

## MATERIAL DATA SHEET

# 17-4 PH STAINLESS STEEL

The alloy chemical composition complies with UNS S17400 and AMS 5604



### General Material and Process Specification

17-4 PH is a martensitic precipitation hardening stainless steel with Cr, Ni and Cu as major alloying elements. This material offers excellent mechanical properties when heat-treated. Due to its high strength and relatively good corrosion resistance, it is widely used in a variety of applications such as aerospace, medical, oil and gas, and food industries.

This data sheet specifies the expected mechanical properties and characteristics of this alloy when manufactured on a FormUp 350 system. All data is based on parts built with AddUp standard 60 µm layer thickness parameters, using 15-45 µm spherical powder.

Physical Properties	Results
Density (%) <sup>1</sup>	Typical 99.95
Theoretical density (g/cm <sup>3</sup> ) <sup>2</sup>	7.8

<sup>1</sup> Relative density analysis was carried out using optical microscopy  
<sup>2</sup> Values based on literature

Surface Roughness Ra (µm) <sup>3,4,5</sup>	As-built	Bead blasted <sup>5</sup>
Vertical surface	5 to 8	4 to 5

<sup>3</sup> Depends on orientation and testing method  
<sup>4</sup> Tested using optical profilometer, cutoff wavelength λc=2.5 mm  
<sup>5</sup> Surface treatment performed with glass blasting medium at 4 bar

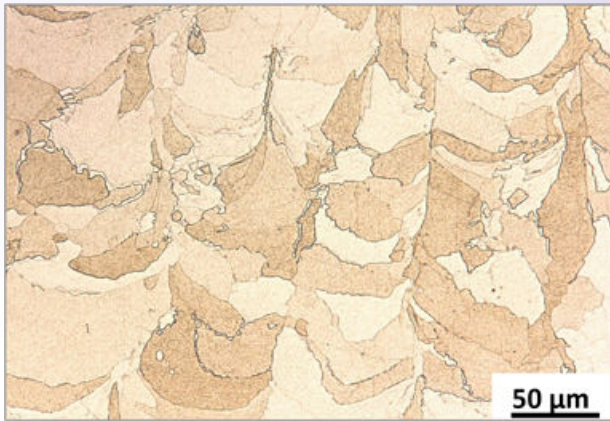
Mechanical Properties <sup>6</sup>	Test Method	Thermal State	
		As-built	Heat-treated <sup>7</sup>
<b>Tensile strength (MPa)</b>	ASTM E8		
Horizontal direction (XY)		-	1325±7
Vertical direction (Z)		939±23	1306±16
<b>Yield strength (MPa)</b>	ASTM E8		
Horizontal direction (XY)		-	1207±7
Vertical direction (Z)		825±28	1192±17
<b>Elongation at failure (%)</b>	ASTM E8		
Horizontal direction (XY)		-	14±1
Vertical direction (Z)		18±1	15±1
<b>Reduction of area (%)</b>	ASTM E8		
Horizontal direction (XY)		-	42±2
Vertical direction (Z)		66±3	52±2

Mechanical Properties <sup>6</sup> (cont.)	Test Method	Thermal State	
		As-built	Heat-treated <sup>7</sup>
<b>Modulus of Elasticity (GPa)</b>	ASTM E8		
Horizontal direction (XY)		-	191±7
Vertical direction (Z)		177±4	191±7
<b>Rockwell hardness (HRC)</b>	ASTM E18		
Horizontal direction (XY)		25±8	44±5
Vertical direction (Z)		30±3	43±3

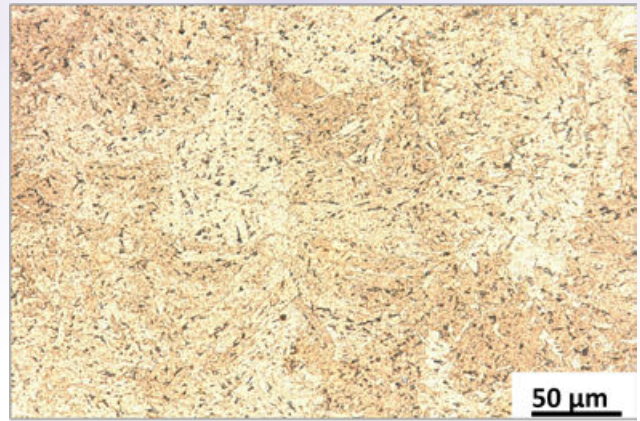
<sup>6</sup> Tested at ambient temperature to ASTM E8. Machined before testing. Values based on a sample size of a minimum 9 across the build plate

<sup>7</sup> Specimens were solution annealed at 1040°C for 1 hour then hardened at 480°C for 1 hour and air cooled to ambient temperature

## Microstructures



As-built



Heat Treated

## Generic Data<sup>8</sup>

### Thermal and Electrical Properties

	Results
Thermal conductivity (W/mK) at 149 to 482°C <sup>9</sup>	18 - 23
Melting Range (°C)	1404 -1440
Coefficient of thermal expansion (µm/(m .°C)) at 21 to 93°C	10.8

<sup>8</sup> Based on the literature data

<sup>9</sup> For condition H900

## Chemical Composition<sup>10</sup>

Element	Fe	Cr	Ni	Cu	Si	Mn	P	S	Nb+Ta	Other total
Weight (%)	Balance	15-17.5	3.0-5.0	3.0-5.0	≤1.0	≤1.0	≤0.04	≤0.03	0.15-0.45	≤ 0.10

<sup>10</sup> Based on the manufacturer material datasheet

## CONNECT WITH US

**AddUp SAS**  
13-33 Rue Verte  
ZI de Ladoux, 63118 Cébazat  
France

+33 (0)4 73 15 25 00

**AddUp Inc**  
5101 Creek Rd,  
Cincinnati, OH 45242  
USA

+1 (513) 745-4510

**AddUp GmbH**  
Campus-Boulevard 30  
52074 Aachen  
Germany

+49 241 4759 8581

**AddUp Solutions Pte. Ltd.**  
2 Cleantech Loop  
#04-06 JTC Launchpad  
@ Jurong Innovation District  
Singapore 637144

+65 6909 9345



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