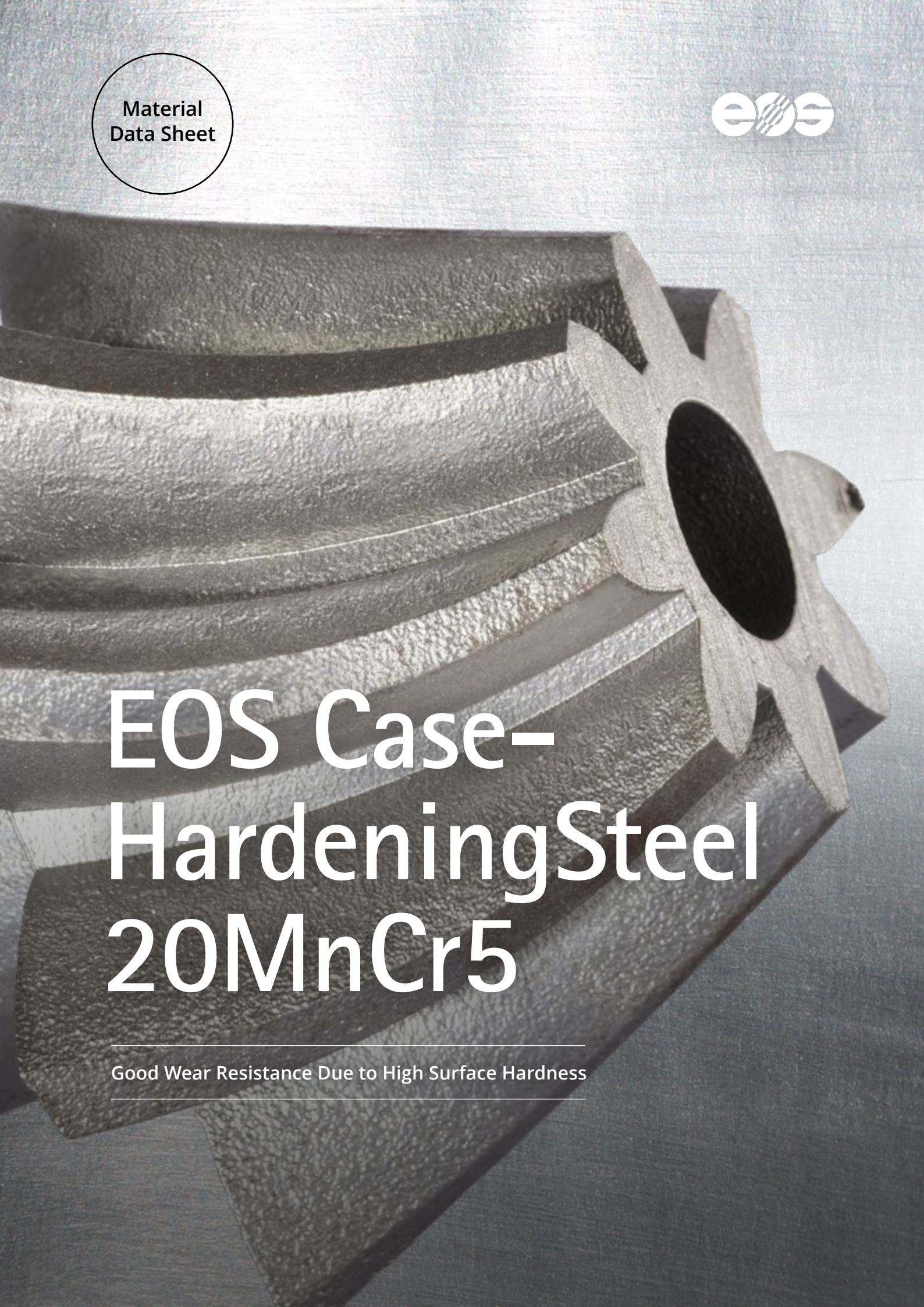
Material
Data Sheet



EOS Case-HardeningSteel 20MnCr5

Good Wear Resistance Due to High Surface Hardness

EOS CaseHardeningSteel 20MnCr5

Case hardening steel with good hardenability reaching good wear resistance due to high surface hardness after heat treatment.

