

Material
Data Sheet



EOS Copper CuCP

Commercially pure copper

EOS Copper CuCP

Commercially pure copper for the EOS M 290 1kW and AMCM M 290 1kW
- 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

Typical Applications:

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

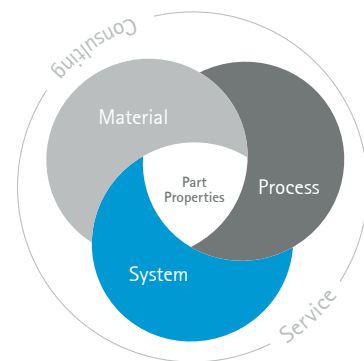
The EOS Quality Triangle

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.



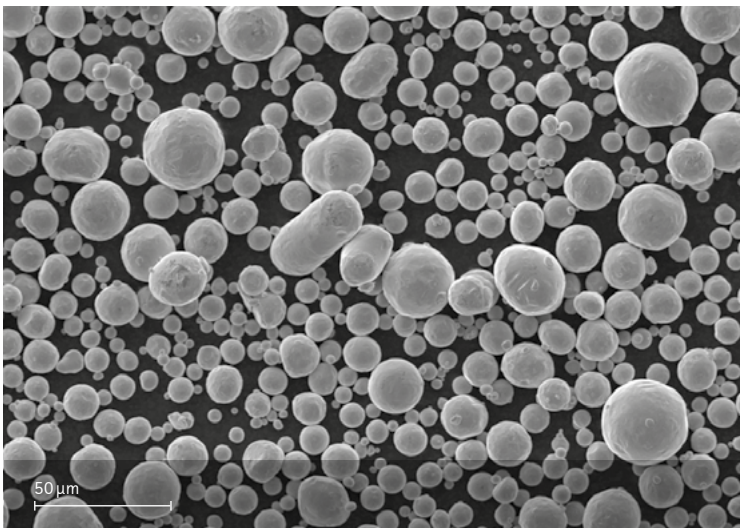
Powder Properties

Powder chemical composition (wt.-%)

Element	Min.	Max.
Cu	99.95	-
O	-	0.04

Powder particle size

Generic particle size distribution	15 - 53 μm
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SEM image of powder

EOS Copper CuCP for EOS M 290 1kW & AMCM M 290 1kW | 40 µm Process Information

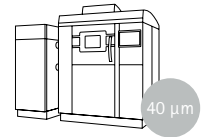


The EOS Copper CuCP process contains two exposure sets. One exposure set with Technology Readiness Level 5 for general use and bulkier parts and an application specific exposure set targeted for inductors.

System set-up	EOS M 290 1kW	AMCM M 290 1kW
EOSPAR name	CuCP_Core040_M294_1X	CuCP_040_M291_1kW_200
Software requirements	EOSPRINT 2.15 or newer EOSYSTEM 2.19 or newer	EOSPRINT 2.13 or newer EOSYSTEM 2.17 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 ³ /s
Minimal wall thickness	0.7 mm

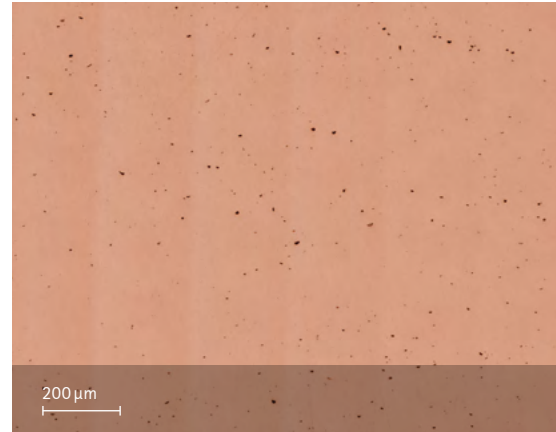


Chemical and Physical Properties of Parts¹

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 ³

*Testing with virgin EOS Copper CuCP powder



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	155	230	45	150
40 μm vertical	160	225	48	150

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).

