

Einsatz additiv gefertigter Bauteile im Hochtemperaturofenbau

AM parts in high-temperature furnace construction

Uwe Lohse

XERION BERLIN LABORATORIES

Content



→ Short Presentation XERION

→ Fields of activity

- Hydrogen Generation
- New Space
- Additive Manufacturing

→ Equipment for Additive Manufacturing

→ Use cases

- Pure Copper
- Ceramics
- Anchor for Refractories



XERION

Facts:

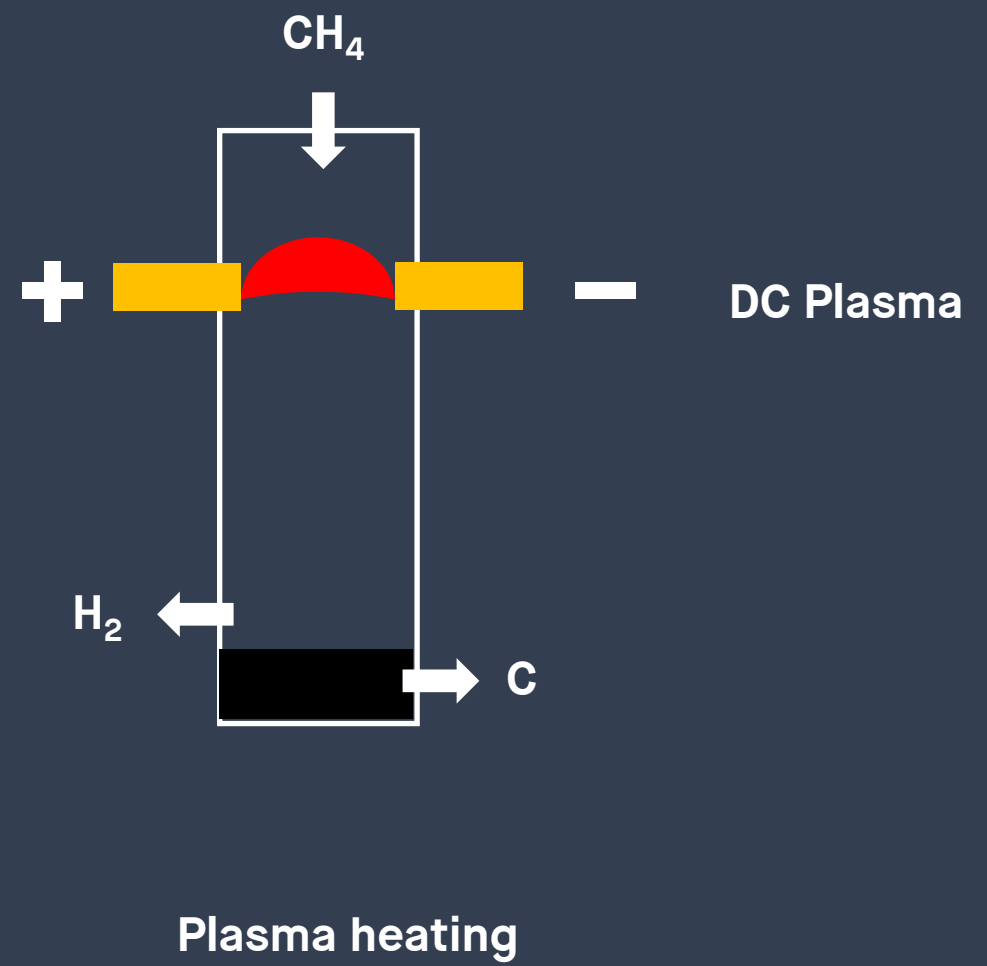
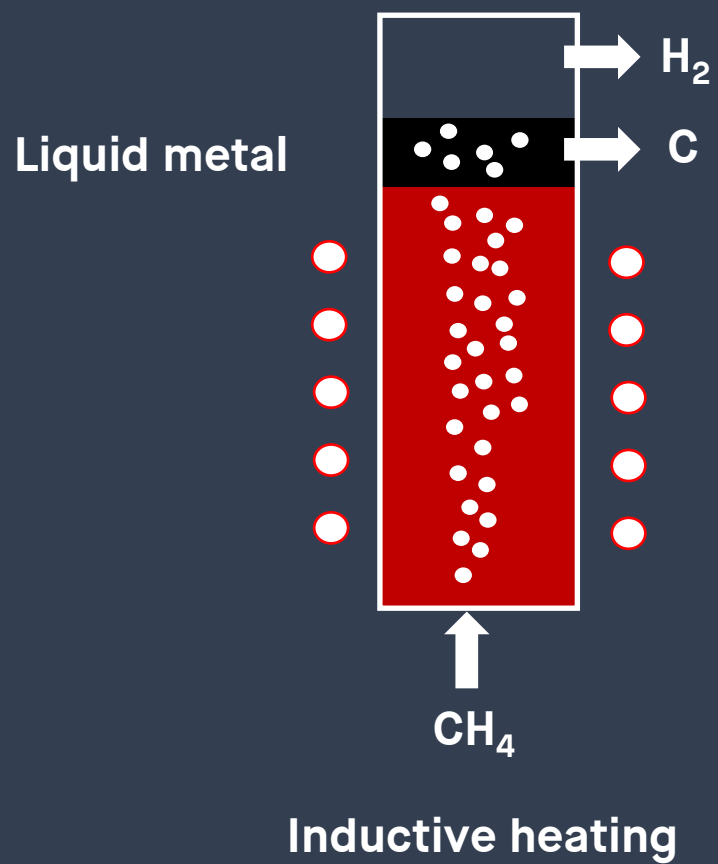
- **Founded 1998**
- **Founder Dr. Uwe Lohse**
- **≈ 500 Thermal Systems delivered worldwide**
- **New building workshop 2020 in Berlin-Adlershof**

