Material
Data Sheet

EOS CopperAlloy CuCrZr

Copper Alloy for rocket and thermal management applications

EOS CopperAlloy CuCrZr

Copper alloy CuCrZr has a favorable combination of electrical and thermal conductivity accompanied with good mechanical properties. This alloy reaches its good properties during heat treatment.

Main Characteristics:

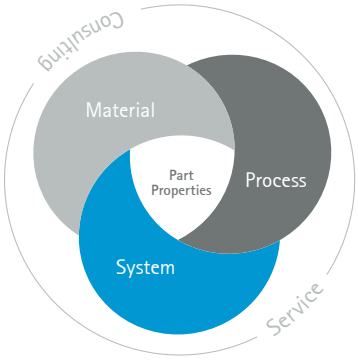
- High productivity 10.9 mm^3/s with 80 µm layer thickness
- Moderate to high conductivity in heat treated condition together with good mechanical properties
- Chemical composition corresponds to C18150 and CW106C

Typical Applications:

- Rocket engine parts
- Heat exchangers
- Induction coils

The EOS Quality Triangle

EOS uses an approach that is unique in the AM industry, taking each of the three central technical elements of the production process into account: the system, the material and the process. The data resulting from each combination is assigned a Technology Readiness Level (TRL) which makes the expected performance and production capability of the solution transparent.



EOS incorporates these TRLs into the following two categories:

- Premium products (TRL 7-9): offer highly validated data, proven capability and reproducible part properties.
- Core products (TRL 3 and 5): enable early customer access to newest technology still under development and are therefore less mature with less data.

All of the data stated in this material data sheet is produced according to EOS Quality Management System and international standards.

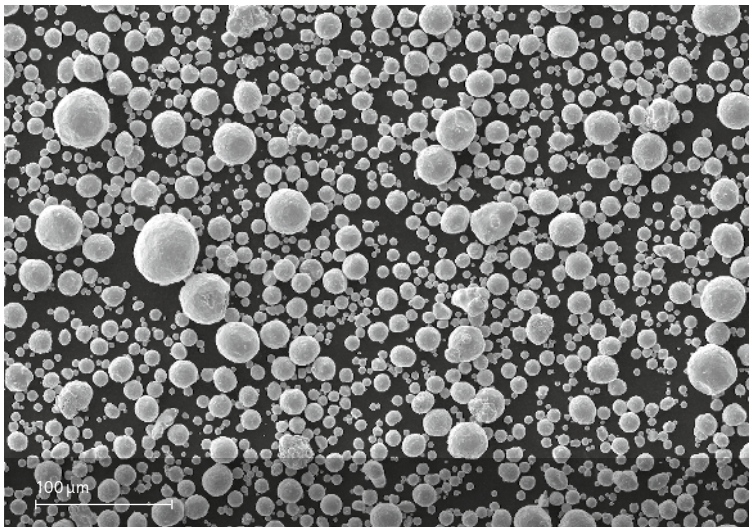
Powder Properties

Powder chemical composition (wt.-%)

Element	Min.	Max.
Copper	Balance	
Chromium	0.45	1.15
Zirconium	0.05	0.25
Silicon	-	0.1
Iron	-	0.08

