

# SANICRO® 30 TUBE AND PIPE, SEAMLESS

DATASHEET

Sanicro® 30 is a low-carbon version of Alloy 800 austenitic nickel-iron-chromium alloy. The grade is used for steam generator tubing in nuclear stations (PWR) and other heat exchangers for temperature up to about 550°C (1020°F) where good resistance to stress corrosion cracking (SCC) and intergranular corrosion is required.

## **STANDARDS**

- UNS: N08800

- EN Number: 1.4558

- EN Name: X2NiCrAlTi32-20

W.Nr.: 1.4558

DIN: X 2 NiCrAlTi 32 20

- BS: NA15

#### Product standards

Seamless condenser and heat exchanger tubes: ASTM A213, B163, EN 10216-5

Seamless tube and pipe: ASTM A312, B407, EN 10216-5

#### Approvals

Approved for use according to ASME Boiler and Pressure Vessel Code Section III, division 1 and Section VIII, division 1 and 2

# CHEMICAL COMPOSITION (NOMINAL) %

#### Chemical composition (nominal) %

St. Comments of the state of th	Si	Mn	P	Santa State	Cr	Ni	Cu	, Ti	Al
≤0.030	0.5	0.6	≤0.020	≤0.015	20	32	≤0.10	0.5	0.3

 $Fe=Bal. \ \ The \ Co \ content \ is \ normally \ max \ 0.10\%. \ Subject \ to \ agreement, \ material \ with \ a \ lower \ Co \ content \ can \ be \ supplied.$ 

# CORROSION RESISTANCE

## General corrosion

Sanicro® 30 has approximately the same resistance to organic and inorganic acids as steel of the ASTM TP 304 type. Its resistance to sodium hydroxide is very good except at the very highest concentrations and temperatures.

#### Pitting

The material has somewhat better resistance to pitting than steel of the ASTM TP 304 type.

Intergranular corrosion and stress corrosion cracking

In comparison with the standard Alloy 800, Sanicro® 30 has improved resistance both to intergranular corrosion and to intergranular stress corrosion cracking. This is obtained by a high degree of stabilization and a production sequence giving a small grain size. The resistance to trans- granular stress corrosion cracking is very good as for all high-nickel alloys.

#### Gas corrosion

In general this grade is not used at temperatures high enough for gas corrosion to be a problem. For such cases the appropriate metal to choose is Sanicro® 31HT. However, compared with Sanicro® 31HT, Sanicro® 30 has about the same resistance to gas corrosion.

#### **BENDING**

Heat treatment after cold bending is not normally necessary, but this point must be decided with regard to the degree of bending and the operating conditions. Heat treatment, if any, should take the form of stress relieving or solution annealing.

Hot bending is carried out at 1050-850°C (1920-1560°F) and should be followed by solution annealing.

#### FORMS OF SUPPLY-FINISHES AND DIMENSIONS

#### Seamless tube and pipe

Tube and pipe are supplied hot- or cold-worked, solution-annealed and white-pickled or bright-annealed. The principal size range can be seen from Fig. 1, but also certain sizes can be delivered on request.

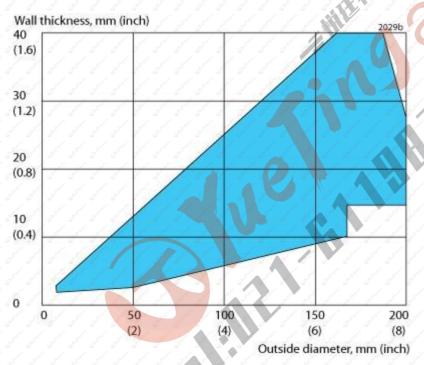


Figure 1. Principal size range for seamless tube and pipe.

## **HEAT TREATMENT**

The tubes are delivered in heat treated condition. If another treatment is needed after further processing the following is recommended.

#### Stress relieving

800-875°C (1470-1605°F), 10-15 minutes, cooling in air

#### Solution annealing

950-1050°C (1740-1920°F), 1-10 minutes, rapid cooling in water or air.

## **MECHANICAL PROPERTIES**

The figures below refer to cold-worked and annealed sizes up to 10 mm (3/8") wall thickness. For larger sizes and other finishes values are given on request.

For heat exchangers tubes, higher yield strength according to ASME Code Case N 20 can be applied. Slightly cold worked condition refers to outside diameter below 30 mm (1.2")

## AT 20°C (68°F)

## Annealed condition

# Metric units

31 <sup>1</sup> 10 <sup>2</sup>	Yield strength	The state of the s	Tensile strength	Elong. Hardness Vickers	3
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30	≥207	≥210	520-689	≥30 150	aTreament C

#### $1 MPa = 1 N/mm^2$

## Imperial units

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ksi	ksi	ksi	%	
	Statement Statem			approx.
≥30	≥31	75-100	≥30	150

Slightly cold-worked condition (O.D. max. 30 mm; 1.2")

# Metric units

Yield strengt	th	Tensile strength	Elong. Hardness Vickers
0.2% offset	1.0% offset		2" 2" " " " " " " " " " " " " " " " " "
MPa	MPa	MPa	<b>%</b>
			approx.
≥335	≥355	570-700	≥30 170

