

Sandvik billets and blooms
– the perfect choice



SANDVIK



Sandvik billets and blooms

Let us be your reliable partner! We offer...

... technical expertise.

Technical support and advice are always available from our product specialists. If you have any questions about material selection, processing or our product program, please contact us through our Sales Units or via our website

www.smt.sandvik.com/billets

... tailor-made on request.

We have a wide range of products, sizes and material grades – many of which have been specially developed to meet particular demands and applications. Close cooperation with customers to meet individual needs has always been part of the Sandvik way of working.

... consistent material properties.

Products with consistent and reliable quality in every delivery are the result of full quality assurance and control throughout the whole manufacturing process.

... easy access for you to reach us.

A worldwide, local network of Sales Units and material experts.





Sandvik billets and blooms – a strong link in the chain

Sandvik offers you a **wide range of stainless and specialty steel products**. We have a great variety of steel grades in our programme. With high flexibility in raw material sourcing and our willingness to find solutions, we can produce tailor-made new grades to meet specific market, country and customer requirements.



Sandvik has a **long experience in producing stainless and high alloyed steels** for use in many industrial segments and application areas. Our materials are the source for a huge variety of products in chemical and petrochemical industry, offshore industry and nuclear power plant to name a few.

With **modern production facilities** designed for producing stainless steel products we are one of the world leading producers within this segment. Production in a fully integrated mill gives us complete control over the material from the melt to the finished product. All processes are carried out in accordance with a well established quality assurance programme, which meets ISO 9001 requirements.

Research and development. Sandvik has one of Europe's largest R&D facilities for stainless steels and special alloys. It includes facilities for full scale production trials and product testing and is operated by highly qualified researchers and engineers.

For more than a century, our research expertise has resulted in new steel grades with improved properties and performance, capable of meeting the ever increasing demands of new environments and applications.

Sandvik Group

The Sandvik Group is a global high technology enterprise with 38,000 employees in 130 countries. Sandvik's operations are concentrated on its three core businesses of Sandvik Tooling, Sandvik Mining and Construction, and Sandvik Materials Technology – areas in which the group holds leading global positions in selected niches.

Sandvik Materials Technology

Sandvik Materials Technology is a world-leading manufacturer of high-value-added products in advanced stainless steels, special alloys, metallic and ceramic resistance materials, as well as process plants and sorting systems.

