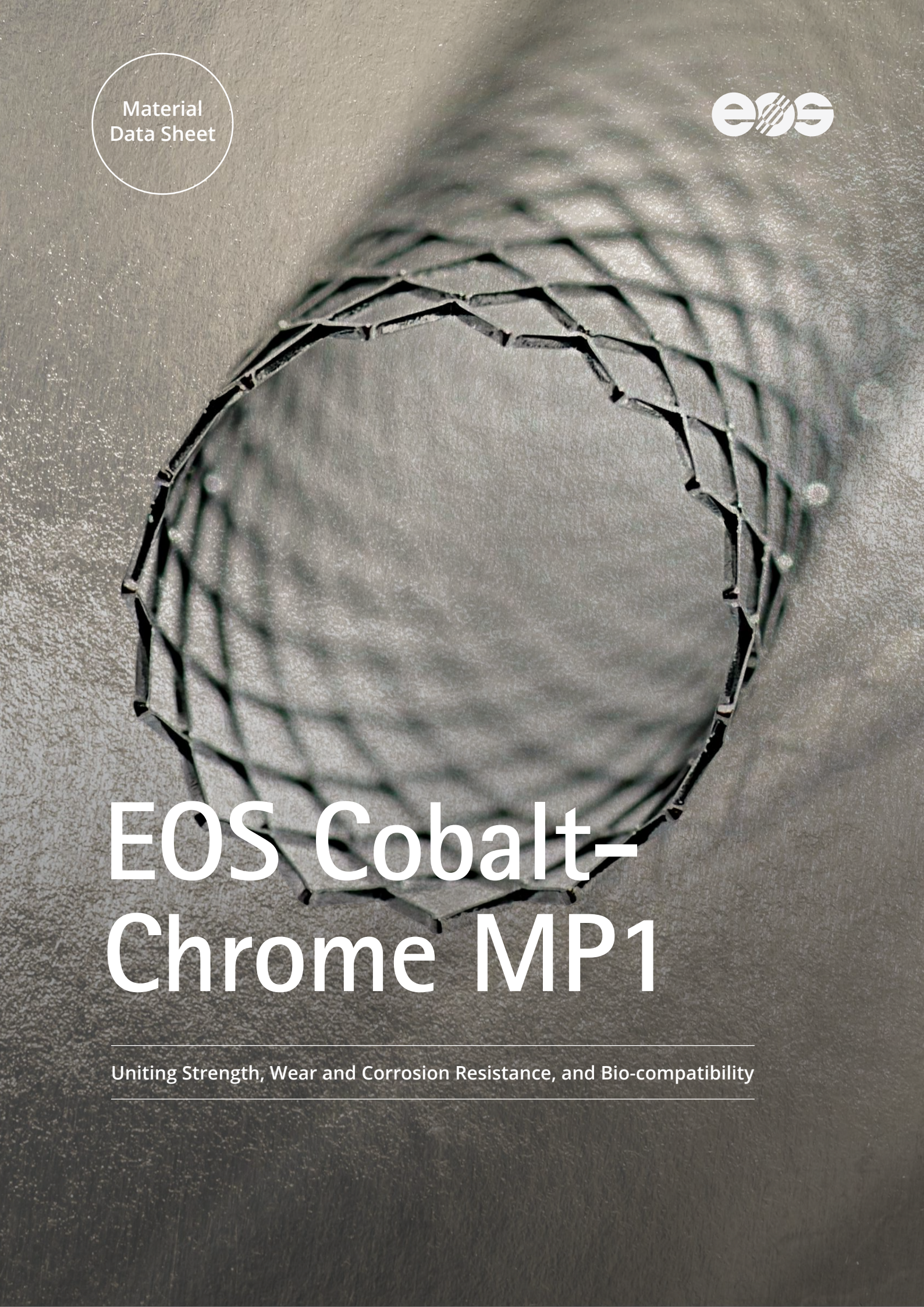
Material
Data Sheet



EOS Cobalt-Chrome MP1

Uniting Strength, Wear and Corrosion Resistance, and Bio-compatibility

EOS CobaltChrome MP1

Parts printed with EOS CobaltChrome MP1 have good corrosion resistance and high mechanical properties even at elevated temperatures. EOS CobaltChrome MP1 is nickel-free and parts show a fine, uniform crystal grain structure. This combination is ideal for many applications in the aerospace and medical industries.

