NIPPON STEEL

NIPPON STEEL Stainless Steel Corporation

NSSC SOLUTION

Sn addition/Resource saving/High-purity ferritic stainless steel

EXPERIENCE
KNOWLEDGE
INNOVATION

NSSC FW™ series

Cr & Ni 35% Saving

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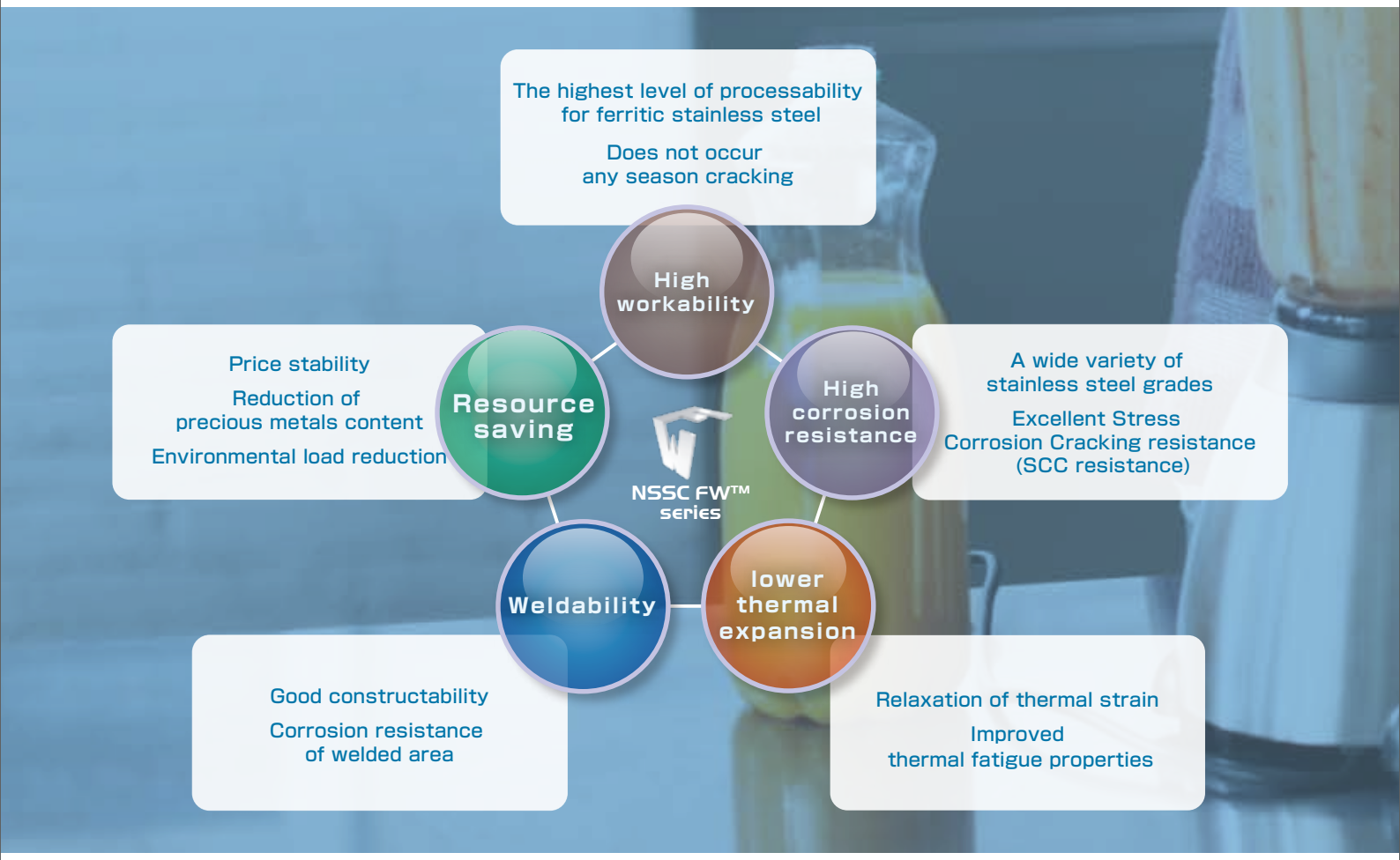
01

