Material
Data Sheet

EOS NickelAlloy IN738

Superalloy for use in high-stress and high-temperature applications

EOS NickelAlloy IN738

Main Characteristics:

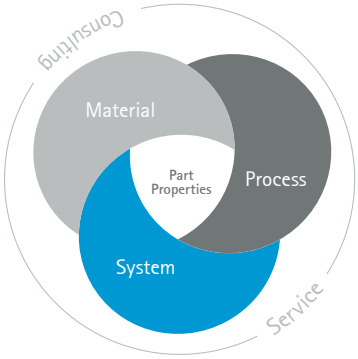
- High strength at high temperatures
- Creep resistance
- Oxidation resistance

Typical Applications:

- Gas turbine components
- Rocket engine turbopumps
- Marine and automotive turbochargers

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 and built part compositions are based on AMS 5410C.

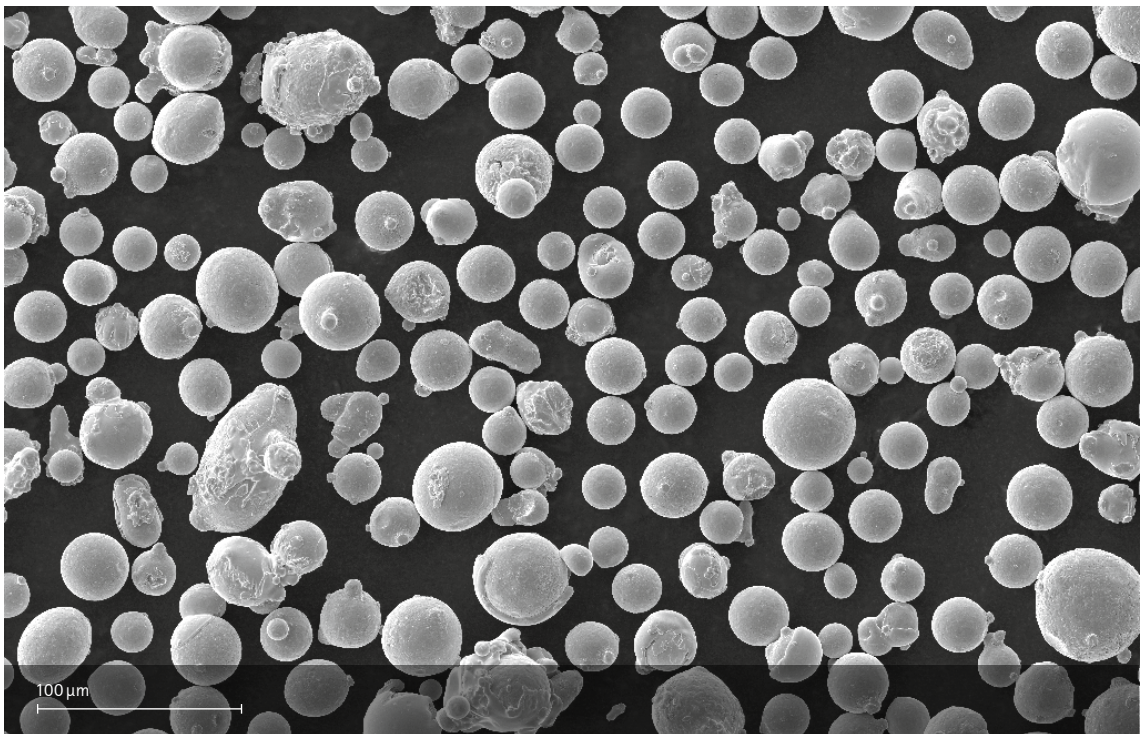
Powder chemical composition (wt.-%)