Main Characteristics:

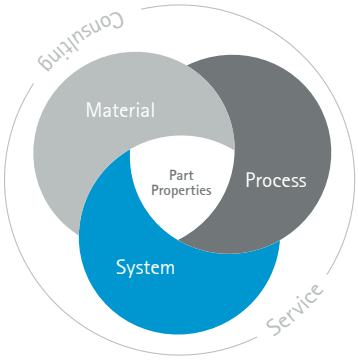
- Corrosion resistance
- Great elevated temperature performance
- Nickel-free

Typical Applications:

- Various applications in aerospace and medical field

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

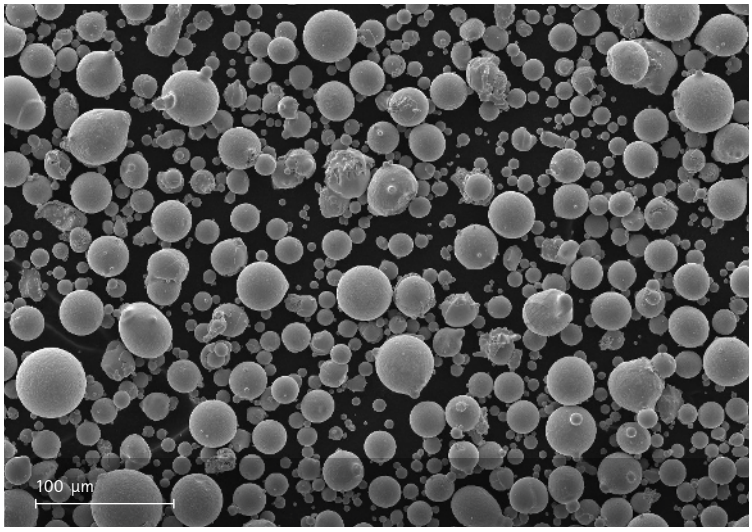
The chemical composition of EOS CobaltChrome MP1 is in accordance with standards ASTM F1537/F799, ASTM F75, ISO 5832-12 and ISO 5832-4.

Powder chemical composition (wt.-%)

Element	Min.	Max.
Co	60	65
Cr	27.00	30.00
Mo	5.00	7.00
W	-	0.20
Ni	-	0.10
Fe	-	0.75
Mn	-	1.00
Si	-	1.00
C	-	0.14

