CNC MACHINING

Stainless Steel 304

Corrosion Resistant Austenitic Stainless Steel

Stainless steel 304 is the industry standard for corrosion resistant hardware, enclosures, and food-grade equipment. CNC machining delivers clean edges, repeatable tolerances, and a premium finish ready for polishing or passivation.



MACHINING ENVELOPE	LEAD TIME	TOLERANCE	PROCESS
1000 × 600 × 500 mm	**5-7 business days**	**±0.025 mm typical**	**CNC Machining**

MECHANICAL PROPERTIES

Stainless Steel 304 delivers dependable strength and impact resistance for sanitary manifolds and fittings, corrosion resistant fasteners and brackets, and sterilizable fixtures and tooling. It yields and stretches well before it fractures instead of cracking, and it stays tough down to cryogenic temperatures.

The minimum rows are the ASTM A240 annealed values for plate; bar stock to A276 or A479 carries minimums set by its finish and size, and the typical rows show what annealed stock usually delivers. ATI, Outokumpu and Rolled Alloys list a slightly higher modulus, 200 GPa, than the Atlas value in the table. 304 cannot be hardened by heat treatment, but cold work raises its strength, and a smooth machined surface improves fatigue life while a corrosive environment reduces it.

PROPERTY	VALUE	TEST STANDARD
Tensile Strength, Annealed (minimum)	**515 MPa**	ASTM A240/A240M
Yield Strength Rp0.2, Annealed (minimum)	**205 MPa**	ASTM A240/A240M
Elongation at Break, Annealed (minimum, 50 mm)	**40 %**	ASTM A240/A240M
Hardness, Annealed (maximum)	**201 HB / 92 HRB**	ASTM A240/A240M
Tensile Strength, Annealed (typical)	**600 MPa**	Outokumpu typical data (9.5 mm plate)
Yield Strength Rp0.2, Annealed (typical)	**290 MPa**	Outokumpu typical data (9.5 mm plate)
Elongation at Break, Annealed (typical)	**58 %**	Outokumpu typical data (9.5 mm plate)
Reduction of Area, Annealed (typical)	**70 %**	Outokumpu typical data (9.5 mm plate)
Rockwell Hardness, Annealed (typical)	**82 HRB**	Outokumpu typical data (9.5 mm plate)
Modulus of Elasticity	**193 GPa**	Atlas Steels 304 data
Poisson's Ratio	**0.30**	Rolled Alloys 304/304L data
Charpy V-Notch Impact Energy (23 °C / −196 °C)	**200 / 115 J**	ATI 304 alloy data

THERMAL PROPERTIES

Food, medical and process equipment in Stainless Steel 304 handles repeated heating, washing and cooling without losing its corrosion resistance or toughness. Its thermal expansion is relatively high for a metal, so allow for it in tight fits that run hot.

The service temperatures are oxidation limits in air, not load ratings, and strength falls as temperature rises. Avoid continuous use between about 425 °C and 860 °C where the part must later resist aqueous corrosion, and use the annealing range to restore softness and corrosion resistance after welding or heavy cold work.

PROPERTY	VALUE	TEST STANDARD
Melting Range	**1399–1421 °C**	ATI 304 alloy data
Thermal Conductivity (100 °C / 500 °C)	**16.3 / 21.5 W/m·K**	Atlas Steels 304 data
Coefficient of Thermal Expansion (0–100 / 0–315 / 0–538 °C)	**17.2 / 17.8 / 18.4 ×10^{-6}/K**	Atlas Steels 304 data
Specific Heat (0–100 °C)	**500 J/kg·K**	Atlas Steels 304 data
Maximum Service Temperature in Air, Intermittent (oxidation)	**870 °C**	Atlas Steels 304 data
Maximum Service Temperature in Air, Continuous (oxidation)	**925 °C**	Atlas Steels 304 data
Solution Annealing Temperature (cool rapidly)	**1010–1120 °C**	Atlas Steels 304 data

PHYSICAL PROPERTIES

A uniform wrought structure machines consistently from part to part and takes downstream finishing predictably.

The composition rows are the specification limits. Chromium gives 304 its corrosion resistance and nickel its austenitic structure. The salt spray result shows how the alloy handles a neutral salt fog, which does not predict service in sea air or sea water.

