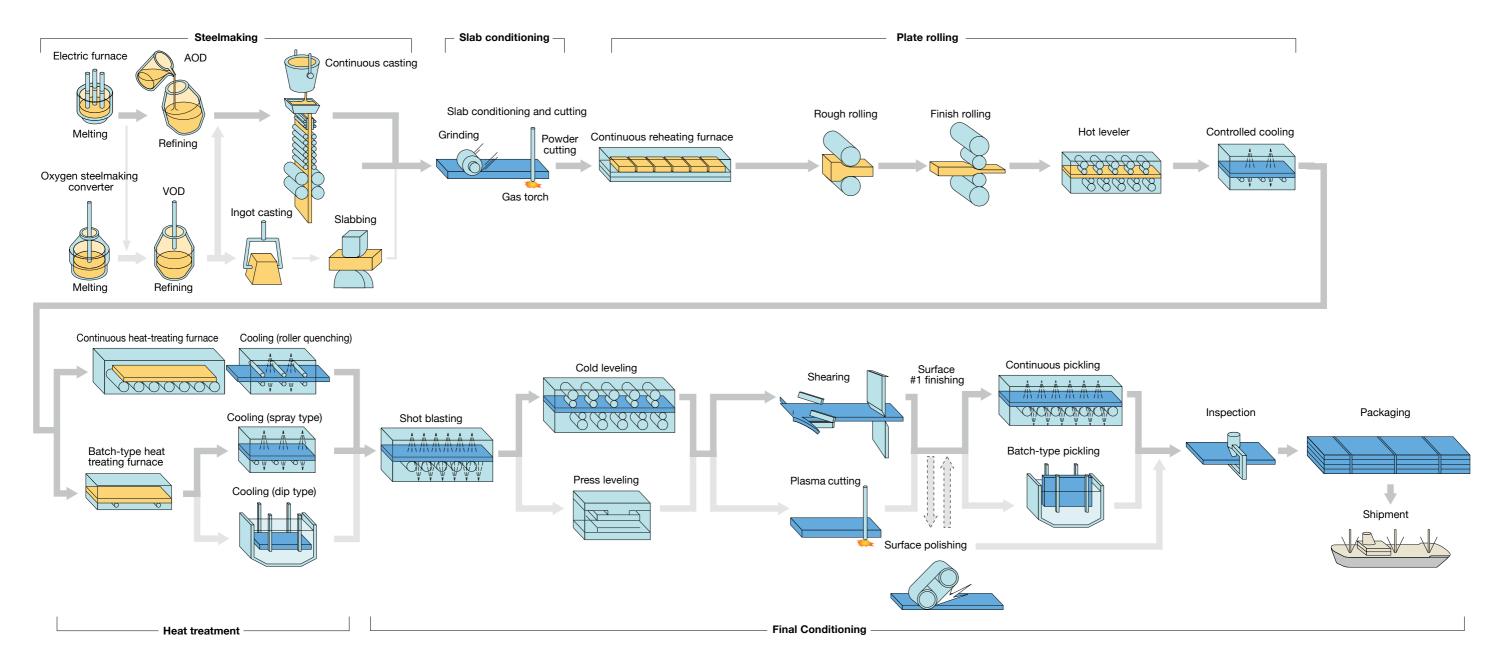
Stainless Steel Plates & Sheets Manufacturing Flow

# Manufacturing Flow

VOD: Vacuum Oxygen Decarburization AOD : Argon Oxygen Decarburization
RQ : Roller Quench



















