Sanicro® 625
Bar
Datasheet

Solid Bar

Sanicro®625 is an extremely versatile nickel-chromium-molybdenum-niobium alloy, suitable for use in severely corrosive environments requiring high strength materials.

Service temperatures ranging from cryogenic to 593°C (1100°F).

Grade characteristics

Excellent

- Corrosion resistance in widely varying acidic and chloride containing environments
- Resistance to general corrosion, pitting, and crevice corrosion
- Resistance to corrosion in hydrogen sulfide environments

Extremely good

- Resistance to chloride-induced stress corrosion cracking

Very high

- Strength within the recommended service temperatures

Very good

- Welding properties

Material designations

- ASTM: UNS N06625 Grade 1
- UNS: N06625
- EN Number: 2.4856

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Product standards

- ASTM B-446 (Grade 1) / ASME SB-446 (Grade 1)
- ANSI/NACE MR0175 / ISO 15156-3
- ANSI/NACE MR0103 / ISO 17945-1
- ISO14067:2018 (CO2e)

Chemical composition and mechanical properties only

ASTM B-564 / ASME SB-564

Approvals

- Pressure Equipment Directive / PED (2014/68/EU)
- Pre-approval for PMA, D≤254 mm
- Approved by the American Society of Mechanical Engineers (ASME) for use in accordance with ASME Boiler and Pressure Vessel Code, Section I, Section III Div. 1 classes 1 and 3, Section VIII div.1.

Climate change impact

Carbon footprint / CO2e data (kg/ton) and Life Cycle Assessment report is available for these products in the range of D 75-230 mm (D3.00”-9.05”).

Material Test Certificate

According to EN 10204/3.1

Chemical composition (nominal)

Chemical composition (nominal) %

C	Si	Mn	P	S	Cr	Ni	Mo	Fe	Nb	Co	Ti	Al
<0.025	<0.50	<0.50	<0.015	<0.015	21	62	8.5	<5	3.5	<1.0	0.2	<0.40

Pitting Resistance Equivalent Number, (PRE) >48.

Applications

Examples of applications for Sanicro® 625

Environmental projects

- Waste-to-Energy production
- Pollution control equipment
- Refuse-derived fuel plants

Renewable energy

- Solar power plants
- Geothermal power
- Bio-fuel production

Oil & Gas / Refinery

- Well construction and service
- Gas lift equipment
- Wellheads and Christmas trees

Chemical processing

- Phosphoric acid production
- Pickling operations

Marine applications

- Drivetrain components
- Offshore piping systems
- Seawater coolant in industries

Corrosion resistance

General corrosion

Sanicro®625 offers excellent resistance to both reducing, oxidizing, and in mixed corrosive environments. The resistance to marine corrosion / sea water is particularly good.

Intergranular corrosion

Sanicro®625 is stabilized against intergranular attack by the niobium content,
and the extra low carbon content. The resistance to IGC is tested acc. to ASTM G-28 Method A (Streicher test).
Criteria: Max. 3mm / year.

Stress Corrosion Cracking

The nickel content of Sanicro®625 is at 62 % which promotes an excellent resistance to stress corrosion cracking induced by both chlorides and alkalis.
This makes it virtually immune to chloride-induced SCC, and the resistance to cracking in the presence of H2S and chlorides is very high. According to NACE MR 0175 / ISO 15156-3 it is acceptable for use in the oil and gas industry with no environmental limits in respect of partial pressures of H2S or elemental sulfur.

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Pitting and crevice corrosion

Sanicro®625 have an extraordinary resistance to pitting and crevice corrosion in seawater at a variety of temperatures. With PRE number ≥48, Sanicro®625 is one of the grades which is least susceptible to these types of corrosion.

Forms of supply

Diameters and finished condition

Sanicro®625 is stocked in imperial dimensions.
Diameter range: 76.2mm-228.6mm (3”-9”)
Delivery condition: Soft annealed, peel-turned and ground to final finish.

Lengths

Bars are delivered in random lengths of 3-6.9 m, depending on diameter.

Straightness, metric units

Height of arch, 2 mm/m

Tolerances, metric units

Diameter tolerances: -0 / +0.79 mm
Surface finish: Ra, max. 3µm

Heat treatment

The Sanicro®625 stock program bars are delivered in soft annealed and quenched condition. Annealing at min. 910°C (1670°F) followed by quenching in water.

