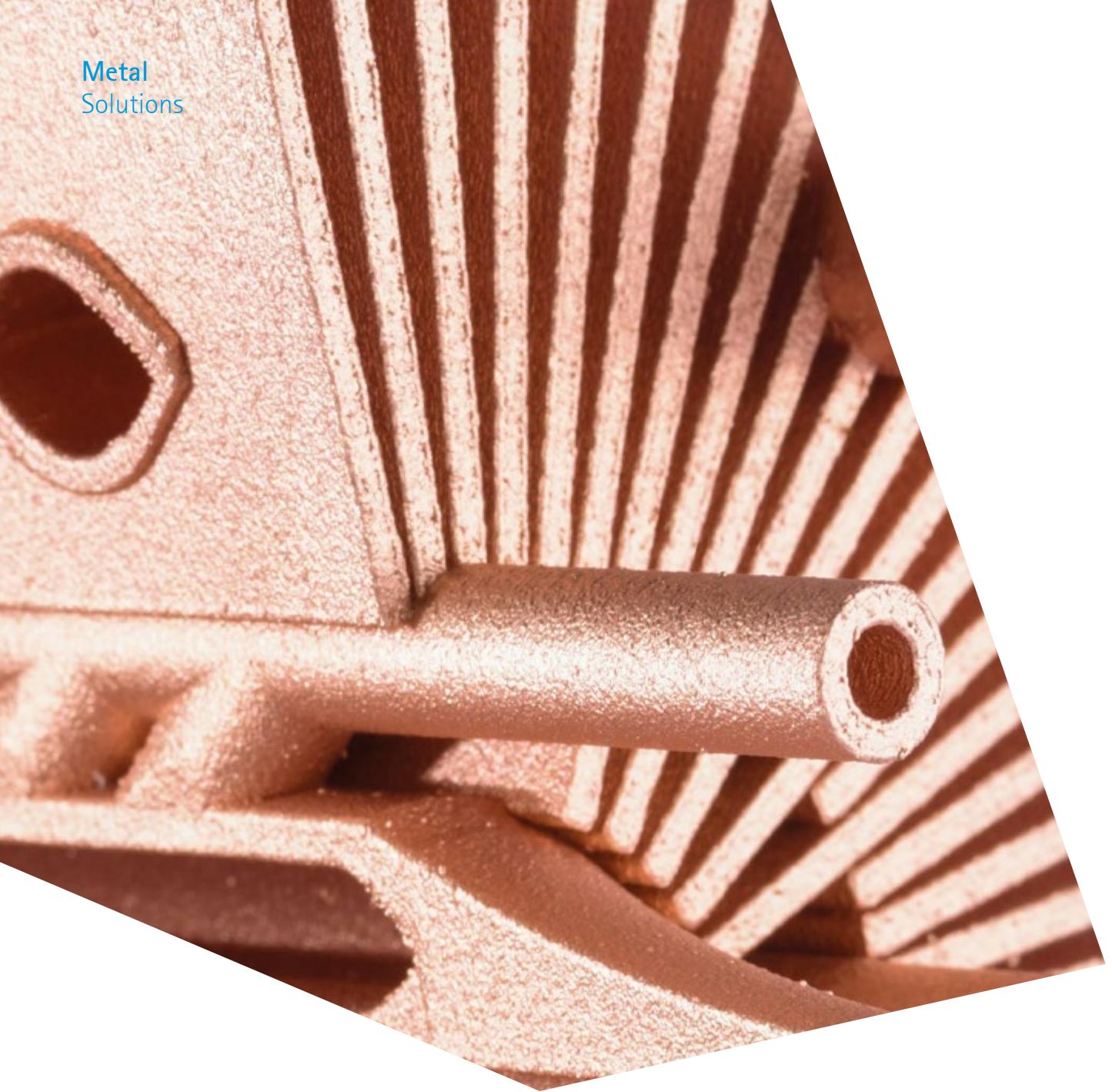


Metal  
Solutions



EOS Copper CuCP  
for AMCM M 290 1kW



# EOS Copper CuCP

Commercially pure copper for the EOS M 290 with 1 kW laser – customized by AMCM – designed to reach excellent conductivity properties. Suitable for a wide variety of applications.

## Main Characteristics:

- Commercially pure copper (> 99.95 % purity)
- Excellent electrical and heat conductivity
- Designed for an EOS M 290 with a 1 kW laser, which is the AMCM M 290 1kW sold by AMCM GmbH

## Typical Applications:

- Electrical motors
- Inductors
- Variety of industry applications requiring excellent conductivity properties

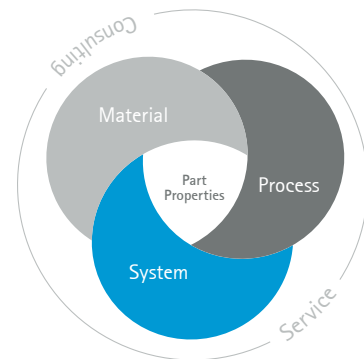
## The EOS Quality Triangle

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.



