Metal Powders for Additive Manufacturing

A member of ALTANA

ECKART

Metal Powders for Additive Manufacturing

ECKART, as member of the ALTANA group, is one of the leading global players with decades of experience in the field of atomization of pure, spherical aluminium powder. Thanks to our high production capacity, we can guarantee reliable supplies.

With the acquisition of TLS, we extended our portfolio with a variety of different metal alloy powders – titanium, aluminium and copper based – as well as the option to provide customized solutions. We are your partner of choice for DIN EN 9100:2018 certified production.

Metal Powders for Additive Manufacturing

A20X: The worldwide strongest aluminium alloy

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A20X: The worldwide strongest aluminium alloy

A20X powder for Additive Manufacturing has been developed for high strength applications, with high temperature capacity. Supplied from the MMPDS approved A205 aluminium alloy to meet the most demanding aerospace use and in and in the A207 version to tolerate higher temperature as an alternative to Al-Si alloys.

- **Aerospace approved as AMS 7033**
- **High temperature performance >180 °C**
- **Fatigue properties significantly exceed other Al alloys**
- **20-63 micron spherical powder**
- **Useable on all LPBF AM Machines**
- **In full aerospace production.**

Composition

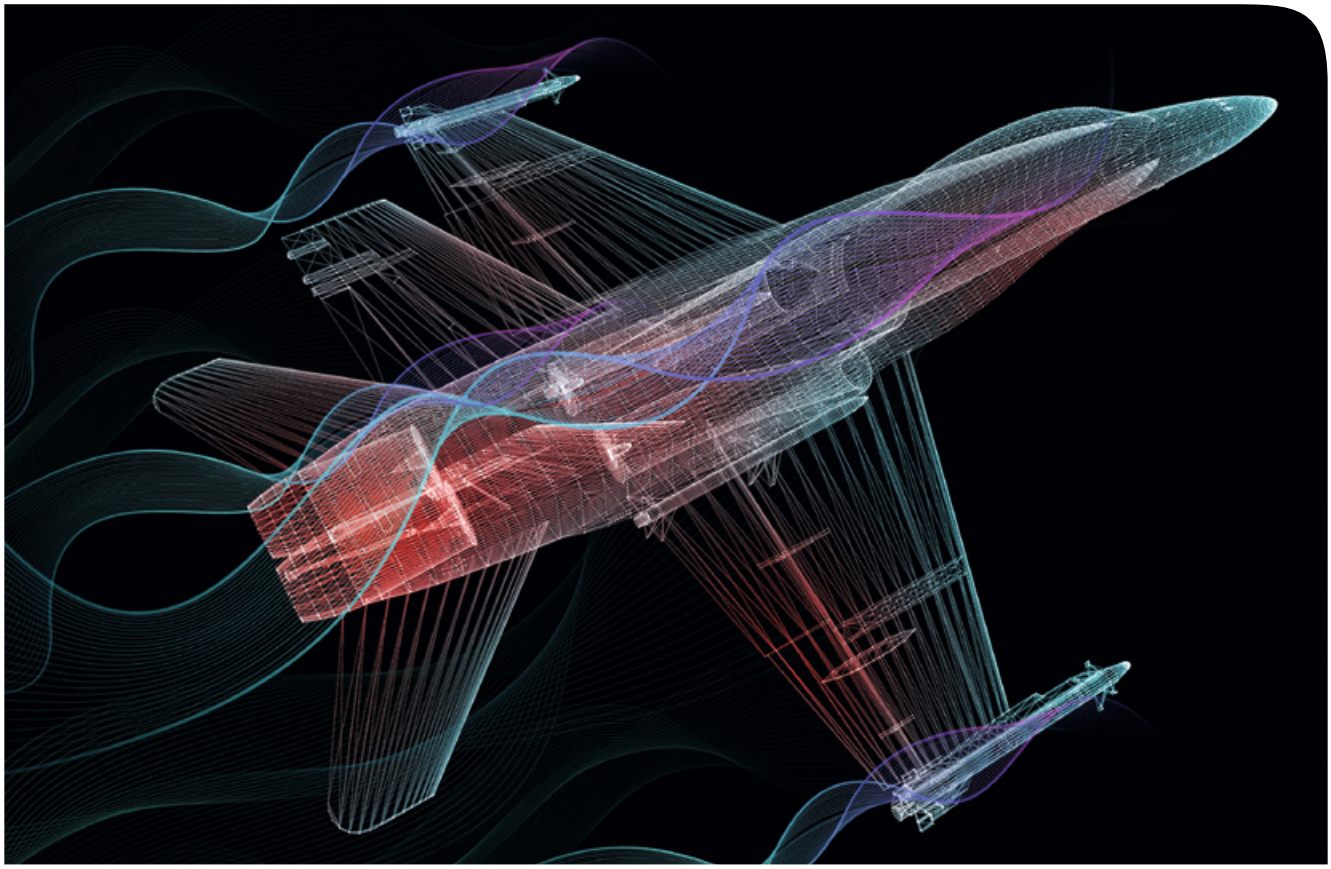
The composition conforms to alloy specification AMS 4471, with the weight percentages shown in the table below, as determined by wet chemical methods in accordance with ASTM E 34, and by spectro-chemical methods in accordance with ASTM E 1251.

