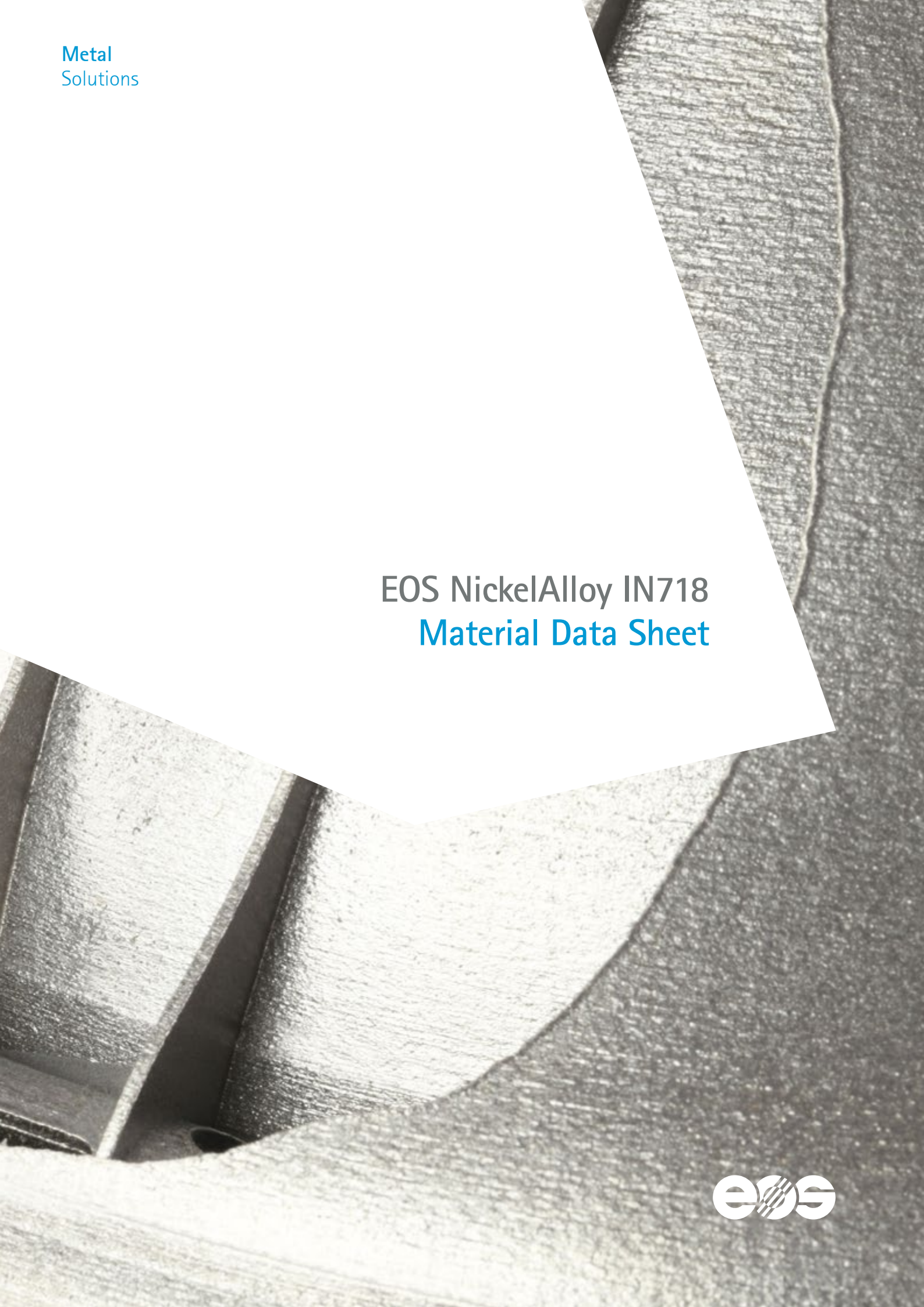
Metal
Solutions

EOS NickelAlloy IN718
Material Data Sheet



EOS NickelAlloy IN718
High Temperature Strength and Corrosion Resistance

EOS NickelAlloy IN718 is a precipitation-hardening nickel-chromium alloy that is characterized by having good tensile, fatigue, creep and rupture strength at temperatures up to 700 °C (1 290 °F). Parts built from EOS NickelAlloy IN718 can be easily post-hardened by precipitation-hardening heat treatments.

EOS NickelAlloy IN718 is a nickel alloy powder intended for manufacturing parts on EOS metal systems with EOS DMLS processes.

Main Characteristics:

- Good tensile, fatigue, creep and rupture strength at temperatures up to 700 °C (1 290 °F)
- Parts are easily precipitation hardened
- Parts can be machined, spark-eroded, welded, micro shot-peened, polished and coated in both as-built and age-hardened states

Typical Applications:

- Gas turbine components
- Instrumentation parts
- Power industry parts
- Process industry parts

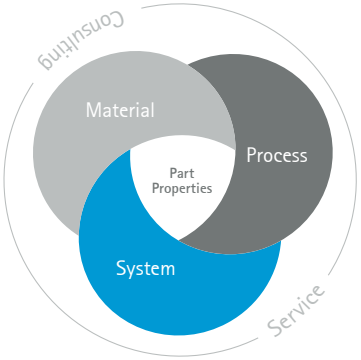
The EOS Quality Triangle

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

The chemical composition of
EOS NickelAlloy IN718 is in compliance
with UNS N07718, AMS 5662, AMS 5664,
W.Nr 2.4668, DIN NiCr19Fe19NbMo3.

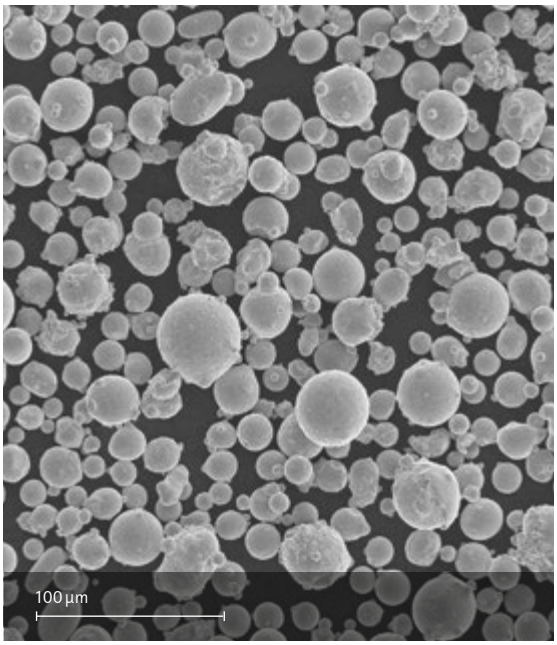
Powder chemical composition (wt.-%)

Element	Min.	Max.
Fe	Rem.	
Ni	50.00	55.00
Cr	17.00	21.00
Nb	4.75	5.50
Mo	2.80	3.30
Ti	0.65	1.15
Al	0.20	0.80
Co	-	1.00
Cu	-	0.30
Si	-	0.35
Mn	-	0.35
Ta	-	0.05
C	-	0.08
S	-	0.015
P	-	0.015
B	-	0.006
Pb	-	0.0005
Se	-	0.0020
Bi		0.00003

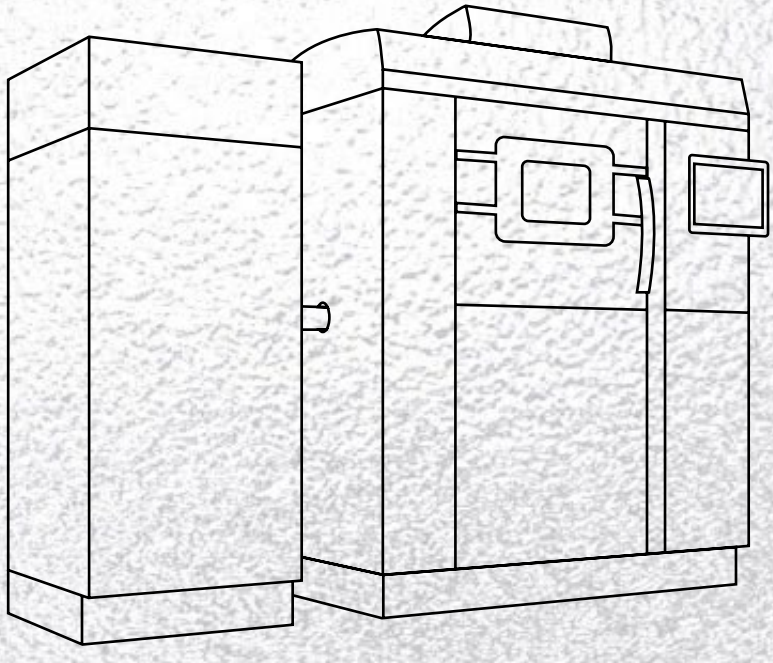
Powder particle size

Generic particle size distribution	20-55 µm

SEM picture of
EOS NickelAlloy IN718 powder.



TRL 9
EOS Premium



EOS NickelAlloy IN718
for EOS M 290 | 40 µm

Process Information
Heat Treatment
Physical Part Properties
Mechanical Properties
Additional Data

(V1.0, CR696, 2020-02)

EOS NickelAlloy IN718 for EOS M 290 | 40 µm
Process Information

System set-up	EOS M 290
EOS material set	IN718 Performance 2.0
EOSPAR name	IN718_040_PerformanceM291_2xx
Software requirements	EOSPRINT 1.7 or newer, EOSPRINT 2.6 or newer, EOSYSTEM 2.9 or newer
Powder part no.	9011-0020
Recoater blade	EOS HSS Blade
Nozzle	EOS Grid Nozzle
Inert gas	Argon
Sieve	63 µm

Additional information	
Layer thickness	40 µm
Volume rate	4.2 mm³/s
Min. wall thickness	Typical 0.3 - 0.4 mm

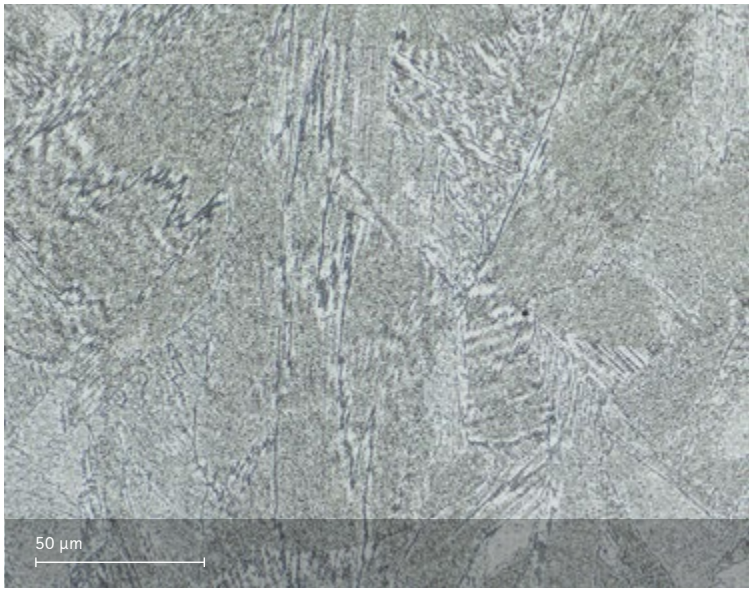
Heat Treatment

Heat treatment procedure conform to Aerospace Material Specification AMS 2774 and AMS 5662.
As manufactured microstructure for additively manufactured IN718 consists of gamma phase (γ). Heat treatment for IN718 is required to produce desired microstructure and part properties (gamma double prime precipitates, γ"). Heat treatment is also used to relieve stresses.

