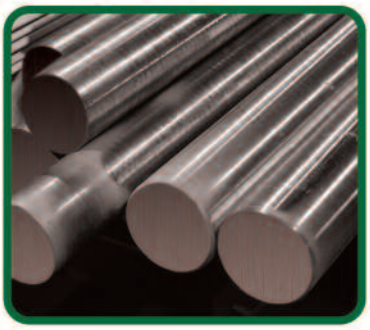
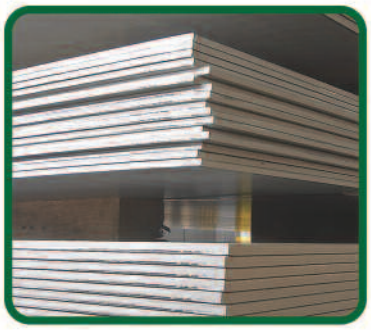
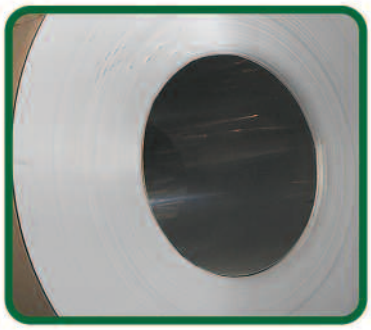
Alloy 17-4 Specifications: UNS S17400



ALLOY 17-4 (ALLOY 630, UNS S17400)

Penn Stainless inventory now includes Alloy 17-4 (Alloy 630, UNS S17400) in sheet, sheet coil, plate, round bar, processed flat bar and tubular products.

GENERAL PROPERTIES

Alloy 17-4 is a chromium-copper precipitation hardening stainless steel that is used for applications requiring high strength and a moderate level of corrosion resistance. It is one of the most widely used precipitation hardening grades, as it has high strength hardness up to about 572°F while demonstrating good corrosion resistance in all heat treated conditions. Alloy 17-4 has adequate resistance to atmospheric corrosion or in diluted acid salts where its corrosion resistance is equivalent to Alloy 304 or 430. Alloy 17-4 can be heat treated to a variety of temperatures to develop a wide range of properties. Its mechanical properties can be optimized with heat treatment where very high yield strength up to 180 ksi can be achieved. Alloy 17-4 should not be used at temperatures above 572°F or at very low temperatures.

APPLICATIONS

Alloy 17-4 is commonly used for applications requiring high strength and a moderate level of corrosion resistance. Some applications that frequently use Alloy 17-4 include:

- Aircraft
- Nuclear waste casks
- Paper mills
- Oil fields
- Mechanical components
- Chemical process components
- Food industry
- Aerospace

STANDARDS ALLOY 17-4 (ALLOY 630)

ASTM/ASME .....UNS S17400
EURONORM X5CrNiCuNb16.4
AFNOR.....Z6CNU17-04
DIN 1.4542

Alloy 17-4 (Alloy 630, UNS S17400) can be processed by Penn Stainless utilizing the following methods:

- Shear Cutting
- Plasma Cutting
- HQ Plasma Cutting
- Dynamic Water Jet Cutting
- Laser Cutting
- Saw Cutting
- Gauer Processing
- Machine Cutting

Inventory:

- Sheet
- Plate
- Round bar
- Rolled flat bar
- S/E processed bar

CORROSION RESISTANCE

- Withstands corrosive attacks better than any of the standard hardenable stainless steels.
- Comparable to Alloy 304 in most media.
- Corrosion resistant in some chemical, petroleum, dairy, and food process industries.
- Subject to crevice or pitting attack if exposed to stagnant sea water for any length of time.

WELDABILITY

- Successfully welded by most common fusion and resistance methods.
- Should not be joined by oxyacetylene welding.
- Generally no pre-heating required.
- Inter-pass temperature must be limited to 248ºF.
- Better toughness is obtained in the weld after a complete heat treatment.

ELEVATED TEMPERATURE USE

- Excellent resistance to oxidation to approximately 1100ºF.
- Long-term exposure to elevated temperature can result in reduced toughness in the precipitation hardened conditions.

PROCESSING / HOT FORMING

- To forge, heat uniformly to 2150 / 2200ºF and hold for half hour per inch.
- Preferred temperature range for hot forming is at 650-900ºF, while the steel is still austenitic.
- To ensure the best condition for the hardening operations, the forgings must be re-heat treated at 1875-1925ºF.
- Cool forgings to below 90ºF to ensure grain refinement.

PROCESSING / COLD FORMING

- Alloy 17-4 is limited to mild operations since in the annealed (solution treated) condition the material is hard.
- For severe cold working the material should be heat treated to condition H1150. This will help prevent possible cracking.
- Bend radius in excess of 7T is often required.
- To improve stress corrosion resistance after cold forming, re-aging at the precipitation-hardening temperature is recommended.