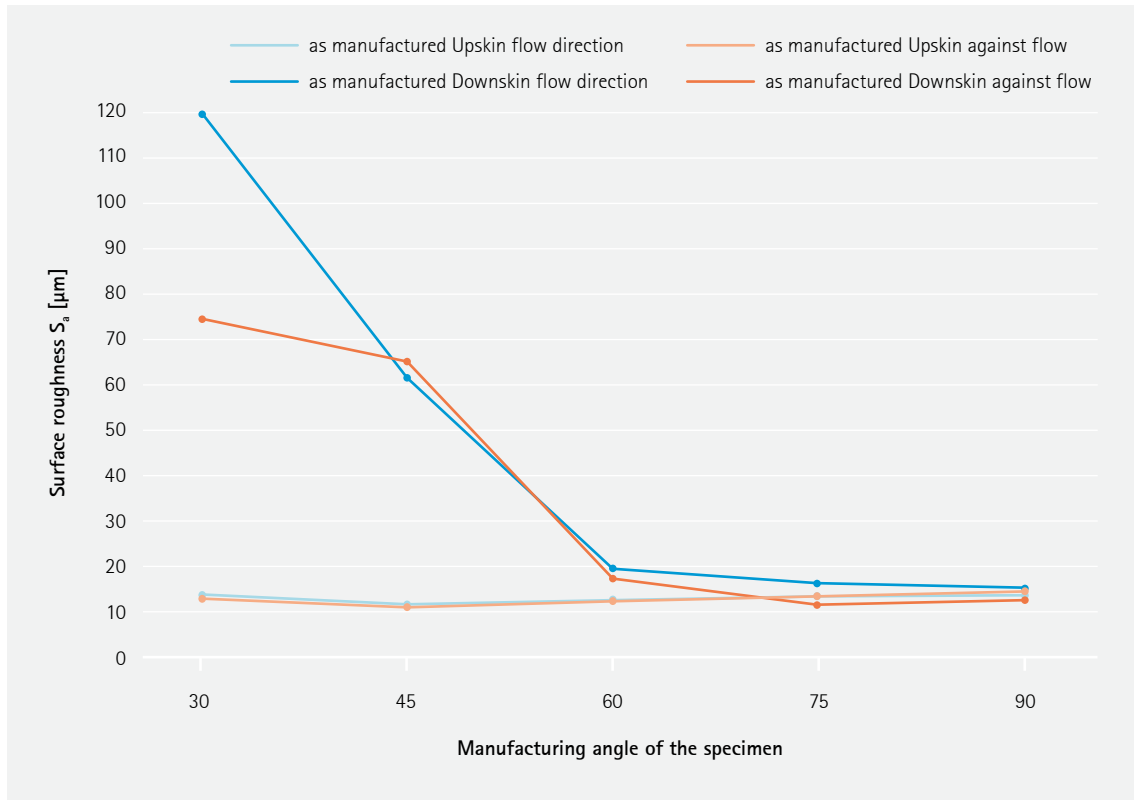
Heat Treatment

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 Data¹

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.

