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17-4 PH Stainless steel preceipitation hardening Alloy UNS 17400, SAE Type 630 Stainless steel

Introduction:

17-4 PH steel is a precipitation hardening alloy uniting high strength steel. Hardening & Tampering is achieved by low temperature treatment, 17-4 PH steel is martensitic in structure. Composing to other alloy of precipitation hardening family : 17-4 PH steel heat treatment would be in the temperature range of 900°F to 1150°F depending on strength & toughness desired.

Features

- High tensile strength and hardness to 600°F [316°C]
- Corrosion resistant
- Excellent oxidation resistance to about 1100°F [593°C]
- Fabricable
- Simple low-temperature heat treatment
- Creep-rupture strength to 900°F [482°C]

Applications

- Fasteners
- Pulp & paper mill equipment
- Valve stems, balls, bushings, seats
- Food processing machinery
- Aircraft structures, accessories, engine parts
- Pump shafts, gears, plungers
- Chemical processing machinery

Chemical Composition (Weight percent)

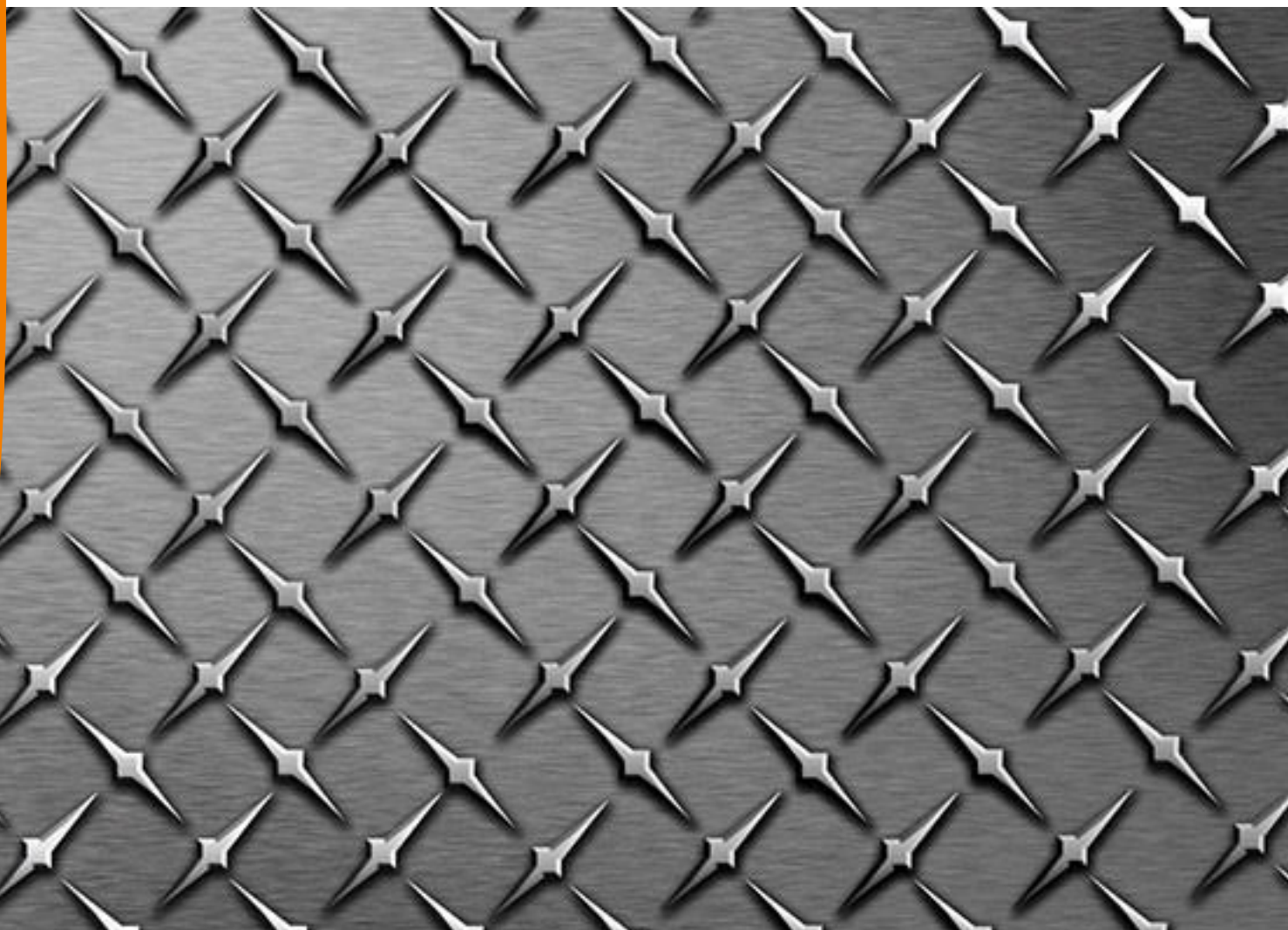
Chromium	15.00 – 17.50
Nickel	3.00 – 5.00
Copper	3.00 – 5.00
Manganese	1.00 max
Silicon	1.00 max
Columbium +	
Tantalum	5XC – 0.45
Carbon	0.07 max
Phosporus	0.040 max*
Sulfur	0.030 max*
Molybdenum	0.50 max
Iron	remainder