Element	Typical
Cr	16
Co	9
Al	3.5
Ti	3.5
W	2.5
Mo	2
Ta	2
Nb	1
C	0.1
Zr + B	0.1

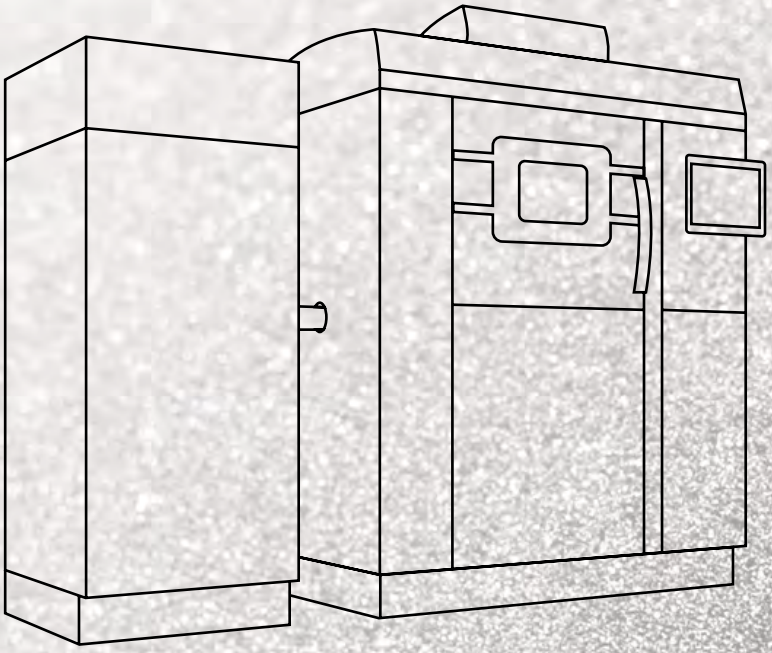
Powder particle size

Generic particle size distribution	20-63 µm

SEM micrograph of EOS NickelAlloy IN738 powder.



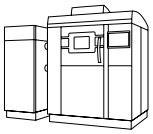
TRL 5
Core



EOS NickelAlloy IN738
for EOS M 290 | 40 µm

Process Information
Heat Treatment
Physical Part Properties
Mechanical Properties
Additional Data

EOS NickelAlloy IN738 for EOS M 290 | 40 µm
Process Information



System set-up	EOS M 290
EOSPAR name	IN738_040_CoreM291_100
Software requirements	EOSPRINT 2.15 or newer EOSYSTEM 2.19 or newer
Powder part no.	9030-0020
Recoater blade	HSS
Nozzle	Grid
Inert gas	Ar
Sieve	63 µm

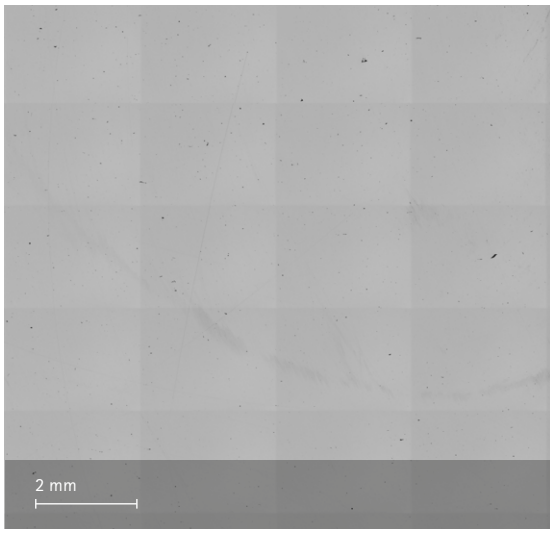
Additional information	
Layer thickness	40 µm
Volume rate	2.7 mm^3/s

Heat Treatment

EOS NickelAlloy IN738 is susceptible to formation of macrocracks upon heat treatment, depending on part geometry. Following are recommendations to mitigate the risk of macrocrack formation: (1) shot peening of parts prior to heat treatment; (2) a combined stress relieve and solution treatment plus HIP treatment using pre-pressurization. Detailed information on the heat treatment can be found in application note.

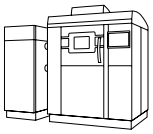
Preferred post-processing chain for EOS NickelAlloy IN738

Chemical and Physical Properties of Parts



Defects	Result	Number of samples
Average defect percentage	0.05 %	5

Mechanical Properties in Heat Treated Condition



Tensile properties heat treated ISO 6892-1/6892-2

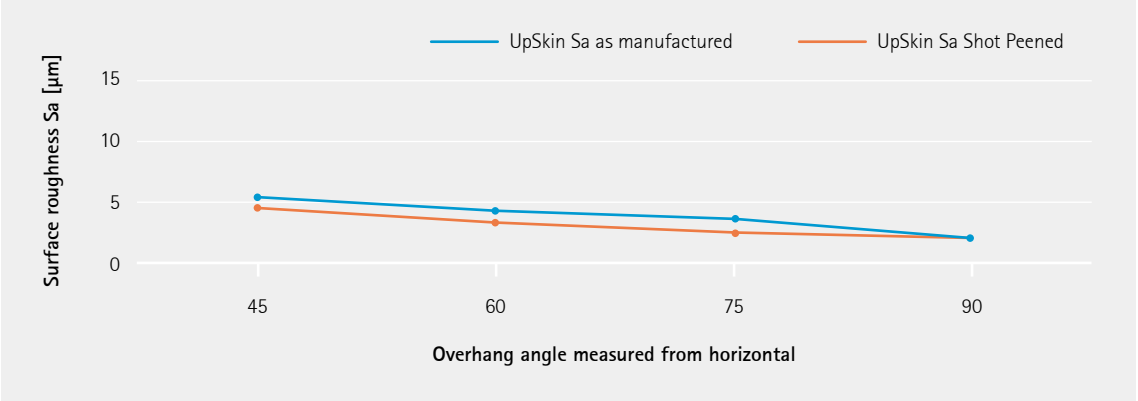
		Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]
25°C heat treated	horizontal	1122	1265	4.5
	vertical	1044	1412	9.4
850°C heat treated	horizontal	482	694	11
	vertical	477	720	20.3