Main Characteristics:

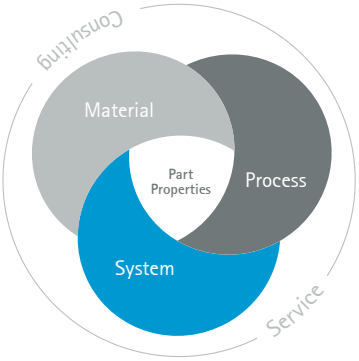
- Good wear resistance
- Excellent surface hardness after carburizing
- Material according to EN-10084 alloy number 1.7147
- Carburizable to achieve surface hardness of 60 HRC

Typical Applications:

- Automotive and general engineering applications
- Gears and powertrain components

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

EOS CaseHardeningSteel 20MnCr5 powder material is in accordance with EN-10084 alloy number 1.7147.

Powder chemical composition (wt.-%)

Element	Min.	Max.
Fe	Balance	
Mn	1.10	1.40
Cr	1.00	1.30
C	0.17	0.22
Si	-	0.40
S	-	0.035

Powder particle size

Generic particle size distribution	15-55 µm

Heat Treatment

Step 1 Hardening:
840 - 870 °C, hold time 30 min when thoroughly heated, water or oil quenching

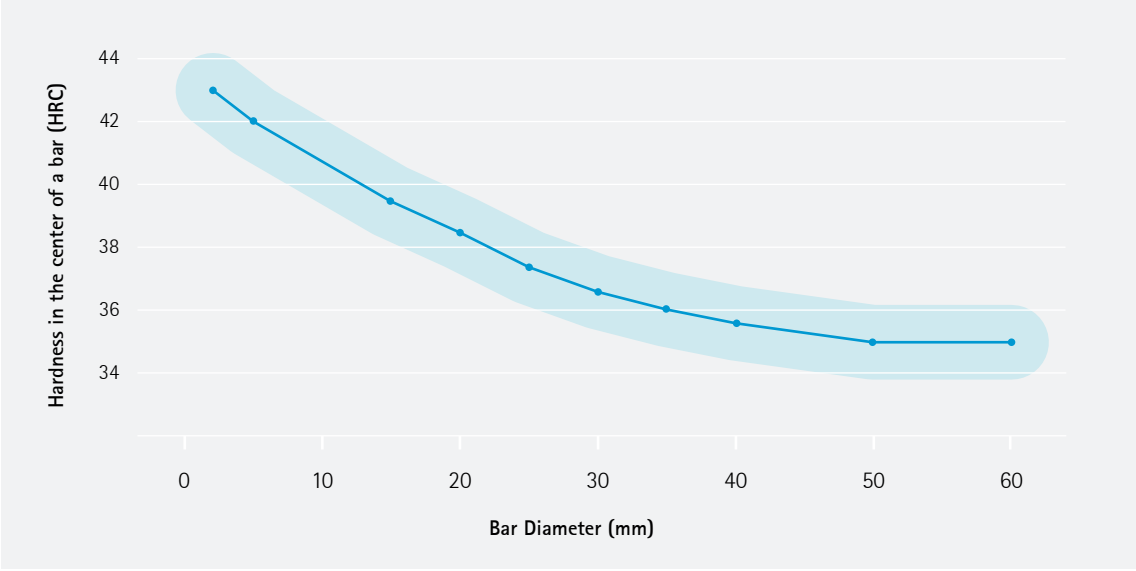
Step 2 Tempering:
160 - 200 °C, hold time 2 h when thoroughly heated, air cooling

Optional softening:
Step 1: Hardening
Step 2: Tempering

Optional softening treatment:
Normalizing 870 °C, hold time 1 h when thoroughly heated, air cooling

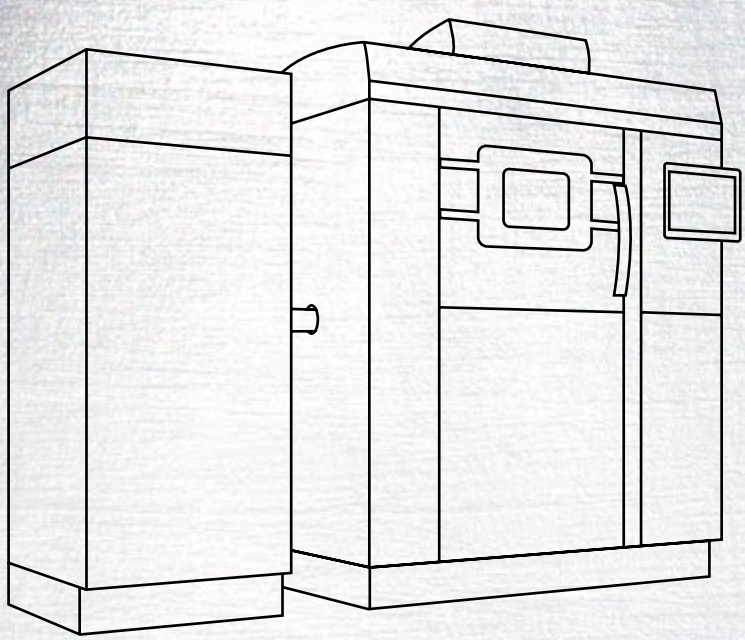
Optional carburizing in carbon rich atmosphere:
Carburizing treatment 860-900 °C, cooling in air. Hardening and tempering to be performed after carburizing.