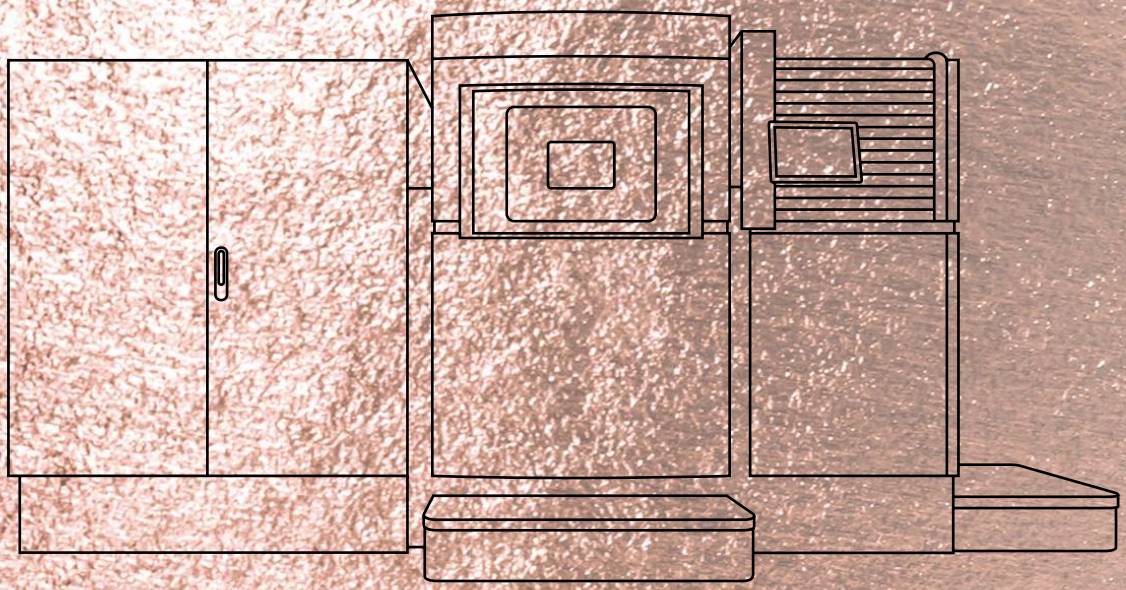
Powder particle size

Generic particle size distribution	15-75 µm



SEM image of powder

TRL 5
Core



EOS CopperAlloy CuCrZr
for EOS M M400-1 I 80 µm

Process Information
Chemical and Physical Part Properties
Heat treatment
Additional Data

EOS CopperAlloy CuCrZr for EOS M400-1 I 80 µm
Process Information

TRL 5
Core

System set-up	EOS M 400-1
EOSPAR name	CuCrZr_080_CoreM400
Software requirements	EOSPRINT 2.11 or newer EOSYSTEM 2.15 or newer
Powder part no.	9030-0003
Recoater blade	HSS blade
Inert gas	Argon
Sieve	90 µm

Additional information	
Layer thickness	80 µm
Volume rate	10.9 mm³/s
Minimal wall thickness	0.8 mm

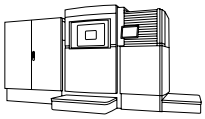
Heat Treatment

Two different heat treatments are recommended for EOS CopperAlloy CuCrZr - one conductivity optimized and one tensile properties optimized.

Conductivity optimized HT:
Step 1 - Solution: 0,5h hold in 980°C under inert gas flow/atmosphere. Quenching in water straight from the furnace
Step 2 - Ageing: 3h hold in 430°C under inert gas flow/atmosphere. Slow cooling in inert gas until temperature is under 100°C

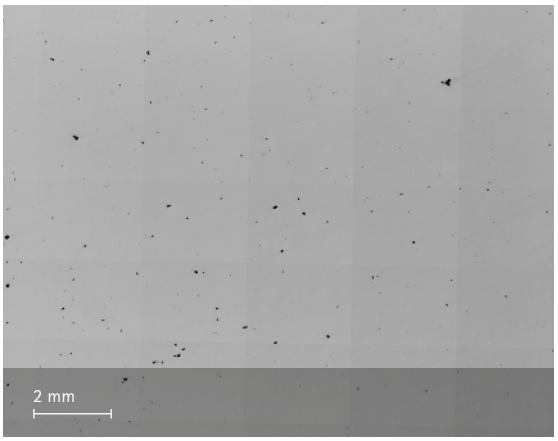
Tensile optimized HT:
Ageing: 1h hold in 490°C under inert gas flow/atmosphere. Slow cooling in inert gas until temperature is under 100°C

Chemical and Physical Properties of Parts[1]



Solid parts chemistry matches the powder chemistry

Defects	Result
Average defect percentage	0.2 %
Density, ISO3369	≥ 8.84 g/cm³



Micrograph

Mechanical properties

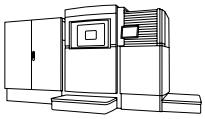
Heat treated	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]	Modulus of elasticity [GPa]
Horizontal Conductivity optimized HT	255	410	30	130 GPa
Vertical Conductivity optimized HT	230	350	35	115 GPa
Horizontal Tensile optimized HT	510	590	18	120 GPa
Vertical Tensile optimized HT	495	540	18	125 GPa

Tensile testing as per ISO 6892-1. Modulus of elasticity testing according to EN ISO 6892-1 Method A, Range 1 (0.00007 1/s).

