410 stainless is a corrosion and heat resistant 12% chromium steel. It is the most widely used of the hardenable stainless steels. Heat treated 410 has mechanical properties comparable to the engineering alloy steel AISI 4130, coupled with the additional benefit of good corrosion resistance. 410 is highly resistant to atmospheric corrosion. Maximum corrosion resistance is obtained by hardening and polishing.

Because 410 is an air hardening steel, it must be given a high preheat, at least 350-400°F before welding, and immediately given a full anneal before the weldment cools. Otherwise the metal will harden, and cracking is likely. Matching composition filler metals are available, AWS E410 covered electrodes and ER410 bare filler wire. Alloy 82 (AWS ERNiCr-3) filler wire has also been used. This nickel alloy is comparatively low strength, and therefore accommodates some of the strain which may otherwise contribute to cracking in the 410 weldment.

Chemistry

	Cr	Mn	Ni	C	Si	P	S	Fe
Min	11.5	-	-	0.08	-	-	-	-
Max	13.5	1.0	0.75	0.15	1.0	0.04	0.03	bal

Per ASTM A240

Specifications

UNS: S41000
W. Nr./EN: 1.4006
AMS: 5612, 5613, QQ-S-763
ASTM: A240, A276, A479
ASME: SA-240, SA-276, SA-479

Physical Properties

Density	0.28 lb/in^3
Melting Range	2700 - 2790°F
Poisson Ratio	0.280
Electrical Resistivity	22.45 $\mu\Omega$ • in
Coefficient of Thermal Expansion (68°F - 212°F)	5.5 μin/in •°F
Thermal Conductivity (212°F)	14.4 BTU/(hr•ft•°F)
Modulus of Elasticity (68°F)	29 •10^6 psi

Mechanical Properties

Specification: A240

Ultimate Tensile Strength, ksi	65
0.2% Yield Strength, ksi	30
Elongation, %	20
Hardness MAX, Brinell	217

**Annealed*
*** Values are minimums unless otherwise stated*

Specification: A276

Ultimate Tensile Strength, ksi	70
0.2% Yield Strength, ksi	40
Elongation, %	20
Hardness MAX, Brinell	-

**Annealed*
*** Values are minimums unless otherwise stated*

Typical Tempered Condition Properties

Temperature, °F	Ultimate Tensile Strength, ksi	0.2% Yield Strength, ksi	Hardness, Brinell
Condition A	80.4	45.4	149
400	202.9	156.1	401
550	187.0	148.3	375
600	186.1	148.8	375
800	188.5	132.9	388
900	188.3	122.6	388
1000	154.3	127.9	331
1200	111.2	85.5	229

Features

- Hardenable stainless which may be tempered as high as 1350°F to produce high impact toughness
- Resistant to atmospheric corrosion

Applications

- Press plates
- Petrochemical equipment
- Gate valves
- Mining machinery
- Distillation trays