



Metal Powders for Additive Manufacturing



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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	Metal Powders for Additive Manufacturing	Special alloys
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A20X

A20X – The worldwide strongest aluminium alloy

A20X powder for Additive Manufacturing has been developed for high strength applications, with high temperature capacity. This material, made from MMPDS-approved A205 aluminium alloy, meets demanding aerospace requirements and opens up new possibilities for applications where the properties of AlSi10Mg and other aluminium alloys are insufficient.

- **Aerospace approved as per AMS 7033**
- **High temperature performance up to 190 °C**
- **Fatigue properties significantly exceed other Al alloys**
- **Useable on all LPBF AM Machines**
- **In full aerospace production.**

Composition

The composition conforms to alloy specification AMS 7033, 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 >99.9% without additional HIP operation.

Tensile Properties (room temperature)

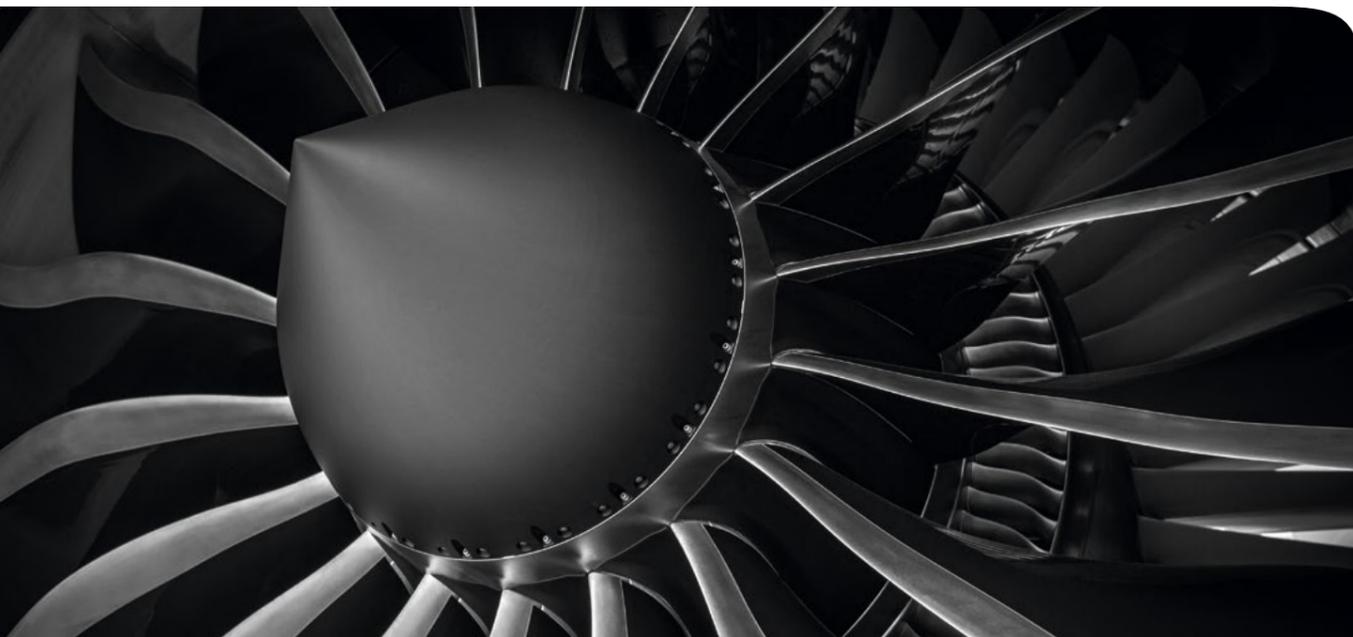
	As built	Stress Relieved ¹	Heat Treatment ²
Ultimate Tensile Strength (MPa)	357 – 394	312	450 – 511
Yield Strength (MPa)	350 – 385	310	390 – 440
Elongation (%)	12 – 15	20	10 – 13
Young's Modulus (GPa)	74	77	79

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 300 °C for 2 hours, air cooled.

(2) ECKART Proprietary Heat Treatment, involving solution treatment, quench and then precipitation hardening, to T7 condition

Temperature	Tensile Strength	Yield Strength	Elongation
20 °C	511 MPa	445 MPa	11%
100 °C	423 MPa	375 MPa	10%
150 °C	369 MPa	354 MPa	20%
200 °C	331 MPa	311 MPa	15%
250 C	224 MPa	215 MPa	12%



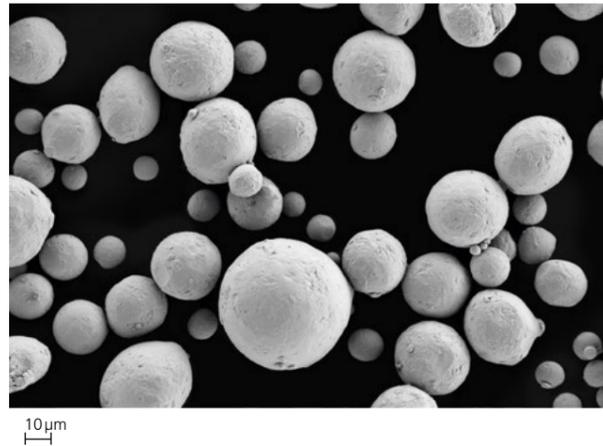
AMspheres Metal Powders

AMspheres 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 electronics and induction coils, for example. ECKART TLS offers a variety of AMspheres Cu powders, ranging from Oxygen-Free High-Conductivity Copper and CuCrZr to special customized alloys.

