High Corrosion Resistant
High Formability
Ferritic Stainless Steel

NSSC 180

STAINLESS STEELS

Nippon Steel & Sumikin Stainless Steel Corporation

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Introduction of High Corrosion Resistant & High Formability Ferritic Stainless Steel "NSSC 180"

1. What type of stainless is NSSC 180. . . . . ?

- NSSC180 is low interstitial ferritic stainless which has equivalent corrosion resistance to SUS 304 in general environment (neutral chloride environment).
- NSSC180, which is corresponding to JIS grade (SUS430 J1L), is NSSC's own grade with higher corrosion resistance by raising Cr content and adding small amount of Ni.
- NSSC180 does not contain Mo whose price is dramatically increasing.
  Also, its chemical composition was designed taking not only corrosion resistance but also formability and weldability into consideration.
- NSSC180 has been used for more than 25 years for various applications.
  ・・・・・ Annual production result is over 20,000MT.

2. Chemical Composition and Basic Properties of NSSC 180

◆ Chemical Composition (mass%)

※1 : Ti,Nb,Zr : 8(C+N)～0.80
※2 : Nb=0.30～0.80、and≧10(C+N)

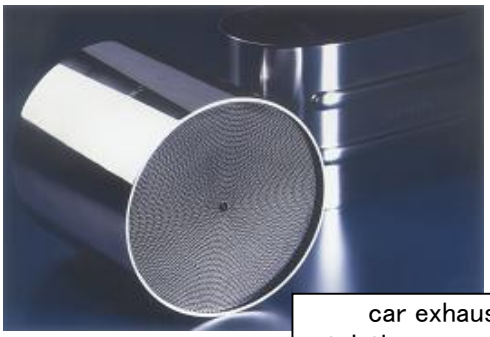
		C	Si	Mn	P	S	Ni	Cr	Cu	Nb	N
spec	SUS304	≦0.08	≦1.00	≦2.00	≦0.045	≦0.030	8.00-10.50	18.00-20.00	—	-	-
	SUS430	≦0.12	≦0.75	≦1.00	≦0.040	≦0.030	-	16.00-18.00	-	-	-
	SUS430J1L	≦0.025				≦0.030	—	16.00-20.00	0.30-0.80	※1	
	NSSC180	≦0.02	≦1.00	≦1.00	≦0.040	≦0.006	≦0.60	19.00-21.00	0.30-0.60	※2	≦0.025
NSSC180typical		**0.013**	**0.51**	**0.12**	**0.024**	**0.002**	**0.30**	**19.15**	**0.41**	**0.40**	**0.017**

3. Applications ・・・・・to be used for various applications based on its characters


car window lace


refrigerator business use(door)


dish washer & dryer(door)


car exhaust system
catalytic converter(outer case)


BBQ stand


IH cooking pan

Result of Field Exposure Test in various Areas

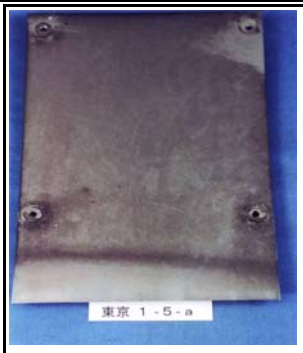
Result of 5 Years Field Exposure Test for SUS 304 & NSSC 180

5 Years Field Exposure Test shows that Corrosion resistance of NSSC180 is almost equivalent to that of SUS304.

＊ Only in the case of volcanic ash area, SUS304 shows slight superior performance to NSSC180.

Test Condition: shore area (Okinawa)　A test of six months

(Test Condition : 5-year Field Exposure Test in various areas)

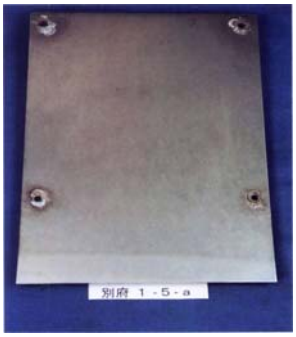


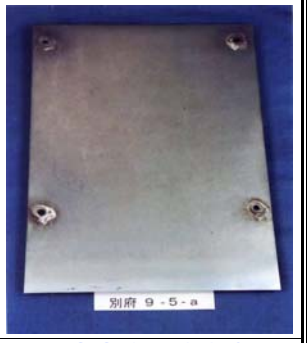
SUS 304 / NSSC 180
City area (Tokyo/Yoyogi)