Step 1:
Solution Annealing: hold at 954 °C (1 750 °F) for 1 hour per 25 mm (0.98 inch) of thickness, air (/argon) cool

Step 2:
Ageing Treatment: hold at 718 °C (1 325 °F) 8 hours, furnace cool to 621 °C (1 150 °F) and hold at 621 °C (1 150 °F) for total precipitation time of 18 hours, air (/argon) cool

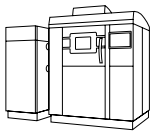
Chemical and Physical Properties of Parts[1]



Heat treated microstructure. Etched according to ASTM E407-07.

Defects	Result	Number of samples
Average defect percentage	0.03 %	10
Density, ISO3369	**Result**	**Number of samples**
Average density	min 8.15 g/cm³	NA

Mechanical Properties in Heat Treated State[1]



Tensile properties heat treated (acc. AMS 2774 and AMS 5662)

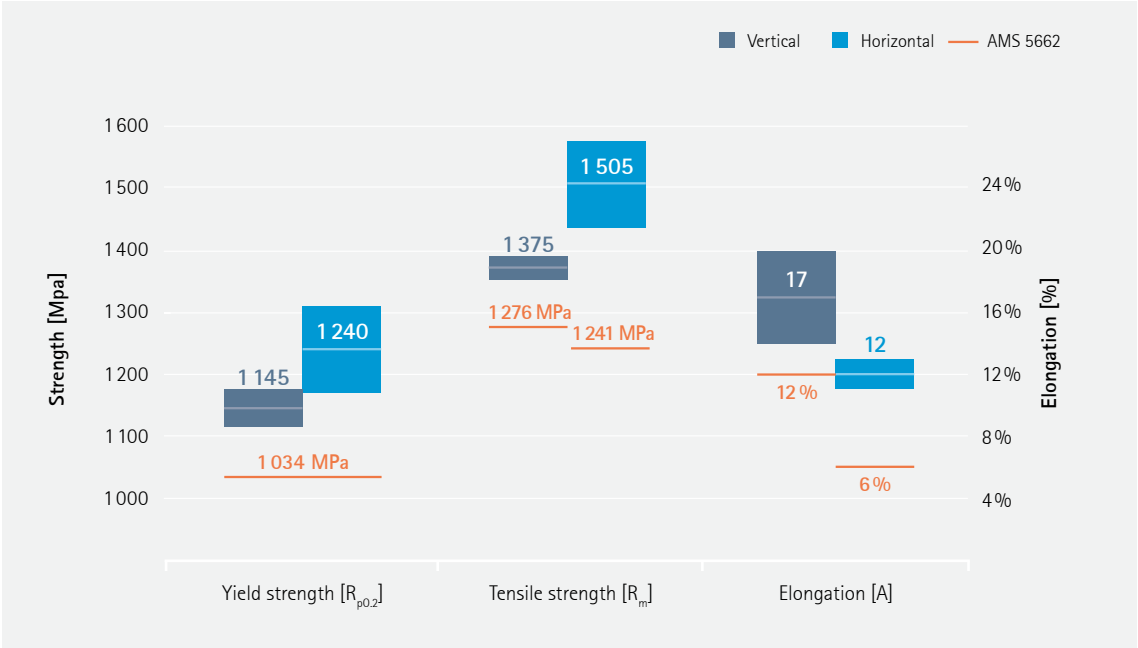
	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]	Number of samples
Vertical	1 145	1 375	17	54
Horizontal	1 240	1 505	12	26

Hardness as per ISO 6508-1

Hardness, HRC	47
Number of samples	45

Hardness as per DIN EN ISO 6506-1:2014

Hardness, HB	466
Number of samples	10

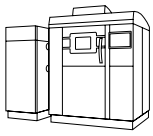


** T90: Tolerance intervals provide upper and lower bounds where 90 % of the population falls with 95 % confidence. Tolerance intervals are based on validation data / QA statistics and are not directly transferrable to other systems.*

Tensile properties as manufactured

	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]	Number of samples
Vertical	650	970	32	41
Horizontal	800	1 090	25	36

Additional Data[1]

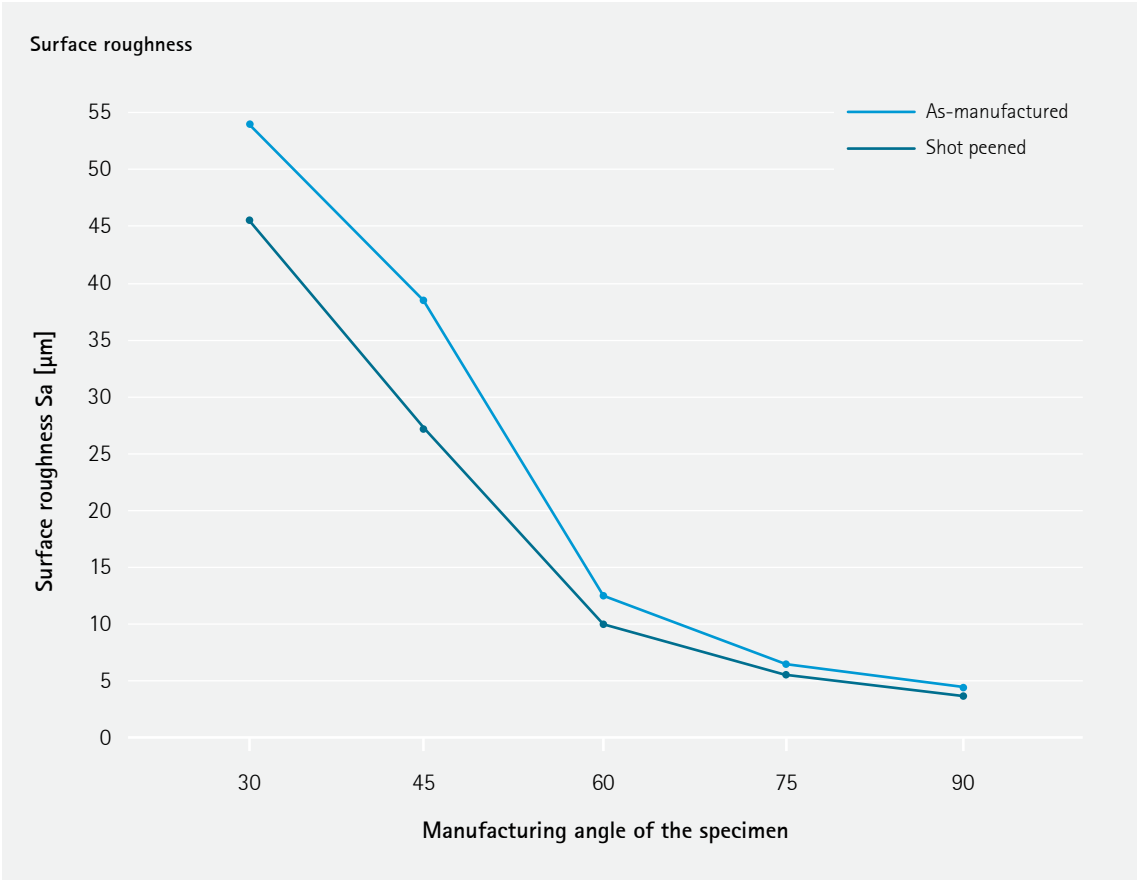


Coefficient of Thermal Expansion ASTM E228-17

Temperature	25-100 °C	25-200 °C	25-300 °C	25-400 °C	25-500 °C	25-600 °C	25-700 °C
CTE	13.1*10^{-6}/K	13.7*10^{-6}/K	14.1*10^{-6}/K	14.4*10^{-6}/K	14.7*10^{-6}/K	15.0*10^{-6}/K	15.5*10^{-6}/K

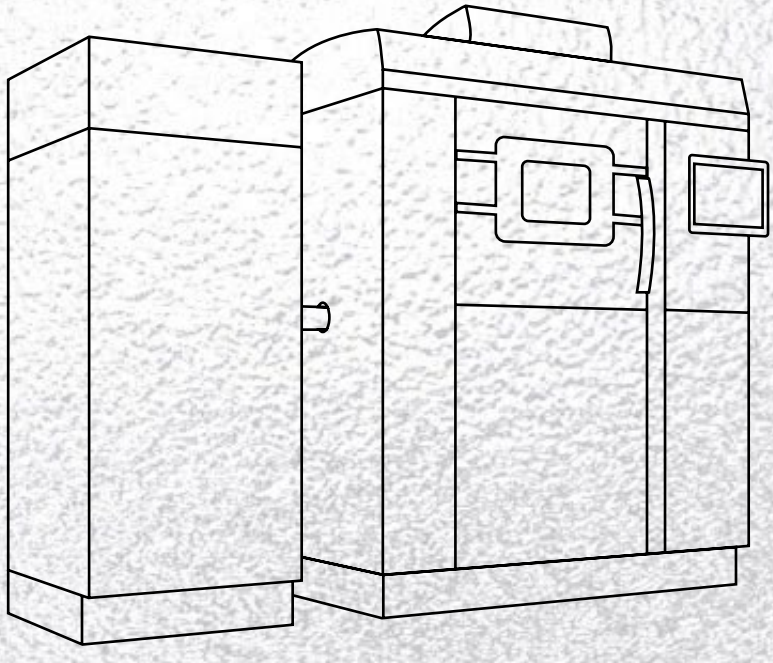
Surface Roughness

Horizontal surface	As-manufactured Sa 4.5 µm	Shot Peened Sa 3.8 µm
Vertical and angled surfaces according to figure		



The surface quality was characterized by optical measurement method according to internal procedure.
The 90 degree angle corresponds to vertical surface.

