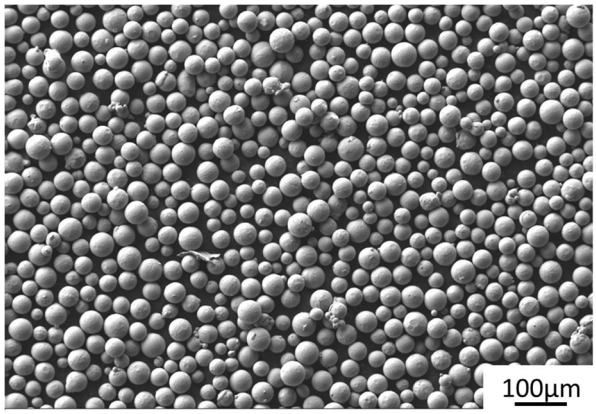
Titanium alloy: MET Ti Grade 23

overview - product table

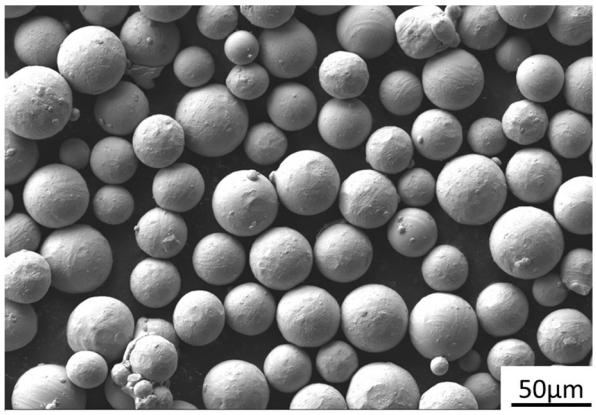
Alternative designation: UNS R56401 / ASTM F136 / DIN 3.7164 / Ti64 ELI / Ti-6Al-4V ELI

Description and general material properties

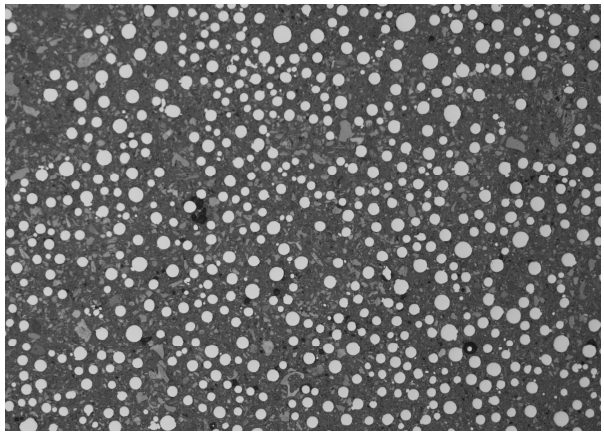
MET Ti6AL4V-ELI, or Grade 23 titanium, is the higher purity version of MET Ti6Al4V with excellent biocompatibility. It's the top choice for any situation where high strength, lightweight, good corrosion resistance, and high toughness are required. In addition, it has a superior damage tolerance to other alloys.
These benefits make MET Ti6AL4V-ELI the most requested titanium grade for dental and medical applications. Moreover, due to its biocompatibility, good fatigue strength, and low young's modulus, it can be used in biomedical applications or other surgical procedures such as implantable components.



Scanning electron microscopy image of Ti Grade 23 powder (100x)



Scanning electron microscopy image of Ti Grade 23 powder (300x)


Microsection - Powder PSD: 15 – 75µm

Powder characteristics

Chemical composition[1]		
Element	Min [wt%]	Max [wt%]
Al	5,5	6,5
V	3,5	4,5
Fe		0,25
O		0,13
C		0,08
N		0,05
Ti	Balance	Balance

Powder characteristics	
Properties*	Value
Main PSD range [µm}	15-63
Flow rate [s/50g][2]	25
Apparent density [g/cm³][3]	2,4

*exemplary values for PSD 15 - 45 µm[4]
1 – values taken from the powder material
2 – according to ASTM B213
3 – according to ASTM B212
4 – according to ASTM B214
5 – according to ISO 13322-2:2006-11

Important – please consider the "medical" note1 and "dual use" note2 !

