SANMAC

Solid and hollow bar stainless steels for machining

SANDVIK

SANMAC

Sanmac improves your production economy

Sanmac is the result of extensive efforts to improve the machinability of stainless steel grades and the design of tooling concepts suitable for stainless steel machining. The result of this co-operation between Sandvik Materials Technology and Sandvik Coromant is improved production economy for you as our customer.

Higher productivity

The family of Sanmac stainless steels has now been further improved through extensive product development to increase productivity for customers in the machining industry. With Sanmac we have been able to reduce tool wear, and increase cutting speeds, giving productivity improvements and therefore significant cost reductions per produced article. The Sanmac program is continuously being extended with new steel grades and dimensions.

Clever together

Working together with Sandvik Materials Technology and Sandvik Coromant gives you good possibilities for expanding your business through improved service and delivery precision to your customers. Our stocks and distribution network combined with improved productivity in your machinery, give you excellent opportunities to shorten your lead times and reduce your inventories.

Sanmac – Always at the cutting edge

The benefits to you include:

Improved cutting speeds and feed rates

- Better machine utilisation
- Reduced fixed cost per produced detail

More details cut per insert edge (less tool wear)

- Better machine utilisation through reduced stoppage time

Integrated production (own melting)

- Continuity from melt to melt
- Less machine setting time and fewer rejections

Excellent availability (from regional stocks)

- Reduced customer inventories
- Reliable delivery service

Wide product range

- Less machining time and less waste

Technical support

- Materials and machining support in your own language

Research & Development

- Continued improvements
- Cost benefits for you
- New Sanmac materials

Close co-operation with Sandvik gives you

- Improved service to your customers
- Enhanced reputation due to improved service and consistency
- Good possibilities for expanding your business

Stock program
Stainless bar steel

Grades and standards

Stainless bar steel

Sandvik	EN	W.-Nr.	UNS	AISI
Sanmac 304/304L	1.4301/ 1.4307	1.4301	S30400/S30403	Type 304/304L
Sanmac 316/316L	1.4401/ 1.4404	1.4401/ 1.4404	S31600/S31603	Type 316/316L
Sanmac 4435	1.4435	1.4436/ 1.4435	S31600/S31603	Type 316/316L
Sanmac 4571	1.4571	1.4571	S31635	Type 316Ti
Sanmac SAF 2205	1.4462	1.4462	S31803/S32205	–
Sandvik SAF 2507	1.4410	–	S32750	–
Sandvik Sanicro 28	1.4563	1.4563	N08028	–

All bar grades fulfill the requirements of PED 97/23/EC.

Chemical composition

Sandvik	Nominal chemical composition, %				
	C	Cr	Ni	Mo	Others
Sanmac 304/304L	≤0.030	18.5	8.5	–	–
Sanmac 316/316L	≤0.030	17	10.5	2.1	–
Sanmac 4435	≤0.030	17.5	12.5	2.6	–
Sanmac 4571	0.03	17	11	2.1	Ti
Sanmac SAF 2205	≤0.030	22.5	5.5	3.2	N
Sandvik SAF 2507	≤0.030	25	7	4	N
Sandvik Sanicro 28	≤0.020	27	31	3.5	Cu

Standards

Sandvik	Size range, mm
Sanmac: 304/304L, 316/316L, SAF 2205	
EN 10 088-3	20 – 450
EN 10272	20 – 250*
ASTM A479, SA 479	20 – 450
NACE MR 0175	independent of size
Sanmac: 304/304L, 316/316L, 4435, 4571	
EN 10 088-3	75 – 450
EN 10272	75 – 250
AD2000-W2	75 – 250**
ASTM A479, SA 479	75 – 450
NACE MR 0175	independent of size
Sandvik Sanicro 28	
EN 10 088-3	100 – 185
EN 10272	100 – 185
NACE MR 0175	independent of size
Sandvik SAF 2507	
EN 10 088-3	20 – 250
EN 10272	20 – 160
ASTM A 479, SA 479	20 – 250
NACE MR 0175	independent of size

* Sandvik SAF 2205 20 – 160 mm

** Sizes >250 mm must be upgraded via TÜV.

Lengths

Diameter, mm	Lengths, m
20 – 70	3.5 – 4.5
75 – 160	5 –7
163 – 250	5 –6
254 – 450	3 –5

Tolerances for mm-sizes

Diameter, mm	Tolerances, mm
20 – 35	-0 / +0.15
40 – 45	-0 / +0.16
50 – 70	-0 / +0.19
75 – 95	-0 / +1.00
100 – 285	-0 / +1.50
290 – 350	-0 / +2.00
360 – 500	-0 / +3.00

Surface conditions

Surface conditions	R_a µm Typical value	Size Ø mm
Peel turned, burnished	1	20 – 285
Peel turned	2	>285 – 350
Rough machined	5	>350

Certificate status according to EN 10204/3.1

Further technical information can be found on page 26 and on our Internet web sites:
www.smt.sandvik.com/sanmac
www.smt.sandvik.com/techcenter

Stock program

Dia-meter mm	Weight kg/m	EN 1.4307 Sanmac 304/304L	EN 1.4404 Sanmac 316/316L	EN 1.4571 Sanmac 4571	EN 1.4435 Sanmac 4435	EN 1.4462 Sanmac SAF 2205	EN 1.4410 Sandvik SAF 2507	EN 1.4563 Sandvik Sanicro 28
20.00	2.5	●	●			●	●	○
25.00	3.9	●	●			●	●	○
30.00	5.5	●	●	●		●	●	○
35.00	7.6	●	●	●		●	●	○
40.00	9.9	●	●	●		●	●	○
45.00	12.5	●	●	●		●	●	○
50.00	15.4	●	●	●		●	●	○
55.00	19.0	●	●	●		●	●	○
60.00	22.2	●	●	●		●	●	○
65.00	26.0	●	●	●		●	●	○
70.00	30.2	●	●	●		●	●	○
75.00	34.7	●	●	●	○	●	●	○
80.00	39.5	●	●	●	○	●	●	○
85.00	44.6	○	●	●	○	●	●	○
90.00	49.9	●	●	●	○	●	●	○
95.00	55.6	○	●	●	○	●	●	○
100	61.7	○	●	●	○	●	●	●
101.6	63.6	●	●	○	○	○	○	○
105	68.0	●	●	●	○	●	○	○
110	74.6	●	●	●	○	●	●	○
114.3	80.6	○	●	○	○	○	○	○
115	81.5	●	●	●	○	●	●	○
120	88.8	●	●	●	○	●	●	○
125	96.3	●	●	●	○	●	●	○
127	99.4	●	●	○	○	○	○	○
130	104	●	●	●	○	●	●	○
133.3	109.6	●	●	○	○	○	○	○
135	112	●	●	●	○	●	●	○
140	121	●	●	●	○	●	●	○
145	130	○	●	●	○	●	●	○
150	139	●	●	●	○	●	●	●
152.4	143.1	●	●	○	○	○	○	○
155	149	○	●	●	○	●	○	○
160	158	●	●	●	○	●	●	○
165	168	●	●	●	○	●	●	○
170	178	●	●	●	○	●	●	○

Stock program (cont.)