Al	Cu	Mg	Ag	Ti	B	Si	Fe	Others, each	Others max.
Bal.	4.20 – 5.00	0.20 – 0.33	0.60 – 0.90	3.00 – 3.85	1.25 – 1.55	0.10 max.	0.08 max.	0.08 max.	0.17 max.

Properties

Density
Bulk density of the alloy : 2.85 g/cm3

Density achieved in Laser Powder Bed Fusion >99.7% without addition HIP operation.

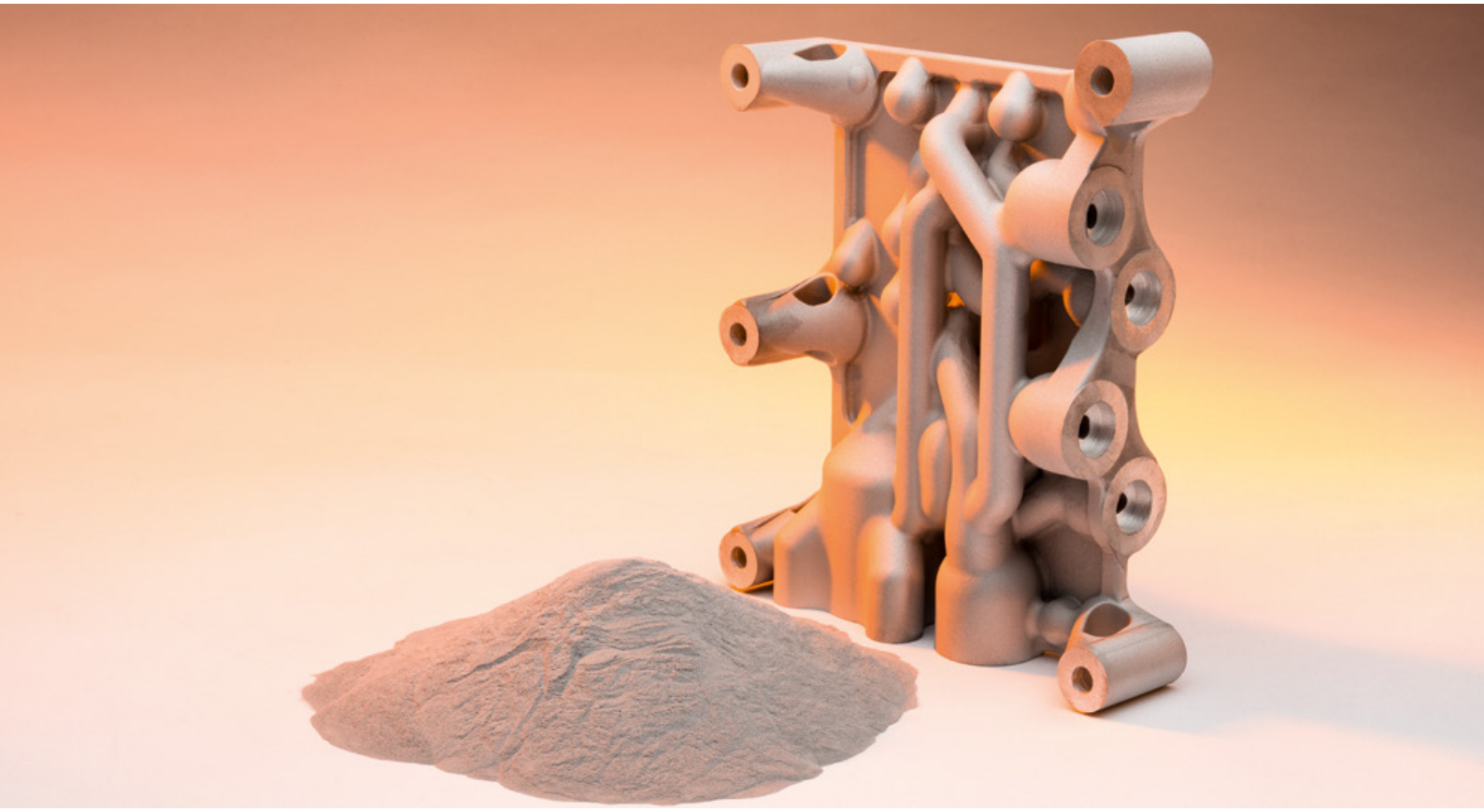


Tensile Properties (room temperature)

	As built	Stress Relieved[1]	Heat Treatment[2]
Tensile Strenght (MPa)	357 – 394	312	450 – 511
Yield Stress (MPa)	350 – 385	310	390 – 440
Elongation (%)	12 – 15	20	10 – 13
Young's Modlus (GPa)	74	77	79

All mechanical testing at room temperature to ASTM B557. Hardness minimum of 140HV. Test bars machined prior to testing. NONE OF THE TEST BARS HAVE BEEN HIP TREATED.
(1) Stress Relieved on the build plate at 300oC for 2 hours, air cooled.
(2) AMT Proprietary Heat Treatment, involving solution treatment, quench and then precipitation hardening, to T7 condition

Temperature	Tensile Strength	Yield Stress	Elongation
20°C	511 MPa	445 MPa	11%
100°C	423 MPa	375 MPa	10%
150°C	369 MPa	345 MPa	20%
200°C	331 MPa	311 MPa	15%
250°C	224 MPa	215 MPa	12%

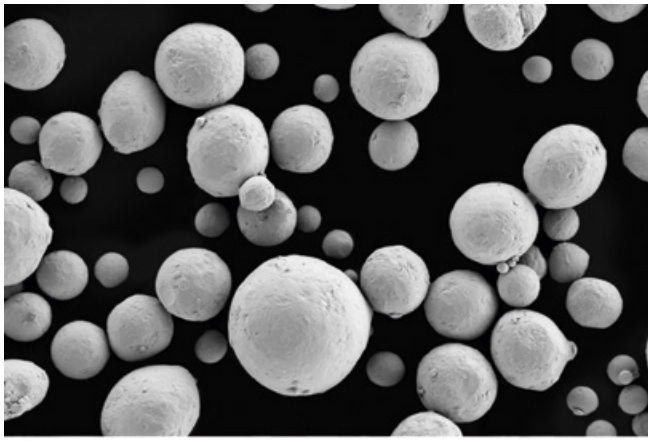


Overview of ECKART TLS Powders

ECKART TLS Copper Powder

Almost all industries hold copper and copper alloys in high regard for their high electrical and thermal conductivity. The application range includes LPBF, EBM, Laser Cladding and Cold Spray. In additive manufacturing, copper powders are used to produce heat exchanger components, components for electrical technology and inductions coils, for example. ECKART TLS offers a wide product range from standard, like low oxygen Cu and CuCr1Zr to special customized alloys.

All grades of copper powder are produced by inert gas atomization, resulting in high quality and spherical powders that are free of contamination.



Chemical Composition

ECKART TLS standard copper powder from stock

	Composition (wt%)				
	Cu	Cr	Zr	Fe	Si
OFHC-Cu	≥99.95	–	–	–	–
Cu 99,7	≥99.70	–	–	–	–
CuCr1Zr	Bal.	0.50 – 1.20	0.03 – 0.30	≤0.08	≤0.10

CuCr1Zr according to CW106C.
Raw material chemical composition of OFHC-Cu according to CW007A

Particle Size Distribution and Powder Properties

Particle size distribution and physical powder properties of copper powder sizes are listed below.
Copper powder sizes according to customer specifications are also available on request.