* 0.025 max, AMS 5622

Form of Specification

UNS S17400		
AMS 5604	Sheet, Strip and Plate	
AMS 5622	Bars, Wire, Forgings, Tubing & Rings Consumable Electrode Melted	
AMS 5643	Bars, Wire, Forgings, Tubing and Righs	
AS 7474	Bolts and Screws, Upset Headed, Heat Treated, Roll Threaded	
ASTM A 564	Type 630	Bars and Shapes
A 693	Type 630	Plate, Sheet and Strip
A 705	Type 630	Forgings
ASME SA-564	Type 630	Bars and Shapes
SA-693	Type 630	Plate, Sheet and Strip
SA-705	Type 630	Forgings
UNS S17480		
AMS 5825	Welding Wire	
AWS A5.9 ER630	Bare Stainless Steel Welding Electrodes and Rods	
UNS W37410		
AMS 5827	Covered Welding Electrodes	
AWS A5.4 E630	Stainless Steel Electrodes for Shielded Metal Arc Welding	

17-4 PH is identical to BS DIN 1.4548/ X5CrNiCuNb17-4-4.





Physical Properties 17-4 PH Steel

	Condition A	Condition H 900	Condition H 1075	Condition H 1150
Density lb/in ³ g/cm ³	0.280 7.75	0.282 7.81	0.283 7.83	0.284 7.86
Linear Coefficient of Thermal Expansion Units of 10 ⁻⁶ /°F [10 ⁻⁶ /°C]				
Temperature Range -100 °F to +70 °F [-73 °C to +21 °C]		5.8 [10.4]	6.0 [10.8]	6.1 [11.0]
+70 °F to 800 °F [+21 °C to +427 °C]	6.3 [11.3]	6.5 [11.7]	6.8 [12.2]	7.2 [13.0]
Magnetic Permeability	Strongly Ferromagnetic in all Conditions			
Thermal Conductivity Btu - ft/hr-ft ² °F [W/m-K]				
70 - 212 °F [21-100 °C]	10.6 [18.3]	10.3 [17.8]		
70 - 932 °F [21 - 500 °C]	13.1 [22.7]	13.1 [22.7]		
Electrical Resistivity microhm-cm	98	77	80	86

Mechanical properties

	Condition A	Condition H 900	Condition H 1075	Condition H 1150
Modulus of Elasticity 10 ⁶ psi [GPa]	28.5 [196]	28.5 [196]	28.5 [196]	28.5 [196]
Modulus of Rigidity 10 ⁶ psi [GPa]	11.2 [77.2]	11.2 [77.2]	11.2 [77.2]	11.2 [77.2]