TRL 5
EOS Core



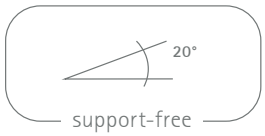
EOS NickelAlloy IN718
for EOS M 290 | 40 µm HiPro

Process Information
Heat Treatment
Physical Part Properties
Mechanical Properties
Additional Data

EOS NickelAlloy IN718 for EOS M 290 | 40 µm HiPro

Process Information

This process parameter includes two variations of the exposure set: the first one provides better productivity while the second one enables low angle buildability down to 20° at least[1]. The low angle buildability can be optimized further through the part geometry and the length of overhang.



System set-up	EOS M 290
EOS material set	IN718 40µm HiPro
EOSPAR name	IN718_040_080_HiProM291_1xx
Software requirements	EOSPRINT 2.11 or newer EOSYSTEM 2.15 or newer
Powder part no.	9011-0020
Recoater blade	EOS HSS Blade
Nozzle	EOS Grid Nozzle
Inert gas	Argon
Sieve	63 µm

Additional information	
Layer thickness	40 µm
Volume rate	5.2 mm³/s
Min. wall thickness	Typical 0.3 - 0.4 mm

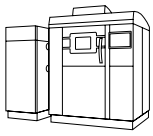
Heat Treatment

Heat treatment procedure conform to Aerospace Material Specification AMS 2774 and AMS 5662.
As manufactured microstructure for additively manufactured IN718 consists of gamma phase (γ). Heat treatment for IN718 is required to produce desired microstructure and part properties (gamma double prime precipitates, γ"). Heat treatment is also used to relieve stresses.

Step 1:
Solution Annealing: hold at 954 °C (1 750 °F) for 1 hour per 25 mm (0.98 inch) of thickness, air (/argon) cool

Step 2:
Ageing Treatment: hold at 718 °C (1 325 °F) 8 hours, furnace cool to 621 °C (1 150 °F) and hold at 621 °C (1 150 °F) for total precipitation time of 18 hours, air (/argon) cool

Chemical and Physical Properties of Parts[1]

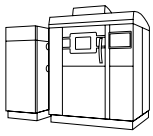


As manufactured microstructure. Etchant: Kalling's II

Defects	Result	Number of samples
Average defect percentage	0.03 %	5
Density, ISO3369	**Result**	**Number of samples**
Average density	min 8.15 g/cm^3	NA

The areal defect percentage was determined from cross-sections of built parts using an optical microscope fitted with a camera and analysis software. The analysis was carried out for sample area of 15 x 15 mm. The defects were detected and analyzed with an image capture/analysis software with an automatic histogram based filtering procedure on monochrome images.

Mechanical Properties in Heat Treated State[1]

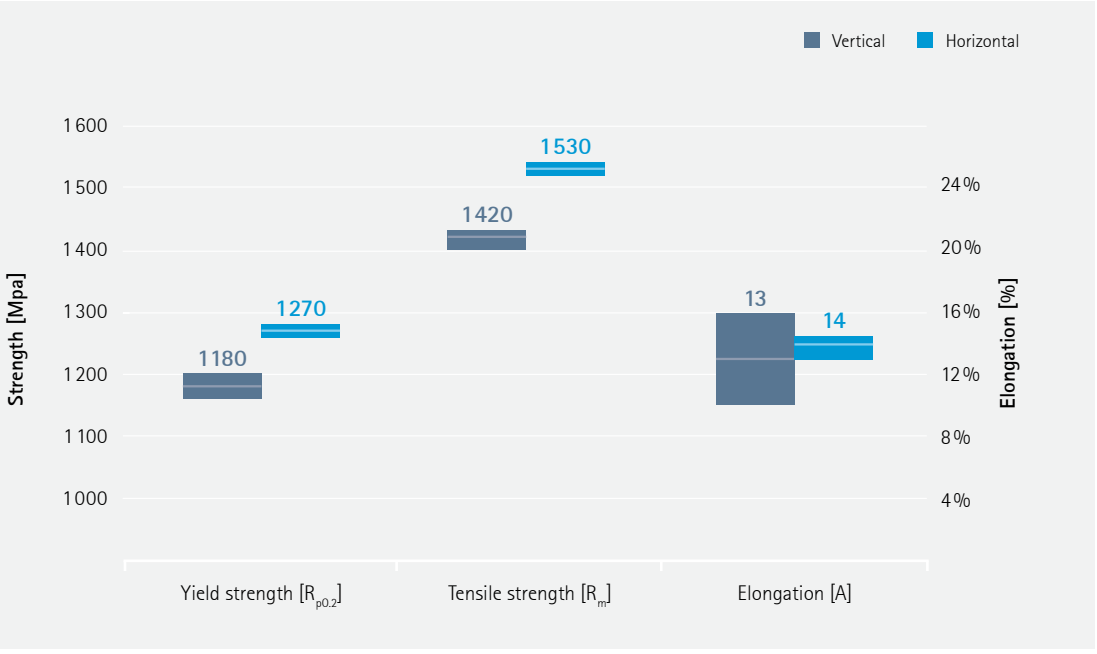


Tensile properties heat treated
ISO6892-1

	Yield strength $R_{p0.2}$ [MPa]	**Tensile strength** R_m [MPa]	**Elongation at break** A [%]
Vertical	1 180	1 420	13
Horizontal	1 270	1 530	14

Hardness as per ISO 6507

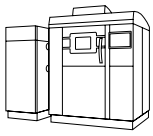
Hardness, HV	479
Number of samples	12

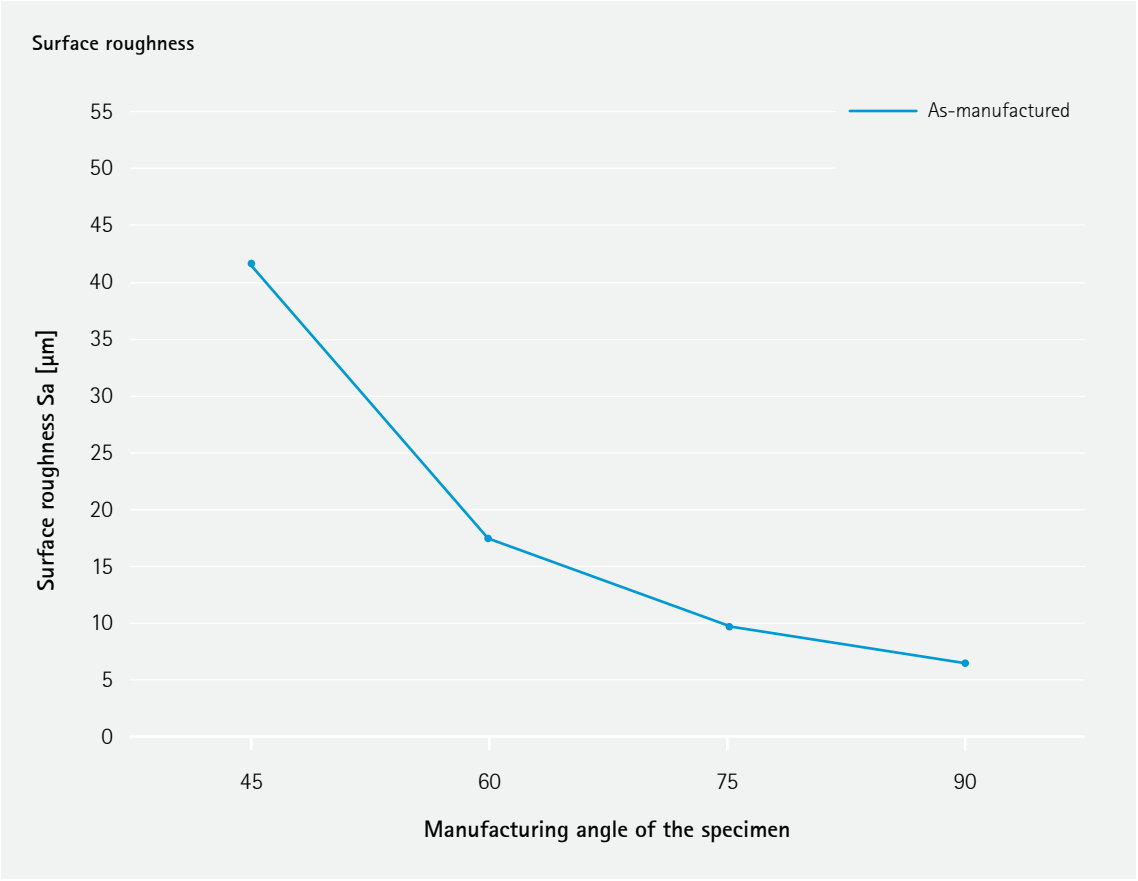


Tensile properties as manufactured

	Yield strength $R_{p0.2}$ [MPa]	**Tensile strength** R_m [MPa]	**Elongation at break** A [%]	**Number of samples**
Vertical	650	990	32	7
Horizontal	790	1 080	26	4

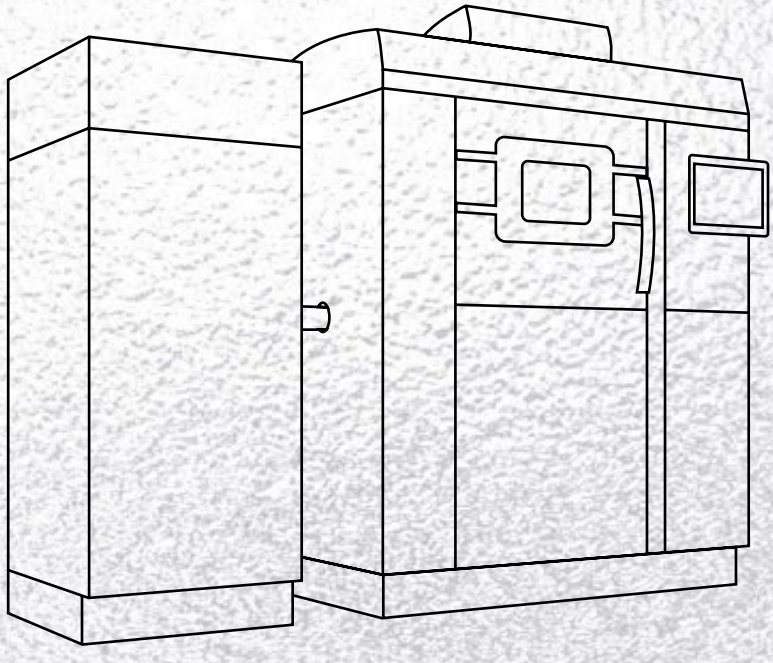
Additional Data[1]





The surface quality was characterized by optical measurement method according to internal procedure.
The 90 degree angle corresponds to vertical surface.

