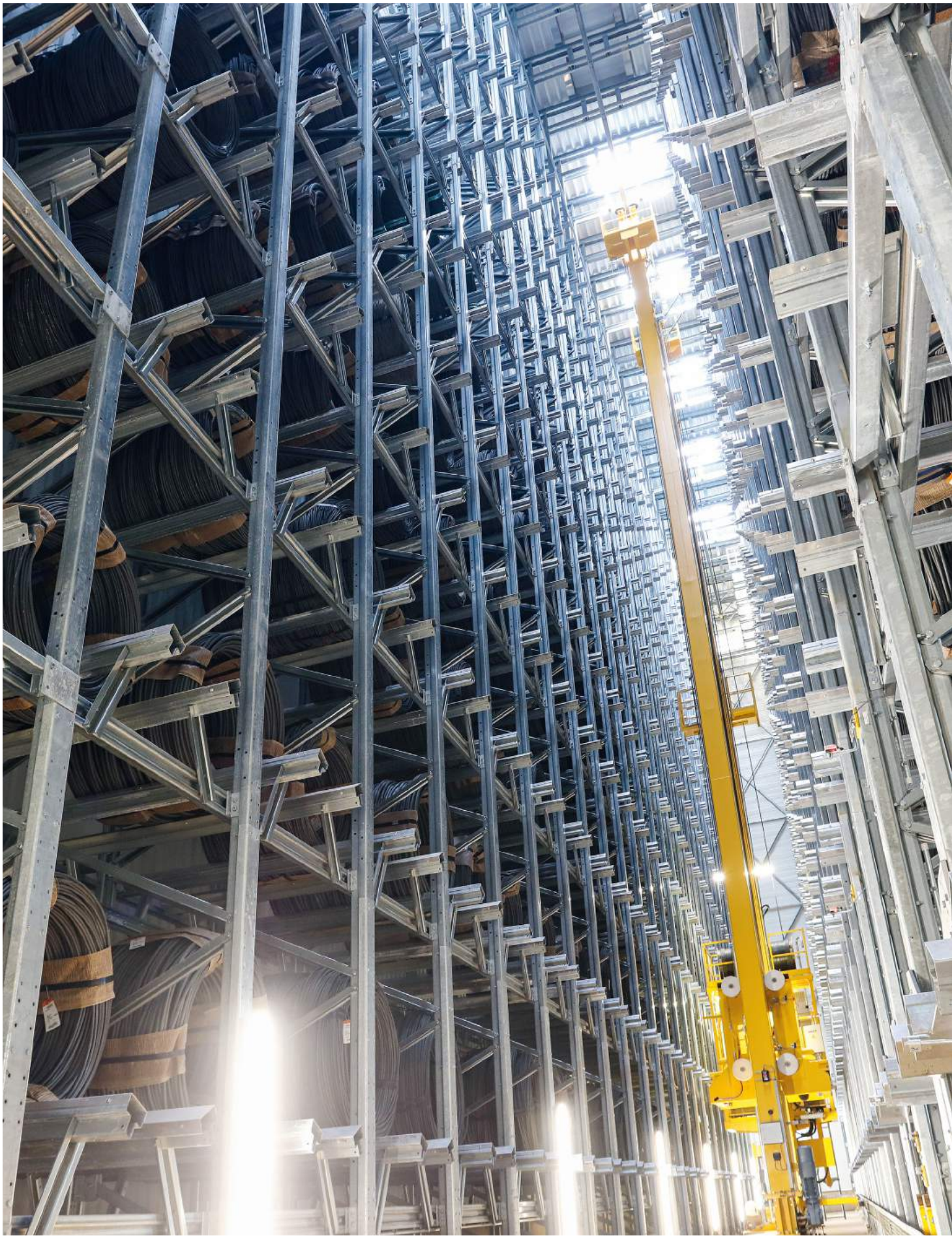
IDENTITY CHECKS

· Spectral analysis
· Eddy current test
· Spark test

LABORATORIES

The use of modern analysis and testing equipment, the expertise of the employees trained in our laboratories and our focus towards the highest standards, create the foundation for achieving consistently reliable test results. For this reason, the chemical and technical laboratories have been approved by the German accreditation body (DAkkS) according to DIN EN ISO/IEC 17025. In order to constantly keep the quality of the analysis techniques on the latest technological level, we use standardised procedures and further develop methods, also in collaboration with the specialised bodies of the German Steel Institute VDEh, and participate in national and international ring tests and comparative studies.

