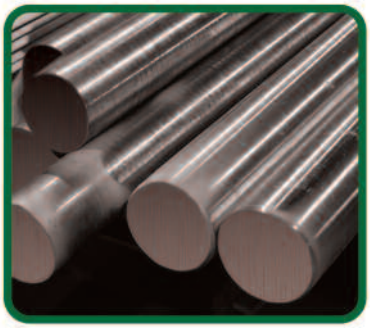
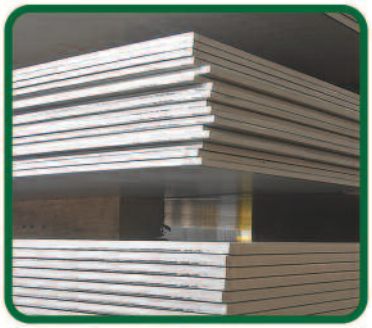
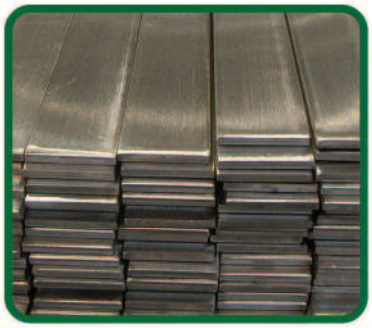
Duplex 2304 Specifications: UNS S32304







DUPLEX 2304 (UNS S32304)

Penn Stainless inventory now includes Duplex 2304 (UNS S32304) in sheet, sheet coil, plate, round bar, processed flat bar and tubular products.

GENERAL PROPERTIES

Duplex 2304 is a 23% chromium, 4% nickel, molybdenum-free duplex stainless steel whose structure is a balance of ferritic and austenitic. It has general corrosion resistance similar or better than Alloys 304L and 316L but with yield strength nearly double that of austenitic stainless steels. Its duplex microstructure and low nickel and high chromium contents also allows Duplex 2304 to demonstrate improved stress corrosion resistant properties compared to 304 and 316. It is typically suitable for all applications in the -58°F to 572°F (-50°C to 300°C) temperature range and is designed to feature high mechanical strength, good weldability, good corrosion resistance, high resistance to stress corrosion cracking, good machinability, low thermal expansion, good fatigue properties, high thermal conductivity, and easy fabrication.

APPLICATIONS

Duplex 2304 is generally used in the same applications in which Alloys 304 and 316L are used. Some examples of these applications include:

- Chloride containing environments
- Welded pipe systems within the Pulp and Paper, Chemical and Petrochemical, and Water Treatment industries
- Transportations
- Heat exchanger tubes
- Architecture, building, construction
- Pressure vessels
- Caustic solutions, organic acids
- Food industry

STANDARDS DUPLEX 2304

ASTM/ASME .....UNS S32304
EURONORM FeMi35Cr20Cu4Mo2
DIN 2.4660

Duplex 2304 (UNS S32304) can be processed by Penn Stainless utilizing the following methods:

- Shear Cutting
- Plasma Cutting
- HQ Plasma Cutting
- Dynamic Water Jet Cutting
- Laser Cutting
- Saw Cutting
- Gauer Processing
- Machine Cutting

Product Offering:

- Plate
- S/E processed bar
- Tubular products
- Structurals

CORROSION RESISTANCE

- Due to its high chromium content of 23%, the corrosion resistance properties of Duplex 2304 are practically equivalent to those of Alloy 316L
- Its duplex microstructure and low nickel and high chromium contents allows Duplex 2304 to have improved stress corrosion resistance properties compared to the 304L and 316L standard austenitic grades.
- More resistant to pitting and crevice corrosion resistance that Alloy 316L
- Outperforms Alloys 304L and 316L in stress corrosion cracking resistance in chloride containing aqueous solutions
- Its corrosion rate in boiling nitric acid (65%) is higher than that of Alloy 316L
- Its high yield strength allows Duplex 2304 to perform well in abrasion/corrosion applications

STRUCTURE

- Microstructure of Duplex 2304 is very stable compared to molybdenum containing duplex stainless steels
- Contains approximately equal amounts of ferritic and austenitic in microstructure after annealing in a temperature about

WELDABILITY

- Can be successfully welded by TIG manual and automatic, PLASMA, MIG, SMAW, SAW, FCAW
- Duplex microstructure renders the alloy less sensitive to hot cracking
- Pre-heating and post welding is not required
- Filler metal should be a balanced ferrite/austenitic type

MACHINABILITY

- Exhibits improved machinability properties particularly when considering drilling
- Low speeds and high feeds will minimize this alloys tendency to work harden

CHEMICAL PROPERTIES

Type	C	Cr	Fe	Mn	Si	S	P	Ni	Cu	N
Duplex 2304	0.03 max	min: 21.50 max: 24.50	balance	2.5 max	1.00 max	0.03 max	0.04 max	min: 0.03 max: 3.5	min: 0.05 max: 2.0	min: 0.05 max: 2.0

MECHANICAL PROPERTIES

Grade	Tensile Strength ksi (MPa) min	Yield Strength 0.2% offset ksi (MPa) min	Elongation (% in 50mm) min	Hardness (Brinell) MAX	Hardness (Rockwell B) MAX
Duplex 2304	87 (600)	58 (400)	25	293	31[J]

PHYSICAL PROPERTIES

	Duplex 2304
Density at 68°F (20°C)	0.28 lbm/in^3 7800 kg/cm^3
Coefficient of Thermal Expansion	ax10^{-6}°C^{-1}
68°F to 212°F (20 -100°C)	13
68°F to 392°F (20 -200°C)	13.5
68°F to 572°F (20 -300°C)	14
Thermal Conductivity	**W.m^{-1}.K^{-1}**
at 68°F (20°C)	17
at 212°F (100°C)	18
at 392°F (200°C)	19
at 572°F (300°C)	20
Electrical Resitivity	**(μ_ cm)**
at 68°F (20°C)	80
at 212°F (100°C)	92
at 392°F (200°C)	100
at 572°F (300°C)	105
Specific Heat	**(Btu/lb/°F)**
32°F to 212°F (20 -100°C)	0.11

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