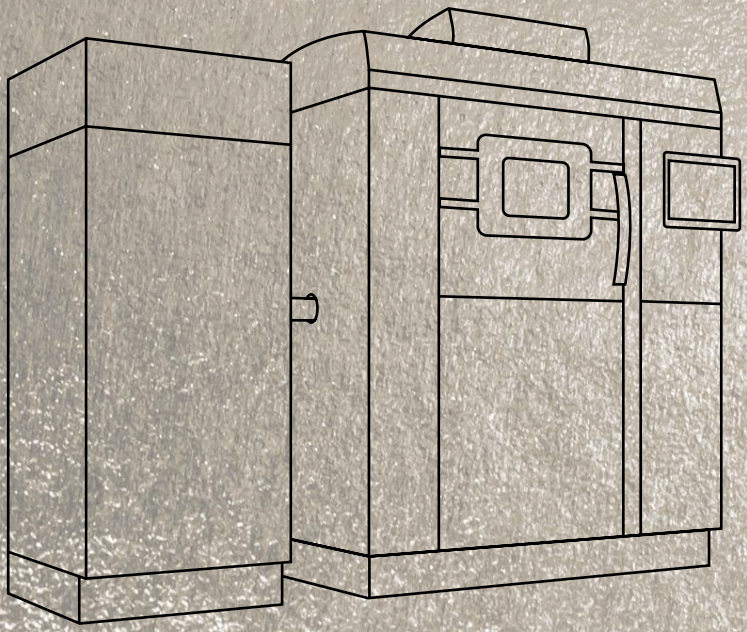
Powder particle size

Generic particle size distribution	15 - 45 µm



SEM image of powder

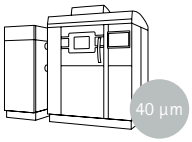
TRL 7
Premium



EOS CobaltChrome MP1
for EOS M 290 | 40 µm

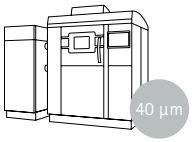
Process Information
Chemical and Physical Part Properties
Heat Treatment
Additional Data

EOS CobaltChrome MP1 for EOS M 290 | 40 µm
Process Information



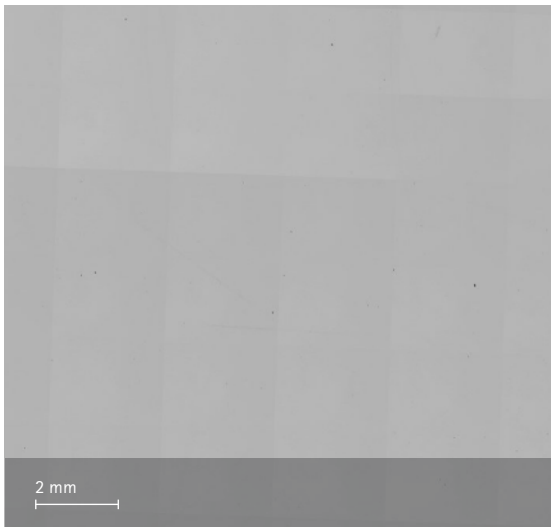
System set-up	EOS M 290
EOSPAR name	MP1_PerformanceM291
Software requirements	EOSPPRINT 2.3 or newer EOSYSTEM 2.1 or newer
Powder part no.	9011-0012
Recoater blade	HSS
Nozzle	EOS Standard Nozzle
Inert gas	Nitrogen
Sieve	63 µm

Additional information	
Layer thickness	40 µm
Volume rate	4.2 mm³/s
Minimum wall thickness	0.4 mm



Chemical and Physical Properties of Parts[1]

Chemical composition of printed parts matches the chemistry of EOS CobaltChrome MP1 powder.



Micrograph of a polished surface, as manufactured

Defects	Result
Average Defect Percentage	<0.1 %
Density, ISO3369	≥ 8.30 g/cm³

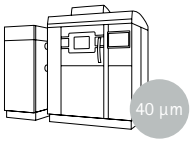
Tensile properties heat treated
ISO6892-1

