

310S / 1.4845

Material no. 1.4845 · X8CrNi25-21 · High-temperature austenitic stainless to 1150 °C

Material group: Heat-resistant austenitic stainless steel (25-20 Cr-Ni type)

Material no. (EN): 1.4845

EN designation: X8CrNi25-21

UNS / AISI: UNS S31008 / AISI 310S

ASTM / ASME equivalent: Pipes: A/SA 312 TP310S · A/SA 213 TP310S · Fittings: A/SA 403 WP310S · Flanges: A/SA 182 F310

Service temperature: Up to +1150 °C (air, oxidising) · pressure service up to ~800 °C

Standards (pipes): EN 10216-5 · ASTM A312 / A213 · VdTÜV 412

Standards (fittings): EN 10253-4 · ASTM A403 WP310S · ASME B16.9

Forms (Nirotec): Elbows · tees · reducers · caps · flanges · custom parts

1 Material Equivalents & Comparable Grades

National equivalents

Standard / region	Designation	Material no. / Grade	Remark
EN	X8CrNi25-21	1.4845	Current European designation
UNS	310S	S31008	ASTM/ASME designation
AISI	310S	–	US designation
ASTM/ASME	A/SA 312 TP310S	UNS S31008	Pressure pipes
ASTM/ASME	A/SA 213 TP310S	UNS S31008	Boiler / superheater tubes
ASTM/ASME	A/SA 403 WP310S	UNS S31008	Buttweld fittings
ASTM/ASME	A/SA 182 F310	UNS S31008	Forgings, flanges
JIS	SUS 310S	–	Japanese equivalent

Alternative materials

Material	Material no.	Reference / use	Note
310 (regular C) / 1.4841	1.4841	Higher C, higher creep strength	Above 1000 °C continuous
347H / 1.4961	1.4961	Lower temperature, creep	Up to 700 °C, power plants
Alloy 800H / 1.4876	1.4876	Nickel-base, best carburisation resistance	Up to 1100 °C complex

Material	Material no.	Reference / use	Note
Alloy 253 MA	1.4835	Si+Ce, similar heat	Alternative for cyclic loading

2 Chemical Composition

Composition in mass percent (%). Standard: EN 10216-5 / ASTM A312. 310S is the weldable variant (S = Low Carbon) of the classic 25-20 high-temperature stainless. The high Cr and Ni content forms a dense and stable oxide scale, giving excellent resistance to high-temperature oxidation in air and sulphur-free atmospheres.

Element	Symbol	Min. (heat)	Max. (heat)	Max. (product)	Function / remark
Carbon	C	–	0.10	0.10	S = low C content for weldability
Silicon	Si	–	1.50	1.50	Oxidation resistance
Manganese	Mn	–	2.00	2.00	Limit
Phosphorus	P	–	0.045	0.045	Impurity limit
Sulfur	S	–	0.015	0.015	Impurity limit
Chromium	Cr	24.0	26.0	26.0	High-temperature oxidation resistance
Nickel	Ni	19.0	22.0	22.0	Austenite stabiliser, carburisation resistance
Nitrogen	N	–	0.11	0.11	Limit

3 Mechanical Properties

Solution annealed – minimum requirements (EN 10216-5)

310S is solution annealed at 1050–1150 °C and rapidly cooled.

Property	Symbol	Unit	Minimum value	Remark
Yield strength 0.2 %	Rp0.2	MPa	≥ 210	Solution annealed
Tensile strength	Rm	MPa	490 – 740	Standard
Elongation at fracture	A	%	≥ 35	Longitudinal specimens
Impact energy (20 °C)	KV	J	≥ 100	Mean value
Hardness	HB	–	≤ 225	Solution annealed
Scaling temperature	T _{scale}	°C	≈ 1150	Air, continuous

Hot yield strength Rp0.2 in MPa (typical values per standard)

Temperature	100 °C	400 °C	600 °C	800 °C	1000 °C
Rp0.2 (MPa)	165	127	115	98	59

4 Physical Properties

Property	Symbol	20 °C	400 °C	800 °C	Unit
Density	ρ	7.90	7.80	7.65	g/cm ³
Modulus of elasticity	E	200	174	145	GPa
Thermal conductivity	λ	15.0	19.0	23.0	W/(m·K)
Coeff. thermal expansion	α	15.9	17.0	18.5	10 ⁻⁶ /K
Specific heat capacity	cp	500	555	610	J/(kg·K)