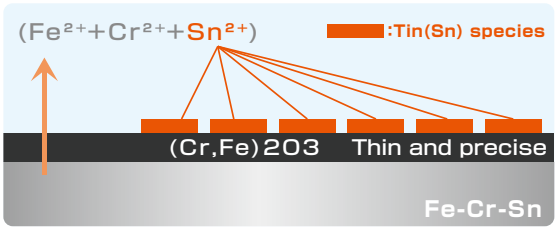
The world's first Sn added and Resource saving High-purity ferritic stainless steel

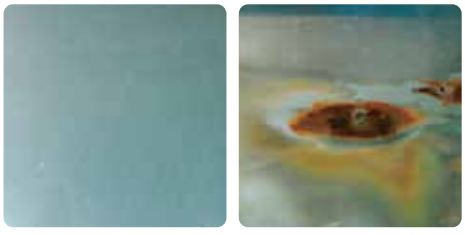


Adding Tin(Sn)

By adding a small amount of Tin,
the FW series shows excellent corrosion resistance even in a saltwater environment
by adsorbing Tin chemical species on the surface.

Low Cr+added Tin(Sn)





NSSC™FW1
14Cr-Sn

14Cr

Comparison between 14Cr-Sn (left) and 14Cr (right)
(Suppresses the rusting by adding Sn)

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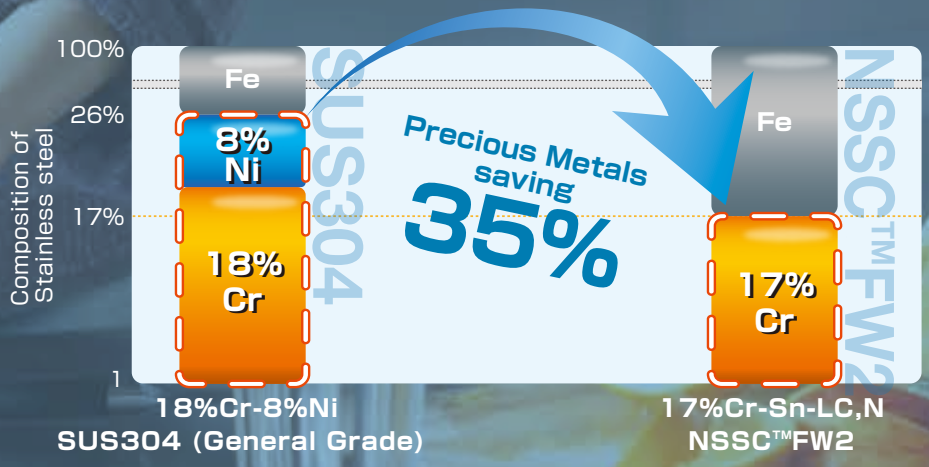
Reducing precious metals by up to 35%!

NSSC FW™ series are nickel- and molybdenum-free,
and has significantly reduced chromium!

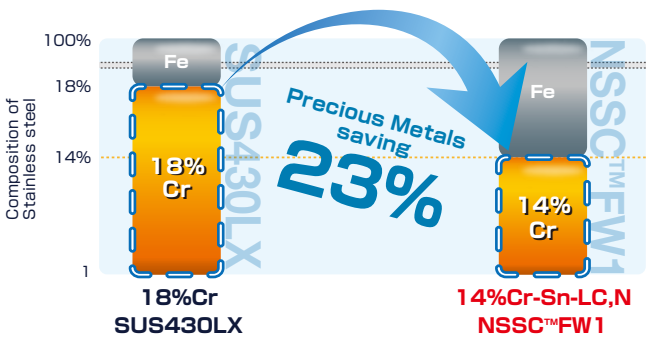
FW2 (17Cr-Sn-LC,N)

Compared with SUS304, FW2 achieves a 35% reduction in precious metals such as chromium and nickel!