HYDROGEN GENERATION

NEW SPACE

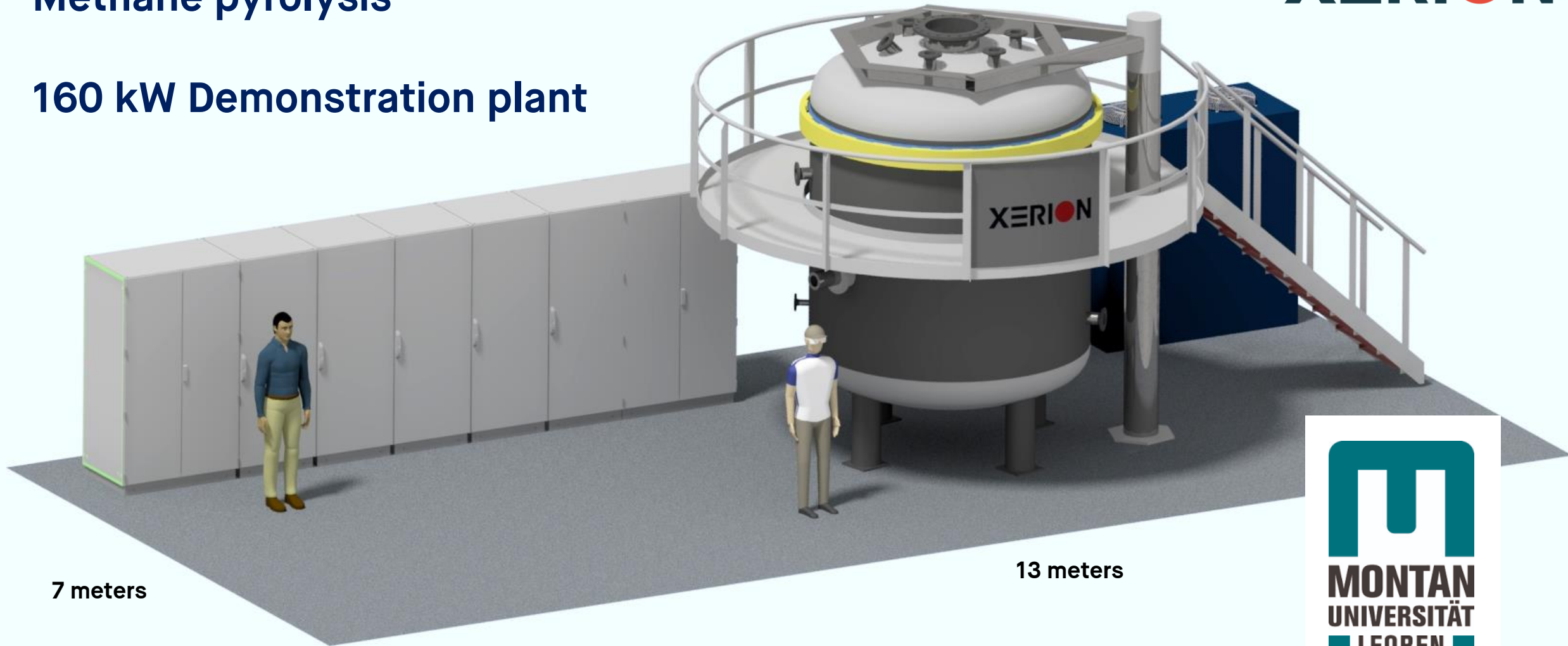
ADDITIVE MANUFACTURING

HYDROGEN GENERATION



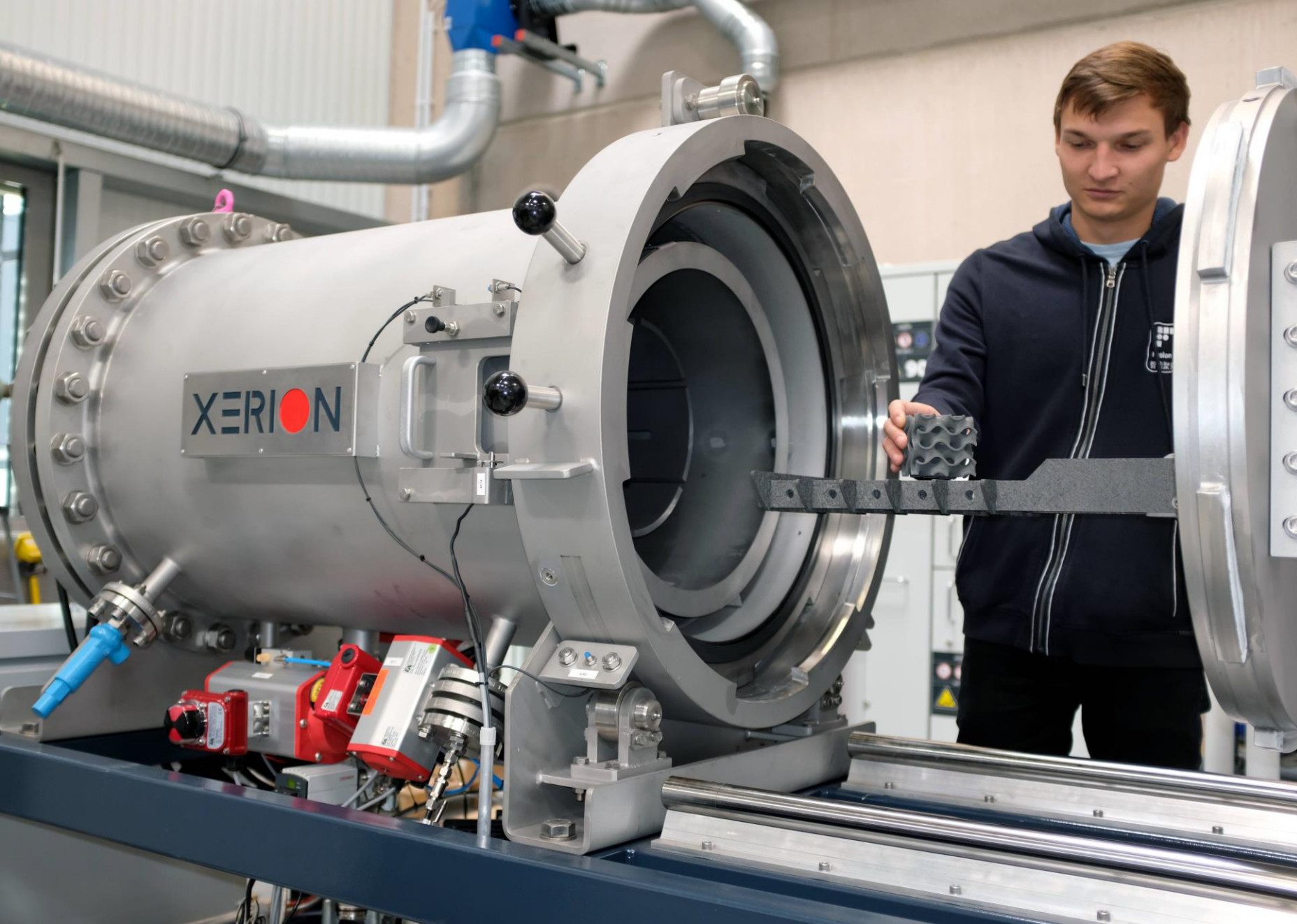
Methane pyrolysis

160 kW Demonstration plant



7 meters

13 meters



XERION

Lab systems for testing
refractories under
hydrogen conditions

→ Tmax 2.000°C

→ pmax 100 bar

→ Vmax 30 m/s

→ Sensors:
Balances
Cameras
Dilatometers
Mass Spectrometers
etc.

NEW SPACE

The XERION logo is positioned in the top right corner. It features the word "XERION" in a bold, white, sans-serif font. The letter "E" is replaced by three horizontal white bars. The letter "O" is replaced by a solid red circle. The background of the entire slide is