

304 / 1.4301

Material no. 1.4301 · X5CrNi18-10 · Standard austenitic stainless steel

Material group: Austenitic stainless steel, 18-10 type

Material no. (EN): 1.4301

EN designation: X5CrNi18-10

UNS / AISI: UNS S30400 / AISI 304

Former DIN designation: V2A (common trade name)

ASTM / ASME equivalent: Pipes: A/SA 312 TP304 · Fittings: A/SA 403 WP304 · Flanges: A/SA 182 F304

Service temperature: -196 °C to +400 °C (continuous, pressure-bearing per AD 2000); up to +800 °C without pressure

Standards (pipes): EN 10216-5 · EN 10217-7 · ASTM A312 / A213

Standards (fittings): EN 10253-4 · ASTM A403 WP304 · 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	X5CrNi18-10	1.4301	Current European designation
UNS	304	S30400	ASTM/ASME designation
AISI	304	–	US trade designation
DIN (old)	X5CrNi18-10 / V2A	1.4301	Identical, predecessor / trade name
ASTM/ASME	A/SA 312 TP304	UNS S30400	Seamless / welded pipes
ASTM/ASME	A/SA 403 WP304	UNS S30400	Buttweld fittings
ASTM/ASME	A/SA 182 F304	UNS S30400	Flanges, forgings
JIS (Japan)	SUS 304	–	Japanese equivalent

Alternative materials

Material	Material no.	Reference / use	Note
304L / 1.4307	1.4307	Low-carbon version ($\leq 0.030\%$ C)	Welded constructions, no carbide precipitation
321 / 1.4541	1.4541	Ti-stabilised, creep resistant	Up to 800 °C continuous

Material	Material no.	Reference / use	Note
316 / 1.4401	1.4401	Mo-alloyed, better pitting resistance	Chloride-bearing media
316L / 1.4404	1.4404	Mo + low carbon	Welded construction in chlorides

2 Chemical Composition

Composition in mass percent (%). Standard: EN 10088-2 / EN 10216-5 / ASTM A312. 304 is a 18-10 chromium-nickel austenitic stainless steel and the world's most widely used stainless steel grade. For welded constructions, the low-carbon variant 304L (1.4307) is recommended to prevent sensitisation.

Element	Symbol	Min. (heat)	Max. (heat)	Max. (product)	Function / remark
Carbon	C	–	0.07	0.07	Standard 304 (for 304L: max 0.030 %)
Silicon	Si	–	1.00	1.00	Limit
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	17.5	19.5	19.5	Passivation, corrosion resistance
Nickel	Ni	8.0	10.5	10.5	Austenite stabiliser
Nitrogen	N	–	0.11	0.11	Strength contribution

3 Mechanical Properties

Solution annealed – minimum requirements (EN 10216-5)

Property	Symbol	Unit	Minimum value	Remark
Yield strength 0.2 %	Rp0.2	MPa	≥ 210	t ≤ 60 mm
Yield strength 1.0 %	Rp1.0	MPa	≥ 250	Reference
Tensile strength	Rm	MPa	520 – 720	–
Elongation at fracture	A	%	≥ 45	Longitudinal specimens
Impact energy (20 °C)	KV	J	≥ 100	Mean value
Hardness	HB	–	≤ 215	Solution annealed

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

Temperature	100 °C	200 °C	300 °C	400 °C	500 °C	550 °C
Rp0.2 (MPa)	157	127	110	98	92	90

4 Physical Properties

Property	Symbol	20 °C	200 °C	400 °C	600 °C	Unit
Density	ρ	7.90	7.83	7.74	7.65	g/cm ³
Modulus of elasticity	E	200	186	172	157	GPa
Thermal conductivity	λ	15	17	19	22	W/(m·K)
Coeff. thermal expansion	α	16.0	16.5	17.5	18.5	10 ⁻⁶ /K
Specific heat capacity	cp	500	540	565	590	J/(kg·K)

5 Corrosion Resistance

Medium / environment	Remark	Resistance
Water, food media, beverages	Standard application – V2A category	++
Atmosphere (urban, industrial)	Resistant	++
Nitric acid (HNO ₃)	Good resistance	++
Dilute organic acids	Resistant	+
Reducing acids (HCl, H ₂ SO ₄)	Limited resistance	o
Chloride-bearing media (low Cl ⁻)	Pitting risk above 50 ppm Cl ⁻	o
Hot chloride solutions	Stress-corrosion cracking (SCC) risk > 60 °C	-
Seawater	Not resistant – pitting and crevice corrosion	-
Hydrofluoric acid (HF)	Not resistant	-
Sour gas (H ₂ S)	Not qualified per NACE MR0175	-

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

304 is the all-rounder for non-chloride-loaded media. For chloride-bearing or sour-service applications, 316L, duplex or nickel-base grades are required.