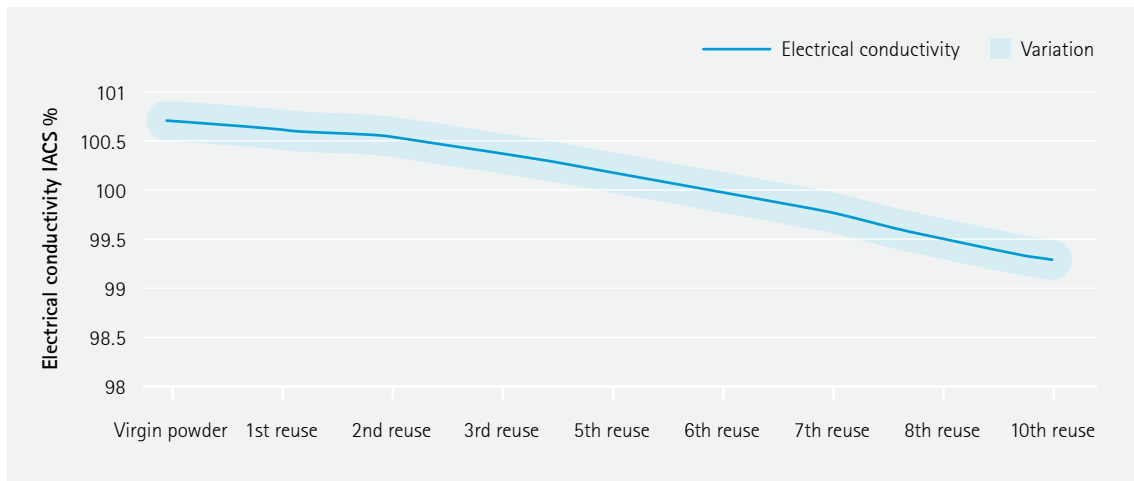
Electrical conductivity and average defect percentage of parts built with EOS Copper CuCP is depended on the use level of powder and position on the building platform. The electrical conductivity can be maximized by heat treating the final parts.

As manufactured

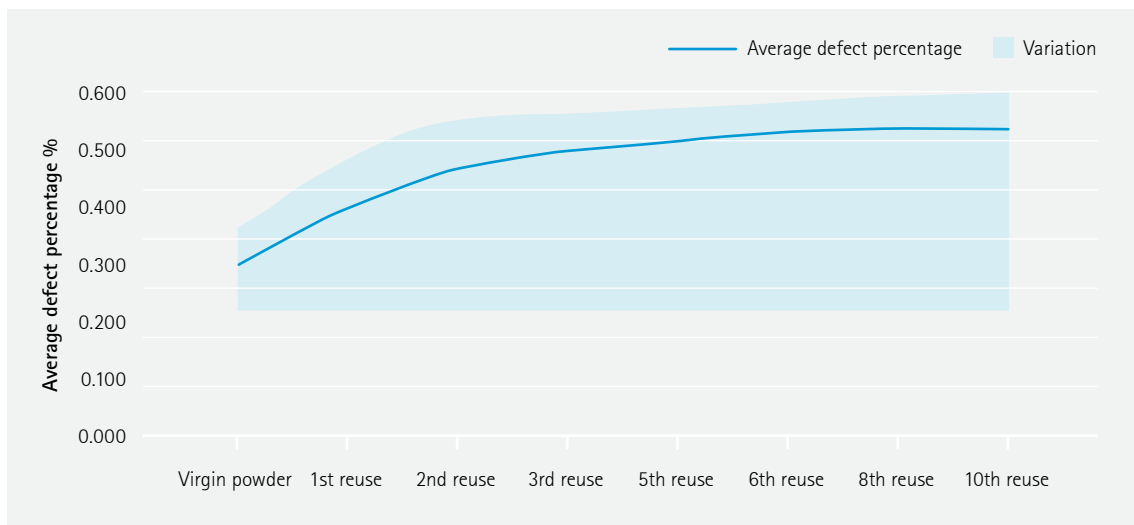
Electrical conductivity

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.

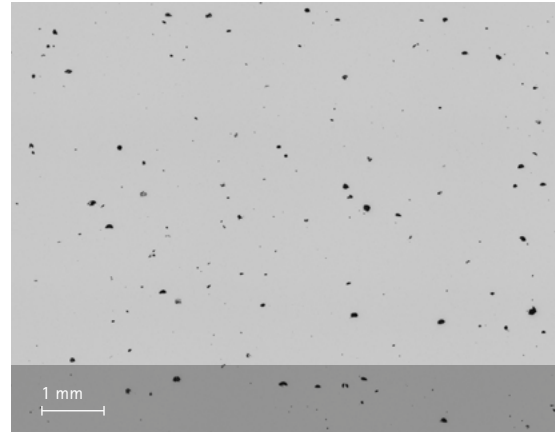


Average defect percentage % over multiple powder reuses. The samples were as manufactured and taken from middle of building platform. There were no measurements after the 4th and 9th reuse. Results may vary over the building platform.

