

# CHRONIFER® 17-4 PH

1.4542/AISI 630 – Precipitation hardening martensitic stainless steel

**Attributes and particularities**

This precipitation hardening martensitic stainless steel is ESR remelted. Its hardening capability reaches 44 HRC. It is a high toughness steel, exhibiting a good corrosion resistance similar to this 1.4301 (AISI 304) steel, but with a much better resistance to stress corrosion cracking.

**Uses**

This steel is well indicated for making medical, surgical and dental instruments as well as other products with similar requirements.

**Applicable standards**

Material Number	1.4542
EN 10088-3	X5CrNiCuNb 16-4
DIN	X5CrNiCuNb 16-4
AFNOR	X5CrNiCuNb 16-4
ASTM	F899
AISI/SAE	AISI 630 (17-4 PH), A564, A564M, A959
NF	S 94-090
JIS	SUS 630
UNS	S17400

**Chemical composition (%<sub>wt</sub>)**

C	Si	Mn	P	S	Cr	Mo	Cu	Ni	Nb/Ta	Fe
Max.	max.	max.	max.	max.	15.0	max.	3.00	3.00	0.15	balance
0.07	0.70	1.00	0.04	0.03	17.0	0.60	5.00	5.00	0.45	

**Dimensions and tolerances**

- Bars Ø < 2.00 mm: ISO h8
  - Bars Ø ≥ 2.00 mm: ISO h6
  - Wires Ø ≥ 0.80 mm: ISO fg7, coils for Escomatic
  - Out of roundness: max. ½ of tolerance
- Tighter tolerances on request

**Executions and Delivery conditions**

- Standard: in bars 3 m (+50/0 mm), coils for Escomatic
- Bars Ø ≥ 2.00 mm: cold drawn, ground polished, max Ra 0.4 µm (N5)  
end of bars: Pointed 60°, chamfered 45°  
eddy-current check according to EN10277-1, Table 1
  - Bars Ø < 2.00 mm: Surface condition: cold drawn
  - Wires Ø < 6.00 mm: Surface condition: cold drawn, coils for Escomatic
- Other executions on request

**Availability**

Standard dimensions on stock, see: [Sale program](#)

**Mechanical Properties**

- Standard delivery condition:
- Strength UTS: 800-1150 MPa, function of the diameter
  - Hardening capability: ≈ 44 HRC

**Cutting conditions**

- Machinability: average  
forms long chips
- Cutting speed:  $V_c \approx 25 - 35$  m/min, Swiss machining
- Lubricant i.e.: individual choice
- The machinability can be improved by an over-aging.  
Over aging procedure: P800 (760°C/2h/air) + H1150M (620°C/4h/air)  
After machining, a solution anneal is necessary before the aging treatment
  - The optimal cutting conditions depend on the machine tool, the cutting tools, the chip dimensions, the lubricant-cooling fluid, as well as the tolerances and surface the roughness to be achieved.



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## Cutting conditions for turning

Anneal condition	Rm (MPa)	Cutting depth (m/min)	6	3	1
		Feed (mm/r)	0.5	0.4	0.2
(Condition A)	900 – 1000	Cutting speed (m/min)	100	160	190

## Forming

Warm: forging: 950 – 1180 °C, slow heating to 800°C, than faster up to the forming temperature of 1150 – 1180°C, cooling in water, oil or air

- A solution anneal must follow the hot forming operation.

Cold: Limited because of the strong cold work hardening.

## Welding

Feasible

- A 200 – 300°C stress relieve or anneal treatment is recommended to ensure the mechanical properties of the welds.

## Annealing

Solution anneal:

- 1020 – 1050°C, Water, oil, or air cooling: function of the size of the parts.

## Aging

In the following tables, the prefixes P and H designating the aging treatments, refer to the following parameters:

- P: Achievable strength Rm (European metric designation)
- H: Aging temperature in °F (American designation), °C = (°F-32) \* 0.5555

Designation of the aging treatment	Condition before aging	Aging	Minimum tensile strength UTS (MPa)
P800 / H1150M	Solution anneal 1020-1050°C/ oil or water quench	760°C/2h/air + 620°C/4h/air	800 / 795
P930 / H1150		620°C/4h/air	930
P960 / H1100		590 / 595°C/4h/air	960 / 965
H1075		580°C/4h/air	1000
P1070 / H1025		550°C/4h/air	1070