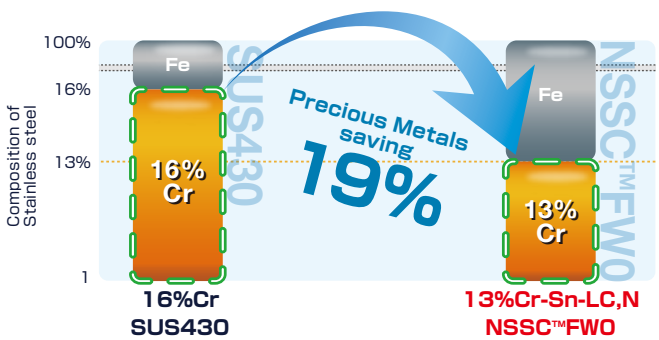
FW1 (14Cr-Sn-LC,N)

Compared with SUS430LX,
FW1 achieves 23% reduction in precious metals!



FW0 (13Cr-Sn-LC,N)

Compared with SUS430,
FW0 achieves 19% reduction in precious metals!



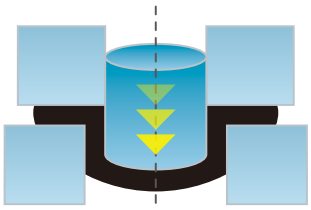
03 EXCELLENT

High workability

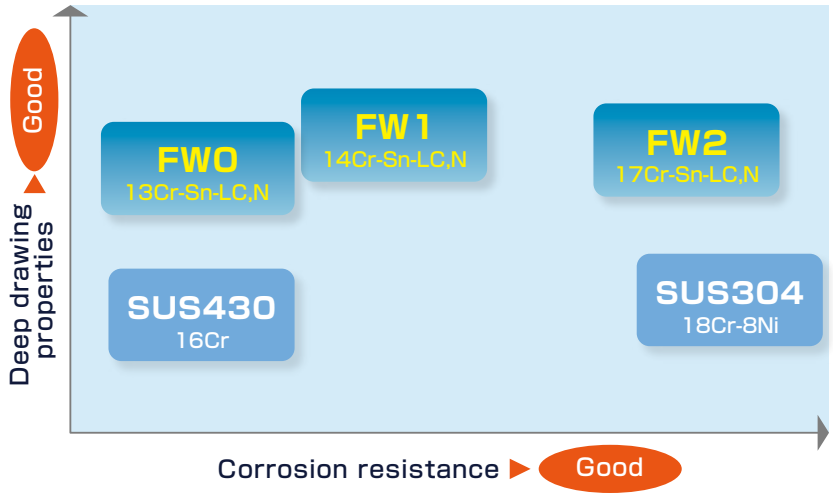
NSSC FW™ has the highest level of workability among the ferritic grades.
By selecting the appropriate process conditions,
it is possible to perform equivalent level of forming processing as of SUS304.

Deep drawing properties

A processing method in which a material is forced into a die (concave mold)
using a punch (convex mold) to form various shapes.

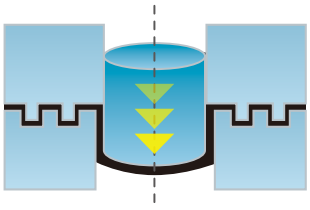


[Deep drawing]
material flows

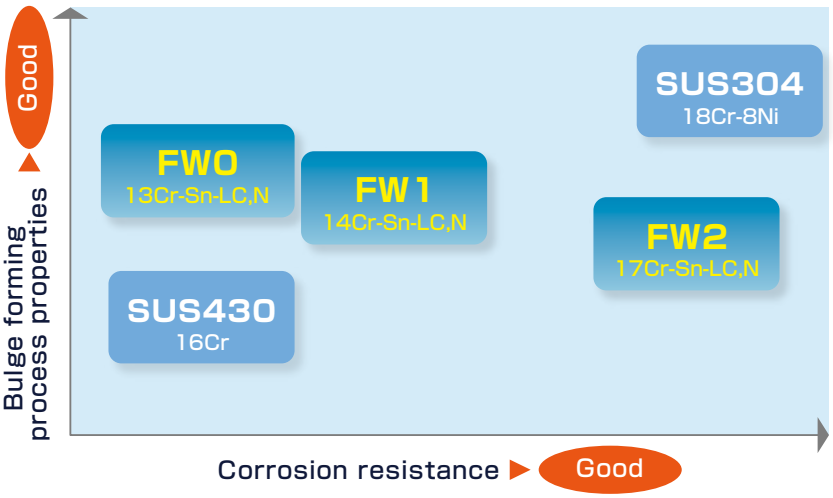


Bulging process properties

A processing method that suppresses the inflow of material using beads(for example),
and transcription the shape of the punch (convex mold) to the material for forming.
The surface area increases as the processing progresses, but the thickness decreases.



