17-4 PH Stainless Steel Pipe & Tube (WNR 1.4542 / UNS S17400)

Alloy 17-4 PH is a precipitation hardening martensitic stainless steel with the additions of copper. It provides a combination of high strength, hardness and corrosion resistance, post heat treatment hardness with excellent corrosion resistance.

It should not be utilized at temperatures above 300°C or at very low temperatures. It has sufficient resistance to atmospheric corrosion or in diluted salts or acids. It is highly resistant to stress corrosion, has good machinability, can be used in low temperature heat treatments that minimise war page and scaling, and it is more cost effective than many high nickel non-ferrous alloys.

Due to the high strength of **17-4PH,** its main use are in aerospace and other high technology industries such as offshore, in gears, valves, nuclear waste casks, turbine blades, moulding dies and shafts, as well as it is been used in petrochemical, petroleum, paper, dairy and food processing industries. The unique combination of properties within **17-4PH Stainless Steel** makes it an effective solution to many design and production problems.

Standard Specification:

ASTM A564 - Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes

ASTM A693 - Precipitation-Hardening Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

17-4 PH Applications

Below are the list of applications in which it is been used

- Food industry
- Pulp and paper industry
- Aerospace
- Offshore
- Mechanical elements
- Nuclear waste casks

17-4 PH 630 1.4542 Standards

EURONORM..... 1.4542 X5CrNiCuNb 16-4

AFNOR.....Z5 CNU 17-4PH

DIN.....1.4542

17-4 PH Corrosion Resistance

It has excellent corrosion resistance. In all aged conditions it is superior to standard hardenable stainless steel grades such as Stainless steel 420, 431 and 410. It resists corrosive attacks better than any hardenable stainless steel and is comparable to Alloy 304 in most media.

It is subjected to crevice corrosion or pitting corrosion attack if exposed to stagnant seawater. It provides corrosion resistant in some petroleum, chemical, paper, dairy and food processing industries which is equivalent to grade 304L.

17-4 PH Chemical Composition

Carbon	Manganese	Phosphorus	Sulfur	Silicon	Chromium	Nickel	Copper	Nb.+Ta..
0.07 max.	1.00 max.	0.040 max.	0.030 max.	1.00 max.	15.00-17.50	3.00-5.00	3.00-5.00	0.15-0.45

17-4 PH Mechanical Properties

Heat treatment	Yield Strength 0.2% N/mm		Ultimate Tensile Strength N/mm		Yield Strength 0.2% ksi		Ultimate Tensile Strength ksi		El%	
	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.
A-hardening 925°F (496°C)-4 hours-air cooling	1070	1207	1170	1310	155	175	170	190	8	14
B-hardening 1100°F (593°C)-4 hours-air cooling	790	931	965	1034	115	135	140	150	10	17

17-4 PH 630 1.4542 Physical Properties

Density: 7780 kg/m³ (.2871 lbs/in³)

Following physical properties have been obtained after hardening 896°F (480°C) – 1 hour - air cooling.

Interval Temperature °C	Thermal expansion ax10-6°C-1		°C	°F	Thermal conductivity (w.m-1.K-1)	Young modulus (Gpa)
0-100	10.8		20	68	14	197
0-200	11		100	212	16	193
0-300	11.3		200	392	18.5	186
0-400	11.6		300	572	20	180
0-500	12		400	752	22	175
			500	932	23	170

17-4 PH 630 1.4542 Processing

Hot Forming

It can be easily hot worked by using most of the common processes. It is suggested to be solution treated at 1900 F then formed during cooling while the material is still austenitic. Post-work solution treatment is required before final hardening. Hot forming should be carried out in a temperature range of 1742-2192°F. A full heat treatment including solution annealing, cooling lower than 76°F and aging at the required temperature must be made after hot forming.

Cold Forming

Despite its high initial yield strength it can be cold worked by most common methods. Cold forming can be performed only to a limited extent and only on plates in the fully softened environment. Stress corrosion resistance is improved by re-aging at the precipitation hardening temperature after cold working. The following processes may be performed: rolling, bending, hydro forming, etc. in fully softened conditions.

