

Short name	X5CrNiCu16-4 X5CrNiCuNb17-4-4
No.	1.4542 (ESR, VAR) 1.4548 (ESR, VAR)
AISI	630
UNS	S17400
Alloy type	17-4 PH

Typical chemical composition, %	C	< 0.07
	Cr	16.00
	Ni	4.00
	Cu	4.00
	Nb + Ta	0.30

PROPERTIES AND USES

A precipitation-hardening, non-corroding steel with good tensile properties, also at low and elevated temperatures. It possesses good corrosion resistance and is weldable.

Normally, the steel is electro-slag-remelted (ESR). However, the material can also be vacuum-arc-remelted (VAR). Both remelting routes lead to an excellent polishing ability of the material.

Corrosion resistance

The corrosion resistance of 1.4542/4548 is in many cases comparable to that of 18/10 CrNi-steels (type 1.4301/06, AISI 304). It is generally better than those of the hardenable 12 % Cr-steels.

In case of the risk of stress corrosion cracking, heat-treatment conditions with high tensile strengths are to be avoided (conditions .5 and .6 = H 925 and H 900).

Weldability

1.4542/4548 is weldable according to common gas shielded welding procedures. Preheating is not required. The risk of cracks in the heat-affected zone is low. After welding a renewed precipitation-hardening is necessary so as to reach the desired properties.

Machinability

The cold workability is limited. The most favorable conditions are H 1075 to H 1150, in which high ductility exists. For thinner sections, cold forming can be done in the solution annealed condition.

Cutting or machining is more difficult than in the case of the usual construction steels. Attention must be paid to suitable cutting tools and cutting conditions, sufficient cooling and sharp cutting edges.

HOT WORKING AND HEAT TREATMENT

Forging	1150–950 °C (2100–1750 °F)		
Brinell Hardness in the annealed condition	Max. 363 HB		
Solution annealing	1.4548.9	(A)	1040 °C / air or oil
Precipitation hardening	1.4548.6	(H 900)	480 °C / 1 h / air
	1.4548.5	(H 925)	495 °C / 4 h / air
	1.4548.4	(H 1025)	550 °C / 4 h / air
		(H 1075)	580 °C / 4 h / air
	1.4548.3	(H 1100)	595 °C / 4 h / air
		(H 1150)	620 °C / 4 h / air
		(H 1150 M)	760 °C / 2 h / air + 620 °C / 4 h / air

MECHANICAL PROPERTIES AT ROOM TEMPERATURE

	Condition	R _{p0.2} MPa	R _m MPa	A ₅ %	Z %	Impact work J (ISO-V)	Hardness
(A)	1.4548.9						≤ 363 HB
(H 900)	1.4548.6	≥ 1170	≥ 1310	≥ 10	≥ 35		40–47 HRC
(H 925)	1.4548.5	≥ 1070	≥ 1170	≥ 10	≥ 38	≥ 7	38–45 HRC
(H 1025)	1.4548.4	≥ 1000	≥ 1070	≥ 12	≥ 45	≥ 20	35–42 HRC
(H 1075)		≥ 860	≥ 1000	≥ 13	≥ 45	≥ 27	≥ 32 HRC
(H 1100)	1.4548.3	≥ 795	≥ 965	≥ 14	≥ 45	≥ 34	30–38 HRC
(H 1150)		≥ 725	≥ 930	≥ 16	≥ 50	≥ 41	28 HRC
(H 1150 M)		≥ 520	≥ 795	≥ 18	≥ 55	≥ 75	≥ 24 HRC

PHYSICAL PROPERTIES

Density	$\rho = 7.8 \text{ g/cm}^3$				
E-Modulus	$E = 196 \cdot 10^3 \text{ MPa}$				
Linear expansion coefficient (between 20 °C and α ($\mu\text{m/K} \cdot \text{m}$))	100	200	300	400	
	10.8	10.8	11.0	11.0	(1.4548.9)
	10.8	10.8	11.1	11.4	(1.4548.6)
	11.9	12.4	12.6	12.6	(H 1150)
Heat conductivity (100 °C)	$\lambda = 17 \text{ W/K} \cdot \text{m}$				(1.4548.6)
Specific heat capacity (0–100 °C)	$C = 460 \text{ J/Kg} \cdot \text{K}$				(1.4548.9)
Electric resistance (20 °C)	$0.75 \Omega \text{ mm}^2/\text{m}$				
Magnetizability	Yes				