



Introduction to NSSC Series Stainless Steels

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Nippon Steel & Sumikin Stainless Steel Corporation



NSSC

STAINLESS STEELS

Introduction
to NSSC Series Stainless Steels



Nippon Steel & Sumikin Stainless Steel Corporation

NSSC Series

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NSSC SERIES Austenitic Stainless Steels

The austenitic type stainless steels, as far as worked with solid solution heat treatment, are non-magnetic and nonhardenable by heat treatment, while they exhibit a wide range of mechanical properties and become slightly magnetic when cold worked.

And especially, they can exhibit the maximum softness, elongation and corrosion resistance in its annealed state; that is, rapid cooling from high temperatures.

NSSC SERIES Ferritic Stainless Steels

This stainless steel is Cr-type, and 18%-Cr stainless is most typical.

It cannot be hardened by heat treatment, while it shows the maximum softness, elongation and corrosion resistance in its annealed state.

It offers magnetism as does the martensitic-type stainless steel.

NSSC SERIES Martensitic Stainless Steels

This type of stainless steel can offer heat-treatment effects similar to those of most alloy steels.

When subjected to appropriate heat treatment, it can also exhibit wide-ranging mechanical properties. This type features strong magnetism.

NSSC SERIES Austenitic-Ferritic (Duplex) Stainless Steels

With a duplex structure of austenite and ferrite, duplex type stainless steels show excellence in corrosion resistance and strength.

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The technical information in this document simply describes typical characteristics and performance of the product and does not provide any guarantees except for the items clearly stated as specifications or standard values.

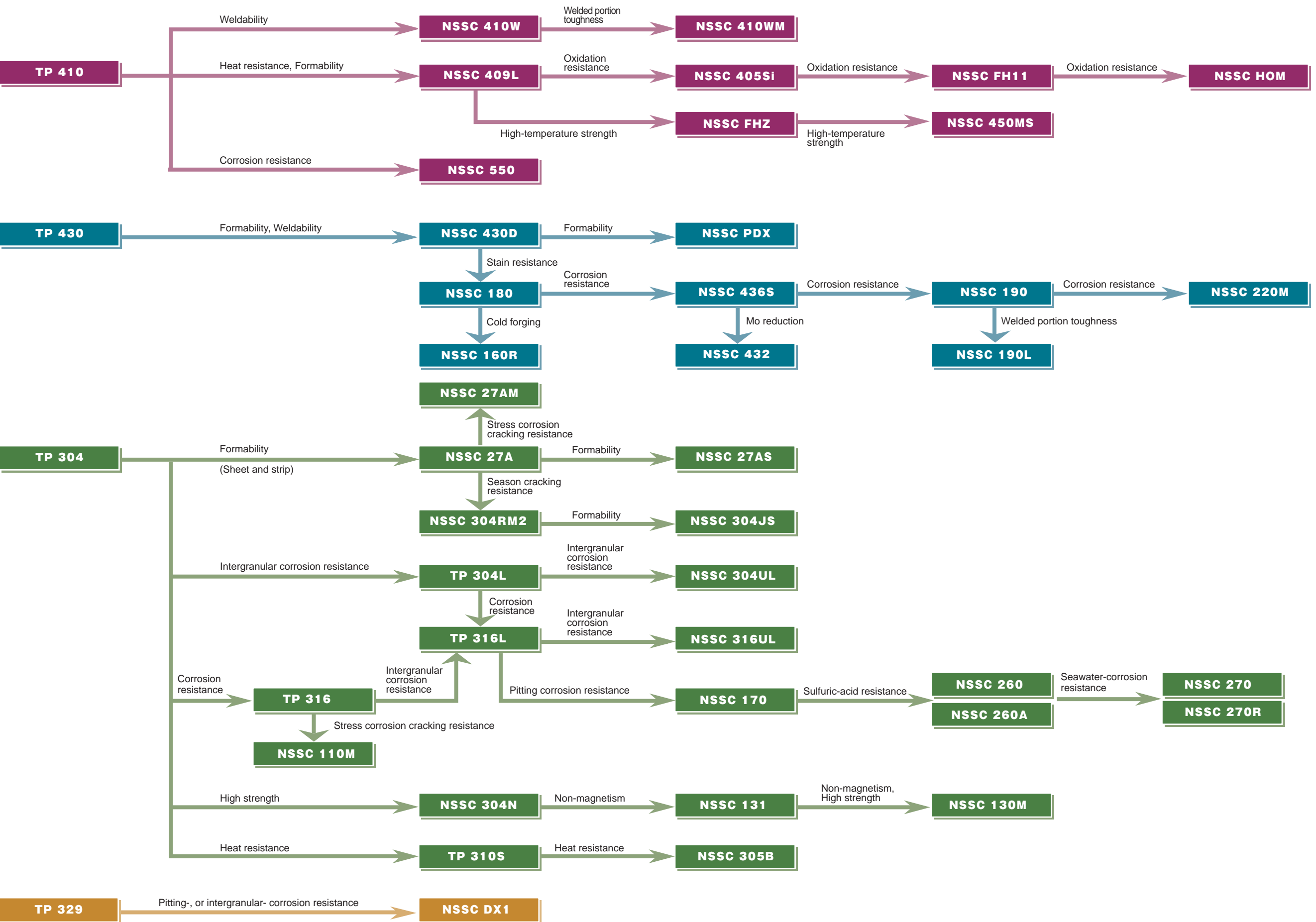
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Introduction to NSSC Series Stainless Steels

STAINLESS STEELS



STAINLESS STEELS

NSSC Series - Chemical Composition, Mechanical Properties and Other Key Information

NSSC SERIES Austenitic Stainless Steels

P : Plate
C : Strip in coil
W : Wire rod

	Symbol of grade	Corresponding specifications	Typical composition	Characteristics	Applications	Product category available	Chemical composition (mass %)										Mechanical properties				
							C	Si	Mn	P	S	Ni	Cr	Mo	N	Other significant elements	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness	Inside radius at bending angle of 180°
Formability	NSSC 27A (YUS 27A)	SUS 304J1	17Cr-7Ni-2Cu	High formability	Kitchen sink, Door knob	C	≤0.08	≤2.00	≤2.00	≤0.040	≤0.030	6.00 – 8.00	16.00 – 18.00	–	–	Cu:1.50 – 2.50	≥205	≥520	≥40	Hv≤200	–
	NSSC 27AM (YUS 27A-M)		17Cr-7Ni-2Cu-1.5Si	High formability, Stress corrosion cracking resistance	Hot-water tank, Dish washer	C	≤0.08	1.00 – 2.00	≤2.00	≤0.040	≤0.030	6.00 – 8.00	16.00 – 18.00	–	–	Cu:1.50 – 2.50	≥205	≥520	≥40	Hv≤200	–
	NSSC 27AS		17Cr-7Ni-2Cu-LC,N	High formability, Softness	Design oriented kitchen sink	C	≤0.05	≤2.00	≤2.00	≤0.040	≤0.030	6.00 – 8.00	15.00 – 18.00	–	≤0.03	Cu:1.50 – 2.50	≥155	≥450	≥40	Hv≤200	–
	NSSC 304RM2 (NAR-304RM2)	–	18Cr-9Ni-1Cu	High formability, Season cracking resistance	Kitchen sink, Beer barrel, Coin	C	≤0.08	≤1.00	≤2.00	≤0.045	≤0.030	9.00 – 10.00	18.00 – 20.00	–	–	Cu:0.5 – 1.5	≥205	≥540	≥50	Hv≤188	–
	NSSC 304JS	SUS 304J1 SUS 304J2	17Cr-8Ni-3Mn-3Cu-LC,N	High formability, Softness, Season cracking resistance	Precision press equipment	C	≤0.03	≤1.00	1.50 – 3.50	≤0.040	≤0.030	7.00 – 9.00	16.00 – 18.00	–	≤0.03	Cu:2.00 – 4.00	≥155	≥450	≥40	Hv≤200	–
High strength	NSSC 130M (YUS 130M)	–	18Cr-6Ni-9Mn-0.3N	High strength, Non-magnetism	Guide pin, Non-magnetic bolt	W	0.07 – 0.12	≤1.00	9.0 – 10.0	≤0.030	≤0.030	5.00 – 6.00	17.00 – 19.00	–	0.20 – 0.35	–	–	–	–	–	–
	NSSC 131 (YUS 131)	–	18Cr-6Ni-5Mn-0.2N	Non-magnetism	Non-magnetic apparel parts, Spoke	W	0.01 – 0.05	≤1.00	3.00 – 7.00	≤0.040	≤0.030	5.00 – 6.00	17.00 – 19.00	–	0.10 – 0.30	–	–	–	–	–	–
	NSSC 304N (YUS 304N)	SUS 304N2 ASTM XM-21	18Cr-8Ni-0.2N-Nb	High strength	High-pressure equipment, Centrifugal separator	P, C	≤0.08	≤1.00	≤2.50	≤0.040	≤0.030	7.50 – 10.50	18.00 – 20.00	–	≤0.25	Nb≤0.14	≥345	≥690	≥40	Hv≤260 HBW≤250	–
High corrosion-resistance	NSSC 304UL (YUS 304UL)	SUS 304L	18Cr-10Ni-LC	Intergranular corrosion resistance	Spent nuclear fuel reprocessing equipment	P	≤0.020	≤1.00	≤2.00	≤0.040	≤0.030	9.00 – 13.00	18.00 – 20.00	–	–	–	≥175	≥480	≥40	HBW≤187	–
	NSSC 316UL (YUS 316UL)	SUS 316L	17Cr-15Ni-2Mo-LC	Intergranular corrosion resistance	Spent nuclear fuel reprocessing equipment	P	≤0.020	≤1.00	≤2.00	≤0.040	≤0.030	12.00 – 16.00	16.00 – 18.00	2.00 – 3.00	–	–	≥175	≥480	≥40	HBW≤187	–
	NSSC 316C (YUS 316C)	SUS 316J1	18Cr-12Ni-2Mo-Cu	Corrosion resistance, Formability	Machine screw, Nut and bolt	W	≤0.08	≤1.00	≤2.00	≤0.045	≤0.030	10.00 – 14.00	16.00 – 18.00	2.00 – 3.00	–	Cu:2.00 – 4.00	–	–	–	–	–
	NSSC 110M (YUS 110M)	SUS 315J1	18Cr-10Ni-2Cu-2Si-0.8Mo	Stress corrosion cracking resistance	Hot-water-supply system, Home appliance, Heat exchanger	C	≤0.08	1.50 – 2.50	≤1.00	≤0.030	≤0.030	9.50 – 11.50	17.50 – 19.50	0.50 – 1.00	–	Cu:1.50 – 2.50	≥205	≥520	≥40	Hv≤200	–
	NSSC 170 (YUS 170)	SUS 317J2	25Cr-13Ni-0.9Mo-0.3N	Pitting corrosion resistance, High strength	Exhaust gas desulfurizer, High temperature usage	P, (C), W	≤0.06	≤1.50	≤2.00	≤0.040	≤0.030	12.00 – 16.00	23.00 – 26.00	0.50 – 1.20	0.25 – 0.40	–	≥345	≥690	≥40	Hv≤260 HBW≤250	–
	NSSC 317LN (YUS 317LN)	SUS 317LN	19Cr-13Ni-3.5Mo-0.2N-LC	Pitting corrosion resistance, High strength	Chemical plant, Chemical tank	P, C	≤0.030	≤1.00	≤2.00	≤0.045	≤0.030	11.00 – 15.00	18.00 – 20.00	3.00 – 4.00	0.10 – 0.22	–	≥245	≥550	≥40	HBW≤217	–
	NSSC 260 (YUS 260)	–	20Cr-15Ni-3Mo-1.5Cu-0.2N-LC	Oxidation resistance, High strength	Chimney, Sulfuric acid plant	P	≤0.030	≤1.50	≤2.00	≤0.040	≤0.030	13.50 – 16.50	18.50 – 21.50	2.50 – 3.50	0.16 – 0.24	Cu:1.00 – 2.00	≥275	≥550	≥35	HBW≤217	–
	NSSC 260A	–	22Cr-16Ni-3.5Mo-2Cu-0.2N-LC	Oxidation resistance, High strength	Chemical tanker	P	≤0.030	≤1.00	≤2.00	≤0.040	≤0.030	13.00 – 17.00	20.00 – 23.00	3.00 – 4.00	0.10 – 0.22	Cu:1.50 – 3.00	≥315	≥600	≥35	HBW≤230	–
	NSSC 270 (YUS 270)	SUS 312L ASTM S31254	20Cr-18Ni-6Mo-0.2N-LC	Seawater-corrosion resistance, High strength	Seawater desalination plant, Building exterior material	P, C	≤0.020	≤0.80	≤1.00	≤0.030	≤0.015	17.00 – 19.50	19.00 – 21.00	5.50 – 6.50	0.16 – 0.24	Cu:0.50 – 1.00	≥300	≥650	≥35	Hv≤230 HBW≤220	–
	NSSC 270R (YUS 270R)	–	20Cr-23Ni-6Mo-LN	Seawater-corrosion resistance	Corrosion resistant screw, nut and bolt, Wire netting	W	≤0.020	≤0.80	≤1.00	≤0.030	≤0.015	22.00 – 23.50	19.00 – 21.00	5.50 – 6.50	≤0.05	Cu:0.50 – 1.00	–	–	–	–	–
High heat-resistance	NSSC 305B (NAR-305B)	SUS XM15J1 ASTM XM-15	19Cr-13Ni-3.5Si	Heat resistance, Oxidation resistance	Automotive exhaust system, Burner	C	≤0.08	3.00 – 4.00	≤1.00	≤0.030	≤0.030	12.00 – 15.00	17.50 – 20.00	–	–	–	≥205	≥540	≥45	Hv≤200	–

NSSC Series - Chemical Composition, Mechanical Properties and Other Key Information