7

Electric furnace Continuous casting

Plate rolling

Heat treating furnace

Cold leveling

Plasma cutting

Continuous pickling

Production

Stainless Steel Plates & Sheets

# Available Product Grades

	Grade					Chemical Composition(%)									Mechanical Properties						
Stainless Steel	ASTM EN		Symbol of Grades	Others							_		0.11	Tensile Pro	operties(1MP	a=1N/mm²)	Hardness				
Group	(A240M)	Number	(NSSC)	(JIS)	С	Si	Mn	Р	S	Ni	Cr	Мо	Others	Yield Strength MPa	Tensile Strength MPa	Elongation %	HBW	HRBW	Bend Test		
	304	(1.4301)		(SUS304)	≦0.07	≦0.75	≦2.00	≦0.045	≦0.030	8.0/10.5	17.5/19.5	_	N≦0.10	≧205	≧515	≧40	≦201	<b>≦</b> 92	_		
	304H				0.04/0.10	≦0.75	≦2.00	≦0.045	≦0.030	8.0/10.5	18.0/20.0	_		≧205	≧515	≧40	≦201	<b>≦</b> 92	_		
	304L	(1.4307)		(SUS304L)	≦0.030	≦0.75	≦2.00	≦0.045	≦0.030	8.0/12.0	17.5/19.5	_	N≦0.10	≧170	≧485	≧40	≦201	<b>≦</b> 92	_		
	304N	(1.4315)		(SUS304N1)	≦0.08	≦0.75	≦2.00	≦0.045	≦0.030	8.0/10.5	18.0/20.0	_	- N:0.10/0.16		≧550	≧30	≦217	≦95	_		
	304LN	(1.4311)		(SUS304LN)	≦0.030	≦0.75	≦2.00	≦0.045	≦0.030	8.0/12.0	18.0/20.0	_	- N:0.10/0.16		≧515	≧40	≦217	<b>≦</b> 95	_		
	309S	(1.4950)		(SUS309S)	≦0.08	≦0.75	≦2.00	≦0.045	≦0.030	12.0/15.0	22.0/24.0	_		≧205	≧515	≧40	≦217	<b>≦</b> 95	_		
	310S	(1.4951)		(SUS310S)	≦0.08	≦1.50	≦2.00	≦0.045	≦0.030	19.0/22.0	24.0/26.0	_		≧205	≧515	≧40	≦217	<b>≦</b> 95	_		
Austenitic	316	(1.4401)		(SUS316)	≦0.08	≦0.75	≦2.00	≦0.045	≦0.030	10.0/14.0	16.0/18.0	2.00/3.00	N≦0.10	≧205	≧515	≧40	≦217	<b>≦</b> 95	_		
Steels	316L	(1.4404)		(SUS316L)	≦0.030	≦0.75	≦2.00	≦0.045	≦0.030	10.0/14.0	16.0/18.0	2.00/3.00	N≦0.10	≧170	≧485	≧40	≦217	<b>≦</b> 95	_		
	316H				0.04/0.10	≦0.75	≦2.00	≦0.045	≦0.030	10.0/14.0	16.0/18.0	2.00/3.00		≧205	≧515	≧40	≦217	<b>≦</b> 95	_		
	316LN	(1.4406)		(SUS316LN)	≦0.030	≦0.75	≦2.00	≦0.045	≦0.030	10.0/14.0	16.0/18.0	2.00/3.00	.00/3.00 N:0.10/0.16		≧515	≧40	≦217	<b>≦</b> 95	_		
	317L	(1.4438)		(SUS317L)	≦0.030	≦0.75	≦2.00	≦0.045	≦0.030	11.0/15.0	18.0/20.0	3.0/4.0	N≦0.10	≧205	≧515	≧40	≦217	<b>≦</b> 95	_		
	317LN	(1.4434)		(SUS317LN)	≦0.030	≦0.75	≦2.00	≦0.045	≦0.030	11.0/15.0	18.0/20.0	3.0/4.0	.0/4.0 N:0.10/0.22		≧550	≧40	≦217	<b>≦</b> 95	_		
	321	(1.4541)		(SUS321)	≦0.08	≦0.75	≦2.00	≦0.045	≦0.030	9.0/12.0	17.0/19.0	_	– N≦0.10 Ti:5×(C+N) /0.70		≧515	≧40	≦217	<b>≦</b> 95	_		
	347	(1.4550)		(SUS347)	≦0.08	≦0.75	≦2.00	≦0.045	≦0.030	9.0/13.0	17.0/19.0	_	Nb:10×C/1.00	≧205	≧515	≧40	≦201	<b>≦</b> 92	_		
	N08904 (904L)	(1.4539)		(SUS890L)	≦0.020	≦1.00	≦2.00	≦0.045	≦0.035	23.0/28.0	19.0/23.0	4.00/5.00	N≦0.10 Cu:1.0/2.0	≧220	≧490	≧35	_	≦90	_		
	S31254	(1.4547)	(NSSC 270)		≦0.020	≦0.80	≦1.00	≦0.030	≦0.010	17.5/18.5	19.5/20.5	6.0/6.5	N:0.18/0.25 Cu:0.50/1.00	≧310	≧655	≧35	≦223	≦96	_		
			(NSSC 170)	SUS317J2	≦0.06	≦1.50	≦2.00	≦0.045	≦0.030	12.00/16.00	23.00/26.00	0.50/1.20	N:0.25/0.40	≧345	≧690	≧40	≦250	≦100	_		

