AlSi10Mg

DIN EN 1706 / EN AC-43000

MATERIAL DATA SHEET

Nikon SLM SOLUTIONS

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MATERIAL

Aluminum – a lightweight and versatile material for more than 100 years now. Various processing routes (e.g. casting, rolling, forging) combined with good strength at a low mass density make aluminum an excellent choice for industrial applications. Good thermal and electrical conductivities as well as a high resistance in corrosive atmosphere complete the profile. AlSi10Mg is one of the most common aluminum alloys, originally designed as hardenable casting alloy for sophisticated designs. Due to its inherent characteristics, AlSi10Mg is particularly suited for lightweight designs and highly stressed components with famous examples from aerospace engineering or the automotive industry – even facing dynamic loads.

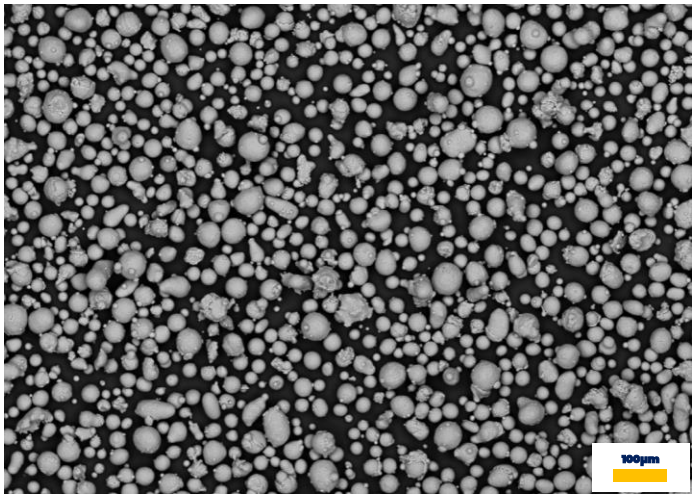
CHEMICAL COMPOSITION

DIN EN 1706[1]

	Al	Si	Mg	Fe	Mn	Ti	Zn	Cu	Ni	Pb	Sn	Total each	Total others
Min.	Bal.	9.00	0.20										
Max.		11.00	0.45	0.55	0.45	0.15	0.10	0.05	0.05	0.05	0.05	0.05	0.15

POWDER PROPERTIES

Particle Size[1]	20-63 µm
Mass Density[2]	≈ 2.67 g/cm³
Particle Shape[3,4]	Spherical, typical batch morphology displayed below



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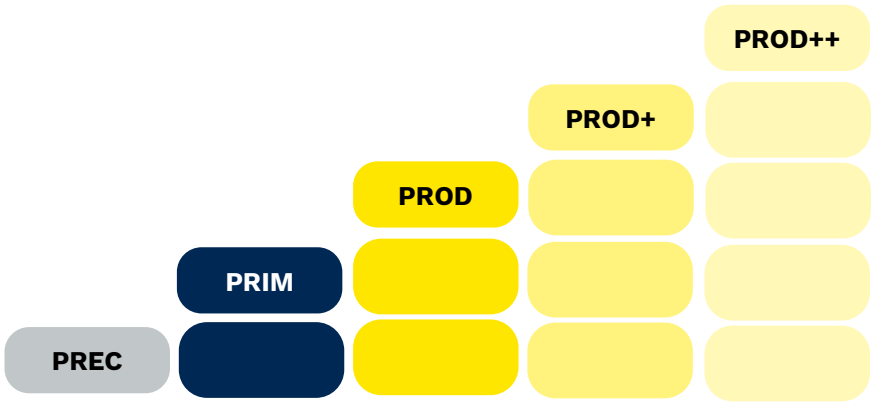
NIKON SLM® PARAMETERS

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

AlSi10Mg

DIN EN 1706 / EN AC-43000

SLM® 280 PRECISION

Parameter Set	AlSi10Mg_SLM280_PREC_MBP3_V1 (30 µm)
Machine Compatibility	SLM® 280 2.0, SLM® 280 Production System (400W)
Validated Data Preparation	Materialise SLM Build Processor
Theoretical System Build Rate[5]	49 cm³/h (Twin)
Minimum Relative Density[6, 8]	99.9 %

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	465	460	305	300	9	6
Vertical	475	445	270	255	6	3
Near-Net-Shape	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	425	380	255	240	5	2

HARDNESS[9]

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

	Vickers hardness HV5	
	M	**MIN**
As built	128	125

SURFACE ROUGHNESS[10]

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	5	22	64	120

MATERIAL DATA SHEET

AlSi10Mg

DIN EN 1706 / EN AC-43000

SLM® 280 PRIME

Parameter Set	AlSi10Mg_SLM280_PRIM_MBP3_V1 (60 µm)
Machine Compatibility	SLM® 280 2.0, SLM® 280 Production System (700 W)
Validated Data Preparation	Materialise SLM Build Processor
Theoretical System Build Rate[5]	136 cm³/h (Twin)
Minimum Relative Density[6,8]	99.5 %