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



Chemical Composition

AMspheres Copper powders from stock.

AMspheres	Composition (wt%)	
	Cu	O
OFHC-Cu	≥99.95	≤0.05
Cu 99.7	≥99.7	≤0.3

Standard copper alloy powders.

AMspheres	Composition (wt%)										
	Cu	Cr	Zr	Fe	Si	Ni	Sn	Al	Mn	Zn	OE
CuCr1Zr	Bal.	0.50 – 1.20	0.03 – 0.3	≤0.08	≤0.10	–	–	–	–	–	≤0.2
CuAl10Fe5Ni5	Bal.	≤0.05	–	4.0 – 5.5	≤0.1	4.0 – 6.0	≤0.1	8.5 – 10.5	≤3.0	≤0.50	–
CuSn10	Bal.	–	–	–	–	–	9 – 11	–	–	–	–

CuCr1Zr according to CW106C.
CuAl10Fe5Ni5 according to CC333G.

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
15 – 53 µm	10 – 20	26 – 36	42 – 54	–	>4.7 g/cm ³
20 – 63 µm*	20 – 30	36 – 46	57 – 65	≤16 s/50g	>4.7 g/cm ³
45 – 100 µm	45 – 56	63 – 78	80 – 110	≤15 s/50g	>4.8 g/cm ³

Particle size distribution according to ASTM B822. Flow rate and apparent density according to ASTM B213 and ASTM B212. Apparent Density stated for pure copper powders. *20-63 µm not available for pure copper powders.



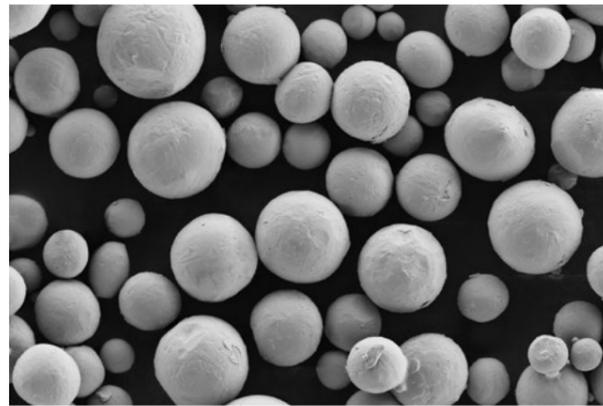
AMspheres Metal Powders

AMspheres Titanium Powder

ECKART TLS has been producing high quality metal powders for over 25 years, developing its processes for a constant improvement in quality. AMspheres 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 AMspheres Titanium Powder are produced by inert gas atomization, resulting in high quality and spherical powders that are free of contamination.



10µm



Chemical Composition

AMspheres Titanium powders from stock, available as Grade 1, Grade 2, Grade 5, and Grade 23.

AMspheres	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.	5.5 – 6.75	3.5 – 4.5	≤0.40	≤0.08	≤0.05	≤0.015	≤0.20	0.11
Grade 23	Bal.	5.5 – 6.5	3.5 – 4.5	≤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 is strongly dependent on the grain size.

AMspheres	Composition (wt%)											
	Ti	Al	Sn	Zr	Mo	Si	V	Cr	Fe	C	N	H
Ti6242	Bal.	5.5 – 6.5	1.8 – 2.2	3.6 – 4.4	1.8 – 2.2	0.06 – 0.10	–	–	≤0.10	≤0.05	≤0.05	≤0.0125
Ti6246	Bal.	5.5 – 6.5	1.75 – 2.25	3.5 – 4.5	5.5 – 6.5	–	–	–	≤0.15	≤0.04	≤0.04	≤0.0125
Ti5553	Bal.	4.4 – 5.7	–	<0.3	4.0 – 5.5	<0.15	4.0 – 5.5	2.5 – 3.5	0.3 – 0.5	≤0.10	≤0.05	≤0.015

Oxygen content is strongly dependent 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
– 25 µm*	7 – 10	13 – 18	25 – 30	–	≥2.0 g/cm³
– 32 µm	7 – 13	17 – 23	29 – 35	–	≥2.0 g/cm³
10 – 45 µm	8 – 16	23 – 33	40 – 50	–	≥2.0 g/cm³
20 – 53 µm	20 – 30	34 – 45	55 – 65	≤40s/50g	≥2.2 g/cm³
20 – 63 µm	25 – 35	40 – 50	58 – 70	≤40s/50g	≥2.2 g/cm³
20 – 75 µm	20 – 30	45 – 55	68 – 78	≤40s/50g	≥2.3 g/cm³
45 – 100 µm	45 – 55	65 – 75	95 – 105	≤40s/50g	≥2.4 g/cm³

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

*Particle size distribution only available for Grade 5 and Grade 23.



