

AISI 630 Stainless Steel

Data sheet

Introduction

Standard	AISI	EN10088-3
Denomination	630	1.4542 / X5CrNiCuNb16-4

Stainless steel grade AISI 630 or 17-4PH is a martensitic precipitation hardening stainless steel grade. It offers great strength and hardness along with good corrosion resistance.

These wide range of characteristics can be summarized as follows:

- Good corrosion resistance
- High strength and hardness
- Good machinability
- Good weldability
- Magnetic

This precipitation hardening steel grade can be used for aircraft fittings, valve parts, propeller shafts, ...

Chemical Composition

Chemical composition of AISI 630 according to American Standard ASTM A564 is:

	C	Si	Mn	P	S	Cr	Ni	Cu	Nb
Min						15,00	3,00	3,00	0,15
max	0,07	1,00	1,00	0,040	0,030	17,50	5,00	5,00	0,45

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Physical Properties

These are the typical values of some physical properties for a steel AISI 630:

Property	20°C	Up to 100°C	Up to 200°C	Up to 300°C
Density (g/cm³)	7,8			
Modulus of Elasticity (GPa)	200	195	185	175
Coef. Of thermal expansion (x10⁻⁶/°C)		10,9		11,1
Thermal Conductivity W/m°C	16			
Thermal Capacity J/Kg°C	500			
Electrical Resistivity mm²/m	0,71			

- **General Corrosion:**

This quality has a general corrosion resistance compared with common martensitic steel grades.

- **Pitting Corrosion:**

The pitting corrosion resistance is given basically by the chromium and molybdenum content. A parameter used to compare the pitting corrosion resistance of different grades is the number PRE [Pitting Resistance Equivalent] which is defined as follows:

$$\text{PRE} = \% \text{Cr} + 3,3 * \% \text{Mo} + 16 * \% \text{N}$$

The higher this parameter is, the better the pitting corrosion resistance of the steel.

	AISI 410	AISI420 (A)	AISI 630
PRE	12	12	15

- **Stress Corrosion Cracking:**

Martensitic steels are generally susceptible to stress corrosion cracking. For applications requiring high stress corrosion cracking, Duplex steels such as 1.4362 and 1.4462 are more suitable.

- **Intergranular Corrosion**

In certain processes or high temperature applications, precipitation of chromium carbides at the grain's boundaries may happen. This Chromium is shifted from the matrix thus favouring intercrystalline corrosion. The high C content of this grade favours the Chromium carbide precipitation and thus the likelihood of intergranular corrosion increases.

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Mechanical Properties

The mechanical properties at room temperature for this martensitic stainless grade AISI 630 are given according to American Standards ASTM A564. The most common conditions are annealed (A), or aged hardened as H1150 or H1150D

Manufacturing

Martensitic precipitation hardening stainless steels have acceptable aptitude to be worked by any manufacturing process as hot forming, cold forming, welding or machining. Different heat treatments can be applied in order to achieve the aimed mechanical properties. These heat treatments can either be an annealing process or a precipitation hardening process.

- **Weldability:**

This AISI 630 grade can be used for welding. Due to the Cu content, it is required to perform a post welding treatment is required to ensure that the aimed mechanical properties are obtained both at the welding region and at the parent material.

- **Heat Treatment:**

The heat treatment for this steel varies depending on the desired final mechanical characteristics. Annealing process consists in heating up to 1025-1055°C followed by quenching. Aging heat treatments consist in a precipitation hardening that can be performed at different temperatures depending on the final goal properties. The lower the temperature, the higher the final hardness:

Heat Treatment	Solution annealing			Hardening	
	Temperature (°C)	Cooling	Temperature (°C)	Holding min time	Cooling
H900	1040 +/-15	Air / Oil	480	1h	Air
H1025	1040 +/-15	Air / Oil	550	4h	Air
H1150	1040 +/-15	Air / Oil	620		
H1150D	1040 +/-15	Air / Oil	620	4h	Air
			620	4h	Air

- **Machinability**

The AISI 630 is suitable for machining operations but different parameters shall be used depending on the precipitation hardening treatment applied.

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