Aheadd® CP1

AA8A61.50

MATERIAL DATA SHEET

Nikon SLM SOLUTIONS

MATERIAL DATA SHEET

Aheadd® CP1

AA8A61.50

MATERIAL

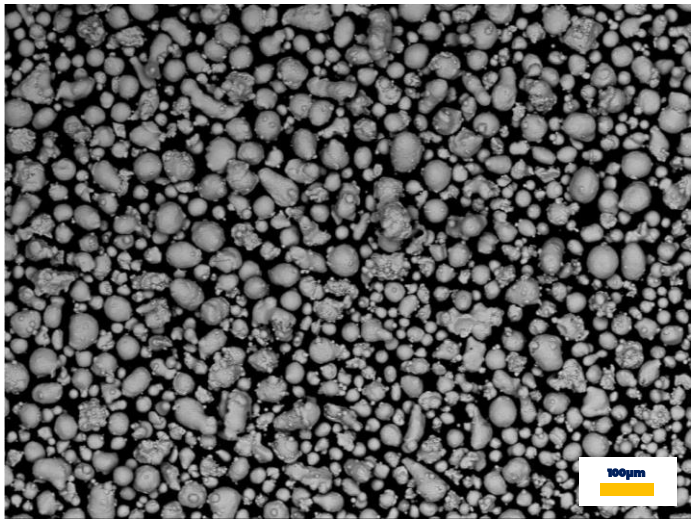
Aheadd® CP1 is a unique Al-alloy designed for the SLM® Process. Alloyed with minor amounts of Zr and Fe and no volatile elements such as Mg, Aheadd® CP1 has a unique combination of strength and ductility like 6000 series alloys, high thermal and electrical conductivity, an outstanding thermal stability up to 300°C, and good corrosion resistance. It can be anodized and polished to achieve the best surface properties for your application. The mechanical and thermal properties can be tailored with a single step heat treatment that does not require a quench, resulting in low anisotropy. Aheadd® CP1 is used in serial production of parts in diverse applications including heat exchangers or light weight parts under thermal load, structural parts, and crash proof parts.

CHEMICAL COMPOSITION

AA8A61.50[1]	Al	Zr	Fe
Min.	Bal.	0.9	0.8
Max.		1.4	1.4

POWDER PROPERTIES

Particle Size[1]	20-63 µm
Mass Density[2]	≈ 2.73 g/cm³
Particle Shape[3,4]	Spherical, typical batch morphology displayed below



MATERIAL DATA SHEET

Aheadd® CP1

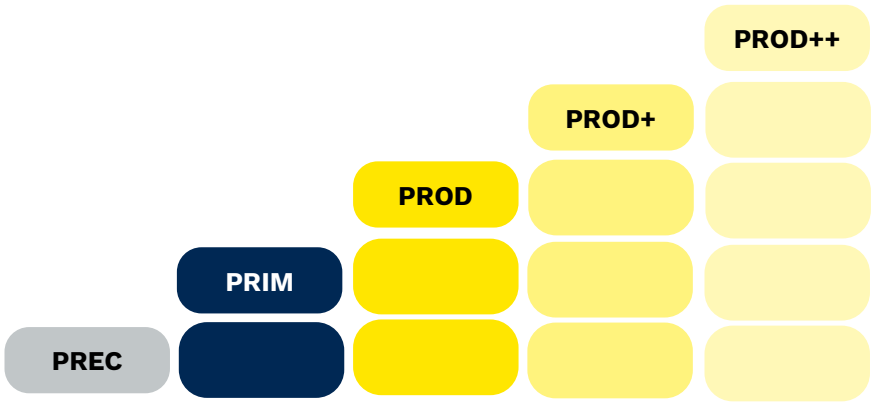
AA8A61.50

NIKON SLM® PARAMETERS

It only takes 3 tools to make you successful with metal additive manufacturing:

1. The **NIKON SLM® machine** fitting your needs,
2. The **metal powder** that defines the later purpose and functionality of a part,
3. Precisely engineered **NIKON SLM® parameters** as the missing link.