NSSC SERIES Ferritic Stainless Steels

P : Plate
C : Strip in coil
W : Wire rod

	Symbol of grade	Corresponding specifications	Typical composition	Characteristics	Applications	Product category available	Chemical composition (mass %)										Mechanical properties				
							C	Si	Mn	P	S	Ni	Cr	Mo	N	Other significant elements	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness	Inside radius at bending angle of 180°
Formability	NSSC 409L (YUS 409D,NAR-409L)	SUH 409L	11Cr-0.2Ti-LC	High formability	Automotive exhaust system, Heat exchanger	C, P	≤0.030	≤1.00	≤1.00	≤0.040	≤0.030	—	10.50 – 11.75	—	≤0.015	Ti:10 (C+N) – 0.75	≥175	≥360	≥25	Hv≤180	1.0t
	NSSC 430D (YUS 430D)	SUS 430LX ASTM 439	17Cr-0.4Ti-LC,N	High formability	Kitchen furnishings, Gas burner	C	≤0.030	≤0.50	≤1.00	≤0.040	≤0.030	—	16.00 – 18.00	—	—	Ti≥0.10 and Ti≥16 (C+N)	≥175	≥360	≥28	Hv≤180	1.0t
	NSSC PDX (YUS PDX)	SUS 430LX ASTM 439	17Cr-0.2Ti-ULC,N	High formability, Softness	Combustion component, Front door of refrigerator	C	≤0.010	≤0.50	≤1.00	≤0.030	≤0.030	—	16.00 – 18.00	—	—	Ti:8 (C+N) – 0.30	≥175	≥360	≥30	Hv≤180	1.0t
High corrosion-resistance	NSSC 160R	—	17Cr-0.4Cu-Nb-LC,N	Cold forging	Wire netting, Screw	W	≤0.02	≤1.00	≤1.00	≤0.040	≤0.006	—	16.00 – 18.00	—	≤0.02	Nb:0.30 – 0.60	—	—	—	—	—
	NSSC 432 (YUS 432,NAR-436J1L)	SUS 436J1L	17Cr-0.5Mo-0.2Ti-LC,N	Corrosion resistance, High formability	Automotive muffler, Kitchen furnishings, Home appliance	C	≤0.010	≤0.14	≤0.20	≤0.035	≤0.006	—	17.00 – 18.00	0.45 – 0.65	≤0.015	Ti:10 (C+N) – 0.30	≥205	≥390	≥25	Hv≤170	1.0t
	NSSC 436S (YUS 436S,NAR-436S)	SUS 436L ASTM 436	17Cr-1.2Mo-0.2Ti-LSi-LC,N	Corrosion resistance, High formability	Automotive muffler, Structural member	C, P	≤0.010	≤0.14	≤0.20	≤0.040	≤0.006	—	17.00 – 18.00	1.00 – 1.50	≤0.015	Ti:10 (C+N) – 0.35	≥205	≥390	≥25	Hv≤170	1.0t
	NSSC 180 (YUS 180)	SUS 430J1L	19Cr-0.4Cu-0.4Nb-LC,N	Stain resistance	Automotive trim material, Kitchen furnishings	C, W	≤0.02	≤1.00	≤1.00	≤0.040	≤0.006	≤0.60	19.00 – 21.00	—	≤0.025	Cu:0.30 – 0.60 Nb≥10 (C+N) and 0.30 – 0.80	≥205	≥450	≥22	Hv≤200	1.0t
	NSSC 190 (YUS 190)	SUS 444	19Cr-2Mo-Nb,Ti-LC,N	Pitting corrosion resistance	Hot-water boiler, Water tank, Solar-heat collector	C, W	≤0.015	≤0.50	≤0.50	≤0.040	≤0.030	—	18.00 – 20.00	1.75 – 2.25	≤0.015	(Ti+Nb) ≥ 16 (C+N)	≥205	≥450	≥22	Hv≤200	t<8mm:0.5t
	NSSC 190L (YUS 190L)		19Cr-2Mo-Nb-V-LC,N	Pitting corrosion resistance, Weldability	Petro-chemical equipment, Heat exchanger, Storage tank	P, (C)	≤0.015	≤0.50	≤0.50	≤0.040	≤0.030	—	18.00 – 20.00	1.75 – 2.25	≤0.015	Nb≥8 (C+N) V≤0.20	≥245	≥410	≥22	Hv≤230 HBW≤217	t<8mm:0.5t t≥8mm:1.0t
	NSSC 220M (YUS 220M)	SUS 445J2	22Cr-1.5Mo-Nb,Ti-LC,N	High stain-resistance	Roofing, Siding	C	≤0.010	≤1.00	≤1.00	≤0.040	≤0.007	≤0.60	22.00 – 23.00	1.50 – 2.50	≤0.020	(Ti+Nb) ≥ 16 (C+N)	≥295	≥470	≥22	Hv≤200	1.0t
	NSSC 405Si	—	12Cr-2Si-0.15Al	Oxidation resistance	Heater, Burner, Gas burner	C	≤0.080	1.00 – 3.00	≤1.00	≤0.040	≤0.030	—	11.50 – 14.50	—	—	Al:0.10 – 0.30	≥295	≥490	≥15	Hv≤230	2.0t
	NSSC FHZ (NAR-FH-Z)	—	13Cr-1Si-Nb-LC	High-temperature strength	Automotive exhaust system, Exhaust gas boiler duct	C	≤0.020	0.80 – 1.40	0.20 – 1.20	≤0.040	≤0.010	—	13.00 – 15.00	—	≤0.025	Nb:0.40 – 0.80	≥205	≥410	≥25	Hv≤200	1.0t
NSSC 450MS (YUS 450 – MS)	—	14Cr-0.5Mo-0.3Nb-0.1Ti-LC	High-temperature strength	Automotive exhaust system (incl. exhaust manifold)	C	≤0.015	≤2.00	≤2.00	≤0.040	≤0.030	—	13.50 – 14.50	0.40 – 1.00	≤0.015	Ti:0.10 – 0.30 Nb:0.20 – 0.50	≥205	≥390	≥25	Hv≤200	1.0t	
NSSC FH11 (NAR-FH-11)	—	18Cr-2.5Si-Nb-LC	Oxidation resistance	Heater, Burner, Gas burner	C	≤0.030	2.40 – 2.80	≤1.00	≤0.040	≤0.030	—	17.50 – 18.50	—	—	Nb:0.20 – 0.50	≥205	≥410	≥22	Hv≤230	1.0t	
NSSC 21M	SUH 21	18Cr-2Al-Ti	Oxidation resistance	Motorcycle muffler	C	≤0.030	≤1.00	≤1.00	≤0.040	≤0.030	—	17.00 – 19.00	—	—	Ti:0.10 – 0.50 Al:1.50 – 2.50	≥205	≥410	≥15	Hv≤230	—	
NSSC HOM (HOM 125)	—	15Cr-4Al-LC,N	Oxidation resistance, Electric resistance	Electric-resistant /heat-resistant apparatus	C	≤0.015	≤1.00	≤1.00	≤0.040	≤0.030	—	14.00 – 16.00	—	—	Al:3.00 – 5.00	≥350	≥520	≥15	Hv≤230	—	
Weldability	NSSC 410W (YUS 410W)	SUS 410L	12Cr-LC	Weldability	Heat-resistant apparatus	P, C, W	≤0.030	≤1.00	≤1.00	≤0.040	≤0.030	—	11.50 – 13.50	—	—	—	≥195	≥360	≥22	Hv≤200	1.0t
	NSSC 410WM (YUS 410W-MS)	SUS 410L	11Cr-Ni-LC,N	Weldability, Weld zone toughness	Marine container frame material	P, C	≤0.030	≤0.50	≤1.00	≤0.035	≤0.025	≤0.50	10.75 – 12.00	—	≤0.025	—	≥315	≥430	≥20	Hv≤240	t≤5mm:1.0t (t≤5mm)

NSSC SERIES Martensitic Stainless Steels

High strength	NSSC 410DA	—	12Cr-0.07C	High hardness	Disc brake	C	≤0.08	≤0.50	≤1.00	≤0.040	≤0.010	Trace amount	11.50 – 13.50	—	—	—	≥205	≥410	≥20	Hv≤200	—
	NSSC 550 (YUS 550)	—	13Cr-2Ni-2Mo	High hardness, High stain-resistance	Self-tapping screw, Nail of high-strength	W	0.10 – 0.20	≤1.00	≤1.00	≤0.040	≤0.010	1.00 – 2.40	12.50 – 14.00	1.80 – 2.30	0.05 – 0.15	—	—	—	—	—	—

NSSC SERIES Austenitic-Ferritic (Duplex) Stainless Steels

High corrosion-resistance	NSSC DX1 (YUS-DX1)	SUS 329J3L DIN 1.4462	22Cr-5Ni-3Mo-LC-0.13N	High strength, Pitting-corrosion /intergranular-corrosion resistance	Chemical plant, Energy-related plat	P	≤0.03	≤1.00	≤2.00	≤0.030	≤0.020	4.50 – 6.50	21.00 – 23.00	2.50 – 3.50	0.08 – 0.20	—	≥450	≥620	≥25	HBW≤290	—
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High-formability austenitic stainless steel

NSSC 27A, NSSC 27AM, NSSC 27AS

17Cr-7Ni-2Cu- (1.5Si) - (LC,N) / Corresponding specification: SUS 304J1

Features and Applications

NSSC 27A: Superior to SUS304 in deep drawability and stretchability
 NSSC 27AM: High performance in stress corrosion cracking resistance, exceeding that of NSSC 27A
 NSSC 27AS: High performance in formability, a feature drawn out by softening process of NSSC 27A

[Typical Applications] Kitchen sink, door knob (NSSC 27A)
 Hot-water tank, dish washer (NSSC 27AM)
 Design oriented kitchen sink (NSSC 27AS)

Chemical composition (mass %)

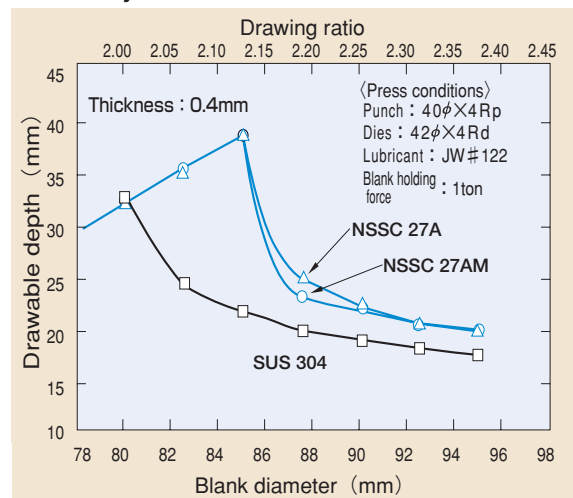
	C	Si	Mn	P	S	Ni	Cr	Cu
NSSC 27A and 27AM - Specification	≤0.08	≤2.00	≤2.00	≤0.040	≤0.030	6.00 - 8.00	16.00 - 18.00	1.50 - 2.50
NSSC 27A - Typical type	0.05	0.44	1.00	0.028	0.001	6.50	17.36	2.25
NSSC 27AM - Typical type	0.04	1.50	1.06	0.026	0.001	6.84	16.87	2.23
NSSC 27AS - Specification	≤0.05	≤2.00	≤2.00	≤0.040	≤0.030	6.00 - 8.00	15.00 - 18.00	1.50 - 2.50
NSSC 27AS - Typical type	0.02	0.43	1.15	0.028	0.001	7.78	16.64	1.83

Characteristics

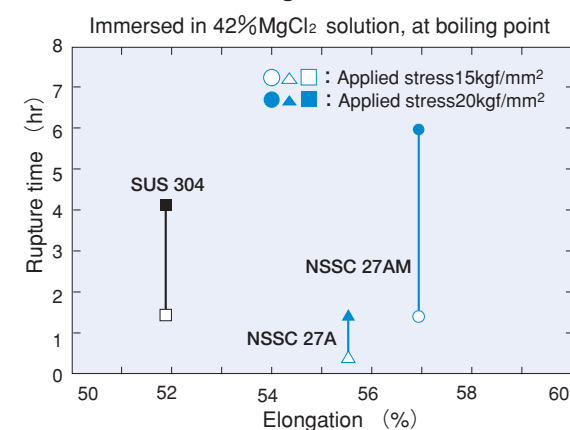
[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv	Erichsen value mm
NSSC 27A and 27AM - Specification	≥205	≥520	≥40	≤200	—
NSSC 27A - Typical type	257	629	56	146	14.4
NSSC 27AM - Typical type	281	657	60	163	14.0
NSSC 27AS - Specification	≥155	≥450	≥40	≤200	—
NSSC 27AS - Typical type	238	550	52	159	14.2
SUS 304 - Typical type	298	668	52	159	11.8

[Drawability]

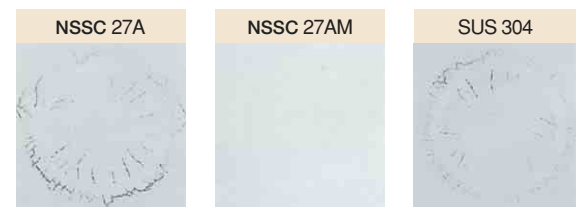


[Stress corrosion cracking resistance]



[Stress corrosion cracking resistance at welded portion]

(Test conditions)
 Immersed in 42% MgCl₂ solution, at boiling point, 4 hours.
 Test specimens : ring bead of TIG welding without filler



Deep-drawing austenitic stainless steel

NSSC 304RM2

18Cr-9Ni-1Cu

Features and Applications

Superior to SUS 304 in formability and season cracking resistance
 1. Superior to SUS 304 in press working as deep-drawing
 2. Superior to SUS 304 in season cracking resistance

[Typical Applications] Kitchen sink both for domestic and business use, beer barrel, coin for game machine

Chemical composition (mass %)

	C	Si	Mn	P	S	Ni	Cr	Cu
Specification	≤0.08	≤1.00	≤2.00	≤0.045	≤0.030	9.00 - 10.00	18.00 - 20.00	0.5 - 1.5
Typical type	0.05	0.41	0.91	0.031	0.002	9.11	18.22	1.0

Characteristics

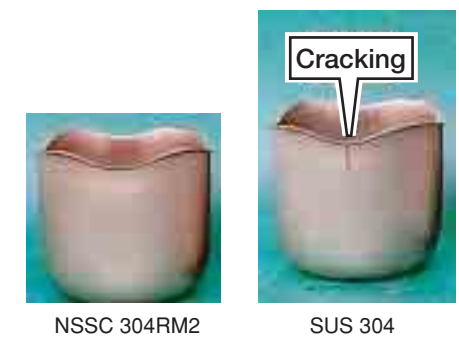
[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
Specification	≥205	≥540	≥50	≤188
Typical type	272	594	57	150

[Season cracking resistance]

Grade	NSSC 304RM2	SUS 304
Result of test	No cracking	Cracking within 24 hours

Thickness of test specimens: 1.5mm Drawing ratio: 2.25
 Immersed in hot water of 80°C for 360 hours, after cup drawing





Ultra-soft, high-formability austenitic stainless steel

NSSC 304JS

17Cr-8Ni-3Mn-3Cu-LC,N / Corresponding grade : SUS 304J1,J2

Features and Applications

A brand-new grade of austenitic stainless steel of ultra-softness (as well as of reduced yield strength and of restrained work hardening)

1. High performance in secondary work after multistage drawings or press work with only a minimal spring back followed
2. High level of season cracking resistance
3. Extremely smaller magnetism than SUS 304 after formation
4. The line-up includes a pre-coated, high lubrication sheet of oil-free

Chemical composition (mass %)

	C	Si	Mn	P	S	Ni	Cr	Cu	N
Specification	≤0.03	≤1.00	1.50 - 3.50	≤0.040	≤0.030	7.00 - 9.00	16.00 - 18.00	2.00 - 4.00	≤0.03
Typical type	0.01	0.46	2.67	0.032	0.002	8.02	17.42	2.71	0.01

Characteristics

[Mechanical properties]

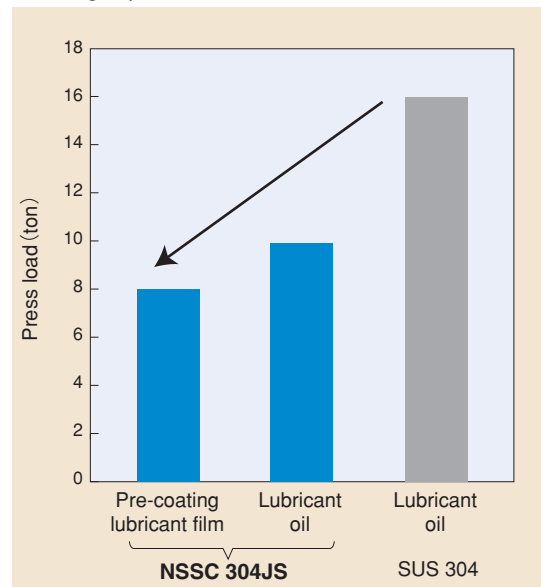
	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv	n value	Pressure bulge height mm
Specification	≥155	≥450	≥40	≤200	—	—
Typical type	201	492	59	109	0.39	42.2
SUS 304 - Typical type	274	680	59	170	0.49	40.3

(Surface finish: No. 2D, Thickness: 1.5mm)

Formability

[Cup drawing formability]

Thickness : 1.5mm
Blank diameter : 90mmφ, Punch diameter : 50mmφ
Drawing depth : 25mm



[Multistage cup drawing formability]

Thickness:0.8mm Lubricant:Johnson-Wax #122
Initial blank diameter :96mmφ
Punch diameter :48mmφ (1st stage) -22mmφ (7th stage)



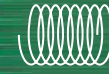
NSSC 304JS Seven-stage drawings (drawing ratio: 4.4)
SUS 304 Two-stage drawings (drawing ratio: 2.2)

[Shape - fixability in hat bending]

Thickness : 0.8mm Forming height : 70mm Blank holding force : 5ton



(NSSC 304JS exhibits only a minimal spring back after press.)