## Imperial units

Yield strength	Tensile strength	Elong. Hardness Vickers					
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# AT HIGHERTEMPERATURES

## Annealed condition

## Metric units

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200	175	195	Steel Steel Steel Steel
300	165	185	Stages Thates thates The
400	160	180	Stranger Stranger Stranger Stranger
500	150	170	Teller Statement Statement Statement
600	145	165	The Fred State of the Fred State of the Stat

# Imperial units

Tem	Temperature						Yield strength										
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# Slightly cold-worked condition

# Metric units

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100	325	y" y" y" y335," y" y" y" y" y" y" y" y"				
200	310	320 / / / /				
300	300	310				
400	290	300				
500	280	290				
600	275	285				

# Imperial units

Temperature	Yield strength	Yield strength						
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and the state of t	, min., , , , , , , , , , , , , , , , , , ,	min.						
200	/ / 47.5 / / / /	48.5						
400	/ / / 45 / / / / /	46 / 46 /						

#### Imperial units

Temperature	Yield strength	
**************************************	0.2% offset	1.0% offset
	ksi ksi	ksi
The control of the co	min.	min.
600	43.5	44.5
800	41.5	43
1000	40.5	42
1100	40 / /	41.5

# PHYSICAL PROPERTIES

Density: 8.0 g/cm3; 0.29 lb/in3

Scalingtemperature in air: 1150°C, 2100°F

# Thermal conductivity

Safeed from the	Temperature, ℃	W/(m ℃)	Temperature, °F	Btu/(ft h °F)
STAT NO.	20° 30° 30° 30° 30° 30° 30° 30° 30° 30° 3	state state state states	68	
Steffer	100	34.7. 34.7. 34.7. 34.7. 34.7.	200	are are a second at the second
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S. Profes	400	18	800	11
Selver .	500	20	1000	12
Ester <u>io</u>	600	23	1100	13 / / /

# Specific heat capacity1)

Temperature, °C	W/(m ℃)	Temperature, °F	Btu/(ft	Btu/(ft h °F)				
20	475	68	0.11	The Transfer Station of Station of Stations				
100	500	200	0.12	Statement Statement Statement Statement				
200	515	400 6 6 6 6	0.12	Statement Statement Statement Statement				
300 36 36 36 36	525	g <sup>th</sup> gf 600 gf gf gf gf gf	0.13	Statement Statement Statement Statement				
400	525	9 <sup>1</sup> 9 <sup>1</sup> 800 9 <sup>1</sup> 9 <sup>1</sup> 9 <sup>1</sup> 9 <sup>1</sup>	0.13	Statement Statement Statement Statement				
500	535	1000	0.13	Sterios Sterios Sterios Sterios				
600	585	31100 and 32 and 34 and 34 and 34	0.14	Statem Statem Statem Statem				

<sup>1)</sup> Meanvalues

# Resistivity

Temperature, °C	ω μΩm	Temperature, ℉	μΩin.
20 31 31 31 31	0.99	68	39 5 5 5
100	1.01	200	39.5
200	1.03	400	40.5
300	1.05	600	41.5
400	1.08	800	43
500	.1.12	1000	45

#### Resistivity

Temperature, °C	μΩm	Temperature, ℉	μΩin.
600	1.18	1100	46

#### Thermal expansion1)

Temperature, ℃	Per °C	Temperature, °F	Per °F
20-100	16,4	68-200	9, , ,
20-200	16,4 ,4 ,4	68-400	9
20-300	16 gard 3 garde 3 garden	68-600	9 , 1 , 1 , 1 , 1 , 1
20-400	/16.5 / //	68-800	9 Andrew Statement Statement Statement
20-500	16.5	68-1000	9 July Bridge State State
20-600	34. 17 State State State State	68-1100	9.5 34.000 34.000 34.000

<sup>1)</sup> Meanvalues (x10-6)

#### Modulus of elasticity1)

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STraT'	400	Skaling	Stelms	Shefin	Stratus	Staffer	Stratus	Status	States	Stration	Staling	State	175	600	3 1	State	States States	States	Status Status	26.1	Status	Station State
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<sup>1) (</sup>x103)

# WELDING

The weldability of Sanicro® 30 is good. Suitable methods of fusion welding are manual metal-arc welding (MMA/SMAW) and gas-shielded arc welding, with the TIG/GTAW method as first choice.

Since the material has low thermal conductivity and high thermal expansion. Welding plans should therefore be carefully selected in advance, so that distortions of the welded joint are minimized. If residual stresses are a concern, solution annealing can be performed after welding.

For Sanicro® 30, heat-input of <1.0 kJ/mm and interpass temperature of <100°C (210°F) are recommended. A string bead welding technique should be used.

Recommended filler metals for temperature TIG/GTAW or MIG/GMAW welding

ISO 18274 S Ni 6082/AWS A5.14 ERNiCr-3 (e.g. Exaton Sanicro 72 HP) MMA/SMAW welding

ISO 14172 E Ni 6182/AWS A5.11 ENiCrFe-3 (e.g. Exaton Sanicro 71)

Disclaimer: Recommendations are for guidance only, and the suitability of a material for a specific application can be confirmed only when we know the actual service conditions. Continuous development may necessitate changes in technical data without notice. This datasheet is only valid for Sandvik materials.