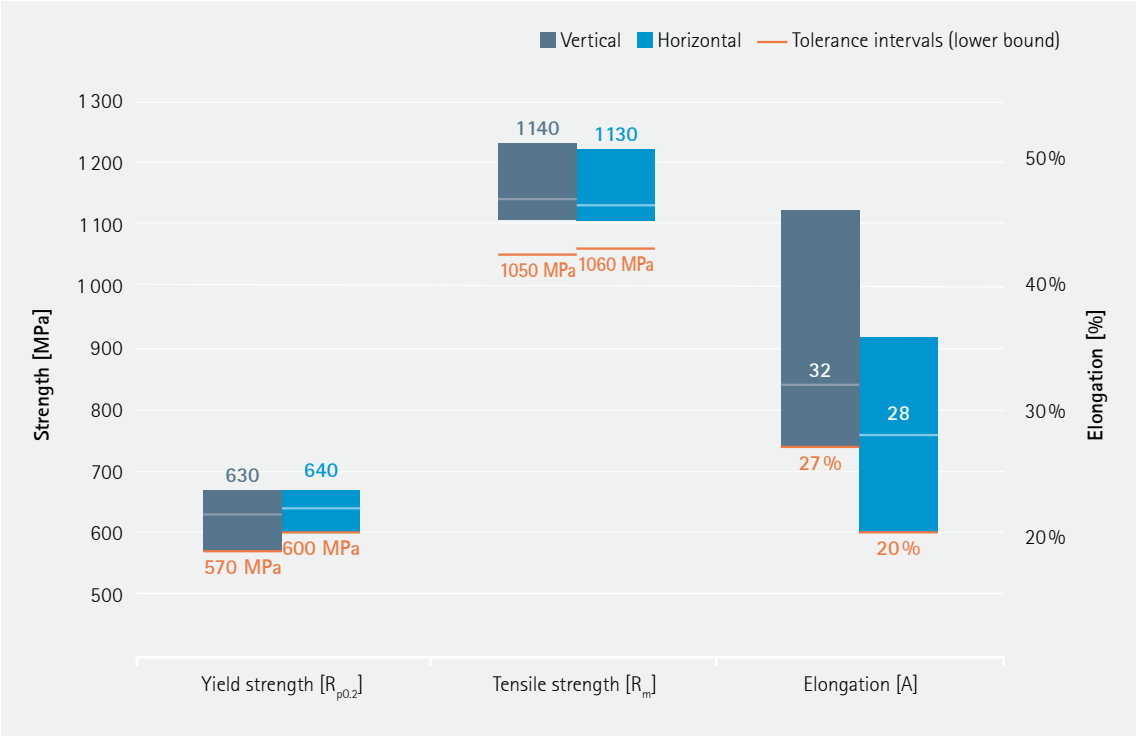
	Yield strength $R_{p0.2}$ [MPa]	**Tensile strength** R_m [MPa]	**Elongation at break** A [%]	**Modulus of elasticity** [GPa]
40 µm horizontal	640	1 130	28	205
40 µm vertical	630	1 140	32	208

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

Hardness, HRC	34
Number of samples	15





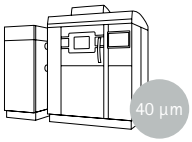
* T90: Tolerance intervals provide upper and lower bounds where 90 % of the population falls with 95 % confidence. Tolerance intervals are based on validation data / QA statistics and are not directly transferrable to other systems.

Tensile properties as manufactured
ISO6892-1

	Yield strength $R_{p0.2}$ [MPa]	**Tensile strength** R_m [MPa]	**Elongation at break** A [%]	**Modulus of elasticity** [GPa]
40 µm horizontal	1 060	1 350	13	191
40 µm vertical	820	1 220	23	170

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



Stress relieving & solution annealing heat treatment relaxes residual stresses, provides anisotropy and increases ductility of the material.

Steps:
Load parts in the cold furnace with Ar-atmosphere.
Heat up with heating rate of 10°C/min.
Soaking time: in temperature of 1150°C ± 15°C (2102°F) for 6h (± 15min).
Quench immediately after soaking to room temperature water.