Non-magnetic, high-strength austenitic stainless steel

NSSC 130M

18Cr-6Ni-9Mn-0.3N

Features and Applications

1. can obtain hardness of 500Hv and over through cold working
2. Non-magnetism and low permeability of less than 1.01 even after tough working
3. Equal level of corrosion resistance to seawater as SUS 304
4. Proof against cold working of 70% or more

[Typical Applications] Guide pins, non-magnetic bolts, non-magnetic apparel parts

Chemical composition (mass %)

	C	Si	Mn	P	S	Ni	Cr	N
Specification	0.07 - 0.12	≤1.00	9.0 - 10.0	≤0.030	≤0.030	5.00 - 6.00	17.00 - 19.00	0.20 - 0.35
Typical type	0.09	0.47	9.43	0.027	0.005	5.61	18.18	0.30

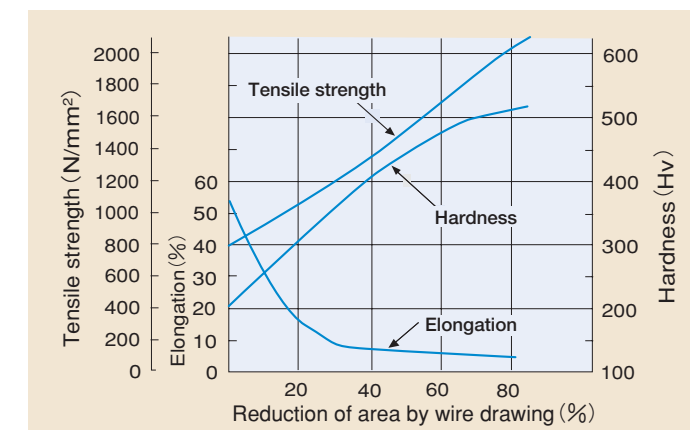
Characteristics

[Mechanical properties] - after solution heat treatment -

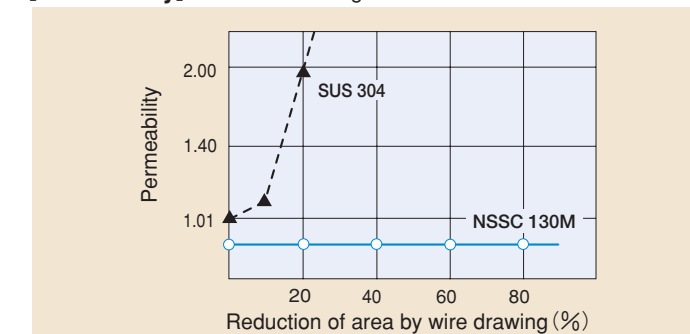
	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %
Typical type	500	850	42.5

[Work hardening characteristics]

-relationship between reduction of area by wire drawing and mechanical properties -



[Permeability] - after wire drawing -





Non-magnetic austenitic stainless steel

NSSC 131

18Cr-6Ni-5Mn-0.2N

Features and Applications

1. Non-magnetism even after tough working (permeability ≤ 1.02)
2. Equal level of corrosion resistance to seawater as SUS 304
3. Proof against cold working of 80% or more

[Typical Applications] Non-magnetic apparel parts, Non-magnetic nail, Spoke

Chemical composition (mass %)

	C	Si	Mn	P	S	Ni	Cr	N
Specification	0.01 - 0.05	≤ 1.00	3.00 - 7.00	≤ 0.040	≤ 0.030	5.00 - 6.00	17.00 - 19.00	0.10 - 0.30
Typical type	0.03	0.42	5.21	0.027	0.001	5.61	17.90	0.16

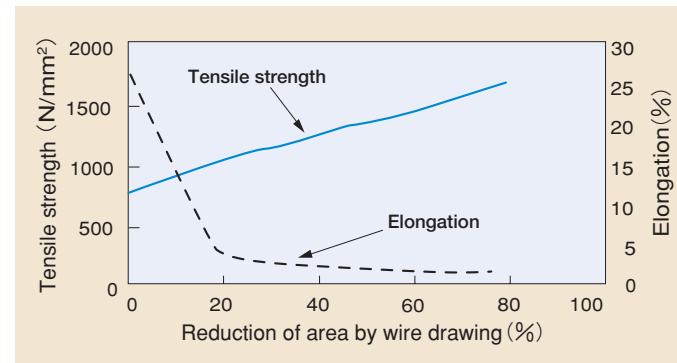
Characteristics

[Mechanical properties] - after solution heat treatment -

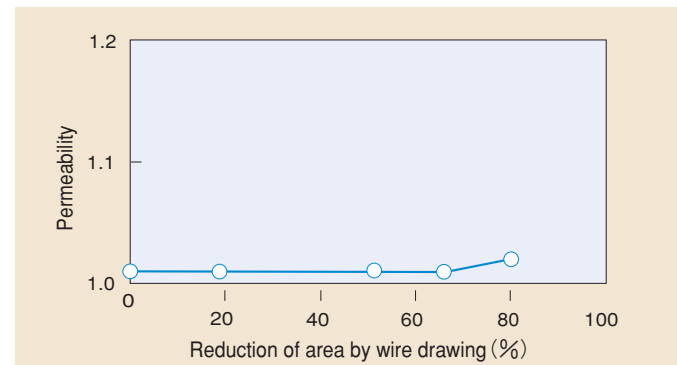
	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %
Typical type	600	780	26

[Work hardening characteristics]

-relationship between reduction of area by wire drawing and mechanical properties-



[Permeability] - after wire drawing -



High-strength austenitic stainless steel

NSSC 304N

18Cr-8Ni-0.2N-Nb / Corresponding grade: SUS 304N2

Features and Applications

Nitrogen-added grade which exhibits much higher strength (yield strength 0.2% offset is particularly high) and provides with advantages over SUS 304 in potential of structural designs

1. Remarkably higher strength at room to elevated temperatures and fatigue strength than those of SUS 304
2. Equal level of corrosion resistance, heat resistance and physical properties as SUS 304
3. High performance of weldability, and especially of the welded joint, with use of welding materials of similar composition

[Typical Applications] High-pressure equipment, Centrifugal separator, equipment employing SUS 304

Chemical composition (mass %)

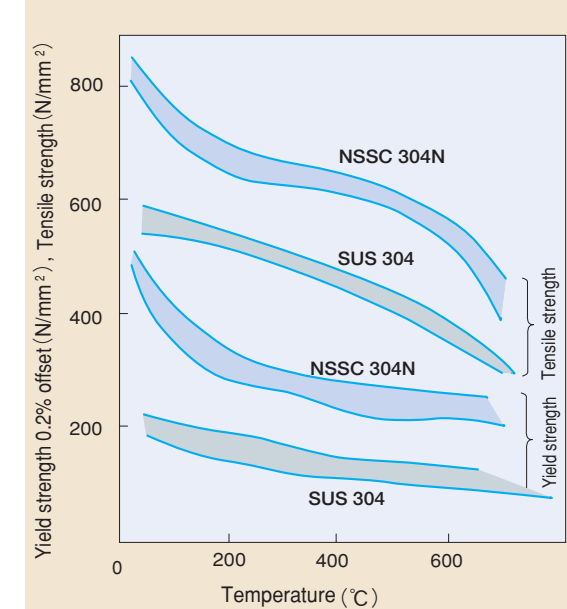
	C	Si	Mn	P	S	Ni	Cr	Nb	N
Specification	≤ 0.08	≤ 1.00	≤ 2.50	≤ 0.040	≤ 0.030	7.50 - 10.50	18.00 - 20.00	≤ 0.14	≤ 0.25
Typical type	0.05	0.71	0.84	0.028	0.001	7.73	19.06	0.11	0.17

Characteristics

[Mechanical properties]

		Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness HBW
NSSC 304N	Specification	≥ 345	≥ 690	≥ 40	≤ 250
	Typical type	481	814	49	170
SUS 304	Specification	≥ 205	≥ 520	≥ 40	≤ 187
	Typical type	255	579	63	126

[High-temperature strength]



[Corrosion resistance]

	Test conditions			NSSC 304N		SUS 304
	Solution composition	Temperature °C	Period hr	Base metal g/m ² /hr	Welded portion g/m ² /hr	Base metal g/m ² /hr
Reduction acid	2% H ₂ SO ₄	Boil	6	184.8	172.4	206.0
Reduction acid	1% HCl	"	"	83.5	57.9	25.0
Reduction acid	10% HCl	25	24	1.60	1.70	0.81
Oxidizing acid	65% HNO ₃ (5cycle)	Boil	48	0.22	0.26	0.15
Organic acid	20% CH ₃ COOH	"	6	0.03	0.05	0.17
Pitting corrosion	0.5M FeCl ₃	25	48	4.75	8.08	9.80

(Test specimens :2mm×30mm×30mm)



Ultra-low-carbon austenitic stainless steel

NSSC 304UL, NSSC 316UL

18Cr-10Ni-LC, 17Cr-15Ni-2Mo-LC / Corresponding grade : SUS 316L

Features and Applications

Superior to SUS 304 and SUS 316L in intergranular corrosion resistance
Secured safety against intergranular corrosion realized with ultra-low carbon content ($C \leq 0.020\%$)

[Typical Applications] Spent nuclear fuel reprocessing equipment, Various equipments susceptible to intergranular corrosion

Chemical composition (mass %)

		C	Si	Mn	P	S	Ni	Cr	Mo
NSSC 304UL	Specification	≤ 0.020	≤ 1.00	≤ 2.00	≤ 0.040	≤ 0.030	9.00 - 13.00	18.00 - 20.00	—
	Typical type	0.014	0.74	1.15	0.024	0.007	10.27	18.51	—
NSSC 316UL	Specification	≤ 0.020	≤ 1.00	≤ 2.00	≤ 0.040	≤ 0.030	12.00 - 16.00	16.00 - 18.00	2.00 - 3.00
	Typical type	0.011	0.70	0.80	0.025	0.004	15.30	16.80	2.35

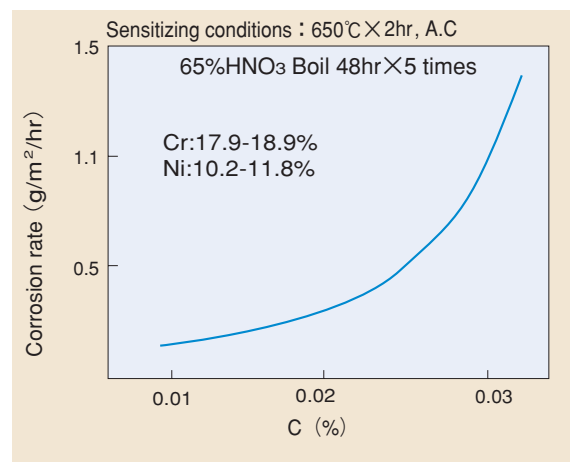
Characteristics

[Mechanical properties]

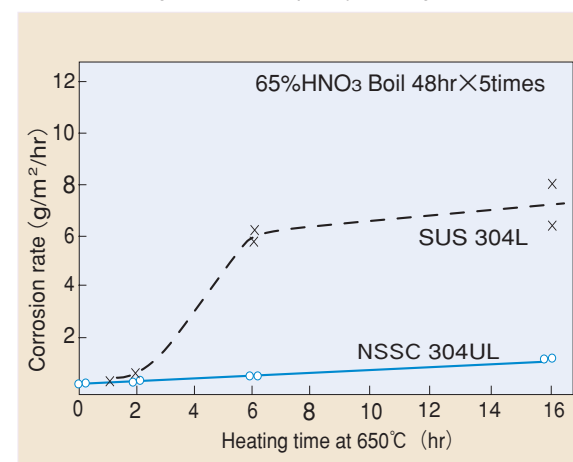
		Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness HBW
NSSC 304UL	Specification	≥ 175	≥ 480	≥ 40	≤ 187
	Typical type	235	549	66	131
NSSC 316UL	Specification	≥ 175	≥ 480	≥ 40	≤ 187
	Typical type	235	510	65	121

[Intergranular corrosion resistance] -65% Nitric Acid Corrosion Test; JIS G 0573-

Effects of carbon on susceptibility to intergranular corrosion



Effects of heating time on susceptibility to intergranular corrosion



Stress corrosion cracking resistant austenitic stainless steel

NSSC 110M

18Cr-10Ni-2Cu-2Si-0.8Mo / Corresponding grade : SUS 315J1

Features and Applications

Exquisite performance of stress corrosion cracking resistance against neutral chlorides
1. High performance in pitting corrosion resistance and chink corrosion resistance, in addition to stress corrosion cracking resistance
2. Equal level of formability as SUS 316
3. Superior to SUS 316 in oxidation resistance

[Typical Applications] Hot-water related equipment as hot-water-supply system or heat exchanger, Flexible pipe or other components of automotive exhaust system, Any other corrosion-sensitive equipment

Chemical composition (mass %)

	C	Si	Mn	P	S	Ni	Cr	Mo	Cu
Specification	≤ 0.08	1.50 - 2.50	≤ 1.00	≤ 0.030	≤ 0.030	9.50 - 11.50	17.50 - 19.50	0.50 - 1.00	1.50 - 2.50
Typical type	0.03	1.90	0.61	0.020	0.001	10.25	17.70	0.69	2.02

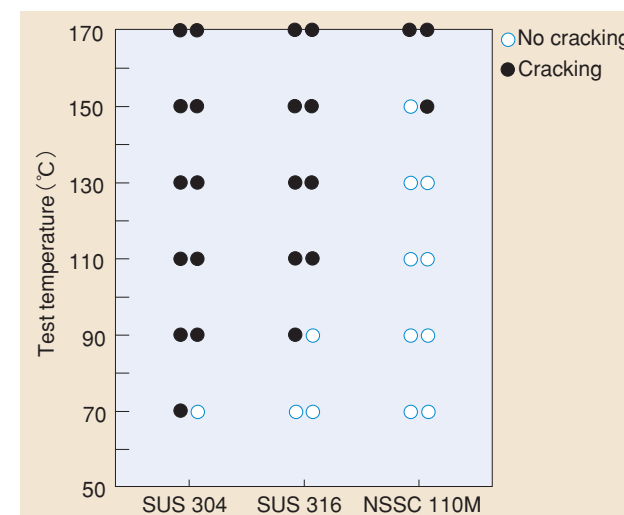
Characteristics

[Mechanical properties] - Formability-

		Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Limit drawing ratio L.D.R.	buldge height mm	Erichsen value mm
NSSC 110M	Specification	≥ 205	≥ 520	≥ 40	—	—	—
	Typical type	320	640	52	2.3	40.0	12.0
比較例	SUS 304	300	680	50	2.3	43.5	13.6
	SUS 316	300	620	46	2.2	40.4	12.4

[Stress corrosion cracking resistance]

Test conditions: Spot welding clearance, 200ppm of Cl⁻ ion, 7days





High-strength, pitting corrosion resistant austenitic stainless steel

NSSC 170

25Cr-13Ni-0.9Mo-0.3N / Corresponding grade : SUS 317J2

Features and Applications

- Largely improved resistance to pitting corrosion, one of the critical drawbacks of stainless steels
- Superior to SUS 316 or SUS 317L in pitting corrosion resistance as well as in chink corrosion resistance
 - Superior to SUS 316 and SUS 317L in oxidation resistance against sulfur acid or hydrochloric acid, etc. and durable to higher acid concentration or higher temperature
 - One and a half times greater high strength than SUS 304, providing with advantage in potential of strength-oriented designs
 - High performance also in formability and in weldability

[Typical Applications] Exhaust gas desulfurizer, Waste liquid treatment equipment, Sludge treatment equipment, High temperature usage (cement plant and others), Plant equipment in general

Chemical composition (mass %)