View accreditations



Neunkirchen: High-rack warehouse for treated wire rod

Further Processing at Saarstahl

For special requirements of steel products, the necessary final physical properties of the materials cannot be achieved by the chemical composition of the steel alone. Thanks to our versatile heat treatment and surface treatment equipment, we are able to give our products precisely the performance properties which they require for their intended application.

FURTHER PROCESSING OF WIRE ROD

Heat Treatment

In the rolling process:
· Stelmor cooled (controlled cooling)
· Thermomechanical rolling
· Normalising rolling

Annealing (regular or inert gas atmosphere):
· Tempering
· Annealing to a specific hardness
· Soft annealing
· Spheroidised annealed
· Annealing to stress relieve

Surface Treatment
In order to achieve the best surface properties, we offer wire rod in the following versions:

· Pickled
· Phosphate coated
· Lime treated
· Soaped
· Polymer coated

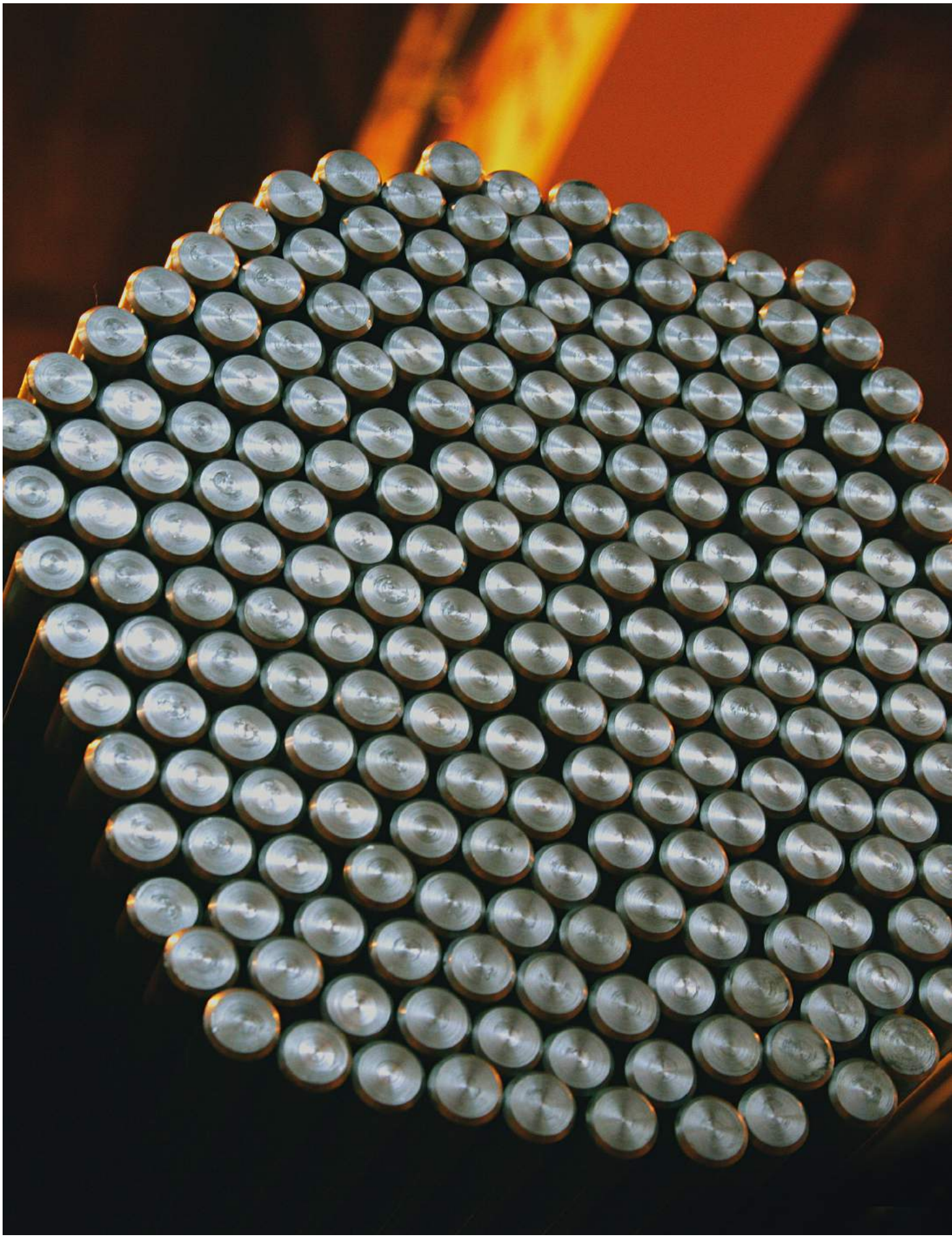
Wire Peeling (wire on bar):
· Conical, biconical and cylindrical
  - Dimensions: 9.00 mm – 19.00 mm
  - Length: 1,600 mm – 4,100 mm