Dia-meter	Weight	EN 1.4307 Sanmac 304/304L	EN 1.4404 Sanmac 316/316L	EN 1.4571 Sanmac 4571	EN 1.4435 Sanmac 4435	EN 1.4462 Sanmac SAF 2205	EN 1.4410 Sandvik SAF 2507	EN 1.4563 Sandvik Sanicro 28
mm	kg/m							
175	189	❍	❍	●	❍	●	❍	❍
180	200	●	●	●	❍	●	●	❍
185	211	●	●	❍	❍	●	●	●
190	223	●	●	●	❍	●	❍	❍
200	247	●	●	●	❍	●	●	❍
203.2	254.4	●	●	❍	❍	❍	❍	❍
205	260	❍	❍				●	
210	272	●	●	●	❍	●	●	❍
215	285	❍	❍	❍	❍	❍	❍	❍
220	298	●	●	●	❍	●	●	❍
225	312	●	●	●	❍	●	●	❍
228.6	322.1	●	●	❍	❍	❍	❍	❍
230	326	●	●	●	❍	●	●	❍
240	355	●	●	●	❍	●	●	❍
241.3	358.8	●	●	❍	❍	❍	❍	❍
250	385	●	●	●	❍	●	●	❍
254	397.7	●	●	❍	❍	❍	❍	❍
260	417	●	●	●	❍	●		
270	450	❍	●	●	❍	●		
280	483	❍	●	●	❍	❍		
285	501	●	●	●	❍	●		
300	555	●	●	●		●		
320	631		■	❍				
325	651	■	■	■		■		
340	713	●	❍					
350	755	■	■	■		■		
375	867		◆			●		
400	987	●	◆	❍		●		
406.4	1017.8	❍	●	❍	❍	❍	❍	❍
425	1114	❍	◆	❍		◆		
450	1249	●	◆			❍		

Condition

- ❍ Produced to order, minimum quantity 10 metric tons
- ● Annealed, peel turned, burnished
- ■ Annealed, peel turned
- ◆ Annealed, rough machined

Order examples

MBR-Sanmac304L-100
MBR-Sanmac4571-100
MBR-SAN28-185
MBR-Sanmac2205-250

Stock program
Stainless hollow bar

Grades and standards

Stainless hollow bar – stock grades

Sandvik	AISI (UNS)	W.-Nr./EN
Sanmac 4305	303	1.4305
Sanmac 304/304L	304/304L	1.4301/1.4307
Sanmac 316/316L	316/316L	1.4401/1.4404
Sanmac 4435	316/316L	1.4436/1.4435
Sanmac 4571	(316Ti)	1.4571
Sanmac SAF 2205	S31803	1.4462

All above grades, excluding Sanmac 4305, fulfill the requirements of PED 97/23/EC (EN 10216-5) leak tightness test deferred to machined component.

Chemical composition

Sandvik	Nominal chemical composition, %				
	C	Cr	Ni	Mo	Others
Sanmac 4305	≤0.035	17.5	9	–	S
Sanmac 304/304L	≤0.030	18.5	9	–	–
Sanmac 316/316L	≤0.030	16.5	11	2.1	–
Sanmac 4435	≤0.030	17.5	12.5	2.6	–
Sanmac 4571	0.03	17	12.5	2.1	Ti
Sanmac SAF 2205	≤0.030	21.5	4.5	3.2	N

Other grades to special order

Tolerances

O.D.: +2/-0% but minimum +1/-0 mm.
I.D.: +0/-2% but minimum +0/-1 mm.
Straightness: Straightness deviation max. 1.5 mm per 1000 mm.
Other tolerances can be offered to special order.

Lengths

Sandvik stainless hollow bar is delivered in lengths ranging from 2.5 to 6.5 m, depending on diameter and grade. Lengths down to 1 m may be included in the delivery.
Cutting services are available.

Guaranteed component sizes

The values indicated are valid for lengths of max. 2.5 x O.D.

Standards
Test certification for hollow bar in stock

Sanmac 304/304L, EN 1.4301/1.4307
Sanmac 316/316L, EN 1.4401/1.4404
OD 32-250 mm
DIN 17456[1)], DIN 17458 TC1[1)],
NFA 49-317,
PED 97/23/EC,
EN 10216-5 TC1, EN 10294-2[2)]
IC-test EN ISO 3651-2A in delivery condition.
NACE MR-0175/ISO 15156

OD 275 mm and larger
ASTM A479, ASTM A276
ASME SA479
EN 10088-3, EN 10294-2[2)]
NACE MR 0175/ISO 15156
IC-test ASTM A262 Pr. E

Sanmac 4571, EN 1.4571
DIN 17456[1)], DIN 17458 TC1[1)],
NFA 49-317,
PED 97/23/EC,
EN 10216-5 TC1, EN 10294-2[2)]
IC-test EN ISO 3651-2A in delivery condition.

Sanmac SAF 2205, EN 1.4462
Heat analysis and mechanical properties
acc. to Sandvik data sheet.
EN 10294-2[2)]
Corrosion test acc to ASTM G 48, Method A.
Impact test (t ≥6 mm)
Micrographic test (400X)
NACE MR 0175/ISO 15156

IC = Intergranular Corrosion.
[1)] The leakage test is deferred to the finished component.
[2)] The European standard for hollow bar expected to be implemented during 2010

Further technical information can be found on page 26 and on our Internet web sites:
www.smt.sandvik.com/sanmac
www.smt.sandvik.com/techcenter

Stock range

O.D.	I.D.	Weight	Guaranteed component sizes [1]				EN 1.4305	EN 1.4301/ 1.4307	EN 1.4404	EN 1.4435	EN 1.4571	EN 1.4462
			Chucked true to O.D.		Chucked true to I.D.							
mm	mm	average kg/m	max. O.D. mm	min. I.D. mm	max. O.D. mm	min. I.D. mm	Sanmac 4305	Sanmac 304/304L	Sanmac 316/316L	Sanmac 4435	Sanmac 4571	Sanmac SAF 2205
32	20	4.2	31.0	21.9	30.1	21.0	○	●	●	○	●	○
32	16	5.1	31.0	18.0	30.0	17.0	○	●	●	○	●	○
36	25	4.5	35.0	26.9	34.1	26.0	○	●	●	○	●	○
36	20	5.9	35.0	22.0	34.0	21.0	○	●	●	○	●	○
36	16	6.8	35.0	18.1	33.9	17.0	○	●	●	○	●	○
40	28	5.5	39.0	29.9	38.1	29.0	○	●	●	○	●	○
40	25	6.5	39.0	27.0	38.0	26.0	○	●	●	○	●	○
40	20	7.8	39.0	22.1	37.9	21.0	○	●	●	○	●	○
45	32	6.7	44.0	33.9	43.1	33.0	○	●	●	○	●	○
45	28	8.2	44.0	30.0	43.0	29.0	○	●	●	○	●	●
45	20	10.5	44.0	22.2	42.8	21.0	○	●	●	○	●	○
50	36	8.0	49.0	38.0	48.0	37.0	○	●	●	○	●	○
50	32	9.7	49.0	34.1	47.9	33.0	○	●	●	○	●	○
50	25	12.1	49.0	27.2	47.8	26.0	○	●	●	○	●	●
56	40	10.2	55.0	42.0	54.0	41.0	○	●	●	○	●	○
56	36	12.1	55.0	38.1	53.9	37.0	○	●	●	○	●	○
56	28	15.2	55.0	30.3	53.7	29.0	○	●	●	○	●	●
60	40	13.2	58.8	42.3	57.7	41.0	○	○	○	○	●	○
63	50	9.9	62.0	51.9	61.1	51.0	○	●	●	○	●	○
63	45	12.2	62.0	47.0	61.0	46.0	○	●	●	○	●	○
63	40	15.4	62.0	42.2	60.8	41.0	○	●	●	○	●	●
63	36	17.3	62.0	38.3	60.7	37.0	○	●	●	○	●	○
63	32	19.0	62.0	34.4	60.6	33.0	○	●	●	○	●	●
71	56	12.9	69.9	58.0	68.9	57.0	○	●	●	○	●	○
71	45	19.6	69.9	47.3	68.6	46.0	○	●	●	○	●	●
71	40	22.3	69.9	42.4	68.5	41.0	○	●	●	○	●	○
71	36	24.1	69.9	38.5	68.4	37.0	○	●	●	○	●	●
75	60	13.7	73.8	62.0	72.8	61.0	○	●	●	○	○	○
75	50	21.1	73.8	52.2	72.6	51.0	○	●	●	○	○	○
75	40	26.0	73.8	42.5	72.3	41.0	○	●	●	○	●	●
80	63	16.4	78.8	65.0	77.8	64.0	○	●	●	○	●	○
80	50	25.3	78.8	52.4	77.4	51.0	○	●	●	○	●	●
80	45	28.3	78.8	47.5	77.3	46.0	○	●	●	○	●	○
80	40	30.9	78.8	42.6	77.2	41.0	○	●	●	○	●	●