5 Corrosion Resistance

Medium / environment	Remark	Resistance
High-temperature oxidation in air	Resistant to 1150 °C (continuous)	++
Hot oxidising atmosphere	Stable Cr oxide layer	++
Carburising atmosphere	Very good resistance (high Ni content)	++
Reducing atmosphere	Good resistance	+
Nitrogen oxides / nitric acid	Resistant	+
Hot sulphur-bearing atmosphere	Limited resistance – sulphidation	o
Cyclic temperature loading	Resistant, but consider thermal expansion	o
σ -phase precipitation 550–950 °C	Embrittlement risk after long exposure	o
Hot halogens (Cl ₂ , F ₂)	Not resistant	-
Molten salts / salt hydrates	Not resistant	-

++ excellent resistance + good resistance o limited resistance - not resistant

310S is the standard high-temperature material for oxidising atmospheres up to 1150 °C. Pressure applications are limited by creep strength to about 800 °C. For sulphur-bearing atmospheres: prefer nickel-base alloys (Alloy 800H, 600).

6 Typical Applications

Industry / plant	Typical application	Operating condition
Industrial furnaces	Muffle furnaces, roller-hearth furnaces, radiant tubes	Up to 1150 °C in air
Heat-treatment plants	Hardening furnaces, annealing furnaces	High-temperature atmosphere
Petrochemical	Cracker coils, splitter tubes	High-temperature process gases

Industry / plant	Typical application	Operating condition
Cement industry	Burner technology, flue-gas piping	Hot aggressive atmosphere
Glass industry	Melting-furnace components	Melting and processing temperatures
Reformer / syngas	Hot-gas piping, headers	Up to ~900 °C

7 Forms Available at Nirotec

Component	Standard (EN)	Standard (ASME/ASTM)	Remark
Elbows	EN 10253-4	ASME B16.9 · A403 WP310S	LR/SR, 90°/45°
Tees	EN 10253-4	ASME B16.9 · A403 WP310S	Equal and reducing branch
Reducers	EN 10253-4	ASME B16.9 · A403 WP310S	Concentric and eccentric
Caps	EN 10253-4	ASME B16.9 · A403 WP310S	Hemispherical caps
Weld neck flanges	EN 1092-1 Type 11	ASME B16.5 · A182 F310	PN 10 – PN 400 / Class 150 – 2500
Custom parts	Per drawing	Per drawing	Custom geometries on request

8 Standards, Approvals & Codes

Standard / code	Title / application
EN 10216-5	Seamless tubes for pressure purposes – stainless steels
EN 10095	Heat-resistant steels and nickel alloys
EN 10253-4	Butt-welding fittings – austenitic stainless steels
EN 1092-1	Flanges and their joints
VdTÜV 412	X8CrNi25-21 – material data sheet
ASTM A312 / A213	Pressure pipes / high-temperature tubes
ASTM A403 WP310S	Buttweld fittings
ASTM A182 F310	Forgings, flanges
AD 2000-W2 / W10	Steels for high-temperature service
PED 2014/68/EU	Pressure Equipment Directive

9 Processing Notes

Weldability

Parameter	Specification / recommendation	Remark
Preheat	Not required	No preheat for austenitics
Post-weld heat treatment	Generally not required	If required: solution anneal 1050–1150 °C
Filler metal	ER310 / E310-XX (AWS A5.9 / A5.4)	Matching filler, or ERNiCrMo-3 (Inconel) for dissimilar joints
Welding processes	GTAW, GMAW, SMAW	Low heat input recommended
Interpass temperature	≤ 150 °C	Prevents hot cracking and σ -phase

- Delivery condition: solution annealed (1050–1150 °C) + water quenched
- Long exposure at 550–950 °C: σ -phase precipitation possible – room-temperature embrittlement
- Identification per EN 10216-5: heat no., 1.4845 / 310S, standard, dimensions
- Not resistant in sulphur-bearing atmosphere (sulphidation)
- Under cyclic high-temperature loading: consider thermal expansion

10 Inquiry & Contact

For a project-specific inquiry we ideally require:

- Standard and type (e.g. ASTM A403 WP310S LR 90°)
- Highest operating temperature and atmosphere (oxidising/reducing)
- Dimensions: DN / NPS, wall thickness or schedule
- Quantity and required delivery date
- Required documentation (EN 10204 type 3.1 / 3.2, NDT)
- Cyclic or constant loading? Atmosphere pure / contaminated?

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