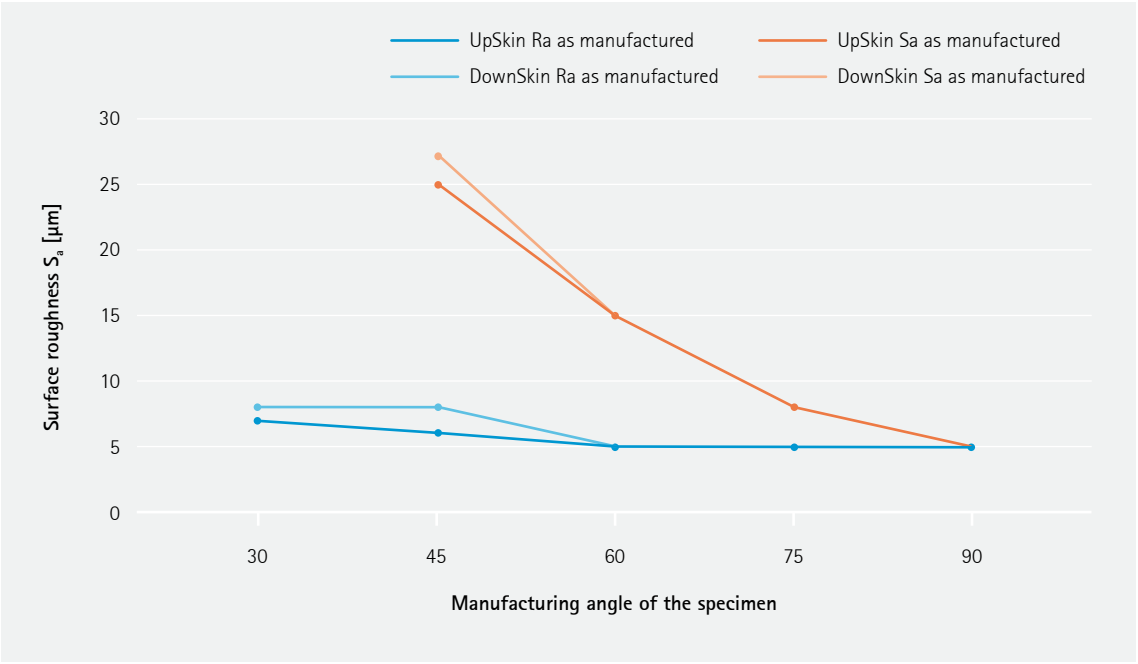
Additional Data[1]

Fatigue

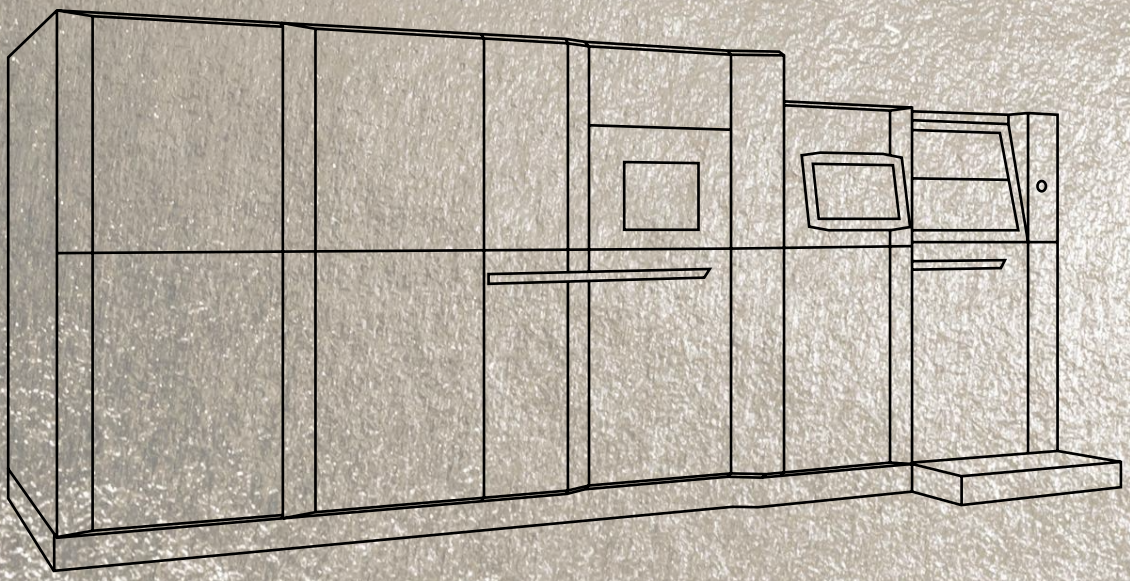
Fatigue Strength [MPa]	543

Rotating bar bending ISO-1143 2010, four point bending. Data analysis: applied staircase method (ISO-12107 2012), 7 samples, mean stress level of least occuring event, run out limit 10M cycles