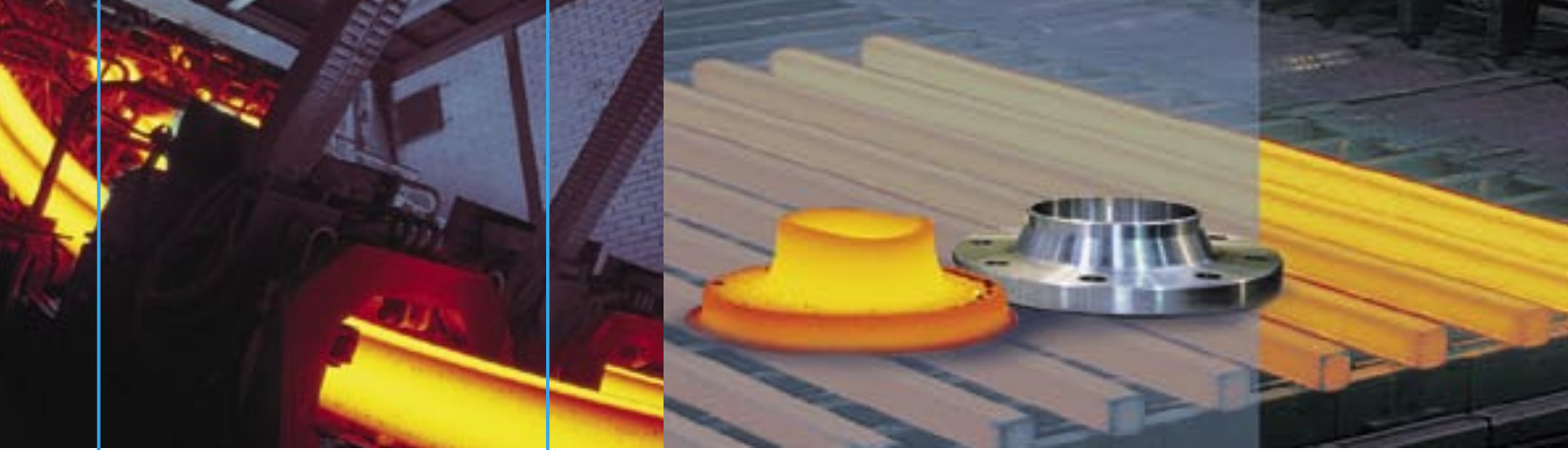
Quality Assurance

Sandvik Materials Technology has Quality Management Systems approved by internationally recognized organizations. We hold for example; the ASME Quality System Certificate as a Materials Organization, approval to ISO 9001 and PED 97/23/EC, as well as approvals from LRQA, JIS, TÜV and others as a materials manufacturer.

Environment

Environmental awareness is an integral part of our business and is at the forefront of all activities within our operation. We hold approval to ISO 14001.





Sandvik billets – advantages

- **Wide range of stainless steel grades and specialty steels**
– Sandvik produces more than 600 grades.
- **Experience and know-how in special grades**
- **Complete size range of billets in sizes 80–350 mm. Larger sizes are being offered on request**
- **Close cooperation with customers**
- **Full service and technical support**
- **Global sales and marketing organization**
- **Strong research and development organization**
- **Quality system approval to ISO 9001**

Sandvik produces blooms and billets in a range of stainless steels, duplex steels and high alloyed materials for customers to further process, by forging, re-rolling and extrusion, into finished products for a variety of application areas.

Billets for forging and re-rolling

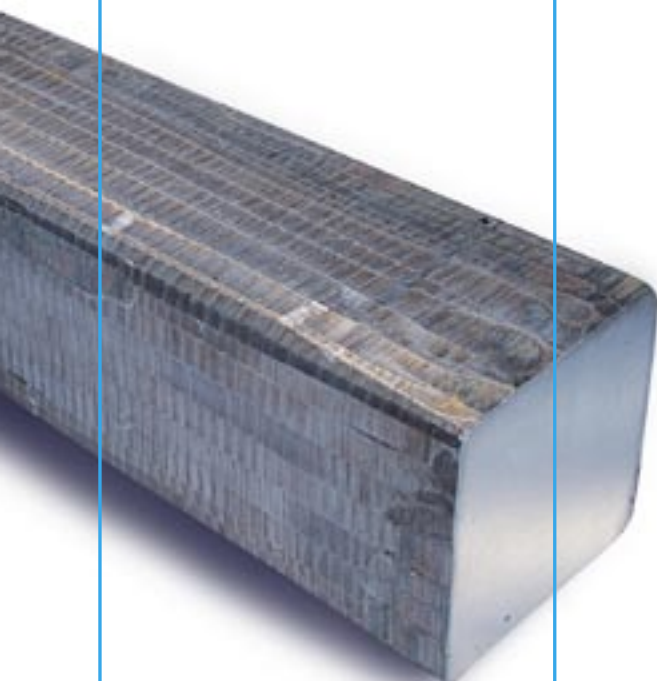
Billets for forging are available in 80–350 mm square or 80–450 mm round sizes. Square billets are offered in the unground, spot ground or fully ground conditions. Round billets are normally supplied peel turned, but are also available in the black condition.