Mechanical properties

Tensile strength

Min. values at room temperature:

Dimension	Proof strength Rp0.2	Tensile strength Rm	Elongation A5
D≤101.9mm	415 MPa / 60 ksi	830 / 120 ksi	30%
D>101.9mm	345 MPa / 50 ksi	760 / 110 ksi	30%

Impact strength

-60°C Min. values	Longitudinal	Transversal (D>60mm)
Average	68J	47J
Single	61J	41J

Hardness

Hardness in the delivery condition is max. 35 HRC.

Physical properties

Density, at 20°C: 8.4 g/cm^3, 0.31 lb/in^3

Thermal conductivity

Temperature, °C	W/(m °C)	Temperature, °F	Btu/(ft h°F)
20	9.8	68	5.7
100	10.8	200	6.2
200	12.5	400	7.2
300	14.1	600	8.2
400	15.7	800	9.1
500	17.5	1000	10.1
600	19	1200	11
700	20	1400	12
800	22.8	1600	13.2
900	25.2	1800	14.6

Specific heat capacity

Temperature, °C	J/(kg °C)	Temperature, °F	Btu/(lb °F)
20	410	68	0.10
100	427	200	0.10
200	455	400	0.11
300	475	600	0.12
400	505	800	0.12
500	525	1000	0.13
600	550	1200	0.14
700	575	1400	0.14
800	600	1600	0.15
900	625	1800	0.15

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Thermal expansion, mean values in temperature ranges (x10^{-6})

Temperature, C	Per °C	Temperature, °F	Per °F
30-100	12.5	86-200	7
30-200	13	86-400	7.5
30-300	13.5	86-600	7.5
30-400	13.5	86-800	7.5
30-500	14	86-1000	8
30-600	14	86-1200	8
30-700	15	86-1400	8.5
30-800	15.5	86-1600	9
30-900	16	86-1800	9

Resistivity

Temperature, °C	µΩm	Temperature, °F	µΩin.
20	1.30	68	51.2
100	1.32	200	52.0
200	1.34	400	52.8
300	1.35	600	53.2
400	1.36	800	53.5
500	1.37	1000	54.3
600	1.38	1200	54.3
700	1.38	1400	54.0
800	1.38	1600	53.5
900	1.38	1800	53.1

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Modulus of elasticity (x10^3) (annealed condition)

Temperature, °C	MPa	Temperature, °F	ksi
20	208	68	30
100	203	200	29.5
200	198	400	28.5
300	193	600	28
400	187	800	27
500	181	1000	26
600	174	1200	24.5
700	166	1400	23.5
800	156	1600	21.5

Modulus of elasticity (x10^3) (solution annealed condition)

Temperature, °C	MPa	Temperature, °F	ksi
20	205	68	29.5
100	200	200	29
200	194	400	28
300	188	600	27
400	182	800	26
500	176	1000	25
600	169	1200	24
700	162	1400	23
800	154	1600	21.5

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Welding

The weldability of Sanicro® 625 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.

For Sanicro® 625, heat-input of <1.2 kJ/mm and interpass temperature of <100°C (210°F) are recommended. A string bead welding technique should be used.

Recommended filler metals

TIG/GTAW or MIG/GMAW welding:
ISO 18274 S Ni 6625/AWS A5.14 ERNiCrMo-3 (e.g. Exaton Ni60)

MMA/SMAW welding:
ISO 14172 E Ni 6625/AWS A5.11 ENiCrMo-3 (e.g. Exaton Ni60)

Machining

General

Machining is an expression used for a number of subtractive manufacturing methods. Mainly turning, milling, drilling. But also other operations like cutting, boring, grinding, reaming and tapping.

For solid bars the initial operations primarily are cutting and external turning to prepare a blank for component manufacturing.

Nickel alloys

Materials within the ISO-S material area are challenging to machine.

The materials vary a lot within the ISO-S group, but in general presents difficult chip control, high cutting forces and tool wear.

In order to get as efficient function and tool life as possible, dedicated cutting tools and strategies to be used.

Getting started

To get it right, the first thing is to know the material to be machined.

As the material properties are input to the selection of start values.

- ISO material group
- Condition/heat treatment
- Actual hardness of the material lot

Consult your cutting tool supplier for start recommendations, since the choice of cutting tools and machine tool set the direction for which start values to use.

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