Heat treatment in the 900°F to 1150°F range : Value as shown below are typical room temperature properties

	Condition A	Condition H 900	Condition H 1075	Condition H 1150
0.2% Offset Yield Strength psi [MPa]	110,000 760	180,000 1,240	135,000 930	125,000 860
Ultimate Tensile Strength psi [MPa]	150,000 1,030	195,000 1,340	155,000 1,070	145,000 1,000
Elongation [percentage in 2"]	8	10	10	10
Hardness Rockwell C scale	33	43	31	28



HEAT TREATING AL 17-4 PH ALLOY

Properties Specified in Aerospace Material Specification (AMS) 5604

Heat Treat to Produce Martensitic Structure	Precipitation Heat Treatment to Produce Desired Strength			
	Precipitation Hardening Heat Treatment	Yield Strength Psi [MPa]	Tensile Strength Psi [MPa]	Hardness Rc
<p align="center">Solution Heat Treatment at 1950 °F (1066 °C)</p> <p align="center">Condition A</p> <p align="center"><i>[This is the condition furnished by Allegheny Ludlum]</i></p>	<p align="center">900 °F [482 °C] 60 minutes Condition H 900</p>	<p align="center">170,000 [1170]</p>	<p align="center">190,000 [1310]</p>	<p align="center">40 to 47</p>
	<p align="center">925 °F [496 °C] 4 Hours Condition H 925</p>	<p align="center">155,000 [1070]</p>	<p align="center">170,000 [1170]</p>	<p align="center">38 to 45</p>
	<p align="center">1025 °F [552 °C] 4 Hours Condition H 1025</p>	<p align="center">145,00 [1000]</p>	<p align="center">155,000 [1070]</p>	<p align="center">35 to 42</p>
	<p align="center">1075 °F [579 °C] 4 Hours Condition H 1075</p>	<p align="center">125,000 [860]</p>	<p align="center">145,000 [1000]</p>	<p align="center">33 to 39</p>
	<p align="center">1100 °F [593 °C] 4 Hours Condition H 1100</p>	<p align="center">115,000 [790]</p>	<p align="center">140,000 [965]</p>	<p align="center">32 to 38</p>
	<p align="center">1150 °F [621 °C] 4 Hours Condition H 1150</p>	<p align="center">105,000 [725]</p>	<p align="center">135,000 [930]</p>	<p align="center">28 to 37</p>
	<p align="center">1400 °F [760 °C] 2 Hours + 1150 °F 4 Hours Condition H 1150 -M form SA 693</p>	<p align="center">75,000 [515]</p>	<p align="center">115,000 [790]</p>	<p align="center">26 to 36</p>

The heat treatments used for the AL 17-4 Precipitation Hardening Alloy are summarized below.

Condition	Temperature	Time
H 900	900 °F ± 10 (482 °C ± 5)	60 min. ± 5 min.
H 925	925 °F ± 10 (496 °C ± 5)	4 hrs. ± 0.25 hr.
H 1025	1025 °F ± 10 (552 °C ± 5)	4 hrs. ± 0.25 hr.
H 1075	1075 °F ± 10 (579 °C ± 5)	4 hrs. ± 0.25 hr.
H 1100	1100 °F ± 10 (593 °C ± 5)	4 hrs. ± 0.25 hr.
H 1150	1150 °F ± 10 (621 °C ± 5)	4 hrs. ± 0.25 min.