EOS Copper CuCP for AMCM M 290 1kW | 40 μm Exposure Set for Inductors Physical Properties of Parts¹

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



Micrograph

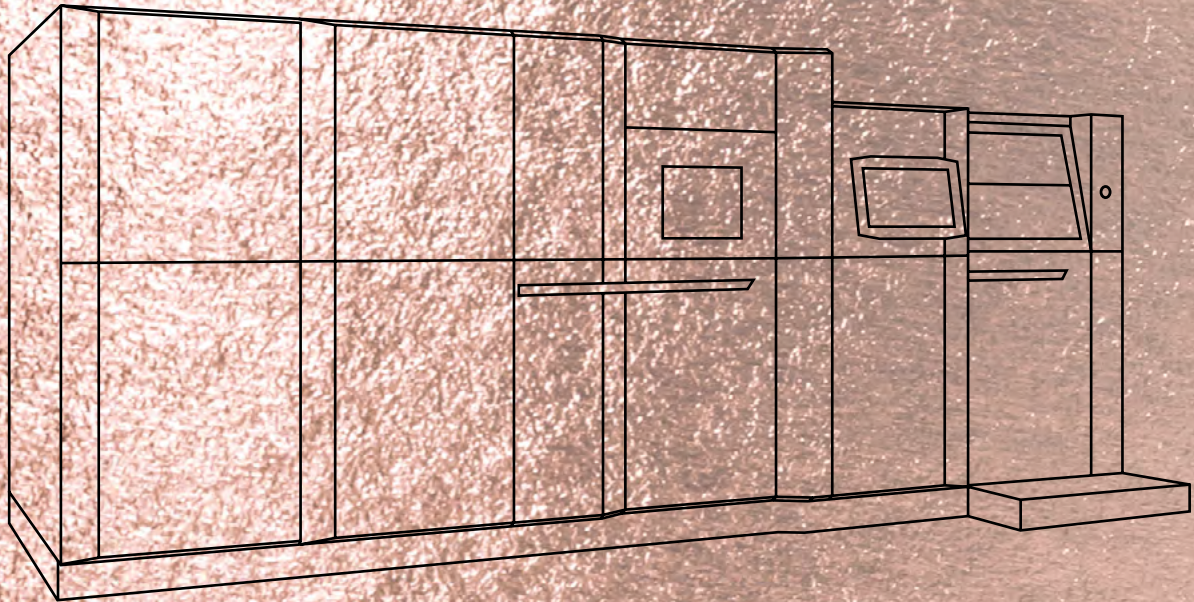
Typical mechanical properties

	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]
as manufactured	155	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.



EOS Copper CuCP for EOS M 300-4 1kW | 40 μm

Process Information

Chemical and Physical Part Properties

Mechanical Properties

EOS Copper CuCP for EOS M 300–4 1kW I 40 µm Process Information

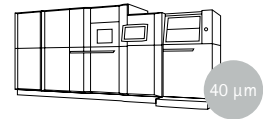


The EOS Copper CuCP process contains two exposure sets. The default exposure set with Technology Readiness Level 5 for general use and bulkier parts and an application specific exposure set targeted for inductors.