Stainless Steel Plates & Sheets Available Product Grades

## Available Product Grades

	Grade					Chemical Composition(%)								Mechanical Properties						
Stainless Steel	ASTM	EN	Symbol of Grades	Others		0.							0.1	Tensile P	roperties (1MP	a=1N/mm²)	Hardness			
Group	(A240M)	Number	(NSSC)	(JIS)	С	Si	Mn	Р	S	Ni	Cr	Мо	Others	Yield Strength MPa	Tensile Strength MPa	Elongation %	HBW	HRBW	Bend Test	
	405	(1.4002)		(SUS405)	≦0.08	<b>≦</b> 1.00	≦1.00	≦0.040	≦0.030	≦0.60	11.5/14.5	_	AI:0.10/0.30	≧170	≧415	≧20	≦179	≦88	<b>*</b> 5	
<b></b>	430	(1.4016)		(SUS430)	≦0.12	≦1.00	≦1.00	≦0.040	≦0.030	≦0.75	16.0/18.0	_		≧205	≧450	≧22	≦183	≦89	<b>*</b> 5	
Ferritic Steels			(NSSC 190L)	SUS444	≦0.025	≦1.00	≦1.00	≦0.040	≦0.030	<b>*</b> 1	17.00/20.00	1.75/2.50	*2	≧245	≧410	≧20	≦217	≦96	*6	
			(NSSC 410W)	SUS410L	≦0.030	≦1.00	≦1.00	≦0.040	≦0.030	<b>*1</b>	11.00/13.50	_		≧195	≧360	≧22	≦183	≦88	*6	
			(NSSC 409L)	SUH409L	≦0.030	≦1.00	≦1.00	≦0.040	≦0.030	<b>*</b> 1	10.50/11.75	_	Ti:6(C+N)/0.75	≧175	≧360	≧25	≦162	≦80	*7	
Martensitic	(410)	(1.4006)		SUS410	≦0.15	<b>≦</b> 1.00	≦1.00	≦0.040	≦0.030	<b>*</b> 1	11.50/13.50	_		≧205	≧440	≧20	≦201	≦93	*6	
Steels	410S	(1.4000)		(SUS410S)	≦0.08	≦1.00	≦1.00	≦0.040	≦0.030	≦0.60	11.5/13.5	_		≧205	≧415	≧22	≦183	≦89	<b>*</b> 5	
	S32101**	(1.4162)			≦0.040	≦1.00	4.00/6.00	≦0.040	≦0.030	1.35/1.70	21.0/22.0	0.10/0.80	N:0.20/0.25 Cu:0.10/0.80	≧450	≧650	≧30	≦290	_	_	
	S82122		(NSSC 2120)		≦0.030	≦0.75	2.0/4.0	≦0.040	≦0.020	1.5/2.5	20.5/21.5	≦0.60	N:0.15/0.20 Cu:0.50/1.50	≧400	≧600	≧30	≦290	≦32(HRC)	_	
A	S32304	(1.4362)			≦0.030	≦1.00	≦2.50	≦0.040	≦0.030	3.0/5.5	21.5/24.5	0.05/0.60	N:0.05/0.20 Cu:0.05/0.60	≧400	≧600	≧25	≦290	≦32(HRC)	_	
Austenitic- Ferritic	S31803	(1.4462)	(NSSC DX1)	(SUS329J3L)	≦0.030	<b>≦</b> 1.00	≦2.00	≦0.030	≦0.020	4.5/6.5	21.0/23.0	2.5/3.5	N:0.08/0.20	≧450	≧620	≧25	≦293	≦31 (HRC)	_	
Steels	S32205	(1.4462)			≦0.030	≦1.00	≦2.00	≦0.030	≦0.020	4.5/6.5	22.0/23.0	3.0/3.5	N:0.14/0.20	≧450	≧655	≧25	≦293	≦31 (HRC)	_	
	S32760	(1.4501)			≦0.030	<b>≦</b> 1.00	≦1.00	≦0.040	≦0.020	6.0/8.0	24.0/26.0	3.0/4.0	*3	≧550	≧750	≧25	≦270	_	_	
	S32750	(1.4410)			≦0.030	≦0.80	≦1.20	≦0.035	≦0.020	6.0/8.0	24.0/26.0	3.0/5.0	*4	≧550	≧795	≧15	≦310	≦32(HRC)	_	
		(1.4507)		SUS329J4L	≦0.030	≦1.00	≦1.50	≦0.040	≦0.030	5.50/7.50	24.00/26.00	2.50/3.50	N:0.08/0.30	≧450	≧620	≧18	≦302	≦32(HRC)	_	