SUS 304 / NSSC 180
Pacifice-Ocean area (Chibapref/Kimitsu)

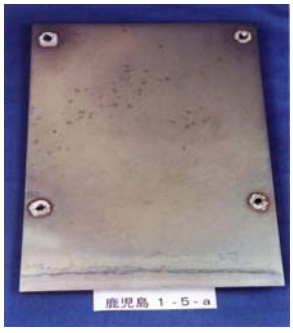
SUS 304 / NSSC 180
Japan-sea coastal area (Niigata)

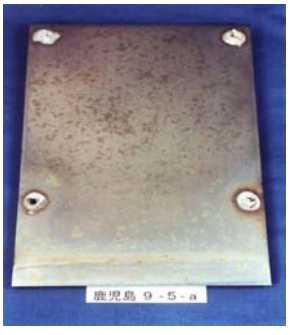
SUS 304 / NSSC 180
Setouchi area (Yamagucgi/Hikari)





SUS 304 / NSSC 180
Hot spring area (Ooita/Beppu)





SUS 304 / NSSC 180
Volcanic ash area (Kagoshima)

Result of CCT

Result of Cyclic Corrosion Test (CCT) for NSSC180 and other Stainless Grades

NSSC 180 shows almost equivalent corrosion resistance to SUS304

< CCT Condition >

- Surface condition: whole surface #600-polished
- 1 cycle condition: artificial sea water(*) spray (35℃, 4hr) → Dry (60℃, 2hr) → Wet (50℃, Humidity 95%, 2hr)
- 12 cycle condition corresponds to that of 2-year field exposure test in salty environmental area like coastal region.
  (= In such condition, corrosion on SUS304 is getting to be conspicuous)

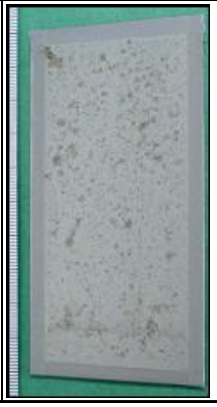
*) Artificial sea water:
It is chloride-based aqueous solution, imitating components of sea water, produced artificially by dissolving commercial chemicals to the prescribed density. It is also used in fish tank for tropical fish. Sodium Chloride is the major component and added Magnesium Chloride and Calcium Chloride.

< CCT 12 Cycles >

NSSC 180	SUS 304	21Cr-Ti	SUS 430
			

< Corrosion on SUS 304 > * 2B finish

- In CCT test for SUS304/2B, corrosion gets to be conspicuous after 12 cycles.