System set-up		M 300–4 1kW
EOSPAR name		CuCP_040_CoreM314_1X
Software requirements		EOSPRINT 2.15 or newer EOSYSTEM 2.19 or newer
Powder part no.		9030-0006
Recoater blade		HSS, silicon or brush
Inert gas		Argon
Sieve		63 µm

Additional information	
Layer thickness	40 µm
Volume rate	Default: 5.4 mm ³ /s Inductor: 4.6 mm ³ /s
Minimal wall thickness	Default: 0.7 mm Inductor: 0.6 mm

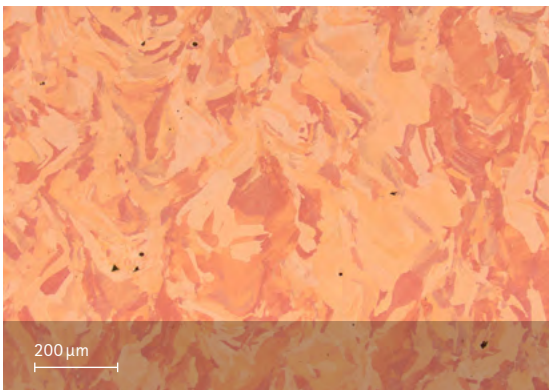
Chemical and Physical Properties of Parts¹



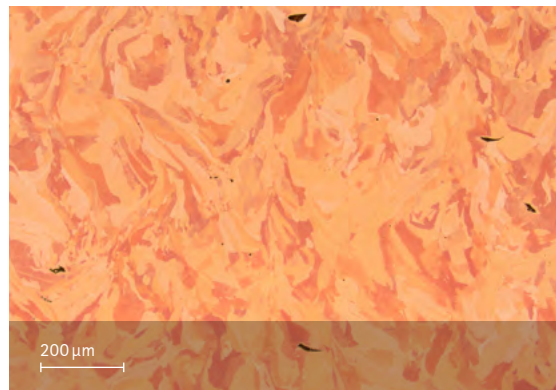
Chemical composition of printed parts matches the chemistry of EOS Copper CuCP powder, but can vary due to different oxygen levels in the process, depending on the machine and use level of the powder.

Defects	Result
Average defect percentage	Default: 0.25 % Inductor: 0.4 %*
Density, ISO3369	≥ 8.88 g/cm ³

*Testing with virgin EOS Copper CuCP powder



Etched Micrograph with Default exposure set



Etched Micrograph with Inductor exposure set

Mechanical properties

As manufactured	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]	Electrical conductivity
40 µm Default horizontal	155	230	40	99.6% IACS
40 µm Default vertical	165	230	45	
40 µm Inductor horizontal	155	230	45	99.7% IACS
40 µm Inductor vertical	155	220	35	

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).
Electrical conductivity measured by Eddy current, ASTM E1004-17