**MINIMUM PROPERTIES IN THE HARDENED CONDITIONS
ASTM A 693 THICKNESS FROM 0.626 TO 4.0"**

CONDITION

Property	UTS kis	0.2 % YS ksi	Elong % in 2" or 4XD	Red. of Area %	Hardness		Impact Charpy V-Notch ft-lbs
					Brinell	Rockwell	
H 900	190	170	10	30	388/477	C 40/48	**
H 925	170	155	10	30	375/477	C 38/47	**
H 1025	155	145	12	35	321/415	C 33/42	15
H 1075	145	125	13	35	293/375	C 29/38	20
H 1100	140	115	14	35	293/375	C 29/38	20
H 1150	135	105	16	40	269/352	C 26/36	30
H 1150-M	115	75	18	45	248/321	C 24/34	55

Minimum impact properties cannot be accepted in this condition.





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**17-4 PH ALLOY TYPICAL ELEVATED TEMPERATURE SHORES
BELLOW SHORT TIME TENSILE PROPERTIES.**

Temperature, °F °C

Property and condition	75(24)	600 (316)	700 (371)	800 (427)	900 (482)	1000 (538)
UTS, Ksi [N/mm²]						
H 925	191 (1317)	165 (1138)	161 (1110)	155 (1069)	145 (1000)	116 (800)
H 1025	174 (1200)	146 (1007)	142 (979)	137 (945)	126 (869)	106 (731)
H 1150	140 (965)	124 (855)	120 (827)	116 (800)	109 (752)	96 (662)
0.2% YS, Ksi [N/mm²]²						
H 925	182 (1255)	145 (1000)	142 (979)	139 (958)	128 (883)	103 (710)
H 1025	168 (1158)	135 (931)	131 (903)	128 (883)	118 (814)	101 (696)
H 1150	129 (889)	120 (827)	114 (786)	112 (772)	104 (717)	93 (641)
Elong. % in 2" [50mm]						
H 925	14	12	12	10	10	16
H 1025	15	12	10	11	12	15
H 1150	17	12	12	13	13	15
Reduction of Area, %						
H 925	54	32	33	34	35	45
H 1025	55	42	38	39	39	43
H 1150	61	54	52	43	51	55

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STRESS-RUPTURE STRENGTH OF 17-4 PH ALLOY TYPICAL VALUES

Condition	Test Temperature		Stress for Rupture in			
			100 Hours		1000 Hours	
	°F	°C	psi	N/mm ²	psi	N/mm ²
H 925	625	329	163,000	1124	160,000	1103
H 1150	625	329	123,000	848	122,000	841
H 925	700	371	154,000	1062	151,000	1041
H 1150	700	371	114,000	786	111,000	765
H 925	800	427	158,000	883	121,000	834
H 1150	800	427	100,000	689	94,000	648
H 1150	900	482	80,000	552	71,000	490

Heat treatment Process For 17-4 PH alloy steel

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.
H 1075, H 1150	Condition A material heated at 1075 or 1150°F ± 15°F for 4 hours and air cooled.
H 900	Condition A material heated at 900°F ± 15°F for 1 hour & air cooled. Maximum hardness but low toughness. Sensitive to stress corrosion cracking.
H 925, H 1025, H 1100	Condition A material heated at specified temperature for 4 hours & air cooled.
H 1150-M	Condition A material heated at 1400 ± 25°F for 2 hours, air cooled, then heated at 1150 ± 15°F for 4 hours and air cooled. This heat treatment used for maximum toughness, and for cryogenic application to -320°F.



17-4 PH Stainless Steel Application

- **Pump Shafts**
- Oil Patch
- Chemical processing
- Oil and petroleum refining
- Food processing
- Paper & pulp industry
- Mechanical Seals
- Nuclear Industries
- Gas processing Industries
- Aerospace
- Marine Vessels

17-4 PH Stainless Steel Stock Shapes

- **Pump Shafts**
- **Square Bar**
- **Round Bar**
- **Boat Shaft**
- **Hex Bar**
- **Flat Bar**

17-4 PH Industry Standards

- AMS 5643
- ASTM A564
- ASTM A693 Grade 630
- UNS S17400
- NACE MR0175/MR01032 [H-1150D Condition]