MARAFORM™
MARAFORM™ is a process specifically developed by Saarstahl for polymer quenching and tempering and of wire coil as an alternative to the classic final quenching and tempering process. Quenching and tempering takes place within very tight hardness ranges. Due to the elimination of final quenching and tempering after cold forming, products made from MARAFORM™-wire rod do not show any distortion of dimensions. As a result, there is no need for the previously required straightening of long parts. Furthermore, with this process, we achieve a particularly high degree of dimensional accuracy as well as high fatigue strength of the thread compared to the previous final quenching and tempering process.

SAG-Protect
SAG-Protect is a corrosion protection system especially for phosphated surfaces (without soap or polymer coating). It protects against the influx of air and moisture. With SAG-Protect, a unique corrosion resistance is achieved, which ensures that the result of processing remains unchanged even after a longer period of storage or under unfavourable storage conditions.

SAG-Composite
SAG-Composite is a unique lubricant system for cold forging, which was developed for the highest demands, in order to improve the adhesion and stability of phosphatisation, and to ensure additional reserves in the case of critical deformation steps or in higher temperature ranges and/or with complex components.

New high-rack warehouse for treated wire rod
The new, fully automated high-rack warehouse situated in the wire rod processing area in Neunkirchen provides optimised storage of annealed and/or surface-coated wire rod. This storage method minimises the risk of mechanical damage and points of corrosion on the wire rod. Furthermore, due to the fully automated system and the resulting load-specific removal, significantly better and faster loading is possible.



Bar steel product example

FURTHER PROCESSING OF BAR STEEL

The further processing of bars at the sites in Nauweiler and Neunkirchen makes Saarstahl a full-service supplier for all types of bar steel. Whether tested, heat-treated, hot rolled and peeled, or cut to the desired bar length, we are able to achieve any treatment condition required.

If it has not already been attained directly from the rolling heat, the optimum microstructure is achieved in each case through heat treatment processes, which are tailored to the product according to the customer's requirements.

Our numerous interlinked inspection lines with automatic sorting are a special feature of our bar steel processing. A 100 % inspection of the bars during the production flow for surface and interior defects, dimensional deviations and identity ensures a high degree of security in our customers' production process with regard to the bars used.

Heat Treatment

In the rolling process:
· Thermomechanical rolling
· Temperature-controlled rolling
· Normalising rolling

Annealing (open):
· Tempering
· Annealing to a specific hardness
· Annealing to a certain microstructure
· Soft annealing
· Spheroidized annealed
· Normalising
· Annealing to stress relieve

Induction hardening and tempering:
· Quenching in water
· Polymer quenching on request

Types

As rolled bars:
· Straightened
· Descaled (blasting, straightening and descaling)
· Various end-finishes
  - Sheared, cut or separated
  - Deburred
  - Chamfered

Rough-peeled bar:
· Straightened and polished
· Various end-finishes
  - Sheared, cut or separated
  - Deburred
  - Chamfered
  - Surface oil-free or oiled
· Bundled and banded
· Packed (e. g. corrosion protection foil)

Manufacture of short lengths:
· Length: 10 mm – 4,000 mm
· Cutting to length or specified weight
· Descaled
· Packed according to customer requirements

Packing:
· Banding of bundles with wire or straps
· Stacking of edge profiles in bundles
· Colour marking at head end (e. g. adhesive labels)
· QR code at head end on request

Drahtwerk St. Ingbert: New pickling line

Further Processing at our Subsidiaries

DRAHTWERK ST. INGBERT GMBH

Drahtwerk St. Ingbert is specialised in the development and production of drawn wires and straightened and cut-to-length bar steel for highly demanding applications. Its expertise is in the drawing process and with regard to excellent surfaces it makes the company one of the leading suppliers in the European market. In order to be able to consistently fulfill customer requirements, continuous investments are made in technical developments at the St. Ingbert site. Besides the new construction of a state-of-the-art and efficient bell-type annealing furnace, a new pickling line for even higher quality and homogeneous coatings was put into operation in 2014. Customers in the automotive and consumer goods industries across Europe are supplied with the following products among others:

