

Inconel® 625

Material no. 2.4856 · NiCr22Mo9Nb · Nickel-base alloy

Material group: Nickel-base alloy, solid-solution strengthened

Material no. (EN): 2.4856

EN designation: NiCr22Mo9Nb

UNS / ASME: UNS N06625

Trade names: Inconel® 625, Nicrofer® 6020 hMo, Alloy 625

ASTM / ASME equivalent: Pipes: A/SA 312 (welded) / B444 (seamless) / B705 · Fittings: B366 WPNCMC · Flanges: B564

Service temperature: −196 °C to +650 °C (continuous service); short term to 900 °C

Standards (pipes): EN 10216-5 · VdTÜV 499 · ASTM B444 / B705 / B704

Standards (fittings): EN 10253-4 · ASTM B366 · 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	NiCr22Mo9Nb	2.4856	Current European designation
UNS	Alloy 625	N06625	ASTM/ASME designation
DIN (old)	NiCr22Mo9Nb	2.4856	Identical, unchanged
ASTM/ASME	A/SA B444 / B705	UNS N06625	Seamless / welded pipes
ASTM/ASME	A/SA B366 WPNCMC	UNS N06625	Buttweld fittings
ASTM/ASME	A/SA B564	UNS N06625	Forgings, flanges
Trade names	Inconel® 625, Nicrofer® 6020 hMo	–	Common trade names

Alternative materials

Material	Material no.	Reference / use	Note
Inconel 825 / 2.4858	2.4858	Lower cost, similar corrosion	Up to ~540 °C
Hastelloy C-276 / 2.4819	2.4819	Superior in reducing acids	Aggressive HCl, H ₂ SO ₄
Alloy 22 / 2.4602	2.4602	Higher Mo/Cr content	Strongly oxidising chloride media

Material	Material no.	Reference / use	Note
Inconel 718 / 2.4668	2.4668	Precipitation hardened, much higher strength	High-strength applications

2 Chemical Composition

Composition in mass percent (%). Standard: ASTM B443 / B444 / VdTÜV 499. Inconel 625 is a solid-solution strengthened nickel-chromium-molybdenum alloy.

Element	Symbol	Min. (heat)	Max. (heat)	Max. (product)	Function / remark
Nickel	Ni	58.0	–	–	Matrix, base element
Chromium	Cr	20.0	23.0	23.0	Corrosion resistance, oxidation
Molybdenum	Mo	8.0	10.0	10.0	Pitting resistance, strength
Niobium+Tantalum	Nb+Ta	3.15	4.15	4.15	Precipitation strengthening
Iron	Fe	–	5.0	5.0	Residual
Cobalt	Co	–	1.0	1.0	Residual
Carbon	C	–	0.10	0.10	Limit for weldability
Manganese	Mn	–	0.50	0.50	Limit
Silicon	Si	–	0.50	0.50	Limit
Phosphorus	P	–	0.015	0.015	Impurity limit
Sulfur	S	–	0.015	0.015	Impurity limit
Aluminium	Al	–	0.40	0.40	Limit
Titanium	Ti	–	0.40	0.40	Limit

3 Mechanical Properties

Annealed condition – minimum requirements (Grade 1, annealed)

Grade 1 (annealed) per ASTM B444 is the typical condition for piping and fittings. Grade 2 (solution annealed) has lower yield but higher elongation and is used for higher temperatures.

Property	Symbol	Unit	Minimum value	Remark
Yield strength 0.2 %	Rp0.2	MPa	≥ 414	Grade 1, annealed
Yield strength 0.2 %	Rp0.2	MPa	≥ 276	Grade 2, solution annealed
Tensile strength	Rm	MPa	≥ 827	Grade 1
Tensile strength	Rm	MPa	≥ 690	Grade 2
Elongation at fracture	A	%	≥ 30	Longitudinal specimens

Property	Symbol	Unit	Minimum value	Remark
Impact energy (20 °C)	KV	J	≥ 60	Reference value
Hardness	HB	–	≤ 240	Reference value, annealed

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

Temperature	100 °C	200 °C	300 °C	400 °C	500 °C	600 °C	650 °C
Rp0.2 (MPa)	370	340	315	295	285	275	270

4 Physical Properties

Property	Symbol	20 °C	200 °C	400 °C	600 °C	Unit
Density	ρ	8.44	8.36	8.25	8.13	g/cm ³
Modulus of elasticity	E	207	199	184	169	GPa
Thermal conductivity	λ	9.8	11.7	14.0	16.1	W/(m·K)
Coeff. thermal expansion	α	12.8	13.1	13.7	14.4	10 ⁻⁶ /K
Specific heat capacity	cp	410	440	475	510	J/(kg·K)