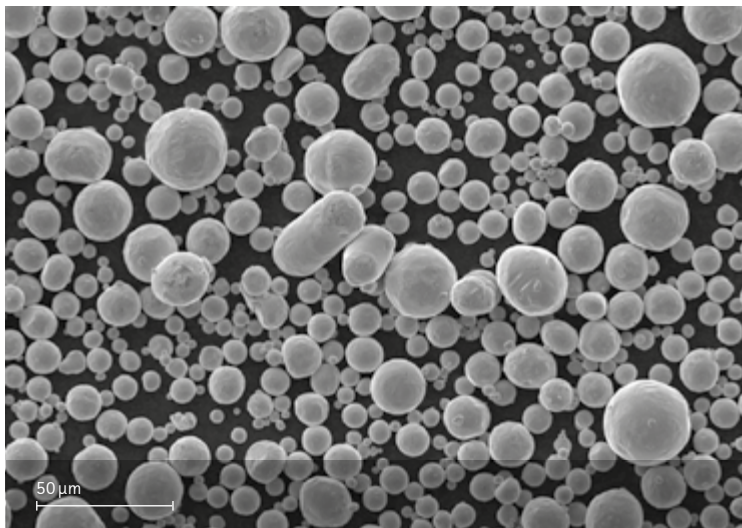
## Powder Properties

### Powder chemical composition (wt.-%)

Element	Min.	Max.
Cu	99,95	-
O	-	0,04

### Powder particle size

Generic particle size distribution	15 - 53 $\mu\text{m}$
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SEM image of powder

## EOS Copper CuCP for AMCM M 290 1kW I 40 µm Process Information

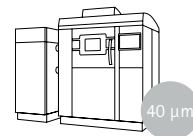


The EOS Copper CuCP process contains of two exposure sets. One exposure set with Technology Readiness Level 5 for general use and bulkier parts and an application specific exposure set targeted for inductors.

System set-up	AMCM M 290 1kW
EOSPAR name	CuCP_040_M291_1kW_200
Software requirements	EOSPRINT 2.11 or newer EOSYSTEM 2.15 or newer
Powder part no.	9030-0006
Recoater blade	HSS, silicon or brush
Nozzle	EOS grid nozzle
Inert gas	Argon
Sieve	63 µm

### Additional information

Layer thickness	40 µm
Volume rate	5.4 mm <sup>3</sup> /s
Minimal wall thickness	0.7 mm

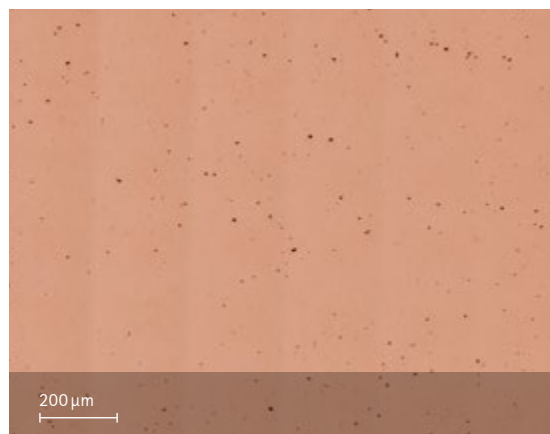


## Chemical and Physical Properties of Parts<sup>1</sup>

Chemical composition of printed parts matches the chemistry of EOS Copper CuCP powder, but can vary due to different oxygen levels in the process, depending on the machine and use level of the powder.

Defects	Result
Average defect percentage	0.4 %*
Density, ISO3369	≥ 8.90 g/cm <sup>3</sup>

\*Testing with virgin EOS Copper CuCP powder



Etched micrograph

### Mechanical properties

As manufactured	Yield strength $R_{p0.2}$ [MPa]	Tensile strength $R_m$ [MPa]	Elongation at break A [%]	Modulus of elasticity [GPa]
40 μm horizontal	159.1	229.9	45.6	156.3
40 μm vertical	161.7	227.0	48.1	153.8

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).