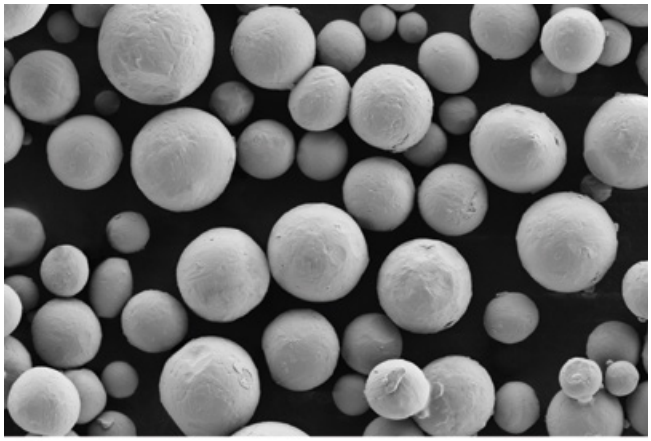
	Particle Size Distribution (µm)			Powder Properties		
	D(10)	D(50)	D(90)	Flow Rate	Apparent Density	Circularity
15 – 53µm	10 – 20	26 – 36	42 – 54	–	–	≥0.94
20 – 63µm*	20 – 30	36 – 46	57 – 65	≤16s/50g	>4.70g/cm³	≥0.94
45 – 100µm	45 – 56	63 – 78	80 – 110	≤15s/50g	>4.80g/cm³	≥0.94

Particle size distribution according to ASTM B822. Flow rate and apparent density according to ASTM B213 and ASTM B212.
Circularity according to ISO 9276-6, mean values measured via dynamic image analysis (ISO 13322-2).
*20-63µm only available for CuCr1Zr.

ECKART TLS Titanium Powder

ECKART TLS has been producing high quality metal powders for over 25 years, developing its processes for a constant improvement in quality. ECKART TLS titanium powder can be used in a wide range of applications, especially in additive manufacturing with powder bed fusing using laser (LPBF) or electron beam (EB-PBF) and also in Metal Injection Molding (MIM).

All grades of titanium powder are produced by inert gas atomization, resulting in high quality and spherical powders that are free of contamination.



Chemical Composition

ECKART TLS titanium powder from stock is available as Grade 1, Grade 2, Grade 5 and Grade 23.

	Composition (wt%)								
	Ti	Al	V	Fe	C	N	H	O-Limit	O-Typical*
Grade 1	Bal.	–	–	≤0.20	≤0.08	≤0.03	≤0.015	≤0.18	0,12
Grade 2	Bal.	–	–	≤0.30	≤0.08	≤0.03	≤0.015	≤0.25	0,15
Grade 5	Bal.	5.50 – 6.75	3.50 – 4.50	≤0.40	≤0.08	≤0.05	≤0.015	≤0.20	0,11
Grade 23	Bal.	5.50 – 6.50	3.50 – 4.50	≤0.25	≤0.08	≤0.03	≤0.0125	≤0.13	0,08

Powder chemical composition of Grade 1 and 2 according to ASTM B348, may also comply with ASTM F67 and F1580.
Powder chemical composition of Grade 5 according to ASTM B348, may also comply with ASTM F136, F1580 and F2924.
Powder chemical composition of Grade 23 according to ASTM B348, may also comply with ASTM F136, F1580, F2924 and F3001.
*Oxygen content strongly depends on the grain size.

Particle Size Distribution and Powder Properties

Particle size distribution and physical powder properties of titanium powder sizes are listed below.
Titanium powder sizes according to customer specifications are also available on request.