Surface Roughness



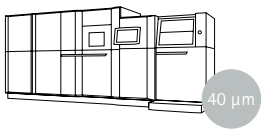
TRL 5
Core



EOS CobaltChrome MP1
for EOS M 300-4 | 40 µm

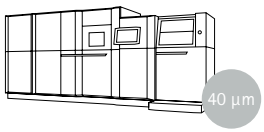
Process Information
Chemical and Physical Part Properties
Heat Treatment
Additional Data

EOS CobaltChrome MP1 for EOS M 300-4 | 40 µm
Process Information



System set-up	EOS M 300-4
EOSPAR name	MP1_040_CoreM304 1.XX
Software requirements	EOSPRINT 2.13 or newer EOSYSTEM 2.17 or newer
Powder part no.	9011-0012
Recoater blade	HSS
Inert gas	Nitrogen
Sieve	63 µm

Additional information	
Layer thickness	40 µm
Volume rate	4.2 mm³/s
Minimum wall thickness	0.4 mm



Chemical and Physical Properties of Parts[1]

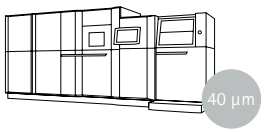
Chemical composition of printed parts matches the chemistry of EOS CobaltChrome MP1 powder.

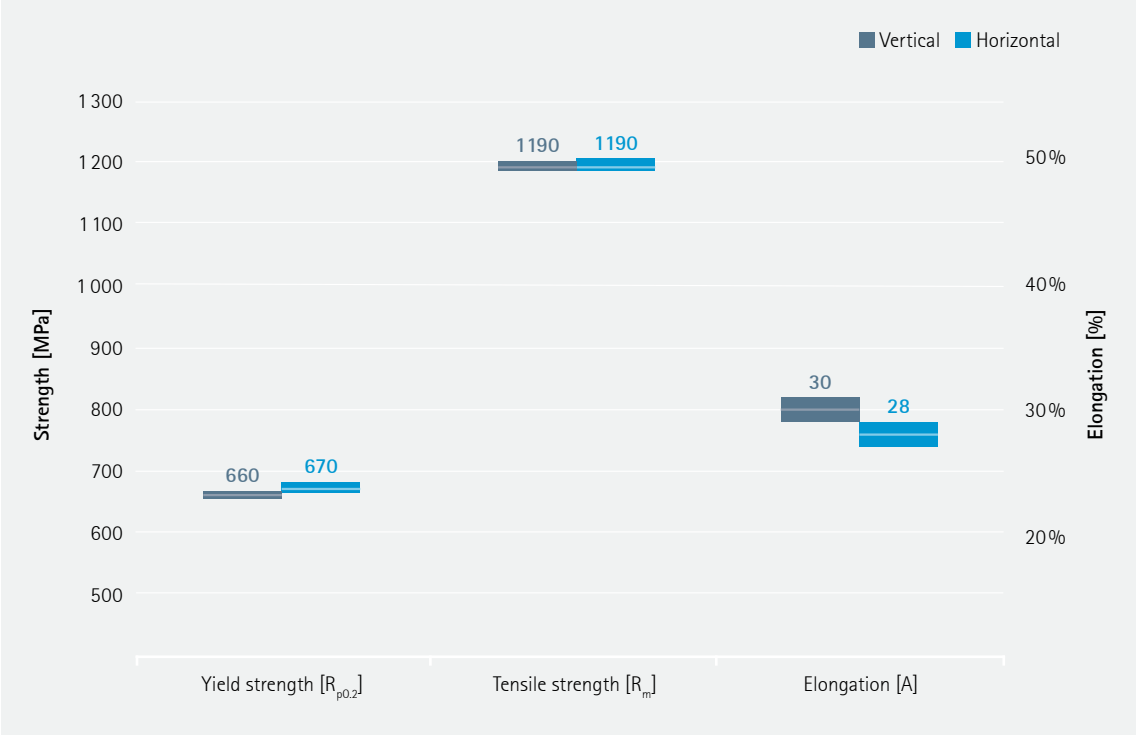
Defects	Result
Average Defect Percentage	<0.1 %
Density, ISO3369	≥ 8.30 g/cm³

Tensile properties ISO6892-1

	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]	Modulus of elasticity [GPa]
40 µm horizontal heat treated	670	1190	28	220
40 µm vertical heat treated	660	1190	30	215

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).