MACHINABILITY

- Can be machined in both solution-treated and precipitation-hardening conditions.
- Machining conditions may vary with hardness of material.
- High-speed tools or preferably carbide tools with standard lubrication are normally used.

CHEMICAL PROPERTIES

Type	Cr	Ni	Cu	Cb + Ta	C	Mn	P	S	Si
17-4 (Alloy 630)	min: 15.0 max: 17.5	min: 3.0 max: 5.0	min: 3.0 max: 5.0	min: 0.15 max: 0.45	0.07 max	1.00 max	0.04 max	0.03 max	1.00 max

MECHANICAL PROPERTIES (CONDITION A)

Solution Treated or Condition A Heat Treatment						
Product Form	**Ultimate Tensile Strength, ksi min.**	**0.2% Yield Strength, ksi min.**	**Elongation % in 2" min.**	**Reduction in Area min. %**	**Hardness, Rockwell, max**	**Hardness, Brinell, max.**
Sheet, Strip, Plate					C38	363
Bar					C38	363

MECHANICAL PROPERTIES (SHEET, STRIP, PLATE)

Hardening or Precipitation Treatment at 900°F						
Thickness, inches	**Ultimate Tensile Strength, ksi min.**	**0.2% Yield Strength, ksi min.**	**Elongation % in 2" min.**	**Reduction in Area min. %**	**Hardness, Rockwell, min. / max**	**Hardness, Brinell, min. / max.**
Under 0.1875"	190	170	5	–	C40 - C48	–
0.1875" to 0.625"	190	170	8	25	C40 - C48	388 / 477
0.625" to 4.0"	190	170	10	30	C40 - C48	388 / 477

Hardening or Precipitation Treatment at 1150°F						
Thickness, inches	**Ultimate Tensile Strength, ksi min.**	**0.2% Yield Strength, ksi min.**	**Elongation % in 2" min.**	**Reduction in Area min. %**	**Hardness, Rockwell, min. / max**	**Hardness, Brinell, min. / max.**
Under 0.1875"	135	105	8	–	C28 - C38	–
0.1875" to 0.625"	135	105	10	35	C26 - C36	269 / 352
0.625" to 4.0"	135	105	16	40	C26 - C36	269 / 352

MECHANICAL PROPERTIES (BAR)

Hardening or Aging Treatment at 900°F						
Thickness, inches	**Ultimate Tensile Strength, ksi min.**	**0.2% Yield Strength, ksi min.**	**Elongation % in 2" min.**	**Reduction in Area min. %**	**Hardness, Rockwell, min.**	**Hardness, Brinell, min.**
Up to 3.0 in. incl.	190	170	10	40	40	388
Over 3.0 in. to 8.0 in. incl.	190	170	8	35	40	388

Hardening or Aging Treatment at 1150°F						
Thickness, inches	**Ultimate Tensile Strength, ksi min.**	**0.2% Yield Strength, ksi min.**	**Elongation % in 2" min.**	**Reduction in Area min. %**	**Hardness, Rockwell, min.**	**Hardness, Brinell, min.**
Up to 8.0 in. incl.	135	105	16	50	28	277

PHYSICAL PROPERTIES

Heat Treated Condition	A	H900	H1075	H1150
Density, lbs/in^3	0.28	0.282	0.282	0.2843
Electrical Resistivity, microhm-cm	98	77		
Specific Heat, BTU/lb/°F (32-212°F)	0.11	0.10		
Thermal Conductivity, BTU/hr/ft^2/in/°F				
300°F		124		
500°F		135		
860°F		156		
900°F		157		
Mean Coefficient of Thermal Expansion, in/in/°F				
-100 to 70°F	–	5.8 x 10^{-6}	–	6.1 x 10^{-6}
70 - 200°F	6.0 x 10^{-6}	6.0 x 10^{-6}	6.3 x 10^{-6}	6.6 x 10^{-6}
70 - 400°F	6.0 x 10^{-6}	6.0 x 10^{-6}	6.5 x 10^{-6}	6.9 x 10^{-6}
70 - 600°F	6.2 x 10^{-6}	6.3 x 10^{-6}	6.6 x 10^{-6}	7.1 x 10^{-6}
70 - 800°F	6.3 x 10^{-6}	6.5 x 10^{-6}	6.8 x 10^{-6}	7.2 x 10^{-6}
70 - 900°F	–	–	–	7.3 x 10^{-6}
Modulus of Elasticity, ksi	9.68 x 10^3	28.5 x 10^3		
Modulus of Rigidity, ksi		11.2 x 10^3	10.0 x 10^3	10.0 x 10^3
Poisson's Ratio (all conditions)		0.272	0.272	0.272

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