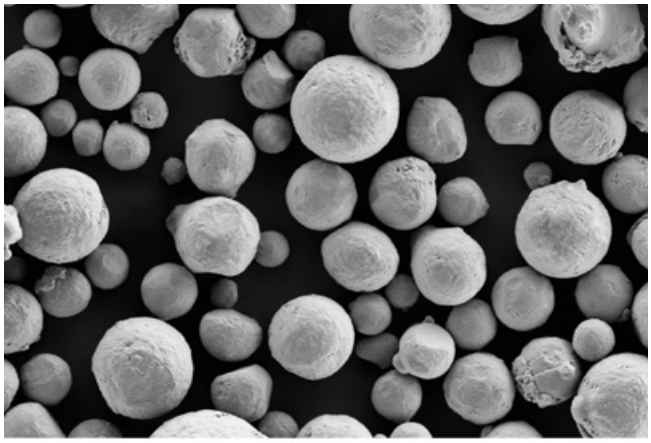
	Particle Size Distribution (µm)			Powder Properties	
	D(10)	D(50)	D(90)	Flow Rate	Apparent Density
– 32µm	7 – 13	17 – 23	29 – 35	–	–
10 – 45µm	8 – 16	23 – 33	40 – 50	–	–
20 – 53µm	20 – 30	35 – 45	55 – 65	≤40s/50g	≥2.20g/cm³
20 – 63µm	25 – 35	40 – 50	60 – 70	≤35s/50g	≥2.20g/cm³
45 – 100µm	45 – 55	65 – 75	95 – 105	≤28s/50g	≥2.40g/cm³

Particle size distribution according to ASTM B822. Flow rate and apparent density according to ASTM B213 and ASTM B212.

ECKART TLS Aluminium Powder

Traditionally AlSi10Mg is used as a casting alloy. In Additive Manufacturing, powder made from AlSi10Mg is commonly used due to the high corrosion resistance, low density and good mechanical strength of the final components. Typical applications are found in prototyping or small series productions within aerospace and automotive industry. ECKART TLS aluminium powder has a very good batch to batch consistency and is available from small to big size batches.

All grades of aluminium powder are produced by inert gas atomization, resulting in high quality and spherical powders that are free of contamination.



Chemical Composition

ECKART TLS standard aluminium powder from stock

	Composition (wt%)										
	Al	Si	Mg	Fe	Ti	Zn	Mn	Cu	Cr	OE	OT
AlSi10Mg	Bal.	9 – 11	0.20 – 0.45	≤0.55	≤0.15	≤0.10	≤0.45	≤0.05	–	≤0,05	≤0,15
AlSi7Mg0.6	Bal.	6.5 – 7.5	0.45 – 0.70	≤0.19	≤0.25	≤0.07	≤0.10	≤0.05	–	≤0,03	≤0,10

AlSi10Mg according to EN AC-43000. AlSi7Mg0.6 according to EN AC-42200.

Particle Size Distribution and Powder Properties

Particle size distribution and physical powder properties of aluminium powder sizes are listed below.
Aluminium powder sizes according to customer specifications are also available on request.

	Particle Size Distribution (µm)			Powder Properties		
	D(10)	D(50)	D(90)	Flow Rate	Apparent Density	Circularity
15 – 53µm	12 – 19	25 – 39	43 – 56	–	–	≥0.94
15 – 63µm	12 – 19	30 – 40	53 – 63	–	–	≥0.94
20 – 63µm	23 – 30	36 – 46	57 – 65	≤25s/50g	≥1.3g/cm³	≥0.94

Particle size distribution according to ASTM B822. Flow rate and apparent density according to ASTM B964 and ASTM B417.
Circularity according to ISO 9276-6, mean values measured via dynamic image analysis (ISO 13322-2).
Powder properties stated for AlSi10Mg.

Special alloys

ECKART TLS offers many different alloys. Our set-up consisting of several EIGA and crucible atomizers enables us to atomize alloys in a temperature range of 500 °C - 2500 °C. With the crucible atomizers, we have the option of alloying by ourselves, whereby in the EIGA pre-alloyed bars are used.

Here are a few examples of alloys we have already produced:

Aluminium:		
AlSi9Cu3	AlSi40	AlSi50
AlSn20Cu	AlSn40Cu	AlZnMg-alloys
Copper:		
CuSn-alloys	CuSi-alloys	CuAl-alloys
Titanium:		
Ti 5-5-5-3	Ti 6-2-4-2	Ti 6-2-4-6
TiNbZr	Ti6Al7Nb	TiAl
Zirconium:		
Zr702	Zr705	
Niobium:		
C103	NbZrTi	
Iron:		
FeSi3	FeAlTi	FeMnAl

Notes

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With compliments

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