[Bulge forming process]
Tensile deformation
without inflow of material



FORMABILITY 04

Processing properties (thickness 0.6mm)

Maintenance after processing can be reduced as a results of less ridging.

NSSC™FW1
(Single cold rolling, drawing ratio: 2.0)

SUS430LX

Multi-step deep drawing is possible without cracking, and does not occur any season cracking.

NSSC™FW2 **SUS304**
(Single cold rolling) Blank dia: ϕ80mm, Lubricant: JW#122
Punch dia (mm): 1st ϕ40→2nd ϕ35→3rd ϕ30→4th ϕ25

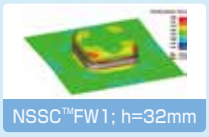
	Deep drawing properties		Bulging process properties	
	average r-value	LDR	n-value	hydraulic bulge Height (mm)
NSSC™FW1	1.7	2.3	0.22	31.5
NSSC™FW2	1.7	2.3	0.24	30.5
NSSC™FW0 (thickness 0.5mm)	1.6	2.2	0.25	—
SUS430	1.0	2.0	0.16	27.0
SUS304	1.1	2.1	0.42	40.5

Example of replacement solution from SUS304 to FW series

Simulation result

Workability comparison under the same conditions as SUS304

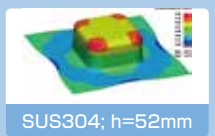
Crack



NSSC™FW1; h=32mm

Blank: 240×240mm
Punch: 100×100mm, Corner r20mm, rp10mm
Die: 103×103mm,rd5mm
COF: 0.10, thickness:0.8mm
Blank holding pressure: 20ton

SUS304



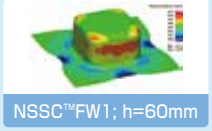
SUS304; h=52mm

NSSC SOLUTION

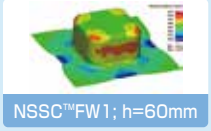
Workability comparison under conditions suitable for the FW series

Blank holder: 10ton COF: 0.06

Good!

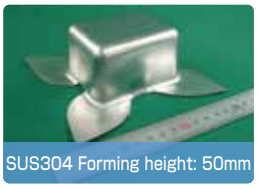


NSSC™FW1; h=60mm

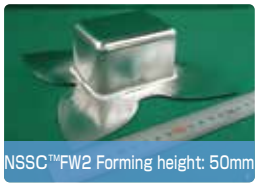


NSSC™FW1; h=60mm

Blank size: SUS304/150×150mm
NSSC™FW2/175×175mm
Thickness: 0.6mmt,blank holding pressure:500kN
Die: 82mm×62mm,rC/9mm,rd/5mm
Punch: 80mm×60mm,rC/8mm,rp/8mm
Lubricant: Die surface/PVC film,Punch surface/#122wax



