NAS75N (UNS S32760)

High Corrosion Resistant Super Duplex Stainless Steel

NAS75N is a super duplex stainless steel with a pitting resistance equivalent (PRE*) number of more than 40, and provides excellent corrosion resistance and strength properties. In comparison with UNS S32205, SUS329J3L, and SUS329J4L (NAS64), it offers superior localized corrosion resistance, and thus is suitable for use in chemical plants, seawater desalination plants, and similar severe environments. Nippon Yakin supplies this product in plate form.

*PRE = %Cr + 3.3 × %Mo + 16 × %N

Steel Grade/Standard

Nippon Yakin Grade	JIS	ASTM A240	EN 10088-2/10028-7
NAS75N	—	UNS S32760	1.4501

Chemical Composition

[wt %]

	C	Si	Mn	P	S	Ni	Cr	Mo	N	Cu	W	PRE*1
Specification (UNS S32760)	≦0.030	≦1.00	≦1.00	≦0.030	≦0.010	6.0~ 8.0	24.0~ 26.0	3.0~ 4.0	0.20~ 0.30	0.50~ 1.00	0.50~ 1.00	≧40
Specification* (EN 1.4501)	≦0.030	≦1.00	≦1.00	≦0.035	≦0.015	6.0~ 8.0	24.0~ 26.0	3.0~ 4.0	0.20~ 0.30	0.50~ 1.00	0.50~ 1.00	—

*EN 10088-2

*1 PRE = %Cr + 3.3 × %Mo + 16 × %N

Physical Properties

Density	[g/cm³]		7.80
Specific heat	[J/kg · K]		466
Electrical resistivity	[μΩ · cm]		99.0
Thermal conductivity	[W/m · K]		12.8
Average coefficient of thermal expansion	[10⁻⁶/°C]	20~100°C	13.5
		20~200°C	13.8
		20~300°C	13.8
		20~400°C	14.0
Young's modulus	[MPa]		18.9 × 10⁴
Magnetism			Y (magnetizable)
Melting range	[°C]		1400~1450

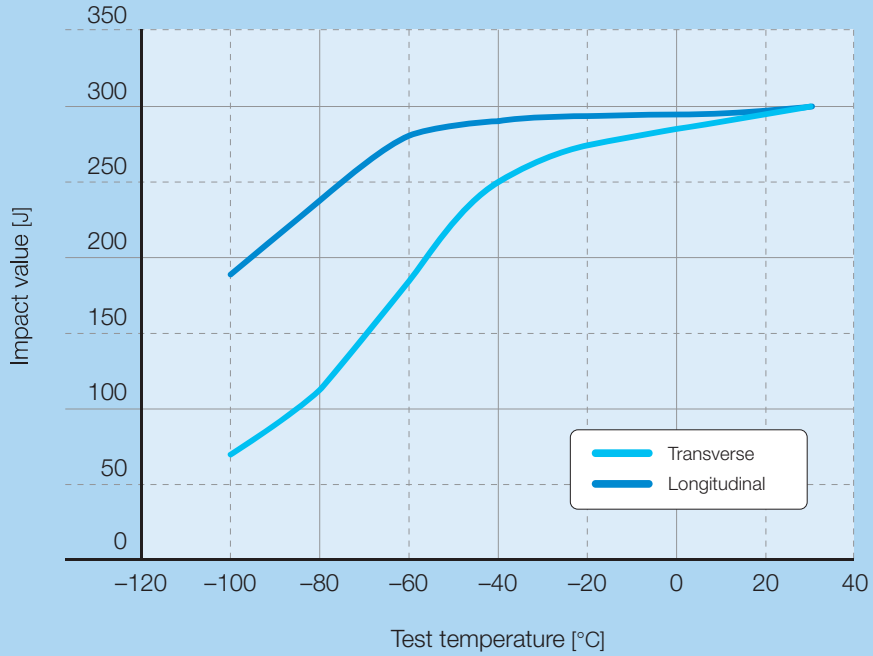
Mechanical Properties

Mechanical Properties at Room Temperature

		0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness [HBW]	Impact value R.T. Vnotch Fullsize (J)	
Specification (UNS S32760)		≧550	≧750	≧25	≦310	—	—
Specification (EN 1.4501)		≧530	730~930	≧25	—	≧100 (long)	≧60 (tr)
Example	Hot-rolled plate 20mm^t	583	834	36	243	295	290
	Hot-rolled plate 8mm^t	616	852	35	243	—	—

