X2CrNiMoN25-7-4 (Super Duplex 2507)

Mat. No. 1.4410 · Austenitic-ferritic super-duplex stainless steel

Mat. No.: 1.4410

EN designation: X2CrNiMoN25-7-4

Trade name: SAF 2507® (Sandvik) · Ferralium 255 (similar)

ASTM/ASME equiv.: Pipes: A/SA 790 S32750 · Fittings: A/SA 815 S32750 · Flanges: A/SA 182 F53

Advantage over Duplex 2205: Higher Cr (25 %), Mo (4 %), N – PREN ~43 – for more aggressive service

PREN value: > 42

Temperature range: −50 °C to +300 °C · embrittlement risk above 300 °C

Standard: EN 10216-5 · EN 10253-4

Delivery forms: Elbows · Tees · Reducers · Caps · Flanges · Pipes

1 Material Equivalents & Comparable Grades

International Equivalents

Standard / Region	Designation	Mat. No. / Grade	Note
EN	X2CrNiMoN25-7-4	1.4410	Current European designation
ASTM	A/SA 790 S32750	–	Pipes
ASTM	A/SA 815 S32750	–	Fittings
ASTM	A/SA 182 F53	–	Flanges
UNS	S32750	–	US material number
Trade name	SAF 2507® (Sandvik)	–	Most widely known trade name

Alternative Materials

Material	Mat. No.	Relation to X2CrNiMoN25-7-4 (Super Duplex 2507)	When to use
Duplex 2205 (1.4462)	1.4462	PREN ~35, lower cost	When PREN 35 is sufficient
6Mo (1.4529)	1.4529	Fully austenitic, PREN ~42	No embrittlement risk, better weldability
Alloy 625 (2.4856)	2.4856	PREN > 70	For the most aggressive service

2 Chemical Composition

Values in mass percent (%). Standard: EN 10216-5.

Super Duplex 2507 has higher Cr (25 %), Mo (4 %) and N (0.3 %) vs. Duplex 2205. This results in PREN > 42 and significantly better corrosion resistance. Max. 300 °C due to sigma phase and 475 °C embrittlement.

Element	Sym.	Min. (Heat)	Max. (Heat)	Max. (Prod.)	Function
Carbon	C	–	0.030	0.035	Very low C
Chromium	Cr	24.00	26.00	26.30	Higher than 2205: more passive protection
Molybdenum	Mo	3.50	4.50	4.70	Higher than 2205: PREN increase
Nickel	Ni	6.00	8.00	8.20	Austenite stabiliser
Nitrogen	N	0.240	0.320	0.340	Austenite stabilisation + PREN contribution

3 Mechanical Properties

Room Temperature – Minimum Requirements

Solution annealed. Significantly higher yield strength than austenitic grades.

Property	Sym.	Unit	Min. Value	Note
Yield strength	Rp0.2	MPa	≥ 550	approx. 2.7× higher than 316L
0.1% proof strength	Rp1.0	MPa	≥ 620	–
Tensile strength	Rm	MPa	750–1000	–
Elongation	A	%	≥ 25	–
Impact (−50 °C)	KV	J	≥ 40	–
Hardness	HB	–	≤ 310	–

Elevated Temperature Yield Strength Rp0.2 in MPa (indicative values)

Temp.	50 °C	100 °C	150 °C	200 °C	250 °C	300 °C
Rp0.2 (MPa)	515	480	455	430	405	380

4 Physical Properties

Property	Sym.	20 °C	200 °C	400 °C	Unit
Density	ρ	7.80	7.70	7.60	g/cm³
Modulus of elasticity	E	200	191	183	GPa
Thermal conductivity	λ	14	16	18	W/(m·K)
Thermal expansion	α	13.0	13.5	14.0	10^{-6}/K

5 Corrosion Behaviour

Medium / Environment	Notes	Rating
Seawater / offshore	PREN > 42 – even during stagnation	++
Hot concentrated chloride solutions	Superior to Duplex 2205	++
Stress corrosion cracking (SCC)	Very good – better than Duplex 2205	++
H_2S service (NACE)	Suitable per NACE MR0175	+
Dilute organic acids	Chemical industry	+
Temperatures > 300 °C	Sigma phase + 475 °C embrittlement – not suitable	–

++ excellent	+ good	o limited	– not suitable

Super Duplex 2507 (PREN ~43) vs. Duplex 2205 (PREN ~35): wherever 2205 reaches its corrosion limits, 2507 is the natural escalation. Max. 300 °C – same limitation as 2205.

6 Typical Applications

Industry / Plant	Typical Application	Operating Conditions
Offshore subsea	Flowlines, umbilicals, manifolds, risers	Seawater + H_2S + CO_2 + high pressure
Seawater desalination	SWRO piping	Maximum chloride loading
Chemical industry	Most aggressive chloride media	Where 2205 fails
Oil & gas (onshore)	Production lines sour service	NACE-compliant under most aggressive conditions
Pulp & paper	High-Cl bleaching plants	PREN > 40 required

7 Delivery Forms at Nirotec

Component	Standard (EN)	Standard (ASME/ASTM)	Note
Elbows	EN 10253-4	ASME B16.9 · A/SA 815 WPS32750	LR/SR, 90°/45°
Tees	EN 10253-4	ASME B16.9 · A/SA 815 WPS32750	Equal and reducing
Reducers	EN 10253-4	ASME B16.9 · A/SA 815 WPS32750	Concentric and eccentric
Caps	EN 10253-4	ASME B16.9 · A/SA 815 WPS32750	Ellipsoidal

Flanges	EN 1092-1	ASME B16.5 · A/SA 182 F53	On request
Pipes	EN 10216-5	A/SA 790 S32750	Seamless

8 Standards, Approvals & Codes

Standard / Code	Title / Application
EN 10216-5	Seamless stainless steel tubes
EN 10253-4	Butt-welding fittings – austenitic-ferritic
NACE MR0175 / ISO 15156	Sour service
PED 2014/68/EU	Pressure Equipment Directive
ASME B31.3	Process Piping

9 Fabrication Notes

Weldability

Parameter	Requirement / Recommendation	Note
Preheat	Not required	Duplex
Heat input	Max. 1.5 kJ/mm – even stricter than 2205	Too high → sigma phase; too low → excess ferrite
PWHT	Solution anneal 1060–1120 °C (if required)	Restores microstructure
Filler	2509 (S32750-type)	Overalloyed for microstructure balance
Ferrite content	Target: 35–65 %	Ferritescope check after welding

- Delivery condition: Solution annealed
- Welding parameters even more critical than for Duplex 2205 – strict WPS required
- Ferrite content 35–65 % – metallographic check recommended
- Pickling and passivation after welding mandatory

10 Enquiry & Contact

For a project-specific quotation, please provide:

- Standard and execution (e.g. LR 90° elbow per EN 10253-4)
- Dimensions: DN / NPS and wall thickness or schedule
- Quantity and requested delivery date
- Documentation: EN 10204 Type 3.1 / 3.2, NDT, third-party inspection
- Any project-specific specifications or special requirements

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All information is provided without warranty. Applicable standards and project specifications at time of order are authoritative.