

1. Standards

AISI 17-4 PH
(precipitate hardening)
DIN 1.4542
Afnor X 5 Cr Ni Cu Nb 17 04

3. Composition

⁽¹⁾ Combustion analysis ⁽²⁾ Microprobe analysis

%	C ⁽¹⁾	≤ 0.07
%	Cr ⁽²⁾	15.0-17.5
%	Ni ⁽²⁾	3-5
%	Cu ⁽²⁾	3-5
%	Nb ⁽²⁾	0.15-0.45
%	Mn ⁽²⁾	≤1.0
%	Si ⁽²⁾	≤1
%	Fe	Compl.

2. Properties and use

Stainless steel with direct martensitic transformation and structural hardening providing an outstanding combination of high strength and good corrosion resistance and excellent mechanical properties up to 300°C. This alloy is based on water atomized powder with a maximum size of 20 microns. This special stainless steel can be used in all applications with high demand on mechanical properties and tough environment (aviation, weapons, climbing and outdoor equipment, medical devices etc...). It can be used for cosmetic applications such as pens, spectacle hinges and can be polished and PVD coated. It cannot be used for parts having long and direct contact with skin.

4. Physical and chemical properties

Some intermittent spots after a 96 hour salt spray test ⁽¹⁾

Theoretical density : 7,78

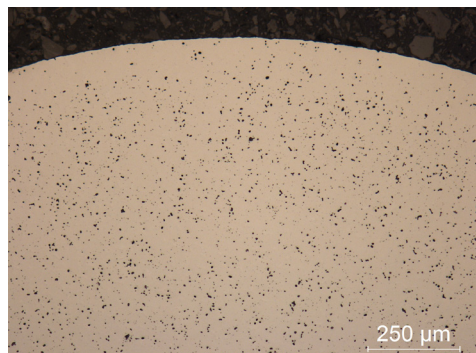
Minimum density : 7,65

⁽¹⁾ according to NF 41-002

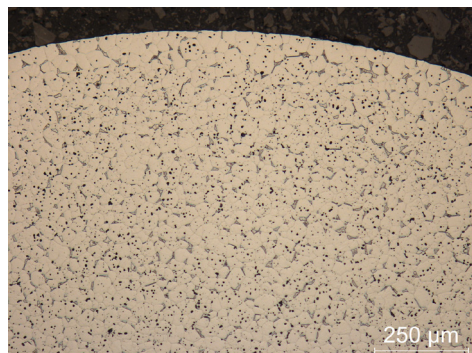
5. Microstructure and mechanical properties as sintered

Microstructures display closed porosities with a maximum diameter of 10µm and a nearly dense layer on the outer surface.

After sintering (quench like conditions) the structure is dual phased with martensite (light grey) and ferrite at the grain boundaries.



Optical microstructure



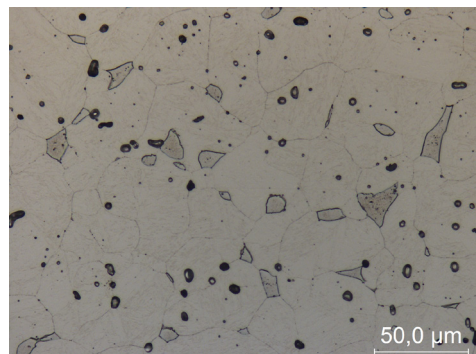
Optical etched microstructure

Traction on 17-4 PH as sintered :

R_m : 950 MPa
 $R_{p0,2}$: 720 MPa
 $A\%$: 6 %
Hardness : 320 Hv₁₀ (32 HRC)
Roughness : Ra < 2 µm

6. Microstructure and mechanical properties with H900 structural hardening

The «as sintered» soft martensite (low carbon and no needles) is an oversaturated solid solution in which the hardening phase can precipitate. This phase appears during annealing and creates ultra-fine copper-based precipitates (not visible on optical micrographs) which strengthen the material by anchoring dislocations. Ferrite is not affected. Depending on time and annealing temperature, a range of properties can be achieved.



Optical etched microstructure exhibiting residual ferrite

Traction on 17-4 PH PH H900 :

$R_m \geq 1100$ MPa
 $R_{p0,2} \geq 950$ MPa
 $A\% \geq 5$ %
Hardness : 400 Hv₁₀ (40HRC)