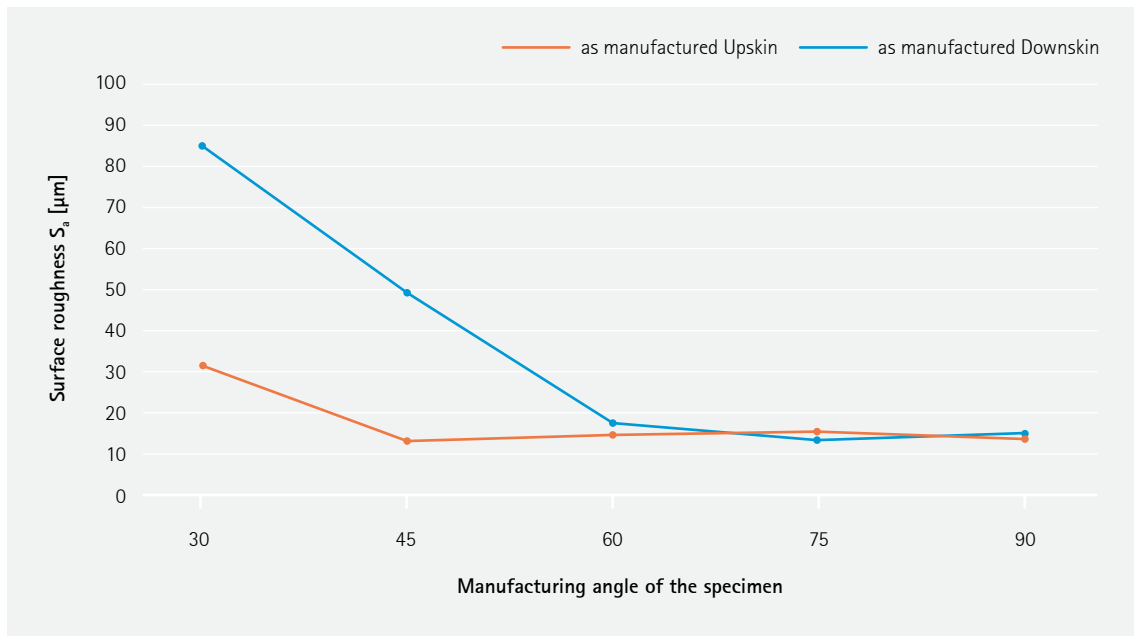
Heat Treatment

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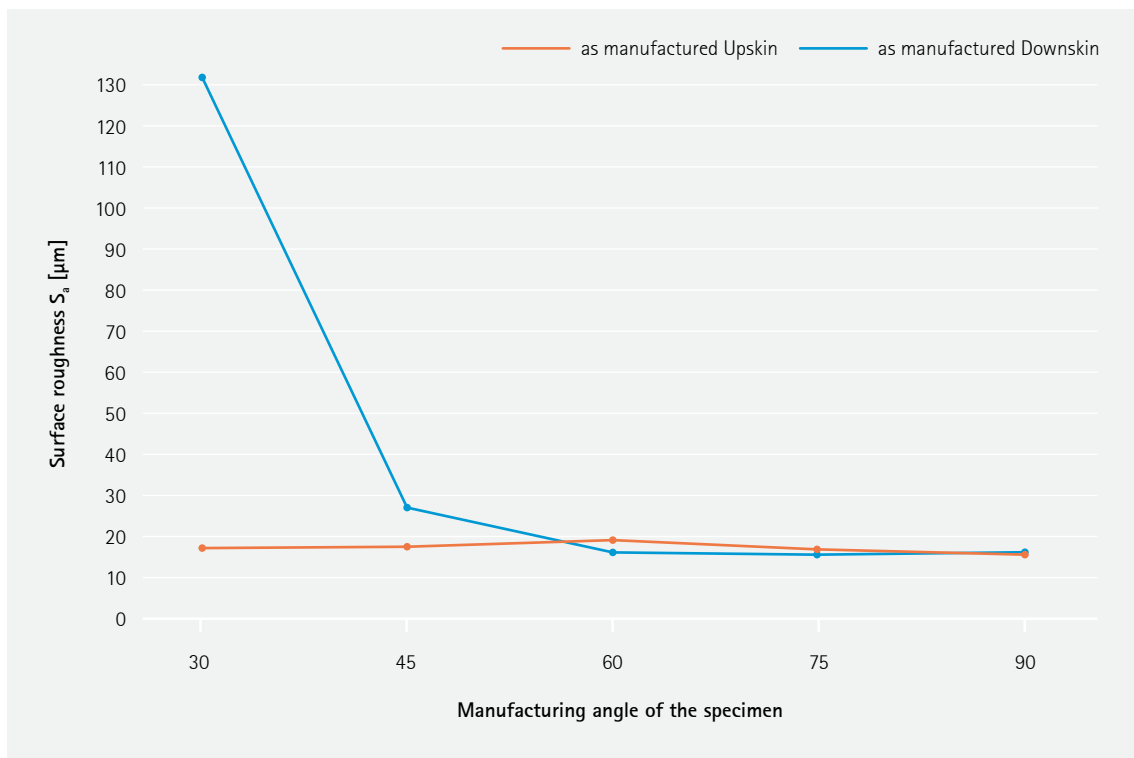
Hold 1 h at ~1 000 °C, slow cooling. Treatment done in heavy argon flow or in vacuum furnace.

Additional Data¹

Surface Roughness – Default exposure set



Surface Roughness – Inductor Exposure Set



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

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#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

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Cover: This image shows a possible application.