a 3D-rendered scene of a lunar or Martian base. The base consists of several interconnected white modules. On the left is a long, low, arched structure. In the center is a larger module with a prominent orange, geodesic dome. To its right are three smaller, rounded dome-shaped modules. A small, blue and white rover is parked on the reddish-brown ground to the right of the base. In the background, there are dark, jagged mountains under a hazy, orange-tinted sky. A crescent moon is visible in the upper left portion of the sky.

XERION

hephaistos[®]

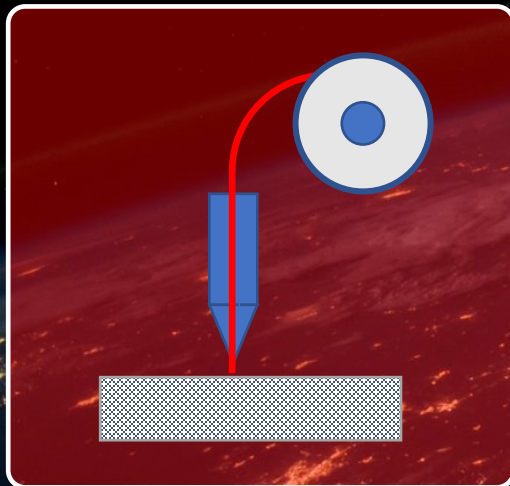
in-space-manufacturing platform

Freiberger Feuerfest-Symposium 26.-27. April 2022

hephaistos[®]

