

JIS

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④ JIS H 4551 : 2000

**Nickel and nickel alloy plate,
sheet and strip**

ICS 77.150.40

Descriptors : copper alloys, nickel, nickel alloys, rolling, sheet materials, strips

Reference number : JIS H 4551 : 2000 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently, JIS H 4551 : 1991 is replaced with JIS H 4551 : 2000.

In order to make it easy the comparison between Japanese Industrial Standard and International standards, the preparation of Japanese Industrial Standards which are in conformity with International Standard, and the proposal of a draft for the International Standard based on the Japanese Industrial Standard, both standards ISO 6208 : 1992, *Nickel and nickel alloy plate, sheet and strip*, and ISO 9722 : 1992, *Nickel and nickel alloys—Composition and forms of wrought products* have been employed for the basis of this revision.

Being in conformance with this Standard may come under the use of the following patent right:

Denomination of invention	Corrosion resistant nickel alloy
Available time limit	2001-06-26

Besides, this description does not affect to any extent the validity, the scope and the like of the above patent right.

The holder of this patent right gives guarantee to the Japanese Industrial Standards Committee with respect to his willingness to permit anyone to exercise the relevant patent right under the nondiscriminatory and reasonable conditions.

There is a possibility that a part of this Standard conflicts with a patent right, application for a patent after opened, utility model right or application for registration of utility model after opening to the public which have other technical properties than those above-mentioned. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the technical properties of this kind.

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Nickel and nickel alloy plate, sheet and strip

Introduction This Japanese Industrial Standard has been prepared on the basis of the first edition of **ISO 6208 Nickel and nickel alloy plate, sheet and strip**, published in 1992; and **ISO 9722 Nickel and nickel alloys—Composition and forms of wrought products**, published in 1922, without any modification in the technical contents which are corresponding to each other, however the items such as dimensions and tolerances, which are not specified in the corresponding International Standards, are supplemented in Annex.

In this Standard, the portions with sidelines or dotted underlines are the items not specified in the corresponding International Standards.

1 Scope This Japanese Industrial Standard specifies rolled nickel and nickel alloy plate, sheet, and strip.

- Remarks**
- 1 Plate means the rolled flat product, measuring more than 4 mm in thickness, prepared by hot rolling or cold rolling.
 - 2 Sheet means the rolled flat product, measuring 4 mm or less in thickness, prepared by hot rolling or cold rolling.
 - 3 Strip means the sheet, with 4 mm or less thickness prepared by hot rolling or cold rolling, which is wound in coil-form, and includes a cold-rolled strip which was cut to make specified length.
 - 4 The International Standards corresponding to this Standard are as follows.

ISO 6208 : 1992 *Nickel and nickel alloy plate, sheet and strip*

ISO 9722 : 1992 *Nickel and nickel alloys—Composition and forms of wrought products*

Informative reference : The products, which have not been specified in this Standard but have been specified in the corresponding International Standards, are specified in the following standards.

At present, **JIS G 7605** is under the procedures for establishment, therefore it is not established yet as a standard, but because it is scheduled to be established in the near future, it has been mentioned here.

JIS G 4902 *Corrosion-resisting and heat-resisting super-alloy plates and sheets*

JIS G 7605 *Nickel and nickel alloy plate, sheet and rolled strip*

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards indicated below shall be applied.

JIS H 0321 *General rules for inspection of non-ferrous metal materials*

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- JIS H 1270 *General rules for chemical analysis of nickel and nickel alloys*
JIS H 1272 *Methods for determination of copper in nickel and nickel alloys*
JIS H 1273 *Methods for determination of iron in nickel and nickel alloys*
JIS H 1274 *Methods for determination of manganese in nickel and nickel alloys*
JIS H 1275 *Methods for determination of carbon in nickel and nickel alloys*
JIS H 1276 *Methods for determination of silicon in nickel and nickel alloys*
JIS H 1277 *Methods for determination of sulfur in nickel and nickel alloys*
JIS H 1278 *Methods for determination of phosphorus in nickel and nickel alloys*
JIS H 1279 *Methods for determination of chromium in nickel alloys*
JIS H 1280 *Methods for determination of molybdenum in nickel alloys*
JIS H 1281 *Methods for determination of vanadium in nickel alloys*
JIS H 1282 *Methods for determination of tungsten in nickel alloys*
JIS Z 2201 *Test pieces for tensile test for metallic materials*
JIS Z 2241 *Method of tensile test for metallic materials*
JIS Z 2244 *Vickers hardness test—Test method*
JIS Z 2245 *Rockwell hardness test—Test method*
JIS Z 2251 *Knoop hardness test—Test method*
ASTM E112 *Test methods for determining average grain size*

3 Type and symbol The type and symbol for plate, sheet, and strip shall follow Table 1. As for the type and symbol of alloys, employ the alloy number or alloy symbol.

