



## 2304 Duplex | UNS-S32304

2304 Duplex | UNS-S32304 stainless is a lean duplex stainless steel that has a microstructure consisting of austenite and ferrite phases. This duplex microstructure and the chemical composition of 2304 Duplex stainless results in an excellent combination of strength and corrosion resistance.

2304 Duplex stainless possesses good resistance to general corrosion in many acid environments, chloride stress corrosion cracking, pitting and crevice corrosion.

### Applications

Rebar has been a primary application for 2304 Duplex stainless. Specific rebar applications have included bridge decks, barrier and retaining walls, anchoring systems and dowels, chemical plant infrastructure, coastal piers and wharves, bridge parapets, sidewalks and bridge pilings. Another application for 2304 Duplex stainless includes bridge tie wire.

The high strength capability of minimum yield strength of 75 ksi (518 MPa) for 2304 Duplex stainless rebar is an added economical advantage.

### Corrosion Resistance

2304 Duplex | UNS-S32304 stainless has good intergranular corrosion resistance in the as-annealed and as-welded conditions due to its low carbon content. Some intergranular attack may occur in the hot rolled unannealed condition.

For optimum corrosion resistance, surfaces must be free of scale, lubricants, foreign particles, and coatings applied for drawing and heading. After fabrication of parts cleaning and/or passivation should be considered.

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### Product Quick Notes

- Higher strength capability, 75 ksi (518 MPa) minimum yield strength is an added economical advantage.
- Good resistance in most oxidizing and reducing acids; chloride pitting and crevice corrosion resistance due to higher chromium, molybdenum and nitrogen content; and resistance to chloride stress corrosion cracking due to its duplex microstructure.

# 2304 Duplex

**UNS Number:** S32304

**DIN Number:** 1.4362

**Type Analysis:** Single figures are nominal except where noted.

<b>Carbon (Maximum)</b>	0.03%	<b>Manganese (Maximum)</b>	2.50%
<b>Phosphorus (Maximum)</b>	0.040%	<b>Sulfur (Maximum)</b>	0.030%
<b>Silicon (Maximum)</b>	1.00%	<b>Chromium</b>	21.50 to 24.50%
<b>Nickel</b>	3.00 to 5.50%	<b>Molybdenum</b>	0.05 to 0.6%
<b>Nitrogen</b>	0.05 to 0.20%	<b>Iron</b>	Balance

**Description:** 2304 Duplex stainless is a lean duplex stainless steel that has a microstructure consisting of austenite and ferrite phases. The duplex microstructure and chemical composition of 2304 Duplex stainless results in an excellent combination of strength and corrosion resistance. 2304 Duplex stainless possesses good resistance to general corrosion in many acid environments, chloride stress corrosion cracking, pitting and crevice corrosion.

**Strength Properties:** In the hot rolled unannealed condition, yield strength of 75 ksi (518 MPa) or higher can be achieved for bar diameters up to 1.375 in. (34.925 mm). Suppliers' technical data sheets can be provided for additional information on specific mechanical properties including yield, ultimate tensile strength and elongation.

## Physical Properties:

<b>Specific Gravity</b>	7.77
<b>Density</b>	0.281 lb/in <sup>3</sup> 7770 Kg/m <sup>3</sup>

**Magnetic Properties:** In the annealed and hot rolled conditions, 2304 Duplex stainless is ferromagnetic.

## Heat Treatment:

**Annealing:** Heat to 1900/2000°F (1038/1093°C) and rapidly quench in water or air. Typical hardness as-annealed is HRC 20.

**Hardening:** Cannot be hardened by heat treatment. Can be hardened only by cold working.

## Workability:

**Hot Working:** Heat uniformly to 2000/2100°F (1093/1149°C). Reheat as often as necessary. Cool forgings in air.

**Cold working:** Cold working increases strength and hardness.

**Weldability:** 2304 Duplex stainless has been welded using many of the standard electric arc welding processes. Autogeneous welding will increase the amount of ferrite present in the weldment and heat affected zone. When a filler metal is required, consider AWS E/ER 2209. Oxyacetylene welding is not recommended because carbon pickup in the weld may occur. Post weld annealing is not required for most applications, but will provide optimum properties for severe service.

## Applicable Specifications

ASTM A955M  
ASTM A276  
ASTM A240  
ASTM A479  
ASME SA479  
BS 6744

## Products:

Rebar  
Wire  
Wire-Rod  
Mesh



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Note that the material may be capable of meeting or being produced to meet other general and customer-specific specifications.