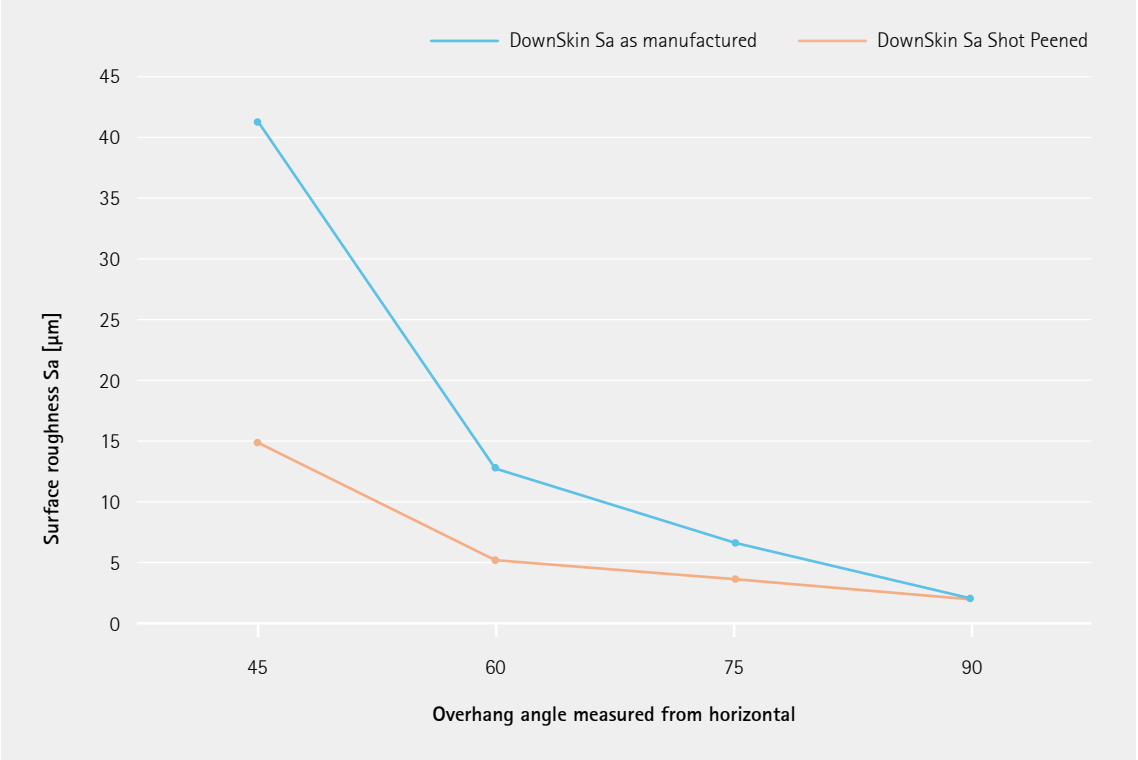
Stress rupture

		Time to rupture [hrs]	Rupture Elongation A [%]
982°C/151 MPa heat treated	horizontal	3.4	6.5
	vertical	15	25
850°C/250 MPa heat treated	horizontal	83.3	6.5
	vertical	352	17

Additional Data

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
EOS
EOS3Dprinting
EOS3Dprinting
#responsiblemanufacturing
#futureisadditive

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 of North America
Phone +1 877 388 7916

EOS Singapore
Phone +65 6430 0463

EOS UK
Phone +44 1926 675 110

Status 011/2024

EOS is certified according to ISO 9001. EOS®, DMLS®, EOSPRINT® and EOSTATE® are registered trademarks of EOS GmbH in some countries.
For more information visit www.eos.info/trademarks.

Cover: This image shows a possible application.

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 suchpowder 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.

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.