

Quality	X5CrNiCuNb16-4	Precipitation hardening	<i>Technical card 2018</i>
Number	1.4542 (17-4 PH)	Stainless Steel	<i>Lucefin Group</i>

Chemical composition

C%	Si%	Mn%	P%	S% ^{a)}	Cr%	Ni%	Mo%	Cu%	Nb%	
max	max	max	max	max			max			
0,07	0,70	1,50	0,040	0,030	15,0-17,0	3,0-5,0	0,60	3,0-5,0	5 x C < 0,45	EN 10088-3: 2014
± 0.01	+ 0.05	± 0.04	+ 0.005	± 0.005	± 0.2	± 0.07	+0.03	± 0.10	+ 0.04	

Product deviations are allowed

^{a)} for improving machinability, it is allowed a controlled sulphur content of 0,015 % - 0,030 %; for polishability, it is suggested a controlled sulphur content of max 0,015 %

Temperature °C. Recommended atmospheres protected with argon or helium, avoiding the nitrogen.

Melting range	Hot-forming	Solution annealing (Solubilization) +AT	Precipitation hardening +P	MMA welding – AWS electrodes
1440-1400	1175-1095	1060-1030 oil, air (HB max 360)	+P800 760 air + 620 air	<i>pre-heating</i> 100-200 <i>annealing after w. aging</i>
Stress-relieving +SR	Mill annealing		+P930 620 air	<i>oint with steel</i> carbon E308L
660-600 furnace	1050-1020 air, oil under Mf (HB max 229)		+P960 590 air	CrMoalloyed ER630
			+P1070 550 air	stainless E630-16
			+P1300 480 oil	<i>cosmetic welding</i> E630-16

Transformation temperature during heating **Ac1** ~627, **Ac3** ~ 704 and during cooling **Ms** ~ 130, **Mf** ~ 30

Chemical treatment = *Pickling* (6 - 25% HNO₃) + (0.5 - 8% HF) hot or cold. *Passivation* 20 - 25% HNO₃ hot

Mechanical properties

Heat-treated material EN 10088-3: 2014 in conditions 1C, 1E, 1D, 1X, 1G, 2D

size		Testing at room temperature							
mm		R	Rp 0.2	A%	A%	Kv ₂ +20 °C	Kv ₂ +20 °C	HBW ^{a)}	heat treatment
from	to	N/mm ²	N/mm ² min	min (L)	min (T)	J min (L)	J min (T)	max	condition
	100	1200 max	-	-	-	-	-	360	+AT
	100	800-950	520	18	-	75	-	-	+P800
	100	930-1100	720	16	-	40	-	-	+P930
	100	960-1160	790	12	-	-	-	-	+P960
	100	1070-1270	1000	10	-	-	-	-	+P1070

^{a)} for information only (L) = longitudinal (T) = transversal

Bright bars of heat-treated material EN 10088-3: 2014 in conditions 2H, 2B, 2G, 2P

size		Testing at room temperature							
mm		R	Rp 0.2	A%	A%	Kv ₂ +20 °C	Kv ₂ +20 °C		heat treatment
from	to	N/mm ²	N/mm ² min	min (L)	min (T)	J min (L)	J min (T)		condition
	10 ^{b)}	900-1100	600	10	-	-	-		
10	16	900-1100	600	10	-	-	-		
16	40	800-1050	520	12	-	75	-		+P800
40	63	800-1000	520	18	-	75	-		
63	160	800-950	520	18	-	75	-		
	100	930-1100	720	12	-	40	-		+P930
	100	960-1160	790	10	-	-	-		+P960
	100	1070-1270	1000	10	-	-	-		+P1070

^{b)} in the range of 1 mm ≤ d < 5 mm, values are valid only for rounds – the mechanical properties of non round bars of < 5 mm of thickness have to be agreed at the time of request and order (L) = longitudinal (T) = transversal

Forged UNI EN 10250-4: 2001 solubilized and precipitation hardening material

size		Testing at room temperature							
mm		R	Rp 0.2	A%	A%	Kv +20 °C	Kv +20 °C		heat treatment
from	to	N/mm ² min	N/mm ² min	min (L)	min (T)	J min (L)	J min (T)		condition
	250	930	720	15	12	40	30		+P930
	250	1070	1000	12	10	20	15		+P1070
	250	1300	1150	8	6	-	-		+P1300

Precipitation hardening temperature °C / Hardness. Material solubilized at 1040 °C . Approximate values

HRC	34	34	38	43	47	42	36	33
HV 10	336	336	372	423	458	412	354	327
N/mm ²	1050	1050	1180	1390	1700	1340	1110	1030
°C	100	200	300	400	450	500	600	650

Effect of **cold-working** (hot-rolled, solution annealing and cold-drawn). Approximate values

R	N/mm ²	880	960	1000	1020	1060	1100	1120	1160	1200	1260
Rp 0.2	N/mm ²	700	820	860	900	980	1000	1000	1020	1050	1080
A	%	20	12	11	10	8	8	8	8	8	8
Reduction %		0	10	15	20	30	40	50	60	70	75

Minimum yield stress and tensile strength values at high temperatures.