- Galvanised wires
- Bright wires
- Cold heading wires
- Plastic-coated wires
- Copper-plated wires
- Others, such as shaped wires
- Free cutting steel wires

Technical Equipment

- State-of-the-art wire coating centre with pickling and coating baths to fulfill the highest technological and qualitative customer requirements
- Wire-annealing centre with 6 pedestals, 4 heating and 2 cooling hoods
- 13 multiple drawing machines
- 8 single block drawing machines
- 2 drawing machines
- 6 PVC / PE coating machines
- 10 straightening machines

SCHWEIßDRAHT LUISENTHAL GMBH

Schweißdraht Luisenthal is a leading supplier in the filler metal sector and supplies the automotive and automotive supplier industry worldwide as well as trade. The company can look back on a tradition lasting almost 100 years and has continuously increased its performance. Schweißdraht Luisenthal is a specialist in hardfacing and thermal injection. The continuously high level of product quality and strong service focus make the company a partner in high demand. The product range covers:

- Spray wires
- Special welding wires (hardfacing), medium and high-alloy
- Premium welding wires (high alloy, Ni-base)

Technical Equipment

- Pickling line with 12 treatment baths
- 2 pre-drawing machines
- 2 medium drawing machines
- 3 fine drawing machines with US-run-through cleaning and winding equipment
- 4 copper-plating drawing machines with winding equipment
- Run-through two-strand copper-plating drawing line
- Barrel-type winder for twist-free laying
- 3 high-performance rewinding machines
- Straightening and cutting machine for TIG bars with embossing device
- Straightening and cutting machine for electrode core bars

Drahtwerk Köln: "Jumbo Coil" product example

SAAR-BLANKSTAHL GMBH

Saar-Blankstahl specialises in sophisticated products made of bright bar steel and produces customised, innovative solutions in excellent quality using state-of-the-art equipment and processes, mostly for the automotive industry, mechanical engineering, the electro-mechanical industry and the turned-part and bearing steel industry. The production programme comprises cold drawing, peeling, grinding and heat treatment under inert gas. Saar-Blankstahl procures the rolled material exclusively from their parent company Saarstahl. As a manufacturer of bright steel, the company offers a wide range of steels with several storage units worldwide, such as:

- Free cutting steels
- Case hardening steels
- Quenched and tempered steels
- Unalloyed / alloyed high-grade constructional steels
- Bearing steels
- Spring steels
- Other quality steels

Technical Equipment

- 8 coil-bar drawing machines with integrated mechanical descaling and 100 % eddy current crack test
- 1 bar drawing line with integrated mechanical descaling, 100 % eddy current crack test and phased-array ultrasonic test (GE)
- 1 bar peeling line with integrated eddy current crack test and phased-array ultrasonic test (GE)
- 1 bar peeling line with integrated 100 % eddy current crack test
- 7 centreless grinding machines
- 1 run-through bright annealing furnace under inert gas
- 5 round straightening machines
- 1 profile straightening machine
- 1 ultrasonic testing system Rota
- 2 saws for fixed lengths

DWK DRAHTWERK KÖLN GMBH

Drahtwerk Köln produces high-quality wire products for customers from more than 50 countries. The products are primarily used in the construction, automotive and cable industries. The products include:

- Prestressing steels as strands as well as wire in coils and as bar steel
- Technical spring steel wire
- Quenched and tempered spring steel wire
- Wires for the cable industry
- Bright, galvanised and zinc-aluminium-coated steel wires
- Rope wires
- Other wires

In particular in the field of spring steel wire and prestressing steel, specifically for onshore wind power applications, Drahtwerk Köln has made numerous investments in the last few years. For example, the company is the only producer worldwide that is capable of supplying 20-tonne coils. This results in significant gains in efficiency for our customers with regard to waste and tooling times.

Technical Equipment

- Wire coil pickling line
- 36 multiple drawing machines and 3 single blocks
- 2 lines for heat treatment (patenting) and coating (zinc and zinc aluminium) as a run-through system
- 2 furnace lines for run-through annealing
- 3 stranding machines for the manufacture of prestressing steel strands
- 2 stabilising systems to manufacture prestressing steel wire
- 1 plastic coating line
- 1 threaded rolling system

Saar-Bandstahl: Product example

CONFLANDEY INDUSTRIES S.A.S.