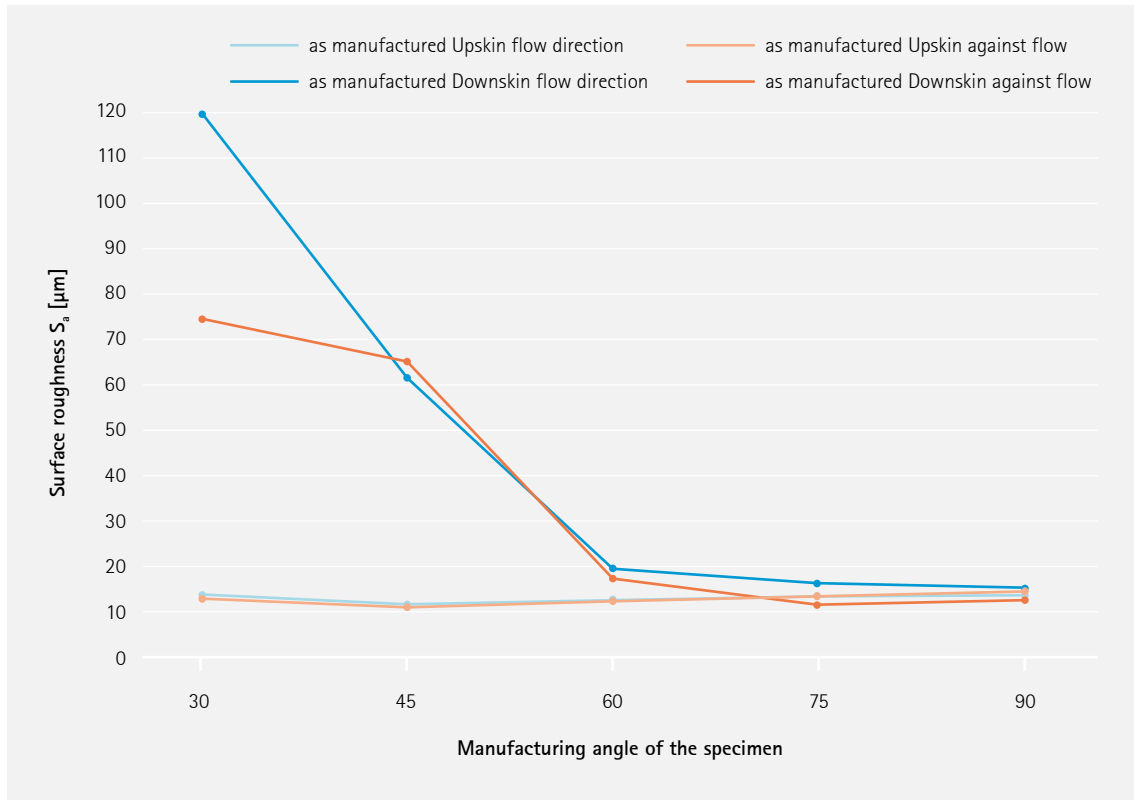
## Heat Treatment

Heat treatment of parts built with EOS Copper CuCP is only optional, but can ensure maximum conductivity and uniform structure.

Hold 1 h at ~1000°C, slow cooling. Treatment done in heavy argon flow or in vacuum furnace.

## Additional Data<sup>1</sup>

### Surface Roughness



## Effects of Powder Reuse

The effects of powder reuse are investigated by running multiple test jobs, until the powder amount was consumed. After every test job, electrical conductivity and porosity were examined, to link powder aging effects to solid part quality.

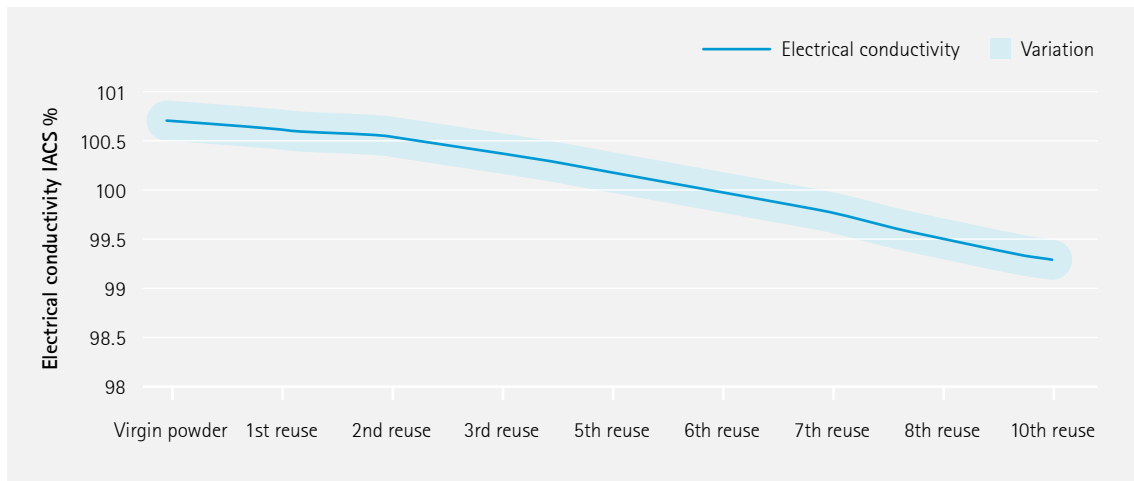
Electrical conductivity and average defect percentage of parts built with EOS Copper CuCP is depended on the use level of powder and position on the building platform. The electrical conductivity can be maximized by heat treating the final parts.