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Technical Data Sheet
Datasheet_v0207 251020

METALPINE
THE ART OF SPHERICAL POWDER

HIGHLY SPHERICAL – PORE FREE METAL POWDER

ISO 9001
AS/EN 9100

High-quality powder for additive manufacturing and more ...
Overview of available powders:

Material class	Name	UNS	ASTM	DIN	EN (European Standard)	Other Standards	Material characteristics
Copper alloys	**MET Cu-OF**	C10200	ASTM B152, ASTM B187	2.0040	CW008A	OFHC (Oxygen-Free High Conductivity Copper)	High purity oxygen-free copper with the highest thermal and electrical conductivity (>99,95% Cu).
	MET CuNi2SiCr	C18000	ASTM B422	2.0855	CW111C	-	Thermally curable low-alloyed copper alloy; higher strength and hardness but slightly decreased thermal and electrical conductivity compared to CuCr1Zr.
	MET CuCr1Zr	C18150	ASTM B441, ASTM B534	2.1293	CW106C	RWMA Class 2	Hardenable copper alloy, combining high strength and hardness with good thermal and electrical conductivity.
	MET GRCop-42	-	NASA-Specific Alloy	-	-	Copper Alloy (Cu-Cr-Nb)	Dispersion-strengthened copper alloy with high strength, good conductivity, and resistivity against low cycle fatigue. - Cu4Cr2Nb (at.%)
	MET-CuNi10	C70600	ASTM B151, ASTM B122	2.0872	CW352H	CuNi 90/10	High corrosion resistance copper alloy with increased seawater resistance through increased Nickel content.
	MET-CuNi30	C71500	ASTM B171, ASTM B466	2.0882	CW354H	CuNi 70/30	High corrosion resistance for marine, offshore and chemical applications. From cryogenic temperatures up to 400°C with good mechanical properties UTS 510MPa & >20% elongation
Stainless Steels	**MET 1.4306**	S30403	ASTM A240, ASTM A276	1.4306	X2CrNi19-11	AISI 304L	Austenitic chromium-nickel steel with a low carbon content (<0,030%); higher content of chromium and nickel results in increased corrosion resistance than 1.4301 or 1.4307.
	MET 1.4404	S31603	ASTM A240, ASTM A276	1.4404	X2CrNiMo17-12-2	AISI 316L	Austenitic chromium-nickel-molybdenum steel with a low carbon content (<0,030%); good resistance to chloric media and non-oxidizing acids.
	MET 1.4462	S31803 / S32205	ASTM A182, ASTM A240, ASTM A789, ASTM A790	1.4462	X2CrNiMoN22-5-3	Duplex 2205, SAF 2205	With greater resistance to stress corrosion cracking (SCC), pitting, and crevice corrosion than standard austenitic stainless steels
Nickel Alloys	**MET Ni**	N02200	ASTM B160, ASTM B162	2.4066 (Ni 200)	NW2200	Pure Nickel	Highly electrical and thermal conductible material, is employed in extensive corrosive environments.
	MET Alloy K500	N05500	ASTM B865	2.4375	NA18	Monel K-500	High strength and hardness nickel-copper alloy with excellent corrosion resistance, suitable for marine technology and chemistry.
	MET IN718	N07718	ASTM B637, ASTM F3055	2.4668	NC19FeNb	Inconel 718	Nickel-chromium-iron alloy with niobium, molybdenum, aluminium, and titanium, leading to outstanding mechanical properties and corrosion resistance.
	MET IN625	N06625	ASTM B443, ASTM B446	2.4856	NC22DNB4	Inconel 625	Low carbon nickel-chromium-molybdenum-niobium alloy enabling service temperatures from cryogenic to 982°C and outstanding corrosion resistance
Titanium Alloys	**MET Ti Grade 5**	R56400	ASTM B265, ASTM B348	3.7165	Ti64	Ti-6Al-4V	Age hardenable titanium-aluminium-vanadium alloy offering an excellent combination of strength, toughness, and ductility with good biocompatibility
	MET Ti Grade 23	R56401	ASTM F136	3.7164	Ti64 ELI	Ti-6Al-4V ELI	"Extra low interstitials" by reduced oxygen and nitrogen content, used for medical and aerospace applications
	MET Ti Grade 2	R50400	ASTM B265, ASTM B348	3.7035	T40	CP Titanium	Pure titanium with excellent biocompatibility and a favorable strength to density ratio for high mechanical performance.
Molybdenum	**MET Mo**	R03610	ASTM B387	2.0615	-	Mo 99%	High melting temperature and low thermal expansion coefficient enable operational temperatures up to 1900°C
Niobium	**MET Nb**	R04200	ASTM B393	2.4100	-	Nb 99,8%	For high-temperature applications exceeding 1200°C and the biomedical field due to its high melting point (2468 °C), with outstanding osteogenic properties and low cytotoxicity.