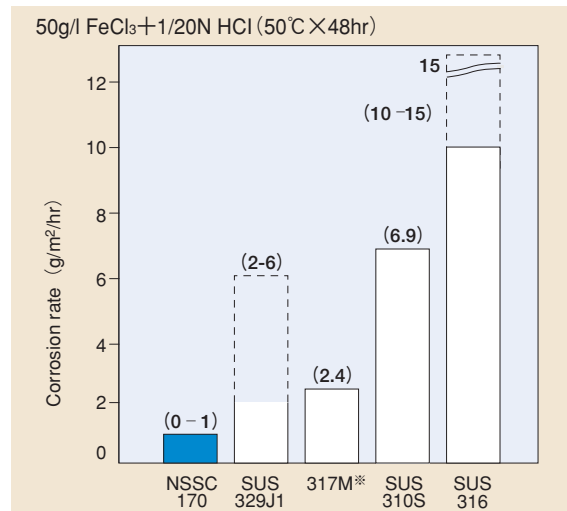
	C	Si	Mn	P	S	Ni	Cr	Mo	N
Specification	≤0.06	≤1.50	≤2.00	≤0.040	≤0.030	12.00 - 16.00	23.00 - 26.00	0.50 - 1.20	0.25 - 0.40
Typical type	0.02	0.92	0.55	0.030	0.001	12.91	24.75	0.80	0.34

Characteristics

[Mechanical properties]

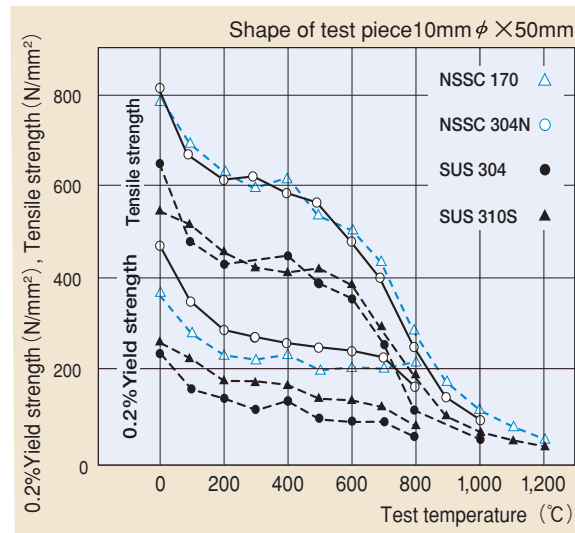
	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness HBW
Specification	≥345	≥690	≥40	≤250
Typical type	392	785	50	175

[Pitting corrosion resistance]



* 317M.....18Cr-16Ni-5Mo

[High-temperature strength]



High-strength, high corrosion resistant austenitic stainless steel

NSSC 317LN

19Cr-13Ni-3.5Mo-0.2N-LC / Corresponding grade : SUS 317LN

Features and Applications

- Superior to SUS 316 and SUS 316L in pitting corrosion resistance as well as in chink corrosion resistance
- High performance also in corrosion resistance to acids such as sulfur acid, phosphoric acid or organic acid, etc.
- Higher yield strength and tensile strength than SUS 317L and equal level of elongation to SUS 317L
- Equal level of weldability as conventional austenitic stainless steel
- Corrosion resistance at weld zone is almost equal to that of base metal, with use of welding materials of similar composition

[Typical Applications] Tank, vessel, chemical plant and others which require higher corrosion resistance than SUS317L as well as high strength

Chemical composition (mass %)

	C	Si	Mn	P	S	Ni	Cr	Mo	N
Specification	≤0.030	≤1.00	≤2.00	≤0.045	≤0.030	11.00 - 15.00	18.00 - 20.00	3.00 - 4.00	0.10 - 0.22
Typical type	0.020	0.60	1.38	0.024	0.001	13.18	18.49	3.49	0.14

Characteristics

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness HBW
Specification	≥245	≥550	≥40	≤217
Typical type (t=11.5mm)	314	608	49	158

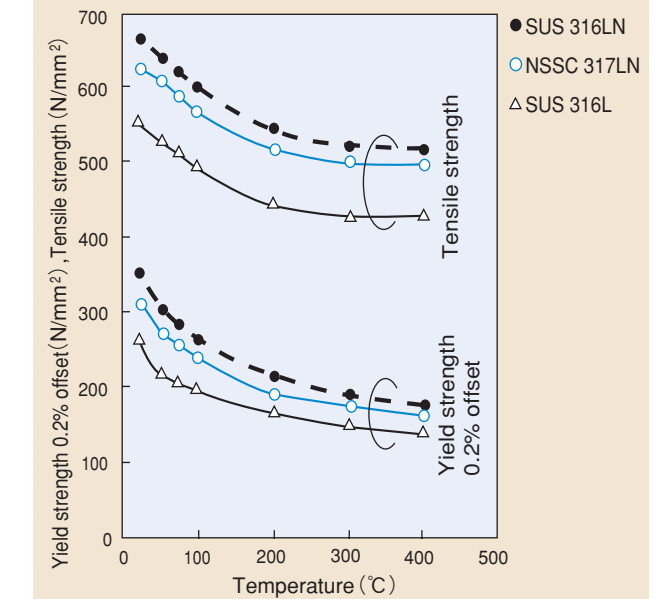
[Chink corrosion resistance] (ASTM G 48 Method B)

(Test conditions)
Test solution: 100g FeCl₃·6H₂O+900ml H₂O (6%FeCl₃)
Test temperature: 0 - 30°C by 2.5°C
Test period: 72hr

Test temperature	Base metal		Welded joint	
	NSSC 317LN	SUS 316L	NSSC 317N (SMAW)	SUS 316L (SMAW)
25	×	×	×	×
22.5	×	×	×	×
20	×	×	×	×
17.5	×	×	×	×
15	×	×	×	×
12.5	×	×	×	×
10	○	×	○	×
7.5	○	×	○	×
5	○	×	○	×
2.5	○	×	○	×
0	○	×	○	×

○:No chink corrosion ×:Generation of chink corrosion

[High-temperature strength]





Sulfuric-acid resistant austenitic stainless steel

NSSC 260, NSSC 260A

20Cr-15Ni-3Mo-1.5Cu-0.2N-LC, 22Cr-16Ni-3.5Mo-2Cu-0.2N-LC

Features and Applications

1. Exquisite performance in sulfuric-acid resistance
2. High performance in localized corrosion resistance such as pitting corrosion resistance or chink corrosion resistance
3. One and a half times greater high strength than SUS 304 or SUS 316L
4. Equal level of weldability as conventional austenitic stainless steel and high performance of welded joint, with use of welding materials of similar composition
5. NSSC 260A is most suitable for chemical tanker

[Typical Applications] Chimney lining, Exhaust gas desulfurizer

Chemical composition (mass %)

		C	Si	Mn	P	S	Ni	Cr	Mo	N	Cu
NSSC 260	Specification	≤0.030	≤1.50	≤2.00	≤0.040	≤0.030	13.50 - 16.50	18.50 - 21.50	2.50 - 3.50	0.16 - 0.24	1.00 - 2.00
	Typical type	0.020	0.50	0.50	0.022	0.001	15.31	20.37	3.20	0.19	1.70
NSSC 260A	Specification	≤0.030	≤1.00	≤2.00	≤0.040	≤0.030	13.00 - 17.00	20.00 - 23.00	3.00 - 4.00	0.10 - 0.22	1.50 - 3.00
	Typical type	0.018	0.46	0.45	0.021	0.001	16.85	22.26	3.23	0.18	1.72

Characteristics

[Mechanical properties]

		Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness HBW
NSSC 260	Specification	≥275	≥550	≥35	≤217
	Typical type (t=8mm) / (t=3.2mm)	380 370	705 735	47 47	172 191
NSSC 260A	Specification	≥315	≥600	≥35	≤230
	Typical type (t=16mm)	333	675	52	159

[Localized corrosion resistance]

Critical pitting corrosion temperature (CPT) and Critical chink corrosion temperature (CCT)

Test conditions : ASTM G48 Method B

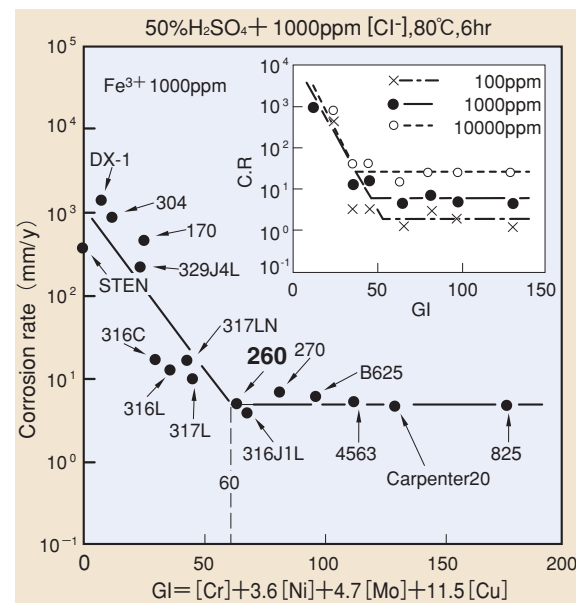
Test solution : 100g FeCl₃·6H₂O+900ml H₂O (6%FeCl₃)

Test period : 72hr

	CPT (°C)	CCT (°C)
NSSC 260	40	20
NSSC 270	70	50
SUS 329J1	55	35
SUS 317L	20	5
SUS 316L	15	0

[General corrosion resistance]

Arrangement of corrosion rate of various stainless steels by use of general corrosion resistance index (GI)



Seawater-corrosion resistant austenitic stainless steel

NSSC 270, NSSC 270R

20Cr-18Ni-6Mo-0.2N-LC / Corresponding grade : SUS 312L, ASTM S31254
20Cr-23Ni-6Mo-LN

Features and Applications

1. Exquisite performance in seawater-corrosion resistance
2. High performance also in corrosion resistance to sulfur acid or organic acid
3. Superior to SUS 316 and duplex stainless steels in stress corrosion cracking resistance against chlorides
4. One and a half times greater high strength than SUS 304 or SUS 316 in room temperature
5. Equal level of weldability as conventional austenitic stainless steels, with use of welding materials of inconel 625series
6. NSSC 270R is most suitable for bar and rod which require cold working

[Typical Applications] Seawater desalination plant, Seawater heat exchanger, Roofing, Food manufacturing plant, Corrosion resistant screw, nut and bolt, Wire netting

Chemical composition (mass %)

		C	Si	Mn	P	S	Ni	Cr	Mo	N	Cu
NSSC 270	Specification	≤0.020	≤0.80	≤1.00	≤0.030	≤0.015	17.00 - 19.50	19.00 - 21.00	5.50 - 6.50	0.16 - 0.24	0.50 - 1.00
	Typical type	0.011	0.49	0.45	0.023	0.001	18.83	20.19	6.13	0.19	0.63
NSSC 270R	Specification	≤0.020	≤0.80	≤1.00	≤0.030	≤0.015	22.00 - 23.50	19.00 - 21.00	5.50 - 6.50	≤0.05	0.50 - 1.00
	Typical type	0.011	0.24	0.59	0.019	0.001	22.72	20.11	6.13	0.02	0.53

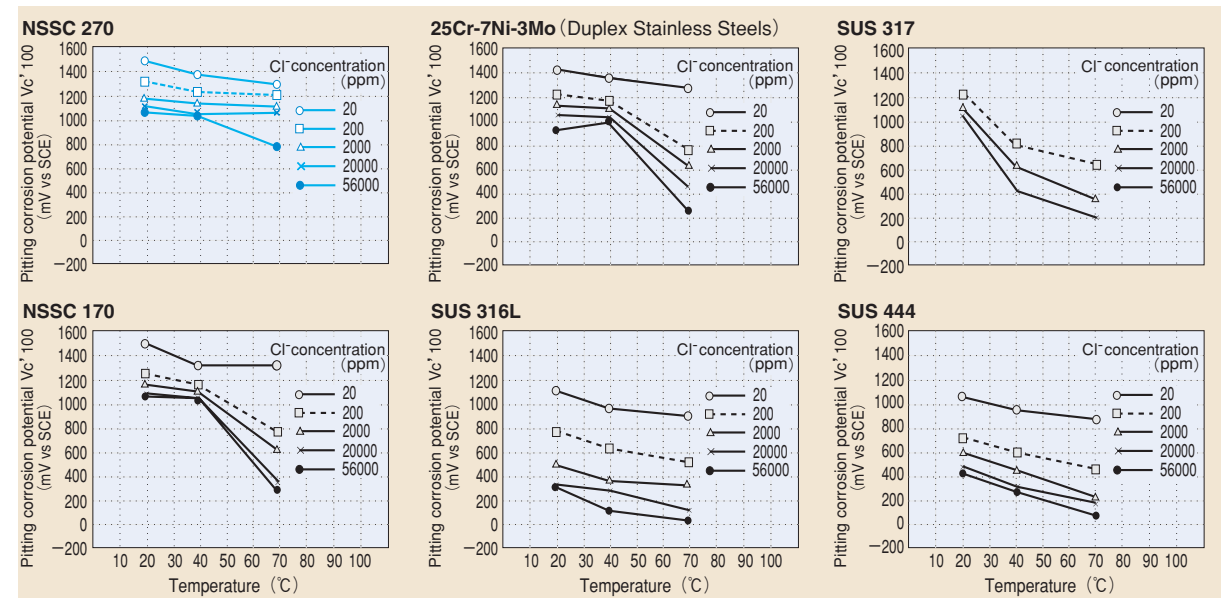
Characteristics

[Mechanical properties]

		Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness	
					HBW	Hv
NSSC 270	Specification	≥300	≥650	≥35	≤220	≤230
	Typical type	t=10mm t=4mm t=1.2mm	363 412 461	755 804 843	51 45 39	170 175 —
NSSC 270R	Typical type (Wire rod)	230	560	47	—	—

[Pitting corrosion resistance]

Effects of [Cl⁻] concentration and temperature to pitting corrosion electric potential





Heat-resistant austenitic stainless steel

NSSC 305B

19Cr-13Ni-3.5Si / Corresponding grade : SUS XM15J1

Features and Applications

Superior to SUS 310S in oxidation resistance in high temperatures
Superior to SUS 311S also in high-temperature strength and creep strength

[Typical Applications] Automotive exhaust system, Industrial oven component, Incinerator

Chemical composition (mass %)

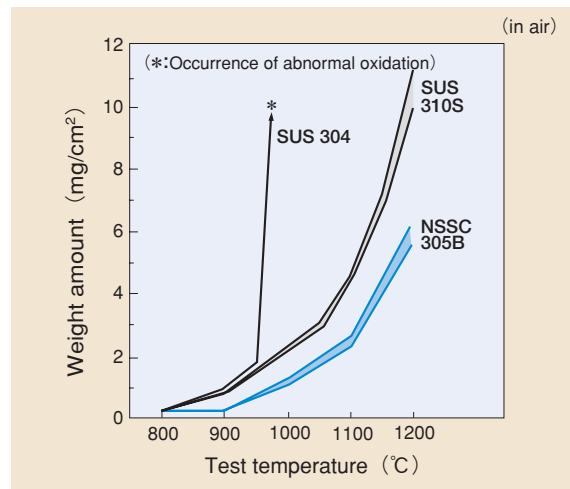
	C	Si	Mn	P	S	Ni	Cr
Specification	≤0.08	3.00 - 4.00	≤1.00	≤0.030	≤0.030	12.00 - 15.00	17.50 - 20.00
Typical type	0.05	3.30	0.90	0.025	0.001	13.23	19.05

Characteristics

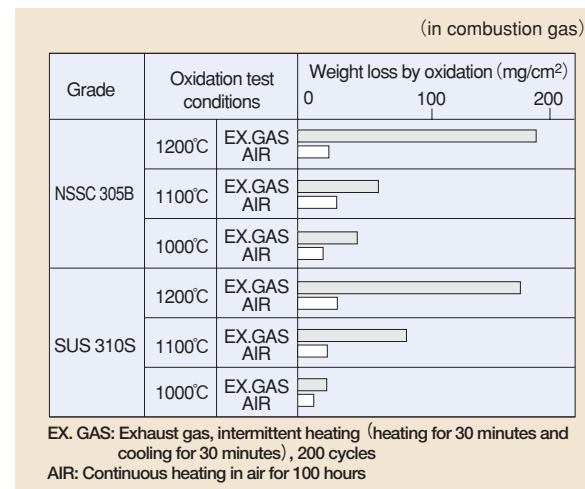
[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
Specification	≥205	≥540	≥45	≤200
Typical type	305	665	60	161