Type of 17-4 PH Stainless Steel Sheet & Plates

Stainless steel 17-4 PH Plain Sheets	17-4 PH Stainless steel Shim Sheets
Stainless steel 17-4 PH Hot Rolled Sheets	17-4 PH Stainless steel Cold Rolled Sheets
Stainless steel 17-4 PH Designer Sheets	17-4 PH Stainless steel Galvanized Sheets
Stainless steel 17-4 PH Perforated Sheet	17-4 PH Stainless steel Galvanized Plates
Stainless steel 17-4 PH Hot Rolled Plates	17-4 PH Stainless steel Cold Rolled Plates
Stainless steel 17-4 PH Perforated Plates	17-4 PH Stainless steel Chequered Plates

17-4 PH ROUND BAR SUPPLIERS

17-4 PH Polished Round Bar

17-4 PH T-Bar

17-4 PH Square Bar

17-4 PH Triangle Bar

17-4 PH Half Round Bar

17-4 PH Rods

17-4 PH Flat Bar

17-4 PH Hex Bar

17-4 PH Hollow Bar

17-4 PH Round Bar

17-4 PH Threaded Bar

17-4 PH Precision Stock Bar

Form :- 17-4 PH Round, Rod, Channel Bar, T-Bar, Precision Ground Bar, 17-4 PH Square Bar, Flat Bar, 17-4 Ph Blocks, 17-4 PH Round Rod, 17-4 PH Rings, 17-4 PH Hollow, 17-4 Ph Triangle, rectangle, Hex [A/F], 17-4 PH Half Round Bar, Threaded, Profiles, 17-4 PH Billet, 17-4 PH Ingot, I/H Bar, Forging etc.



17-4 PH Round Bar

AMS 5643 Steel 17-4 PH Rectangular Bar	17-4 PH UNS S17400 Flat Bar
AISI Stainless Steel 17-4 PH T-Bar	ASTM 17-4 PH Stainless Steel Rounds
PH 17-4 Stainless Steel Square Bar	AMS 5643 Steel 17-4 PH Half-Round Bar
17-4 PH Alloy Round Bar	Alloy Steel 17-4 PH Hexagonal Bar
AMS 5643 Steel 17-4 PH Threaded Bar	PH 17-4 Stainless steel Reber
ASTM 17-4 PH Stainless Steel Hollow Bar	AMS 5643 Steel 17-4 PH Precision ground Bar
SS 17-4 PH UNS S17400 Precision Ground Stock	17-4 PH UNS S17400 Triangle bar
AMS 5643 SS 17-4 PH Rods	Alloy steel 17-4 PH Hex Bar
PH 17-4 Stainless Steel Hexagon Bar	SS 17-4 PH UNS S17400 Forged Bar
ASTM 17-4 PH Stainless Steel Round Bar	17-4 PH Stainless Steel Round Rod
SS 17-4 PH UNS S17400 Bright Bar	AMS 5643 SS 17-4 PH Black Bar
AMS 5643 Steel 17-4 PH Billets Bar	SS 17-4 PH UNS S17400 Ingot
17-4 PH DIN 1.4542 Spring Steel Bar	17-4 PH Stainless Steel Forged Round Bar
17-4 PH Stainless Steel Threaded Bar	17-4 PH DIN 1.4542 Cold Drawn & Polished Square Bar
PH 17-4 Stainless Steel Cold Drawn Bar	Cold Rolled AMS 5643 Steel 17-4 PH Round Hot Forged Bar
17-4 Stainless Steel Round Bar Suppliers	Ss 17-4 Bright Bar Manufactures
17-4 Stainless Steel Flat Bar Suppliers	17-4 PH h900 round bar for shaft
17-4 PH DIN 1.4542 Round Hot Forged Bar	PH 17-4 Stainless Steel Polish Bar
Alloy steel 17-4 PH Polished Round Bar	Bright 17-4 PH stainless steel UNS S174000 Hollow Bar
AMS 5643 Steel 17-4 PH Black Surface Round Bar	17-4 PH DIN 1.4542 Round Bar For Shaft
17-4 Stainless Steel Welding Rod	
17-4 PH Stainless steel AMS 5643 round bar	
17-4 PH Stainless steel AMS 5643 welding rod	
AMS 5643 17-4 PH h900 Round Bar	