TRL 7
EOS Premium



EOS NickelAlloy IN718
for EOS M 290 | 80 µm HiPro

Process Information
Heat Treatment
Physical Part Properties
Mechanical Properties
Additional Data

EOS NickelAlloy IN718 for EOS M 290 | 80µm HiPro
Process Information

System set-up	EOS M 290
EOS material set	IN718 80 µm HiPro
EOSPAR name	IN718_040_080_HiProM291_1xx
Software requirements	EOSPRINT 2.11 or newer EOSYSTEM 2.15 or newer
Powder part no.	9011-0020
Recoater blade	EOS HSS Blade
Nozzle	EOS Grid Nozzle
Inert gas	Argon
Sieve	63 µm

Additional information	
Layer thickness	80 µm
Volume rate	8.2 mm³/s
Min. wall thickness	Typical 0.3 - 0.4 mm

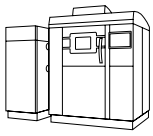
Heat Treatment

Heat treatment procedure conform to Aerospace Material Specification AMS 2774 and AMS 5662.
As manufactured microstructure for additively manufactured IN718 consists of gamma phase (γ). Heat treatment for IN718 is required to produce desired microstructure and part properties (gamma double prime precipitates, γ"). Heat treatment is also used to relieve stresses.

Step 1:
Solution Annealing: hold at 954 °C (1 750 °F) for 1 hour per 25 mm (0.98 inch) of thickness, air (/argon) cool

Step 2:
Ageing Treatment: hold at 718 °C (1 325 °F) 8 hours, furnace cool to 621 °C (1 150 °F) and hold at 621 °C (1 150 °F) for total precipitation time of 18 hours, air (/argon) cool

Chemical and Physical Properties of Parts[1]

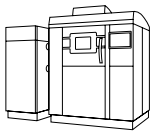


Heat treated microstructure.
Etchant: Kalling's II

Defects	Result	Number of samples
Average defect percentage	0.02 %	10
Density, ISO3369	**Result**	**Number of samples**
Average density	min 8.15 g/cm^3	NA

The areal defect percentage was determined from cross-sections of built parts using an optical microscope fitted with a camera and analysis software. The analysis was carried out for sample area of 15 x 15 mm. The defects were detected and analyzed with an image capture/analysis software with an automatic histogram based filtering procedure on monochrome images.

Mechanical Properties in Heat Treated State[1]



Tensile properties heat treated
ISO6892-1

	Yield strength $R_{p0.2}$ [MPa]	**Tensile strength** R_m [MPa]	**Elongation at break** A [%]
Vertical	1 200	1 440	15
Horizontal	1 240	1 500	14

Hardness as per ISO 6507

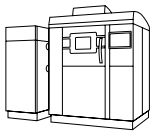
Hardness, HV	465
Number of samples	12

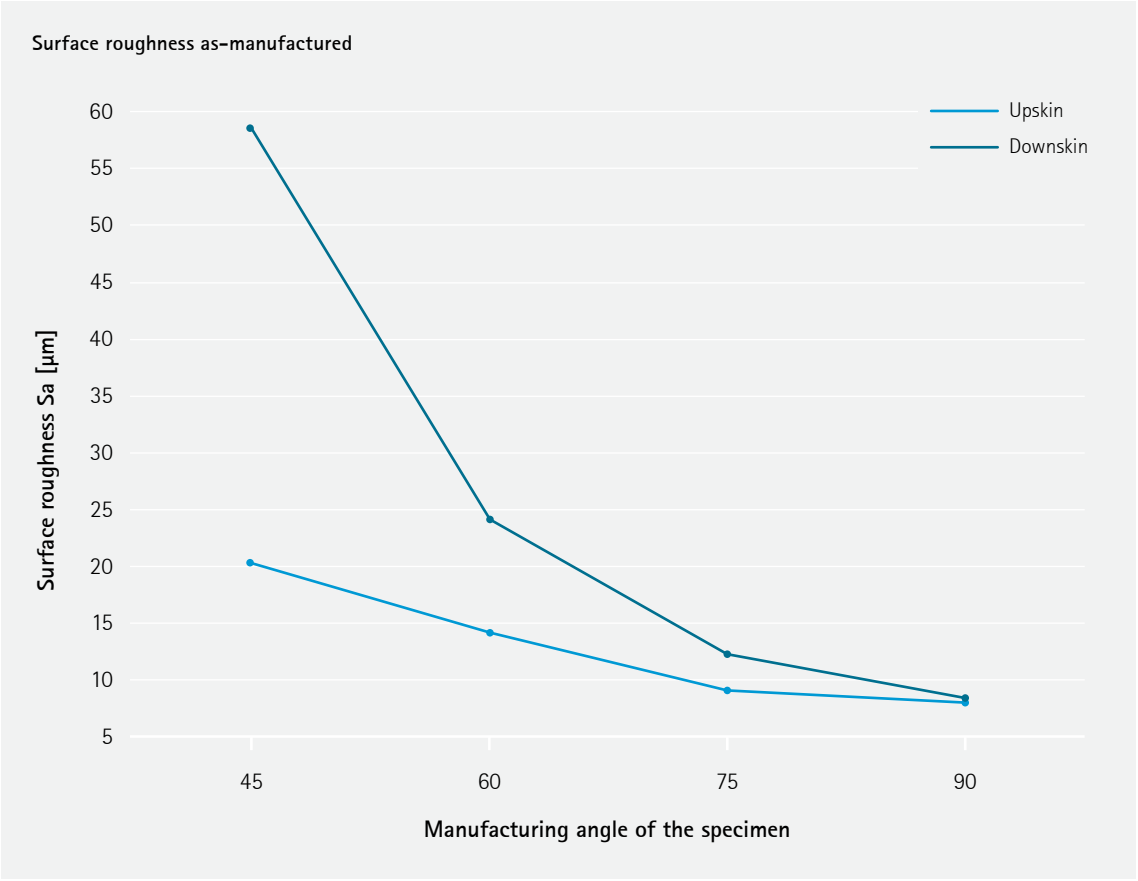
** T90: Tolerance intervals provide lower bounds where 90 % of the population falls with 95 % confidence. Tolerance intervals are based on validation data / QA statistics and are not directly transferable to other systems.*

Tensile properties as manufactured

	Yield strength $R_{p0.2}$ [MPa]	**Tensile strength** R_m [MPa]	**Elongation at break** A [%]	**Number of samples**
Vertical	660	1 010	32	7
Horizontal	770	1 070	27	5

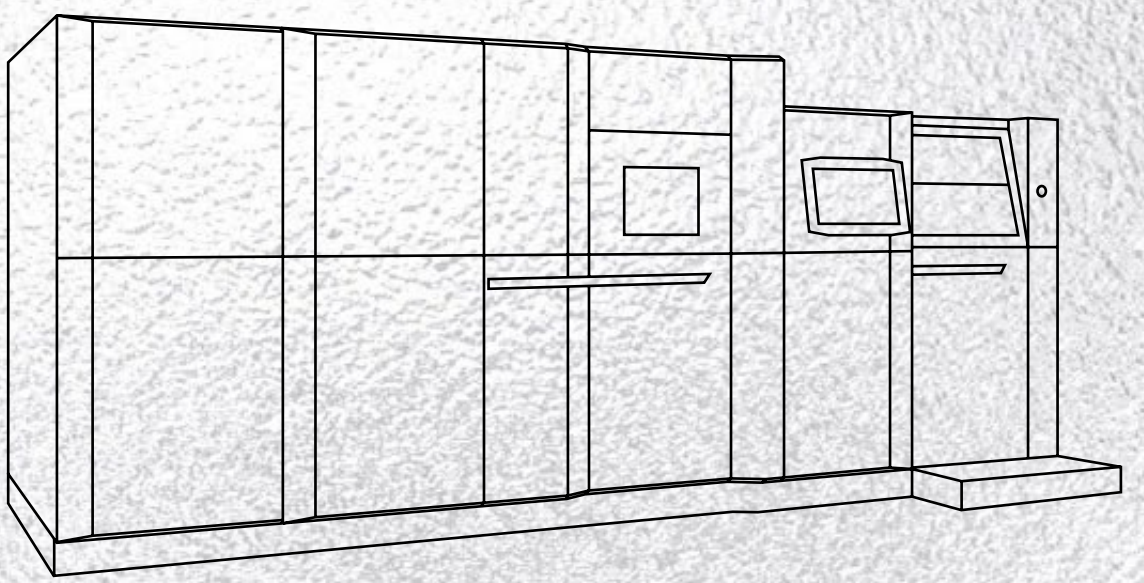
Additional Data[1]





The surface quality was characterized by optical measurement method according to internal procedure.
The 90 degree angle corresponds to vertical surface.

TRL 3
EOS Core



EOS NickelAlloy IN718
for EOS M 300-4 | 40 µm

Process Information
Heat Treatment
Physical Part Properties
Mechanical Properties

EOS NickelAlloy IN718 for EOS M 300-4 | 40 µm
Process Information

System set-up	EOS M 300-4
EOS material set	IN718 40µm M300-4
EOSPAR name	IN718_040_CoreM304 1.X
Software requirements	EOSPRINT 2.9 or newer, EOSYSTEM 2.12 or newer
Powder part no.	9011-0020
Recoater blade	EOS HSS Blade, two-sided recoating
Inert gas	Argon
Sieve	63 µm

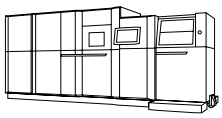
Additional information	
Layer thickness	40 µm
Volume rate	up to 4 x 4.2 mm³/s

Heat Treatment

Heat treatment procedure conform to Aerospace Material Specification AMS 2774 and AMS 5662.
As manufactured microstructure for additively manufactured IN718 consists of gamma phase (γ). Heat treatment for IN718 is required to produce desired microstructure and part properties (gamma double prime precipitates, γ"). Heat treatment is also used to relieve stresses.