Hardness



Hardness in the center of a bar as a function of its diameter

TRL 3
Core



EOS CaseHardeningSteel 20MnCr5
for EOS M 290 | 40/80 µm

Process Information
Physical Part Properties
Additional Data

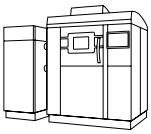
EOS CaseHardeningSteel 20MnCr5 for EOS M 290 | 40/80 µm

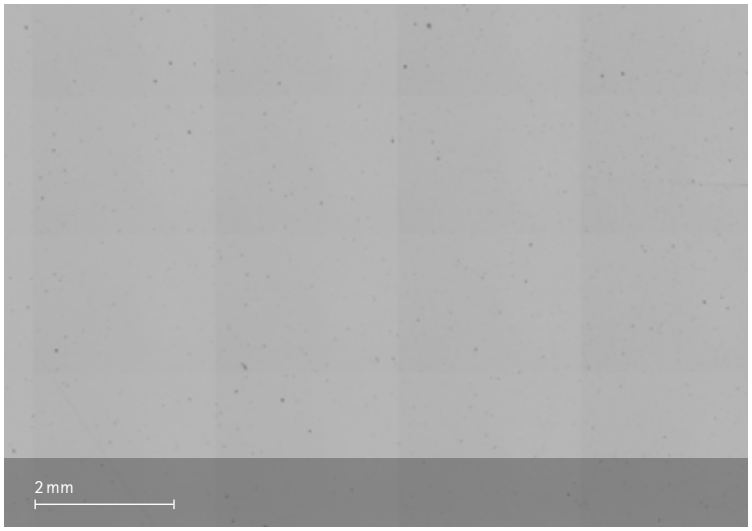
Process Information

System set-up	EOS M 290
EOSPAR name	20MnCr5_040_080_CoreM291_100
Software requirements	EOSPRINT 2.13 or newer EOSYSTEM 2.17 or newer
Powder part no.	9030-0004
Recoater blade	EOS ceramic blade
Nozzle	EOS grid nozzle
Inert gas	Nitrogen
Sieve	75 µm

Additional information	
Layer thickness	40µm, 80 µm & 40/80 µm Skin
Volume rate	4.1 mm³/s (40 µm), 7.9 mm³/s (80 µm), 4.1 - 7.9 mm³/s (40/80 µm Skin)

Chemical and Physical Properties of Parts[1]





Micrograph of polished surface

Defects	Result
Typical defect percentage	40 µm <0.1 %* & 80 µm <0.2 %*

* Defect % varies with platform position.

Typical part properties heat treated
ISO 6892-1

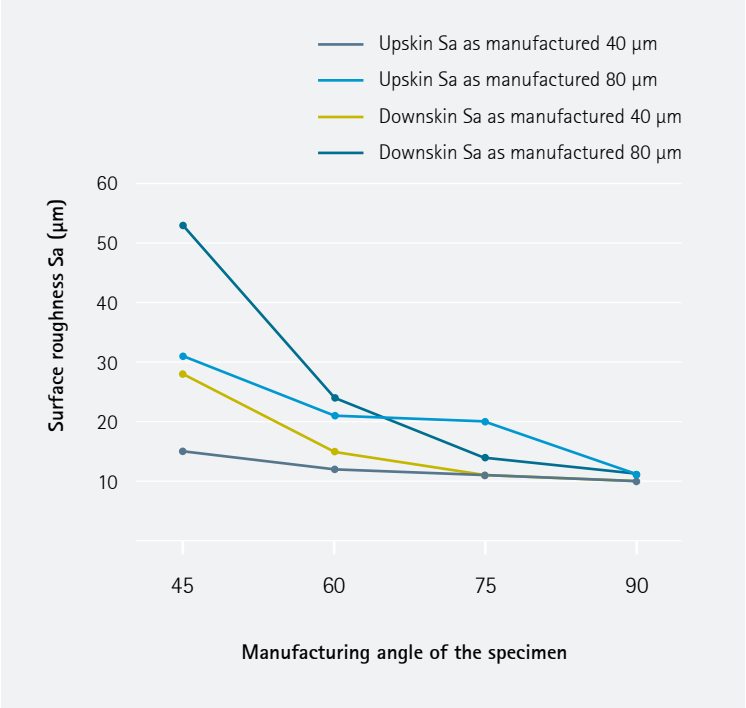
	Yield strength $R_{p0.2}$ [MPa]	**Tensile strength** R_m [MPa]	**Elongation at break** A [%]
40 µm horizontal	1 320	1 510	9
80 µm horizontal	1 270	1 490	9
40 µm vertical	1 310	1 510	9
80 µm vertical	1 280	1 490	9