in-space-manufacturing platform

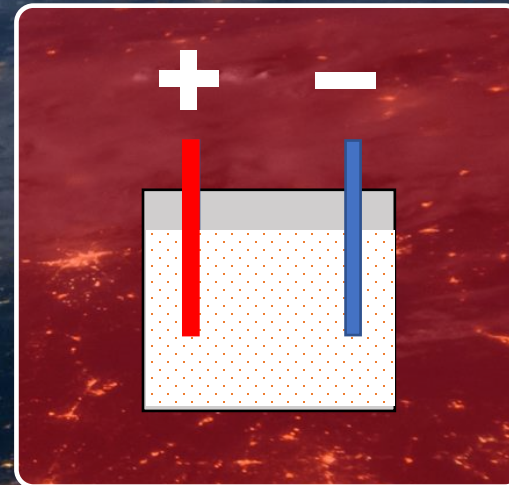
XERION



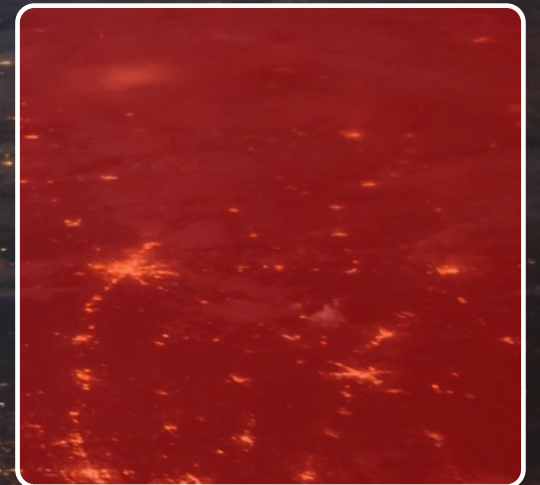
additive



induction



electrolysis



control unit

power supply

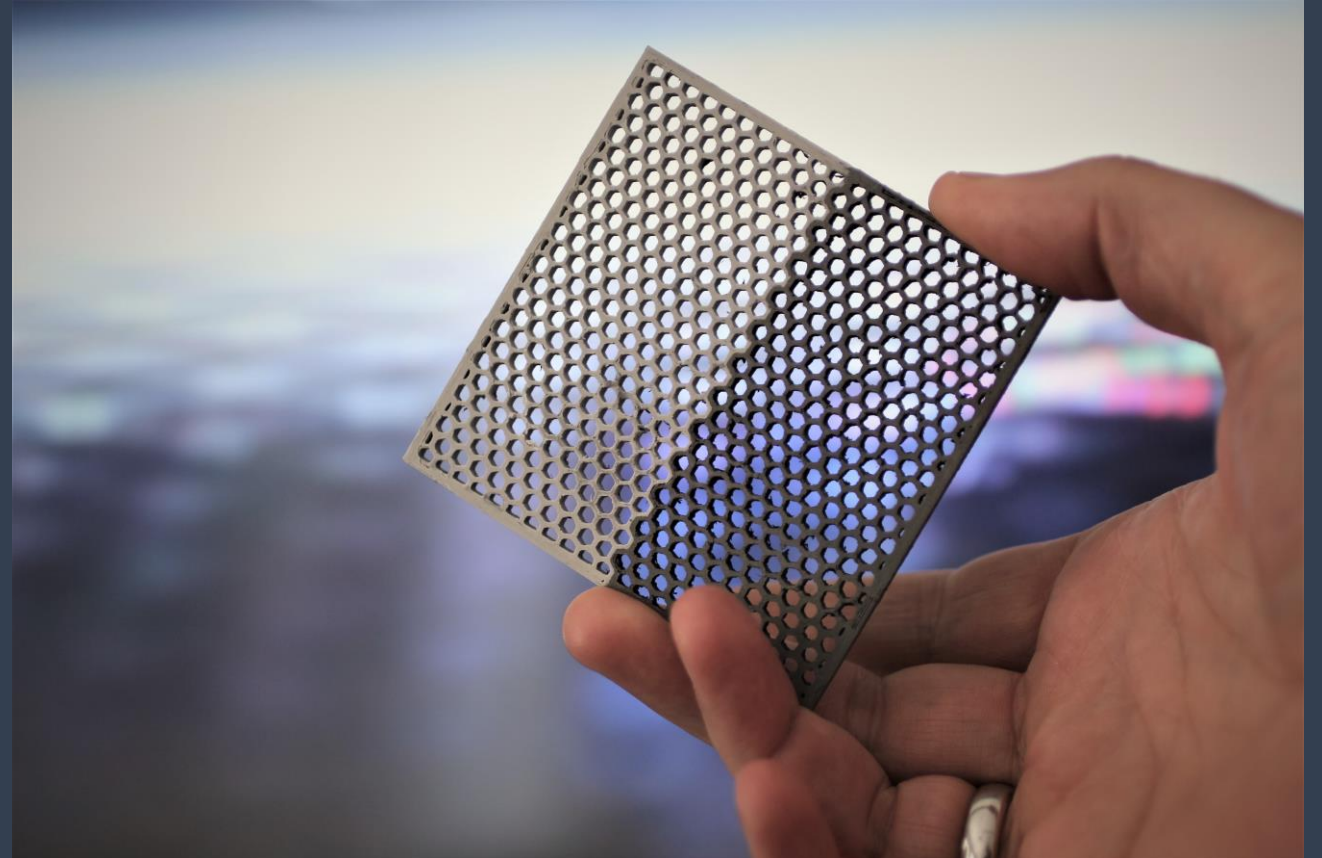
water cooling

ADDITIVE MANUFACTURING

Equipment

Filament Printing Technology (FDM / FFF)