PROPERTY	VALUE	TEST STANDARD
Density	**7.90 g/cm^3**	Atlas Steels 304 data
Neutral Salt Spray (5% NaCl, 100 h)	**No rusting or staining**	ASTM B117 (ATI data)
Chromium (Cr)	**17.5–19.5 %**	ASTM A240/A240M
Nickel (Ni)	**8.0–10.5 %**	ASTM A240/A240M
Carbon (C)	**≤ 0.07 %**	ASTM A240/A240M
Manganese (Mn)	**≤ 2.00 %**	ASTM A240/A240M
Silicon (Si)	**≤ 0.75 %**	ASTM A240/A240M
Phosphorus (P)	**≤ 0.045 %**	ASTM A240/A240M
Sulfur (S)	**≤ 0.030 %**	ASTM A240/A240M
Nitrogen (N)	**≤ 0.10 %**	ASTM A240/A240M

ELECTRICAL PROPERTIES

Stainless Steel 304 conducts electricity, so machined housings, fixtures and functional prototypes can be grounded through the part, and the resistivity value gives engineers a reliable input for current flow and grounding calculations.

The permeability row shows how close annealed 304 is to non-magnetic. Cold work raises it, so heavily formed or cold-worked areas can become slightly magnetic.

PROPERTY	VALUE	TEST STANDARD
Electrical Resistivity (20 °C)	**7.2×10^{-7} Ω·m**	Atlas Steels 304 data
Magnetic Permeability (annealed / 30% cold worked)	**1.005 / 1.163**	ATI 304 alloy data

CHEMICAL PROPERTIES

ATI gives corrosion rates in boiling solutions, and Outokumpu gives the temperature above which 304 corrodes faster than 0.13 mm a year. 304 resists dilute nitric, acetic and phosphoric acids well, while boiling dilute hydrochloric and sulfuric acids and hot strong caustic attack it.

Chlorides set the limit: pitting, crevice corrosion and stress corrosion cracking become likely in warm chloride solutions, and ATI recommends 316 for higher chloride levels, lower pH or higher temperatures. Use the ratings for screening and confirm them for your application.

CHEMICAL	CORROSION RATE WHEN BOILING (ATI)	EXCEEDS 0.13 MM/A ABOVE (OUTOKUMPU)
Acetic acid 20%	**< 0.01 mm/a**	**Not tested**
Acetic acid 80%	**Not tested**	**100 °C (pitting)**
Phosphoric acid 20%	**< 0.03 mm/a**	**Not tested**
Phosphoric acid 85%	**Not tested**	**80 °C**
Nitric acid 10%	**Not tested**	**Above boiling**
Nitric acid 65%	**0.2 mm/a**	**100 °C**
Formic acid 45%	**1.4 mm/a**	**Not tested**
Formic acid 50%	**Not tested**	**10 °C or below**
Hydrochloric acid 0.2%	**Not tested**	**Above boiling**
Hydrochloric acid 1%	**2.5 mm/a**	**30 °C (pitting)**
Sodium hydroxide 50%	**3.0 mm/a**	**85 °C**
Sulfamic acid 10%	**3.7 mm/a**	**Not tested**
Sulfuric acid 10%	**11.3 mm/a**	**Not rated**

COMPLIANCE

Type 304 is specified under ASTM A240/A240M for plate, sheet and strip and under ASTM A276 and A479 for bar and shapes, with A479 covering bar for boilers and pressure vessels.

ATI states that Type 304 is accepted by the National Sanitation Foundation for food preparation and storage, and by the Dairy and Food Industries Supply Association sanitary standards committee for contact with dairy products. Food and dairy certification is held by the maker of the finished equipment, with 304 as an accepted material of construction.

STANDARD	STATUS

ASTM A240/A240M (UNS S30400) Plate, sheet and strip: chemistry and annealed minimums of 515 MPa tensile, 205 MPa yield and 40% elongation	Alloy specification
ASTM A276 / A479 (UNS S30400) Bar and shapes (A479 for boiler and pressure-vessel use); annealed minimums depend on the finish and bar size	Alloy specification
NSF food equipment acceptance ATI: Type 304 is accepted by NSF for food preparation and storage	ATI statement
Dairy contact acceptance ATI: accepted for contact with dairy products by the Dairy and Food Industries Supply Association Sanitary Standards Committee; a standard brewery material	ATI statement

MANUFACTURING

Colours & finishes	**Deburring, passivation, electropolishing and bead blasting**
Surface finish	**As-machined Ra 1.6-3.2 µm; precision finish Ra 0.4 µm**