Since 2006, Conflandey Industries in France has been part of the Saarstahl Group. The wire drawing plant can look back on a tradition lasting over 100 years. Thanks to its specialisation and expertise, Conflandey is able to offer its customers tailor-made solutions and thereby fulfill the highest technical demands. Drawn wire from Conflandey can be found in a wide variety of applications worldwide, e.g. in the automotive industry, the furniture industry, in construction or in paper mills. The products include:

- Paper clip wire
- Galvanised or copper-plated, redrawn wires
- Galvanised or copper-plated industrial wires
- Tyre cords
- Cable armouring wires

Technical Equipment

- 2 pickling lines
- 34 multiple drawing machines for pre- and final drawing
- 96 wet drawing machines
- Facilities for heat treatment (patenting lines and annealing furnaces)
- 4 electro-galvanizing lines
- Copper coating lines
- 6 machines for the manufacture of paper clip strip steel

SAAR-BANDSTAHL GMBH

Saar-Bandstahl supplies automotive suppliers, the metal goods and the electrotechnical industry with sophisticated cold strip steel products. The company plays a significant role in particular among automotive suppliers. With state-of-the art equipment and processes, products with a high level of homogeneity and dimensional accuracy are created to consistently meet customer specifications. Strict quality controls ensure excellent surface quality.

The delivery programme of Saar-Bandstahl primarily comprises:

- Soft steels
- AME (Magnetic soft iron)
- Constructional steels
- Spring steels
- Tool steels
- Bearing steels

The cold strip steel products can either be delivered as coils or strip material.

Technical Equipment

- 1 quarto cold-rolling reversing stand
- 1 dual skin pass mill
- 3 H2-hood-type annealing furnaces
- 2 HNX hood-type annealing furnaces
- 1 longitudinal slitting system
- 1 crosswise slitting system

Customer Service

Together with a varied product range to meet the highest quality demands, Saarstahl offers its customers comprehensive service. With our service principle "Everything from a single source" we can fulfill customer requirements very quickly and individually as a full-service provider. With our own further processing possibilities and numerous subsidiaries, we supply the complete product range of wire rod and bar steel.

For each product, our customers are advised all along the line with innovative solutions by experts from the fields in R&D, Quality Control and Sales. In doing so, we place particular importance on reliability. For this reason, our service concept not only covers specialised customer recommendations, but also proactive support on site.

In addition, we have set up a global sales and transport network for our customers. Individual logistics solutions and warehousing concepts allow us to deliver our steel to any desired place in the world according to schedule requirements. We are thus able to provide our customers with the timely product delivery which they require for their production.

Environmental Awareness

Saarstahl is comprehensively committed to pro-active environmental protection. Our experts from the environmental protection department deal with issues such as emission control and water protection, waste disposal and recycling management, as well as the handling of hazardous goods. In doing so, we not only pay attention to the adherence to environmentally relevant regulations, but even go one step further. At Saarstahl, production processes are continuously developed with regard to improvements in environmental protection and conservation of resources. Continuous investments in environmental protection measures, such as energy optimisation programmes, underline this. At the same time, we promote and support environmentally-conscious behaviour and thinking in each individual employee. Through our tailored training programmes, we educate our employees to create an understanding that allows them to carry out their activities responsibly and in line with our environmental targets. We require our suppliers to adhere to national and international environmental laws and that they continuously seek to improve their environmental protection standards. A selection of measures for environmental protection by our company are:

- Saarstahl invested € 1.5 M in the LD steelmaking plant for the new construction of a hall for slag tipping. This resulted in a greatly reduced emission of diffuse dust.

- Due to the new secondary metallurgy with its high-power dust extraction system and further optimisation measures on other dust extraction systems, the total dust emissions at the Völklingen location could be reduced by approx. 35 %.

- For the outward transport of our residual materials, we are making increased use of the environmentally friendly water route by ship. Thus, in addition to reducing fuel consumption, we are also relieving the motorways of approx. 2,600 trucks per year.