Stock range (continued)

O.D.	I.D.	Weight	Guaranteed component sizes [1]				EN 1.4305	EN 1.4301/ 1.4307	EN 1.4404	EN 1.4435	EN 1.4571	EN 1.4462
			Chucked true to O.D.		Chucked true to I.D.							
mm	mm	average kg/m	max. O.D. mm	min. I.D. mm	max. O.D. mm	min. I.D. mm	Sanmac 4305	Sanmac 304/304L	Sanmac 316/316L	Sanmac 4435	Sanmac 4571	Sanmac SAF 2205
85	67	18.5	83.7	69.1	82.6	68.0	○	●	●	○	○	○
85	55	26.8	83.7	57.4	82.3	56.0	○	●	●	○	○	○
85	45	33.5	83.7	47.6	82.1	46.0	○	●	●	○	●	○
90	71	20.6	88.6	73.1	87.6	72.1	○	●	●	○	●	○
90	63	27.1	88.6	65.3	87.3	64.0	○	●	●	○	●	●
90	56	32.3	88.6	58.5	87.1	57.0	○	●	●	○	●	○
90	50	36.1	88.6	52.6	87.0	51.0	○	●	●	○	●	●
95	75	23.0	93.5	77.3	92.4	76.2	○	●	●	○	○	○
95	67	29.9	93.5	69.3	92.2	68.0	○	●	●	○	○	○
95	50	42.1	93.5	52.7	91.8	51.0	○	●	●	○	●	●
100	80	24.4	98.5	82.3	97.4	81.2	○	●	●	○	●	○
100	71	32.7	98.5	73.4	97.2	72.1	○	●	●	○	●	●
100	63	39.2	98.5	65.5	97.0	64.0	○	●	●	○	●	●
100	56	42.3	98.5	58.7	96.8	57.0	○	●	●	○	●	○
106	80	32.3	104.4	82.5	103.1	81.2	○	●	●	○	●	●
106	71	40.6	104.4	73.5	103.0	72.1	○	●	●	○	●	●
106	63	47.1	104.4	65.7	102.7	64.0	○	●	●	○	●	○
106	56	52.1	104.4	58.9	102.5	57.0	○	●	●	○	●	●
112	90	30.2	110.3	92.5	109.2	91.4	○	●	●	○	●	○
112	80	40.6	110.3	82.6	108.9	81.2	○	●	●	○	●	●
112	71	48.8	110.3	73.7	108.7	72.1	○	●	●	○	●	○
112	63	55.3	110.3	65.8	108.5	64.0	○	●	●	○	●	●
118	90	39.0	116.2	92.7	114.9	91.4	○	●	●	○	●	●
118	80	49.4	116.2	82.8	114.6	81.2	○	●	●	○	●	●
118	71	57.6	116.2	73.8	114.5	72.1	○	●	●	○	●	○
118	63	64.2	116.2	66.0	114.2	64.0	○	●	●	○	●	●
125	100	38.3	123.1	102.7	121.9	101.5	○	●	●	○	●	○
125	90	49.8	123.1	92.8	121.7	91.4	○	●	●	○	●	●
125	80	60.2	123.1	82.9	121.4	81.2	○	●	●	○	●	○
125	71	68.5	123.1	74.0	121.2	72.1	○	●	●	○	●	●
132	106	42.0	130.0	108.8	128.8	107.6	○	●	●	○	●	●
132	90	61.1	130.0	93.0	128.4	91.4	○	●	●	○	●	●
132	80	71.5	130.0	83.1	128.1	81.2	○	●	●	○	●	○
132	71	79.7	130.0	74.2	127.9	72.1	○	●	●	○	●	○

Stock range (continued)

O.D.	I.D.	Weight	Guaranteed component sizes [1]				EN 1.4305	EN 1.4301/ 1.4307	EN 1.4404	EN 1.4435	EN 1.4571	EN 1.4462
			Chucked true to O.D.		Chucked true to I.D.							
mm	mm	average kg/m	max. O.D. mm	min. I.D. mm	max. O.D. mm	min. I.D. mm	Sanmac 4305	Sanmac 304/304L	Sanmac 316/316L	Sanmac 4435	Sanmac 4571	Sanmac SAF 2205
140	112	47.8	137.9	115.0	136.6	113.7	○	●	●	○	●	●
140	100	63.3	137.9	103.1	136.3	101.5	○	●	●	○	●	●
140	90	74.9	137.9	93.2	136.1	91.4	○	●	●	○	●	○
140	80	85.2	137.9	83.3	135.8	81.2	○	●	●	○	●	○
150	125	47.4	147.7	128.1	146.5	126.9	○	●	●	○	●	○
150	106	74.2	147.7	109.3	146.0	107.6	○	●	●	○	●	●
150	95	87.7	147.7	98.4	145.7	96.4	○	●	●	○	●	○
150	80	103.3	147.7	83.6	145.3	81.2	○	●	●	○	●	●
160	132	56.2	157.6	135.3	156.3	134.0	○	●	●	○	●	○
160	122	71.6	157.6	125.4	156.0	123.8	○	●	●	○	●	○
160	112	85.8	157.6	115.5	155.8	113.7	○	●	●	○	●	●
160	90	112.9	157.6	94.0	155.2	91.4	○	●	●	○	○	●
170	140	63.8	167.4	143.5	166.0	142.1	○	●	●	○	●	●
170	130	80.2	167.4	133.6	165.8	132.0	○	●	●	○	●	○
170	128	80.8	167.4	131.6	165.7	130.0	○	○	○	○	○	●
170	118	98.4	167.4	121.7	165.5	119.8	○	●	●	○	●	○
170	106	114.7	167.4	109.8	165.2	107.6	○	●	●	○	●	○
170	100	122.3	167.4	103.9	165.0	101.5	○	●	●	○	○	○
180	150	68.4	177.3	153.6	176.0	152.3	○	●	●	○	●	○
180	140	86.1	177.3	143.7	175.7	142.1	○	●	●	○	○	○
180	125	110.0	177.3	128.9	175.3	126.9	○	●	●	○	●	●
180	100	144.4	177.3	104.1	174.7	101.5	○	●	●	○	○	○
190	160	73.0	187.1	163.8	185.7	162.4	○	●	●	○	●	●
190	150	91.9	187.1	153.9	185.5	152.3	○	●	●	○	●	○
190	140	109.9	187.1	144.0	185.3	142.1	○	●	●	○	●	○
190	132	123.0	187.1	136.0	185.1	134.0	○	●	●	○	●	●
200	170	77.6	197.0	173.9	195.6	172.6	○	●	●	○	○	○
200	160	97.6	197.0	164.0	195.4	162.4	○	●	●	○	●	●
200	150	117.0	197.0	154.1	195.2	152.3	○	●	●	○	○	○
200	140	134.0	197.0	144.2	194.9	142.1	○	●	●	○	●	○
212	170	109.0	208.8	174.2	207.2	172.6	○	●	●	○	●	●
212	150	148.0	208.8	154.4	206.6	152.3	○	●	●	○	○	○
212	130	182.0	208.8	134.6	206.2	132.0	○	●	●	○	●	●