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	445	435	285	270	6	3
Vertical	435	390	255	240	4	2
Near-Net-Shape	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	370	330	245	230	3	1

HARDNESS[9]

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

	Vickers hardness HV5	
	M	**MIN**
NHT	123	117

SURFACE ROUGHNESS[10]

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	23	33	134	178

MATERIAL DATA SHEET

AlSi10Mg

DIN EN 1706 / EN AC-43000

SLM® 280 PRODUCTIVITY

Parameter Set	AlSi10Mg_SLM280_PROD_MBP3_V1 (90 µm)
Machine Compatibility	SLM® 280 2.0, SLM® 280 Production Series (700 W)
Validated Data Preparation	Materialise SLM Build Processor
Theoretical System Build Rate[5]	172.5 cm³/h (Twin)
Minimum Relative Density[6,8]	99.5 %

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	425	410	265	250	5	3
Vertical	415	380	235	225	4	2
Near-Net-Shape	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	360	330	230	215	3	1

HARDNESS[9]

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

	Vickers hardness HV5	
	M	**MIN**
NHT	120	114

SURFACE ROUGHNESS[10]

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	16	23	93	128

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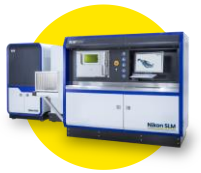

SLM® 500 PRECISION

Parameter Set	AlSi10Mg_SLM500_PREC_MBP3_V1 (30 µm)
Machine Compatibility	SLM® 500 1.3 (400 W)
Validated Data Preparation	Materialise SLM Build Processor
Theoretical System Build Rate[5]	98 cm³/h (Quad)
Minimum Relative Density[6, 8]	99.8 %

MECHANICAL PROPERTIES[7]

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

Non-heat-treated (NHT)

	Tensile strength R_m [MPa]		Yield strength $R_{p0.2}$ [MPa]		Elongation at break A [%]	
Machined	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Horizontal	450	435	300	290	8	6
Vertical	470	445	280	270	5	3
Near-Net-Shape	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	425	380	265	245	3	1

Heat-treated (SR1)[11]

	Tensile strength R_m [MPa]		Yield strength $R_{p0.2}$ [MPa]		Elongation at break A [%]	
Machined	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Horizontal	280	275	165	155	17	15
Vertical	285	275	165	155	14	11
Near-Net-Shape	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	270	260	150	140	15	12

HARDNESS[9]

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

	Vickers hardness HV5	
	M	**MIN**
NHT	127	120

SURFACE ROUGHNESS[10]

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	12	25	80	152

MATERIAL DATA SHEET

AlSi10Mg

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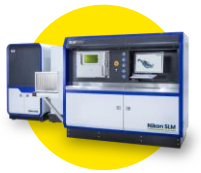

SLM® 500 PRIME

Parameter Set	AlSi10Mg_SLM500_PRIM_MBP3_V1 (60 µm)
Machine Compatibility	SLM® 500 1.3 (700 W)
Validated Data Preparation	Materialise SLM Build Processor
Theoretical System Build Rate[5]	272 cm³/h (Quad)
Minimum Relative Density[6, 8]	99.4 %

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	430	405	275	250	6	3
Vertical	425	385	255	245	4	1
Near-Net-Shape	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	375	340	245	225	3	1

Heat-treated (SR1)[11]

	Tensile strength R_m [MPa]		Yield strength $R_{p0.2}$ [MPa]		Elongation at break A [%]	
Machined	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Horizontal	275	260	145	130	14	11
Vertical	280	265	150	135	10	5
Near-Net-Shape	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	255	240	135	125	10	3

HARDNESS[9]

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

	Vickers hardness HV5	
	M	**MIN**
NHT	120	114

SURFACE ROUGHNESS[10]

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	20	23	118	139

MATERIAL DATA SHEET

AlSi10Mg

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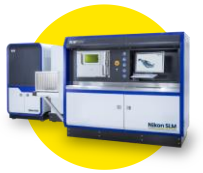


SLM® 500 PRODUCTIVITY

Parameter Set	AlSi10Mg_SLM500_PROD_MBP3_V1 (90 µm)
Machine Compatibility	SLM® 500 1.3 (700 W)
Validated Data Preparation	Materialise SLM Build Processor
Theoretical System Build Rate[5]	345 cm³/h (Quad)
Minimum Relative Density[6, 8]	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	405	380	250	225	6	3
Vertical	400	365	235	225	4	2
Near-Net-Shape	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	345	315	230	210	2	1

Heat-treated (SR1)[11]

