

NASNW400 (UNS N04400)

High Corrosion Resistant Ni-Cu Alloy

NASNW400 (NW4000, UNS N04400), with a composition comprising Ni and Cu, is an alloy which provides a combination of the noble metal properties of Cu and the passivation property of Ni and offers excellent corrosion resistance. Taking advantage of these properties, it is used in seawater desalination plant, heat exchangers, overlay materials for marine structures, and similar applications. Nippon Yakin supplies this product in plate, sheet and strip form.

Grade/Standard

Nippon Yakin Grade	JIS G 4902	ASTM B127	EN
NASNW400	NW4400	UNS N04400	—

Chemical Composition

	C	Si	Mn	S	Ni	Cu	Fe
Specification (NW4400)	≤0.30	≤0.50	≤2.00	≤0.024	≥63.00	28.00~34.00	≤2.50
Specification (UNS N04400)	≤0.3	≤0.5	≤2.0	≤0.024	≥63.0	28.0~34.0	≤2.5

Physical Properties

Density	[g/cm ³]		8.80
Specific heat	[J/kg · K]	20°C	424
Electrical resistivity	[μΩ · cm]		54.7
Thermal conductivity	[W/m · K]		23.9
Average coefficient of thermal expansion	[10 ⁻⁶ /°C]	20~100°C	13.6
		20~200°C	14.1
		20~300°C	14.6
		20~400°C	15.0
Young's modulus	[MPa]		17.8 × 10 ⁴
Melting range	[°C]		1300~1350

Mechanical Properties

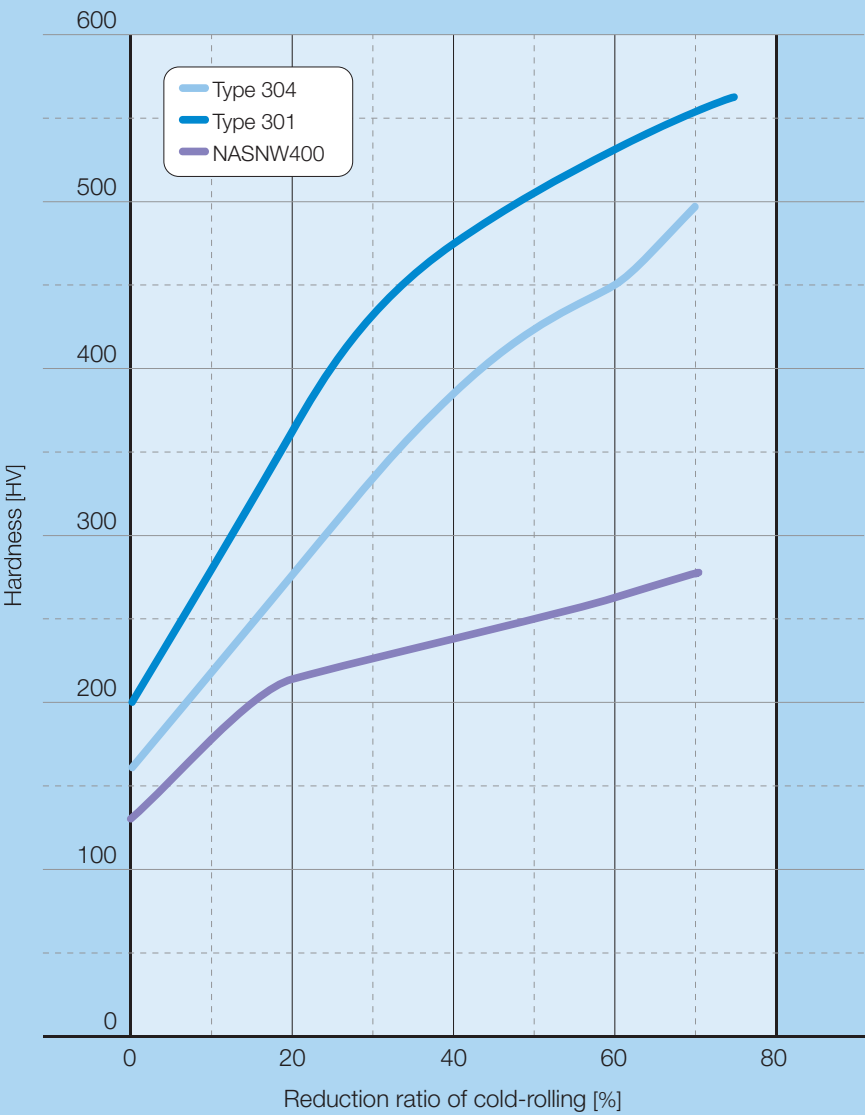
Mechanical Properties at Room Temperature

