

MARTENSITIC STAINLESS STEELS

WHAT ARE MARTENSITIC STAINLESS STEELS?

Martensitic stainless steel is an alloy which is mainly comprise of chromium with little to no nickel content as compared to their Austenitic Counterpart. Due to its chemical composition, heat and aging treatments can lead to martensitic steel being hardened and strengthened giving it very high abrasion resistance and toughness. Although it is strong but due to the lack of Nickel, Martensitic stainless steel's corrosion resistance is lower as compared to Austenitic stainless steels.

Martensitic stainless steel can be further broken up into two categories of low and higher carbon variants. High Carbon Martensitic Stainless Steel has a range of 0.61% to 1.50% of carbon content whereas Low Carbon Martensitic Stainless Steel has between 0.05% to 0.25% of carbon content.

Categories	Grades	UNS	Bars	Round Bar Size Range (in mm)	Condition
MARTENSITIC & PH STAINLESS STEEL	SS 410	S41000	●	12.70 - 330.20	Annealed
	SS 416	S41600	●	12.70 - 266.70	Quenched and Tempered / Annealed
	SS 431	S43100	●	38.10 - 100.00	Quenched and Tempered
	SS 440C	S44004	●	57.15 - 101.60	Annealed
	15-5 PH H1075	S15500	●	120.65 - 146.05	Precipitate Hardened or aged H1075
17-4PH H1075	S17400	●	12.70 - 330.20	Precipitate Hardened or aged H1075/ H1150/H1150D/Condition A	

SS410 (UNS S41000)

Stainless Steel 410 is a 12% chromium martensitic stainless steel alloy that can be heat treated to obtain a wide range of mechanical properties via hardening, tempering and polishing. Quenching and tempering leads to an increase in hardness in the right temperatures. These are generally used for applications involving mild corrosion, heat resistance and high strength.

KEY PROPERTIES (Annealed)

Yield Strength	40 KSI Min
Tensile Strength	70 KSI Min
Elongation	16% Min
Hardness	-

SPECIFICATIONS
ASTM/ASME A276/A479/A276/SA479

CONDITION
Annealed

Typical chemical composition, by % mass

Chromium	Manganese	Silicon	Nickel
Cr	Mn	Si	Ni
11.50 - 13.50%	1.00% Max	1.00% Max	0.75%
Carbon	Phosphorus	Sulphur	Iron
C	P	S	Fe
0.15% Max	0.04% Max	0.03% Max	Balance

KEY PROPERTIES (CON A)

Yield Strength	40 KSI Min
Tensile Strength	75 KSI Min
Elongation	30% Min
Hardness	262 HB

SPECIFICATIONS
ASTM A582

CONDITION
Condition A
Quenched and Tempered

Typical chemical composition, by % mass

Chromium	Manganese	Silicon	Carbon
Cr	Mn	Si	C
12.00 - 14.00%	1.25% Max	1.00% Max	0.15% Max
Molybdenum	Sulfur	Phosphorus	Iron
Mo	S	P	Fe
0.6% Max	0.15% Min	0.06% Max	Balance

SS416 (UNS 41600)

Stainless Steel 416 is a martensitic, free machining stainless steel alloy that is generally considered to be the first free machining stainless steel. It has the highest machinability of any steel at about 85% of that of a free machining carbon steel.

KEY PROPERTIES

Yield Strength	40 KSI Min
Tensile Strength	75 KSI Min
Elongation	30% Min
Hardness	262 HB

SPECIFICATIONS

ASTM A479, Q7800

CONDITION

Quenched and Tempered

Typical chemical composition, by % mass

Chromium	Manganese	Silicon	Carbon
Cr	Mn	Si	C
15.00 - 17.00%	1.00% Max	1.00% Max	0.20% Max
Phosphorus	Sulfur	Iron	
P	S	Fe	
0.04% Max	0.03% Min	Balance	

SS440C (UNS S44004)

Stainless steel 440C is a martensitic, heat-treatable grade with one of the highest hardness, strength and wear resistance among the various 440 grades. There are four types available including 440A, 440B and 440F. It has moderate corrosion resistance when compared to other stainless steels, and it exhibits its best corrosion resistance in its hardened and tempered form.

KEY PROPERTIES (440C)

Yield Strength	65 KSI Min
Tensile Strength	110 KSI Min
Elongation	14% Min
Hardness	269 HB Max

SPECIFICATIONS

ASTM/ASME A276/A479/A276/SA479/SA481
NACE MR0175/MR0103

CONDITION

Annealed

Typical chemical composition, by % mass

Chromium	Carbon	Manganese	Silicon	Nickel
Cr	C	Mn	Si	Ni
16.00 - 18.00%	1.00 - 1.20%	1.00% Max	1.00% Max	1.00% Max
Molybdenum	Phosphorus	Sulphur	Iron	
Mo	P	S	Fe	
0.80% Max	0.04% Max	0.03% Max	Balance	

KEY PROPERTIES (H1075)

Yield Strength	125 KSI Min
Tensile Strength	145 KSI Min
Elongation	13% Min
Reduction of Area	45% Min
Hardness	32 HRC Min

SPECIFICATIONS

ASTM A564 UNS H1075

CONDITION

Condition AH1075/H1150/H1150D

Typical chemical composition, by % mass

Chromium	Nickel	Copper	Manganese	Silicon
Cr	Ni	Cu	Mn	Si
15.00 - 17.00%	3.00 - 5.00%	3.00 - 5.00%	1.00% Max	1.00% Max
Niobium + Tantalum	Carbon	Phosphorus	Sulphur	
Nb + Ta	C	P	S	
0.15 - 0.45%	0.07% Max	0.04% Max	0.03% Max	

17-4 PH (UNS S17400)

Stainless Steel 17-4PH is a Precipitation Hardening (PH) martensitic stainless steel which is also known as grade 630 stainless steel. 17-4PH exhibits moderate corrosion resistance and high strength which can be further optimized based on the different heat treatment temperatures it undergoes.

15-5 PH (UNS S15500)

Stainless Steel 15-5 PH is a Precipitation Hardening (PH) martensitic stainless steel which is also known as XM-12. 15-5PH was developed as a modification to 17-4 PH with a more refined microstructure obtained through the remelting process resulting in improvement in toughness of the material. Both 15-5PH and its predecessor 17-4PH exhibit high strength and moderate corrosion resistance.

KEY PROPERTIES (H1075)

Yield Strength	150 KSI Min
Tensile Strength	175 KSI Min
Elongation	13% Min
Reduction of Area	45% Min
Hardness	311 HB Min

SPECIFICATIONS

ASTM A564 / ASME SA564

CONDITION

Precipitate Hardened or Anneal H1075

Typical chemical composition, by % mass

Chromium	Nickel	Copper	Manganese	Silicon
Cr	Ni	Cu	Mn	Si
14.00 - 15.50%	3.50 - 5.50%	2.50 - 4.50%	1.00% Max	1.00% Max
Niobium + Tantalum	Carbon	Phosphorus	Sulphur	
Nb + Ta	C	P	S	
0.15 - 0.45%	0.07% Max	0.04% Max	0.03% Max	