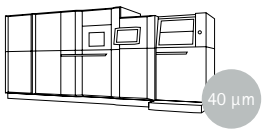


Tensile properties as manufactured ISO6892-1

	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]	Modulus of elasticity [GPa]
40 µm horizontal	1 030	1 270	8	190
40 µm vertical	820	1 200	16	180

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



Stress relieving & solution annealing heat treatment relaxes residual stresses, provides anisotropy and increases ductility of the material.

Steps:
Load parts in the cold furnace with Ar-atmosphere.
Heat up with heating rate of 10°C/min.
Soaking time: in temperature of 1150°C ± 15°C (2102°F) for 6h (± 15min).
Quench immediately after soaking to room temperature water.

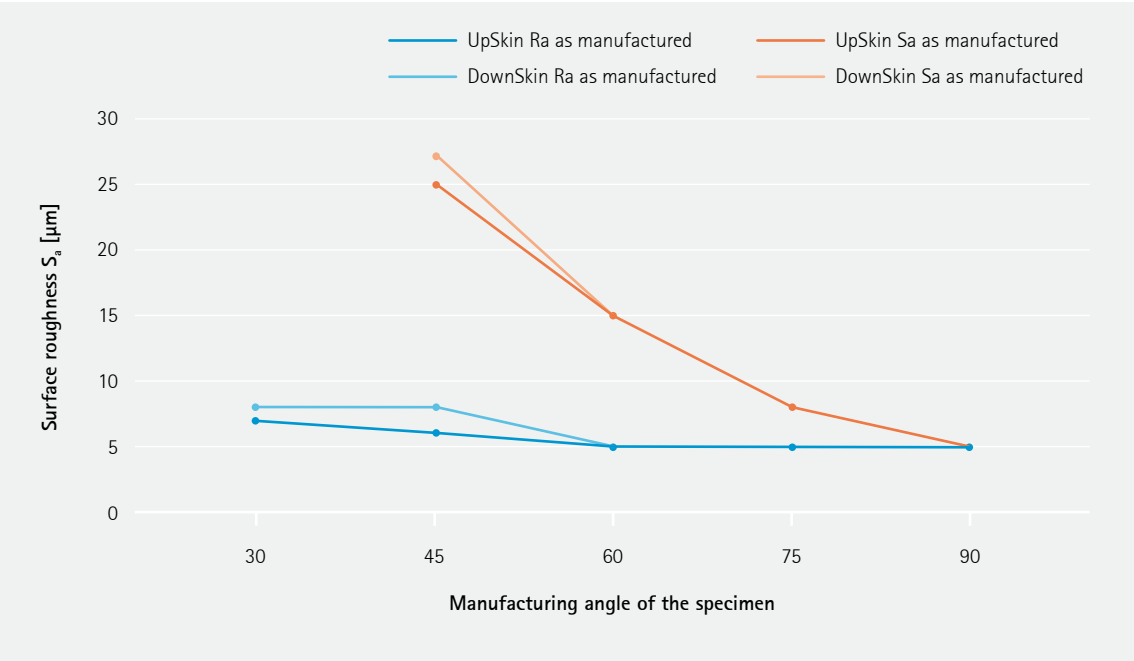
Additional Data[1]

Fatigue

Fatigue Strength [MPa]	406

Applied staircase method according to ISO 1099 using stress ratio of -1, 15 samples. Run out limit 10M cycles. Heat treated.

Surface Roughness



[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. The achievement of certain part properties as well as the assessment of the suitability of this material for a specific purpose is the sole responsibility of the user.

Any information given herein is subject to change without notice.

Status 03/2024

Cover: This image shows a possible application.

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