Hardness as per ISO 6507-1

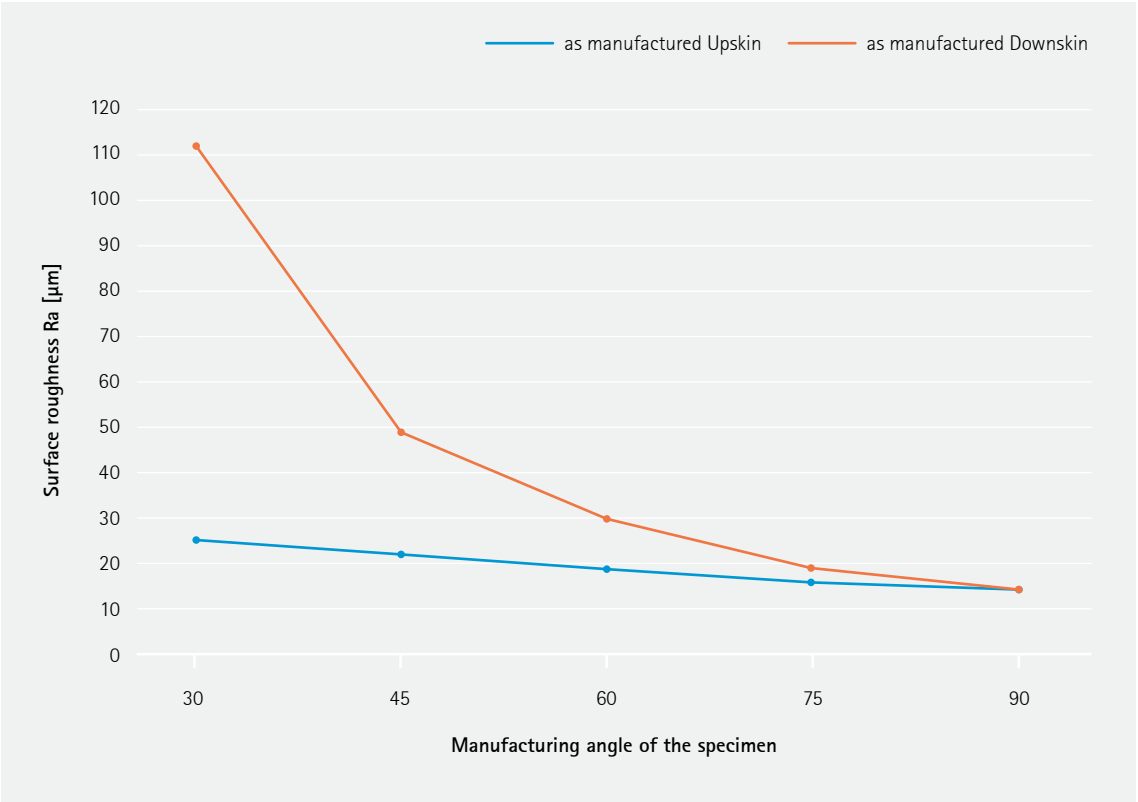
Conductivity optimized HT	120 HV10
Tensile optimized HT	190 HV10

Additional Data[1]

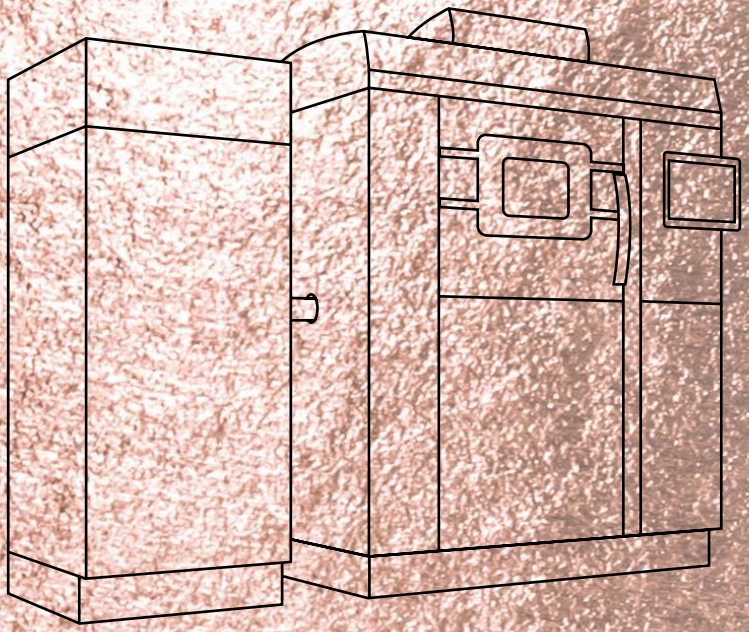


Electrical conductivity		
According to ASTM E1004-17	**Result**	**Samples**
Heat treated - Conductivity optimized	88 %IACS	2 sample cubes, all measured from 5 surfaces
Heat treated -Tensile optimized	76 %IACS	3 sample cubes, all measured from 5 surfaces
As manufactured	23 %IACS	1 sample cube, measured from 5 surfaces

