Material
Data Sheet

EOS StainlessSteel SuperDuplex

Austenitic-Ferritic Duplex Stainless Steel for Extreme Conditions

EOS StainlessSteel SuperDuplex

EOS StainlessSteel SuperDuplex is an austenitic-ferritic duplex stainless steel for extreme conditions. The high chromium, molybdenum and nitrogen alloying give excellent corrosion resistance in many difficult environments. The product is optimized for additive manufacturing while maintaining super duplex properties. The optimization of phase balance enables use of the product in as manufactured condition in many use cases.

The general pitting resistance equivalent PREN for EOS SuperDuplex is 41 (PREN = %Cr + 3.3 X %Mo + 16 X %N).

Main Characteristics:

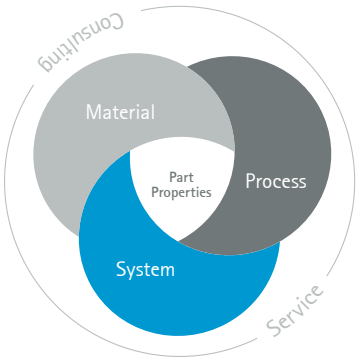
- Excellent resistance to uniform, pitting and crevice corrosion
- High strength together with high corrosion resistance

Typical Applications:

- Oil and gas industry
- Pulp and paper manufacturing devices
- Mining and off-shore equipment

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.

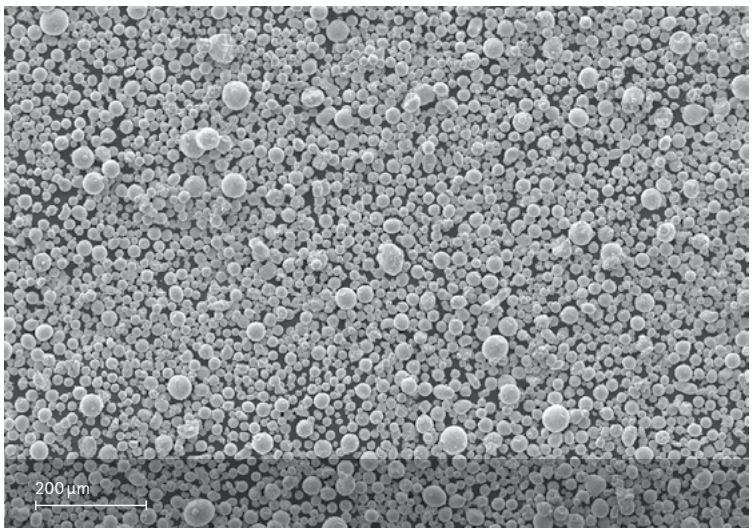
Powder Properties

Powder chemical composition (wt.-%)

Element	Min.	Max.
Fe	Balance	
Cr	22.0	26.0
Ni	9.0	13.0
Mo	3.0	6.0
N	0.15	0.35
C	-	0.03

Powder particle size

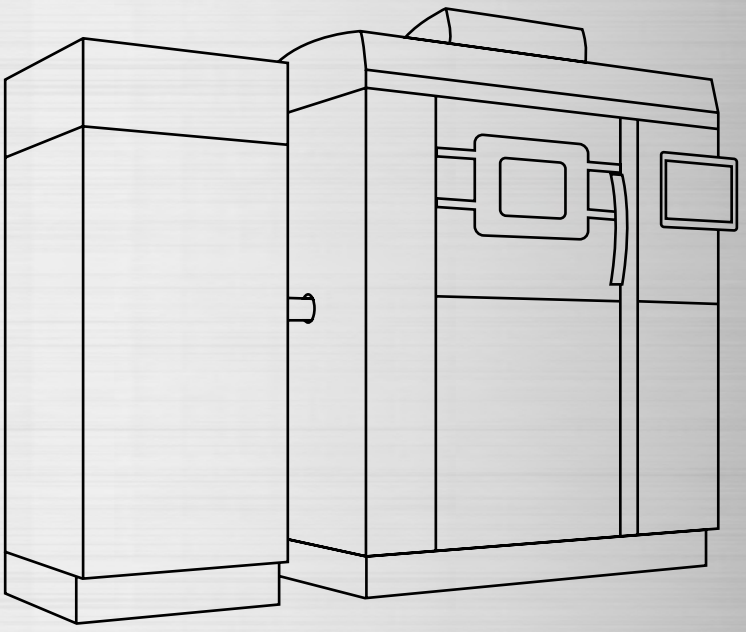
Generic particle size distribution	20-65 µm



SEM image of powder

TRL 3

Core



EOS StainlessSteel SuperDuplex
for EOS M 290 | 40/80 µm

Process Information

Physical Part Properties

Additional Data

EOS StainlessSteel SuperDuplex for EOS M 290 | 40/80 µm
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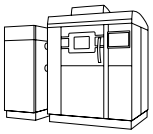
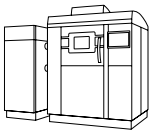


System set-up	EOS M 290
EOSPAR name	SuperDuplex_040_080_CoreM291_100
Software requirements	EOSPRINT 2.8 or newer EOSYSTEM 2.12 or newer
Powder part no.	9030-0009
Recoater blade	Ceramic
Nozzle	EOS grid nozzle
Inert gas	Argon
Sieve	75 µm