Stock range (continued)

O.D.	I.D.	Weight	Guaranteed component sizes [1]				EN 1.4305	EN 1.4301/ 1.4307	EN 1.4404	EN 1.4435	EN 1.4571	EN 1.4462
			Chucked true to O.D.		Chucked true to I.D.		Sanmac 4305	Sanmac 304/304L	Sanmac 316/316L	Sanmac 4435	Sanmac 4571	Sanmac SAF 2205
mm	mm	average kg/m	max. O.D. mm	min. I.D. mm	max. O.D. mm	min. I.D. mm						
224	180	121.0	220.6	184.4	218.9	182.7	❍	●	●	❍	❍	❍
224	140	199.0	220.6	144.8	217.9	142.1	❍	●	●	❍	❍	❍
236	190	133.0	232.4	194.6	230.7	192.9	❍	●	●	❍	❍	❍
236	150	216.0	232.4	155.0	229.7	152.3	❍	●	●	❍	❍	●
250	200	153.0	246.2	204.9	244.3	203.0	❍	●	●	❍	❍	●
275	200	247	270.6	205.5	268.4	203.1	❍	❍	●	❍	❍	❍
300	200	340	295.5	206.1	292.4	203.1	❍	❍	●	❍	❍	❍
340	200	507	334.9	207.1	330.8	203.1	❍	❍	●	❍	❍	❍
380	230	609	374.3	237.8	369.5	233.5	❍	❍	●	❍	❍	❍
400	300	478	394.0	307.6	390.9	304.5	❍	❍	●	❍	❍	❍
420	300	585	413.7	308.6	410.1	304.5	❍	❍	●	❍	❍	❍

● = Stock size
❍ = Produced to order. Minimum quantities from 750 to 5000 kg depending on size.

[1] The values indicated are valid for lengths less than 2.5 times the outside diameter.

Order examples
THB-Sanmac316L-32-20
THB-Sanmac2205-250-200
(THB = Tube Hollow Bar)

Properties
Bar and hollow bar

Technical data for bar and hollow bar

PROPERTIES	Sanmac 4305 Hollow b.	Sanmac 304/304L Bar/ Hollow b.	Sanmac 316/316L Bar/ Hollow b.	Sanmac 4435 Bar/ Hollow b.
MECHANICAL PROPERTIES at 20°C				
Proof strength,				
$R_{p0.2}$, MPa, min	– 215**	205* 210**	205* 220**	205* 220**
$R_{p1.0}$, MPa, min	– 245**	230* 240**	240* 250**	240* 250**
Tensile strength, R_m, MPa	500–700**	515–680	515–690	515–690
Elongation, A %, min	40**	45* 40**	40	40
Reduction of area, Z %, min	–	50*	50*	50*
Hardness, HB, max. HRB, max.	– 90**	215* 90**	215* 90**	215* 90**
PHYSICAL PROPERTIES				
Density, g/cm^3	7.9	7.9	8.0	8.0
Modulus of elasticity at 20°C, MPa	200 000	200 000	200 000	200 000
Specific heat capacity at 20°C, J/kg °C	475	475	485	485
Thermal conductivity at 20°C, W/m °C	15	15	14	14
Thermal expansion at 30 – 100°C, x10^{-6} per °C	16.5	16.5	16.5	16.5
For further information see our data sheets		S-8703* S-1824**	S-8704* S-1840**	S-8705* S-1841**

* = Bar ** = Hollow bar

PROPERTIES	Sanmac 4571 Bar/ Hollow b.	Sanmac SAF 2205 Bar/ Hollow b.	Sandvik SAF 2507 Bar	Sandvik Sanicro 28 Bar
MECHANICAL PROPERTIES at 20°C				
Proof strength,				
$R_{p0.2}$, MPa, min	210* 220**	450	550	220
$R_{p1.0}$, MPa, min	245* 250**	500	–	–
Tensile strength, R_m, MPa	515–700* 510–710**	660–860* 680–880**	760–930	500-750
Elongation, A %, min	40* 35**	25	25	35
Reduction of area, Z %, min	50*	–	–	–
Hardness, HB HRB HRC	max. 215* max. 90** –	max. 270* – max. 28**	appr. 260 – max. 28	max. 220 – appr. 14
PHYSICAL PROPERTIES				
Density, g/cm^3	8.0	7.8	7.8	8.0
Modulus of elasticity at 20°C, MPa	200 000	200 000	200 000	195 000
Specific heat capacity at 20°C, J/kg °C	485	480	480	460
Thermal conductivity at 20°C, W/m °C	14	14	14	10
Thermal expansion at 30 – 100°C, x10^{-6} per °C	16.5	13	13	15
For further information see our data sheets	S-8706* S-1852**	S-8702* S-1873**	S-8701*	S-1885**

* = Bar ** = Hollow bar

Resistance to corrosion

Steel type Sandvik	Sulph. acid	Nitric acid	Formic acid	Acetic acid	Pitting/ crevice corr.	SCC
Sanmac 304/304L	–	+	–	–	–	–
Sanmac 316/316L	0	0	0	0	0	0
Sanmac 4435	0	0	0	0	0	0
Sanmac 4571	0	0	0	0	0	0
Sanmac SAF 2205	+	0	++	+	+++	+++
SAF 2507	++	+	+++	++	+++++	+++++
Sanicro 28	+++++	++	+	++	++++	++++

0 = Reference value
+ = More resistant than reference value
– = Less resistant than reference value

Weldability

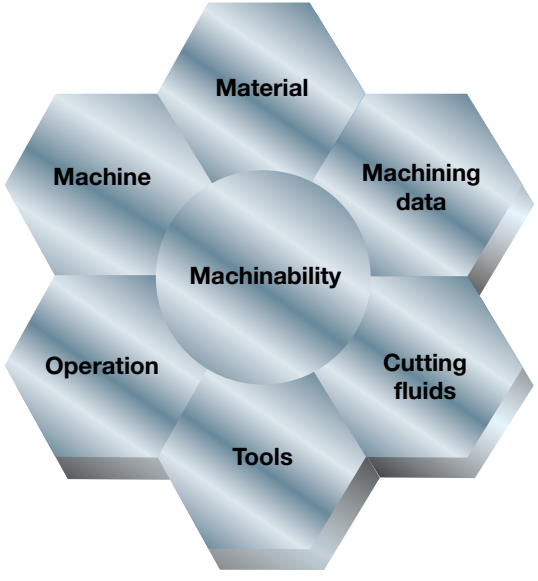
Suitable welding methods for Sanmac grades are manual metal arc welding with covered electrodes MMA and gas shielded arc welding, with the TIG and MIG methods as first choice. During TIG welding, especially autogenous welding, a correct setting of the welding current is of great importance. However, when filler metal is used, the weldability is the same as for the standard material.