## Mechanical properties after aging

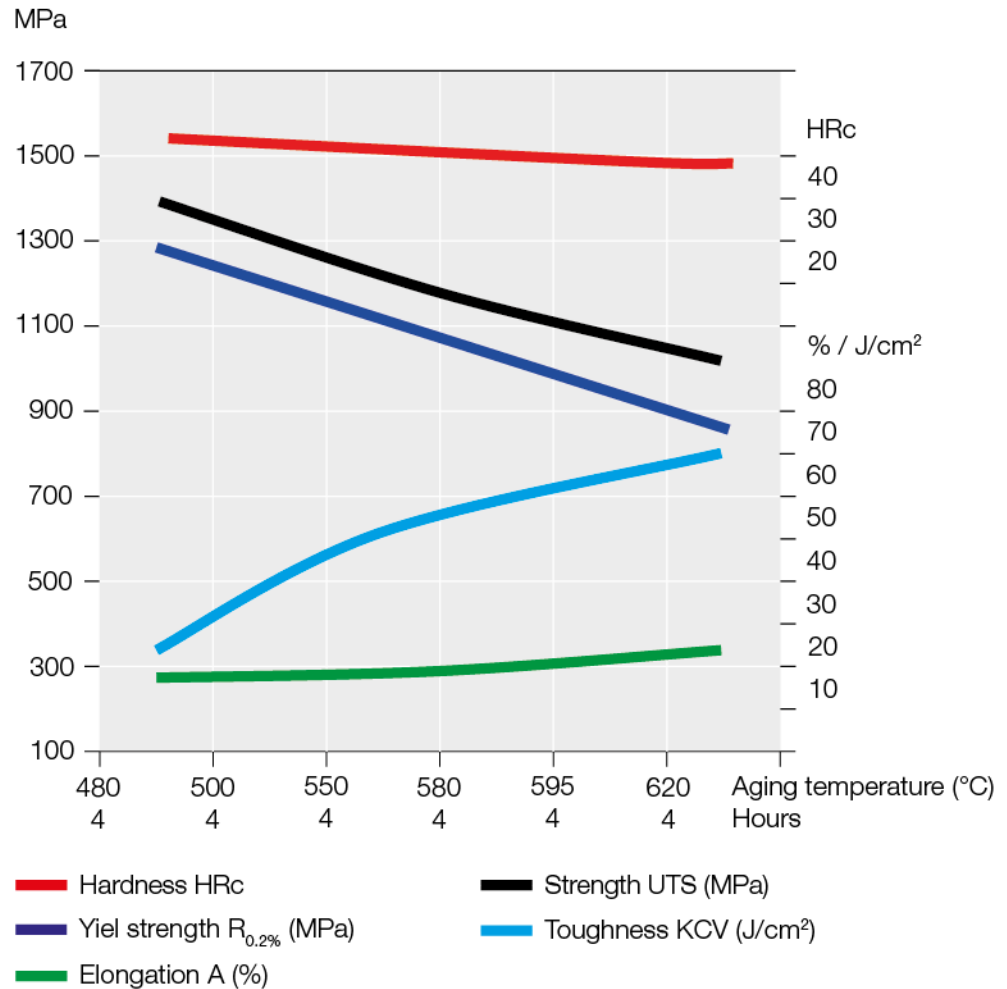
Aging treatment	Yield strength R <sub>0.2</sub> min (MPa)	Tensile strength UTS (MPa)	Elongation A <sub>5</sub> min (%)	Toughness ISO-V min (J)
P800	520	800 – 900	18	75
P930	720	930 – 1000	16	40
P960	790	960 – 1160	12	
P1070	1000	1070 – 1270	10	
H1150M	520	795	18	
H1150	725	930	16	41
H1100	795	965	14	34
H1075	860	1000	13	27
H1025	1000	1070	12	20
H925	1345	1375	8	HRc ≤ 43
H900	1375	1445	7	HRc ≤ 45



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## Aging diagram



### Polishing

Well adapted to mirror polish.

### Laser marking

• The laser marking heat in the Heat Affected Zone (HAZ) may modify the local microstructure and affect negatively its corrosion resistance. [More info](#)

### Pickling and passivation

It is strongly recommended to use products, pickling and passivation procedures well adapted to the treatment of precipitation hardening martensitic stainless steels.

### Scaling and Oxidation

• The possible formation of oxide layers or scaling, can strongly impair the corrosion resistance. These oxidations should always be eliminated either mechanically by an abrasion process, or chemically by pickling. [More info.](#)

### Elementary precautions

• The elementary and most simple and easiest precautions to adopt, are to always keep the parts clean, free of working residues, polished, and correctly dried.  
 • Use only chlorine free disinfection solutions, cleaning and washing solutions and products. [More Info](#)



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## Pickling

Descaling:

- 50%<sub>vol</sub> Hydrochloric acid\*: 2 minutes at 82°C
- 15%<sub>vol</sub> Nitric acid + 3%<sub>vol</sub> Hydrofluoric acid: 4 minutes at room temperature
- Repeat if necessary, but with shortened times of 1 respectively 2 minutes, rinse.

Pickling of a colored oxidation:

- 15%<sub>vol</sub> Nitric acid + 3%<sub>vol</sub> Hydrofluoric acid: 4 to 6 minutes at room temp., rinse
- Repeat if necessary, but with shortened times of respectively 2 and 3 minutes, rinse.
- Chlorhydric acid, hydrochloric acid and muriatic acid are different designations for the same product.

## Desmut

Desmut Final treatment to eliminate any hydrogen pickup:

- Desmut in 20%<sub>vol</sub> nitric acid at room temperature, rinse
- Bake 1 to 3h at 150/175°C to eliminate any possible hydrogen pickup contamination.

## Physical properties

Properties	Units	Temperature (°C)				
		20	200	300	400	500
Density	g cm <sup>-3</sup>	7.80				
Young Modulus E	GPa	197				
Electrical resistance	Ω mm <sup>2</sup> m <sup>-1</sup>	0.71				
Thermal expansion	m m <sup>-1</sup> K <sup>-1</sup>	20–100°C	20–200°C	20–300°C	20–400°C	20–500°C
	10 <sup>-6</sup>	10.9		11.1		
Thermal conductivity	W m <sup>-1</sup> K <sup>-1</sup>	16-17				
Specific heat	J kg <sup>-1</sup> K <sup>-1</sup>	500				
Melting range		1400-1450°C				
Magnetism		Ferromagnetic, can be magnetized. <a href="#">More Info</a>				

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