Our open parameters are the result of our vast experience in multi-laser technology and a diligent development and qualification procedure. They are key to produce fully functional parts with properties you can expect and rely on – whether you are new to AM or a large-scale production operator. We offer them to you in the following categories: **Precision (PREC)** for high-resolution complex details, **Prime (PRIM)** for balanced properties with improved productivity and **Productivity (PROD)** for the highest build rates. Pushing boundaries is in our work culture, we can also offer a new dimension of productivity on selected materials with **Productivity+ (PROD+)** and **Productivity++ (PROD++)** parameters.



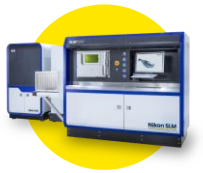
MATERIAL QUALIFICATION

As one of the inventors of the selective laser melting process, we impose the most comprehensive test procedures on ourselves: hundreds of samples, multiple systems, various powder batches, numerous heat-treatments, machined vs. near-net-shape tensile specimens, several surface roughness conditions and angles, fatigue behavior, corrosion investigation, creep testing... Did we miss anything? Get in touch with us!

MATERIAL DATA SHEET

Aheadd® CP1

AA8A61.50



SLM® 500 PRODUCTIVITY

Parameter Set	CP1_PROD_SLM500_MBP3_V1 (90 µm)
Machine Compatibility	SLM® 500 1.3 (700 W)
Validated Data Preparation	Materialise SLM Build Processor
Theoretical System Build Rate[5]	344.8 cm^3/h (Quad)
Minimum Relative Density[6, 7]	99.0 %

MECHANICAL PROPERTIES[7]

M: Mean | MIN: Minimum (95 % population coverage / 95 % confidence level)[8]

Non-heat-treated

	Tensile strength R_m [MPa]		Yield strength $R_{p0.2}$ [MPa]		Elongation at break A [%]	
Machined	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Horizontal	185	180	120	110	24	21
Vertical	180	175	115	110	23	15
Near-Net-Shape	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	180	170	115	105	25	18

Heat-treated (HT1)[9]

	Tensile strength R_m [MPa]		Yield strength $R_{p0.2}$ [MPa]		Elongation at break A [%]	
Machined	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Horizontal	305	300	275	270	16	10
Vertical	300	290	275	265	14	7

HARDNESS[10]

M: Mean | MIN: Minimum (95% Population Coverage / 95% Confidence Level)[8]

	Vickers hardness HV5	
	M	**MIN**
NHT	56	50
HT1[9]	98	93

SURFACE ROUGHNESS[11]

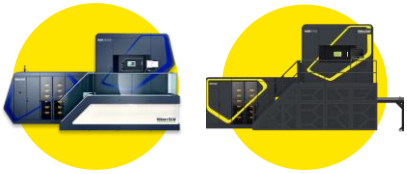
M: Mean | MAX: Maximum (95% Population Coverage / 95% Confidence Level)[8]

	Roughness average Ra [µm]		Mean roughness depth Rz [µm]	
	M	**MAX**	**M**	**MAX**
As built	14	18	85	114

MATERIAL DATA SHEET

Aheadd® CP1

AA8A61.50



NXG PRIME

Parameter Set	CP1_NXG600_PRIM_MBP3_V1 (60 µm)
Machine Compatibility	NXG XII 600, NXG 600E (1000 W)
Validated Data Preparation	Materialise SLM Build Processor
Theoretical System Build Rate[5]	636 cm³/h (12 Lasers)
Minimum Relative Density[6,7]	99.8 %

MECHANICAL PROPERTIES[7]

M: Mean | MIN: Minimum (95 % population coverage / 95 % confidence level)[8]

Non-heat-treated

	Tensile strength R_m [MPa]		Yield strength $R_{p0.2}$ [MPa]		Elongation at break A [%]	
Machined	M	MIN	M	MIN	M	MIN
Horizontal	185	180	135	130	24	22
Vertical	185	180	120	115	24	21

Heat-treated (HT1)[9]

	Tensile strength R_m [MPa]		Yield strength $R_{p0.2}$ [MPa]		Elongation at break A [%]	
Machined	M	MIN	M	MIN	M	MIN
Vertical	315	305	295	285	16	12

HARDNESS[10]

M: Mean | MIN: Minimum (95% Population Coverage / 95% Confidence Level)[8]