Recommendations of filler metal

Steel type Sandvik	TIG (GTAW/141) Sandvik	MIG (GMAW/131) Sandvik	FCAW (136) Sandvik	MMA (SMAW/111) Sandvik
Sanmac 304/304L	19.9.L or 19.9.LSi	19.9.L or 19.9.LSi	19.9.LT	19.9.LR. 19.9.LB or 19.9.LRHD
Sanmac 316/316L Sanmac 4571	19.12.3.L or 19.12.3.LSi	19.12.3.L or 19.12.3.LSi	19.12.3.LT	19.12.3.LR. 19.12.3.LB or 19.12.3.LRHD
Sanmac 4435	20.25.5.LCu	20.25.5.LCu		20.25.5.LCuR
Sanmac SAF 2205	22.8.3.L or 25.10.4.L		22.9.3.LT	22.9.3.LR 25.10.4.LR

For further welding information, see our Internet web sites:
www.smt.sandvik.com/sanmac and www.smt.sandvik.com/techcenter

Machining



The art of machining stainless steel

Austenitic and duplex stainless steels have properties that give them a different machinability compared to carbon steel or ferritic and martensitic stainless steels. The greatest difference is the high ductility of austenitic and duplex stainless steels, as well as their tendency to work harden and form built-up edges on the cutting tool. Moreover, in duplex materials, chip forming is made more difficult by the high strength of these materials.

In Sanmac materials, machinability has been improved without jeopardising properties such as corrosion resistance and mechanical strength.
The non-metallic inclusions in Sanmac steels are of great significance to the improved machinability. In addition to sulphides, Sanmac steels contain oxide inclusions that improve chip breaking and reduce tool wear.
Apart from the material and tool, the machining result is influenced by the machine itself, by the cutting data, coolant, and type of operation.

To obtain long insert/tool-life with good chip breaking when turning, a generous flow of cutting fluid should be used. The cutting fluid removes heat from the chip and facilitates chip breaking, at the same time giving improved dimensional stability. In the case of internal machining, chip evacuation is improved if cutting fluid is applied through the cutting tool.

Work hardening

In all machining that involves cutting austenitic and duplex stainless steels, work hardening is more pronounced than in carbon steel or ferritic and martensitic stainless steels. The machined surface becomes harder at the same time as tool-life decreases.

Always observe the following:
- Use modern cutting tools with suitable geometries for machining austenitic and duplex stainless steels.
- Change the insert regularly. A worn insert causes more severe work hardening.

Strength

High strength in combination with high ductility in austenitic and duplex stainless steels makes chip breaking more difficult and increases the risk of vibration, which damages the surface and reduces the service life of the insert.

Always observe the following:
- Use stable machines only.
- Make sure that the workpiece is properly secured and use stable tool holders.
- Try to minimise tool overhang - this is especially important in drilling and internal turning.
- In case of vibrations, often a problem during internal turning, use tools with small nose radius even though this increases the risk of plastic deformation at the nose.

Cutting data recommendations

The recommendations are based on machining with modern CNC machines with normal power and speed ratings. When changing the cutting data to compensate for external factors, only small changes in feed should be made. Recommended tool-life is 10–15 minutes unless otherwise stated.

Turning

The diagrams show the ranges within which cutting data can be chosen to obtain a tool-life of 10 minutes or more when machining austenitic Sanmac materials (4305, 304/304L, 316/316L, 4435, 4571) and a tool-life of 7 minutes or more in the duplex material Sanmac SAF 2205.
The areas are limited in the event of low feeds because of unacceptable chip breaking. In the case of high cutting speeds, plastic deformation is the most dominant cause of failure. When feed increases and the cutting speed falls, edge frittering (chipping) increases significantly.
The diagrams are applicable for normal cutting times. For long, continuous cuts, the cutting speeds should be reduced somewhat.
The machining areas are limited by different wear mechanisms. Once the type of wear has been determined, the cutting data can be optimised with the aid of the diagrams.

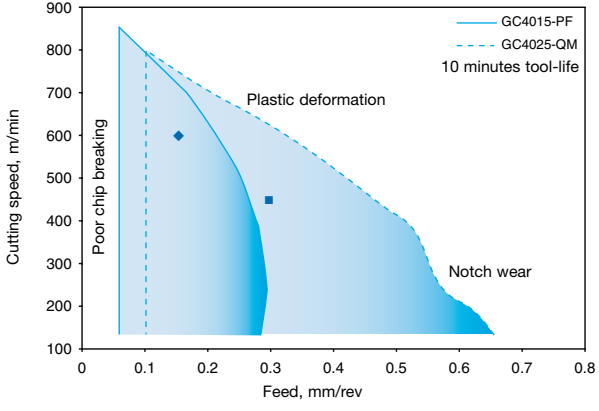
Tools

Sandvik Coromant M-Line tools, available in T-Max P, CoroTurn 107, and CoroTurn 111, are optimised for stainless steel turning.

Turning of Sanmac 4305
Recommended inserts and cutting data (starting values for a tool-life of 15 minutes).

Insert Geometry	Grade*	Cutting data Feed mm/rev	Cutting speed m/min	Application
◆ PF	GC4015	0.15	600	Finishing, copy turning
■ QM	GC4025	0.30	450	Medium machining

* Sandvik Coromant inserts



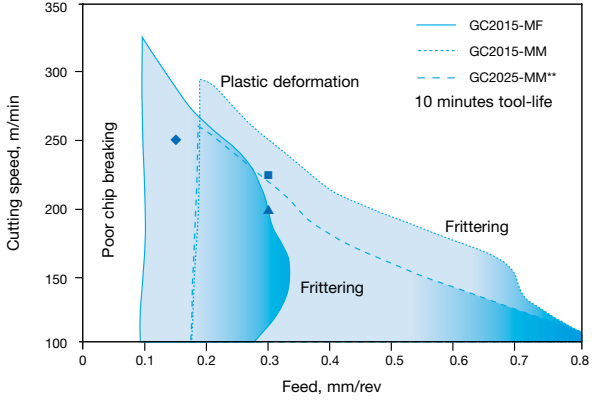
◆ ■ Recommended starting values, in accordance with table above

Turning of Sanmac 304/304L, Sanmac 316/316L
Recommended inserts and cutting data (starting values for a tool-life of 15 minutes).