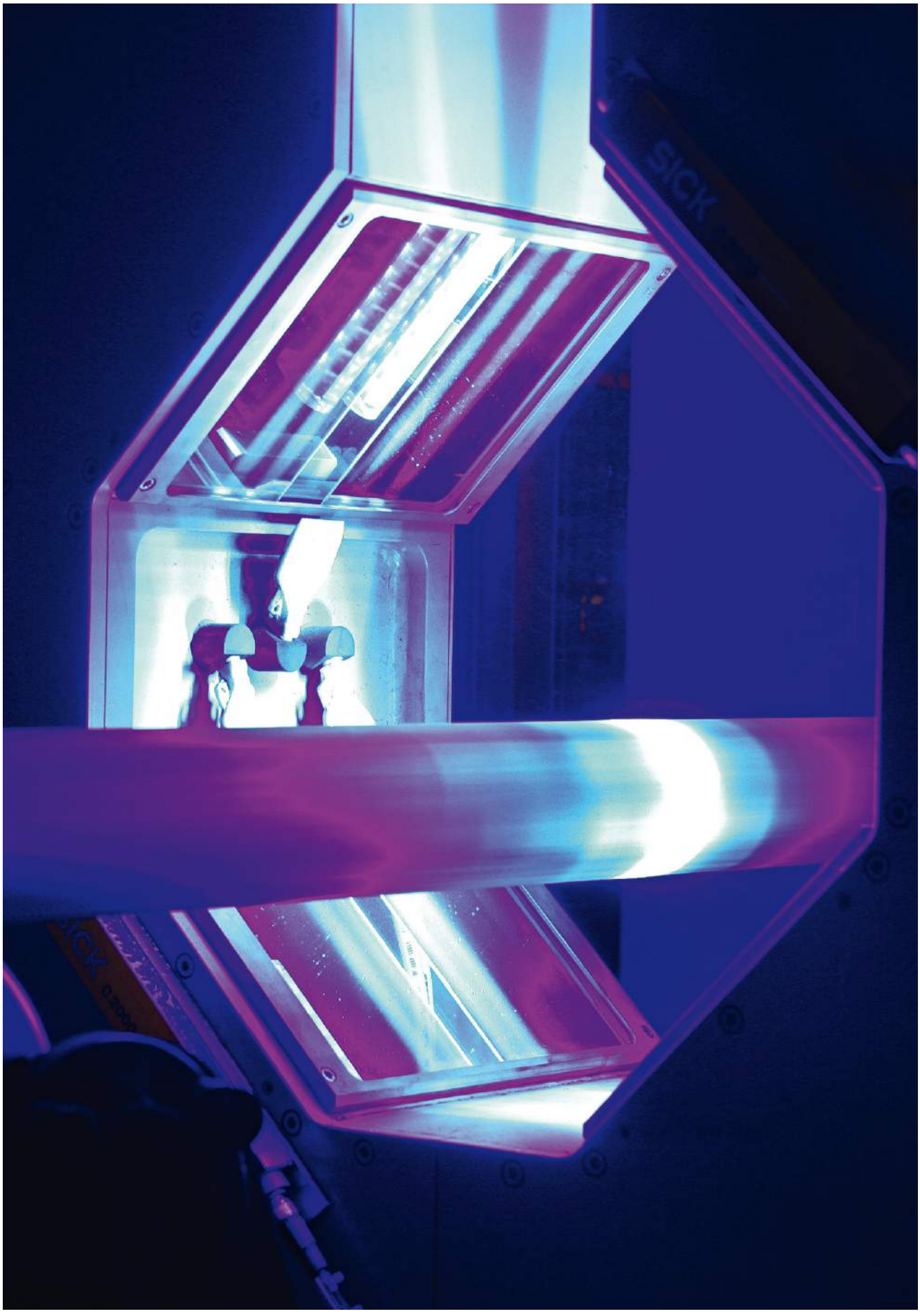
Corporate Social Responsibility

Corporate Social Responsibility (CSR) as an integral part of the company culture covers responsible behaviour and sustainable economic activity. We not only measure our corporate success according to economic aspects but also take ecological and social aspects into account. In doing so, we aim at creating added value for our customers and employees, society, the environment and for our company.

After an audit, EcoVadis, an assessment agency with international activities, presented the Saarstahl Group with a silver award for its CSR activities. With this result, Saarstahl is among the top third of all companies evaluated by EcoVadis.