- Cost effective
- High Technology Readiness (TRL)
- Cavities and infill profiles can be manufactured
- Easy way of producing multi materials components
- No free powder, No laser, No flammable gases



Filament materials



STAINLESS STEEL
316 L

Sinter temperature
Sinter atmosphere

1.390°C
N2/H2

BASF ULTRAFUSE™ 316L USABLE !



STAINLESS STEEL
17-4 PH

Sinter temperature
Sinter atmosphere

1.390°C
N2/H2

BASF ULTRAFUSE™ 17-4PH USABLE !



PURE COPPER
CU

Sinter temperature
Sinter atmosphere

1.060°C
N2/H2



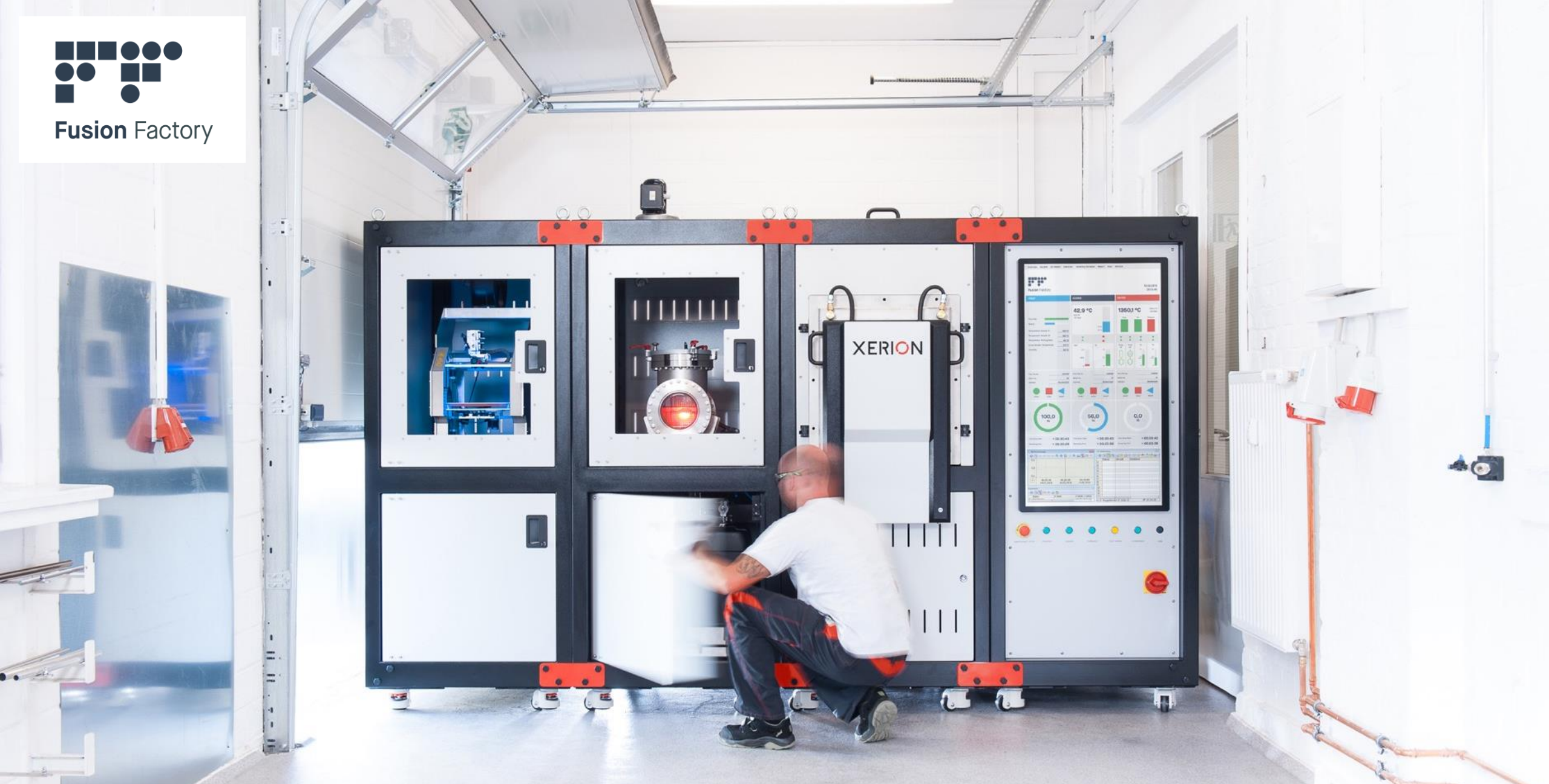
CERAMIC
Al₂O₃

Sinter temperature
Sinter atmosphere

1.550°C
Air



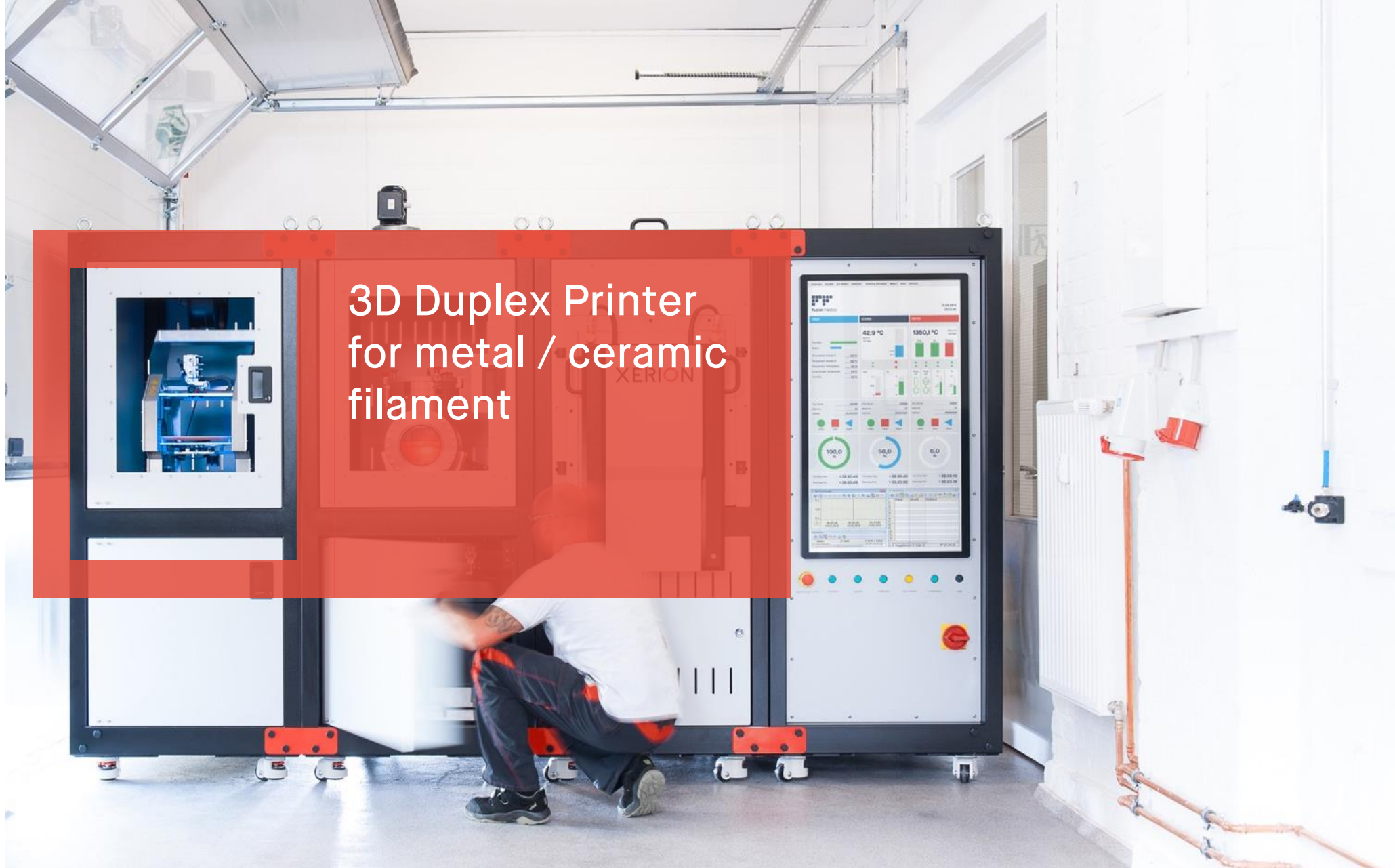
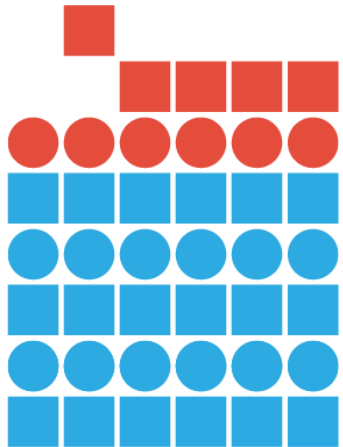
Fusion Factory





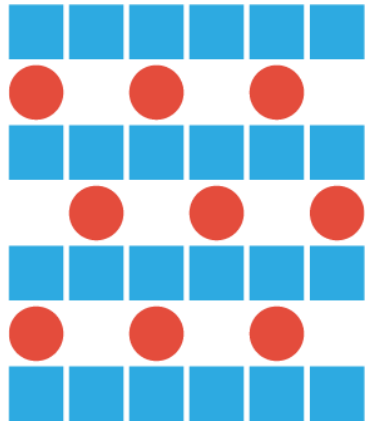
Fusion Factory

Step 1
Print it !