Insert Geometry	Grade*	Cutting data Feed mm/rev	Cutting speed m/min	Application
◆ MF	GC2015	0.15	250	Finishing, copy turning
■ MM	GC2015	0.30	225	Medium to rough machining under stable conditions
▲ MM**	GC2025	0.30	200	Medium to rough machining under less stable conditions

In the case of large cutting depths and rough surfaces, the MR geometry in grade GC2025 is also recommended. For very demanding operations at low cutting speeds, the MR geometry in grade GC2035 is recommended.

* Sandvik Coromant inserts
** MR for Sanmac 316/316L hollow bar

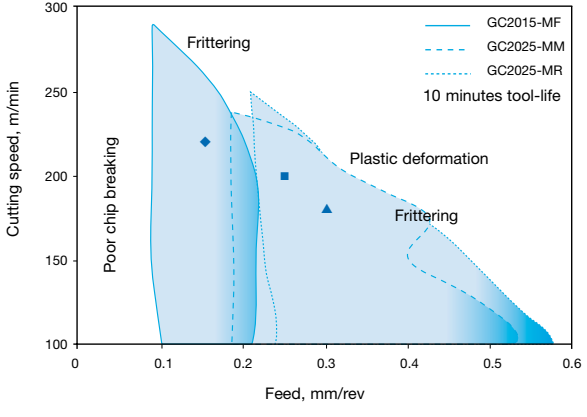


◆ ■ ▲ Recommended starting values, in accordance with table above

Turning of Sanmac 4571
Recommended inserts and cutting data (starting values for a tool-life of 15 minutes).

Insert Geometry	Grade*	Cutting data Feed mm/rev	Cutting speed m/min	Application
◆ MF	GC2015	0.15	220	Finishing, copy turning
■ MM	GC2025	0.25	200	Medium to rough machining under stable conditions
▲ MR	GC2025	0.30	180	Medium to rough machining under less stable conditions

* Sandvik Coromant inserts



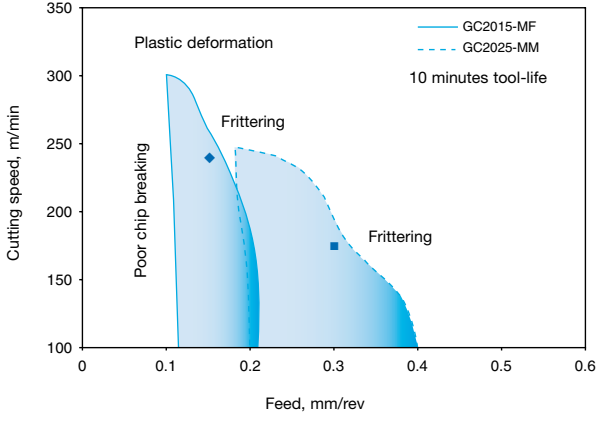
◆ ■ ▲ Recommended starting values, in accordance with table above

Turning of Sanmac 4435
Recommended inserts and cutting data (starting values for a tool-life of 15 minutes).

Insert Geometry	Grade*	Cutting data Feed mm/rev	Cutting speed m/min	Application
◆ MF	GC2015	0.15	240	Finishing, copy turning
■ MM	GC2025	0.30	175	Medium to rough machining

In the case of large cutting depths and rough surfaces, the MR geometry in grade GC2025 is also recommended. For very demanding operations at low cutting speeds, the MR geometry in grade GC2035 is recommended.

* Sandvik Coromant inserts



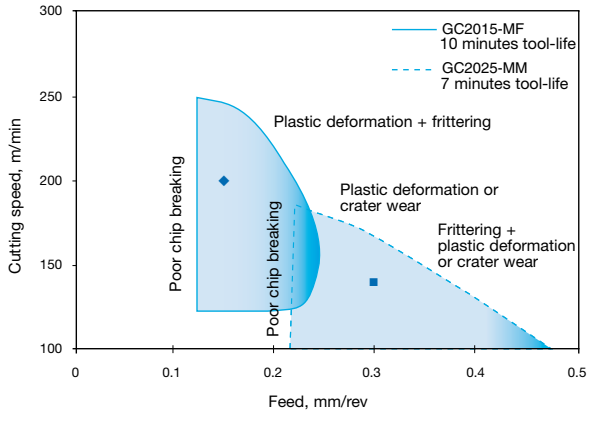
◆ ■ Recommended starting values, in accordance with table above

Turning of Sanmac SAF 2205
Recommended inserts and cutting data (starting values).

Insert Geometry	Grade*	Cutting data Feed mm/rev	Cutting speed m/min	Application
◆ MF	GC2015	0.15	200	Finishing, copy turning
■ MM	GC2025	0.30	140	Medium to rough machining

Turning in Sanmac SAF 2205 duplex steel is considerably more demanding than in the Sanmac austenitic materials. This is mainly due to the higher strength of Sanmac SAF 2205.

* Sandvik Coromant inserts



◆ ■ Recommended starting values, in accordance with table above

Types of wear

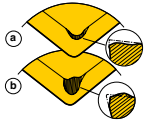
The most important types of wear in general turning of stainless steels are flank wear, plastic deformation, frittering (chipping) and notch wear.

Flank and notch wear

Causes: a) Cutting speed too high, or insert has insufficient wear resistance. **b/c**) Oxidation or excessive attrition wear. **Solutions: a**) Reduce the cutting speed. Choose a more wear resistant insert grade. **b/c**) Reduce the cutting speed. Choose a smaller entering angle.

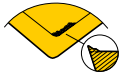
Plastic deformation

Cause: Too high insert temperature in combination with high pressure.
Solution: Choose a more wear resistant insert grade.
a) Edge depression. Reduce the cutting speed.
b) Flank impression. Reduce the feed.



Built-up edge

Cause: Workpiece material welds progressively onto the insert.
Solution: Increase the cutting speed.



Edge frittering (chipping)

Causes: Too brittle insert grade, too weak insert geometry or built-up edge.
Solutions: Choose a tougher insert grade, choose an insert with a stronger edge or, in case of built-up edge, increase the cutting speed.

Thread cutting

Indexable inserts can be used for external thread cutting in all diameters. Threading with screw-cutting dies or die heads is cost effective only for small diameters. For internal threading with short and normal cutting lengths, thread cutting with indexable inserts is recommended from hole diameter 12 mm and up.
For long cutting lengths, thread cutting with indexable inserts is recommended for hole diameters above 20 mm.

Thread turning

Due to the tendency of austenitic and duplex stainless steels to work harden, radial infeeds are recommended. A generous flow of cutting fluid should be used, partly to obtain a reliable process and partly to guide the chips. The recommendations apply for a tool life of 30 minutes for the austenitic material and 10 minutes for the duplex material. T-Max U-Lock is Sandvik Coromant's thread turning system.

Insert Geometry	Grade*	Cutting speed m/min
All Round (austenitic)	GC1020	160**
F (duplex)	GC1020	120

* Sandvik Coromant inserts
** Higher cutting speed can be used for Sanmac 4305.

Thread tapping

Coated threading taps can increase productivity by up to 100%, in comparison with uncoated threading taps. For the advantages of coated threading taps to be realised, a generous flow of cutting fluid must be used. The recommendations apply for a tool-life of 30 minutes.

Steel type	Cutting speed, m/min
Austenitic	4-15*
Duplex	4-10

* Higher cutting speed can be used for Sanmac 4305.

