

# NAS Ni201 (UNS N02201)

## NAS High Corrosion Resistant Pure Nickel

Pure Nickel (NAS Ni201) offers excellent corrosion resistant against caustic soda, chlorine gas, etc. In particular, it is used as a material for caustic soda manufacturing equipment by diaphragm electrolysis method. Nippon Yakin supplies this product in plate, sheet and strip form.

### Grade/Standard

NAS	JIS H4551	ASTM B162	EN
NAS Ni201	NW2201	UNS N02201	2.4068

### Chemical Composition

	C	Si	Mn	S	Ni	Cu	Fe
Specification (NW2201)	≤0.02	≤0.3	≤0.3	≤0.010	≥99.0	≤0.2	≤0.4
Specification (UNS N02201)	≤0.02	≤0.35	≤0.35	≤0.01	≥99.0	≤0.25	≤0.40

### Physical Properties

Density	[g/cm <sup>3</sup> ]	8.88	
Specific heat	[J/kg · K]	456	
Electrical resistivity	[μΩ · cm]	9.2	
Thermal conductivity	[W/m · K]	72.7	
Average coefficient of thermal expansion	[10 <sup>-6</sup> /°C]	25~100°C	12.9
		25~200°C	13.6
		25~300°C	14.2
Young's modulus	[MPa]	21.1 × 10 <sup>4</sup>	
Melting range	[°C]	1433~1444	

Mechanical Properties

Mechanical Properties at Room Temperature

		Thickness [mm]	Tensile strength [MPa]	0.2% Proof stress [MPa]	Elongation [%]	
Specification (NW2201)	Annealed	≤1.2	≥345	≥80	≥30	
		≤1.2~2.7	≥345	≥80	≥35	
		≥2.7	≥345	≥80	≥40	
	As hot-rolled	≥1.5	≥350	≥85	≥30	
Specification (UNS N02201)	Annealed	—	≥345	≥80	≥40	
Example	Cold-rolled sheet	Annealed	0.6	415	231	43

Corrosion Resistance

Alkali Resistance

NAS Ni201 provides extremely high corrosion resistance against alkalis.

Alloy	Corrosion rate in boiling sodium hydroxide solution (mm/y)		
	20%	40%	60%
SUS 304	0.01	2.77	13.30
NAS 64	<0.01	0.51	5.79
NAS 185N	<0.01	0.51	2.36
NAS NW22	<0.01	0.03	0.06
NAS Ni201	<0.01	0.02	0.03

Test time: 24h

Acid Resistance

Alloy	Corrosion rate in sulfuric acid at 80°C (mm/y)					
	5%	10%	20%	40%	60%	80%
SUS 304	1.93	14.59	195.2	1347	231.8	151.4
NAS 64	<0.01	0.02	1.07	191.9	1054	60.72
NAS 185N	0.02	0.04	1.32	2.89	3.20	4.78
NAS NW22	0.01	0.02	0.02	0.04	0.47	0.34
NAS Ni201	1.01	1.15	1.86	3.83	13.70	0.79

Test time: 24h

Alloy	Corrosion rate in hydrochloric acid at 80°C (mm/y)			
	0.1%	1%	2%	3%
SUS 304	0.02	2.42	7.16	18.99
NAS 64	0.01	0.01	12.94	30.51
NAS 185N	0.01	0.02	4.20	7.21
NAS NW22	0.02	0.03	0.02	0.04
NAS Ni201	0.99	7.28	13.38	15.91

Test time: 24h

(Reference)

Nippon Yakin	JIS	UNS No.	Chemical composition
SUS 304	SUS 304	S30400	18Cr-8Ni
NAS 64	SUS 329J4L	S32506	25Cr-6.5Ni-3.3Mo-0.17N
NAS 185N	SUS 312L	S31254	20Cr-18Ni-6Mo-0.8Cu-0.2N
NAS NW22	NW 6022	N06022	57Ni-21Cr-14Mo-3W-4Fe
NAS Ni201	NW 2201	N02201	99Ni

**Workability**

Because the work hardenability of Pure Nickel is low, it is suitable for severe cold working by methods such as spinning and coining.

**Weldability**

Possible welding methods include shielded metal arc welding, TIG, MIG, and resistance welding. ENi-1 welding consumable should be used for TIG and MIG welding.

**Heat Treatment**

Heat treatment of NAS Ni201 is normally performed at the temperature range from 760 to 1050°C followed by being quenched in water or rapidly cooled by other means.

**Pickling**

It should be noted that descaling of NAS Ni201 is somewhat difficult in comparison with Type 304.

**Applications**

Materials for caustic soda manufacturing equipment, cell phone terminals, various types of battery parts, automotive electrical/electronic device parts

**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  
E-Mail: [inquiry@nyk.jp](mailto:inquiry@nyk.jp)  
URL: <http://www.nyk.co.jp/en/>

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