5 cycles	12 cycles	20 cycles
		

Result of SST

Result of SST for NSSC 180

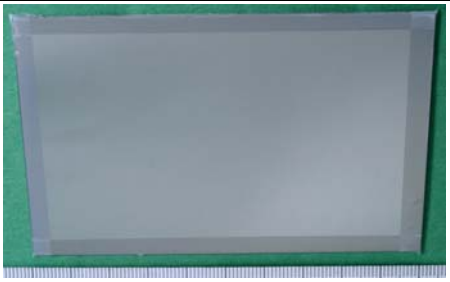
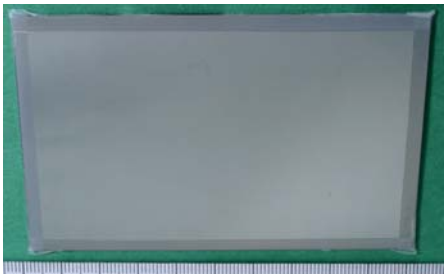
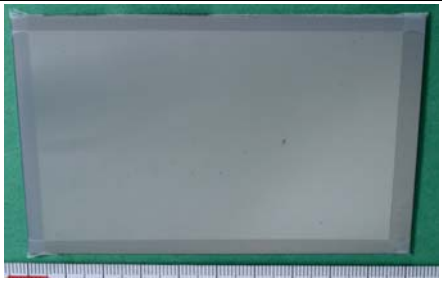
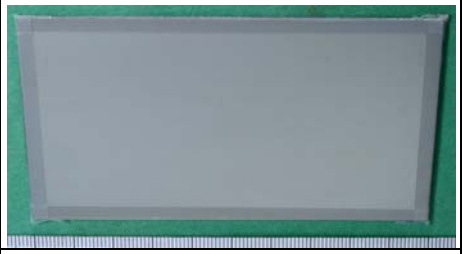
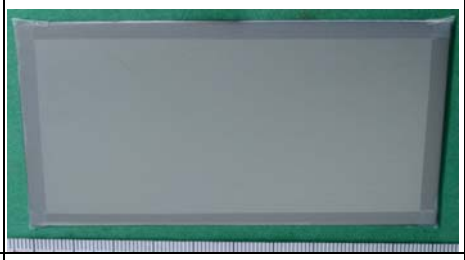
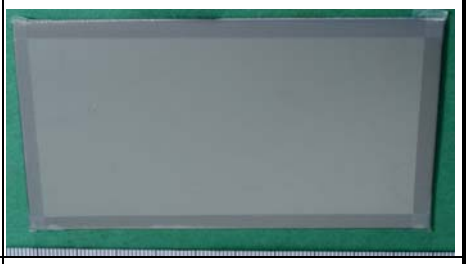
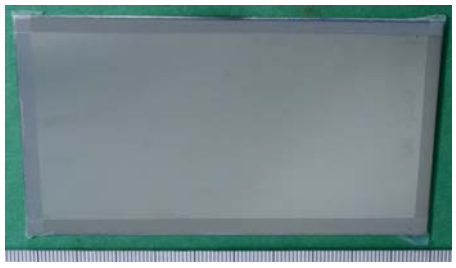
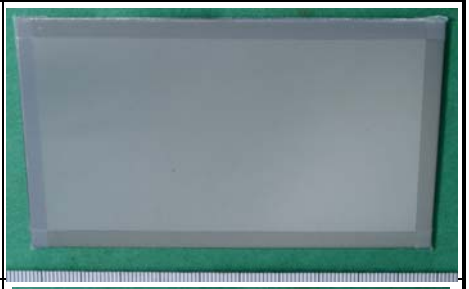
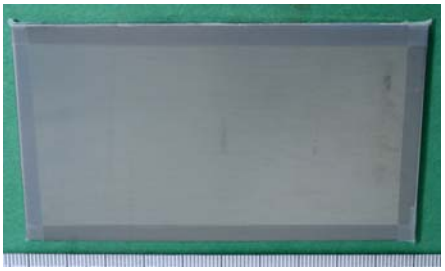
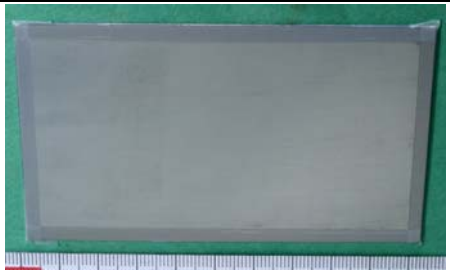
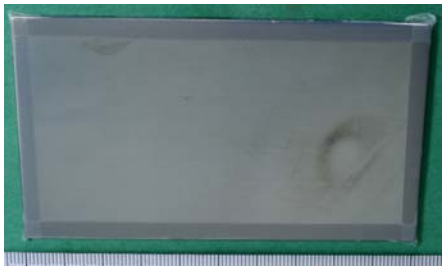
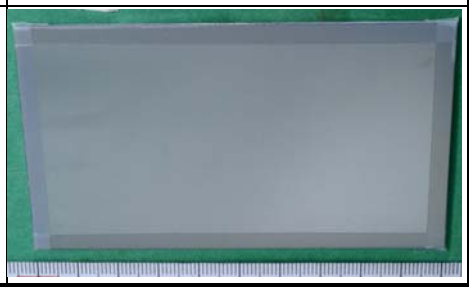
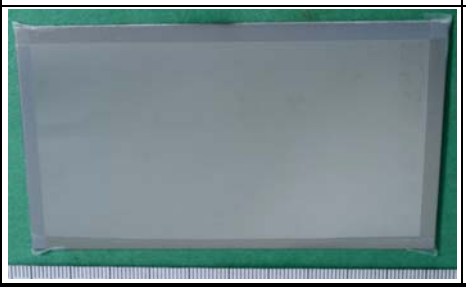
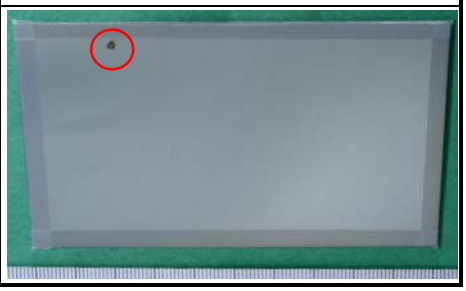
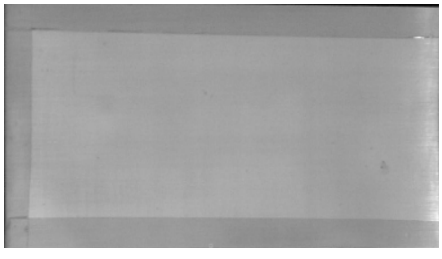
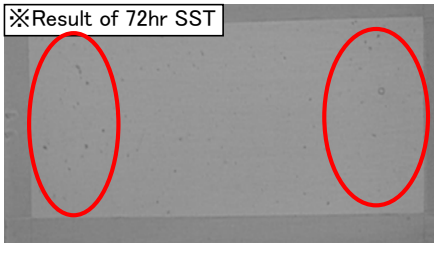
・Corrosion resistance of NSSC180 is almost equivalent to that of SUS304.