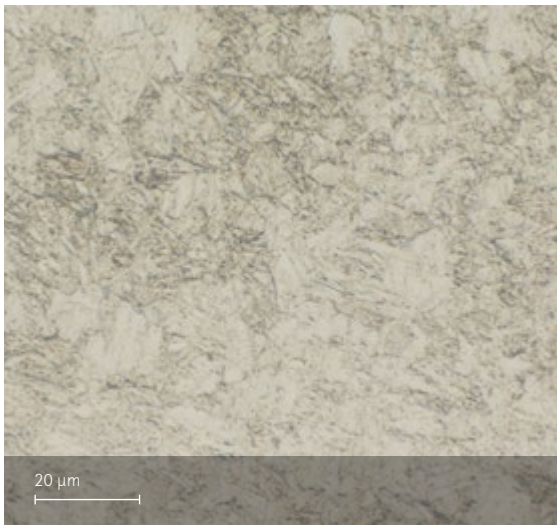
Hardness as manufactured
ISO 148-1

Layer thickness	40 µm	80 µm
Charpy-C [J], room temperature	30	30

Additional Data[1]

Surface Roughness



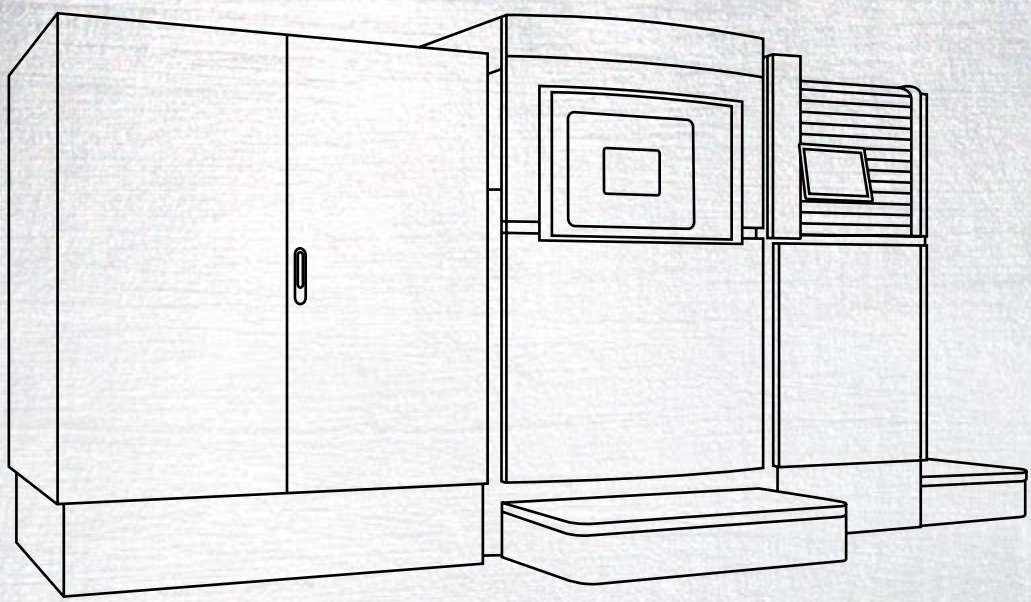


Etched microstructure image.
Heat treated state.

Coefficient of Thermal Expansion ASTM E228

Temperature	25-100 °C	25-200 °C	25-300 °C	25-400 °C
CTE	12.8 *10^{-6}/K	13.7*10^{-6}/K	15.1*10^{-6}/K	15.1*10^{-6}/K

TRL 3
Core



EOS CaseHardeningSteel 20MnCr5
for EOS M 400-4 | 40/80 µm

Process Information Physical
Part Properties
Additional Data

EOS CaseHardeningSteel 20MnCr5 for EOS M 400-4 | 40/80 µm

Process Information

System set-up	EOS M 400-4
EOSPAR name	20MnCr5_040_080_CoreM404_100
Software requirements	EOSPRINT 2.13 or newer EOSYSTEM 2.17 or newer
Powder part no.	9030-0004
Recoater blade	EOS ceramic blade
Inert gas	Nitrogen
Sieve	75 µm