Step 1:
Solution Annealing: hold at 954 °C (1 750 °F) for 1 hour per 25 mm (0.98 inch) of thickness, air (/argon) cool

Step 2:
Ageing Treatment: hold at 718 °C (1 325 °F) 8 hours, furnace cool to 621 °C (1 150 °F) and hold at 621 °C (1 150 °F) for total precipitation time of 18 hours, air (/argon) cool



Chemical and Physical Properties of Parts[1]

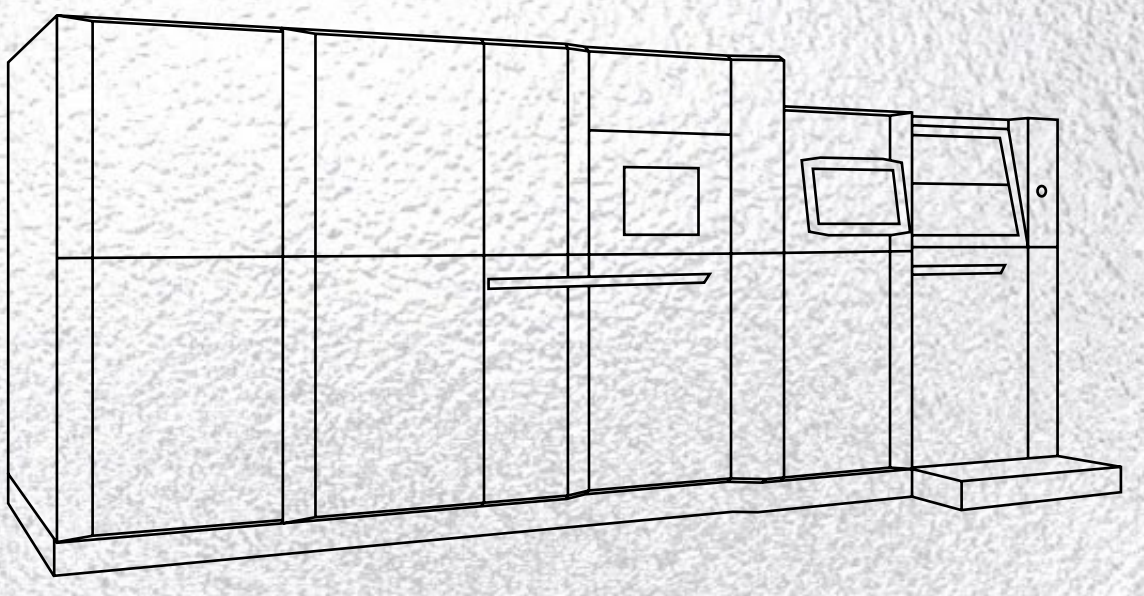
Defects	Result	Number of samples
Average defect percentage	< 0.05	64
Max. pore size	< 100 µm	64

Mechanical Properties[1]

Typical part properties	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]	Number of samples
As manufactured vertical	634	957	36	158
As manufactured horizontal	796	1 092	27	62
Heat treated vertical	1 141	1 370	20	159
Heat treated horizontal	1 267	1 531	15	44

Mechanical properties tested according to EN ISO 6892-1 B10. The values in the table are average values. Heat treatment procedure in accordance with AMS 5662.

TRL 5
EOS Core



EOS NickelAlloy IN718
for EOS M 300-4 | 80 µm HiPro

Process Information
Heat Treatment
Physical Part Properties
Mechanical Properties

EOS NickelAlloy IN718 for EOS M 300-4 | 80 µm HiPro
Process Information

System set-up	EOS M 300-4
EOS material set	IN718 80 µm HiPro
EOSPAR name	IN718_080_HiProM304_1xx
Software requirements	EOSPRINT 2.11 or newer EOSYSTEM 2.15 or newer
Powder part no.	9011-0020
Recoater blade	EOS HSS Blade
Inert gas	Argon
Sieve	63 µm

Additional information	
Layer thickness	80 µm
Volume rate	up to 4 x 9.9 mm³/s
Minimum Wall Thickness	Typical 0.3-0.4 mm

Heat Treatment

Heat treatment procedure conform to Aerospace Material Specification AMS 2774 and AMS 5662.
As manufactured microstructure for additively manufactured IN718 consists of gamma phase (γ). Heat treatment for IN718 is required to produce desired microstructure and part properties (gamma double prime precipitates, γ"). Heat treatment is also used to relieve stresses.

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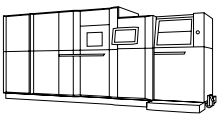
Chemical and Physical Properties of Parts[1]

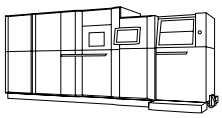


As manufactured microstructure. Etchant: Kalling's II

Defects	Result	Number of samples
Average defect percentage	0.03 %	5
Density, ISO3369	**Result**	**Number of samples**
Average density	min 8.15 g/cm^3	NA

The areal defect percentage was determined from cross-sections of built parts using an optical microscope fitted with a camera and analysis software. The analysis was carried out for sample area of 15 x 15 mm. The defects were detected and analyzed with an image capture/analysis software with an automatic histogram based filtering procedure on monochrome images.

Mechanical Properties in Heat Treated State[1]

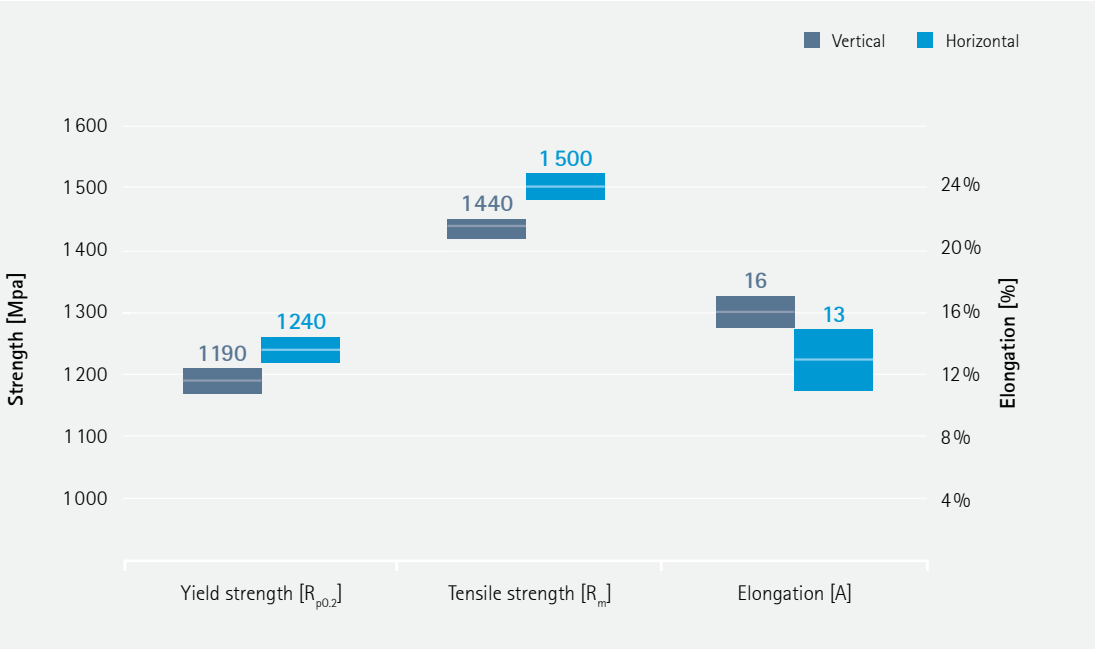


Tensile properties heat treated
ISO6892-1

	Yield strength $R_{p0.2}$ [MPa]	**Tensile strength** R_m [MPa]	**Elongation at break** A [%]
Vertical	1 190	1 440	16
Horizontal	1 240	1 500	13

Hardness as per ISO 6507

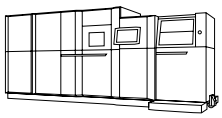
Hardness, HV	456
Number of samples	12

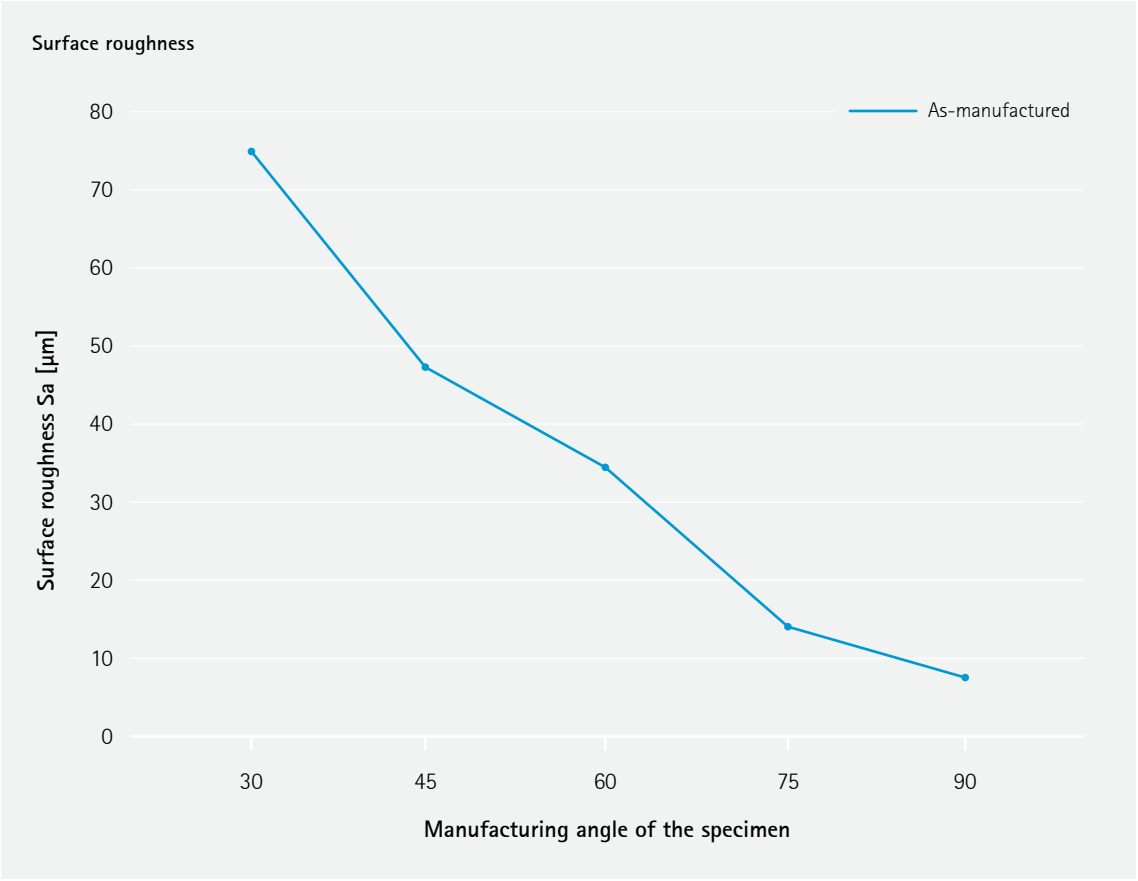


Tensile properties as manufactured

	Yield strength $R_{p0.2}$ [MPa]	**Tensile strength** R_m [MPa]	**Elongation at break** A [%]	**Number of samples**
Vertical	620	1 070	26	8
Horizontal	760	1 000	33	6

