

# EOS StainlessSteel SuperDuplex Material Data Sheet

# 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 ( $PREN = \%Cr + 3.3 \times \%Mo + 16 \times \%N$ ).

## 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

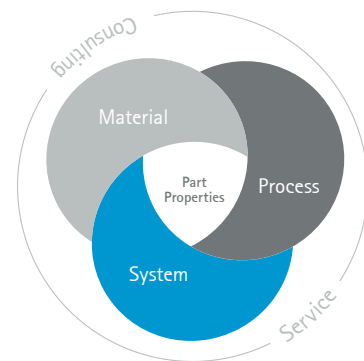
## The EOS Quality Triangle

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.



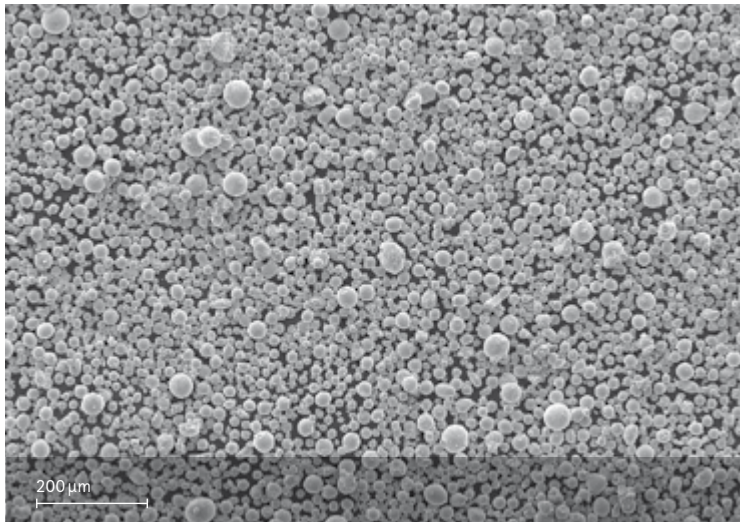
## Powder Properties

### 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

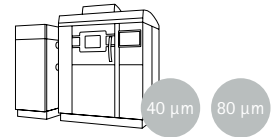
### Powder particle size

Generic particle size distribution	20-65 $\mu\text{m}$
------------------------------------	---------------------



*SEM image of powder*

## EOS StainlessSteel SuperDuplex for EOS M 290 | 40/80 $\mu\text{m}$ Process Information



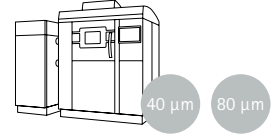
System set-up	EOS M 290
EOSPAR name	SuperDuplex_040_080_CoreM291_100
Software requirements	EOSPRINT 2.8 or newer EOSYSTEM 2.12 or newer
Powder part no.	9030-0009
Recoater blade	Ceramic
Nozzle	EOS grid nozzle
Inert gas	Argon
Sieve	75 $\mu\text{m}$

### Additional information

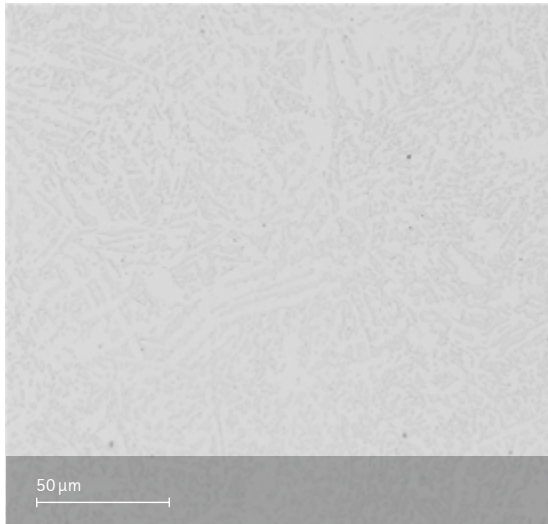
Layer thickness	40 $\mu\text{m}$ , 80 $\mu\text{m}$ Et 40/80 $\mu\text{m}$ Skin
Volume rate*	4.1 $\text{mm}^3/\text{s}$ (40 $\mu\text{m}$ ), 7.9 $\text{mm}^3/\text{s}$ (80 $\mu\text{m}$ ), 4.1 - 7.9 $\text{mm}^3/\text{s}$ (40/80 $\mu\text{m}$ Skin)

\* 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/cm <sup>3</sup>

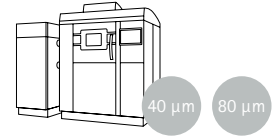
Phase Balance	As manufactured	Heat treated
Ferrite content, 40 μm	60-70 %	20 %
Ferrite content, 80 μm	50-60 %	20 %

