

NAS 329J3L (UNS S32205, S31803)

NAS High Corrosion Resistant Duplex Stainless Steel

NAS 329J3L (SUS 329J3L, UNS S32205, S31803) is an Austenitic-ferritic stainless steel, which has superior corrosion resistance and high strength. It has better localized corrosion resistance than Type 316L and 317L, and the steel is applied in the industrial fields like chemical plant, seawater desalination plant, seawater pump, and so on. Nippon Yakin supplies this product in plate, sheet and strip form.

Steel Grade/Standard

NAS	JIS G4304/4305	ASTM A240	EN 10088-2/10028-7
NAS 329J3L	SUS 329J3L	UNS S32205/S31803	1.4462

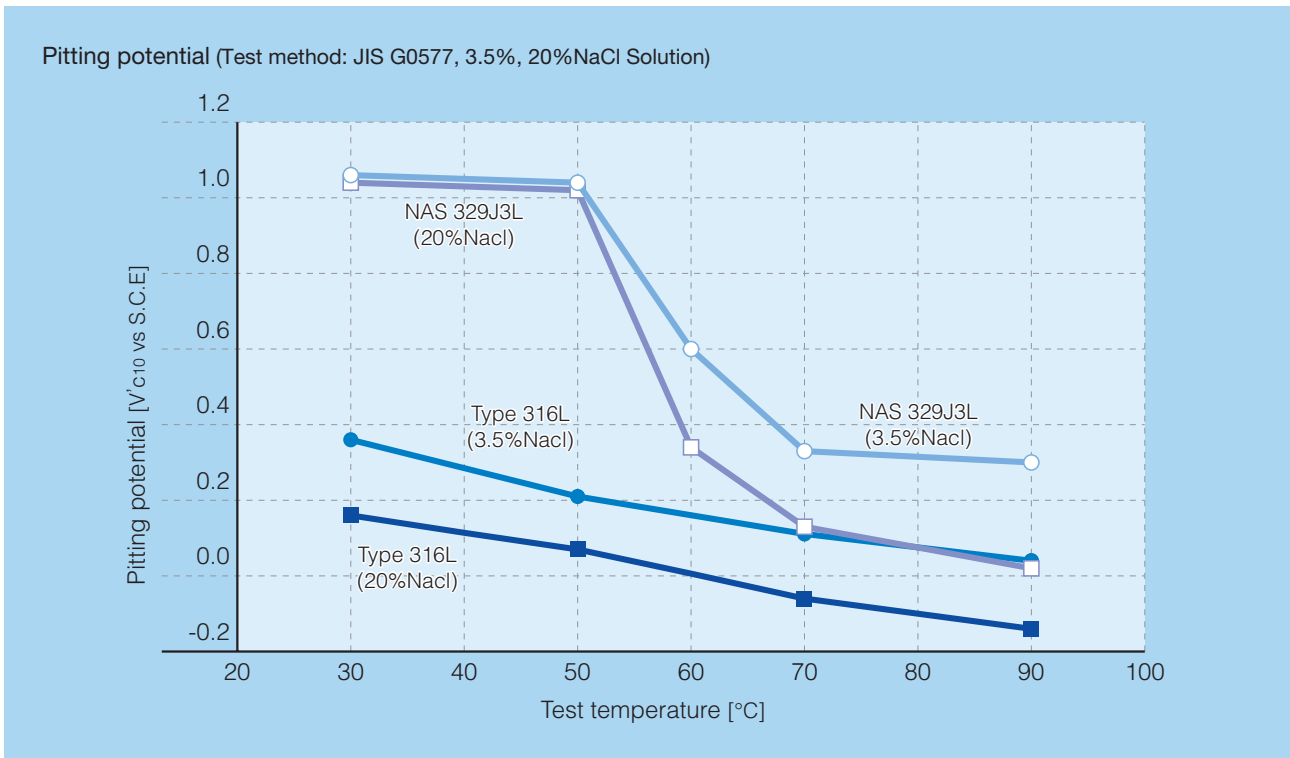
Chemical Composition

	C	Si	Mn	P	S	Ni	Cr	Mo	N
Specification (SUS 329J3L)	≤0.030	≤1.00	≤2.00	≤0.040	≤0.030	4.50~6.50	21.00~24.00	2.50~3.50	0.08~0.20
Specification (UNS S32205)	≤0.030	≤1.00	≤2.00	≤0.030	≤0.020	4.5~6.5	22.0~23.0	3.0~3.5	0.14~0.20
Specification (UNS S31803)	≤0.030	≤1.00	≤2.00	≤0.030	≤0.020	4.5~6.5	21.0~23.0	2.5~3.5	0.08~0.20

[wt %]