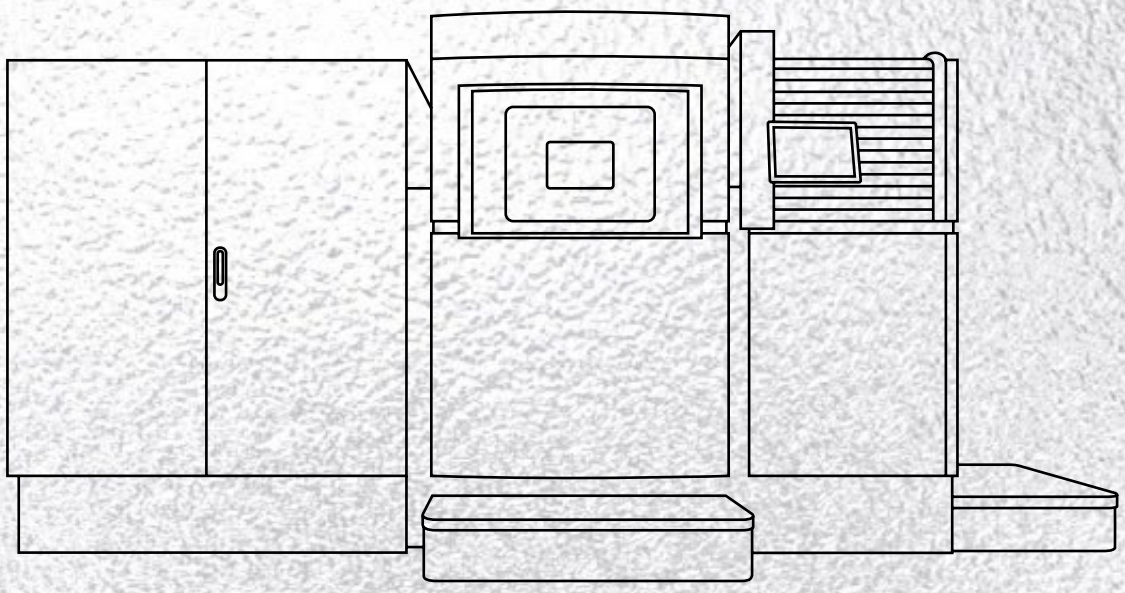
Additional Data[1]





The surface quality was characterized by optical measurement method according to internal procedure.
The 90 degree angle corresponds to vertical surface.

TRL 5
EOS Core



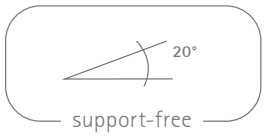
EOS NickelAlloy IN718
for EOS M 400-4 | 40 µm HiPro

Process Information
Heat Treatment
Physical Part Properties
Mechanical Properties
Additional Data

EOS NickelAlloy IN718 for EOS M 400-4 | 40 µm HiPro

Process Information

This process parameter includes two variations of the exposure set: the first one provides better productivity while the second one enables low angle buildability down to 20° at least[1]. The low angle buildability can be optimized further through the part geometry and the length of overhang.



System set-up	EOS M 400-4
EOS material set	IN718 HiPro M400-4
EOSPAR name	IN718_040_080_HiProM404_100
Software requirements	EOSPRINT 2.11 or newer, EOSYSTEM 2.15 or newer
Powder part no.	9011-0020
Recoater blade	EOS HSS Blade
Nozzle	Aerospike V2
Inert gas	Argon
Sieve	63 µm

Additional information	
Layer thickness	40 µm
Volume rate	4 x 5.2 mm³/s
Min. wall thickness	Typical 0.3 - 0.4 mm

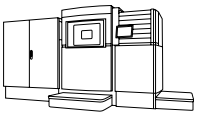
Heat Treatment

Heat treatment procedure conform to Aerospace Material Specification AMS 2774 and AMS 5662.
As manufactured microstructure for additively manufactured IN718 consists of gamma phase (γ). Heat treatment for IN718 is required to produce desired microstructure and part properties (gamma double prime precipitates, γ"). Heat treatment is also used to relieve stresses.

Step 1:
Solution Annealing: hold at 954 °C (1 750 °F) for 1 hour per 25 mm (0.98 inch) of thickness, air (/argon) cool

Step 2:
Ageing Treatment: hold at 718 °C (1 325 °F) 8 hours, furnace cool to 621 °C (1 150 °F) and hold at 621 °C (1 150 °F) for total precipitation time of 18 hours, air (/argon) cool

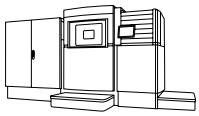
Chemical and Physical Properties of Parts[1]



Heat treated microstructure.
Etched with Kalling's II etchant.

Defects	Result	Number of samples
Average defect percentage	0.01 %	10
Density, ISO3369	**Result**	**Number of samples**
Average density	min 8.21 g/cm^3	NA

Mechanical Properties[1]

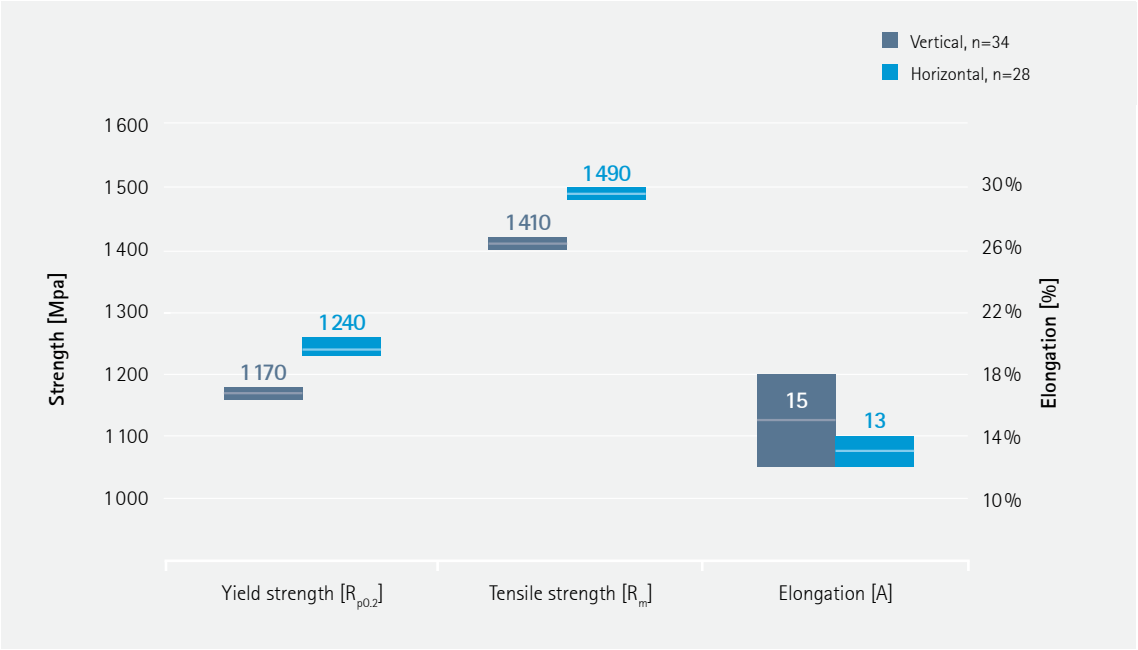


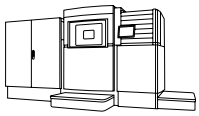
Tensile properties heat treated
ISO6892-1

	Yield strength $R_{p0.2}$ [MPa]	**Tensile strength** R_m [MPa]	**Elongation at break** A [%]
Vertical	1 170	1 410	15
Horizontal	1 240	1 490	13

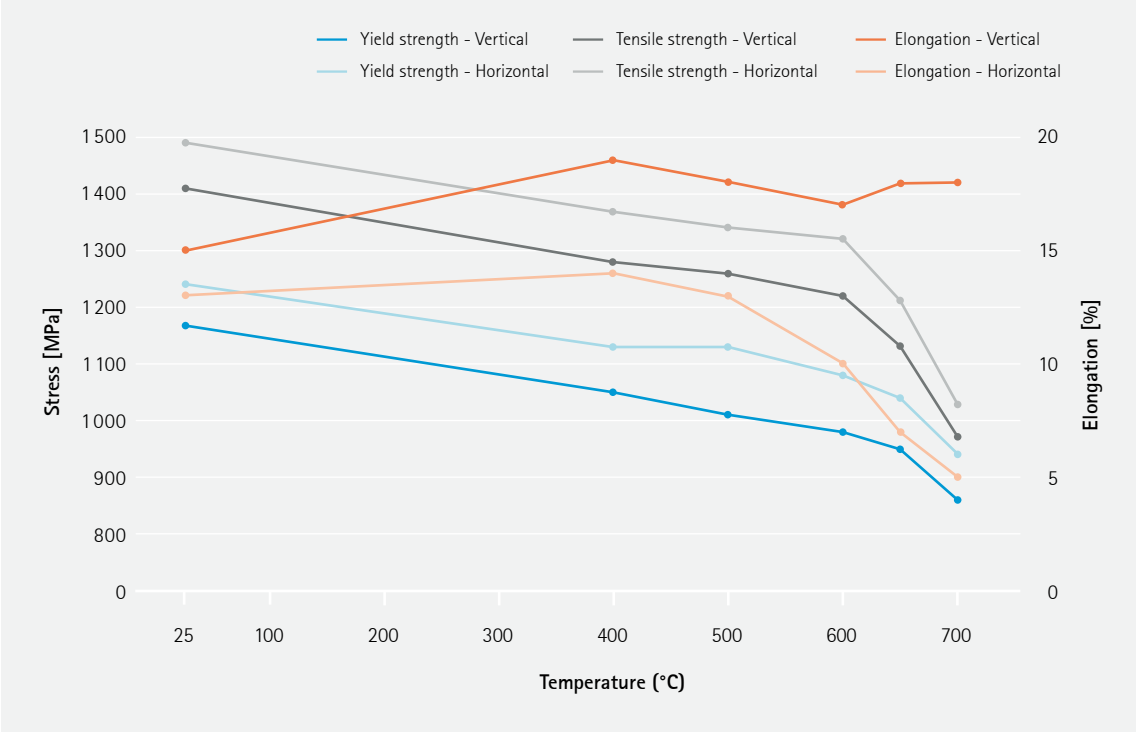
Hardness as per ISO 6507

Hardness, HV	463
Number of samples	6





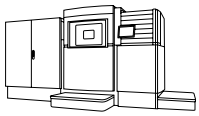
Tensile properties at elevated temperatures