Impact Value

Charpy impact test (14mm^t hot-rolled plate, full size)



Corrosion Resistance

NAS75N has excellent localized corrosion resistance (pitting corrosion, crevice corrosion) and acid resistance in comparison with Type 304, Type 316L, NAS329J3L (UNS S32205), NAS64.

Pitting Corrosion Resistance

Alloy	ASTM G48 Method A		ASTM G48 Method C
	22°C	50°C	Critical pitting corrosion temperature CPT (°C)
NAS329J3L	○	×	50
NAS64	○	○	55
NAS75N	○	○	70

Test conditions

ASTM G48 Method A (○: No pitting corrosion, ×: Pitting corrosion)
- Test solution: 6%$FeCl_3$
- Test temperature: 22°C, 50°C (Recommended temperature in this test)
- Test time: 72h

ASTM G48 Method C
- Test solution: 6%$FeCl_3$ + 1%HCl
- Test time: 72h

Crevice Corrosion Resistance

Alloy	ASTM G48 Method D
	Critical crevice corrosion temperature CCT (°C)
NAS329J3L	25
NAS64	30
NAS75N	45

Test conditions ASTM G48 Method D
- Test solution: 6%$FeCl_3$ + 1%HCl
- Test time: 72h

Acid Resistance

Alloy	Corrosion rate in sulfuric acid at 80°C (mm/y)					
	5%	10%	20%	40%	60%	80%
NAS329J3L	0.01	0.17	4.65	365.9	1456	106.4
NAS64	<0.01	0.02	1.07	191.9	1054	60.72
NAS75N	<0.01	<0.01	0.04	59.33	442.4	40.23

Test time: 24h

Alloy	Corrosion rate in hydrochloric acid at 80°C (mm/y)			
	0.1%	1%	2%	3%
NAS329J3L	0.02	0.03	31.10	60.62
NAS64	0.01	0.01	12.94	30.51
NAS75N	0.01	0.01	<0.01	25.41

Test time: 24h

Alloy	Corrosion rate in boiling phosphoric acid (mm/y)				Corrosion rate in boiling nitric acid (mm/y)		
	20%	40%	60%	80%	20%	40%	60%
NAS329J3L	0.03	0.06	3.96	5.52	0.02	0.04	0.11
NAS64	0.01	0.06	0.25	4.99	0.02	0.02	0.08
NAS75N	0.01	0.01	0.17	3.90	0.01	0.02	0.08

Test time: 24h

(Reference)

Alloy	JIS	UNS No.	Chemical composition
NAS329J3L	SUS329J3L	S32205	22Cr-5.3Ni-3.2Mo-0.16N
NAS64	SUS329J4L	S32506	25Cr-6.5Ni-3.3Mo-0.17N
NAS75N	—	S32760	25Cr-6.5Ni-3.6Mo-0.6Cu-0.6W-0.27N

Workability

The high-temperature strength of NAS75N is basically the same as Type 430 in the range of 950~1150°C. It should be noted that the strength increases abruptly below 900°C. Solution annealing should be done after hot working. 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. Use of welding electrodes for UNS S32760 is recommended. Preheating and postheating are not necessary. In welding, the interpass temperature should be no more than 100°C in order to prevent formation of intermetallic compounds.

Heat Treatment

Solution annealing of NAS75N should be performed at 1100°C and higher followed by being quenched in water or rapidly cooled by other means. (Conditions provided in ASTM A480/A480M)

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

Seawater desalination plant, Chemical plant, Seawater pump.

Certification

It is possible to manufacture UNS S32760 in accordance with the NORSOK standard below. The thickness is up to 40mm.

- NORSOK M-650
- NORSOK M-630 MDS D55

For more information, please contact:
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2024.02.29