Physical Properties

Density	[g/cm ³]	7.80
Specific heat	[J/kg · K]	460
Electrical resistivity	[μΩ · cm]	87.0
Thermal conductivity	[W/m · K]	13.9
Average coefficient of thermal expansion [10 ⁻⁶ /°C]	20~100°C	12.7
	20~200°C	13.1
	20~300°C	13.5
	20~400°C	13.8
Young's modulus	[MPa]	19.5 × 10 ⁴
Magnetism		Y (magnetizable)
Melting range	[°C]	1420~1465



SCC Resistance

Test method: U-bending test piece, 20~42% Boiling MgCl₂ solution, 300hr

Steelgrade	Test conditions	20% 108°C	25% 110°C	30% 115°C	42% 142°C
NAS 329J3L		○	○	×	×
Type 304		×	×	×	×
Type 316L		○	×	×	×

○: No crack ×: Crack

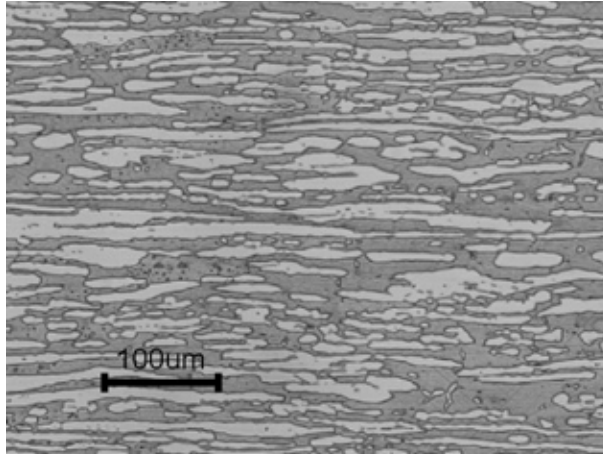
Acid Resistance

Crossion rate: g/m²/hr

Steelgrade	Test conditions	Suifuric acid 80°C					Hydrochloric acid 80°C				
		5%	10%	20%	40%	60%	80%	0.1%	1.0%	2.0%	3.0%
NAS 329J3L		<0.1	0.1	3.3	250.5	263.1	90.4	<0.1	<0.1	19.0	51.5
Type 316L		1.1	2.9	20.1	291.3	72.0	11.1	<0.1	2.5	6.7	13.5

Microstructure

It consists of 40~50% of ferritic phase and the rest of austenitic phase. (Grey part is ferritic phase and white part is austenitic phase)



A cross sectional microstructure of 16mm thick plate

Mechanical Properties

Mechanical Properties at Room Temperature

		0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness	
					[Hv]	[HB]
Specification (SUS 329J3L)		≥ 450	≥ 620	≥ 18	≤ 320	≤ 302
Specification (UNS S32205)		≥ 450	≥ 655	≥ 25	—	≤ 293
Specification (UNS S31803)		≥ 450	≥ 620	≥ 25	—	≤ 293
Example	Hot-rolled plate 16mm ^t	563	780	35	—	222
	Cold-rolled sheet 2mm ^t	630	828	28	253	—

Corrosion Resistance

Local corrosion resistance such as pitting, crevice, and stress corrosion cracking of NAS 329J3L is better than conventional stainless steel such as type 304 and 316L. General corrosion resistance in acidic environment is good if the acid content is low.

Pitting and Crevice Corrosion Resistance

Critical pitting corrosion temperature · Critical crevice corrosion temperature

Test method: ASTM G48 Method D, 6%FeCl₃ + 1%HCl, 72hr

Steelgrade	Critical pitting corrosion temperature	Critical crevice corrosion temperature
NAS 329J3L	50°C	25°C
Type 316L	10°C	≤ 0°C

Workability

High temperature strength is similar to Type 430 in the range of 1150~950°C. However the steel shows rapid increase in the strength below 900°C. Regarding cold workability, care is required as proof stress is high and elongation is low in comparison with Type 304.

Weldability

Various welding methods are applicable in the same manner as with the standard austenitic stainless steels, including shielded metal arc welding, TIG welding, and plasma welding. Same duplex grade type welding consumable should be used.

Heat Treatment

Solution heat treatment should be performed in the range of 1020~1100°C followed by rapid cooling. Cooling rate should be high in order to shorten the time exposing at temperature range which may cause the brittleness by 475°C brittleness and σ phase formation.

Pickling

A mixture of nitric acid and fluoric acid is used in pickling. However, because descaling is somewhat difficult in comparison with Type 304, alkali immersion before acid pickling, and if possible, shot blasting are extremely effective.

Applications

- Chemical Plant, Chemical Tanker
- Seawater desalination Plant, Seawater pump
- Thermal power plant flue gas desulfurization plants
- Pulp and paper plants
- Bridge

For more information, please contact:

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