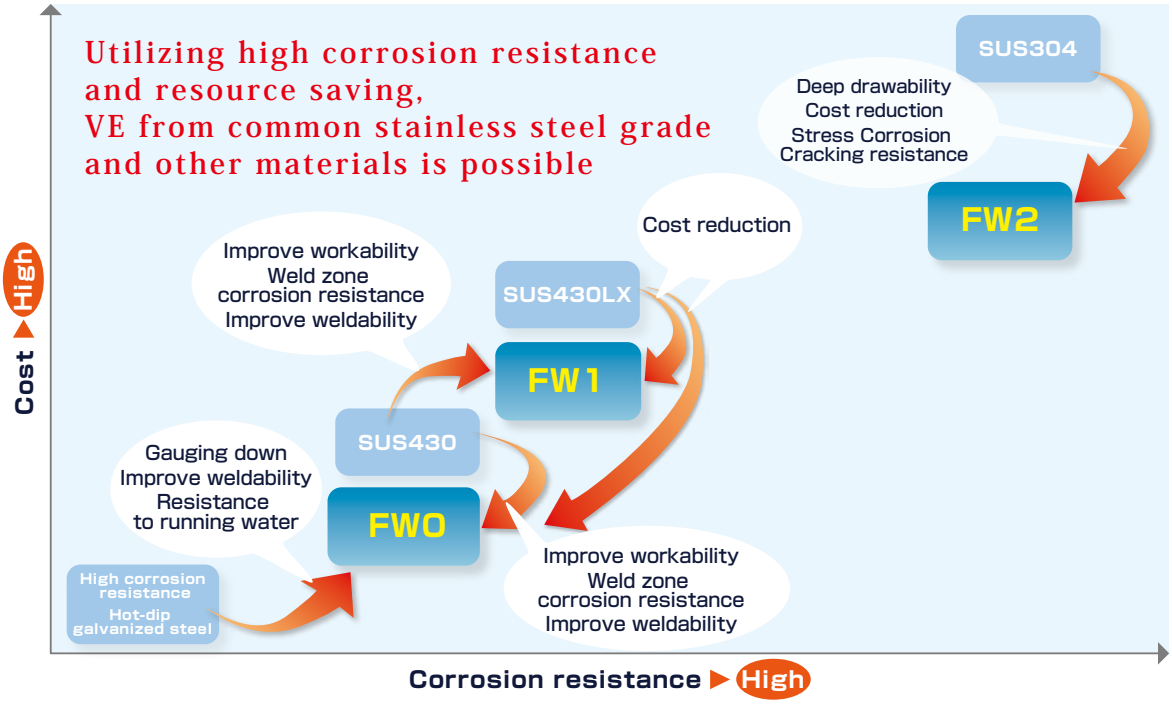
SUS304 Forming height: 50mm



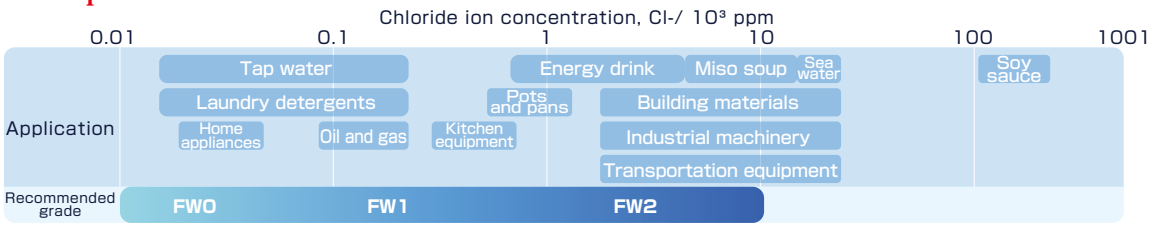
NSSC™FW2 Forming height: 50mm

05 HIGH CORROSION RESISTANCE

High corrosion resistance



Scope and use



FWO

Corrosion resistance of SST is equivalent or even higher than SUS430.

As TIG welding

NSSC™FWO SUS430

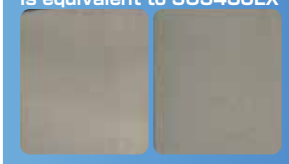
TIG welding → #600 polishing

NSSC™FWO SUS430

Test conditions: 5%NaCl,35℃,24hr

FW1

Corrosion resistance of SST is equivalent to SUS430LX

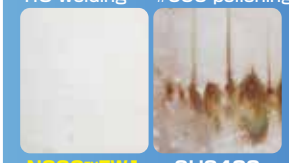


NSSC™FW1 SUS430LX

Test conditions: 5%NaCl, 35℃, 168hr

Corrosion resistance including welded area is significantly superior compare to SUS430

TIG welding → #600 polishing

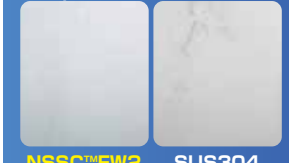


NSSC™FW1 SUS430

Immersion conditions:
0.5%NaCl, 80℃, 168hrs

FW2

Corrosion resistance of MST is equivalent to SUS304



NSSC™FW2 SUS304

Test Conditions:
0.5%NaCl+2%H_2O_2, 35℃,24hr

Corrosion resistance in exposure test is equivalent to SUS304.