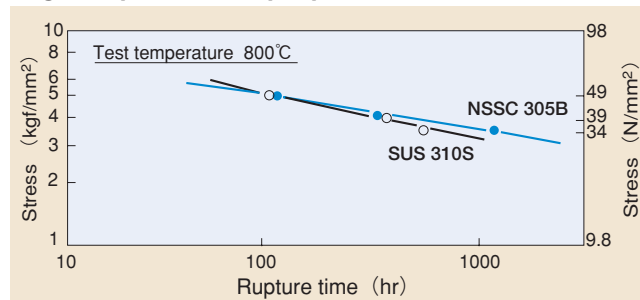
[Oxidation resistance]



[Oxidation resistance]



[High-temperature creep rupture characteristics]



High-formability ferritic heat-resistant steel

NSSC 409L

11Cr-0.2Ti-LC / Corresponding grade : SUH 409L

Features and Applications

Superior to Ti-containing 11Cr heat-resistant steels such as ASTMTP409 or SUH 409 in formability and weldability
1. High performance in oxidation resistance in high temperatures up to around 750°C
2. With extra-low carbon ferritic structure, it exhibits higher performance in formability and weldability than conventional similar grades

[Typical Applications] Automotive exhaust system (front pipe, converter, muffler, etc.), Equipments requiring oxidation resistance such as heat exchanger or others, Farm machinery, Transformer cases

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr	Ti
Specification	≤0.030	≤1.00	≤1.00	≤0.040	≤0.030	10.50 - 11.75	10(C+N) - 0.75
Typical type	0.005	0.45	0.35	0.024	0.001	11.05	0.23

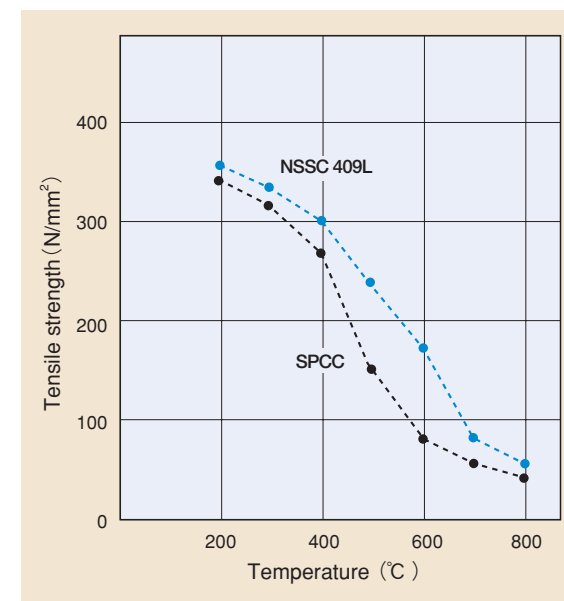
Characteristics

[Mechanical properties]

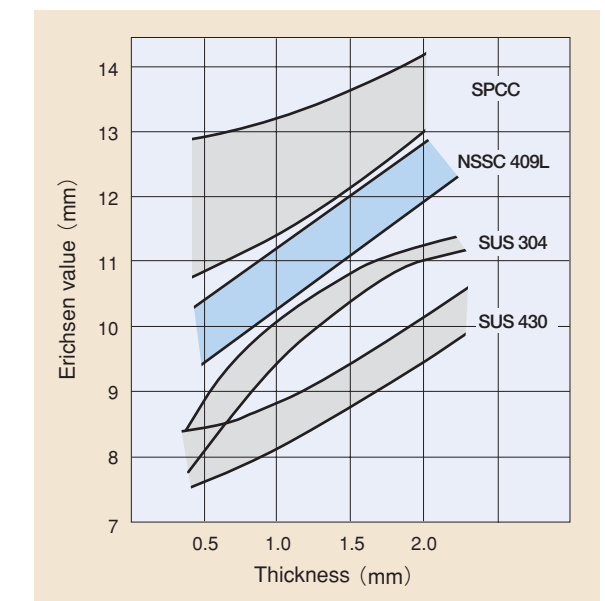
(Thickness: 1.2mm)

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
Specification	≥175	≥360	≥25	≤180
Typical type	233	420	36	132

[High-temperature strength]



[Strechability]





High-formability ferritic heat-resistant steel

NSSC 430D

17Cr-0.4Ti-LC,N / Corresponding grade : SUS 430LX

Features and Applications

1. Exquisite performance in formability, especially in deep drawability and stretchability, a feature of ultra-low-carbon stainless steel
2. Superior to SUS 430 in corrosion resistance
3. High performance in corrosion resistance and formability at weld zone.

[Typical Applications] Home appliance (washing machine's drum, etc.), Kitchen furnishings, Door knob, Gas burner

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr	Ti
Specification	≤0.030	≤0.50	≤1.00	≤0.040	≤0.030	16.00 - 18.00	Ti ≥ 0.10 and Ti ≥ 16(C+N)
Typical type	0.005	0.10	0.11	0.025	0.002	16.39	0.29

Characteristics

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
Specification	≥175	≥360	≥28	≤180
Typical type	296	436	32	144

[Formability]

(Thickness:0.7mm)

	r value	n value	Erichsen value mm	Conical-cup value
NSSC 430D	1.67	0.27	10.0	27.0
SUS 430	1.18	0.23	9.3	28.4

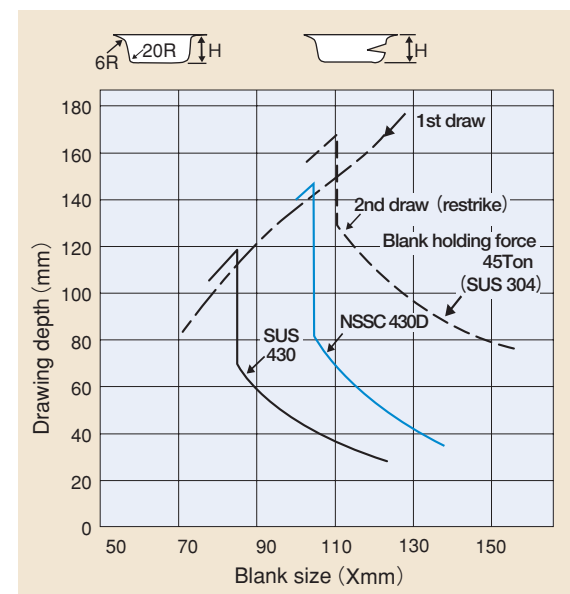
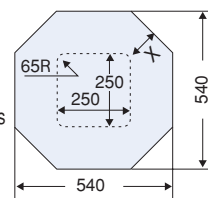
[Corrosion resistance]

Grade	3% solution of salt; dip & dry	3% solution of salt; immersed
NSSC 430D	○	○
SUS 430	△	△

Remarks ○: Ratio of rusted area is less than 1%
△: Ratio of rusted area is between 1% and 5%

[Drawability]

(Test conditions)
Blank size (mm) : see the right figure
Press conditions : blank holding force of 35 tons
Lubricant : Johnson Wax #122



High-formability ferritic stainless steel

NSSC PDX

17Cr-0.2Ti-ULC,N / Corresponding grade : SUS 430LX

Features and Applications

17% Cr ferritic stainless steel in which high-formability has been realized owing to technological advancement both for steel fineness and for steel sheet producing.

1. High work-limitation and minimal press rising (surface streaks)
2. Metal mold for ordinary steel can be applicable, owing to its softness
3. Superior to SUS 430 in corrosion resistance
4. High performance of weldability and excellence of corrosion resistance and formability at weld zone.

[Typical Applications] Combustion component, Front door of refrigerator, Battery case, Structural hardware

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr	Ti	N
Specification	≤0.010	≤0.50	≤1.00	≤0.030	≤0.030	16.00 - 18.00	8(C+N) - 0.30	—
Typical type	0.003	0.06	0.08	0.014	0.002	16.47	0.16	0.009

Characteristics

[Mechanical properties]

(Thickness:1.0mm)

Grade	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
NSSC PDX	Specification	≥175	≥360	≥30
	Typical type	237	386	38
SUS 430	Specification	≥205	≥450	≥22
	Typical type	319	486	28

[Formability]

(Thickness:0.5mm)

Grade	r value	n value	Erichsen value mm	Ridging rank
NSSC PDX	2.0	0.27	11.2	A
SUS 430	1.1	0.18	9.3	B

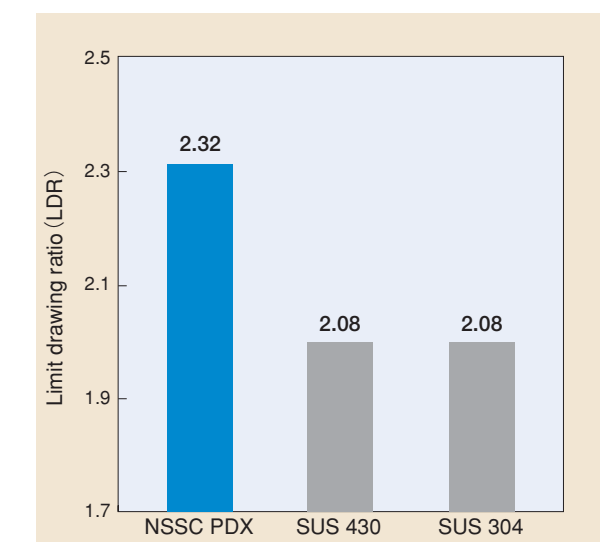
Ridging rank A: surface streaks of ≤10μm at tensile test

[Characteristics of welded portion (in case of TIG weld)]

	Erichsen value (mm)	Results of intergranular corrosion resistance test (Strauss test)
NSSC PDX	10.2	No intergranular corrosion
SUS 430	3.0	Generation of intergranular corrosion (desulfurization)

[Limit drawing ratio -TZP test-]

(Test conditions) •Thickness of test specimens : 0.5mm
•Blank diameter : 80 - 130mmφ
•Punch diameter : 50mmφ
•Punch shoulder R : 5mm





High stain-resistant ferritic stainless steel

NSSC 160R

17Cr-0.4Cu-Nb-LC,N

Features and Applications

Developed as material for wire rod of advanced stain resistance without adding Ni or Mo

1. Superior to existing SUS 430 in stain resistance
2. Less work hardening than SUS 304 and superior to it in elongation
3. High performance of weldability, especially of corrosion resistance around weld zone and extensibility

[Typical Applications] A variety of wire nettings, Fastening products, Precision machine component, Automotive component

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr	Cu	Nb	N	Nb/(C+N)
NSSC 160R	≤0.02	≤1.00	≤1.00	≤0.040	≤0.006	16.00-18.00	0.30-0.60	0.30-0.60	≤0.02	≥10
Typical type	0.01	0.40	0.50	0.035	0.005	16.10	0.40	0.50	0.01	20

Characteristics

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Wire Drawing %
Typical type	260	430	32	82

(Data of 5.5φ wire rod)

[Stain resistance]

Salt spray test (SST)

(Test conditions)

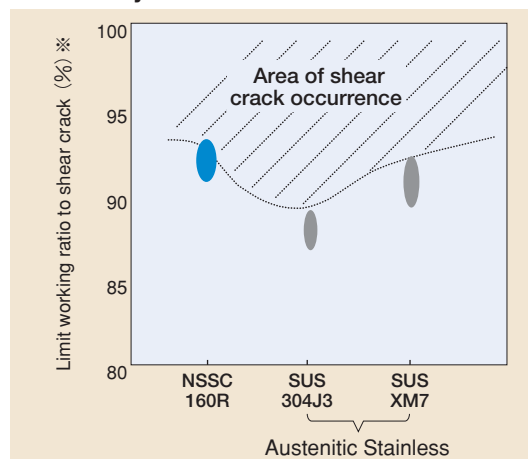
5%NaCl, 35°C, 1000h

	(inferior) ← Stain resistance rating → (superior)					
	F	E	D	C	B	A
NSSC 160R						■
SUS 430			■	■		
SUS 304						■

[Physical properties]

	Density (g/cm ³)	Electric resistivity (μΩ·xcm) [20°C]	Thermal expansion ratio (/°C) [0-800°C]	Thermal conductivity (W/m·°C) (100°C)	Specific heat (J/kg/°C)
Typical type	7.70	62	11.8x10 ⁻⁶	26.0	460

[Formability]



※Limit working ratio to shear crack after two-stepped cold forging of wire edge (as mimic working of screw head)

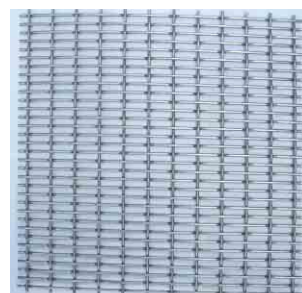
Application Examples

Stainless steel fasteners (screw, nail, bolt, etc.)



- Replacement from nickel-based stainless steel (VA)
- Replacement from plated steel products (improved durability)
- Magnetic tools compatible

Wire netting (for industrial machinery or building materials, etc.)



- Replacement from nickel-based stainless steel (VA)
- Replacement from plated steel products (improved durability)
- Enabling magnetic detection and removal of fragments in wire netting



High stain-resistant ferritic stainless steel

NSSC 432

17Cr-0.5Mo-0.2Ti-LC,N / Corresponding grade : SUS 436J1L

Features and Applications

Lower cost than SUS 436L by reduction of Mo content

1. Equal level of formability as SUH 409L, while slightly inferior to SUS 436S in application performance such as condensate corrosion resistance, salt corrosion resistance etc.

[Typical Applications] Automotive exhaust system, Kitchen furnishings, Home appliance, Building interior material, Gate, Handrail

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr	Mo	Ti	N
Specification	≤0.010	≤0.14	≤0.20	≤0.035	≤0.006	17.00-18.00	0.45-0.65	10(C+N)-0.30	≤0.015
Typical type	0.005	0.10	0.12	0.026	0.001	17.20	0.50	0.22	0.010

Characteristics

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
Specification	≥205	≥390	≥25	≤170
Typical type	245	450	34	134

[Formability]

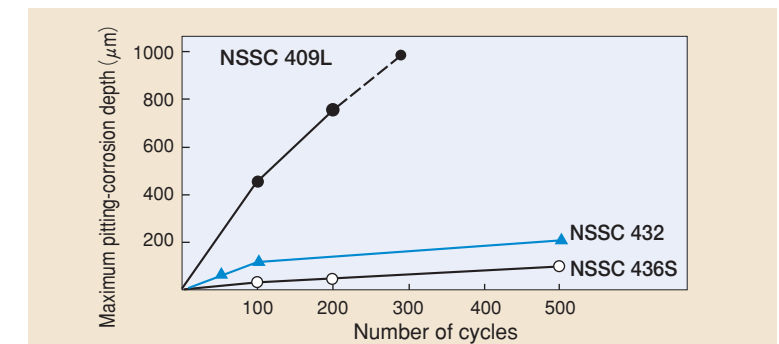
	r value	n value
NSSC 432	1.74	0.26
NSSC 436S	1.61	0.24
NSSC 409L	1.30	0.24

[Corrosion resistance]

(1) Salt spray test

(Test conditions)

Artificial seawater/ASTM standard
One cycle consists of 'spraying for 4 hours, drying for 2 hours and wetting for 2 hours'

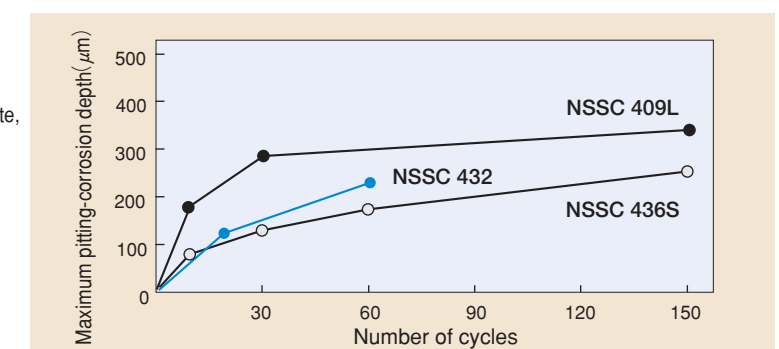


(2) Automotive exhaust gas test using mimic condensate

(Test conditions)

One cycle consists of 'partial immersion in condensate, heating at 130°C for 4 hours and cooling'

Condensate: 50ppm [Cl⁻], 100ppm [SO₄²⁻],
500ppm [CO₃²⁻], 220ppm [NH₄⁺],
pH8.5





High stain-resistant ferritic stainless steel

NSSC 436S

17Cr-1.2Mo-0.2Ti-LSi-LC,N / Corresponding grade : SUS 436L

Features and Applications

High performance of corrosion resistance, especially pitting corrosion resistance, and weldability met in this grade which has been developed by adding Mo and Ti to high purity ferritic base material.

