SS 410, Type 410, WNR 1.4006, UNS S41000, AISI 304, ASTM 410, Grade 410, AFNOR Z 10 C 13

Introduction :

Grade 410 stainless steels provide good corrosion resistance properties and it is general-purpose martensitic stainless steels containing 11.5% chromium. By a series of processes such as hardening, tempering and polishing the corrosion resistance of this grade can be further enhanced. Grade 410 steels can be harden by quenching and tempering. It is used for applications involving mild corrosion, heat resistance and high strength. The techniques that require final heat treatment are used to fabricate martensitic stainless steels. When compared to that of austenitic grades these grades are less resistant to corrosion. By their loss of strength at high temperatures, due to over-tempering and loss of ductility at sub-zero temperatures their operating temperatures are often affected. Grade 410 steels are resistant to hot gases, steam, food, fresh water, dry air, mild acids and alkalies. Maximum corrosion and heat resistance through hardening is obtained by this metal. 410 stainless steels are less corrosion resistant than austenitic grades and 430 stainless steel ferritic alloys containing 17% chromium. At temperatures of up to 650 °C grade 410 steels provides good scaling resistance. At temperatures ranging from 400 to 580 °C the mechanical properties of the material tends to reduce. By using all conventional welding techniques grade 410 steels can be welded. And to mitigate cracking, the materials should pre-heated at 150 to 260 °C followed by post-weld annealing treatment.

Chemical Composition

	SS 410	TYPE 410	WNR 1.4006	UNS S41000	AISI 410	ASTM 410	GRADE 410S	AFNOR Z 10 C 13
Carbon	0.15max	0.15max	0.15max	0.15max	0.15max	0.15max	0.15max	0.15max
Manganese	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max
Phosphorus	0.040 max	0.040 max	0.040 max	0.040 max	0.040 max	0.040 max	0.040 max	0.040 max
Sulfur	0.030 max	0.030 max	0.030 max	0.030 max	0.030 max	0.030 max	0.030 max	0.030 max
Silicon	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max
Chromium	11.5-13.5	11.5-13.5	11.5-13.5	11.5-13.5	11.5-13.5	11.5-13.5	11.5-13.5	11.5-13.5

Mechanical Properties

	SS 410	TYPE 410	WNR 1.4006	UNS S41000	AISI 410	ASTM 410	GRADE 410S	AFNOR Z 10 C 13
UTS, ksi (Mpa)	75(517)	75(517)	75(517)	75(517)	75(517)	75(517)	75(517)	75(517)
0.2% YS, ksi (Mpa)	45(310)	45(310)	45(310)	45(310)	45(310)	45(310)	45(310)	45(310)
Elongation % 2" (50.8mm)	25	25	25	25	25	25	25	25
Hardness, Rockwell B	80	80	80	80	80	80	80	80

Standard Available in forms :

- ASTM A182/ ASME SA182 Stainlees Steel Pipe Fittings
- ASTM A213 / ASME SA213 Seamless Stainless Steel Pipes
- ASTM A240/ ASME SA240 Stainless Steels Sheets / Plates
- ASTM A249/ ASME SA249 Stainless Steel Welded Tubes
- ASTM A269/ ASME SA269 Stainless Steel Tubes
- ASTM A270/ ASME SA270 Stainless Steel Sanitary Tubes
- ASTM A312/ ASME SA312 Stainless Steel Pipes
- ASTM A403/ ASME SA403 Stainless Steel Pipe Fittings
- ASTM A554/ ASME SA554 Stainless Steel Welded Tubes
- ASTM A731/ ASME SA731 Stainless Steel Pipes
- ASTM A789/ ASME SA789 Stainless Steel Tubes
- ASTM A790/ ASME SA790 Stainless Steel Pipes
- ASTM A791/ ASME SA791 Stainless Steel Tubes

Products Available in forms :

- SS 410, Type 410, WNR 1.4006, UNS S41000, AISI 304 Plates
- SS 410, Type 410, WNR 1.4006, UNS S41000, AISI 304 Pipes
- SS 410, Type 410, WNR 1.4006, UNS S41000, AISI 304 Round Bar
- SS 410, Type 410, WNR 1.4006, UNS S41000, AISI 304 Tube
- SS 410, Type 410, WNR 1.4006, UNS S41000, AISI 304 Flanges
- SS 410, Type 410, WNR 1.4006, UNS S41000, AISI 304 Wire
- SS 410, Type 410, WNR 1.4006, UNS S41000, AISI 304 Fittings

Corrosion Resistance

- Grade 410 stainless steels are resistant to hot gases, steam, food, mild acids and alkalies, fresh water and dry air.
- These steels obtain maximum corrosion and heat resistance through hardening.
- However, grade 410 steels are less corrosion resistant than austenitic grades and grade 430 ferritic alloys containing 17% chromium.
- Smooth surface finish offers improved performance of steels.

Heat Resistance

- Grade 410 steels have good scaling resistance at temperatures of up to 650°C.
- However, the mechanical properties of the material will tend to reduce at temperatures ranging from 400 to 580°C.

Heat Treatment

Annealing -

- Grade 410 steels can be fully annealed at temperatures from 815 to 900°C, followed by slow furnace cooling and air-cooling.
- Process annealing of grade 410 steels can be carried out at temperatures ranging from 650 to 760°C and air-cooled.

Hardening -

- Hardening of grade 410 steels can be performed at 925 to 1010°C, followed by air and oil quenching.
- Heavy sections of grade 410 need to be oil quenched.
- Tempering, to enhance the mechanical properties and hardness of grade 410 steels, follows this process.
- It is not recommended to perform tempering at temperatures from 400 to 580°C.

Welding

- Grade 410 steels can be welded using all conventional welding techniques, but the materials should pre-heated at 150 to 260°C followed by post-weld annealing treatment, to mitigate cracking.
- Grade 410 welding rods are recommended for tempering and post-hardening. In the "as welded" conditions, grade 309 filler rods can be used to achieve a ductile joint.
- According to AS 1554.6 standards, grade 309 electrodes or rods are preferred for welding 410 steels.

Machining

- Grade 410 steels can be easily machined in highly tempered or annealed conditions.
- However, it is hard to machine grade 410 steels if they are hardened above 30HRC.
- Free machining grade 416 is the best alternative.

Applications

- Bolts, screws, bushings and nuts
- Petroleum fractionating structures
- Shafts, pumps and valves
- Mine ladder rungs
- Gas turbines

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