NSSC™FW2 SUS304

Appearance of samples exposed for 2 years in Okinawa

TECHNICAL DATA

Technical data

FW2(17Cr-Sn-LC,N)

Specification

Mechanical properties

	0.2% proof stress (N/mm²)	tensile strength (N/mm²)	elongation (%)	Hardness (HV)
Specification	≧205	≧390	≧25	≦200
Representative value	279	463	32	144

Surface Finish: No.2B, Thickness: 0.6mm

reference

SUS304	297	675	61	173

Physical properties

Measured results

Item	Unit	value	reference SUS304
Density	kg/mm/m² (room temperature)	7.70	7.93
Specific electrical resistivity	10-8Ωm (room temperature)	54	72
Specific heat	kJ/kg/℃ (0～100℃)	0.48	0.50
Heat conductivity	W/m/℃ (100℃)	25.6	16.3
Heat expansion coefficient	10-6/℃ (room temperature to 100℃)	10.8	16.9
Longitudinal elastic modulus	kN/mm²	211	193

FW1(14Cr-Sn-LC,N)

Specification

Mechanical properties

	0.2% proof stress (N/mm²)	tensile strength (N/mm²)	elongation (%)	Hardness (HV)
Specification	≧175	≧360	≧28	≦180
Representative value	260	420	35	130

Surface Finish: No.2B, Thickness: 0.6mm

reference

SUS430LX	296	436	32	144

Physical properties

Measured results

Item	Unit	value	reference SUS430LX
Density	kg/mm/m² (room temperature)	7.70	7.70
Specific electrical resistivity	10-8Ωm (room temperature)	51	60
Specific heat	kJ/kg/℃ (0～100℃)	0.49	0.46
Heat conductivity	W/m/℃ (100℃)	26.6	26.4
Heat expansion coefficient	10-6/℃ (room temperature to 100℃)	10.8	10.4
Longitudinal elastic modulus	kN/mm²	217	200

FW0(13Cr-Sn-LC,N)

Specification

Mechanical properties

	0.2% proof stress (N/mm²)	tensile strength (N/mm²)	elongation (%)	Hardness (HV)
Specification	≧175	≧360	≧28	≦160
Representative value	253	449	32	144

Surface Finish: No.2B, Thickness: 0.5mm

reference

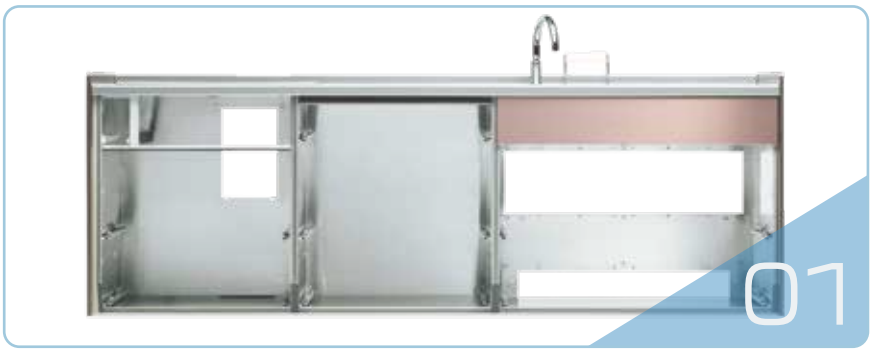
SUS430	308	516	26	155

Physical properties

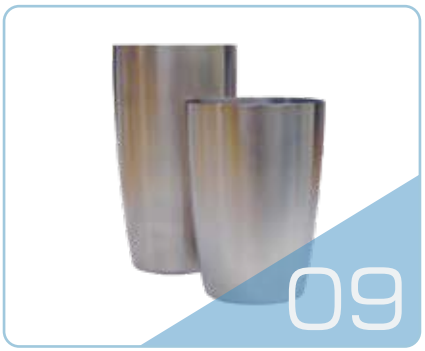
Measured results

Item	Unit	value	reference SUS430
Density	kg/mm/m² (room temperature)	7.70	7.70
Specific electrical resistivity	10-8Ωm (room temperature)	51	57
Specific heat	kJ/kg/℃ (0～100℃)	0.49	0.46
Heat conductivity	W/m/℃ (100℃)	26.6	24.2
Heat expansion coefficient	10-6/℃ (room temperature to 100℃)	10.8	11
Longitudinal elastic modulus	kN/mm²	217	200

