17-4 stainless is an age-hardening martensitic stainless combining high strength with the corrosion resistance of stainless steel. Hardening is achieved by a short-time, simple low-temperature treatment. Unlike conventional martensitic stainless steels, such as type 410, 17-4 is quite weldable. The strength, corrosion resistance and simplified fabrication can make 17-4 stainless a cost-effective replacement for high strength carbon steels as well as other stainless grades.

At the solution treating temperature, 1900°F, the metal is austenitic but undergoes transformation to a low-carbon martensitic structure during cooling to room temperature. This transformation is not complete until the temperature drops to 90°F. Subsequent heating to temperatures of 900-1150°F for one to four hours precipitation strengthens the alloy. This hardening treatment also tempers the martensitic structure, increasing ductility and toughness.

Rolled Alloys stocks 17-4 in condition "A", and also stocks material in the hardened condition H1150 and H1150D.

Specifications

UNS: S17400 **W. Nr./EN:** 1.4548 **ASTM:** A 693, A 564, A 705, Type 630 **AMS:** 5604, 5643, 5825
ASME: SA 693, SA 564, SA 705, Type 630 **NACE:** MR0175 **ISO:** 15156-3

Chemical Composition, %

	Ni	Cr	Mo	Mn	Cu	Si	C	Cb+Ta	S	P	Fe
MIN	3.0	15.0	–	–	3.0	–	–	5 x C	–	–	–
MAX	5.0	17.5	0.50	1.0	5.0	1.0	0.07	0.45	0.03	0.04	balance

Features

- High tensile strength and hardness to 600°F
- Corrosion resistant
- Excellent oxidation resistance to about 1100°F
- Creep-rupture strength to 900°F

Applications

- Gate valves
- Chemical processing equipment
- Pump shafts, gears, plungers
- Valve stems, balls, bushings, seats
- Fasteners

Physical Properties

Density: 0.282 lb/in^3 **Melting Range:** 2560-2625°F **Poisson's Ratio:** 0.272 **Electrical Resistivity:** 463 Ohm-circ mil/ft

Temperature, °F	70	212	392	572
Coefficient of Thermal Expansion* in/in°F x 10^{-6}	–	7.2	7.5	7.8
Thermal Conductivity Btu • ft/ft^2 • hr • °F	8.6	9.2	9.8	10.4
Modulus of Elasticity Dynamic, psi x 10^6	29.0	28.1	27.0	26.1

** 70°F to indicated temperature.*

Mechanical Properties

Representative Tensile Properties, Longitudinal Direction

	H900*	H925	H1025	H1075	H1100	H1150	H1150D	H1150-M
Ultimate Tensile Strength, ksi	200	190	170	165	150	145	140	125
0.2% Yield Strength, ksi	185	175	165	150	135	125	120	85
Elongation % in 2" or 4XD	14	14	15	16	17	19	22	22
Reduction of Area, %	50	54	56	58	58	60	65	68
Hardness, Brinell (Rockwell)	420 (C 44)	409 (C42)	352 (C 38)	341 (C 36)	332 (C 35)	311 (C 33)	294 (C 31)	277 (C 27)
Impact Charpy V-Notch, ft - lbs	15	25	35	40	45	50	55	100

**For applications requiring greater impact toughness, aging for 4 hours develops typical properties UTS - 196 ksi, 0.2% YS - 181 ksi, Elongation in 2" - 14%, Reduction of Area - 52%, Hardness - Rockwell C 43, and Charpy V-notch impact - 20 foot-pounds*

Heat Treatment

Designation	Processing
Condition A**	Heated at 1900°F ± 25°F for 1/2 hour, air (Solution Treated) cooled or oil quenched to below 90°F. Normally performed at mill.
H900	Condition A material heated at 900°F ± 15°F for 1 hour and air cooled. Maximum hardness but low toughness. Sensitive to stress corrosion cracking. Heating 4 hours improves toughness with about 4 ksi reduction in tensile and yield.
H925, H1025, H1075, H1100, H1150	Condition A material heated 4 hours at specific temperature, and air cooled.
H1150D	Condition A material heated 4 hours at 1150°F, air cooled, heated again for an additional 4 hours at 1150°F and air cooled.
H1150-M	Condition A material heated at 1400°F ± 25°F for 2 hours, air cooled, then heated at 1150°F ± 15°F for 4 hours and air cooled.

***For most applications, 17-4 stainless should not be used in Condition A. This is true even though the desired tensile strength may be provided by that condition. While the alloy is relatively soft in condition A, the structure is untempered martensite that has low fracture toughness and ductility, while poor resistance to stress-corrosion cracking. Superior service performance is assured by using 17-4 stainless in the heat-treated condition.*

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