\*\* S32101: Sold under license from Outokumpu Stainless AB (re. patents on LDX2101® grade) in the Territory (designated countries) .

\*3: N:0.20/0.30, Cu:0.50/1.00, W:0.50/1.00, Cr+3.3Mo+16N≥40

\* 4 : N:0.24/0.32, Cu≦0.50, Cr+3.3Mo+16N≧41

\*5: Bending Angle: 180°, Inside Radius t $\leq$ 9.52: equal to one half the specimen thickness, 9.52<t $\leq$ 25.4: equal to the specimen thickness 25.4<t: not required

\* 6 : Bending Angle : 180°, Inside Radius : equal to the specimen thickness
\* 7 : Bending Angle : 180°, Inside Radius t<8 : equal to one half the specimen thickness, 8≦t : equal to the specimen thickness</li>

## Quality Management System (at Yawata Works)

### **■**General Purpose•Pressure Vessel

<u></u>		
Quality System Standard/Specification	Standard/Specification	Grade
ISO9001	Available Standard	Available Grade
ISO9001 (JIS Q9001) (JIS Q1001 Certification System)	JIS G4304	Approved Grade
PED 97/23/EC (PRESSURE VESSEL)	JIS G4304 ASTM A240/A240M ASME SA-240/SA-240M EN 10028-7	Approved Grade
AD2000-W0 (PRESSURE VESSEL)	EN10028-7 AD2000-W2, W10 VdTUV418	Austenitic : Available Grade Austenitic • Ferritic : 1.4410, 1.4462

### **■**Offshore Structure

Quality System Standard/Specification	Standard/Specification	Grade
NORSOK M-650	NORSOK M-630	MDS R15 UNS S31254 MDS D45 UNS S31803 UNS S32205 MDS D55 UNS S32750

### **■**Ship Classification Societies

Society	Grade	Products			
Nippon Kaiji Kyokai (NK)*1	KSUS304, KSUS316L, KSUS316LN e.t.c.	Stainless Steel			
Lloyd's Register of Shipping (LR)	LR304L, LR316L, LR316LN e.t.c.	Stainless Steel			
Det Norske Veritas (DNV)	NV304L, NV316L, NV316LN e.t.c.	Stainless Steel			
Bureau Veritas (BV) Mode I *1	BV304L, BV316L, BV316LN e.t.c.	Stainless Steel			
Korean Resister of Shipping (KR)	RSTS304L, RSTS316L, RSTS316LN	Stainless Steel			
Germanisher Lloyd (GL)	1.4306 (304N) , 1.4541 (321) , 1.4404 (316L) , 1.4550 (347)	Stainless Steel specified in EN Standard			

