Material
Data Sheet

# EOS NickelAlloy IN718 API

## IN718 Alloy According to Oil and Gas Industry Standard*

*API 6ACRA standard, material designation "120K".

# EOS NickelAlloy IN718 API

**Main Characteristics:**

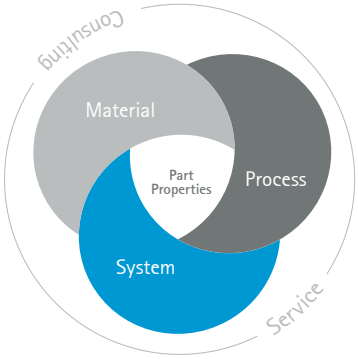
- High impact toughness at low temperatures
- High tensile ductility
- Excellent corrosion resistance in typical oil and gas environments

**Typical Applications:**

- Piping, tubing, and manifolds for downhole applications
- Pumping, separation, and injection equipment
- Fixtures and fasteners

**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 meet the chemical composition requirements of API 6ACRA standard.

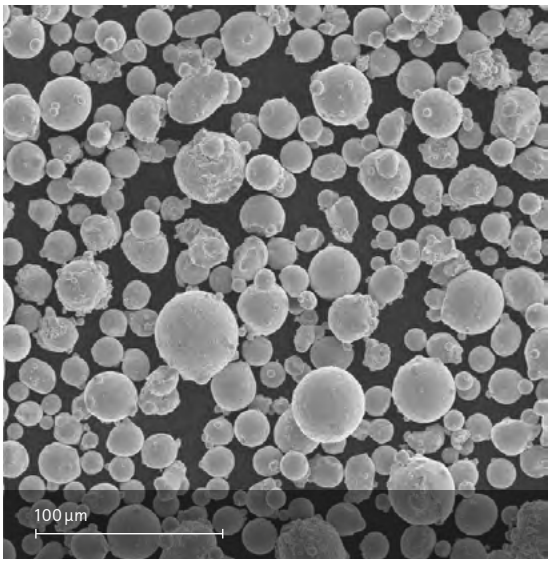
**Powder chemical composition (wt.-%)**

| Element | Min. | Max. |
|---|---|---|
| Fe | balance | |
| Ni | 50.0 | 55.0 |
| Cr | 17.0 | 21.0 |
| Nb+Ta | 4.87 | 5.20 |
| Mo | 2.80 | 3.30 |
| Ti | 0.80 | 1.15 |
| Al | 0.40 | 0.60 |
| C | - | 0.045 |
| Co | - | 1.00 |
| Mn | - | 0.35 |
| Si | - | 0.35 |
| P | - | 0.010 |
| S | - | 0.010 |
| B | - | 0.0060 |
| Cu | - | 0.23 |
| Pb | - | 0.0010 |
| Se | - | 0.0005 |
| Bi | - | 0.00005 |
| Ca | - | 0.0030 |
| Mg | - | 0.0060 |