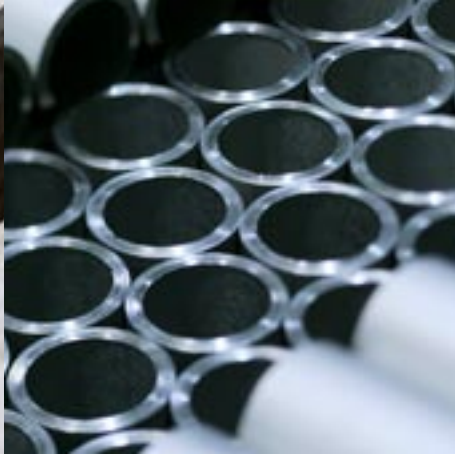
Billets are suitable for producing all types of forged products, flanges, discs, rings, valves, forged parts, axles etc. A wide range of high alloyed materials is available from Sandvik for these product areas.

We can provide quick delivery from stock in the duplex and super duplex grades, Sandvik SAF 2205 and SAF 2507, as well as other special grades. Please contact us for more information.

Enhanced machinability Sanmac grades are available to forging companies.

Billets for re-rolling are used for producing bar, wire, strip, hexagons and profiles. They are available hot rolled/forged in 80–350 mm square and rectangular sizes. Often, a more simplified production route can be used compared to forging billets, since in most cases products do not require a dense centre. For many of these products, concast (continuous cast) material can be used, which contributes to lower raw material costs.





Billets for tube and profile extrusion

Extrusion billets are used to manufacture tube and profile with a high demand on material properties and surface standard. As a leading producer of extrusion billets, Sandvik has many years experience in this field, which has proven to be a prerequisite for uniformity and consistent high quality. We supply extrusion billets in a size range of 80–325 mm round in the peel turned condition with polished or belt-ground surfaces.

An efficient production route involves continuous casting followed by rolling or forging in a single stage to the finished diameter.

We offer extrusion billets in standard grades. Special grades can be offered on request.

Sandvik billets

- are 100% ultrasonically and eddy current tested in a fully automated inspection line to ensure the highest quality standards.
- have close tolerance control on size, length and straightness to meet the most stringent customer requirements.
- are peel turned in advanced peel turning machines to very fine “mirror finish” surfaces. Surface roughness directly affects the surface standard of the finished tube/profile. Our machines supply the market with the best possible surface finishes. Ra values of 3.8 µm max are guaranteed, with normal values below 0.5 µm.

Concast blooms

We offer concast blooms in commercial standard steels in three sizes: 365x265 mm, 265 mm and 150 mm square with a very fine surface finish. Electromagnetic stirrers ensure a homogenous structure.





Sandvik grades for your applications

Sandvik's wide range of austenitic and duplex stainless steels and high alloy materials are used in equipment in many different industries such as:

- **Chemical and petrochemical**
- **Oil & gas/ Offshore**
- **Nuclear**
- **Food**
- **Pulp & paper**

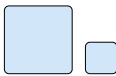
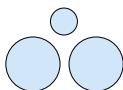


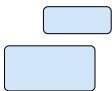

Specifications and chemical compositions for the grades available are shown in the table on page 7. Further information about steel grades can be found by selecting Tech Center/Billets from the menu on our website: www.smt.sandvik.com

Forms of supply

We produce round-cornered square billets in the unground, spot ground or fully ground condition, as well as round billets in the peel turned or black condition – depending on steel grade and size. Special grades are normally supplied in the fully ground or peel turned condition.



Sizes and tolerances

Square billets 	Size range, mm:	80 – 200	>200 – 350	
	Tolerances, mm:	$\pm 2 - \pm 4$	± 5	
	Lengths, m:	4 - 6.3	3 – 5.3	
	Condition of supply:	Unground Spot ground Fully ground	Fully ground	
Round billets 	Size range, mm:	80 – 200	>200 – 450	
	Tolerances, mm:	± 3	± 5	
	Lengths, m:	max 10	3 – 8	
	Condition of supply:	Peel turned	Peel turned Rough turned	
Extrusion billets 	Size range, mm:	77 – 193	>200 – 450	
	Tolerances, mm:	± 2	± 5	
	Lengths, m:	max 10	3 – 8	
	Condition of supply:	Unground	Unground	
Concast blooms 	Size range, mm:	265x265	265x365	150x150
	Tolerances, mm:	± 5	± 5	± 5
	Lengths, m:	1.5 - 6	1.5 – 6	5 – 7
	Condition of supply:	As cast	As cast	As cast
Slabs 	Thickness, mm:	95 – 153		
	Width, mm:	150 – 400		
	Tolerances, mm:	$\pm 3 - \pm 4$		
	Lengths, m:	2.5 – 5.3		
Ingots 	Size	Weight		
	20" sqr	1690 kg		
	23" sqr	2600 kg		
	24" sqr	3400 kg		
	26" sqr	4500 kg		
	27" sqr	5300 kg		
	34" octagon	6500 kg		