		0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness [HV]
Specification (NW4400)	Annealing	≥ 195	≥ 485	≥ 35	—
Specification (UNS N04400)	Annealing Hot-rolled plate	≥ 195	≥ 485	≥ 35	
	Cold-rolled sheet	≥ 195	485~585	≥ 35	
Example	Annealing Hot-rolled plate 12mm ^t	209	513	52	131

Work Hardening

Because work hardening of NASNW400 is substantially smaller than that of Type 301 and Type 304, bending forming and similar working can be performed easily.

Results of work hardening test



Corrosion Resistance

Acid Resistance

Alloy	Corrosion rate in sulfuric acid at 80°C (mm/y)					
	5%	10%	20%	40%	60%	80%
SUS316L	1.67	4.69	71.91	764.9	704.5	33.74
NAS64	<0.01	0.02	1.07	191.9	1054	60.72
NAS254N	0.02	0.05	1.02	2.11	2.16	7.76
NASNW400	0.28	0.27	0.20	0.16	0.14	0.80

Test time: 24h

Alloy	Corrosion rate in boiling sulfuric acid (mm/y)			
	5%	10%	20%	40%
SUS316L	8.19	24.61	178.9	3129
NAS64	0.35	1.65	17.68	2829
NAS254N	1.17	3.30	7.90	24.65
NASNW400	0.21	0.36	0.53	2.12

Test time: 24h

Alloy	Corrosion rate in hydrochloric acid at 80°C (mm/y)			
	0.1%	1%	2%	3%
SUS316L	0.02	2.73	6.75	14.88
NAS64	0.01	0.01	12.94	30.51
NAS254N	0.01	0.02	0.01	9.14
NASNW400	0.34	0.40	0.46	0.63

Test time: 24h

Alloy	Corrosion rate in boiling formic acid (mm/y)			
	20%	40%	60%	80%
SUS316L	0.35	0.62	0.73	0.49
NAS64	0.01	<0.01	0.25	0.40
NAS254N	0.04	0.11	0.23	0.30
NASNW400	0.05	0.08	0.05	0.02

Test time: 24h

(Reference)

Alloy	JIS	UNS No.	Chemical composition
SUS316L	SUS316L	S31603	17Cr-12Ni-2Mo
NAS64	SUS329J4L	S32506	25Cr-6.5Ni-3.3Mo-0.17N
NAS254N	SUS836L	S32053	23Cr-25Ni-5.5Mo-0.2N
NASNW400	NW4400	N04400	65Ni-32Cu-1Fe

Workability

Because ordinary temperature strength of NASNW400 is lower than that of Type 304, the cold working such as bending is easier than Type 304.

Weldability

Possible welding methods include shielded metal arc welding, TIG, MIG, and resistance welding. ENiCu-7 welding consumable should be used for TIG and MIG welding.

Heat Treatment

Solution annealing of NASNW400 is normally performed at the temperature range from 700 to 900°C followed by being quenched in water or rapidly cooled by other means.

Pickling

It should be noted that descaling of NASNW400 is somewhat difficult in comparison with Type 304.

Applications

Chemical plants, Fluorine-related equipment, Oil and gas extraction, Heat exchangers, Sacrificial anode.

For more information, please contact:

Nippon Yakin Kogyo Co., Ltd.

Material Solutions Sales Department

San-Ei Bldg., 5-8, 1-chome Kyobashi, Chuo-ku,

Tokyo 104-8365 Japan

TEL: +81-3-3273-4649 FAX: +81-3-3273-4642

URL: <https://www.nyk.co.jp/en/>

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