<sup>\*1</sup> Manufacturing Process Approved

10 11 Stainless Steel Plates & Sheets Sizes Available

## Sizes Available

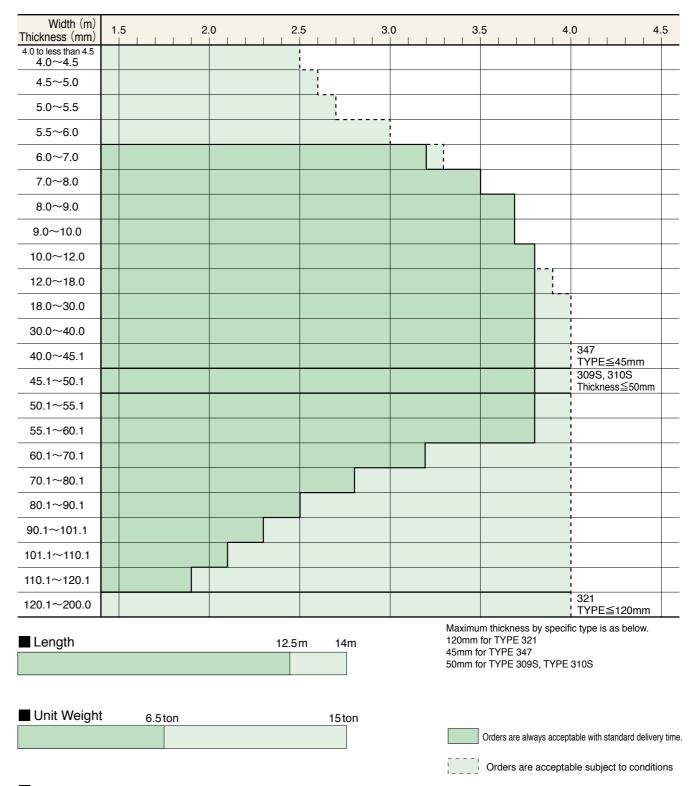
## Ferritic Steels / Martensitic Steels (TYPE 405, 410S, 430, SUS444, NSSC 190L) Size Width (m) 2.0 Thickness (mm) 4.0 to less than 4.5 4.0~4.5 4.5~5.0 5.0~5.5 5.5~6.0 6.0~7.0 7.0~8.0 8.0~9.0 9.0~10.0 10.0~12.0 12.0~20.0 20.0~30.0 TYPE405, 430 30.0~40.1 Thickness≦40mm 40.1~50.0 50.0~60.0 60.0~80.0 80.0~100.0 100.0~120.0 120.0~200.0 Length 12.5 m 14m Orders are always acceptable with standard delivery time. Orders are acceptable subject to conditions. SUS 444, NSSC 190L Orders are always acceptable.

Unit Weight 5ton SUS 444, NSSC 190L Orders are acceptable subject to conditions.

Minimum Size Width≥1,219mm, Length≥2,000mm

Please contact us when you need other type or size than mentioned above.

Austenitic Steels (1)(TYPE 304, 304L, 321, 347, 309S, 310S)



Minimum Size Width≥1,219mm, Length≥2,000mm (heavy plate 2,500mm)

Please contact us when you need other type or size than mentioned above.