< SST Condition >
5% NaCl, 35℃

Grade	Surface：2B		
	24hr	100hr	400hr
NSSC 180	A	A	A
SUS 304	A	A	A
SUS 436L	—	A	A
21Cr-Ti	A	A	A
SUS 432			B
SUS430	A	※B	—

※Result of 72hr SST

A：No rust
B：Rust

	Surface：2B		
	24hr	100hr	400hr
NSSC180			
SUS304			
SUS 436L			
21Cr-Ti			
SUS432			
SUS 430		 ※Result of 72hr SST	

Result of Formability Test

・Regarding formability of NSSC180, drawing property is superior to SUS304 because of higher r-value, though elongation is inferior to SUS304.

1.Physical properties

	Density [g/cm3]	Conefficient of linear expansion [×10-6/℃]	Thermal conductivity [w/m・℃]	Specific heat [KJ/kg/℃]	Electricresistivity [μΩ-cm(rT)]
NSSC 180	7.70	11.8	25.6	0.46	59
SUS 304	7.93	17.3	16.3	0.50	72
SUS 430	7.70	10.5	26.0	0.46	60
21Cr-Ti	7.74	10.5	22.5	0.44	58

2. Mechanical Properties (Typical Data)

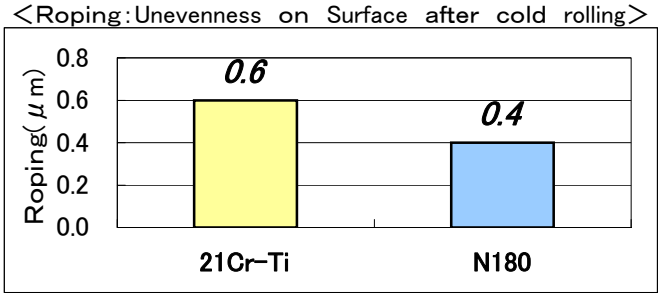
Grade	0.2%P/S [N/mm^2]	T/S [N/mm^2]	E/L [%]	Hardness Hv	Grain Size GSN
NSSC 180	314	500	32	153	8.9
SUS 304	284	686	54	167	7.1
21Cr-Ti	320	458	31	—	7.8

3. Formability (Typical Data)

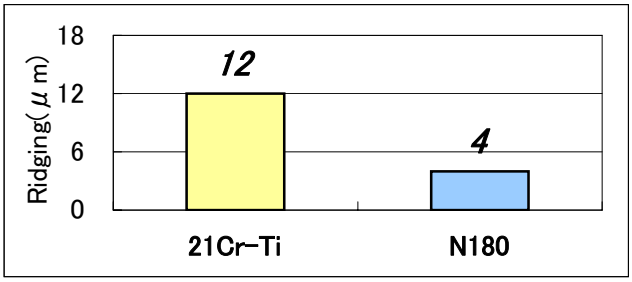
Grade	Ave. r-value	⊿r	Roping [μm]	Ridging [μm]	LDR	Surface roughness after cup-drawing [μm]
NSSC 180	1.45	0.30	0.4	4	2.2	4.8
SUS 304	0.98	0.27	—	—	2.0	2.6
21Cr-Ti	1.37	0.62	0.6	12	2.1	8.7

・r-value : Distortion on width direction vs. Distortion on thickness direction. Bigger means better drawability.
・⊿r : Smaller means less anisotropy. (= less earing occurs.)
・LDR : Ratio of max blank diameter vs. punch diameter, drawable in one forming without crack.
・Surface roughness after cup-drawing : Surface roughness on side wall of test piece drawn at Drawing Ratio 2.0.

