UniFuse™ 17-4PH 60µm 400W Performance

· Laser Powder Bed Fusion 3D printing

Chemical Composition:

· Powder conforms to AMS 7012 size/chemistry class D

Element	Fe [wt.-%]	Cr [wt.-%]	Mn [wt.-%]	C [wt.-%]	Si [wt.-%]	Ni [wt.-%]	Cb [wt.-%]	S [wt.-%]	P [wt.-%]	Cu [wt.-%]
Min	Bal.	15.0	0.0	0.0	0.0	3.0	0.15	0.0	0.0	3.0
Max	Bal.	17.5	1.0	0.07	1.0	5.0	0.45	0.03	0.04	5.0

Powder Properties:

Density (g/cm^3)

Tap Density[i]	**5.9** ± 0.15 g/cm^3

Typical properties at nominal density and nominal composition:

Material properties [1]	Symbol	Annealed and Aged[6]
Density [g/cm^3] [2]	ρ	7.78 – 7.79
Density [%] [2]	%	99.9 – 100.0
Porosity [%] [2]	p	0.0 – 0.1
Ultimate Tensile Strength [MPa] [3] [4]	R_m xy-bar	1167 ± 15
	R_m z-bar	1170 ± 40
Yield Strength [MPa] [3] [4]	$R_{p0.2}$ xy-bar	1051 ± 16
	$R_{p0.2}$ z-bar	1040 ± 30
Young's Modulus [GPa] [3] [4]	E	192 ± 21
Fracture Elongation [%] [3] [4]	A xy-bar	13.6 ± 0.9
	A z-bar	16.3 ± 1.3
Surface roughness in z-direction, no treatment [5]	R_a	9.0 ± 1.1

Remarks:

1) Properties are given for the laser melted product printed at 60µm layer thickness. Auxiliary operations may influence the displayed properties. Auxiliary operations like e.g. surface modifications by coating processes, bead blasting, etc. performed at Uniformity Labs or the customer will affect mechanical and physical properties. It is strongly recommended to communicate and discuss this item with the responsible Uniformity Labs personnel.

2) The indicated density limits are valid for the mean density of a component. For complex and geometrically unfavorable shapes the local segment density can deviate from these limits and therefore materials properties may be affected.

3) Materials properties stated in the table above have been determined on the basis of ASTM E8-21 and therein cited norms on horizontal and vertical tensile cylinders machined to ASTM E8-21 geometry.

4) Mechanical characteristics are typical mean values valid for the indicated nominal density level. Density level with +/- one standard deviation representative of variation in a single build for coupon placement spanning the build plate. Results may vary from printer to printer.

5) Roughness measurement in accordance with DIN EN ISO 4287.

6) Treated according to ASTM A564 (H1025); 1040C solution anneal, 550C aging for 4 hours. HIP prior to solution anneal (e.g., 1160C hold for 3 hrs) optional. Variations in H1025 peak temperature and age hold time will impact strength and fracture elongation.

7) Uniformity Labs Annealed and Aged properties are compared to Armco 17-4PH stainless steel datasheet. Armco datasheet can be found: https://www.aksteel.nl/files/downloads/172888_armco_17-4_ph_pdb_euro_final_secured_89.pdf