Stainless steel grades

EN No.	Sandvik grade	Type of steel		Chemical composition					Round billets	Square/Rect billets	Concast blooms	Extrusion billets
		AISI	UNS	C	Cr	Ni	Mo	Others				
Austenitic stainless steels												
1.4305	6RA11	303	S30300	0.05	18	9.0	-	S=0.3	●	●	●	
1.4301	5LR11	304	S30400	0.05	18.5	8.5	-	-	●	●	●	
1.4301	6LR11	304	S30400	0.05	18.5	9.5	-	-	●	●	●	●
1.4307	4LR11	304L	S30403	≤0.030	18.5	8.5	-	-	●	●	●	
1.4306	3R12	304L	S30403	≤0.020	18.5	10.5	-	-	●	●	●	●
1.4541	8LR30	321/321H	S32100	0.06	17.5	9.5	-	Ti=0.4	●	●	●	
1.4541	6R35	321/321H	S32100	0.05	17.5	10.5	-	Ti=0.4	●	●	●	●
1.4550	6R44	347/347H	S34700	0.05	17.7	10.2	-	Nb=0.7	●	●	●	●
1.4401	6LR62	316	S31600	0.05	17	11.5	2.1	-	●	●	●	●
1.4436	5R60	316	S31600	0.04	17	12.5	2.6	-	●	●	●	●
1.4404	4LR61	316L	S31603	≤0.030	17	11.5	2.3	-	●	●	●	
1.4404	3R65	316L	S31603	≤0.030	17	11.5	2.1	-	●	●	●	●
1.4435	3R60	316L	S31603	≤0.030	17.5	13	2.6	-	●	●	●	●
1.4438	3X1R63	317L	S31703	≤0.030	18.5	13.5	3.1	-	●	●	●	
1.4438	3R64	317L	S31703	≤0.030	18.5	14.5	3.1	-	●	●	●	●
1.4571	8LR70	316Ti	S31635	0.060	17	11	2.1	Ti=0.4	●	●	●	
1.4571	5R75	316Ti	S31635	0.04	17	12.5	2.1	Ti=0.4	●	●	●	●
1.4893	253MA		S30815	0.08	21	11	-	Ce= 0.05 N= 0.17	●	●		
1.4301	Sanmac /4307	304/304L	S30400/ S30403	≤0.030	18.5	9.5	-		●	●	●	
1.4401	Sanmac /4404	316/316L	S31600/ S31603	≤0.030	16.5	11.5	2.1	-	●	●	●	
1.4435	Sanmac 1.4435	316L	S31603	≤0.030	17.5	12.5	2.6	-	●	●	●	
1.4571	Sanmac 1.4571	316Ti	S31635	0.03	17	12	2.1	Ti=0.4	●	●	●	
1.4541	Sanmac 1.4541	321	S32100	0.03	17.5	9.5	-	Ti=0.4	●	●	●	
High-alloyed austenitic steels and nickel alloys												
1.4845	7RE10	310	S31008	0.05	24.5	21	-	-	●	●	●	●
1.4539	2RK65	904L	N08904	<0.020	19.5	24.5	4.1	Cu=1.5	●	●	●	●
1.4563	Sanicro 28	-	N08028	≤0.020	26.5	30.5	3.3	Cu=1.0	●	●	●	
1.4547	254SMO	-	S31254	<0.020	20	18	6.1	Cu=0.7	●	●	●	
1.4959	Sanicro 31HT	Alloy 800HT	N08810/11	<0.07	20.5	30	-	Ti=0.5 Al= 0.5	●	●		
	Sanicro 32Cu	Alloy 20	N08020	<0.03	19.5	32.5	2.2	Cu=3.3 Nb=0.25	●	●		
2.4858	Sanicro 41Cu	Alloy 825	N08825	≤0.025	20.0	38.5	2.6	Cu=1.7 Ti=0.7 Al	●	●		
2.4816	Sanicro 70	Alloy 600	N06600	<0.040	16.5	72.5	-	Ti=0.3 Al Fe=9.3	●	●		
Duplex steels (ferritic-austenitic)												
1.4460	5RD58	329	S32900	0.04	26	5	1.3	-	●	●	●	●
1.4362	SAF 2304	-	S32304	≤0.030	22.5	4.5	0.3	N=0.1	●	●	●	
1.4462	SAF 2205	-	S31803	≤0.030	22	5	3.1	N=0.18	●	●	●	●
1.4410	SAF 2507	-	S32750	≤0.030	25.0	7	4.0	N=0.3	●	●		
1.4462	Sanmac SAF 2205	-	S31803 S32205	≤0.030	22.5	5.5	3.2	N=0.18	●	●	●	
Ferritic and martensitic steels												
1.4006	2XC24	410	S41000	0.13	12.5	0.35	-	-	●	●	●	
1.4028	6C27	420	S42000	0.3	13.5	-	-	-	●	●		
-	12C27	420	S42000	0.6	13.5	-	-	-	●	●		
-	4C54	446	S44600	0.17	26.5	-	-	N=0.17	●	●		
1.4016	0XC34	430	S43000	0.03	17	-	-	-	●	●		