Cutting speeds in the upper range should be chosen for coated threading taps.

Drilling

The recommended methods for drilling give the most cost effective results for the respective diameter ranges. When producing holes with diameters larger than 58 mm, short-hole drilling is used up to 58 mm, followed by internal turning up to the desired diameter. Cutting data for internal turning should be chosen in accordance with the turning recommendations.
The recommendations for drilling are applicable for a tool-life of 30 minutes.

Drilling with Sandvik Coromant Delta C drill, diameter 3–12.7 mm
Code R415.5. Grade GC1220
(diameter range 3–20 mm)

Feed* mm/rev	Cutting speed m/min
0.08–0.22	55 (austenitic)** 45 (duplex)

* The lower value should be selected for smaller diameters.
** Higher cutting speed can be used for Sanmac 4305.

Short hole drilling, diameter 12.7–58 mm
Coromant U-drill, R416.2

Insert Geometry	Grade*	Cutting data Feed mm/rev	Cutting speed m/min
-53	Central insert GC1020	–	– (austenitic and duplex)
-53	Peripheral insert GC1020**	0.04–0.18	160 (304/304L and 316/316L) 150 (4435 and 4571)
-53	Peripheral insert GC3040	0.04–0.18	300 (4305) 200 (304/304L and 316/316L)*** 190 (4435 and 4571)***
-53	Peripheral insert GC1020**	0.04–0.18	100 (duplex)

* Sandvik Coromant inserts
** GC1120 for diameters below 17.5 mm
*** Stable conditions

Drilling with Sandvik Coromant Delta drill (complementary drill)
Code R411.5 Grade K20
(diameter range 9.5–30.4 mm)

Feed* mm/rev	Cutting speed m/min
0.14–0.20	50 (austenitic)** 35 (duplex)

* The lower feed value should be selected for smaller diameters.
** Higher cutting speed can be used for Sanmac 4305

Drilling with high speed steel (HSS) drill
(diameter 1–3 mm)

Feed* mm/rev	Cutting speed** m/min
0.03–0.09	20–30 (4305) 10–15 (304/304L, 316/316L, 4435 and 4571) 8–15 (duplex)

* The lower feed value should be selected for smaller diameters.
** The higher cutting speed should be selected for coated drills.

Milling

When milling austenitic and duplex stainless steels it is important to choose a correct combination of milling cutter system, insert geometry and grade, together with appropriate cutting data.

When milling stainless steels, cutters with positive geometries should be used to reduce the work hardening of the material and thereby increase the tool-life. The following tools from Sandvik Coromant are recommended for stainless steel milling:

- CM390 for end-, square shoulder and face milling.
- CM245 for face milling.
- CM331 for slotting, side and face milling.
- Coromill Plura solid end mills.

Use of appropriate cutting data means that milling is carried out at cutting speeds above the range where there is a risk of built-up edge formation.

Dry milling is the first choice when milling austenitic and duplex stainless steels. When engaged in a cut the cutting edge is strongly heated, followed by cooling down when exiting the cut. Use of cutting fluid causes a more rapid cooling of the insert, which can result in a reduced tool-life due to thermal cracking of the edge.

If cutting fluid is needed (e.g. when the surface finish can not be reached in the dry condition) the cutting speed must be reduced by approximately 40-60% to prevent tool wear due to increased thermal load on the inserts. When used, cutting fluid should be supplied in large amounts around the cutting edges throughout the process.

Milling with CoroMill cutters (starting values)

Steel type	Roughing Geometry/ Grade*	Speed m/min	Finishing Geometry/ Grade*	Speed m/min
Austenitic	MM-2030	185**	ML-2030	235**
Duplex	MM-2030	155	ML-2030	195

* Sandvik Coromant inserts.
** Higher cutting speed can be used for Sanmac 4305

Parting-off and grooving

The recommendations for parting-off and grooving are applicable to most types of grooving operations in stainless steel materials. The feed should be chosen according to the width of the groove. The lowest feed value should be selected for the smallest groove width. Sandvik Coromant's system for parting-off and grooving is CoroCut.

Parting-off

Insert Geometry	Grade*	Cutting data Feed mm/rev	Cutting speed m/min
-5E or -CM	To the centre (bar)	0.05–0.20	130 (austenitic)**
	GC2145	0.05–0.20	100 (duplex)
-5E or -CM	Through wall, (hollow bar, centrum bored bar)	0.05–0.20	150 (austenitic)**
	GC2135	0.05–0.20	120 (duplex)

Alternative geometries when using T-Max Q-Cut inserts are -5F to prevent problems with vibrations and -4E under unstable conditions. Corresponding alternatives for the CoroCut system are -CF in case of vibrations and -CR at unstable conditions. Cutting data as above.

Grooving

Insert Geometry	Grade*	Cutting data Feed mm/rev	Cutting speed m/min
-5G or -GM	First choice, GC4125	0.05–0.20	170 (austenitic)**
		0.05–0.20	140 (duplex)
-4G or -GF	Second choice, GC4125	0.05–0.20	170 (austenitic)**
		0.05–0.20	140 (duplex)

* Sandvik Coromant inserts
** Higher cutting speed can be used for Sanmac 4305.

Sawing

Both band sawing and cold (circular) sawing are ideal for cutting Sanmac steels.
If there are requirements on smooth surfaces or if small sections are to be cut, cold sawing is preferable.
Band sawing is the more flexible approach, as it can cover a larger variety of sections and sizes. It is also the most cost effective, especially when using bimetal blades suited for stainless steel sawing.

For ultimate productivity in high-speed cutting and lower cost per cut, it is recommended that cemented carbide tipped blades suited for stainless steel sawing are used.
Tooth pitch (TPI) should be selected according to the dimensions of the material to be cut.

Sawing of Sanmac

Grade	Cutting data Band speed m/min	Average removal rate cm²/min	Application
Bimetal blades	25–45*	12.9–34.8*	General
Cemented carbide tipped blades	65–120*	23.9–69.0*	High productivity

* For Sanmac SAF 2205 the lower speeds and removal rates should be chosen.
For larger dimensions a slight decrease in band speed, in combination with an unchanged removal rate, is recommended.