### Typical mechanical properties

		Yield strength R <sub>p0.2</sub> [MPa]	Tensile strength R <sub>m</sub> [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	240
	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

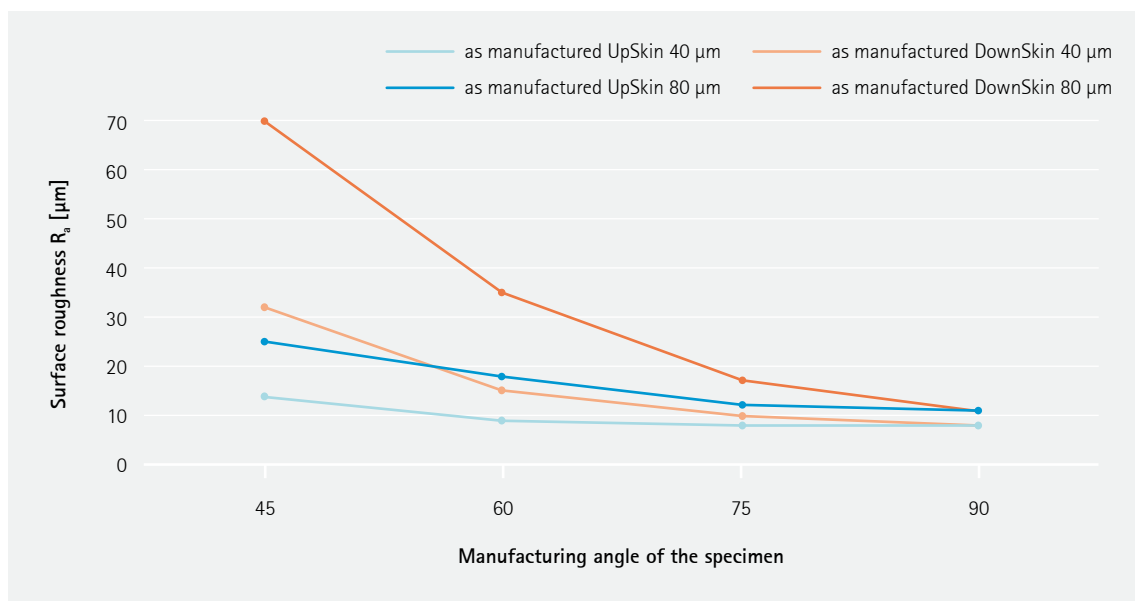
	State	As manufactured	Heat treated
Typical impact toughness [J]	40 μm	110	155
	80 μm	70	140

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 <sup>-6</sup> /K	11.12*10 <sup>-6</sup> /K	11.51*10 <sup>-6</sup> /K
	As manufactured	80 μm	11.71*10 <sup>-6</sup> /K	12.89*10 <sup>-6</sup> /K	13.48*10 <sup>-6</sup> /K
	Heat treated	40/80 μm	13.63*10 <sup>-6</sup> /K	14.81*10 <sup>-6</sup> /K	15.32*10 <sup>-6</sup> /K

### Surface Roughness



## 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

**in** EOS

 EOSGmbH

 EOS.global

 EOSGmbH

#ShapingFuture

#ResponsibleManufacturing

## 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 North America  
Phone +1 877 388 7916

EOS Singapore  
Phone +65 6430 0463

EOS UK  
Phone +44 1926 675 110

Status 01/2022 (Pre-CR29)

EOS is certified according to ISO 9001. EOS® and EOSPRINT® are registered trademarks of EOS GmbH Electro Optical Systems in some countries. For more information visit [www.eos.info/trademarks](http://www.eos.info/trademarks).

Cover: This image shows a possible application.

Part properties stated above are provided for information purposes only and EOS makes no representation or warranty whatsoever, and disclaims any liability, with respect to actual part properties achieved with this material. Part properties are subject to variation and dependent on factors such as system parameters, process and test geometries. Therefore actual part properties may deviate and users of this material are exclusively responsible to determine its suitability for the intended use. The part properties stated above have been determined by testing this material with above specified type of EOS Laser Powder Bed Fusion 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.

### Important Note

This data sheet specifies the powder properties of the EOS powder type referenced above. If you purchase powder from EOS, EOS will deliver such powder in conformity with the version of this data sheet prevailing at the time of your order. If you purchase powder from any source other than EOS, EOS makes no warranties or representations with respect to powder properties to you whatsoever, and claims with respect to the quality or properties of EOS powder are available only against the seller of such powder in accordance with your agreement with the seller, not against EOS. - EOS data sheets are subject to change without notice. This data sheet does not constitute a guaranty or warranty of properties or fitness for a specific purpose and may not be relied upon as such.