	Vickers hardness HV5	
	M	MIN
NHT	57	55
HT1[9]	97	93

SURFACE ROUGHNESS[11]

M: Mean | MAX: Maximum (95% Population Coverage / 95% Confidence Level)[8]

	Roughness average Ra [µm]		Mean roughness depth Rz [µm]	
	M	MAX	M	MAX
As built	Pending		Pending	

MATERIAL DATA SHEET

Aheadd® CP1

AA8A61.50

DISCLAIMER

The properties and mechanical characteristics apply to powder that is tested and sold by Nikon SLM Solutions, and that has been processed on Nikon SLM Solutions machines using the original Nikon SLM Solutions parameters in compliance with the applicable operating instructions (including installation conditions and maintenance). The part properties are determined based on specified procedures. More details about the procedures used by Nikon SLM Solutions are available upon request.

The specifications correspond to the most recent knowledge and experience available to us at the time of publication and do not form a sufficient basis for component design on their own. Certain properties of products or parts or the suitability of products or parts for specific applications are not guaranteed. The manufacturer of the products or parts is responsible for the qualified verification of the properties and their suitability for specific applications. The manufacturer of the products or parts is responsible for protecting any third-party proprietary rights as well as existing laws and regulations.

MDS_Aheadd® CP1_2024-11.2_EN

CONTACT

Headquarters

Nikon SLM Solutions AG
Estlandring 4
23560 Lübeck
Germany

Phone: +49 451 4060-3000

www.nikon-slm-solutions.com

NOTES

[1] With respect to powder material. Compositions stated as mass or weight percent.

[2] Material density varies within the range of possible chemical composition variations.

[3] According to DIN EN ISO 3252:2023.

[4] Secondary Electron Image of a typical powder batch.

[5] Theoretical system build rate = layer thickness x scan speed x hatch distance x number of lasers. The value represents a com-parable indicator but remains a theoretical value after all. It does expressively not reflect true build rates, which are influenced by part geometry, ratio between hatch and contour areas, area of exposure, recoating times, and more.

[6] Optical density determination at test specimens by light microscopy according to internal specification. Relative density may vary depending on part geometry, orientation, volume, and other process factors. Population coverage: 99 %, confidence level: 99 %.

[7] Tensile testing was performed in accordance to DIN EN ISO 6892-1:2020 B and conducted at room temperature. Samples are either machined before testing or tested in near-net-shape without any surface finishing (geometry according to DIN 50125:2022-C6x30). Samples labelled “Horizontal” correspond to a polar angle of $\theta = 90°$; samples labelled “vertical” correspond to a polar angle of $\theta = 0°$ (DIN EN ISO/ASTM 52921). Values include overlap samples, i.e. multiple lasers work simultaneously on one specimen. All data is derived from standardized SLM Solutions qualification jobs. Samples are built out of both virgin powder as well as used powder. Population coverage: 95 %, confidence level: 95 %.

[8] Minimum values are set by using tolerance interval method, which is a statistical approach based on the input of population coverage (PC) and confidence level (CL). Tolerance intervals ensure that a certain percentage of samples within a batch will be above the minimum value with a certain probability, e.g. the probability that 95 % of all samples will be above the stated minimum value (within a defined batch and tested according to mentioned specifications) is 95 %.

[9] Heat treatment, set temperature of 400°C with a ramp up rate of 20°C/min, in air, load samples or component when oven has reached 200°C, hold at 400°C for 4 hours, furnace cool by turning furnace off, remove samples at 200°C or lower and air cool.

[10] Hardness testing according to DIN EN ISO 6507-1:2024. Measurement direction “2” according to VDI 3405 2.1. Values include overlap samples, i.e. multiple lasers work simultaneously on one specimen. All data is derived from standardized SLM Solutions qualification jobs. Samples are built out of both virgin powder as well as used powder.

[11] Roughness measurement on vertical walls according to DIN EN ISO 21920-3:2022; $\lambda c = 2.5$ mm. Values include overlap samples, i.e. multiple lasers work simultaneously on one specimen. All data is derived from standardized SLM Solutions qualification jobs. Samples are built out of both virgin powder as well as used powder.