Sanicro® 61
Tube and pipe, seamless
Datasheet

Sanicro® 61 is a nickel-chromium alloy characterized by:

- Good strength at high temperatures
- Excellent resistance to high temperature corrosion, particularly in oxidizing conditions

The alloy is suitable for a wide range of applications where resistance to both heat and corrosion is a requirement.

Standards

- UNS: N06601

Product standards

- ASTM B167
- ASME SB167

Chemical composition (nominal)

Chemical composition (nominal) %

C	Si	Mn	P	S	Cr	Ni
0.03	0.3	0.6	≤0.025	≤0.015	23	60

Others:
Al=1.3

Applications

Sanicro® 61 is a general-purpose, highly corrosion resistant alloy suitable for a wide range of high temperature applications such as:

- Muffle tubing
- Recuperators
- Superheaters
- Thermocouple protection tubes

Corrosion resistance

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Sanicro® 61 has superior resistance to, in particular, oxidation at high temperatures up to 1200°C (2200°F). The grade also offers excellent resistance to oxide scaling under cyclic thermal conditions, largely owing to the addition of aluminium.

Forms of supply

Sanicro® 61 seamless nickel alloy tubing is supplied bright annealed in the outside diameter range 27.67-48.3 mm (0.75-1.5 in. nominal) and wall-thickness range 2.0-4.0 mm (0.079-0.160 in.).

Tolerances

Size OD, mm	Tolerances OD, mm	Wall thickness %
26.67-48.3	+0.4/-0.8	+/-10

Mechanical properties

At 20 °C (68 °F)

Proof strength		Tensile strength		Elong.
$R_{p0.2}$ [1)]		R_m		$A_{2"}$
MPa	ksi	MPa	ksi	%
≥205	≥30	550-760	80-110	≥30

1 MPa = 1 N/mm^2
1) $R_{p0.2}$ corresponds to 0.2% offset yield strength

Physical properties

Density, at 20 °C; 68°F : 8.1 g/cm^3, 0.29 lb/in^3

Thermal conductivity

Temperature, °C	W/(m °C)	Temperature, °F	Btu/(ft h°F)
20	11.2	68	6.5
100	12.7	200	7.3
200	14.3	400	8.3
300	16.0	600	9.4
400	17.7	800	10.5
500	19.5	1000	11.6
600	21.0	1200	12.8
700	22.8	1400	13.8
800	24.4	1600	14.8

900	26.1	1800	15.8
1000	27.8	2000	16.9

Specific heat capacity

Temperature, °C	J/(kg °C)	Temperature, °F	Btu/(lb °F)
20	448	68	0.11
100	469	200	0.11
200	498	400	0.12
300	523	600	0.13
400	548	800	0.13
500	578	1000	0.14
600	603	1200	0.15
700	632	1400	0.16
800	657	1600	0.16
900	686	1800	0.17
1000	712	2000	0.18

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

Temperature, °C	Per °C	Temperature, °F	Per °F
30-100	13.8	86-200	7.6
30-200	14.4	86-400	8.0
30-300	14.6	86-600	8.1
30-400	14.8	86-800	8.3
30-500	15.2	86-1000	8.5
30-600	15.6	86-1200	8.9
30-700	16.1	86-1400	9.2
30-800	16.7	86-1600	9.5
30-900	17.2	86-1800	9.8
30-1000	17.8	86-2000	10.2

Resistivity

Temperature, °C	µΩm	Temperature, °F	µΩin.

20	1.18	68	46.5
100	1.19	200	46.9
200	1.21	400	47.6
300	1.22	600	48.1
400	1.23	800	48.5
500	1.24	1000	48.9
600	1.25	1200	49.2
700	1.25	1400	49.2
800	1.25	1600	49.3
900	1.26	1800	49.6
1000	1.26	2000	49.9

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

Temperature, °C	MPa	Temperature, °F	ksi
20	207	68	30.0
100	202	200	29.4
200	197	400	28.5
300	191	600	27.6
400	185	800	26.6
500	178	1000	25.4
600	170	1200	24.1
700	161	1400	22.5
800	150	1600	20.5
900	138	1800	18.4
1000	125	2000	16.2

Welding

The weldability of Sanicro® 61 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® 61, 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 6601/AWS A5.14 ERNiCrFe-11

ISO 18274 S Ni 6617/AWS A5.14 ERNiCrCoMo-1 (e.g. Exaton Ni53)

MMA/SMAW welding

ISO 14172 E Ni 6117/AWS A5.11 ENiCrCoMo-1

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