Stainless Steel Plates & Sheets Sizes Available

#### Austenitic Steels 2 (TYPE 316, 316L, 317L) Austenitic-Ferritic (Dual-phase) Steels (S32304, S31803, S32205, SUS329J3L, NSSC DX1) Size Size Width (m) Width (m) 2.0 Thickness (mm) Thickness (mm) 4.0 to less than 4.5 4.0 to less than 4.5 4.0~4.5 4.0~4.5 4.5~5.0 4.5~5.0 5.0~5.5 5.0~5.5 5.5~6.0 5.5~6.0 6.0~7.0 6.0~7.0 7.0~8.0 7.0~8.0 8.0~9.0 8.0~9.0 9.0~10.0 9.0~10.0 10.0~12.0 10.0~16.0 12.0~18.0 16.0~18.0 18.0~30.0 18.0~20.0 30.0~40.0 20.0~25.0 40.0~50.0 25.0~30.0 50.0~60.1 30.0~40.0 60.1~70.1 40.0~50.0 70.1~80.1 50.0~60.0 80.1~90.1 60.0~80.0 90.1~100.1 100.1~110.1 80.0~100.0 110.1~120.0 100.0~200.0 120.0~200.0 Length 12.5 m 14m Length 12.5m 14m Orders are always acceptable with standard delivery time. Unit Weight Orders are acceptable subject to conditions. 4.5ton 6.5ton Unit Weight TYPE 317L : Thickness≦50mm 6.5ton 15ton Minimum Size Width≥1,219mm, Length≥2,500mm

Orders are always acceptable with standard delivery time. Orders are acceptable subject to conditions.

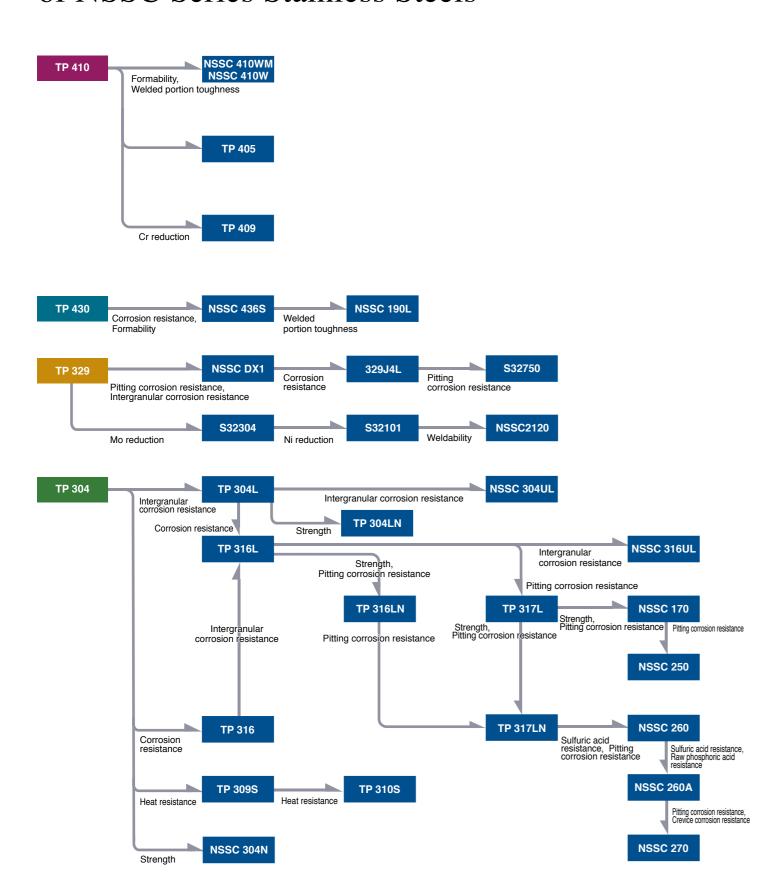
Please contact us when you need other type or size than mentioned above.

Please contact us when you need other type or size than mentioned above.

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Minimum Size Width≥1,219mm, Length≥2,000mm (heavy plate 2,500mm)

