






Velo3D Sapphire Printer Family Materials Overview

The Sapphire family of printers are capable of printing a variety of metals, depending on the need and use case. This flexibility gives engineers more options and configurations to achieve their goals. Furthermore, Velo3D participates in a NASA guided program to build a database of material properties.

This process, while targeted at the qualification required for manned space flight, is highly applicable to many industries and helps to establish a set of design allowables for each material. Detailed material properties are available from our website or by [contacting our engineering team](#).

Image	Name	Known for	Typical Applications
	Aheadd® CP1	Aheadd CP1 is Constellium’s new high-performance Aluminum-Iron-Zirconium powder, designed for laser powder bed fusion. Aheadd CP1 brings high strength and ductility, excellent thermal and electrical conductivity, high productivity LPBF processing, and simplified post-processing.	Ideal for heat transfer applications in the motorsport, defense and aerospace industries.
	Aluminum F357	A foundry-grade beryllium free aluminum-silicon alloy. It has excellent weldability and corrosion resistance and is heat treatable to T5, T6, and T7. It is a lightweight, corrosion resistant, and highly dynamic load-bearing material.	Ideal for heat transfer in the defense and automotive industries.
	Copper GRCop-42	A copper-chromium-niobium alloy, developed by NASA to additively manufacture parts in need of high-strength dispersion and high conductivity. It retains strength at temperature, has excellent creep resistance, and a low cycle fatigue life.	Valuable for rocket engine components such as fuel injector faces and combustion chamber linings with regenerative cooling.
	HASTELLOY® C22	An alloy containing chromium, molybdenum, tungsten, and iron, making the alloy resistant to seawater corrosion with excellent weldability. Resistant to both uniform and localized corrosion and a variety of mixed industrial chemicals. Superior pitting, crevice attack, and stress corrosion cracking.	Used in corrosive environments with high chloride and high temperature conditions, such as flue-gas scrubbers, nuclear fuel re-processing, sour gas handling, and pesticide production.
	HASTELLOY® X	A nickel-chromium-iron-molybdenum alloy that is corrosion resistant. It possesses excellent forming and welding characteristics and is easy to fabricate with localized corrosion resistance and oxidation resistance up to 2200° F (1200° C).	Used in high temperature and corrosive atmosphere applications. Commonly used in gas turbines, energy generation applications such as transition duct, combustor cans, afterburners, and spray bars.
	forAM® HAYNES® 282®	A gamma-prime strengthened superalloy developed for high temperature structural applications, especially those in aero and industrial gas turbine engines. It possesses a unique combination of creep strength, thermal stability, weldability, and fabricability.	Ideal for high temperature applications such as gas turbine and power/process industry parts.
	HAYNES® 214® (UNS N07214)	A nickel-chromium-aluminum-iron alloy designed to provide the optimum high-temperature oxidation resistance, while at the same time allowing for conventional forming and joining. This alloy offers outstanding oxidation resistance to 2300° F (1260° C).	Ideal for high temperature, oxygen rich environments including turbo-machinery components found in rocket engines.
	Inconel® 625	A nickel-based superalloy that possesses high strength properties and resistance to elevated temperature. Shows remarkable protection against corrosion and oxidation. It has an ability to withstand high stress over a wide temperature range, both in and out of water, as well as resisting corrosion while exposed to highly acidic environments.	Ideal for nuclear energy and marine applications.

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	Inconel® 718	A precipitation-hardenable nickel-based alloy known for superb tensile strength under extreme pressure and heat. It has rupture strength at temperatures up to 1290° F (700° C), and is characterized by its superb fatigue, creep and corrosion resistance in extreme environments.	Ideal for applications in gas turbine and power/process industry parts in aerospace, defense, and chemical industries.
	M300 Steel	M300 Steel is an ultra-low carbon alloy with very high strength and hardness properties derived from intermetallic compounds rather than carbon content. The material is comprised mainly of nickel, with cobalt, molybdenum, and titanium as secondary intermetallic alloying metals.	Ideal for tooling applications such as High Pressure Die Cast (HPDC) inserts, injection molding, and other types of tooling.
	Scalmalloy®	Made from scandium (Sc), aluminum (Al) and magnesium (Mg), it is the only AM alloy which substitutes for high strength 7000-series aluminum. It has outstanding properties in terms of weldability and low thermal expansion, and is well-suited for anodizing processes and offers good corrosion resistance.	Ideal for highly loaded, safety-critical parts exposed to high mechanical stress and which are required to be light weight.
	Stainless 415	Stainless Steel 415 is a chromium-nickel stainless steel with additional molybdenum. Stainless 415 exhibits high mechanical properties due to the concentration of molybdenum and nickel. Its molybdenum content also provides basic pitting and crevice corrosion resistance.	The combination of good corrosion resistance and excellent strength and toughness makes it a perfect candidate for mechanically highly stressed components in wet corrosive environments.
	Ti 6Al-4V	An alpha-beta titanium alloy characterized by its strength-to-mass ratio and corrosion resistance. It is a strong lightweight alloy suitable for highly loaded structures. Parts built with this alloy on a Velo3D Sapphire printer can be heat treated like other manufacturing methods.	Used in jet engines, gas turbines, pressure vessels, and biomechanical components.

Alloy	Vendor	Vendor Part Number
Aheadd® CP1	Constellium	Aheadd CP1
Aluminum F357	Tekna	AlSi7Mg-63/20-F357
Aluminum F357	Tekna	AlSi7Mg-63/20-CS11
Aluminum F357	Valimet	AM-357
Copper GRCop-42	Carpenter	Carpenter CT-GRCop42-AAAA
Copper GRCop-42	KBM	RocketPowder GRUCU42015063ROC
Copper GRCop-42	Praxair	TruForm Cu42-N30
Copper GRCop-42	Praxair	TruForm CU42-P55
Hastelloy® X	Praxair	TruForm HXLC
Hastelloy® C22	Oerlikon	MetcoAdd 6022A
Hastelloy® C22	Praxair	Truform 22
Haynes® 214	Haynes	TruForm 214-N51
Haynes® 282	Höganäs	Amperprint 0233, Haynes 282
Inconel® 625	Carpenter	CarTech Micro-Melt 625
Inconel® 625	Praxair	TruForm 625-2
Inconel® 625	Tekna	Imphytek Ni-625

Alloy	Vendor	Vendor Part Number
Inconel® 718	Böhler Edelstahl	Böhler L718 AMPO
Inconel® 718 API	Böhler Edelstahl	Böhler L718API AMPO
Inconel® 718	Carpenter	PowderRange 718F
Inconel® 718 API	Carpenter	LPW-718API-AABH
Inconel® 718	Continuum	OptiPowder 718
Inconel® 718	Oerlikon	MetcoAdd 718C
Inconel® 718	Praxair	TruForm 718-35
M300 Steel	Praxair	FE-339-3
Scalmalloy®	Toyo Alum.	SCALMA40B5
Stainless 415	Carpenter	Carpenter CT 415-AAVD 45-90 µm
Ti-6Al-4V grade 5	AP&C	Ti-6Al-4V grade 5 45-106µm
Ti-6Al-4V grade 5	Tekna	TEKMAT Ti64-53/20, grade 5
Ti-6Al-4V ELI grade 23	Tekna	TEKMAT Ti64-53/20, grade 23
Ti-6Al-4V grade 23	AP&C	Ti6Al-4V grade 23 15-53
Ti-6Al-4V grade 23	Carpenter	Puris Ti 6Al-4V ELI Grade23 15-45
Ti-6Al-4V grade 23	Praxair	Ti-123, TruForm 64-23