About stainless steel

Stainless steel refers to alloy steel containing chrome (Cr) and nickel (Ni) in addition to the 6 iron elements whose Cr content is approximately above 11%. Basically stainless steel should be Fe-Cr alloy containing Cr for about 11% and Ni, Mo, Cu, Al and/or Si, etc. are added to improve corrosion resistance, mechanical properties, processing properties and other properties.

As the primary raw materials are Cr and Ni, they are classified into 2 major categories: Cr and Cr-Ni. They are also classified into categories of martensitic, ferrite and austenitic in terms of metal composition. Also, there are other stainless steel materials such as austenitic/ferrite stainless steel and precipitation-hardened stainless steel, etc.

● Stainless steel categories

Categories	Cr		Cr-Ni
Metal composition	Martensitic	Ferrite	Austenitic
Hardening	Quenching hardening	Non-quenching hardening	Processing hardening

● Effects of each element on performance

Element		Performance improvement
C	Low carbon	Corrosion resistance (resistance to grain boundary corrosivity)
	High carbon	Strength and hardness
Mo		Corrosion resistance (resistance to porous corrosion)
Cu		Acid resistance
Ti・Nb		Corrosion resistance (resistance to grain boundary corrosivity)
Si・Al		Oxidation resistance
S・Se		Machinability

Types and features of stainless steel

Classification code	Features
SUS302	Standard type 18Cr-8Ni steel. SUS303 and SUS304 are both improved variants of SUS302. Addition of Ni improves corrosion resistance and mechanical properties.
SUS303	Machinability is improved by addition of S and P to SUS302. However, its corrosion resistance are relatively low. Mo is added to improve the corrosion resistance.
SUS304 SUS304L	This is an improved variant of SUS302 and features smaller amount of carbon and is superior in corrosion resistance and weldability. This is the most standard product among austenitic stainless steel. SUS304L has carbon content lower than that of SUS304 and the resistance to grain boundary corrosion and weldability are improved.
SUS310S	This has good corrosion resistance and oxidation resistance as well as excellent high-temperature properties due to addition of Ni and Cr and is used as heat resistant steel. This reduces the processing hardening by cold processing while weakening its magnetic property, so it is used as low process hardening steel and nonmagnetic steel.
SUS316 SUS316L	This has good corrosion resistance and acid resistance as well as high-temperature strength due to addition of Mo and is used as heat resistant steel. SUS316L has carbon content lower than that of SUS316 and the resistance to grain boundary corrosion and weldability are improved.
SUSXM7	Cu is added to SUS304 to suppress the processing hardening in cold processing.
SUS430	This is a standard type of 18Cr steel, having a good cold processing property and corrosion resistance. Because of its inexpensive price, it is widely used in many applications.
SUS434	Mo is added to SUS430 to improve the corrosion resistance.
SUS410	Representative martensitic stainless steel This has excellent mechanical properties and corrosion resistance after heat treatment.
SUS403	Corrosion resistance and toughness after heat treatment are improved with Si and Cr composition range narrowed down. This is used for valves, pump shafts, edges, bolts, nuts, steam turbine blades and jet engine components, etc.
SUS416	Machinability of 13Cr steel is improved by addition of S and P. Its corrosion resistance are relatively lower than the standard type.
SUS431	Toughness and corrosion resistance are improved by addition of Ni and Cr, respectively and its corrosion resistance is the best among martensitic materials that endure heat treatment. This is used for papermaking machines, marine shafts and aerospace components, etc.
SUS440C	This has the highest hardness among stainless steel materials and excellent abrasion resistance, so this is used for dice and ball bearings, etc.
SUS631J1	This is precipitation-hardened stainless steel with the highest heat resistance among JIS steel types and used for thin plates and wire springs.

Chemical components and mechanical properties of various stainless steel materials

● Austenitic

Classification code	Chemical components (%)									Mechanical property		
	C	Si	Mn	P	S	Ni	Cr	Mo	Others	Tensile strength (N/mm^2)	Extension (%)	Brinell hardness (HB)
SUS302	0.15 or less	1.00 or less	2.00 or less	0.045 or less	0.03 or less	8.00 - 10.00	17.00 - 19.00	–	–	520 or above	40 or above	187 or less
SUS303	0.15 or less	1.00 or less	2.00 or less	0.20 or less	0.15 or above	8.00 - 10.00	17.00 - 19.00	0.60 or less	–	520 or above	40 or above	187 or less
SUS304	0.08 or less	1.00 or less	2.00 or less	0.045 or less	0.03 or less	8.00 - 10.50	18.00 - 20.00	–	–	520 or above	40 or above	187 or less
SUS304L	0.03 or less	1.00 or less	2.00 or less	0.045 or less	0.03 or less	9.00 - 13.00	18.00 - 20.00	–	–	480 or above	40 or above	187 or less
SUS310S	0.08 or less	1.50 or less	2.00 or less	0.045 or less	0.03 or less	19.00 - 22.00	24.00 - 26.00	–	–	520 or above	40 or above	187 or less
SUS316	0.08 or less	1.00 or less	2.00 or less	0.045 or less	0.03 or less	10.00 - 14.00	16.00 - 18.00	2.00 - 3.00	–	520 or above	40 or above	187 or less
SUS316L	0.03 or less	1.00 or less	2.00 or less	0.045 or less	0.03 or less	12.00 - 15.00	16.00 - 18.00	2.00 - 3.00	–	480 or above	40 or above	187 or less
SUSXM7	0.08 or less	1.00 or less	2.00 or less	0.045 or less	0.03 or less	8.50 - 10.50	17.00 - 19.00	–	Cu : 3.00 - 4.00	480 or above	40 or above	187 or less

● Ferrite

Classification code	Chemical components (%)									Mechanical property		
	C	Si	Mn	P	S	Ni	Cr	Mo	Others	Tensile strength (N/mm^2)	Extension (%)	Brinell hardness (HB)
SUS430	0.12 or less	0.75 or less	1.00 or less	0.04 or less	0.03 or less	0.60 or less	16.00 - 18.00	–	–	450 or above	22 or above	183 or less
SUS434	0.12 or less	1.00 or less	1.00 or less	0.04 or less	0.03 or less	0.60 or less	16.00 - 18.00	0.75 - 1.25	–	450 or above	22 or above	183 or less

● Martensitic

Classification code	Chemical components (%)									Mechanical property		
	C	Si	Mn	P	S	Ni	Cr	Mo	Others	Tensile strength (N/mm^2)	Extension (%)	Brinell hardness (HB)
SUS410	0.15 or less	1.00 or less	1.00 or less	0.04 or less	0.03 or less	0.60 or less	11.50 - 13.50	–	–	540 or above	25 or above	159 or above
SUS416	0.15 or less	1.00 or less	1.25 or less	0.06 or less	0.15 or above	0.60 or less	12.00 - 14.00	0.60 or less	–	540 or above	17 or above	159 or above
SUS440C	0.95 - 1.20	1.00 or less	1.00 or less	0.04 or less	0.03 or less	0.60 or less	16.00 - 18.00	0.75 or less	–	780 or above	15 or less	56HRC or above

● Values in chart are for reference only. They are not guaranteed values.

NBK ▶+81-575-23-1162 ▶info@nbk1560.com ▶http://www.nbk1560.com