1. Superior to SUS 430LX in corrosion resistance and high performance of weldability owing to its softness
2. High performance of intergranular corrosion resistance as well as drawability in weld zone

[Typical Applications] Automotive exhaust system, Kitchen furnishings, Home appliance, Building interior material, Gate, Handrail

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr	Mo	Ti	N
Specification	≤0.010	≤0.14	≤0.20	≤0.040	≤0.006	17.00 - 18.00	1.00 - 1.50	10(C+N) - 0.35	≤0.015
Typical type	0.005	0.10	0.09	0.022	0.002	17.20	1.22	0.23	0.011

Characteristics

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
Specification	≥205	≥390	≥25	≤170
Typical type	275	470	33	142

[Formability]

(Thickness:1.2mm)

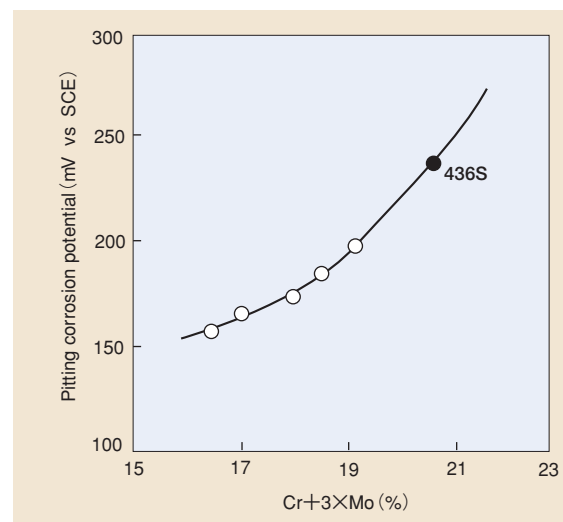
	r value	n value	Erichsen value mm	Conical-cup mm
NSSC 436S	1.61	0.24	10.7	45.6
NSSC 180	1.14	0.24	9.9	46.8
NSSC 409L	1.30	0.24	—	—

[Corrosion resistance]

(1) Measurement of pitting corrosion potential

(Test conditions)

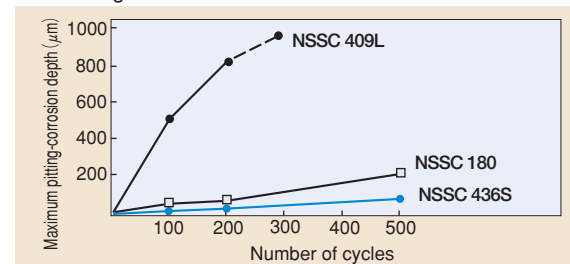
Measurement conditions: 30°C, 3.5% NaCl solution, Ar deaeration
Potential sweep rate :20mV/min



(2) Salt spray test

(Test conditions)

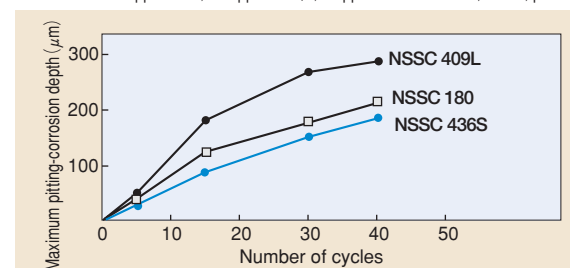
Artificial seawater/ASTM standard
One cycle consists of 'spraying for 4 hours, drying for 2 hours and wetting for 2 hours'



(3) Automotive exhaust gas test using mimic condensate

(Test conditions)

One cycle consists of 'partial immersion in condensate, heating at 250°C for 3 hours and cooling'
Condensate:1000ppm [Cl⁻],5000ppm [SO₄²⁻],100ppm each of [CO₃²⁻], [NO₃⁻], pH 8.9



High stain-resistant ferritic stainless steel

NSSC 180

19Cr-0.4Cu-0.4Nb-LC, N / Corresponding grade : SUS 430J1L

Features and Applications

Stepped up stain resistance with no Mo addition

1. Almost equal level of stain resistance as SUS 304
2. Superior to SUS 430 in extensibility and formability as a feature of low-carbon stainless steel
3. Exquisite performance in high-temperature characteristics such as oxidation resistance, high-temperature strength, etc.

[Typical Applications] Automotive trim material, Automotive exhaust system, Kitchen furnishings, Home appliance, Solar-heat collector, Gate, Handrail

Chemical composition (mass %)

	C	Si	Mn	P	S	Ni	Cr	Cu	Nb	N
Specification	≤0.02	≤1.00	≤1.00	≤0.040	≤0.006	≤0.60	19.00 - 21.00	0.30 - 0.60	≥10(C+N) and 0.30 - 0.80	≤0.025
Typical type	0.013	0.51	0.12	0.024	0.002	0.30	19.15	0.41	0.40	0.017

Characteristics

[Mechanical properties]

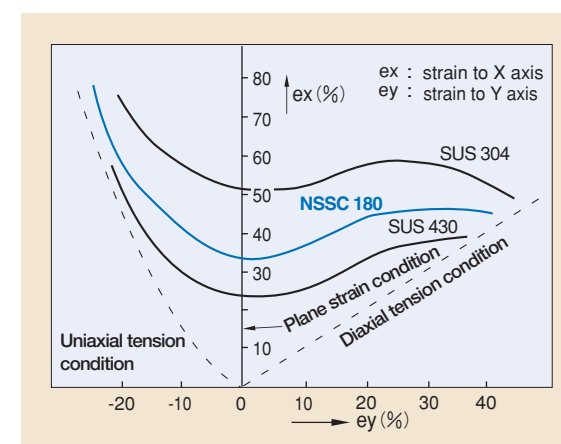
	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
Specification	≥205	≥450	≥22	≤200
Typical type	314	500	32	153

[Formability]

(Thickness:0.8mm)

	r value	Marginal contraction ratio	Bulge height mm	Erichsen value mm
NSSC 180	1.41	2.3	31.5	9.6

[Formability / Limiting deformation curve]



[Stain resistance]

(Test conditions)

0.5%NaCl+0.2%H₂O₂, 35°C, 24hr Based on JIS Z 2371

Grade	Surface finishes	Stain resistance rating (superior ← inferior)					
		A	B	C	D	E	F
NSSC 180	2B	■					
	BA	■					
	HL	■					
SUS 430	2B						
	BA						
	HL						
SUS 304	2B						
	BA						
	HL						



High corrosion resistant ferritic stainless steel

NSSC 190

19Cr-2Mo-Nb,Ti-LC,N / Corresponding grade : SUS 444

Features and Applications

Much higher performance of stress corrosion cracking resistance than austenitic stainless steels as well as highly improved performance of intergranular-, pitting- and chink- corrosion resistances (NSSC 190 is suitable for sheets or wire rod, while NSSC 190L is suitable for plates.)

1. Exquisite performance of stress corrosion cracking resistance and intergranular corrosion resistances
2. Superior to SUS 304 in pitting corrosion resistance and chink corrosion resistance
3. High performance of formability and weldability

[Typical Applications] Hot-water boiler, Solar-heat collector, Water tank

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr	Mo	N	Ti+Nb
Specification	≤0.015	≤0.50	≤0.50	≤0.040	≤0.030	18.00-20.00	1.75-2.25	≤0.015	≥16 (C+N)
Typical type	0.007	0.14	0.12	0.030	0.002	18.77	1.90	0.011	0.421

Characteristics

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
Specification	≥205	≥450	≥22	≤200
Typical type	358	533	29	172

[Stress corrosion cracking resistance]

(1) 42%MgCl₂ Solution

Grade	Load stress		Rupture time
	(kgf/mm ²)	(N/mm ²)	
NSSC 190	27	265	No rupture after 1,000 hours
	30	294	∕
	32	314	∕
SUS 304	15	147	Rupture after 3 hours
	20	196	Rupture after 1 hours
SUS 316	15	147	Rupture after 7 hours
	20	196	Rupture after 4 hours

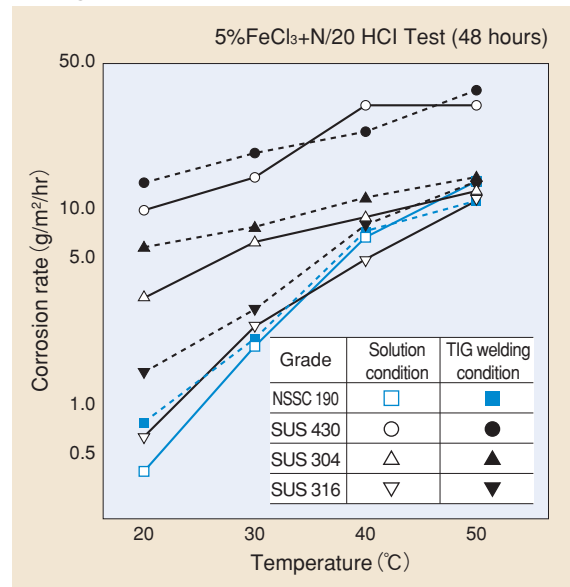
(2) High-temperature chloride solution

(Test conditions)
Pure water and NaCl (Cl⁻ concentration: 30/600ppm), 300°C (87kg/mm²)
Test piece: 1mmt×15mmw×100mmL (10R U-Bend)

Grade	Heat treatment	Cl ⁻ concentration	Cracking		
			100hr	200hr	300hr
NSSC 190	Anneal	30	○	○	○
		600	○	○	○
SUS 304	Sens	30	○	○	○
		600	○	○	○
SUS 316	Anneal	30	○	○	○
		600	○	○	○
SUS 304	Sens	30	○	×	×
		600	○	×	×
SUS 316	Sens	30	○	○	○
		600	○	○	○

(Heat treatment)
Anneal: no further working as produced
Sensitizing conditions: NSSC 190 1200°C×5min, A.C.
SUS 304, 316 650°C×2hr, A.C.

[Pitting corrosion resistance]



High corrosion resistant ferritic stainless steel

NSSC 190L

19Cr-2Mo-Nb-V-LC,N / Corresponding grade : SUS 444

Features and Applications

Developed on the basis of NSSC 190, exclusively for the usage as heavy plate, it exhibits high performance of toughness and weldability in the shape of plate with large thickness

1. High performance of toughness in both base metal and weld zone at the temperature of 0°C or more
2. Exquisite performance of stress corrosion cracking resistance
3. Higher level of pitting corrosion resistance or chink corrosion resistance than SUS 304, and especially as high performance of pitting corrosion resistance as SUS 316
4. Superior to SUS 304 in oxidation resistance, and to SUS 316 in organic acid resistance
5. Recommended as material for end plate, welded tube, clad plate or others because of its high performance of weldability and formability

[Typical Applications] Petroleum refining equipment, Petro-chemical equipment, Desalinization equipment, Industrial heat exchanger, Town gas manufacturing facility, Cl⁻ containing device, Hot water tank

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr	Mo	Nb	V	N
Specification	≤0.015	≤0.50	≤0.50	≤0.040	≤0.030	18.00-20.00	1.75-2.25	≥8 (C+N)	≤0.20	≤0.015
Typical type	0.004	0.07	0.07	0.025	0.003	18.75	1.82	0.156	0.06	0.008

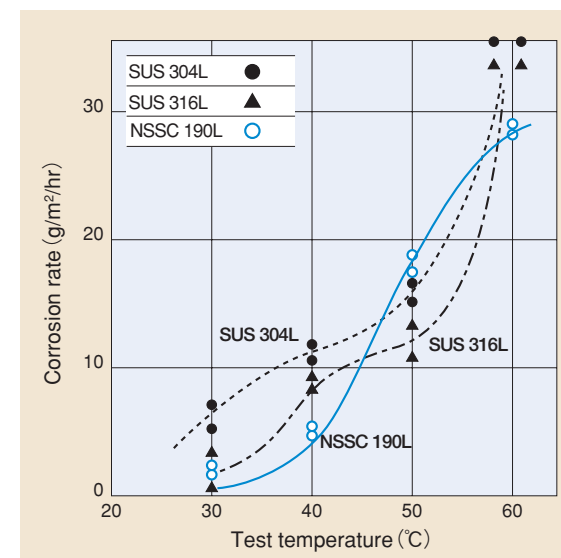
Characteristics

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness HBW	Bending 180°
Specification	≥245	≥410	≥22	≤217	t<8 0.5t, t≥8 1.0t
Typical type	t=6mm	412	500	35	166
	t=12mm	392	500	35	170

[Pitting corrosion resistance]

(Test conditions)
Test solution: 50g/l FeCl₃+HCl
Test period: 48hr
Test piece: 6mmt×30mmφ
Surface finish: Full surface finished with #320 polish



[Stress corrosion cracking resistance in High-temperature chloride solution]

(Test conditions)
Cl⁻: 600ppm and NaCl added (Test solution was renewed every 100 hours)
Test temperature: 300°C
Pressure: 87kg/cm²
Test piece: U-bent type for stress test

Base metal	Welding material	Welding method	Heat input kJ/cm	Result of microscopic observation
NSSC 190L	D316UL	TIG	10.8	No occurrence of stress corrosion cracking
			14.4	No occurrence of stress corrosion cracking
			19.3	No occurrence of stress corrosion cracking
			24.0	No occurrence of stress corrosion cracking
SUS 304L	D308L	Arc manual welding	13.4	No occurrence of stress corrosion cracking
			15.0	Transgranular-type stress corrosion cracking in base metal
SUS 316L	D316L	Arc manual welding	15.0	Transgranular-type stress corrosion cracking in base metal and weld zone



High stain-resistant ferritic stainless steel

NSSC 220M

22Cr-1.5Mo-Nb, Ti-LC,N / Corresponding grade : SUS 445J2

Features and Applications

High performance of stain resistance is available in this grade which has been developed by combined addition of Ti and Nb to 22%Cr-2%Mo ferritic base material.