# Guide to Selection of Approproate Grade of NSSC Series Stainless Steels



## List of NSSC Series Stainless Steels

		Chemical Composition  Mechanical Properties  Upper/Tensile Properties  Lower/Hardness, (Bend)		rrosion resista			Form	St	Ξ	8		
Stainless Steel Group	Symbol of Grade (similar grade)			Stress corrosion resistance	Pitting corrosion resistance	Intergranular corrosion resistance	Formability Deep drawability	Strength	Heat-resistance	Weldability	Application examples	
	NSSC 270 (S31254)	20Cr-18Ni-6Mo-0.7Cu-0.2N-LC 0.2YS≥300, TS≥650, EL≥35 HBW≦223, HRB≦96	0	0	0	0		0			Seawater water conversion device, Chimney, Salt manufacture plant, Food manufacture plant	
	NSSC 260A ( — )	22Cr-16Ni-3.5Mo-2Cu-0.2N-LC 0.2YS≧315, TS≧600, EL≧35 HBW≦230, HRB≦95	0		0	0		0			Chemical tanker, Chimney, Sulfuric acid plant	
	NSSC 260 ( — )	20Cr-15Ni-3Mo-1.5Cu-0.2N-LC 0.2YS≥275, TS≥550, EL≥35 HBW≦217, HRB≦95	0		0	0		0			Chimney, Sulfuric acid plant	
	NSSC 250	25Cr-18Ni-2.5Mo-0.3N-LC 0.2YS≧345, TS≧690, EL≧40 HBW≦250, HRB≦100	0	0	0	0		0			Chemical plant, Food manufacture plant	
Austenitic Steels	NSSC 170 (SUS 317J2)	25Cr-13Ni-0.9Mo-0.3N 0.2YS≧345, TS≧690, EL≧40 HBW≦250, HRB≦100			0			0			Exhaust gas desulfurizer, Waste fluid processor, High temperature usage	
	NSSC 304ULC (TYPE304L)	18Cr-10Ni-ULC 0.2YS≧175, TS≧480, EL≧40 HBW≦187, HRB≦90				0					Nuclear fuel reprocess equipment	
	NSSC 316ULC (TYPE316L)	17Cr-15Ni-2Mo-ULC 0.2YS≧175, TS≧480, EL≧40 HBW≦187, HRB≦90				0					Nuclear fuel reprocess equipment	
	NSSC 304N (TYPE304N)	18Cr-8Ni-0.2N 0.2YS≧345, TS≧690, EL≧40 HBW≦250, HRB≦100						0			Equipment which needs higher strength than Type 304	
Austenitic-	NSSC DX1 (S31803)	22Cr-5Ni-3Mo-0.13N-LC 0.2YS≧450、TS≧620、EL≧25 HBW≦290		0	0			0			Chemical plant, Energy related plant, Chemical tanker	
Ferritic Steels	NSSC 2120 (S82122)	21Cr-2Ni-1Cu-0.17N-LC 0.2YS≧400, TS≧600, EL≧30 HBW≦290, HRC≦32		0				0			Desalination plants Chemical tanker	
	NSSC 190L (SUS 444)	19Cr-2Mo-Nb-V-ULC-LN 0.2YS≧275, TS≧410, EL≧22 HBW≦217, HRB≦96, Bend®3		0	0	0				0	Chemical plant, Hot water tank	
	NSSC 436S (SUS 436L)	17Cr-1.2Mo-0.2Ti-LC-LN 0.2YS≧205, TS≧390, EL≧25 HBW≦162, HRB≦85, Bend*²			0		0				Automotive exhaust system part, Kitchen equipment, Household electric appliances part, Building interior material, Gate	
Ferritic Steels	NSSC 410WM (SUS 410L)*1	11Cr-LC-LN-Ni 0.2YS≧315, TS≧430, EL≧20 HBW≦230, Bend*4								0	Marine container frame material	
	NSSC 410W (SUS 410L)	12Cr-LC 0.2YS≧195, TS≧360, EL≧22 HBW≦183, HRB≦88, Bend*²						0		0	Heat-resistant equipment	
	NSSC 409L (SUH 409L)	11Cr-Ti-LC 0.2YS≧175, TS≧360, EL≧25 HBW≦183, Bend <sup>s2</sup>					0		0	0	Equipment related to automotive exhaust system	

<sup>\*1</sup> Please consult us to need discussion before your order.