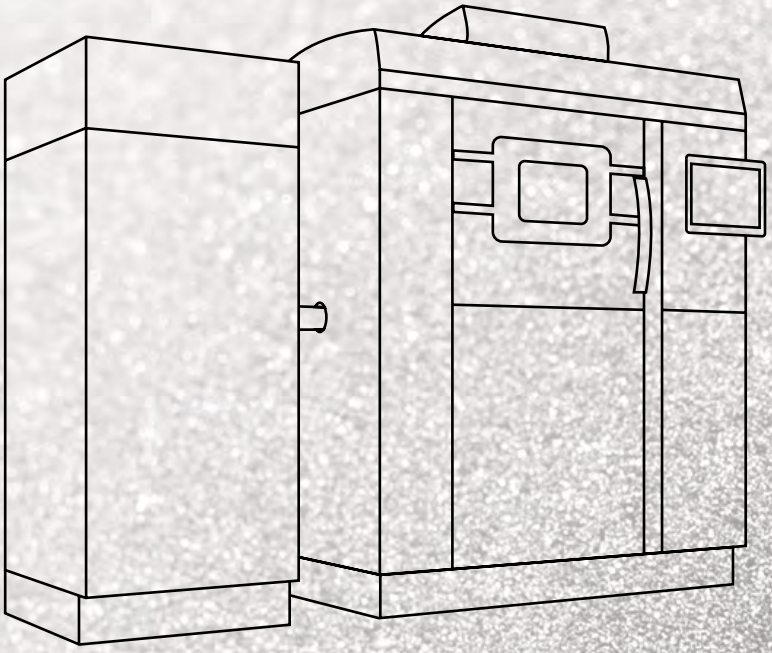
**Powder particle size**

| | |
|---|---|
| Generic particle size distribution | 20-55 µm |

*SEM micrograph of EOS NickelAlloy IN718 API powder*



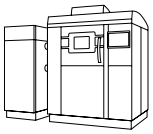
TRL 9
Premium



# EOS NickelAlloy IN718 API
# for EOS M 290 | 40 µm

Process Information
Heat Treatment
Physical Part Properties
Mechanical Properties
Additional Data

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



| System set-up | EOS M 290 |
|---|---|
| EOSPAR name | IN718_040_PerformanceM291_2xx* |
| Software requirements | EOSPRINT 1.17 or newer<br>EOSPRINT 2.6 or newer<br>EOSYSTEM 2.9 or newer |
| Powder part no. | 9011-0050 |
| Recoater blade | HSS |
| Nozzle | Grid |
| Inert gas | Ar |
| Sieve | 63 µm |

* Powder is compatible with all IN718 process parameters

| Additional information | |
|---|---|
| Layer thickness | 40 µm |
| Volume rate | 4.2 $mm^3/s$ |
| Minimum wall thickness | Typical 0.3 - 0.4 mm |

## Heat Treatment

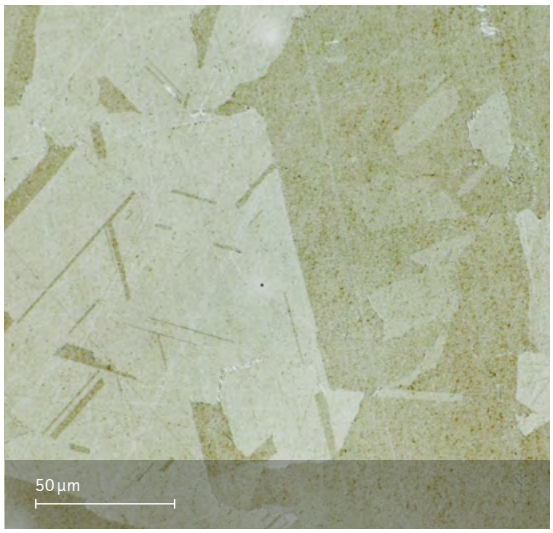
Heat treatment includes solution treatment, rapid quenching and aging steps and is developed according to data from: (i) standard "API 6ACRA Age-hardened Nickel-based Alloys for Oil and Gas Drilling and Production Equipment (Houston, TX: American Petroleum Institute, 2015)", (ii) literature and (iii) test runs made at EOS. Detailed information on the heat treatment is available in the application notes.

**Step 1:**
**Solution Treatment:**
1060 °C ±10 °C, 120 min.

**Quenching:**
Forced Ar-gas quenching with rate 130 °C/min (1060-300 °C).

**Step 2:**
**Aging:**
815 °C ± 5 °C, 360 min. Forced Ar-gas cooling with rate ~25 °C/min (815-300 °C).

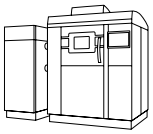
## Chemical and Physical Properties of Parts




Heat treated microstructure. Etched with Kallings 2.
Section parallel to the building direction.

| Defects | Result | Number of samples |
|---|---|---|
| Average defect percentage | 0.03 % | 10 |
| Average defect percent | ≥ 8.15 g/cm³ | |

