

Technical Data Sheet

ATI 22™

Nickel-base Alloy (UNS N06022)



Introduction

ATI 22™ alloy is a Ni-Cr-Mo alloy that provides outstanding resistance to pitting, crevice corrosion, intergranular attack, and stress corrosion cracking. The combination of Cr, Ni, Mo, and W provides excellent resistance to a broad range of both oxidizing and reducing environments.

ATI's plate mill has been producing this alloy since 1987. The alloy is used in a wide range of applications including flue-gas desulfurization systems, bleaching processes in pulp-and-paper plants, waste incinerators, sour gas service, chemical processing plants, pharmaceutical plants, and radioactive waste storage.

The ATI 22™ alloy possesses high strength, good ductility, excellent welding and forming characteristics. The UNS N06022 alloy has been incorporated in ASTM and ASME specifications and is available in a wide range of product forms such as plate, sheet, strip, tube, pipe, bar, billet, and forgings.

Product Form	Specification	
	ASTM	ASME
Plate, Sheet and Strip	B575	SB-575
Tube (Welded)	B619	SB-619
Tube (Seamless)	B622	SB-622

Typical Composition

Chemical Element	Typical ATI 22™ Alloy	UNS N06022 Range
Carbon	<0.010	0.015 max
Sulfur	0.001	0.02 max
Silicon	0.03	0.08 max
Chromium	21.50	20.0/22.5
Molybdenum	13.30	12.5/14.5
Vanadium	0.16	0.35 max
Cobalt	0.90	2.5 max
Tungsten	2.65	2.50/3.50
Iron	2.50	2.00/6.00
Nickel	Balance	Balance
Manganese	0.20	0.50 max
Phosphorus	0.010	0.02 max

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Physical Properties

The values reported on the following page are representative of the typical composition in the annealed condition.

Property	Value	Units
Density at 72 °F (22 °C)	0.314	lb/in ³
	8.69	g/cm ³
Melting Range	2470-2530	°F
	1354-1388	°C
Thermal Conductivity at 127 °F (53 °C)	5.5	BTU/hr • ft • °F
	9.4	W/m • K
Thermal Expansion Coefficient at 68-422 °F (20-217 °C)	6.91	µin/in/°F
	12.44	µm/m/°C
Specific Heat at 72 °F (22 °C)	0.10	Btu/lb/°F
	422	J/kg • K
Elastic Modulus at 72 °F (22 °C)	30.0	10 ⁶ psi
	207	GPa

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Corrosion Resistance

As shown in the following tables the ATI 22™ alloy demonstrates outstanding corrosion resistance in a multitude of aggressive environments. The alloy resists intergranular carbide precipitation and mu-phase formation during welding operations, resulting in similar corrosion rates for wrought versus as-welded structures.

Corrosion Rate in Boiling Test Solutions

Test* Solution	Condition	Alloy	Corrosion Rate MPY (mm/a)
HCl (1%)	Plain	ATI 22™	14.1 (0.36)
		ATI 276™	13.1 (0.33)
		ATI 625™	36.2 (0.92)
HCl (1%)	Welded (GTAW)	ATI 22™	13.0 (0.329)
		ATI 276™	11.5 (0.293)
		ATI 625™	-
H ₃ PO ₄ (20%)	Plain	ATI 22™	0.1 (0.003)
		ATI 276™	0.4 (0.010)
		ATI 625™	0.4 (0.010)
H ₃ PO ₄ (20%)	Welded (GTAW)	ATI 22™	0.1 (0.003)
		ATI 276™	0.2 (0.005)
		ATI 625™	-
H ₂ SO ₄ (10%)	Plain	ATI 22™	13.8 (0.351)
		ATI 276™	13.9 (0.353)
		ATI 625™	25.3 (0.642)
H ₂ SO ₄ (10%)	Welded (GTAW)	ATI 22™	13.8 (0.351)
		ATI 276™	19.8 (0.503)
		ATI 625™	-
FeCl ₃ (6%)	Plain	ATI 22™	0.6 (0.015)
		ATI 276™	-
		ATI 625™	-
FeCl ₃ (6%)	Welded (GTAW)	ATI 22™	0.6 (0.015)
		ATI 276™	-
		ATI 625™	-

*Concentrations in percent by weight. Test exposures - five 48-hour test periods.

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Corrosion Rates Measured with ASTM Test Procedures

ASTM Test Method	Condition	Alloy	Corrosion Rate MPY (mm/a)
G28 Practice A	Plain	ATI 22™	30.0 (0.76)
		ATI 276™	220.0 (5.59)
		ATI 625™	23.0 (0.58)
G28 Practice A	Welded (GTAW)	ATI 22™	64.3 (1.63)
		ATI 276™	-
		ATI 625™	-
G28 Practice B	Plain	ATI 22™	4.5 (0.11)
		ATI 276™	45.0 (1.14)
		ATI 625™	>3500 (>89)
G28 Practice B	Welded (GTAW)	ATI 22™	14.2 (0.36)
		ATI 276™	-
		ATI 625™	-
A262 Practice C	Plain	ATI 22™	67.7 (1.72)
		ATI 276™	908.0 (23.1)
		ATI 625™	-
A262 Practice C	Welded (GTAW)	ATI 22™	69.7 (1.77)
		ATI 276™	923.2 (23.4)
		ATI 625™	-
A262 Practice D	Plain	ATI 22™	136.8 (3.47)
		ATI 276™	-
		ATI 625™	-
A262 Practice D	Welded (GTAW)	ATI 22™	112.2 (2.85)
		ATI 276™	-
		ATI 625™	-

G28-Practice A = boiling Fe₂(SO₄)₃-50% H₂SO₄/24 hrs

G28-Practice B = boiling 23% H₂SO₄+1.2%HCl + 1% FeCl₃+1% CuCl₂/24 hrs

A262-Practice C = boiling 65% HNO₃/five 48hr exposures

A262-Practice D = boiling 10% HNO₃-3% HF/two 2hr exposures

Weldability

The ATI 22™ alloy is readily welded using gas-tungsten arc, gas-metal arc, and shielded-metal arc welding techniques. Filler metals are typically made of matching compositions.

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Mechanical Properties

Typical room temperature mechanical properties in the annealed condition are presented in the following table for plate in the thickness range of 0.1875" to 2.00".

Property	Typical Plate	ASTM B575
Yield Strength, 0.2% offset	50 Ksi (345 MPa)	45* Ksi (310* MPa)
Tensile Strength	105 Ksi (724 MPa)	100* Ksi (690* MPa)
Elongation, % in 2" (51mm)	67%	45%*
Hardness	172 Brinell 87 HRB	100** HRB

*minimum, **maximum

Specifications

ASTM B575
ASME SB 575

Product Forms

ATI 22™ alloy is available in a wide range of product forms such as plate, sheet, strip, tube, pipe, bar, billet, and forgings.

Potential Applications

The alloy is used in a wide range of applications including flue-gas desulfurization systems, bleaching processes in pulp-and-paper plants, waste incinerators, sour gas service, chemical processing plants, pharmaceutical plants, and radioactive waste storage.