Additional information	
Layer thickness	40µm, 80 µm & 40/80µm Skin
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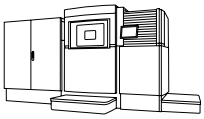

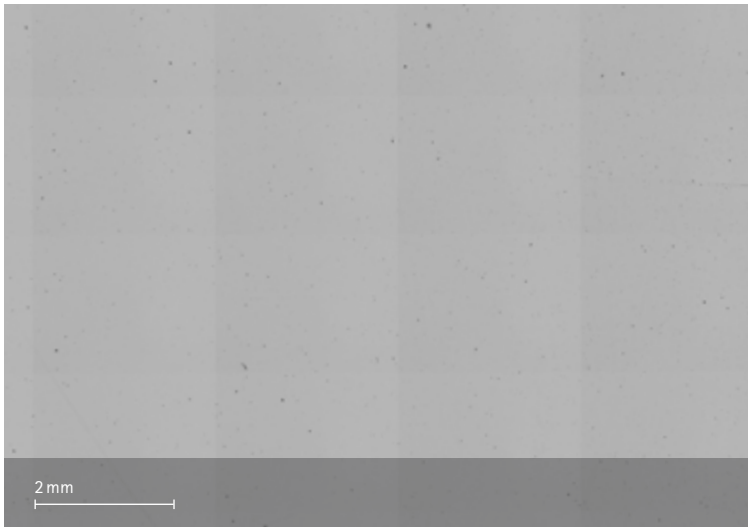

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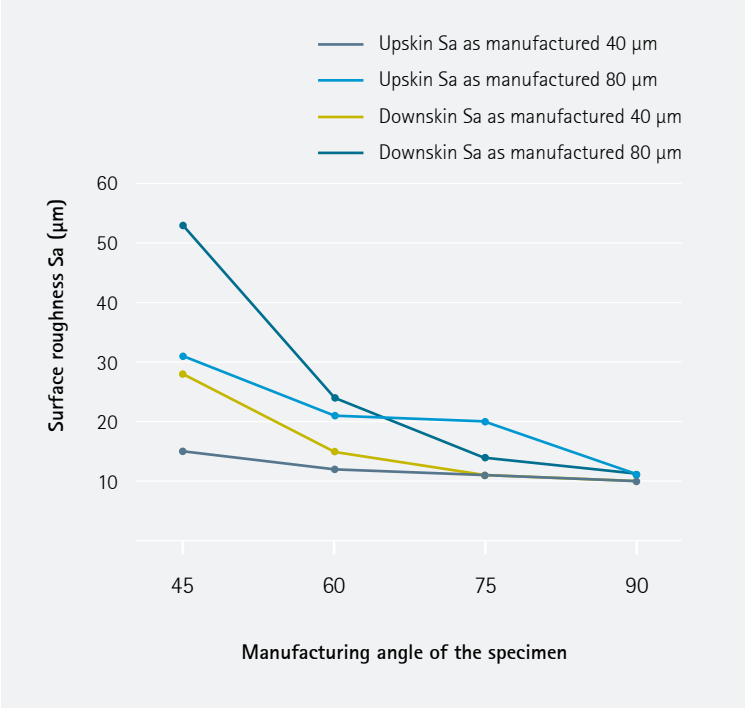

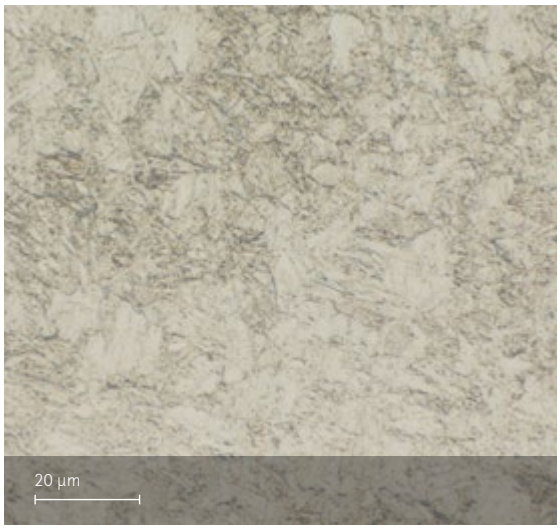

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[1] Part properties are provided for information purposes only and EOS makes no representation or warranty, and disclaims any liability, with respect to actual part properties achieved. Part properties are dependent on a variety of influencing factors 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.

Status 08/2024

Cover: This image shows a possible application.

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