Large Diameter 17-4 PH Stainless Steel Round Bar	AISI Stainless Steel 17-4 PH flat bright round bar
17-4 PH Round Bar	17-4 PH Flat Bar Suppliers
17-4 PH Flat Bar	17-4 PH Hex Bar
17-4 PH Stainless Bar	17-4 PH H900 Bar
17-4 PH Stainless Steel Bar	17-4 PH Stainless Steel Flat Bar
17-4 PH Welding rod	17-4 PH Stainless Steel Rod
17-4 PH Threaded Rod	ASTM a705 type 630
ASTM a7065 gr 630	ASTM a705 grade 630
17-4 PH Stainless Bar	17-4 PH Rod
17-4 PH H900 Round Bar	17-4 PH Square Bar
grade 630 stainless steel bar	ASTM A564 Grade 630
17-4 Welding Bar	17-4 Stainless steel Welding Rod Suppliers
17-4 Ss Threaded Bar Supplier	Bright 17-4 bar Suppliers
17-4 Stainless Steel Hex Bar	17-4 Stainless Steel Hexagonal Bars
17-4 Stainless Steel Hex Bar Suppliers	17-4 Stainless Steel Hexagon Bar
Stainless Steel 17-4 Cold Drawn Bar	Stainless steel 17-4 Hollow Bar Manufacturers
17-4 Spring Steel Bar Suppliers	17-4 Forged Round Bar Manufacturer
Solid Round 20mm 17-4 PH Stainless Steel UNS S17400 Bar	Cold drawn 17-4 PH Alloy Round Bar
ASTM A276 AISI 17-4PH Stainless Steel UNS S17400 Bar	Cold drawn ASTM A276 AISI 17-4PH Stainless Steel Round Bar
17-4PH Steel Round Bar	ASTM Steel S17400 Hex Bar
Steel S17400 Flat Bar	JIS SUS 630 17-4PH Round Bar
17-4PH Steel Black Bar	JIS SUS 630 17-4PH Black Bar
Stainless Steel Grade 17-4 PH Hex Bar	ASME SA 276/479 Stainless Steel 17-4PH Hex Bar
Stainless Steel Type 17-4 PH Round Bar	ASME SA 276/479 Stainless Steel 17-4PH Round Bar

Stainless steel type 17-4 PH Bar	type 630 stainless steel Round Bar
ASTM a693 UNS S17400 Hex Bar	stainless steel type 17-4 PH Black Bar
ASTM a693 UNS S17400 Round Bar	ASTM a693 grade 630 Round Bar
type 630 stainless steel Hex Bar	ASTM a693 UNS S17400 Hex Bar
17-4 PH Stainless Steel Hex Bar	17-4 PH Stainless Steel Bar Stock
17-4 PH Stainless Steel Bar	17-4 PH Stainless Steel Hex Bar
PH 17-4 Stainless Steel RCS Bar	Bright Black Stainless Steel 17-4 PH h900 round bar
Half 17-4 PH stainless steel UNS S17400 Round Bar	Bright Black surface 17-4 PH Stainless Steel Round Bar
Half stainless steel PH 13-8 mo round bar	Stainless steel 17-4 PH yield strength Rod
Half stainless steel 17-4 PH h900 round bar	DIN 1.4542 SS Strength Bar
DIN 1.4542 SS UNS S17400 Round Bar	Hot Rolled 17-4 PH stainless steel UNS S17400 Round Bar
Hot Rolled stainless steel PH 13-8 mo UNS S17400 Round Bar	stainless steel 17-4 PH yield strength Bar