# Mechanical Properties in Heat Treated Condition



**Tensile properties heat treated ISO 6892-1 (equivalent to ASTM A 370)**

| **Heat treated** | **Yield strength** $R_{p0.2}$ [MPa] | **Tensile strength** $R_m$ [MPa] | **Elongation at break** A [%] | **Reduction of area** A [%] |
|---|---|---|---|---|
| Horizontal | 882 | 1267 | 26 | 45 |
| Vertical | 865 | 1236 | 28 | 47 |

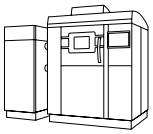
**Hardness ISO 6508-1**

| | |
|---|---|
| Heat treated | 37 HRC |
| Number of Samples | 2 |

**Impact toughness heat treated (1060 °C, 2 h + 815 °C/ 6 h)**
ISO 148-1

| | |
|---|---|
| Charpy-V [J], -60 °C | 71-73 |

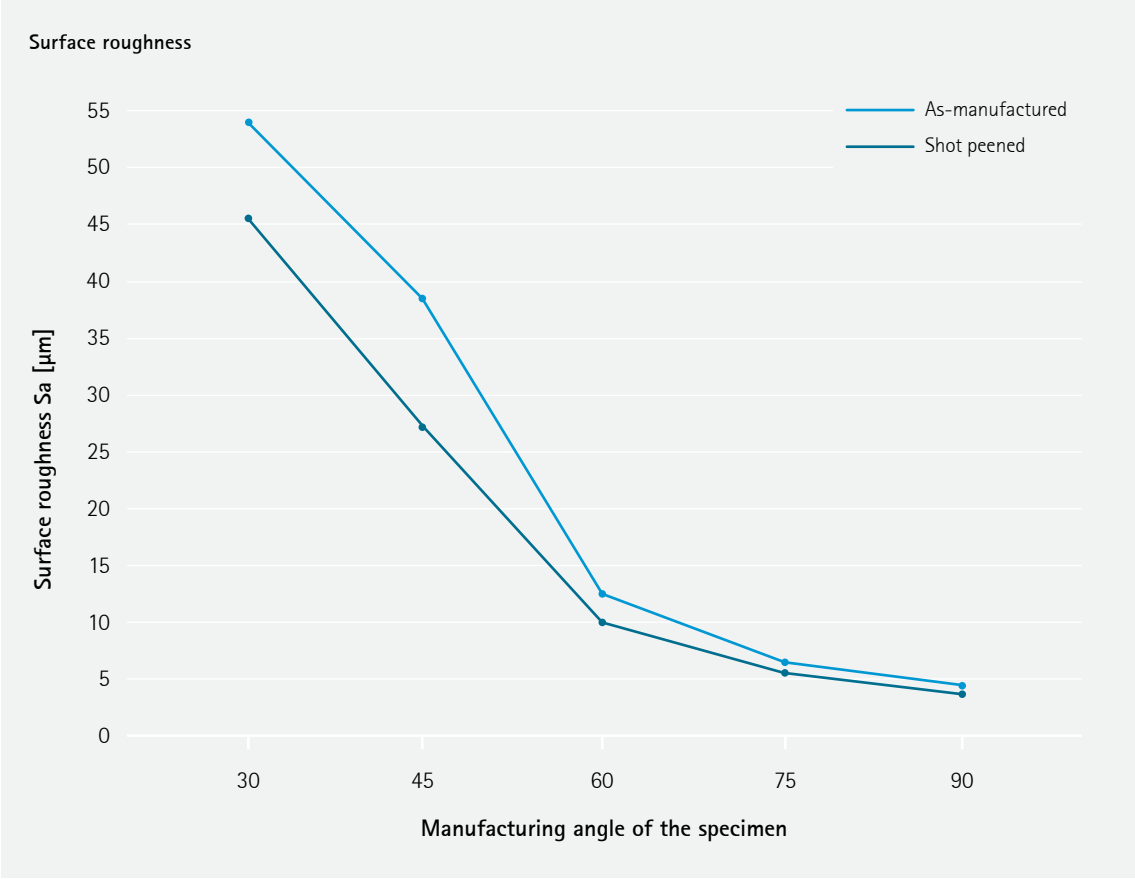
# Additional Data



## Coefficient of Thermal Expansion ASTM E228

| 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




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

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 01/2025



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.