3D Duplex Printer
for metal / ceramic
filament

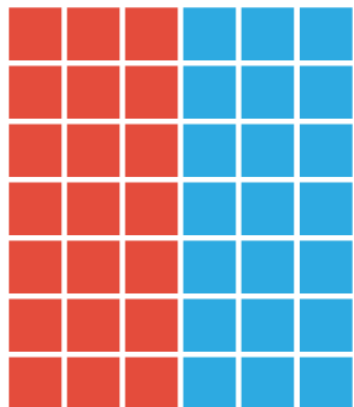
Step 2
Treat it !





Fusion Factory

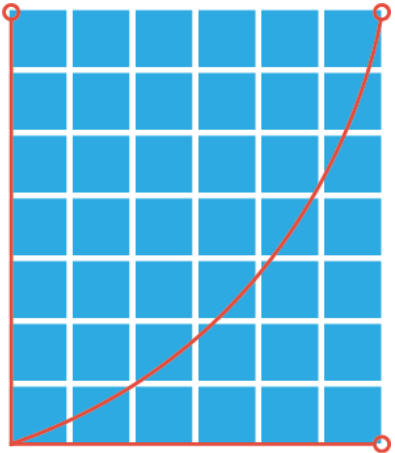
Step 3
Compact it !





Fusion Factory

Control it !