<Roping : Unevenness on Surface after cold rolling>

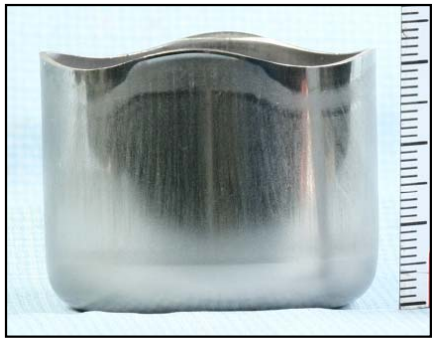
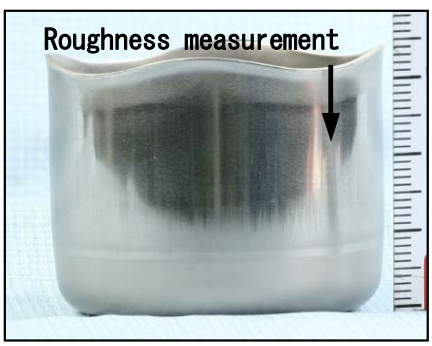


<Ridigin : Unevenness on Surface after forming>



4.Surface Roughness after forming

＊Drawing condition : Blank φ80㎜, Punch φ40㎜, BHF=1ton, Johnson-Wax

NSSC 180	SUS 304	21Cr-Ti
		

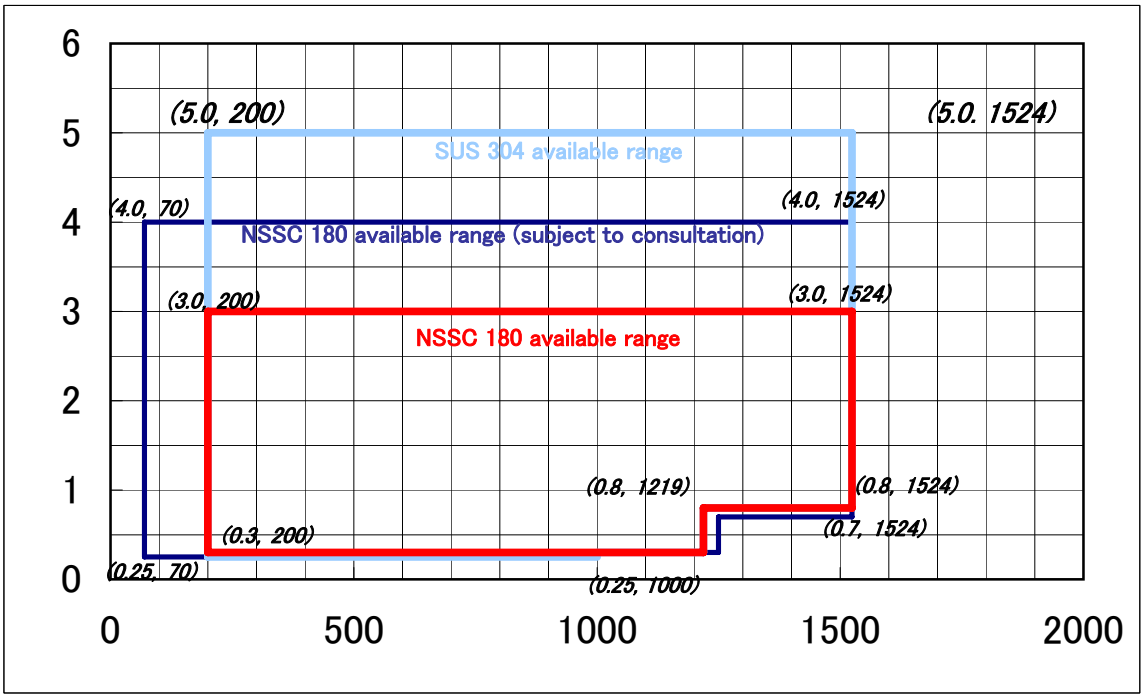
Available Size Range & Weldability

1. Character of NSSC180

・NSSC180 is 19-Cr-based low interstitial ferrite with added Nb,
also with added small amount of Cu and Ni to get better corrosion resistance.

2. Available Size Range

＊Wide range of thickness is available not only thinner gauges, but also thicker gauges.
Wide variety of surface finishes (2D, 2B, BA, HL, No.4 and others) are also available.
(need to inquire)



3. Welding Condition (Appropriate range for welding current / welding speed)

＊Thickness 0.8㎜, TIG, gap 0mm