

EOS CaseHardeningSteel 20MnCr5 Material Data Sheet

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, mechanical part

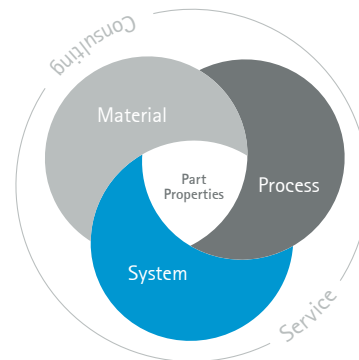
The EOS Quality Triangle

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

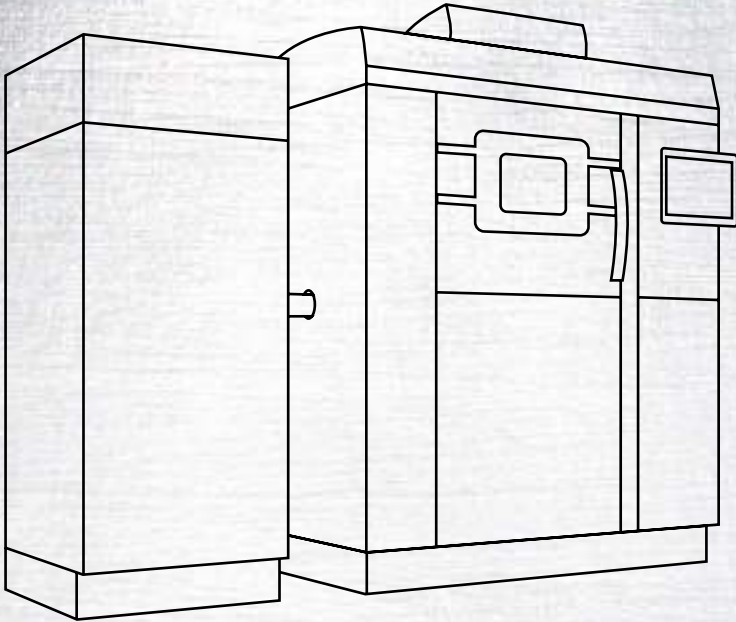
EOS CaseHardeningSteel 20MnCr5 powder material is in accordance with EN-10084 alloy number 1.7147.

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
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EOS CaseHardeningSteel 20MnCr5 for EOS M 290 | 40 μm

Process Information
Physical Part Properties
Heat Treatment
Additional Data

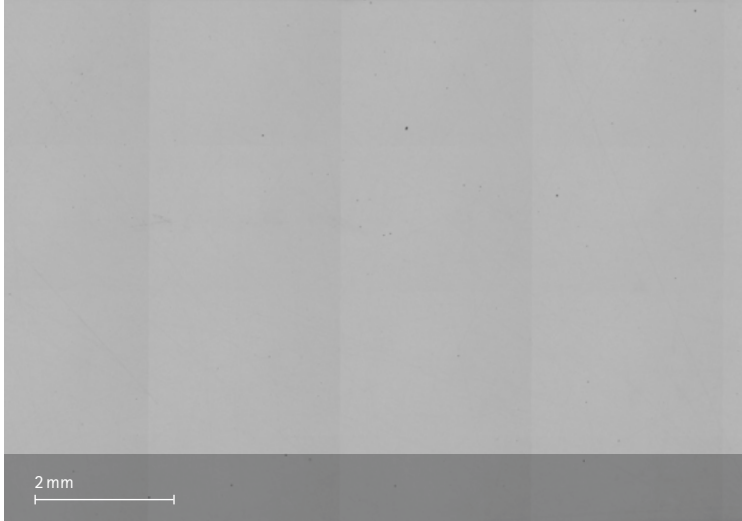
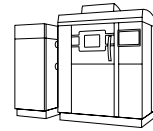
EOS CaseHardeningSteel 20MnCr5 for EOS M 290 | 40 µm Process Information

System set-up		EOS M 290
EOS ParameterSet		20MnCr5_040_CoreM291 1.X
EOSPAR name		20MnCr5_040_CoreM291_100.eospar
Software requirements		EOSPRINT 2.7 or newer EOSYSTEM 2.11 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		40 µm
Volume rate		3.84 mm ³ /s

Chemical and Physical Properties of Parts



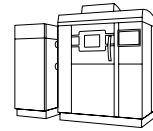
Micrograph of polished surface

Defects	Result
Porosity	< 0.5 %

Typical part properties

	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]
Heat treated horizontal	1 265	1 480	9
Heat treated vertical	1 265	1 480	9

Heat Treatment



Hardening:

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

Tempering:

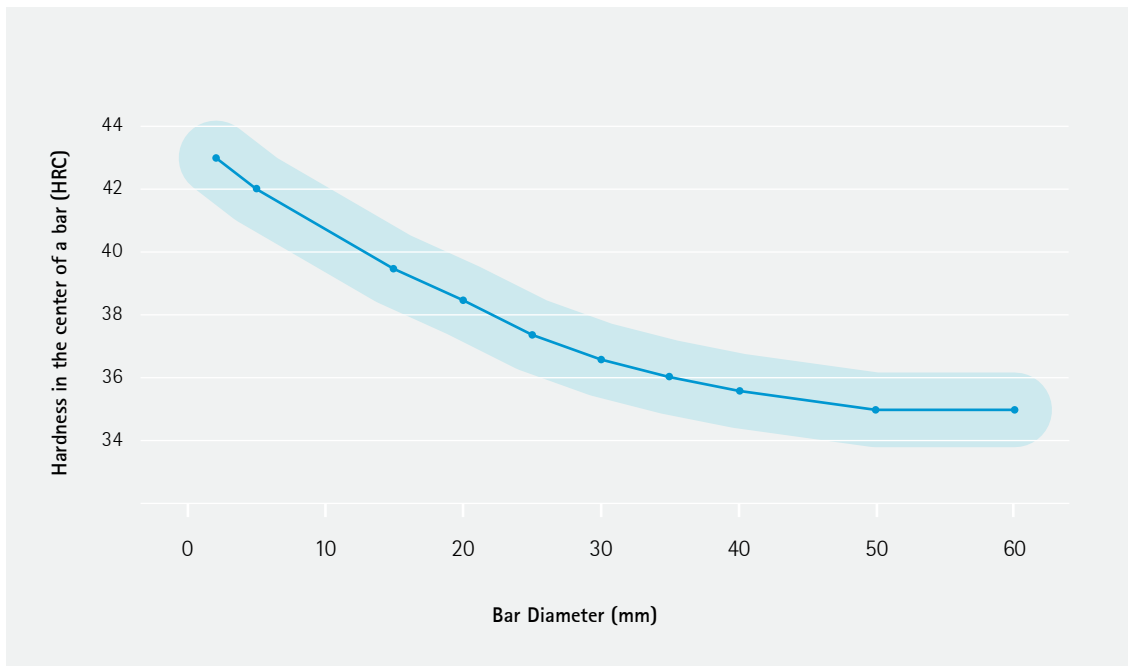
160 - 200 °C, hold time 2 h when thoroughly heated, air cooling

Optional softening treatment:

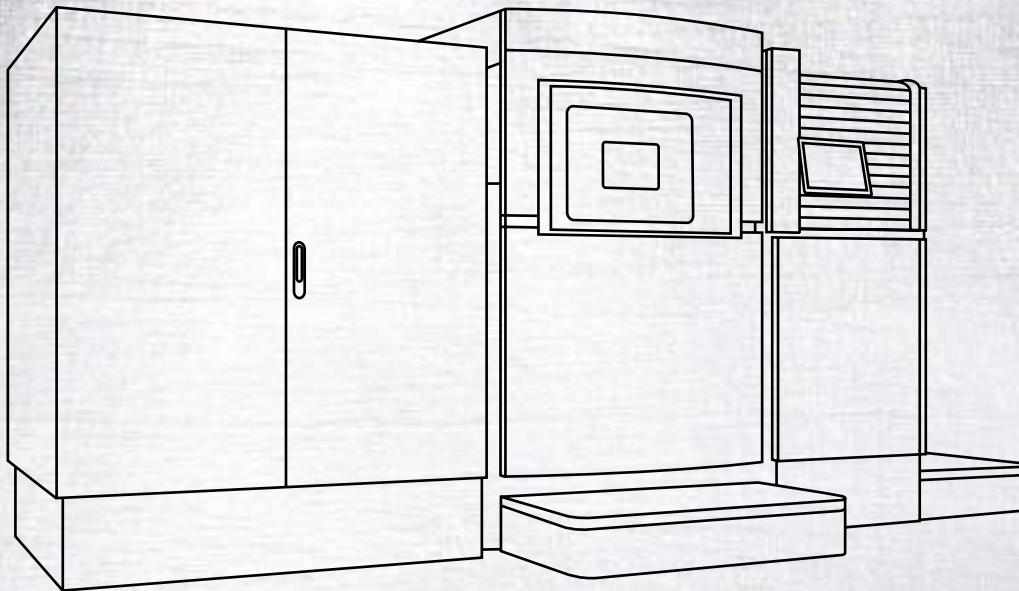
Normalizing 870 °C, hold time 1 h when thoroughly heated, air cooling