Solubilized and precipitation hardening material EN 10088-3: 2014

Rp 0.2	N/mm ²	500	490	480	470	460	heat treatment condition				
Rp 0.2	N/mm ²	680	660	640	620	600	+P800				
Rp 0.2	N/mm ²	730	710	690	670	650	+P930				
Rp 0.2	N/mm ²	880	830	800	770	750	+P960				
Prova a	°C	100	150	200	250	300	+P1070				

Thermal expansion	10 ⁻⁶ · K ⁻¹	▶	10.8	11.0	11.3	11.6	12.0	
Modulus of elasticity	longitudinal GPa		200	193	186	180	170	
Poisson number	ν		0.291					
Electrical resistivity	Ω · mm ² /m		0.71					
Electrical conductivity	Siemens · m/mm ²		1.41					
Specific heat	J/(Kg · K)		500					
Density	Kg/dm ³		7,80					
Thermal conductivity	W/(m · K)		14.0	16	18.5	20.0	22.0	23.0
Relative magnetic permeability	μ _r		max 135					
°C			20	100	200	300	400	500

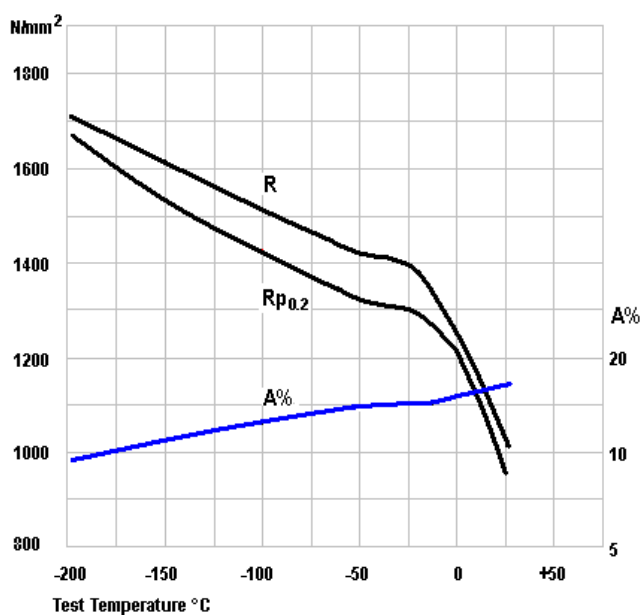
The symbol ▶ indicates between 20 °C and 100 °C, 20 °C and 200 °C

Corrosion resistance	Atmospheric	Chemical	x petrolchemical, stress corr. cracking, food processing		
Fresh water	<i>industrial</i> <i>marine</i>	<i>medium</i> <i>oxidizing</i> <i>reducing</i>			
x	x x	x x			

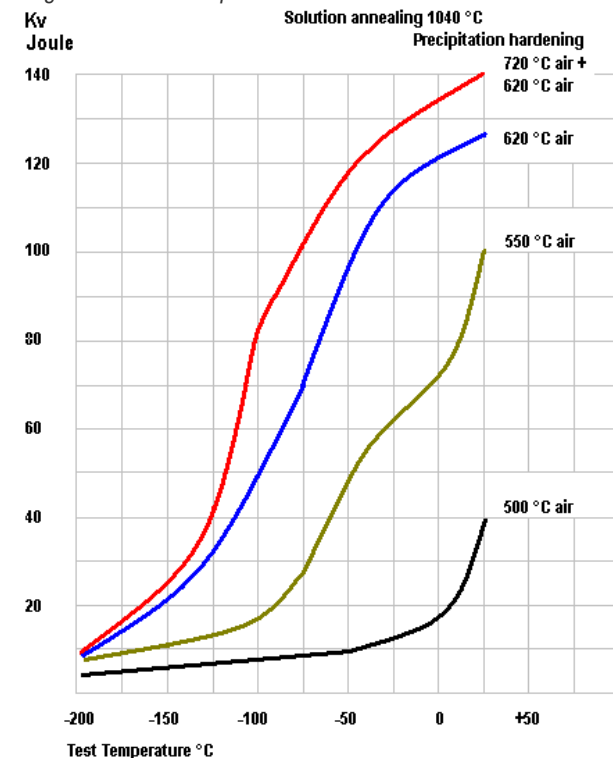
Magnetic	yes
Machinability	related to ist hardness
Hardening	precipitation hardening
Service temperature in air	do not use at temperatures higher than those of artificial aging (max 540 °C)

Europe	USA	USA	China	Russia	Japan	India	R. Corea
EN	UNS	ASTM	GB	GOST	JIS	IS	KS
X5CrNiCuNb16-4	S17400	Type 630	05Cr17Ni4Cu4Nb		SUS 630		STS 630

Mechanical properties at low temperature



Toughness at low temperatures



Solution annealing 1040 °C
 Precipitation hardening 600 °C