Designation Sandvik	Chemical composition (nominal), %					Standards*					Pressure purpose		Mechanical properties		
						USA	USA	Germany	France	Europe	PED[7]	ASME	Proof strength	Tensile strength	Elongation
	C	Cr	Ni	Mo	Others	ASTM TP	UNS	W.-Nr.	AFNOR	EN	EN 10216-5		$R_{p0.2}$ MPa, min.	R_m MPa	A %, min.
Austenitic stainless steels															
3R12	≤0.030	18.5	10	–	–	304L/304	S30403/S30400	1.4306/1.4301	Z2CN18-10	1.4306/1.4301	X	X	210	515-680	45
Sandvik 3R60	≤0.030	17.5	13	2.6	–	316L/316	S31603/S31600	1.4435/1.4436	Z2CND17-13	1.4435/1.4436	X	X	220	515-690	45
3R65	≤0.030	17	11.5	2.1	–	316L/316	S31603/S31600	1.4404/1.4401	Z2CND17-12/Z6CND17-11	1.4404/1.4401	X	X	220	515-690	45
6R35	0.05	17.5	10.5	–	Ti	321	S32100	1.4541/1.4878[1]	(Z6CNT18-10)	1.4541	X	X	210	515-690	45
5R75	0.05	17	12	2.1	Ti	316Ti	S31635	1.4571	(Z6CNDT17-12)	1.4571	X	–	220	510-710	45
3R19	≤0.030	18.5	9	–	N	304LN	S30453	1.4311	(Z2CN18-10AZ)*	1.4311	X	X	270	550-750	35
3R64	≤0.030	18.5	14.5	3.1	–	317L	S31703	(1.4438)*	(Z3CND19-15-04)**	1.4438**	–	X	220	515-690	35
3R68	≤0.030	17	13	4.1	N	–	–	1.4439	–	1.4439	X	–	290	580-800	35
8R40	0.06	17.5	11	–	Nb	347	S34700	1.4550	–	1.4550	X	X	220	515-690	35
3R60 U.G.	≤0.020	17.5	14	2.6	–	316L	S31603	1.4435	(Z2CND17-12)*	1.4435	X	X	190	490-690	40
Duplex stainless steels															
Sandvik SAF 2205	≤0.030	22	5	3.2	N	–	S31803/S32205	1.4462	Z2CND22-05-03	1.4462	X	X	485	680-880	25
Sandvik SAF 2507	≤0.030	25	7	4	N	–	S32750	–	–	1.4410	X	X	550	800-1000	25
Sandvik SAF 2304	≤0.030	23	4.5	–	N	–	S32304	1.4362	Z2CN23-04AZ	1.4362	X	X	400	600-820	25
3RE60	≤0.030	18.5	4.5	2.6	Si, N	–	S31500	1.4417	Z2CND18-05-03	1.4424	X	X	450	700-880	30
High-alloy austenitic stainless steels and nickel alloys															
2RK65	≤0.020	20	25	4.5	Cu	–	N08904	1.4539	Z1NCDU25-20-04	1.4539	X	X	230	520-720	35
Sandvik Sanicro 28	≤0.020	27	31	3.5	Cu	–	N08028	1.4563	Z1NCDU31-27-03	1.4563	X	X[8]	220	550-750	40
2RE10	≤0.015	24.5	20.5	≤0.10	–	–	S31002	1.4335	Z2CN25-20	1.4335	X	X[9]	210	500-670	35
2RE69	≤0.020	25	22	2.1	N	–	S31050	1.4466[6]	Z1CND25-22AZ	1.4466	X	X	270	580-780	30
254 SMO	≤0.020	20	18	6.1	N, Cu	–	S31254	(1.4529)*	Z1CNDU20-18-06AZ	1.4547	X	X	310	655-850	35
Sandvik Sanicro 30	≤0.030	20	32	–	Ti, Al	Alloy 800	N08800	1.4558	–	1.4558	X	X[8]	205	520-690	30
Sandvik Sanicro 41	≤0.030	20	38.5	2.6	Cu, Ti	Alloy 825	N08825	2.4858	–	–	–	X	175	≥520	30
Sandvik Sanicro 69	0.02	30	60	–	Fe	Alloy 690	N06690	2.4642	NC 30FE (RCCM)	2.4642**	–	X	240	≥585	30
High-temperature grades															
2C48	0.09	23.5	–	–	N	446-2	S44600	–	–	–	–	–	275	≥450	20
4C54	≤0.20	26.5	–	–	N	446-1	S44600	1.4749	–	1.4749**	–	X	275	500-700	20
5R10	0.04	18.5	9.5	–	–	304/304H	S30400/S30409	1.4301	Z6CN18-09	1.4301/1.4948	X	X	210	515-690	45
6LR62	0.05	17	11.5	2.1	–	316, 316H	S31600/S31609	1.4401	Z6CND17-12	1.4401	–	–	205	515-790	45
8R41	0.06	16.5	13	–	Nb	–	–	1.4961	–	1.4961	X	–	205	510-690	35
7RE10	0.06	24.5	21	–	–	310S/310H	S32108/S32109	1.4845	Z12CN25-20	1.4845**	–	X	220	515-750	35
253 MA	0.08	21	11	–	Si, N, Ce	–	S30815	(1.4893)	–	1.4835**	–	X[8]	310	650-850	40
353 MA	0.07	25	35	–	Si, N, Ce	–	S35315	–	–	1.4854**	–	–	260	≥600	35
Sandvik Sanicro 31HT	0.07	21	31	–	Ti, Al	–	N08811/ N08810	1.4959[2])/ 1.4876[2])[3]	–	1.4959	X	X[8]	170	500-700	35
8RE18	0.07	22.5	14	–	–	309S/309H	S30908/S30909	1.4833	–	1.4833**	–	X	205	≥515	35
Esshete 1250	0.1	15	9.5	1.0	Mn, V, Nb, B	–	S21500	–	–	1.4982	X	–	230	540-740	35
Sandvik Sanicro 61	0.03	23	60	–	Al	–	N06601	–	–	–	–	–	205	≥550	30
Sandvik Sanicro 70	≤0.05	16.5	72.5	–	Fe	Alloy 600	N06600	2.4816	–	–	–	X	245	≥560	35
Special grades for machining															
Sanmac 304/304L	≤0.030	18.5	9	–	–	304/304L	S30400/S30403	1.4301	Z2CN18-10/Z6CN18-09	1.4301/1.4307	X	X	210	515-680	40[4]
Sanmac 316/316L	≤0.030	16.5	11	2.1	–	316/316L	S31600/S31603	1.4401/1.4404	Z2CND17-12	1.4401/1.4404	X	X	220	515-690	40[4]
Sanmac 4435	≤0.030	17.5	12.5	2.6	–	316/316L	S31600/S31603	1.4436/1.4435	Z2CND17-13	1.4436/1.4435	X	X	220	515-690	40[4]
Sanmac 4571	0.03	17	12.5	2.1	Ti	316Ti	S31635	1.4571	–	1.4571	X	–	220	510-710	35
Sanmac SAF 2205	≤0.030	21.5	4.5	3.2	N	–	S31803	1.4462	Z2CND22-05-03	1.4462	X	X	450	680-880	25
10RE51	0.04	26	5	1.3	–	–	S32900	1.4460[5]	–	1.4460	X	X	485	620-800	20
Sanmac 4305	≤0.035	17.5	9	–	S	303	S30300	1.4305	–	1.4305	X	–	215	500-700	45

[1] Valid for SEW 470
[2] DIN 17459
[3] Sandvik Sanicro 31H
[4] NFA 49-317 with min 45% can be fulfilled
[5] Valid for SEW 400
[6] 1.4465 can be certified
[7] Pressure Equipment Directive 97/23/EC
[8] Also Code Case exists
[9] Code Case exists

* In brackets, nearest equivalent steel grade
** Not applicable for tube and pipe. Only for information.

Plug the leak in your production costs

Sanmac – Cost savings through higher productivity

www.smt.sandvik.com/sanmac

SANDVIK

Sandvik Materials Technology
SE-811 81 Sandviken, Sweden, Phone: +46 26-26 30 00, Fax +46 26-26 02 20
e-mail: sanmac.smt@sandvik.com
www.smt.sandvik.com

S-02909-ENG. 03.2010. Printed by Sandvikens Tryckeri AB. Sweden.