Compliance

For Saarstahl, compliance means adherence to rules and self-imposed ethical standards, but also prevention of legal violations and infringements of the law. This is seen as a common task of all employees in the company. A compliance committee set up especially for this purpose conveys the principles and measures in order to inform about adherence to the rules, and therefore, prevent infringements in our company. We would thus like to demonstrate towards our business partners and other external institutions and people that we adhere to the laws and self-imposed rules and that we are committed to the highest standards of integrity.



Mecana testing facility

Certification

The fulfillment of our customers' high quality requirements and responsible treatment of the environment are documented, among others, in numerous certificates and awards which we have received. The certification of the company for the field of energy according to DIN EN ISO 50001, for quality according to DIN EN ISO 9001 and IATF 16949, as well as for the environment according to DIN EN ISO 14001, confirm our high standards.

View certification

AWARDS

Bosch Global Supplier Award 2013 / 2014

DENSO Regional Cooperation Award 2015

Michelin Supplier Award 2013

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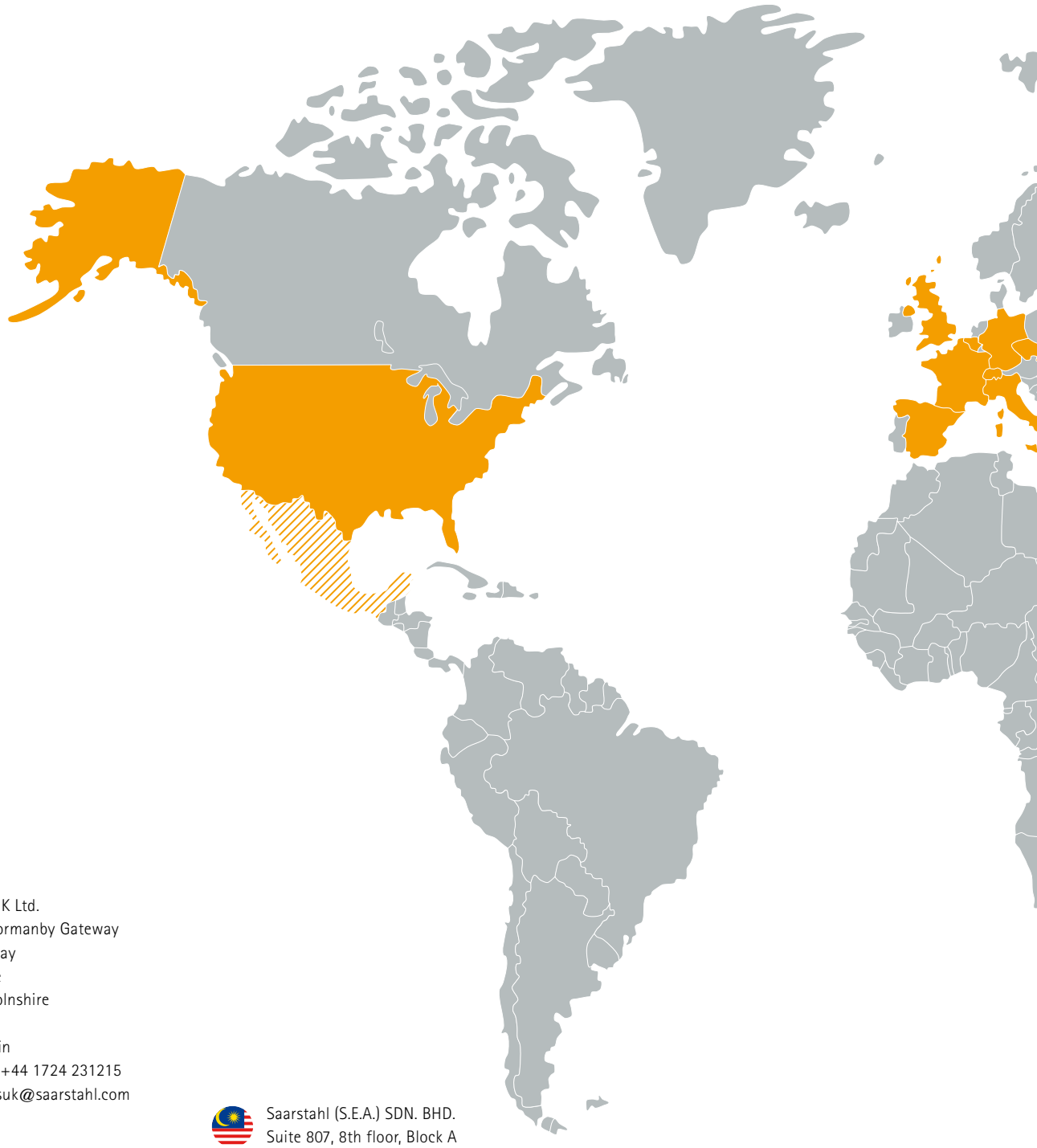
Saar-Bandstahl