Some grades require a minimum quantity of AOD heat (50–60 tonnes) or one HF heat (5–10 tonnes). Contact your Sandvik sales office regarding delivery quantities for grades in which you are interested.

Sandvik, Sanmac, Sanicro, SAF 2304, SAF 2205 and SAF 2507 are trademarks owned by Sandvik AB.

253MA and 254SMO are trademarks owned by Outokumpu Stainless.

Recommendations are for guidance only, and the suitability of a material for a specific application can be confirmed only when the actual service conditions are known. Continuous development may necessitate changes in the technical data without notice.



SANMAC

Sanmac materials are easy to machine

SANDVIK
Coromant

Through collaboration with Sandvik Coromant, the world leading producer of cemented carbide inserts, we have gained experience of chip forming during machining of stainless steels, which is unrivalled in the steel industry. The outstanding properties of Sanmac grades have been discovered by many manufacturers of stainless steel components such as flanges, valves, rings, discs etc. Modified inclusion contents, accurate chemistry and controlled production are the secret behind these materials. The high level of machinability has been achieved without compromising properties such as corrosion resistance and mechanical strength.

The Sanmac machinability concept gives forgemasters a range of materials with excellent machining properties for sawing, cutting, turning and drilling, which lowers machining costs and dramatically increases productivity.

Sanmac materials are available in grades 304/304L, 316/316L, 4435, 4571, 4541 and Sandvik SAF 2205/F51.

Vacuum arc remelted material

For customers requiring a high quality material with low impurity and extremely low contents of non-metallic inclusions, e.g. for springs and valves, medical implants, components for the electronic or semi-conductor industries, steels melted in the normal way can be remelted in a high-vacuum furnace. This production method is designated VAR (Vacuum Arc Remelting) and "HV" is added to the steel designation.

By vacuum arc remelting, billets from ingot cast material or continuously cast blooms are melted under a vacuum atmosphere. VAR steels and super alloys, as well as titanium and zirconium and their alloys, are used in a large number of high integrity applications, where cleanliness, homogeneity and improved fatigue properties in the final product are essential. The aerospace, power generation, defence and nuclear industries rely on the properties and performance of these advanced remelted materials.