Other materials on request

Comment for additional note

"Medical" Note 1:
This powder has not been developed, tested, or certified as a medical device according to Directive 93/42/EEC (MDD) or Regulation (EU) 2017/745 (MDR). It is not intended as a medical device, particularly for the purposes specified in Art. 2 No. 1 MDR. Insofar as you intend to use the powder as raw material for the manufacture of pharmaceutical products or medical devices (e.g., as raw material, which as material

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must meet the requirements of Annex 1, Chapter II MDR), the responsibility and liability for all analyses, tests, evaluations, procedures, risk assessments, conformity assessments, approval, and certification procedures as well as for all other official and regulatory measures required for this purpose shall lie solely with you both concerning the pharmaceutical product and/or medical device manufactured by you and about the properties, suitability, testing, evaluation, risk assessment, other requirements for the use of the powder as raw material. In this respect, the limitations of liability under our General Terms and Conditions and the system sales or material contracts shall apply.

"Dual Use" Note 2:
These goods are subject to the European or Austrian export license requirement when exported from the EU. Please note that a licensing requirement may also result from the final destination and the intended use of the goods (**dual use**).

Additional information to our powder production:

According to your needs, any metal or alloy can be atomized with our proprietary process. All products can be produced in narrow particle size distributions (PSD), as shown below; other PSDs are available on request.

PSD [µm]	$d10_{min}$ [µm]	$d90_{max}$ [µm]	Technology
5 - 20	4	25	Metal Injection Moulding/Cold Spray
15 - 45	10	48	Cold Spray/Binder Jetting/Laser Powder Bed Fusion
15 - 53	10	56	Standard for Powder Bed Applications
20 - 63	18	66	Laser Powder Bed Fusion
45 - 116	40	118	Electron Beam Powder Bed Fusion/DED
50 - 150	50	133	Directed Energy Deposition

COMMISSION PROCESSING

Metalpine GmbH is your service partner for the high-quality production of spherical metal powders and related preparation processes.

lowest CO_2 impact

Powder production

We developed a unique powder production process to provide perfect spherical powders (patented). Any metal or alloy can be atomized according to your needs. Our processes are run with Argon 5.0 as atomization gas in a dust-free production environment to guarantee maximum product quality. All subsequent processes (production, classifying, screening, packaging) can be done under Argon atmosphere to ensure an oxygen-free production line.

Backup powder production and R&D plant

Supplementary to our production site in Graz, we have a second production line in Niklasdorf, Austria. The secondary plant is mainly dedicated to R&D but is available as a backup production line to increase flexibility for our customers.

Powder screening

We can screen your powder with various screening technologies at grain sizes ranging from 10 to 1000 microns.

Powder classifying

Our state-of-the-art classifiers can provide narrow particle size distributions, produce ultrafine powders, or remove dust from your powders.

Pore Free & highly spherical

"Pore Free" is defined with 0% pores and with "highly spherical" we understand a sphericity >0,9.

Packaging

With our 17 Sustainable Development Goals in mind, we try to reduce the amount of waste by offering different packaging than commonly used white bottles, which are thrown away after usage. Of course, we pack the powders according to our customer's needs and help to manage transport organization.

Laboratory Services

Our in-house laboratory measures particle size distributions with laser light scattering (ISO 13320) and digital image processing (ISO 13322-2). Additionally, we offer tab density measurements (ISO3953, ASTM B527) and flowability measurements by Hall Flow Meter (ISO 4490, ASTM B213). For more complex flowability problems, Schulze Ring Shear tests can be conducted by our university partners, and additionally, we offer analysis of our products in collaboration with certified laboratories.

Certification

Aerospace accreditation **AS / EN9100**

Quality Management System according to **ISO 9001**

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