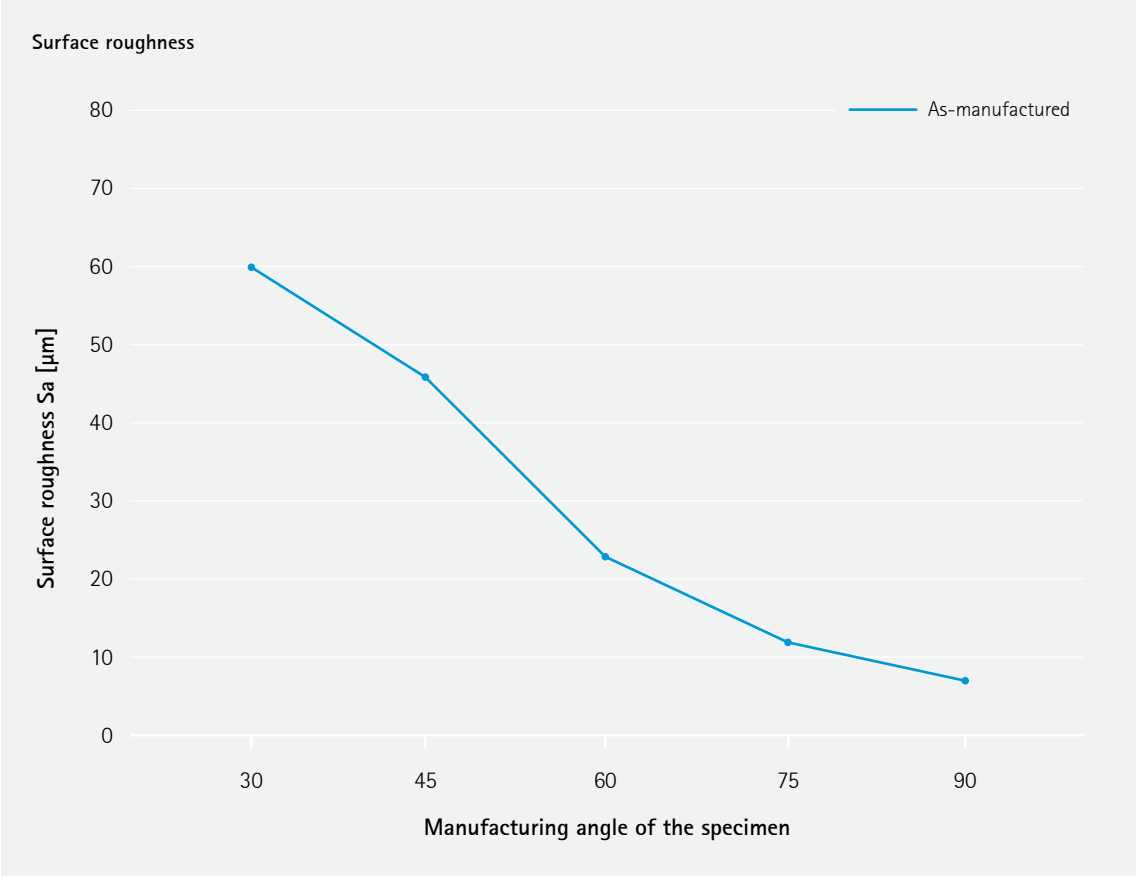
Tensile properties as manufactured

	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]	Number of samples
Vertical	630	970	30	14
Horizontal	770	1 060	26	14

Additional Data[1]



Surface Roughness



The surface quality was characterized by optical measurement method according to internal procedure.
The 90 degree angle corresponds to vertical surface.

Creep Performance ASTM E292

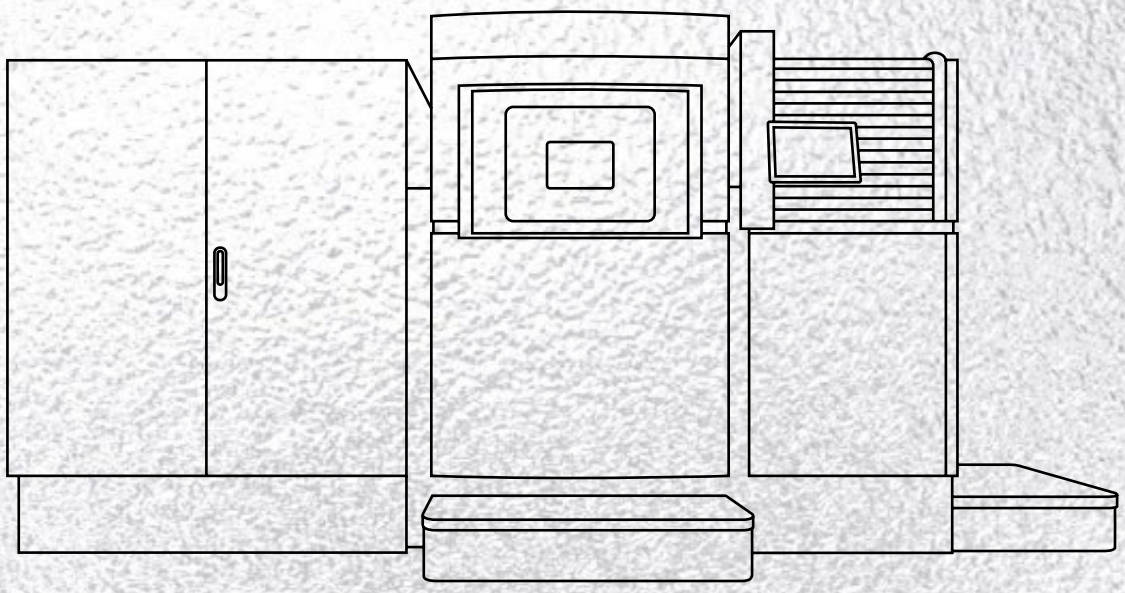
The stress-rupture performance of EOS NickelAlloy IN718 was tested on vertically oriented samples, in heat-treated condition. No HIP was applied. The data presents the Larson-Miller parameter values achieved at stress levels of 689 MPa.

Sample condition: Smooth & Notched

Stress [MPa]	Temperature [°C]	Test Duration [h]	Elongation [%]	LMP
689	650	53	5	20.05

TRL 7

EOS Premium



EOS NickelAlloy IN718
for EOS M 400-4 | 80 µm HiPro

Process Information

Heat Treatment

Physical Part Properties

Mechanical Properties

Additional Data

EOS NickelAlloy IN718 for EOS M 400-4 | 80 µm HiPro

Process Information

This process provides high productivity with a volume rate that is 119 % faster than the IN718 40 µm Flexline and 77 % faster than IN718 40 µm HiPro processes.

System set-up	EOS M 400-4
EOS material set	IN718 HiPro 80 µm
EOSPAR name	IN718_040_080_HiProM404_100
Software requirements	EOSPRINT 2.11 or newer, EOSYSTEM 2.15 or newer
Powder part no.	9011-0020
Recoater blade	EOS HSS Blade
Nozzle	Aerospike V2
Inert gas	Argon
Sieve	63 µm

Additional information	
Layer thickness	80 µm
Volume rate	4 x 9.2 mm³/s
Min. wall thickness	Typical 0.3 - 0.4 mm

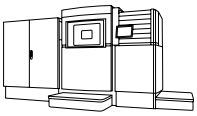
Heat Treatment

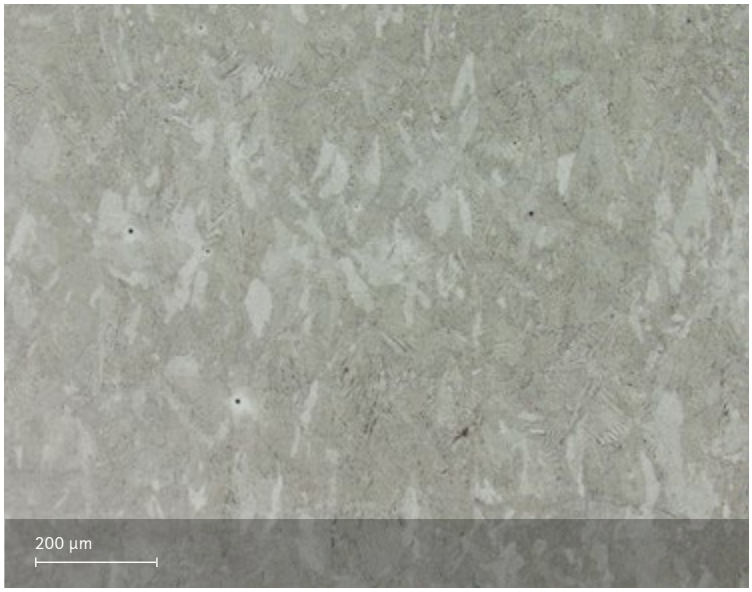
Heat treatment procedure conform to Aerospace Material Specification AMS 2774 and AMS 5662.
As manufactured microstructure for additively manufactured IN718 consists of gamma phase (γ). Heat treatment for IN718 is required to produce desired microstructure and part properties (gamma double prime precipitates, γ"). Heat treatment is also used to relieve stresses.

Step 1:
Solution Annealing: hold at 954 °C (1 750 °F) for 1 hour per 25 mm (0.98 inch) of thickness, air (/argon) cool

Step 2:
Ageing Treatment: hold at 718 °C (1 325 °F) 8 hours, furnace cool to 621 °C (1 150 °F) and hold at 621 °C (1 150 °F) for total precipitation time of 18 hours, air (/argon) cool

Chemical and Physical Properties of Parts[1]

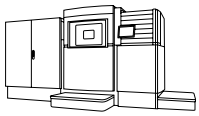




Heat treated microstructure.
Etched with Kalling's II etchant.

Defects	Result	Number of samples
Average defect percentage	0.025 %	13
Density, ISO3369	**Result**	**Number of samples**
Average density	min 8.25 g/cm^3	NA

Mechanical Properties in Heat Treated State[1]



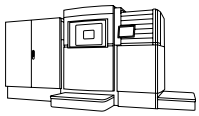
Tensile properties heat treated at room temperature (acc. AMS 2774 and AMS 5662)

	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]	Number of samples
Vertical	1 200	1 430	13	30
Horizontal	1 250	1 500	12	30