Watches

a typical product from VAR production, with high demands on cleanliness.

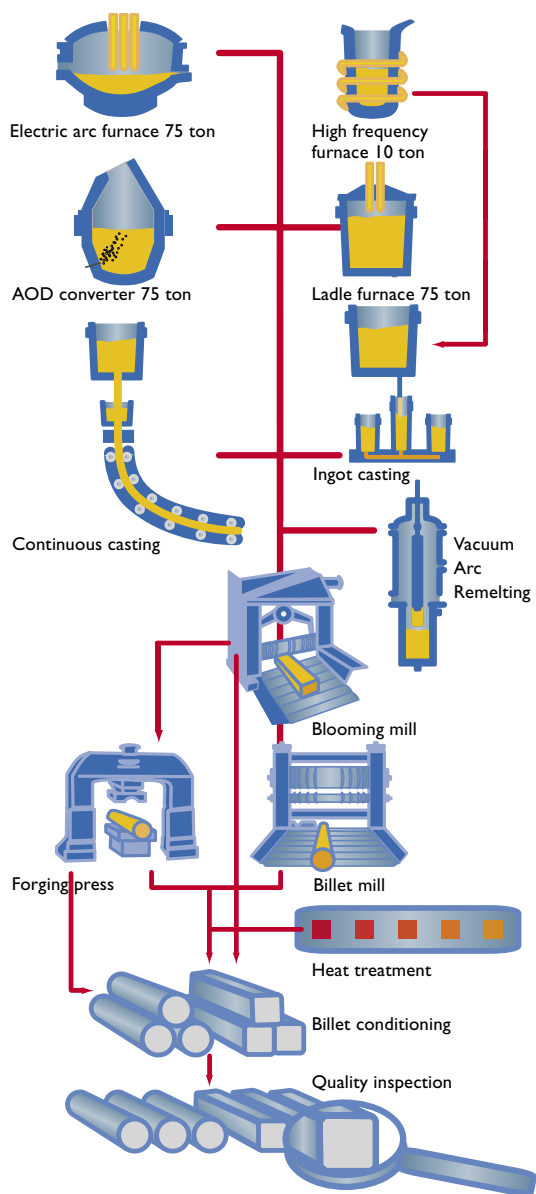


Vacuum Arc Remelting (VAR)

a production method that gives a product with high cleanliness and homogeneity.



Sandvik production routes for primary products



Sandvik's production plants are designed specially for the efficient manufacture of long product in stainless steel and high alloy materials, in round, square and rectangular sections.

After melting in a 75 tonne **electric arc furnace**, steel is tapped into a ladle and transferred to the **AOD** (Argon Oxygen Decarburization) converter, where the principal metallurgical process is performed.

The steel is then transported to the **ladle furnace** where the inclusions can be modified. Finally, the ladle is lifted up to the casting platform to be cast as **ingots** or as continuously cast blooms.

In **continuous casting**, the steel passes from the tundish through ceramic tubes to three water-cooled copper moulds where it starts to solidify.

For special steels, required in smaller quantities, we melt in a 10 tonne **HF** (High Frequency) **furnace**.

Steel melted in the normal way can be remelted in the **VAR** (Vacuum Arc Remelting) **furnace** to produce a steel with a low content of non-metallic inclusions.

Sandvik has recently invested in a modern rolling mill consisting of a blooming mill and an integrated billet mill. In the **blooming mill**, ingots and the continuously cast (concast) material from the melting plant are pre-rolled for the forging press and the billet mill. Here, all rectangular (strip) and square (wire) billets, as well as some sizes of round bar for extrusion, are produced.

Sandvik has a hydraulic **forging press** with a maximum press force of around 1,800 tonnes.

The new **billet mill** is used for rolling round and square billets in sizes below 200 mm.

In **billet conditioning**, finishing operations such as straightening, cutting, peel turning, grinding, marking and quality inspection are carried out.

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