17-4 PH Welding

Arc and resistance welding processes used on standard grades of stainless steel are applicable to 17-4PH stainless steel. It can be welded by the following welding processes such as GTAW, GMAW, SMAW, SAW and PAW should not be used without preliminary testing.

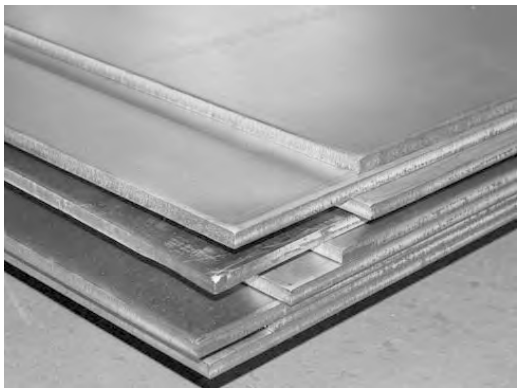
Usually, no preheating must be done and interpass temperature must be limited to 248°F. The better toughness is obtained in the weld after a complete heat treatment.

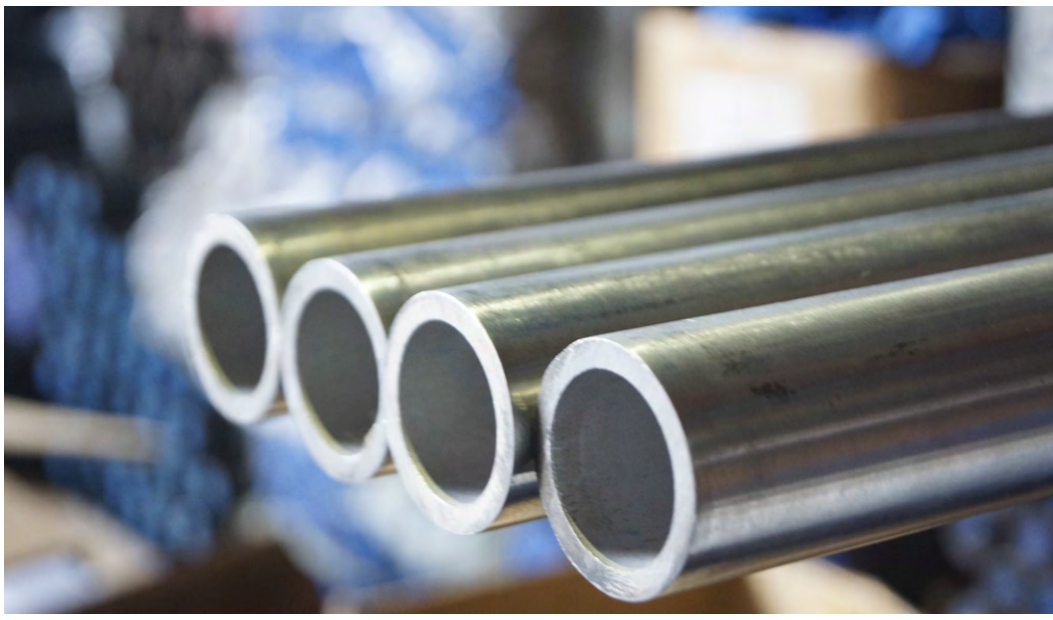
Due to the martensitic microstructure, low oxygen content in the weld metal is preferable to increase ductility and toughness. To avoid cold cracking, the introduction of hydrogen in the weld must be limited. It can be welded with homogeneous filler metals such as E 630 electrodes and ER 630 wires.

17-4 PH 630 1.4542 Machining

It has machining characteristics similar to stainless steel 302, 304 and 410 grades. The high hardness and strength in Condition H900 is the most difficult to machine and the material should be machined at 60% of the rate which is used for Condition A.

It can be machined in both solution treated and precipitation hardened conditions. Machining condition may differ according to the hardness of it. It can be machined in the annealed condition, however condition H1150M will yield best results. Post machining solution treatment of parts will be required prior to final hardening if machining in this condition.





TUBOS

107 Kika Street, Supariwala Bldg,
Gulalwadi, Mumbai - 400 004.

web: www.tubos.in
email: info@tubos.com
Tel: +91-22-6636 2001