As manufactured

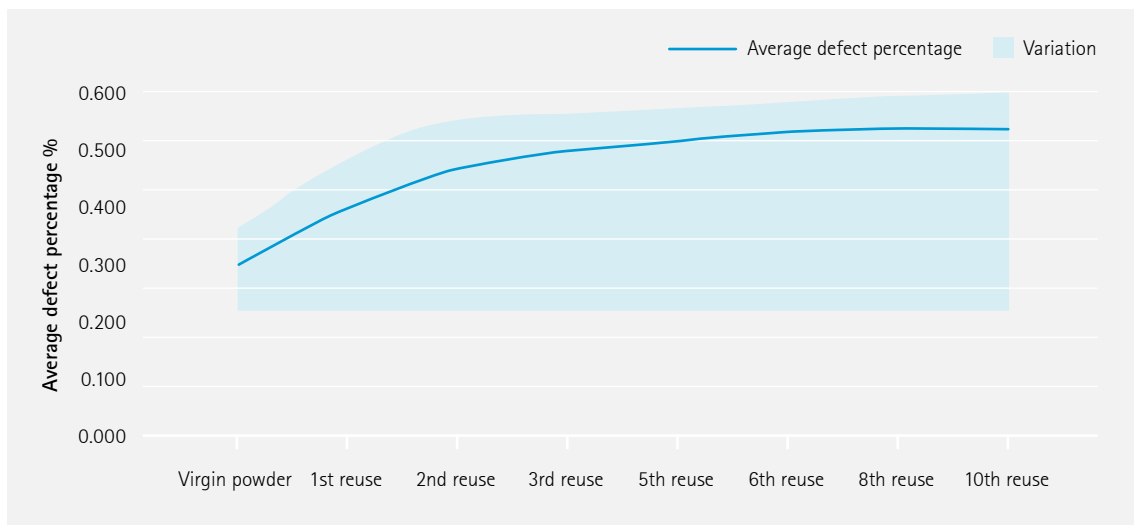
Electrical conductivity

avg. 100.7 IACS%

Testing with virgin EOS Copper CuCP powder and according ASTM E1004-17, Eddy Current



Electrical conductivity IACS% over multiple powder re-uses. The samples were as manufactured and taken from middle of building platform. There were no measurements after the 4th and 9th reuse. Results may vary over the building platform. Testing according ASTM E1004-17, Eddy Current.

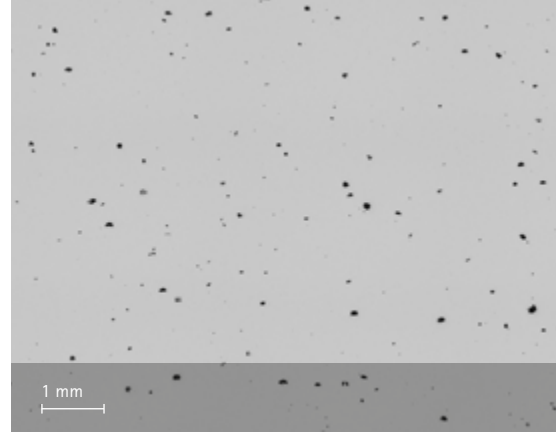


Average defect percentage % over multiple powder reuses. The samples were as manufactured and taken from middle of building platform. There were no measurements after the 4th and 9th reuse. Results may vary over the building platform.

**EOS Copper CuCP for AMCM M 290 1kW | 40  $\mu\text{m}$**   
**Exposure Set for Inductors**  
**Physical Properties of Parts<sup>1</sup>**

The EOS Copper CuCP process contains of two exposure sets. The application specific exposure set is targeted for inductors.

Average defect percentage	0.5 %
Minimum wall thickness	0.7 mm



Etched micrograph

**Typical mechanical properties**

	Yield strength $R_{p0.2}$ [MPa]	Tensile strength $R_m$ [MPa]	Elongation at break A [%]
as manufactured	156	220	55

**Typical conductivity**

	As built surface [%IACS]	Grinded (P180) [%IACS]
Without heat treatment*	97.4 - 100.2	100.1 - 101.6
Heat treated*	98.4 - 101.4	101.5 - 102.6

\*Conductivity has been measured by eddy current meter. Results are depending on surface orientation.



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<sup>1</sup> 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.

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Cover: This image shows a possible application.