Surface Roughness



TRL 3
Core



EOS CopperAlloy CuCrZr
for EOS M 290 1kW I 80 µm

Process Information
Chemical and Physical Part Properties

EOS CopperAlloy CuCrZr for EOS M 290 1kW & AMCM M 290 1kW I 80 µm

Process Information

Core

System set-up	EOS M 290 1kW	AMCM M 290 1kW
EOSPAR name	CuCrZr_080_CoreM400	CuCrZr_080_CoreM291_1kW_100
Software requirements	EOSPRINT 2.15 or newer EOSYSTEM 2.19 or newer	EOSPRINT 2.7 or newer EOSYSTEM 2.11 or newer
Powder part no.	9030-0003	
Recoater blade	HSS	
Inert gas	Argon	
Sieve	90 µm	

Additional information	
Layer thickness	80 µm
Volume rate	15.4 mm³/s

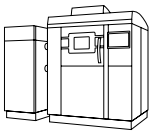
Heat Treatment

Two different heat treatments are recommended for EOS CopperAlloy CuCrZr - one conductivity optimized and one tensile properties optimized.

Conductivity optimized HT:
Step 1 - Solution: 0,5h hold in 980°C under inert gas flow/atmosphere. Quenching in water straight from the furnace
Step 2 - Ageing: 3h hold in 430°C under inert gas flow/atmosphere. Slow cooling in inert gas until temperature is under 100°C

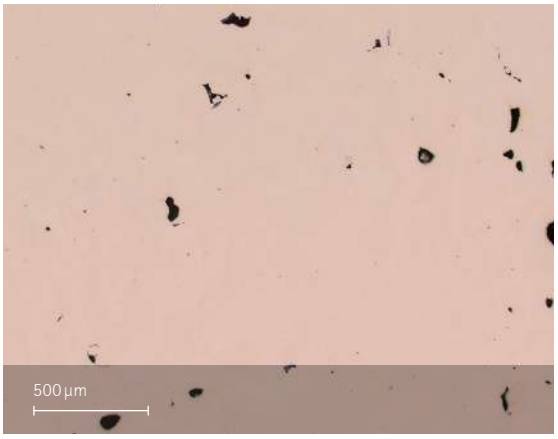
Tensile optimized HT:
Ageing: 1h hold in 490°C under inert gas flow/atmosphere. Slow cooling in inert gas until temperature is under 100°C

Chemical and Physical Properties of Parts[1]



Solid parts chemistry matches the powder chemistry

Defects	Result
Average defect percentage	0.2 %
Density, ISO3369	≥ 8.84 g/cm³



Micrograph

Typical part properties

Heat treated	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]	Conductivity
As manufactured	160	210	40	> 20 % IACS
Heat treated	210	340	25	> 80 % IACS

Tensile testing as per ISO 6892-1. Conductivity tested acc. ASTM E1004-17.

Headquarters

EOS GmbH
Electro Optical Systems
Robert-Stirling-Ring 1
D-82152 Krailling/Munich
Germany
Phone +49 89 893 36-0
info@eos.info

www.eos.info
EOS
EOS3Dprinting
EOS3Dprinting
#responsiblemanufacturing
#futureisadditive

Further Offices

EOS France
Phone +33 437 497 676

EOS Greater China
Phone +86 21 602 307 00

EOS India
Phone +91 443 964 8000

EOS Italy
Phone +39 023 340 1659

EOS Japan
Phone +81 45 670 0250

EOS Korea
Phone +82 2 6330 5800

EOS Nordic & Baltic
Phone +46 31 760 4640

EOS of North America
Phone +1 877 388 7916

EOS Singapore
Phone +65 6430 0463

EOS UK
Phone +44 1926 675 110

[1] Part properties are provided for information purposes only and EOS makes no representation or warranty, and disclaims any liability, with respect to actual part properties achieved. Part properties are dependent on a variety of influencing factors and therefore, actual part properties achieved by the user may deviate from the information stated herein.
This document does not on its own represent a sufficient basis for any part design, neither does it provide any agreement or guarantee about the specific properties of a material or part or the suitability of a material or a part for a specific application.

Status 04/2024

Cover: This image shows a possible application.