<sup>\*2</sup> Bending Angle: 180°, Inside Radius: equal to the specimen thickness

<sup>\*3</sup> Bending Angle:180°, Inside Radius t<8:equal to one half the specimen thickness, 8≦t:equal to the specimen thickness

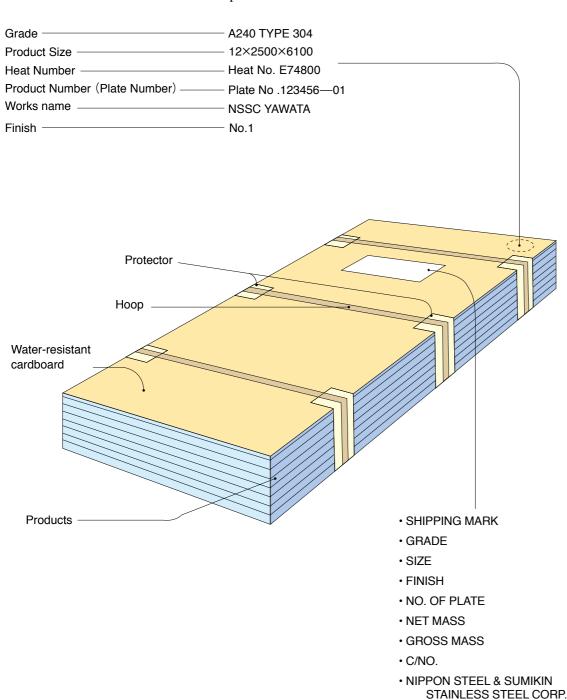
<sup>\*4</sup> Bending Angle:180°, Inside Radius 4.0≦t<5.0: equal to the specimen thickness,

<sup>5.0&</sup>lt;t≦6.4∶equal to one and a half the specimen thickness, 6.4<t∶equal to twice the specimen thicknes

## Marking and Packaging

### (Example)

### Record on the actual product



MADE IN JAPAN

## Precautions in Use

If stainless steel sheets are improperly handled or used, they cannot fully exhibit their characteristic features. When handling or using stainless steel sheets, attention should be paid to the following points.

### Storage and Unloading

- 1. If stainless steel sheets get wet during unloading or storage, rusting will occur. Accordingly, stringent care should be taken to avoid their unloading on rainy days or their getting wet by seawater. Storage at high humidity or in a sulfur-dioxide atmosphere should be avoided. Storage in a dry, clean place is recommended.
- 2. Damaged packing paper should be repaired.



Handling SDS is available on NSSC website or by contacting NSSC offices.

- 1. Because cutting bundling and packaging hoops (bands) may touch your face and your body, be careful about bouncing hoops and hoop-tips.
- 2. To avoid injury, do not handle unpacked sheets by bare hand. In handling these sheets, particularly with Cut-ends and cutting chips with burr may be injurious, careful handling and use of rotective gloves are recomended.

## Directions for Ordering

Stainless steel sheet and strip can demonstrate their optimum characteristic performances when the appropriate steel grade is properly selected in terms of application, design, fabrication and other similar conditions. Please place your orders after obtaining the advice of Nippon Steel & Sumikin Stainless Steel regarding the above conditions.

## When placing orders

Please include the following information as specifically as possible.

- 1. Standard to be applied
- for example, JIS G 4304, ASTM, ASME, EN, any special specification, etc.
- for example, JIS (SUS No.), ASTM, ASME (Type No.), etc.
- as heat-treated or not, pickled or not, Buff finish No., one or both side(s)
- Thickness×Width×Length (availability of enlarged scale)
- 5. Volume
- Number of plate(s) and weight
- 6. Usage and how to be processed
- Name of plant, Temperature to be applied, Pressure, Kind of liquid or gas applied,
- Method and conditions of processing, Method of welding, etc.
- 7. Delivery time

### Technical services

Please feel free to consult Nippon Steel & Sumikin Stainless Steel's headquarters as to technical matters such as grade selection and applications of stainless steel sheet and strip. Nippon Steel & Sumikin Stainless Steel is ready to offer appropriate technical services on the basis of extensive research and expertise and achievements accumulated over long years of technical services.