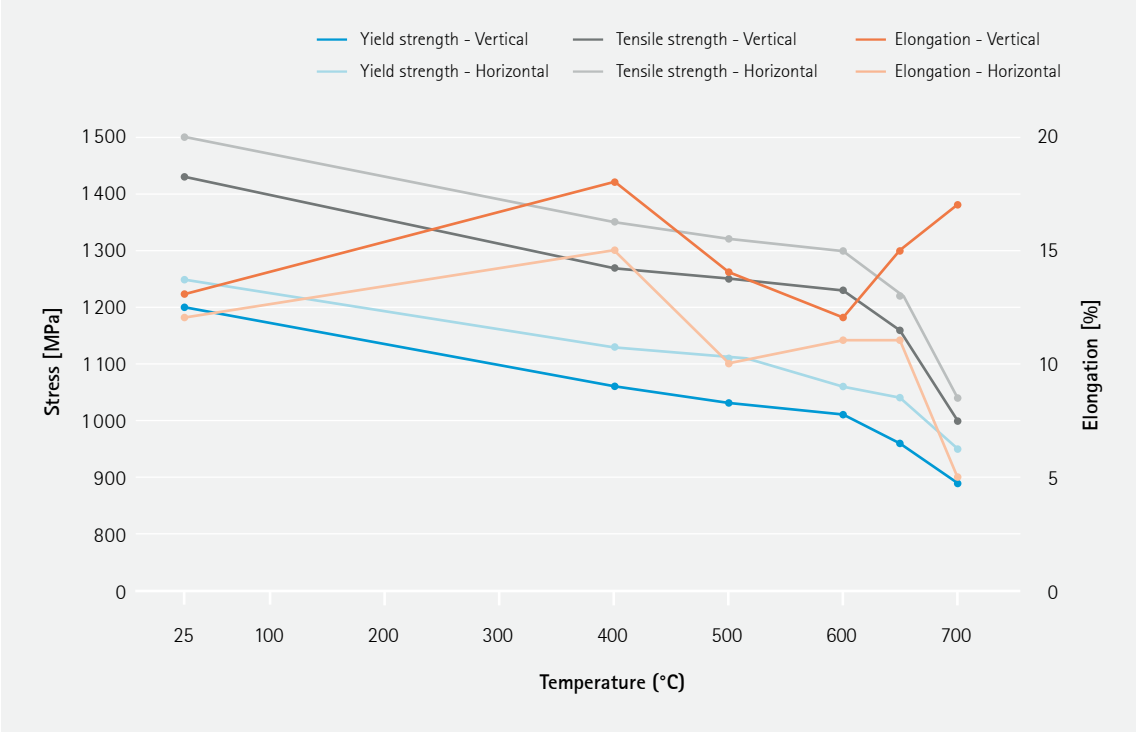
Hardness as per ISO 6507

Hardness, HV	467
Number of samples	12

** T90: Tolerance interval provides limits within which 90 % of the population falls with 95 % level of confidence. Tolerance intervals are based on e.g validation data / QA statistics.*



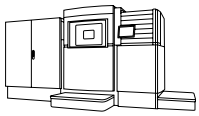
Tensile properties at elevated temperatures

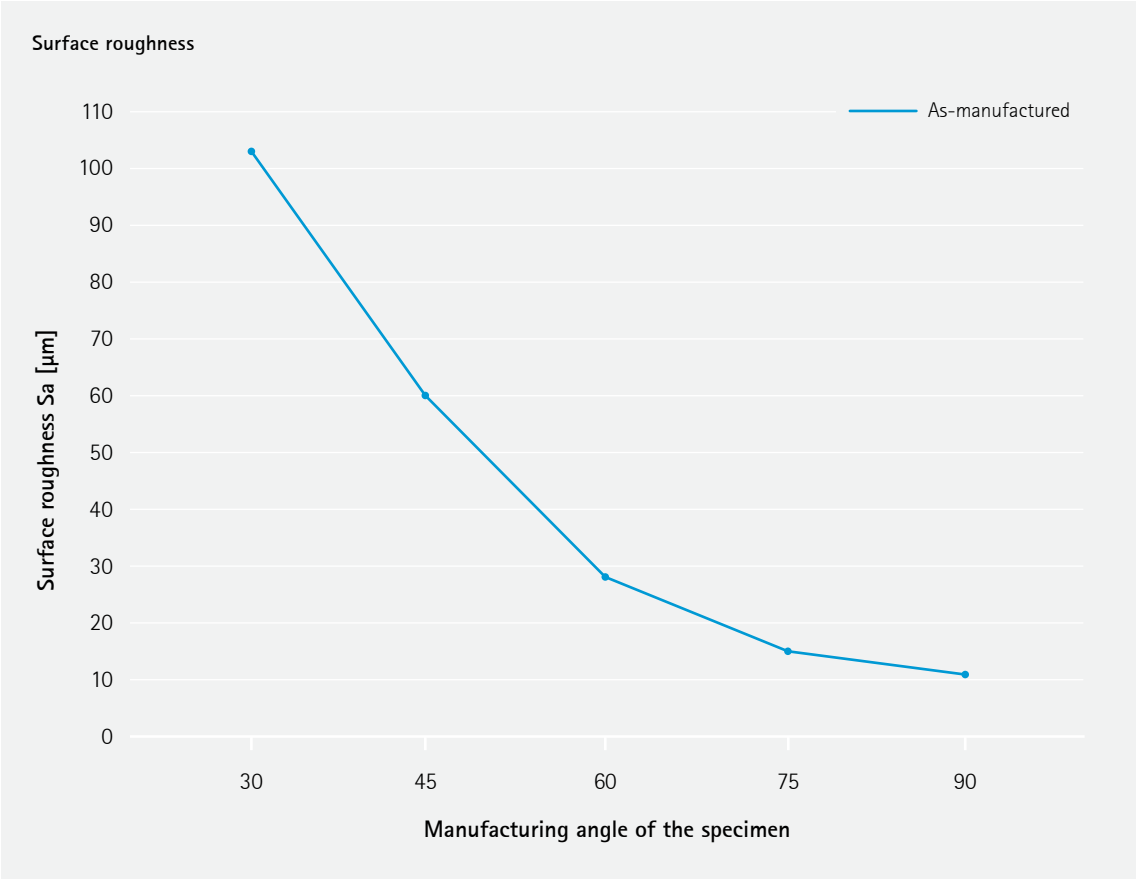


Tensile properties as manufactured

	Yield strength $R_{p0.2}$ [MPa]	Tensile strength R_m [MPa]	Elongation at break A [%]	Number of samples
Vertical	630	980	29	8
Horizontal	750	1 060	25	4

Additional Data[1]





The surface quality was characterized by optical measurement method according to internal procedure.
The 90 degree angle corresponds to vertical surface.

Creep Performance ASTM E292

The stress-rupture performance of EOS NickelAlloy IN718 was tested on vertically oriented samples, in heat-treated condition. No HIP was applied. The data presents the Larson-Miller parameter values achieved at stress levels of 689 MPa.

Sample condition: Smooth & Notched

Stress [MPa]	Temperature [°C]	Test Duration [h]	Elongation [%]	LMP
689	650	56	9	20.07

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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.**
Any information given herein is subject to change without notice.

Status 01/2023

Cover: This image shows a possible application.

EOS NickelAlloy IN718

EOS NickelAlloy IN718 is a heat and corrosion resistant nickel alloy powder intended for processing on EOS DMLS systems.

This document provides information and data for parts built using EOS NickelAlloy powder (EOS art.-no. 9011-0020) on the following specifications:

- EOS DMLS system: M400 SF
- EOSYSTEM: EOSPRINT v.1.2/HCS v.2.2.40
- EOS Parameter set IN718_040_FlexM400_1.11

Description

Parts built from EOS NickelAlloy IN718 have chemical composition corresponding to UNS N07718, AMS 5662, AMS 5664, W.Nr 2.4668, DIN NiCr19Fe19NbMo3. This kind of precipitation-hardening nickel-chromium alloy is characterized by having good tensile, fatigue, creep and rupture strength at temperatures up to 700 °C (1290 °F).

This material is ideal for many high temperature applications such as gas turbine parts, instrumentation parts, power and process industry parts etc. It also has excellent potential for cryogenic applications.

Parts built from EOS NickelAlloy IN718 can be easily post-hardened by precipitation-hardening heat treatments. In both as-built and age-hardened states the parts can be machined, spark eroded, welded, micro shot-peened, polished and coated if required. Due to the layerwise building method, the parts have a certain anisotropy.

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Internet: www.eos.info

Technical Data

Powder properties

Material composition		
Element	**Min**	**Max**
Ni	50	55
Cr	17.0	21.0
Nb	4.75	5.5
Mo	2.8	3.3
Ti	0.65	1.15
Al	0.20	0.80
Co	-	1.0
Cu	-	0.3
C	-	0.08
Si, Mn	-	0.35
P, S	-	0.015
B	-	0.006
Fe	-	Balance

Max. particle size	
Particles > 63µm [1]	max. 0.3 wt.-%

[1] Sieve analysis according to DIN ISO 4497 or ASTM B214.

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General process data

Layer thickness	40 µm
Volume rate [2]	4.2 mm³/s (15.2 cm³/h)

[2] The volume rate is a measure of build speed during laser exposure of the skin area. The total build speed depends on this volume rate and many other factors such as exposure parameters of contours, supports, up and downskin, recoating time, Home-In or LPM settings.

Physical and chemical properties of parts*

Part density [3]	min. 8.15 g/cm3
Surface roughness after shot peening [4]	Ra < 6.5 µm; Rz < 50.0 µm

[3] Weighing in air and water according to ISO 3369.
[4] Measurement according to ISO 4287. The numbers were measured at the horizontal (up-facing) and all vertical surfaces of test cubes. Due to the layerwise building the roughness strongly depends on the orientation of the surface, for example sloping and curved surfaces exhibit a stair-step effect.

Tensile data at room temperature* [5, 6]

	As built	Heat treated [7]
Ultimate tensile strength, Rm	1040 MPa	1470 MPa
Yield strength, Rp0.2	710 MPa	1200 MPa
Elongation at break A	26 %	15 %

[5] The numbers are average values and are determined from samples with horizontal and vertical orientation.
[6] Tensile testing according to ISO 6892-1:2009 (B) Annex D, proportional test pieces, diameter of the neck area 5 mm (0.2 inch), original gauge length 25 mm (1 inch).
[7] Heat treatment procedure conform to Aerospace Material Specification AMS 2774D and AMS 5662:
1. Solution Anneal at 954 °C (1750 °F) for 1 hour per 25mm (0.98 inch) of thickness, air (/argon) cool.
2. Ageing treatment; hold at 718 °C (1325 °F) 8 hours, furnace cool to 621 °C (1150 °F) and hold at 621 °C (1150 °F) for total precipitation time of 18 hours., air (/argon) cool.

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Abbreviations

min. minimum

max. maximum

wt. weight

*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.

This powder has not been developed, tested or certified as a medical device according to Directive 93/42/EEC (MDD) or Regulation (EU) 2017/745 (MDR) and is not intended to be used as a medical device, in particular for the purposes specified in Art. 2 No. 1 MDR. Insofar as you intend to use the powder as raw material for the manufacture of pharmaceutical products or medical devices (e.g. as raw material which as a material must meet the requirements of Annex 1, Chapter II MDR), the responsibility and liability for all analyses, tests, evaluations, procedures, risk assessments, conformity assessments, approval and certification procedures as well as for all other official and regulatory measures required for this purpose shall lie solely with you both with regard to the pharmaceutical product and/or medical device manufactured by you and with regard to the properties, suitability, testing, evaluation, risk assessment, other requirements for use of the powder as raw material.
This also applies to applications with food contact. In this respect, the limitations of liability pursuant to our General Terms and Conditions and the system sales or material contracts shall apply.

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