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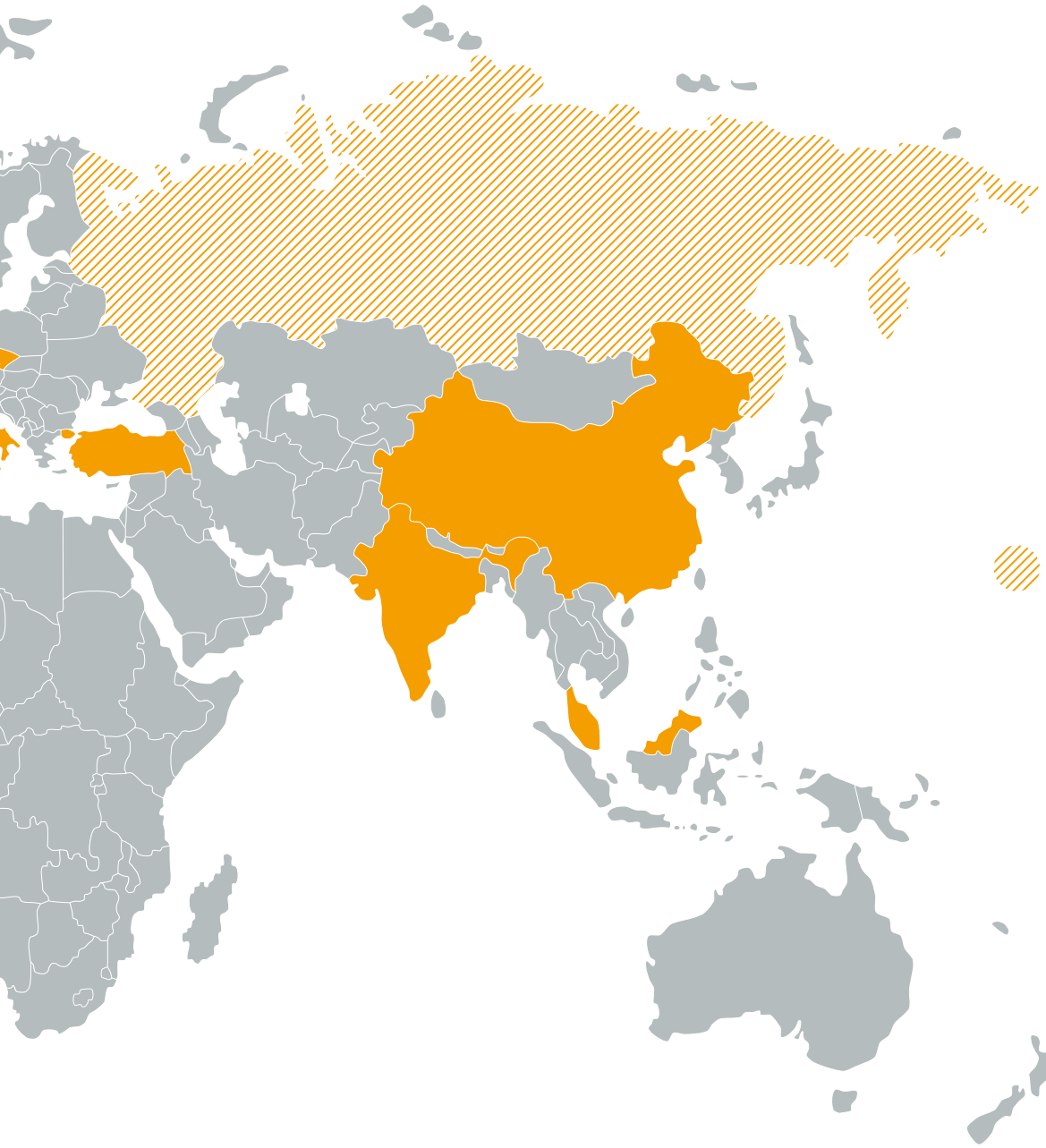

There will also be contacts available for customers on site in Russia and Mexico in the near future.

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