1. Superior to SUS 316 in stain resistance
2. Owing to its low thermal expansion coefficient, suitable for such applications that require high resistance to thermal expansion or contraction as roof, exterior wall, etc.
3. Exhibits a little higher hardness than SUS 304

[Typical Applications] Building exterior materials such as roofing, siding or others

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr	Ni	Mo	N	(Ti+Nb)/(C+N)
Specification	≤0.010	≤1.00	≤1.00	≤0.040	≤0.007	22.00 - 23.00	≤0.60	1.50 - 2.50	≤0.020	≥16
Typical type	0.005	0.10	0.13	0.026	0.001	22.29	0.10	1.63	0.013	28.92

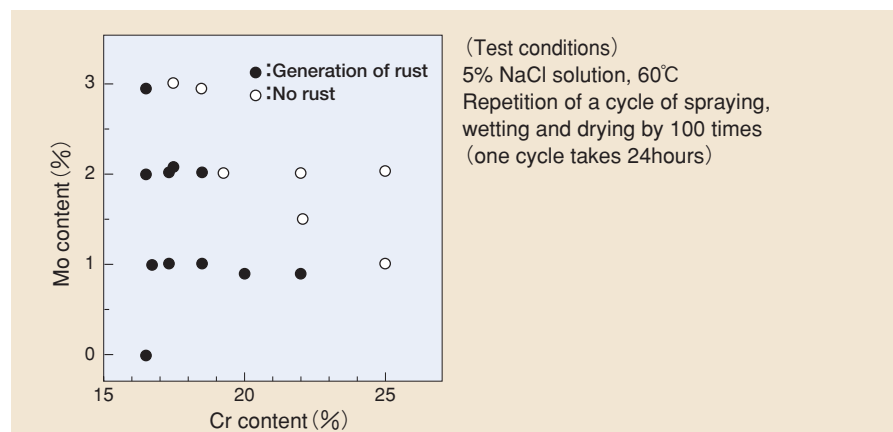
Characteristics

[Mechanical and physical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv	Bending 180°	Average thermal expansion coefficient (multiplied by 10 ⁻⁶ /°C)
Specification	≥295	≥470	≥22	≤200	1.0t	—
Typical type	370	516	30	175	No cracking	10.4 (30 - 100°C)

[Corrosion resistance]

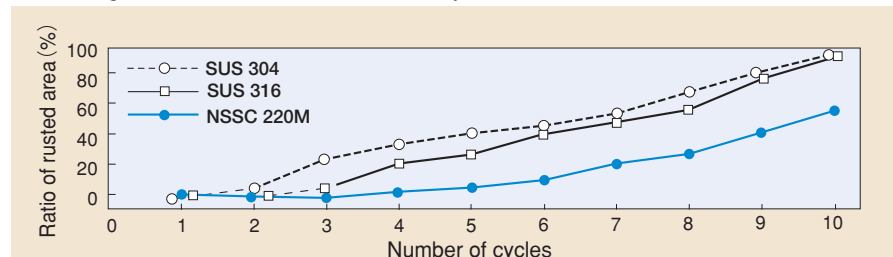
(1) Stain resistance and content of Cr and Mo



(2) Repetitive drying and wetting accelerated corrosion test

(Test method)

Repetition of a cycle of seawater spraying in room temperature, drying at 60°C for 30 minutes and wetting at 50°C, 100%, for RH 30minutes by 10 times



Oxidation resistant ferritic stainless steel

NSSC 405Si

12Cr-2Si-0.15Al

Features and Applications

1. Exquisite performance of oxidation resistance at high temperatures
2. Insignificant thermal deformation owing to its low thermal expansion coefficient
3. High formability which facilitates cold working and welding

[Typical Applications] Combustion tube of oil-burning stove, Component of burners or firing furnaces

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr	Al
Specification	≤0.080	1.00 - 3.00	≤1.00	≤0.040	≤0.030	11.50 - 14.50	0.10 - 0.30
Typical type	0.07	1.75	0.12	0.021	0.004	13.02	0.12

Characteristics

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
Specification	≥295	≥490	≥15	≤230
Typical type	Hot-rolled sheet	530	19	210
	Cold-rolled sheet	345	28	180

[Oxidation resistance]

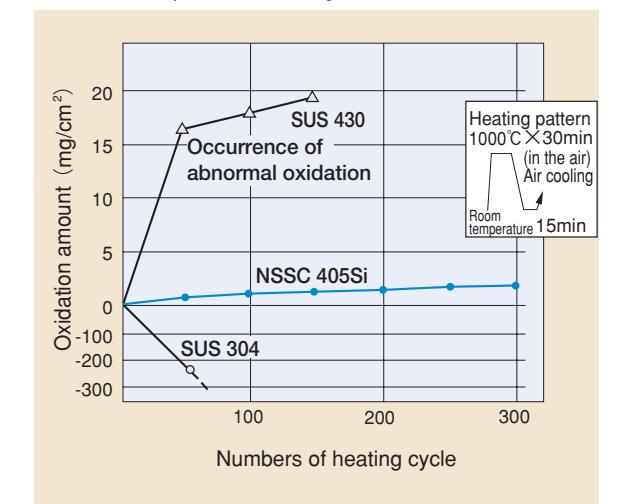
Oxidation test inside an oil-burning stove

Grade	Surface finishes	50h	100h	200h	600h
NSSC 405Si	#400 polished	○	○	○	○
SUS 430	2B	×	×	×	×
SUH 409	2B	×	×	×	×

Hanged from combustion tube of a small-sized oil-burning stove with reflex mirrors
○:No rust ×:Generation of red rust

Intermittent oxidation test in the air

The figure below shows the relationship between oxidation amount and repetitive reheating to 1,000°C for 30 minutes.





Heat resistant ferritic stainless steel

NSSC FHZ

13Cr-1Si-Nb-LC

Features and Applications

Stepped up high-temperature characteristics by addition of Nb

1. Endowed with high performance of high-temperature strength and thermal fatigue characteristics by addition of Nb
2. Superior to SUH 409L in oxidation resistance because of its high content of Si

[Typical Applications] Automotive exhaust system (exhaust manifold, front pipe, etc.), Plant component (waste-heat boiler duct of power plant and others)

Chemical composition (mass %)

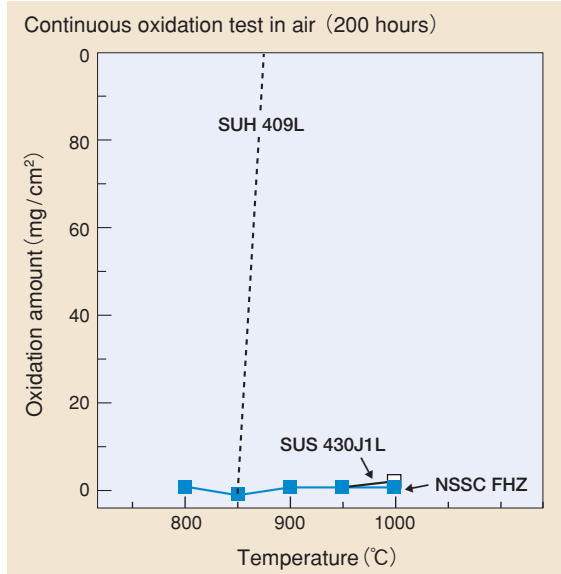
	C	Si	Mn	P	S	Cr	Nb	N
Specification	≤0.020	0.80 - 1.40	0.20 - 1.20	≤0.040	≤0.010	13.00 - 15.00	0.40 - 0.80	≤0.025
Typical type	0.010	1.12	0.45	0.022	0.001	13.21	0.43	0.006

Characteristics

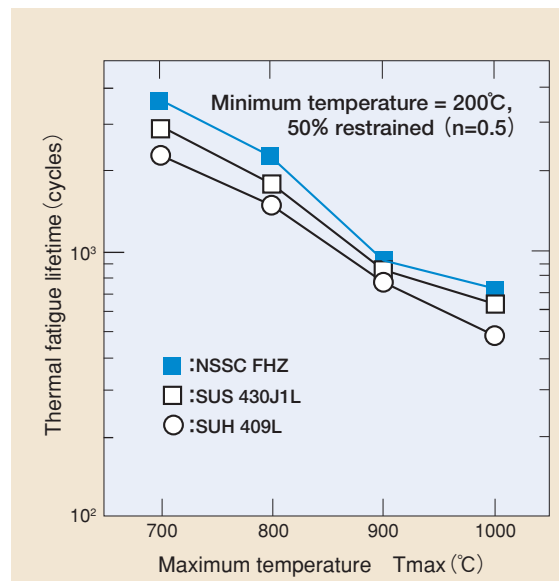
[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
Specification	≥205	≥410	≥25	≤200
Typical type	311	492	34	152

[Oxidation resistance]



[Thermal fatigue characteristics]



Heat resistant ferritic stainless steel

NSSC 450MS

14Cr-0.5Mo-0.3Nb-0.1Ti-LC

Features and Applications

Stepped up high-temperature characteristics by combined addition of Nb, Ti and Mo

1. Superior to NSSC 180 in thermal fatigue characteristics in high-temperature and high-temperature strength
2. Exquisite performance of oxidation resistance in high-temperature air up to around 950°C
3. Superior to NSSC 180 also in formability such as stretchability and drawability

[Typical Applications] Automotive exhaust system (exhaust manifold, etc.), Smoke duct, Heat exchanger, Heat-resistant apparatus

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr	Mo	Nb	Ti	N
Specification	≤0.015	≤2.00	≤2.00	≤0.040	≤0.030	13.50 - 14.50	0.40 - 1.00	0.20 - 0.50	0.10 - 0.30	≤0.015
Typical type	0.010	0.94	0.95	0.029	0.005	13.90	0.50	0.30	0.13	0.010

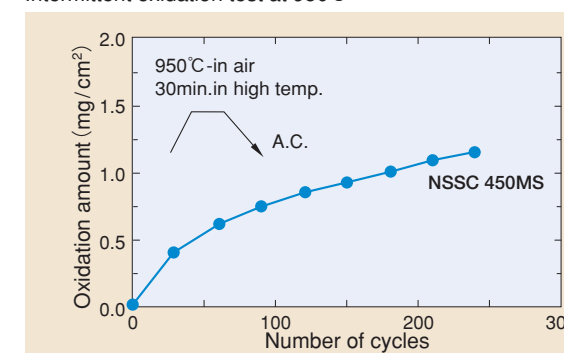
Characteristics

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv	r value
Specification	≥205	≥390	≥25	≤200	—
Typical type	297	471	34	160	1.28

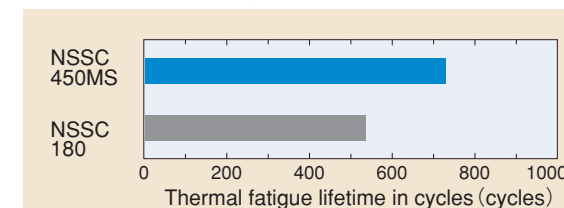
[Oxidation resistance]

Intermittent oxidation test at 950°C

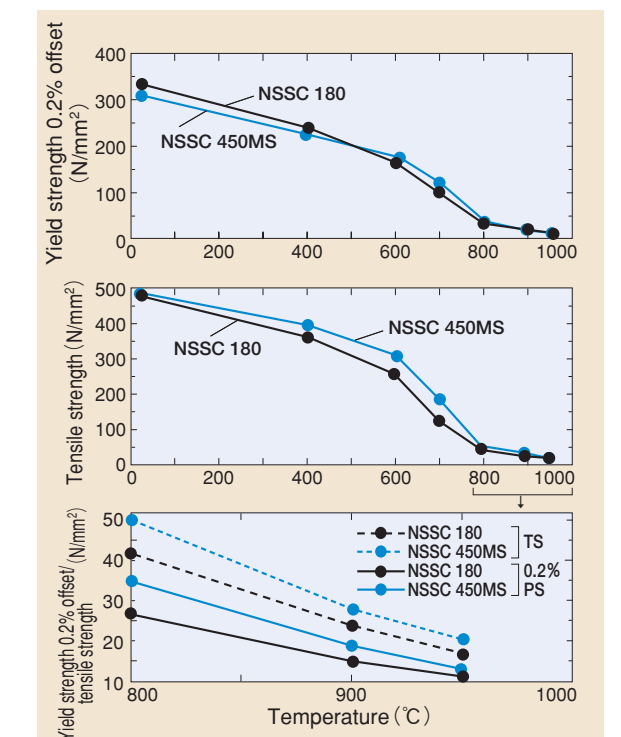


[Thermal fatigue characteristics]

(Test conditions) 2mmt, 100% restrained, 900°C/200°C



[High-temperature tensile characteristics]





Heat resistant ferritic stainless steel

NSSC FH11

18Cr-2.5Si-Nb-LC

Features and Applications

Stepped up high-temperature characteristics by addition of Si and Nb

1. High performance of rust resistance in burning atmosphere as well as in high-temperature humid atmosphere
2. Superior to SUS 430 in high-temperature strength

[Typical Applications] Combustion parts of heater, etc.

Chemical composition (mass %)

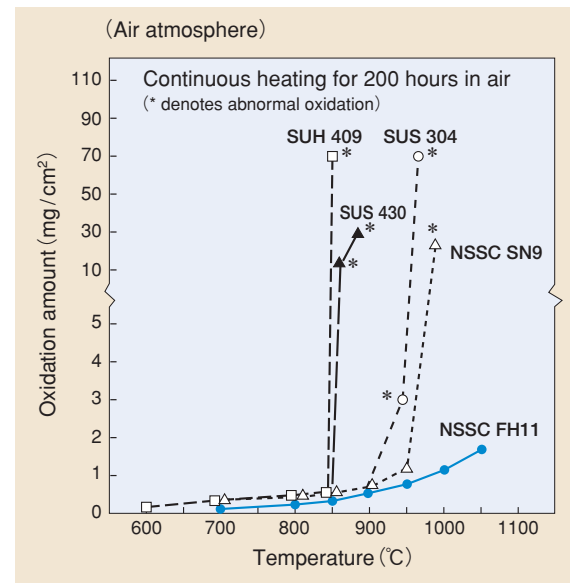
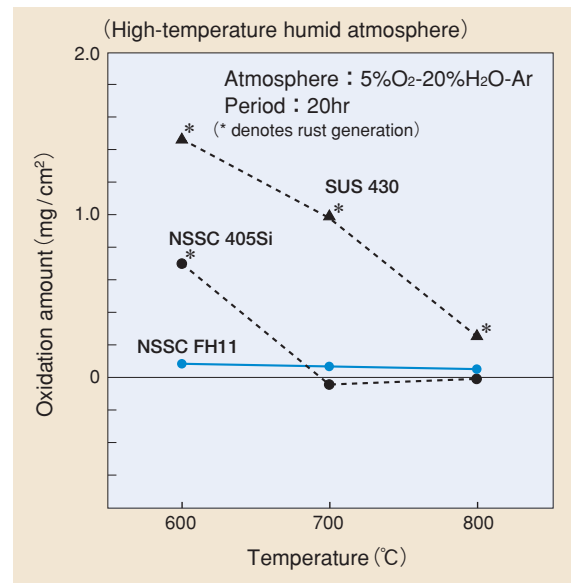
	C	Si	Mn	P	S	Cr	Nb
Specification	≤0.030	2.40 – 2.80	≤1.00	≤0.040	≤0.030	17.50 – 18.50	0.20 – 0.50
Typical type	0.020	2.59	0.29	0.022	0.001	18.22	0.31

Characteristics

[Mechanical properties]

	Yield strength 0.2% offset in N/mm ²	Tensile strength in N/mm ²	Elongation in %	Hardness in Hv/1kg
Specification	≥205	≥410	≥22	≤230
Typical type	431	588	29	203

[Oxidation resistance]



Oxidation- and electric-resistant ferritic stainless steel

NSSC HOM

15Cr-4Al-LC,N

Features and Applications

1. Distinguished performance of oxidation resistance owing to its forming of alumina oxide on surface in high-temperature atmosphere
2. Insignificant thermal deformation caused by heating or cooling owing to its low thermal expansion ratio
3. Large scale of electric resistivity

[Typical Applications] Combustion tube of oil-burning stove, Grid resistor of cars or ships

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr	Al
Specification	≤0.015	≤1.00	≤1.00	≤0.040	≤0.030	14.00 – 16.00	3.00 – 5.00
Typical type	0.003	0.20	0.12	0.024	0.001	15.00	4.60

Characteristics

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
Specification	≥350	≥520	≥15	≤230
Typical type	493	656	24	208

[Physical properties]

Specific gravity	Electric resistivity	Average thermal expansion coefficient
7.20	125±6μΩ·cm (at 20°C)	11.5×10 ⁻⁶ (1/°C)(20 – 500°C)