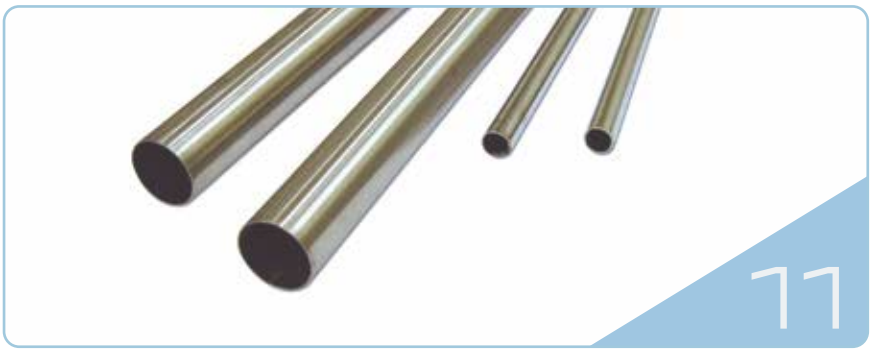
Application example



01. Cabinet (FW1)
02. Knife cutting board sterilizer (FW1)
03. Large kitchen bat (FW2)
04. Pot (FW2)
05. Kitchen sink (FW1)
06. IH rice cooker (FW1/FW2)
07. Grill plate (FW0)
08. Water tank (FW2)
09. Tumbler (FW2)
10. Washing tub (FW1)



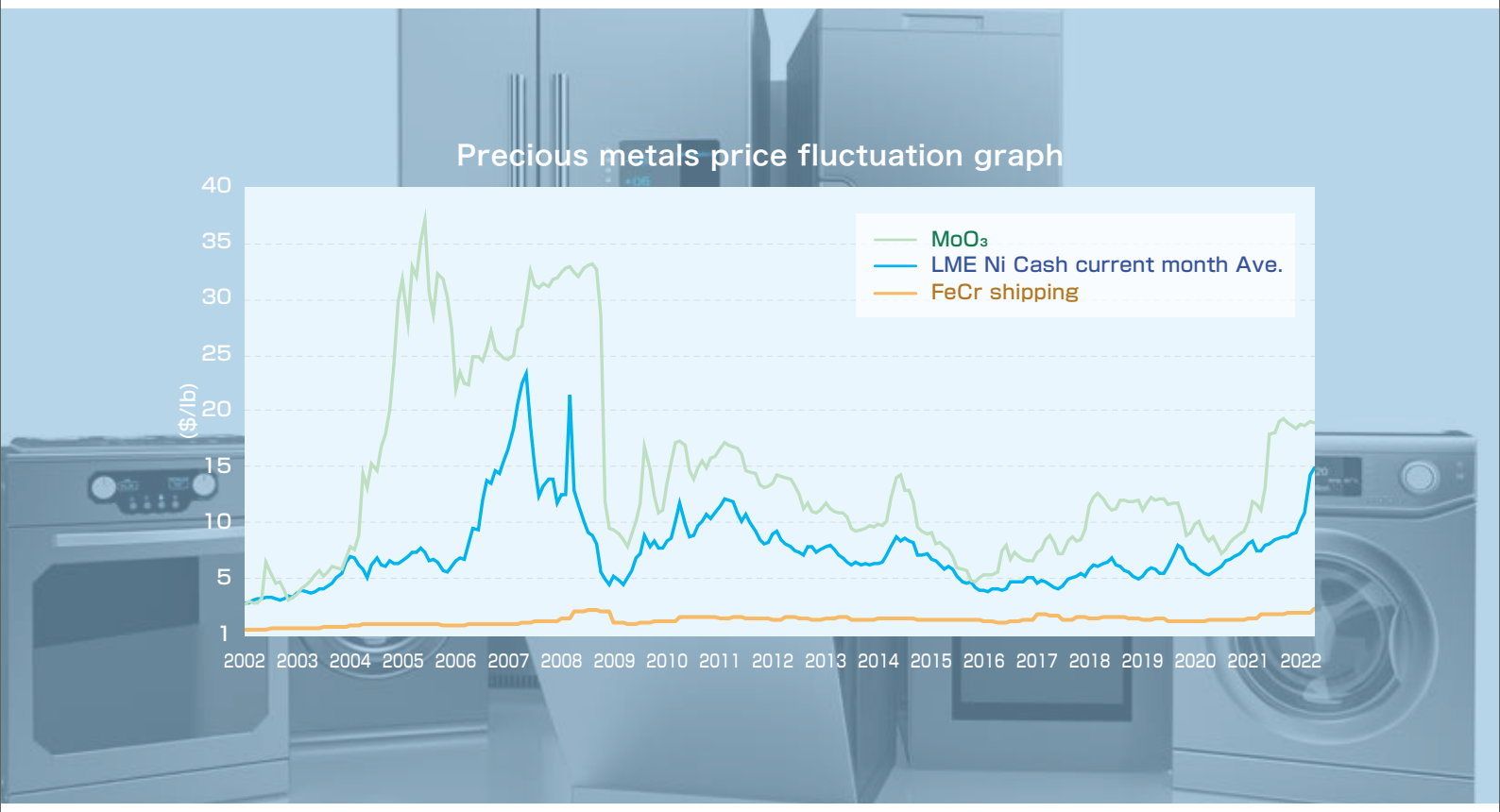
11. Ornamental tubing (FW2)
12. Folding container (FW0)
13. Clamp for solar panel (FW2)
14. Gutter Blacket (FW2)
15. Crystallizing dish (FW1)
16. Chimney (FW0)
17. Elevator lining (FW1)
18. Vacuum packaging machine (FW1)
19. Bread making equipment (FW1)
20. Garbage storage box (FW2)