Additional Data

Hardness



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



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

Process Information Physical

Part Properties

Heat Treatment

Additional Data

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

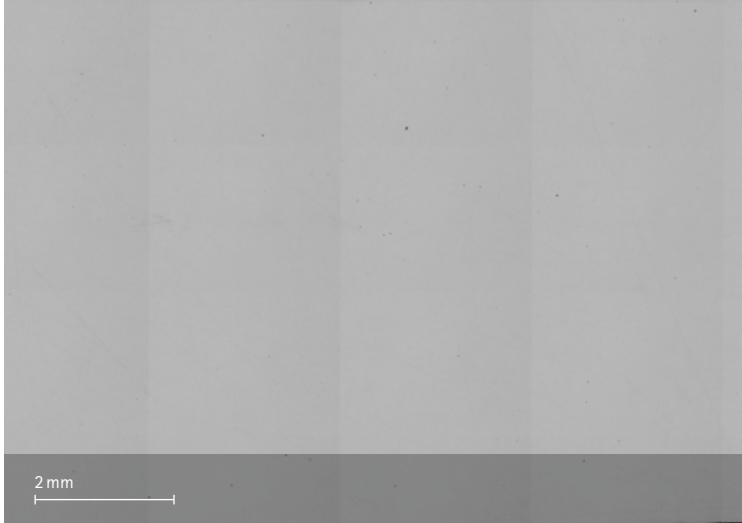
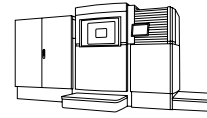
Process Information

System set-up	EOS M 400-4
EOS ParameterSet	20MnCr5_040_Core M404 1.X
EOSPAR name	20MnCr5_040_CoreM404_100.eospar
Software requirements	EOSPRINT 2.7 or newer EOSYSTEM 2.11 or newer
Powder part no.	9030-0004
Recoater blade	EOS ceramic blade
Inert gas	Nitrogen
Sieve	75 µm

Additional information

Layer thickness	40 µm
Volume rate	4 x 3.84 mm ³ /s

Chemical and Physical Properties of Parts



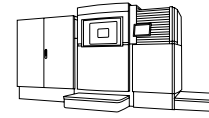
Micrograph of polished surface

Defects	Result
Porosity	< 0.5 %

Typical part properties

	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]
Heat treated horizontal	1265	1480	9
Heat treated vertical	1265	1480	9

Heat Treatment



Hardening:

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

Tempering:

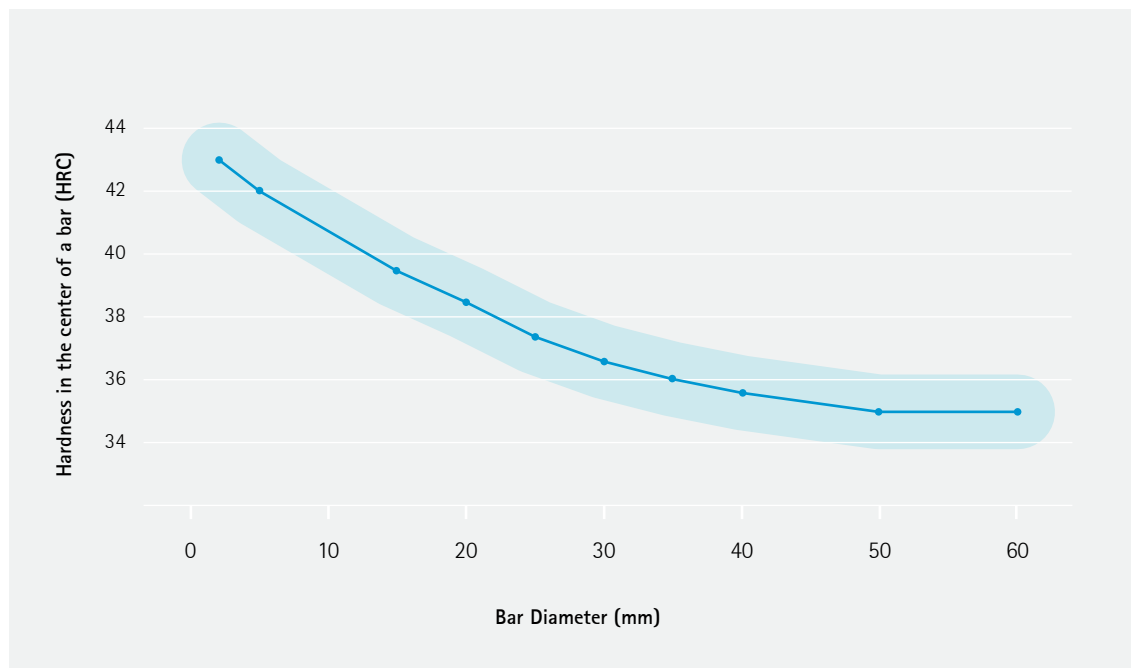
160 - 200 °C, hold time 2 h when thoroughly heated, air cooling

Optional softening treatment:

Normalizing 870 °C, hold time 1 h when thoroughly heated, air cooling

Additional Data

Hardness



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

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Cover: This image shows a possible application.

The quoted values refer to the use of this material with above specified type of EOS DMLS system, EOSYSTEM and EOSPRINT software version, parameter set and operation in compliance with parameter sheet and operating instructions. Part properties are measured with specified measurement methods using defined test geometries and procedures. Further details of the test procedures used by EOS are available on request. Any deviation from these standard settings may affect the measured properties. The data correspond to EOS knowledge and experience at the time of publication and they are subject to change without notice as part of EOS' continuous development and improvement processes. EOS does not warrant any properties or fitness for a specific purpose, unless explicitly agreed upon. This also applies regarding any rights of protection as well as laws and regulations.