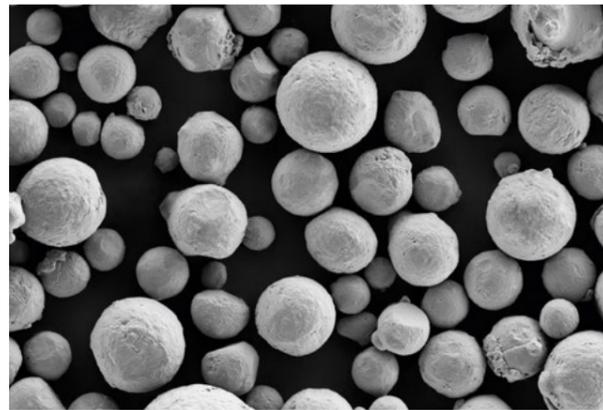
AMspheres Metal Powders

AMspheres 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 moderate mechanical strength of the final components. Typical applications are

found in prototyping or serial production within aerospace and automotive industries. AMspheres Aluminium Powder has a very good batch-to-batch consistency and is available from small to big size batches.

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



10 μm



Chemical Composition

AMspheres Aluminium powders from stock.

AMspheres	Composition (wt%)												
	Al	Si	Mg	Fe	Ti	Zn	Mn	Cu	Ni	Pb	Sn	OE	OT
AlSi10Mg	Bal.	9.0 – 11.0	0.20 – 0.45	≤0.55	≤0.15	≤0.10	≤0.45	≤0.05	≤0.05	≤0.05	≤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
Al	>99.7	≤0.06	–	≤0.15	–	–	–	–	–	–	–	–	–

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
15 – 53 μm	12 – 19	30 – 40	53 – 63	–	≥1.3 g/cm ³
20 – 63 μm	23 – 30	36 – 46	57 – 65	≤25 s/50 g	≥1.3 g/cm ³
20 – 75 μm	22 – 30	44 – 54	70 – 78	≤25 s/50 g	≥1.3 g/cm ³
45 – 100 μm	47 – 63	65 – 80	80 – 110	≤25 s/50 g	≥1.3 g/cm ³

Flow rate and apparent density according to ASTM B964 and ASTM B417. Powder properties stated for AlSi10Mg.



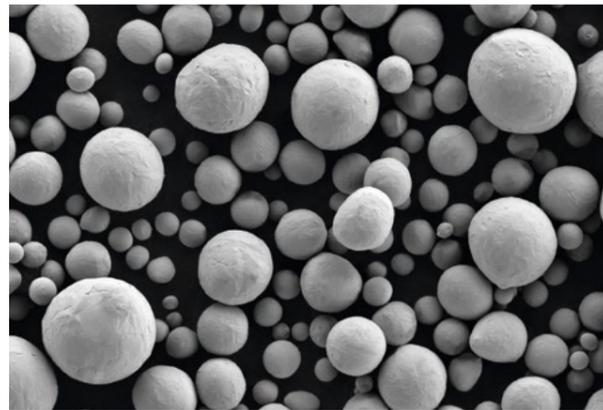


AMspheres Metal Powders

AMspheres Zirconium Powders

Zirconium is a highly corrosion- and heat-resistant metal used in a variety of applications including pyrotechnics, aerospace and defense. Our Zr702 powder is produced using the EIGA method, ensuring excellent sphericity and high purity. We offer a variety of particle size

distributions according to customer requests. Furthermore, our advanced atomization capabilities extend to Zr-based alloys such as Zr705.



10 μm



Chemical Composition

AMspheres Zirconium powders from stock.

AMspheres	Composition (wt%)			
	Zr + Hf	Hf	Fe + Cr	Nb
Zr702	≥99.2	≤4.5	≤0.2	–
Zr705	≥95.5	≤4.5	≤0.2	2.0 – 3.0

Particle Size Distribution

Typical particle size distributions are listed below. Other particle size distributions are available upon request.

	Particle Size Distribution (μm)		
	D10	D50	D90
10 – 45 μm	8 – 16	25 – 35	42 – 55
45 – 150 μm	43 – 61	75 – 95	110 – 145

Particle size distribution according to ASTM B822.





AMspheres Special alloys

ECKART TLS offers many different AMspheres 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 crucible atomizers, we can perform alloying ourselves. Using EIGA, we offer toll atomization of pre-alloyed bars provided by the customer.

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

Aluminium:					
AlSi9Cu3	AlSi40	AlSi50	6061	7075	
Copper:					
CuSn-alloys	CuSi-alloys	CuNi-Alloys			
Titanium:					
TiNbZr	Ti6Al7Nb	NiTi			
Niobium:					
C103					
Iron:					
FeSi3					
Commercially Pure Powders:					
Ni	Fe	Cr	Mo	Sn	Zn





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