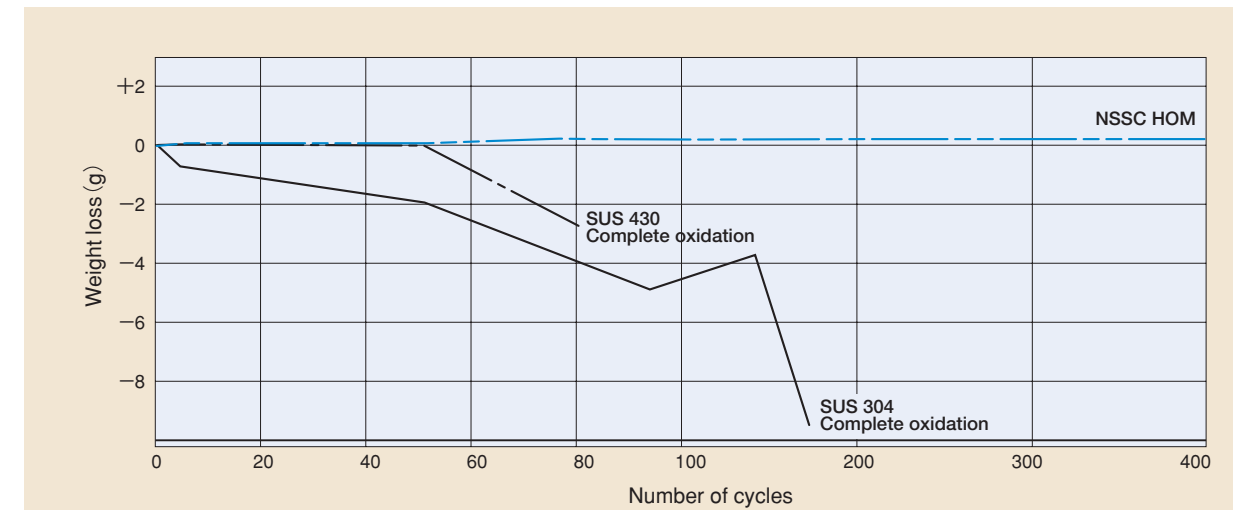
[Oxidation resistance]

Intermittent oxidation test in the air

(Test condition)

Heating conditions: One cycle consists of '30 minutes at 1200°C and 30 minutes at room temperature'

Test specimens: thickness×20×50mm





High weldability ferritic stainless steel

NSSC 410W

12Cr-LC/Corresponding grade : SUS 410L

Features and Applications

Stepped up welding workability and mechanical properties at weld zone

1. High performance of weldability which enables MIG welding and arc welding without pre- and post- heating.
2. High performance of bending workability and toughness of welded joint
3. Exhibits wide range of mechanical properties according to choice of heat-treating conditions
4. Equal level of corrosion resistance and high-temperature oxidation resistance as conventional grade as SUS 410L

[Typical Applications] Heat-resistant equipment, Other equipments or building materials used in environmental conditions which don't require highest level of corrosion resistance

Chemical composition (mass %)

	C	Si	Mn	P	S	Cr
Specification	≤0.030	≤1.00	≤1.00	≤0.040	≤0.030	11.50 - 13.50
Typical type	0.020	0.48	0.53	0.022	0.002	11.75

Characteristics

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv	Bending	
					Angle	Inside radius
Specification	≥195	≥360	≥22	≤200	180°	1.0t
Typical type	284	462	30	145	No cracking	

[Mechanical properties after temper heat treatment]

Tempering temperature °C	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Bending (r=1t)	Hardness Hv
700	481	627	22.0	No cracking	187
750	320	523	27.6	No cracking	170
800	285	490	32.8	No cracking	136

(Thickness:8mm)

[Mechanical properties of welded joints]

Grade	Welding method	Welding materials	Thickness mm	Tensile strength N/mm ²	Rupture location	Rupture impact test *			Bending test **
						vE ₀ J	vE ₂₀ J	vTrs °C	
NSSC 410W	Base metal	—	9.5	549	—	51.0	61.8	< -100	r=1.0t No cracking
	MIG	YM-309	∕	Dle	Base metal	66.7	74.5	-60	r=2.0t No cracking
	Arc hand	309R	∕	557	∕	54.9	69.6	-18	r=2.0t No cracking
	∕	410Nb	∕	556	∕	44.1	59.8	+32	r=2.0t No cracking
SUS 405	Base metal	—	7.0	—	—	30.4	32.4	-35	
	Arc hand	309R	∕	500	Base metal	—	6.9	—	
	∕	410Nb	∕	504	∕	—	—	—	

(*Impact test piece: L direction, subsize 5 JIS No.4 **Bending test: L direction, roller bend test)



High weldability ferritic stainless steel

NSSC 410WM (YUS 410W-MS)

11Cr-Ni-LC,N/Corresponding grade : SUS 410L

Features and Applications

High performance of yield strength, weldability and weld zone characteristics and therefore suitable for welded structure of thickness over 3mm above all

1. Distinguished performance of weldability which enables welding without pre- and post- heating.
2. High performance of bending workability and toughness of welded joint
3. Superior to SUS 410 in yield strength which provides with advantage in potential of strength-oriented designs
4. YUS 410W-MS is an accredited grade of Article 37 of the Construction Standard Act

[Typical Applications] Marine container frame material, Structural construction material, Other materials which require both high yield strength and bending workability

Chemical composition (mass %)

	C	Si	Mn	P	S	Ni	Cr	N
Specification	≤0.030	≤0.50	≤1.00	≤0.035	≤0.025	≤0.50	10.75 - 12.00	≤0.025
Typical type	0.022	0.12	0.85	0.021	0.002	0.38	10.85	0.008

Characteristics

[Mechanical properties]

Specification	Plate thickness	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv
Typical type	t=4.5mm	412	510	28	157
	t=6.4mm	392	490	31	153

[Bendability]

	Thickness (mm)	Bending angle	Inside radius	Judgment
Specification	t≤5.0	90°	1.0t	No cracking on outside bent zone
	5.0<t≤6.4	∕	1.5t	∕
	6.4<t	∕	2.0t	∕
Typical type	t=4.5	∕	1.0t	No cracking
	t=6.4	∕	1.5t	No cracking

(Test specimens: JIS No.4)

[Toughness]

Thickness (mm)	Direction	NSSC 410WM			TP 409		
		vE ₀ J	vE ₂₀ J	vTrs °C	vE ₀ J	vE ₂₀ J	vTrs °C
4.5	*1 L	29	28	-86	—	—	—
	C	30	29	-82	—	—	—
6.5	*2 L	64	73	-80	32.4	37.3	-32
	C	49	53	-85	23.5	29.4	-32

*1: Subsize 3mm, Charpy test specimens (2mm V-notch)

*2: Subsize 5mm, Charpy test specimens (3mm V-notch)



High-strength, high stain-resistant ferritic stainless steel

NSSC 550

13Cr-2Ni-2Mo

Features and Applications

1. Superior to SUS 304 in corrosion resistance by appropriate addition of Cr and Mo as well as by control of trace elements
2. Superior to SUS 304 in performances of wire drawing as well as cold-heading

[Typical Applications] Self-tapping screw, High-strength nail, Various kinds of pins, High-strength chain and other applications requiring high hardness and high stain resistance

Chemical composition (mass %)

	C	Si	Mn	P	S	Ni	Cr	Mo	N
Specification	0.10 - 0.20	≤1.00	≤1.00	≤0.040	≤0.010	1.00 - 2.40	12.50 - 14.00	1.80 - 2.30	0.05 - 0.15

Characteristics

[Mechanical properties]

Longitudinal elastic modulus N/mm ²	Transverse elastic modulus N/mm ²	Density g/mm ³	Thermal expansion coefficient cm/°C
2.05×10 ⁵	7.94×10 ⁴	7.75	11.5×10 ⁻⁶

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness Hv	Impact value J/cm ²
After annealing	—	872	61	283	—
After tempering at 200°C following annealing at 1,150°C	1150	1750	29	550	80

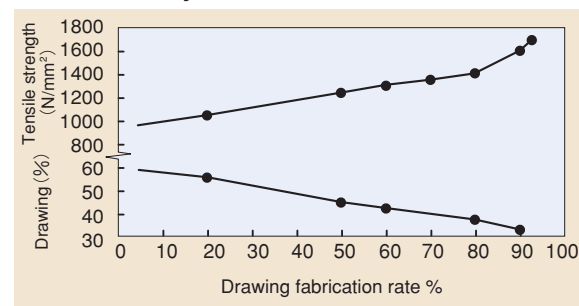
[Stain resistance]

Pitting corrosion potential

(Test conditions)
Solution of 3.5% NaCl, Ar deaeration at 30°C

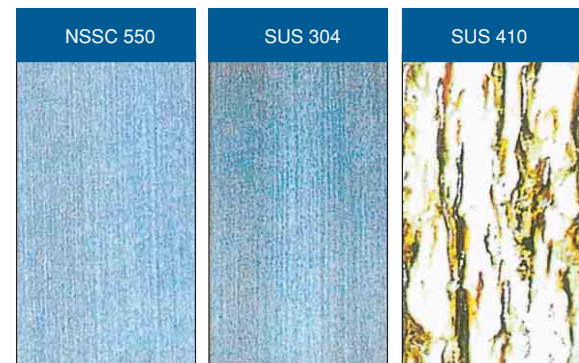
	Pitting corrosion potential (mV vs. SCE)					
	-100	0	+100	+200	+300	+400
NSSC 550	○					
SUS 304	○					
SUS 410	○					

[Cold workability]



Salt spray test

(Test conditions) JIS Z 2371, 240 hours



High-strength, high corrosion resistant duplex stainless steel

NSSC DX1

22Cr-5Ni-3Mo-LC-0.13N / Corresponding grade : SUS 329J3L, DIN 1.4462

Features and Applications

Exquisite performance of high-strength and high corrosion resistance corresponding DIN 1.4462

1. Superior to SUS 316 or SUS 317 in pitting corrosion resistance as well as in chink corrosion resistance
2. High performance of yield strength which is twice as high as SUS 304 or SUS 317 at room temperature
3. Equal level of weldability as conventional austenitic stainless steel with use of welding materials of similar composition

[Typical Applications] A variety of equipments for chemical plant, Body of revolution for centrifugal separator

Chemical composition (mass %)

	C	Si	Mn	P	S	Ni	Cr	Mo	N
Specification	≤0.03	≤1.00	≤2.00	≤0.030	≤0.020	4.50 - 6.50	21.00 - 23.00	2.50 - 3.50	0.08 - 0.20
Typical type	0.02	0.46	1.75	0.020	0.001	5.15	21.68	2.93	0.13

Characteristics

[Mechanical properties]

	Yield strength 0.2% offset N/mm ²	Tensile strength N/mm ²	Elongation %	Hardness HBW	Charpy absorbed energy vEo J
Specification	≥450	≥620	≥25	≤290	—
Typical type	t=6.0mm	588	784	35	216
	t=12.7mm	549	774	40	304
	t=20.0mm	510	745	39	226

[Chink corrosion resistance]

(Test conditions) ASTM G48 Method B
Test temperature: 0 - 25°C
Test solution: 100g FeCl₃·6H₂O + 900ml H₂O (6% FeCl₃)
Test period: 72hr

Test temperature (°C)	Grade	NSSC DX1 Base metal	NSSC DX1 welds			SUS 316L Base metal	SUS 316LN Base metal	SUS 317L Base metal
			SMAW (12.7t)	SAW (12.7t)	SAW (20.0t)			
25.0		×	×	×	×	×	×	×
22.5		×	×	×	×	×	×	×
20.0		×	×	×	×	×	×	×
17.5		○	×	○	○	×	×	×
15.0		○	○	○	○	×	×	×
12.5		○	○	○	○	×	×	×
10.0		○	○	○	○	×	○	○
7.5		○	○	○	○	×	○	○
5.0		○	○	○	○	×	○	○
2.5		○	○	○	○	×	○	○
0		○	○	○	○	×	○	○

(○ : No chink corrosion × : Generation of chink corrosion)



1 Product and company identification

[Product name]

Stainless steel sheets and strip
Heat-resistant steel sheets and strip

[Supplier]

Nippon Steel & Sumikin Stainless Steel Corporation
Address : 3-2-2 Nihonbashi-Hongokucho, Chuo-ku, Tokyo
Division in charge : Technical Division
Telephone number : 03-3276-4890
Facsimile number : 03-3276-4928
Emergency address and telephone number: Same as above

2 Composition/information on ingredients

Substance or preparation Preparation (Alloy)

Main ingredients

Ingredient Name	Conc. (%)	CAS No.	ICSC No.
Iron [Fe]	Balance	7439-89-6	—
Silicon [Si]	Under 5	7440-21-3	—
Manganese [Mn]	Under 12	7439-96-5	0174
Nickel [Ni]	Under 37	7440-02-0	0062
Chromium [Cr]	Under 32	7440-47-3	0029
Molybdenum [Mo]	Under 7	7439-98-7	—
Copper [Cu]	Under 5	7440-50-8	0240
Niobium [Nb]	Under 2	7440-03-1	—
Titanium [Ti]	Under 3	7440-32-6	—
Aluminum [Al]	Under 5	7429-90-5	—
Tungsten [W]	Under 3	7440-33-7	—
Cobalt [Co]	Under 21	7440-48-4	—

3 Hazards identification

At present, we have no effective information on hazards identification under general conditions. However, the fumes resulting from welding, autogenous cutting, etc. and the fine particles resulting from grinding, etc. may irritate the respiratory organs, the mucous membrane of the eye, etc. Burns may result from arcing. Moreover, cutting chips or the like may be injurious to the skin.

4 First-aid measures

After receiving the first-aid measure required, consult a physician if necessary. Examples of first-aid measures are given below.

- ◆ If respiration becomes difficult due to fumes or the like, apply a respiratory aid and consult a physician immediately.
- ◆ When a burn is caused by arcing or the like, cool the affected part and receive medical treatment if necessary.
- ◆ If the mucous membrane of the eye or the like is irritated by fumes, fine particles, etc., wash the affected part with water and consult a physician immediately.
- ◆ When the skin is injured by cutting chips or the like, keep the wound clean and receive medical treatment if necessary.

5 Fire-fighting measures

Fine particles may be combustible and explosive.

6 Accidental release measures

As the product is a solid, it is not released under general conditions.

7 Handling and storage

Avoid unnecessary wetting with water, contact with acids and high-temperature and high-humidity environments. In the case of heavy product, take precautions to prevent the possibility of falling.

8 Exposure controls/personal protection

At present, we have no effective information on exposure controls and personal protection under general conditions. When performing welding, autogenous cutting, grinding, cutting, etc., wear masks, goggles, gloves, work clothes, etc. for prevention of fume inhalation and irritation to the mucous membrane and for protection from arcs and cutting chips.

9 Physical and chemical properties

Physical state A silver-white solid under general conditions
Physical properties Fusion point : 1,455 ~ 1,535°C
Density : Approx. 7.7~8.0 g/cm³

10 Stability and reactivity

The product is stable with low reactivity under general conditions. However, rust may appear if the product comes into contact with water or an oxidizing substance. This rusting may be accompanied with a deficiency of oxygen or the generation of hydrogen.

This data sheet has been drawn up in accordance with ISO 11014-1 "Safety Data Sheet for Chemical Products", Part 1 "Content and Order of Sections" (hereinafter referred to as "ISO"). The definitions of terms conform to ISO.

In this data sheet, the information which is available at Nippon Steel & Sumikin Stainless Steel Corp. at the time of sheet preparation is furnished to the users as the "reference

11 Toxicological information

At present, we have no effective epidemiological information on the toxicological (health) effects of this steel product. For some of alloying elements, however, toxicological effects may be pointed out, for example, in cases where the concentration of respective element exceeds a certain level (e.g., allowable concentration) during the operations described in Section 8. The toxicological information is obtained from, for example, the ICSC (supervised by the Environmental Health Bureau, Ministry of Health and Welfare), etc.

12 Ecological information

At present, we have no effective ecological information. For some of alloying elements, however, environmental effects may be pointed out. The ecological information is obtained, for example, from the ICSC (supervised by the Environmental Health Bureau, Ministry of Health and Welfare), etc.

13 Disposal considerations

Basically, disposal is entrusted to legally approved industrial waste management contractors. If there is any substance adhering to the waste to be disposed of, the contractor is selected, paying attention to the adhering substance.

14 Transport information

In the case of heavy product, exercise care for prevention of load shifting. It is desirable to cover the product with tarpaulin or the like to prevent infiltration of rain water, etc.

15 Regulatory information

No specific information

16 Other information

For inquiries, refer to Technical Div., Nippon Steel & Sumikin Stainless Corporation. phone : +81-3-3276-4890, Facsimile : +81-3-3276-4928

information" for securing safe handling of the product. Referring to this data sheet, the users should take appropriate safety measures on their own responsibility depending on the actual state of handling. This data sheet is not intended for assuring the safety of the product. There is a possibility of hazards which are not described in this data sheet and for which our company does not have any specific information.