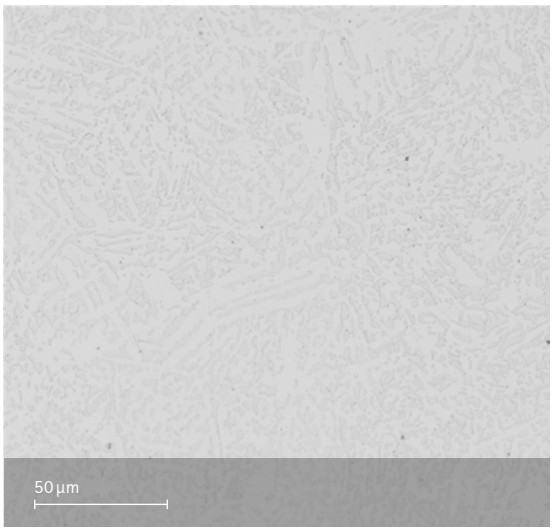
Additional information	
Layer thickness	40 µm, 80 µm & 40/80 µm Skin
Volume rate*	4.1 mm³/s (40 µm), 7.9 mm³/s (80 µm), 4.1 - 7.9 mm³/s (40/80 µm Skin)

* Volume rate depends on the part dimensions and skin thickness.



Chemical and Physical Properties of Parts

Chemical composition of built parts is compliant to EOS StainlessSteel SuperDuplex powder chemical composition.



Micrograph etched, heat treated state
Etchant: Aqua regia

Defects	Result
Porosity	40 µm / 0.04 % 80 µm / 0.08 %
Density, ISO3369	≥ 7.80 g/cm³

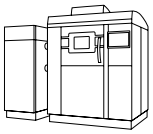
Phase Balance	As manufactured	Heat treated
Ferrite content, 40 µm	60-70 %	20 %
Ferrite content, 80 µm	50-60 %	20 %

Typical mechanical properties

		Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]	Modulus of elasticity [GPa]
Heat treated, 40 µm	horizontal	580	870	34	200
	vertical	560	860	34	
As manufactured, 40 µm	horizontal	1 170	1 260	13	200
	vertical	1 020	1 180	16	
Heat treated, 80 µm	horizontal	570	870	33	200
	vertical	560	860	35	
As manufactured, 80 µm	horizontal	1 030	1 130	17	200
	vertical	880	1 050	20	

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



Solution annealing

Hold temperature 1 100 °C, hold time 0.5 h when thoroughly heated, water quenching
Typical dimensional change after heat treatment -0.4 % (40 µm) or -0.8 % (80 µm).

Additional Data

Impact toughness

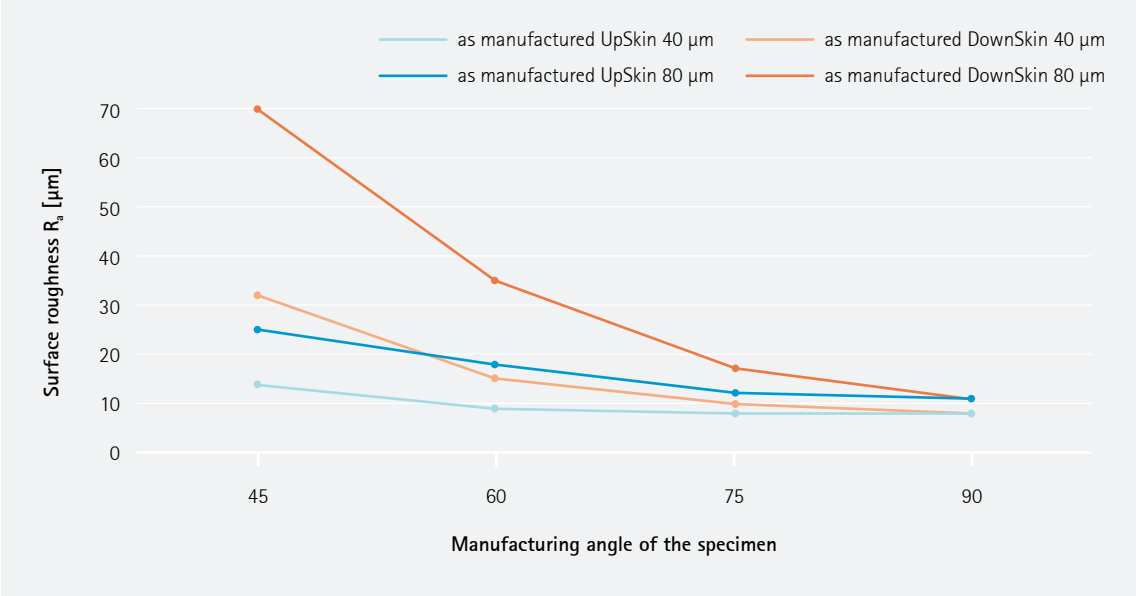
	State	As manufactured	Heat treated
Typical impact toughness [J]	40 µm	110	155
	80 µm	70	140

Testing according to ISO 148-1,
V-notch at room temperature.

Coefficient of Thermal Expansion ASTM E228

Temperature			25 – 100 °C	25 – 200 °C	25 - 300 °C
CTE	As manufactured	40 µm	$10.42*10^{-6}$/K	$11.12*10^{-6}$/K	$11.51*10^{-6}$/K
	As manufactured	80 µm	$11.71*10^{-6}$/K	$12.89*10^{-6}$/K	$13.48*10^{-6}$/K
	Heat treated	40/80 µm	$13.63*10^{-6}$/K	$14.81*10^{-6}$/K	$15.32*10^{-6}$/K

Surface Roughness



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Cover: This image shows a possible application.