5 Corrosion Resistance

Medium / environment	Remark	Resistance
Seawater, brine	Excellent pitting and crevice resistance, PREN ~50	++
Sulphuric acid (dilute, hot)	Resistant up to medium concentrations	+
Hydrochloric acid (dilute)	Good resistance at low concentrations	+
Phosphoric acid	Resistant across full concentration range	++
Nitric acid	Good resistance, oxidising conditions	++
Caustic alkalis (NaOH)	Excellent up to high concentration	++
Stress-corrosion cracking (Cl ⁻)	Highly resistant – key advantage over austenitic stainless	++
High-temperature oxidation	Stable oxide layer up to 980 °C	++
Sulphidising atmospheres	Limited at high temperatures	o
Hydrofluoric acid	Not recommended at elevated concentration	–

++ excellent resistance

+ good resistance

o limited resistance

– not resistant

Inconel 625 combines high resistance to pitting, crevice and stress-corrosion cracking with excellent strength up to 650 °C – the standard choice where austenitic stainless or duplex grades fail.

6 Typical Applications

Industry / plant	Typical application	Operating condition
Offshore / marine	Subsea piping, umbilicals, manifolds, riser components	Seawater, sour service
Chemical / pharmaceutical	Reactors, scrubbers, heat exchangers, acid piping	Mixed-acid environments
Power generation (FGD)	Flue-gas desulphurisation, scrubber piping	Acidic, chloride-loaded gases
Aerospace	Combustion / exhaust components, bellows	Up to ~650 °C continuous
Nuclear	Reactor internals, control rod components	Per ISO 19443 / RCC-M
Oil & gas (sour service)	Wellhead components, manifolds, completion equipment	NACE MR0175 / ISO 15156

7 Forms Available at Nirotec

Component	Standard (EN)	Standard (ASME/ASTM)	Remark
Elbows	EN 10253-4	ASME B16.9 · B366 WPNCMC	LR/SR, 90°/45°, custom angles
Tees	EN 10253-4	ASME B16.9 · B366 WPNCMC	Equal and reducing branch
Reducers	EN 10253-4	ASME B16.9 · B366 WPNCMC	Concentric and eccentric
Caps	EN 10253-4	ASME B16.9 · B366 WPNCMC	Hemispherical caps
Weld neck flanges	EN 1092-1 type 11	ASME B16.5 · B564	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 pipes for pressure purposes – stainless and nickel-base alloys
EN 10253-4	Butt-welding fittings – austenitic and austenitic-ferritic (duplex) stainless and nickel-base steels
EN 1092-1	Flanges and their joints
VdTÜV 499	Material data sheet – NiCr22Mo9Nb (2.4856)
ASTM B444 / B704 / B705	Seamless / welded pipes – UNS N06625
ASTM B366	Factory-made wrought nickel-alloy fittings

Standard / code	Title / application
ASTM B564	Nickel-alloy forgings
NACE MR0175 / ISO 15156	Materials for use in H ₂ S-containing environments (sour service)
PED 2014/68/EU	Pressure Equipment Directive
ASME B31.1 / B31.3	Power piping / process piping

9 Processing Notes

Weldability

Parameter	Specification / recommendation	Remark
Preheat	Not required	Room-temperature welding
Post-weld heat treatment	Generally not required	PWHT only in special applications
Filler metal	ERNiCrMo-3 (AWS A5.14)	Matching nickel-base filler
Welding processes	GTAW (TIG), GMAW (MIG), SMAW	All standard processes suitable
Interpass temperature	≤ 150 °C	Avoid carbide precipitation

- Delivery condition: solution annealed (grade 2) or annealed (grade 1)
- Cleanliness: free from grinding marks, oil and contaminants before welding
- Identification per ASTM B444: heat number, 2.4856 / UNS N06625, standard, dimensions
- Suitable for both onshore and offshore applications including sour service per NACE MR0175

10 Inquiry & Contact

For a project-specific inquiry we ideally require:

- Standard and type (e.g. ASTM B444 grade 1 / B366 WPNCMC LR 90°)
- Dimensions: DN / NPS, wall thickness or schedule
- Quantity and required delivery date
- Required documentation (EN 10204 type 3.1 / 3.2, NDT, external inspection)
- Project-specific specification or special requirements (NACE MR0175, sour service, etc.)

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