Table 1 Type and symbol

Type and symbol		Informative reference		
Alloy number	Alloy symbol	Former type and symbol (JIS H 4551 : 1991)		Example of services
		Type	Symbol	
NW2200	Ni99.0	Ordinary-carbon nickel plate	NNCP	Sodium-hydroxide manufacturing apparatus, parts for electronic and electric appliances, etc.
NW2201	Ni99.0 · LC	Low-carbon nickel plate	NLCP	
NW4400	NiCu30	Nickel—copper alloy plate Nickel—copper alloy strip	NCuP NCuR	Sea-water desalting apparatus, salt manufacturing apparatus, distilling tower for crude oil, etc.
NW4402	NiCu30 · LC	—	—	
NW5500	NiCu30Al3Ti	Nickel—copper—aluminium—titanium alloy plate	NCuATP	High-strength parts for such as sea-water desalting apparatus, salt manufacturing apparatus, distilling tower for crude oil, etc.
NW0001	NiMo30Fe5	Nickel—molybdenum alloy plate Class 1	NM1P	Hydrochloric-acid manufacturing apparatus, urea manufacturing apparatus, ethylene-glycol manufacturing apparatus, chloroprene-monomer manufacturing apparatus, etc.
NW0665	NiMo28	Nickel—molybdenum alloy plate Class 2	NM2P	
NW0276	NiMo16Cr15Fe6W4	Nickel—molybdenum—chromium alloy plate	NMCrP	Acid pickling apparatus, antipollution apparatus, apparatus for petrochemical industry, apparatus for synthetic-fiber industry, etc.
NW6455	NiCr16Mo16Ti	—	—	
NW6022	NiCr21Mo13Fe4W3	—	—	
NW6007	NiCr22Fe20Mo6Cu2Nb	Nickel—chromium—iron—molybdenum—copper alloy plate Class 1	NCrFMCu1P	Phosphoric-acid manufacturing apparatus, hydrofluoric-acid manufacturing apparatus, antipollution apparatus, etc.
NW6985	NiCr22Fe20Mo7Cu2	Nickel—chromium—iron—molybdenum—copper alloy plate Class 2	NCrFMCu2P	
NW6002	NiCr21Fe18Mo9	Nickel—chromium—molybdenum—iron alloy plate	NCrMFP	Furnace for industry, gas turbine, etc.

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4 Quality

4.1 Appearance Plate, sheet, and strip shall have regular shape, superior and uniform finish, and have no harmful defects for service.

Remarks : Finishing condition of surface shall follow the agreement between the parties concerned with delivery.

4.2 Chemical composition The chemical composition of plate, sheet, and strip shall be as specified in Table 2.

4.3 Mechanical properties The mechanical properties (tensile strength, proof stress, elongation, and hardness) of plate, sheet, and strip shall be as specified in Table 3.

Table 2 Chemical composition and density

Type and symbol		Chemical composition														Density (informative) (Mg/m³)		
Alloy number	Alloy symbol	Al	B	C	Co	Cr	Cu	Fe	Mn	Mo	Ni	P	S	Si	Ti	W	Others	
NW2200	Ni99.0	—	—	0.15	—	—	0.2	0.4	0.3	—	99.0	—	0.010	0.3	—	—	—	8.9
NW2201	Ni99.0-1C	—	—	0.02	—	—	0.2	0.4	0.3	—	99.0	—	0.010	0.3	—	—	—	8.9
NW4400	NiCu30	—	—	0.30	—	—	28.0 34.0	2.5	2.0	—	63.0	—	0.025	0.5	—	—	—	8.8
NW4402	NiCu30-1C	—	—	0.04	—	—	28.0 34.0	2.5	2.0	—	63.0	—	0.025	0.5	—	—	—	8.8
NW5500	NiCu30Al3Ti	2.2 3.2	—	0.25	—	—	27.0 34.0	2.0	1.5	—	Remain- der	0.020	0.015	0.5	0.35 0.85	—	—	8.5
NW0001	NiMo30Fe 5	—	—	0.05	2.5	1.0	—	4.0 6.0	1.0	26.0 30.0	Remain- der	0.040	0.030	1.0	—	—	V:0.2 to 0.4	9.2
NW0665	NiMo28	—	—	0.02	1.0	1.0	—	2.0	1.0	26.0 30.0	Remain- der	0.040	0.030	0.1	—	—	—	9.2
NW0276	NiMo16Cr15Fe4W4	—	—	0.010	2.5	14.5 16.5	—	4.0 7.0	1.0	15.0 17.0	Remain- der	0.040	0.030	0.08	—	3.0 4.5	(1)	8.9
NW6455	NiCr16Mo16Ti	—	—	0.015	2.0	14.0 18.0	—	3.0	1.0	14.0 17.0	Remain- der	0.040	0.030	0.08	0.7	—	—	8.6
NW6022	NiCr21Mo13Fe4W3	—	—	0.015	2.5	20.0 22.5	—	2.0 6.0	0.5	12.5 14.5	Remain- der	0.025	0.020	0.08	—	2.5 3.5	V:0.35 max.	8.7
NW6007	NiCr22Fe20Mo6Cu2Nb	—	—	0.05	2.5	21.0 23.5	1.5 2.5	18.0 21.0	1.0 2.0	5.0 7.5	Remain- der	0.040	0.030	1.0	—	(2)	Nb + Ta: 1.7 to 2.5	8.3
NW6985	NiCr22Fe20Mo7Cu2	—	—	0.015	5.0	21.0 23.5	1.5 2.5	18.0 21.0	1.0	6.0 8.0	Remain- der	0.040	0.030	1.0	—	1.5	Nb + Ta: 0.5 max.	8.3
NW6002	NiCr21Fe18Mo9	—	0.010	0.05 0.15	0.5 2.5	20.5 23.0	—	17.0 20.0	1.0	8.0 10.0	Remain- der	0.040	0.030	1.0	—	0.2 1.0	—	8.2

Notes (1) NW0276 may contain V of 0.35 % or less.

(2) NW6007 may contain W of 1.0 % or less.

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- Remarks
- 1 The single expression of value of chemical composition means the maximum value. Provided in case of Ni it is the minimum value.
 - 2 Unless Co content is specified, the content of Co, up to the maximum 1.5 %, can be regarded as Ni. In this case, marking of Co content is not needed.
 - 3 When the content of Ni is expressed as "Remainder", obtain the percentage content of each specified element, subtract them from 100, then discard the lower digits than the second decimal, and adopt the left value as percentage content of nickel.
 - 4 Density is the averaged value.