Price stability

Price trends of raw materials : chromium, nickel, molybdenum

FW series restrain the cost and have a great price stability by thorough resource saving (no nickel/ molybdenum added, reduced chromium) and minimizing the impact of fluctuations of raw material price.



Award

2010

2010 Nikkei Excellent Product Service Award/Best Award

Nikkei Business Daily Award

2012

2012 The Japan Institute of Metals and Materials

Technical Development Award

2012

Monozukuri Nippon Grand Award

Prime Minister's Award

Head Office

Tekko Building 17F, 1-8-2 Marunouchi,
Chiyoda-ku, Tokyo 100-0005, Japan
Phone +81-3-6841-4800

Branches

Osaka Sales Office

Sumitomo Bldg. 4-5-33 Kitahama, Chuo-ku,
Osaka-shi,Osaka
541-0041, Japan
Phone +81-6-4706-1180

Nagoya Sales Office

Takisada Bldg.2-13-19 Nishiki, Naka-ku,
Nagoya-shi, Aichi
460-0003, Japan
Phone +81-52-232-2250

Niigata Sales Office

Taiju-Seimei Niigata Bldg. 1-3-10 Higashi Oodori,
Chuo-ku, Niigata-shi,
Niigata 950-0087, Japan
Phone +81-25-246-3113

Chugoku Sales Office

Hiroshima-Teppouchou Bldg. 10-12 Teppouchou,
Naka-ku, Hiroshima-shi, Hiroshima
730-0017, Japan
Phone +81-82-511-5115

Kyushu Sales Office

Hakata-NS Bldg. 5-18 Tenya-machi, Hakata-ku,
Fukuoka-shi, Fukuoka
812-0025, Japan
Phone +81-92-273-7090

Hokuriku Marketing Branch

Kitanippon Sakurabashi Bldg. 1-18, Sakurabashi-dori,
Toyama-shi, Toyama
930-0004, Japan
Phone +81-76-415-0527

Overseas Offices

Bangkok Office

(NS-Thainox Auto Company Limited.)

1 MD Tower, 20th Floor, Soi Bangna-Trad 25, Bangna-Trad Road, KM.3,
Bangna Nuea, Bangna, Bangkok 10260 Thailand
Phone +66-2-744-0720

Shanghai Office

(NIPPON STEEL Stainless Steel (Shanghai) Company Limited)

Room No.904, UNITED PLAZA, 1468 Nanjing Road West, Shanghai
200040, China
Phone +86-21-62892928

Guangzhou Office

(NIPPON STEEL Stainless Steel (Shanghai) Company Limited
Guangzhou Branch)

Room No.1404, South Tower, GT Land Plaza 2, No.8 Zhujiang Xi Road,
Guangzhou 510623, China
Phone +86-20-38739850

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Creating the future one step ahead

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Head Office Product Development Department

Phone +81-3-6841-5290

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