

Stainless Steel 2205

Description

2205 stainless steel is a widely used duplex stainless steel (UNS S32205 / S31803), with a microstructure consisting of approximately 50% ferrite and 50% austenite. It combines the excellent corrosion resistance of austenitic stainless steels with the high strength advantages of ferritic stainless steels, filling the performance gap between common austenitic stainless steels (such as 316L) and high-cost super duplex stainless steels or nickel-based alloys. It is extensively applied in various industrial fields such as petrochemicals, marine engineering, and environmental water treatment. Among them, UNS S32205 is an optimized version with a higher nitrogen content, offering slightly better performance than the earlier S31803, and the two are often used interchangeably.

Features

Its yield strength is significantly higher than that of common austenitic stainless steels, allowing it to withstand high loads without the need for additional strengthening treatments. This enables a reduction in the thickness of structural components, thereby lowering the overall weight. With its well-balanced duplex microstructure, it exhibits excellent toughness at both room temperature and low temperatures (down to -50°C). It also has low notch sensitivity, making it less prone to brittle fracture. It can adapt to cyclic loading conditions, resisting fatigue damage during long-term service and making it suitable for complex scenarios involving mechanical vibration and pressure fluctuations. Its corrosion resistance surpasses that of 316L stainless steel, particularly in resisting chloride-induced pitting, crevice corrosion, and stress corrosion.

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cracking (SCC), making it well-suited for chlorine-containing environments. It withstands moderately corrosive media such as acetic acid, formic acid, and urea, and can also perform in "acidic" environments containing CO₂ and H₂S. However, it is not suitable for strong reducing acids like concentrated sulfuric acid or hydrochloric acid.

Parameters

Chemical Composition (%)

Composition	C	Si	Mn	P	S	Cr	Ni	Mo	N
Min.	-	-	-	-		22	4.5	3	0.14
Max.	0.03	1	2	0.03	0.02	23	6.5	3.5	0.2

Physical Properties

Temperature	F	°C	68	20	212	100	392	200	572	300
Density	lb/in ³	g/cm ³	0.278	7.7	-	-	-	-	-	-
Elastic Modulus	psi x 10 ⁶	GPa	27.6	190.4	26.1	179.6	25.4	174.8	24.9	171.8
Linear Expansion Coefficient (68°F-T)	10 ⁻⁶ /°F	10 ⁻⁶ /°C	-	-	7.5	13.5	7.8	14	8.1	14.6
Thermal Conductivity	Btu/h ft°F	W/m.K	8.7	15	9.2	15.9	9.8	17	10.4	18
Specific Heat Capacity	Btu/lb/°F	J/kg.K	0.112	468.9	0.119	499.2	0.127	536.6	0.134	561.1
Resistivity	Ω•in x 10 ⁻⁶	Ω•m x 10 ⁻⁷	33.5	0.851	35.4	8.99	37.4	9.51	39.4	10

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Note: For reference only

China		Japan	USA		International Organization for Standardization		European Standard	
GB	ISC	JIS	AST M	UNS	ISO	Numerical Designation	EN	Numerical Designation
022Cr23Ni5Mo3N	S22053	SUS329J3L	2205	S32205	X2CrNiMoN 22-5-3	4462-318-03-1	X2CrNiMoN 22-5-3	1.4462