	Tensile strength R_m [MPa]		Yield strength $R_{p0.2}$ [MPa]		Elongation at break A [%]	
Machined	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Horizontal	260	250	130	120	15	11
Vertical	270	265	140	120	10	5
Near-Net-Shape	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	250	230	125	115	6	4

HARDNESS[9]

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

	Vickers hardness HV5	
	M	**MIN**
NHT	114	106

SURFACE ROUGHNESS[10]

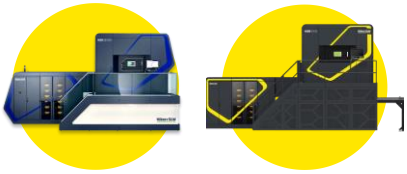
M: Mean | MAX: Maximum (95% Population Coverage / 95% Confidence Level)[8]

	Roughness average Ra [µm]		Mean roughness depth Rz [µm]	
	M	**MAX**	**M**	**MAX**
As built	15	24	92	141

MATERIAL DATA SHEET

AlSi10Mg

DIN EN 1706 / EN AC-43000



NXG PRIME

Parameter Set	AlSi10Mg_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]	720 cm³/h (12 Lasers)
Minimum Relative Density[6, 8]	99.6 %

MECHANICAL PROPERTIES

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	425	400	275	265	6	3
Vertical	430	410	250	240	4	2
Near-Net-Shape	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	385	360	245	230	3	1

Heat-treated (SR1)[11]

	Tensile strength R_m [MPa]		Yield strength $R_{p0.2}$ [MPa]		Elongation at break A [%]	
Machined	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	295	280	165	160	9	7
Near-Net-Shape	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	285	275	155	145	9	7

HARDNESS[9]

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

	Vickers hardness HV5	
	M	**MIN**
NHT	115	110

SURFACE ROUGHNESS[10]

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	13	16	77	95

MATERIAL DATA SHEET

AlSi10Mg

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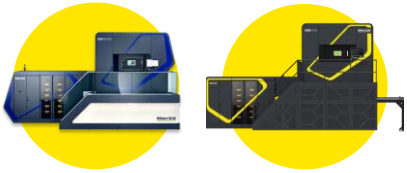

NXG PRODUCTIVITY

Parameter Set	AlSi10Mg_NXG600_PROD_MBP3_V1 (90 µm)
Machine Compatibility	NXG XII 600, NXG 600E (1000 W)
Validated Data Preparation	Materialise SLM Build Processor
Theoretical System Build Rate[5]	1200 cm³/h (12 Lasers)
Minimum Relative Density[6, 8]	98.8 %

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**
Vertical	330	280	240	230	2	1
Near-Net-Shape	**M**		**M**		**M**	
Vertical	325	295	235	225	2	1

Heat-treated (SR1)[11]

	Tensile strength R_m [MPa]		Yield strength $R_{p0.2}$ [MPa]		Elongation at break A [%]	
Machined	**M**	**MIN**	**M**	**MIN**	**M**	**MIN**
Vertical	250	210	145	135	5	1
Near-Net-Shape	**M**		**M**		**M**	
Vertical	255	225	140	130	4	1

HARDNESS[9]

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

	Vickers hardness HV5	
	M	**MIN**
NHT	115	110

SURFACE ROUGHNESS[10]

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	15	17	90	107

MATERIAL DATA SHEET

AlSi10Mg

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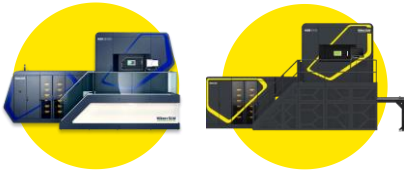

NXG PRODUCTIVITY+

Parameter Set	AlSi10Mg_NXG600_PROD+_MBP3_V1 (120 µm)
Machine Compatibility	NXG XII 600, NXG 600E (1000 W)
Validated Data Preparation	Materialise SLM Build Processor
Theoretical System Build Rate[5]	1850 cm³/h (12 Lasers)
Minimum Relative Density[6, 8]	98.7 %

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**	**M**	**M**
Vertical	280	255	1
Near-Net-Shape	**M**	**M**	**M**
Vertical	280	230	1

HARDNESS[9]

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

	Vickers hardness HV5	
	M	**MIN**
NHT	110	105

SURFACE ROUGHNESS[10]

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	17	90	107

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AlSi10Mg

DIN EN 1706 / EN AC-43000

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_AlSi10Mg_2024-04.1_EN

CONTACT

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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 (method A / method 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-D6x30 and 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] 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.

[10] Roughness measurement on vertical walls according to DIN EN ISO 21920-3:2022; $\lambda c = 2.5$ mm. Glass bead blasting is an additional post-processing step after corundum blasting. 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] Stress relieving according to ASTM F3318-18, at 285°C (+/-14°C), held for 120 min (+/-15 min) cooled in air.