6 Typical Applications

Industry / plant	Typical application	Operating condition
Food industry / beverages	Tanks, piping, fittings	Hygienic, FDA / 3-A compatible
Pharmaceutical / chemical	Reactor piping, columns	Mildly corrosive process media
Architecture / building	Facades, railings, structural elements	Outdoor weathering
Water treatment	Piping, valves, vessel internals	Drinking water, process water

Industry / plant	Typical application	Operating condition
Brewery / dairy	Hygienic piping per 3-A / EHEDG	Cleaning agents, sanitisers
General industrial plants	Non-aggressive process piping	Standard stainless application

7 Forms Available at Nirotec

Component	Standard (EN)	Standard (ASME/ASTM)	Remark
Elbows	EN 10253-4	ASME B16.9 · A403 WP304	LR/SR, 90°/45°, custom angles
Tees	EN 10253-4	ASME B16.9 · A403 WP304	Equal and reducing branch
Reducers	EN 10253-4	ASME B16.9 · A403 WP304	Concentric and eccentric
Caps	EN 10253-4	ASME B16.9 · A403 WP304	Hemispherical caps
Weld neck flanges	EN 1092-1 Type 11	ASME B16.5 · A182 F304	PN 10 – PN 400 / Class 150 – 2500
Custom parts	Per drawing	Per drawing	Special-form components on request

8 Standards, Approvals & Codes

Standard / code	Title / application
EN 10216-5	Seamless tubes for pressure purposes – stainless steels
EN 10217-7	Welded tubes for pressure purposes – stainless steels
EN 10088-1/-2	Stainless steels – general / sheet and strip
EN 10253-4	Butt-welding pipe fittings – austenitic and austenitic-ferritic (duplex) stainless steels
EN 1092-1	Flanges and their joints
ASTM A312 / A213	Seamless / welded austenitic stainless steel pipes / tubes
ASTM A403	Wrought austenitic stainless steel fittings
ASTM A182	Forged austenitic stainless steel flanges and components
PED 2014/68/EU	Pressure Equipment Directive
ASME B31.1 / B31.3	Power / process piping

9 Processing Notes

Weldability

Parameter	Specification / recommendation	Remark
Preheat	Not required	Avoid preheat to prevent grain coarsening
Post-weld heat treatment	Generally not required	Solution anneal only for sensitised material
Filler metal	ER 308L / 308LSi (AWS A5.9)	Low-carbon filler preferred
Welding processes	GTAW, GMAW, SMAW, plasma	All standard processes suitable
Interpass temperature	< 150 °C	Prevents carbide precipitation

- Delivery condition: solution annealed at 1010–1120 °C, water quenched (austenitic structure)
- For welded constructions, 304L (1.4307) is recommended to avoid sensitisation
- Identification per EN 10216-5: heat no., 1.4301, standard, dimensions, condition
- Surface finish: pickled (standard) or polished / ground (on request)
- Magnetic permeability: very low (≤ 1.05) in annealed condition; cold work induces some magnetism

10 Inquiry & Contact

For a project-specific inquiry we ideally require:

- Standard and type (e.g. ASTM A312 TP304 / A403 WP304 LR 90°)
- Dimensions: DN / NPS, wall thickness or schedule
- Surface finish (pickled, polished, mirror, etc.)
- Quantity and required delivery date
- Required documentation (EN 10204 type 3.1 / 3.2, NDT, external inspection)
- Project-specific specification (PMI, 3-A, FDA, etc.)

Nirotec GmbH & Co. KG

Otto-Hahn-Str. 4 · 59423 Unna · Germany

Tel.: +49 (0) 2303 / 985-0 · info@nirotec.de · www.nirotec.de