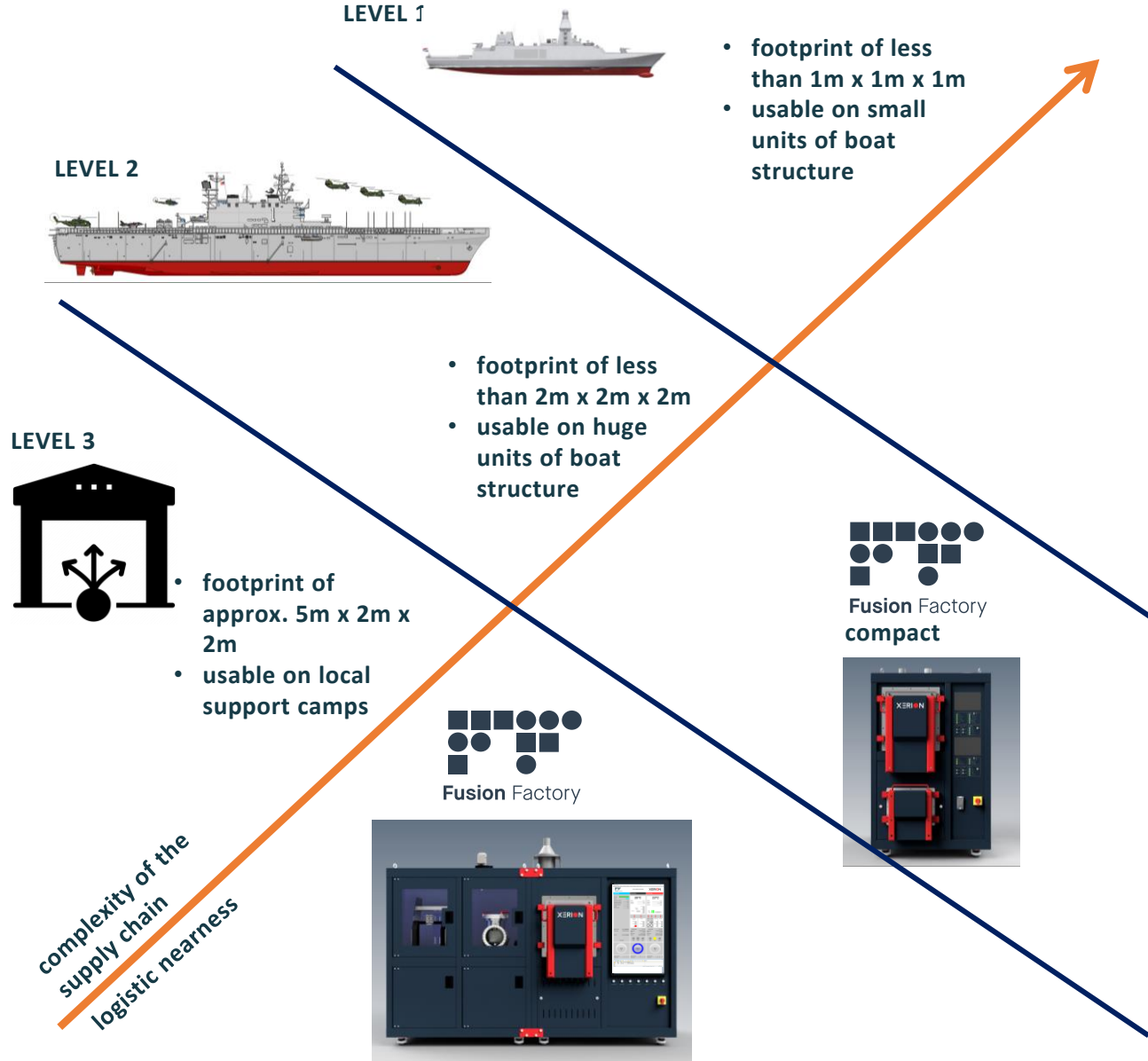
Control
Unit



XERION



Installed in 19" racks
Mobile applications
On site production



Fusion Factory
compact



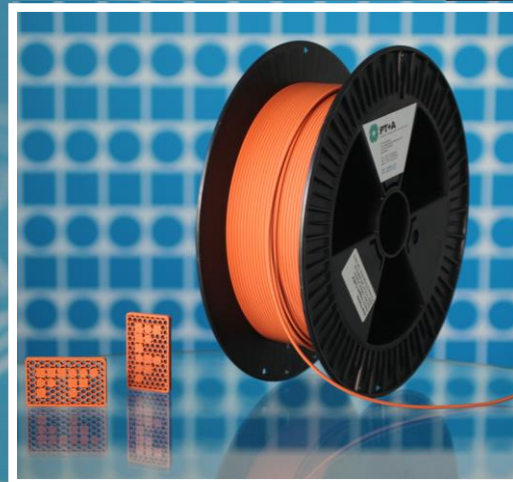
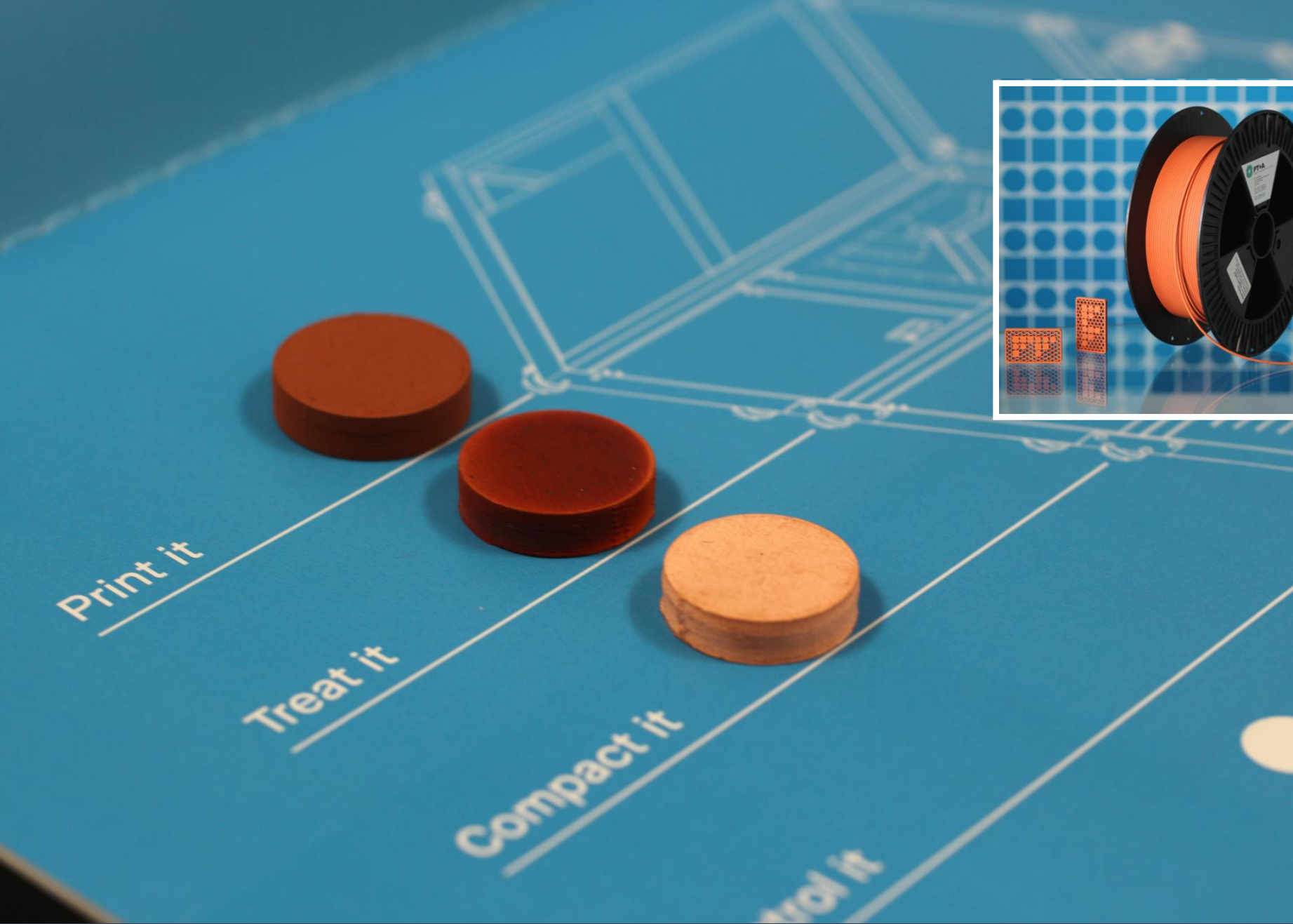
Fusion Factory



Picture according to: S. Hartig a, J. P. Wulfsberg „integration of additive manufacturing to support temporary self-sufficient operating systems based on the example of the german navy“

ADDITIVE MANUFACTURING

Use Cases: Pure Copper



XERION



Deutsches
Kupferinstitut

Analysis:

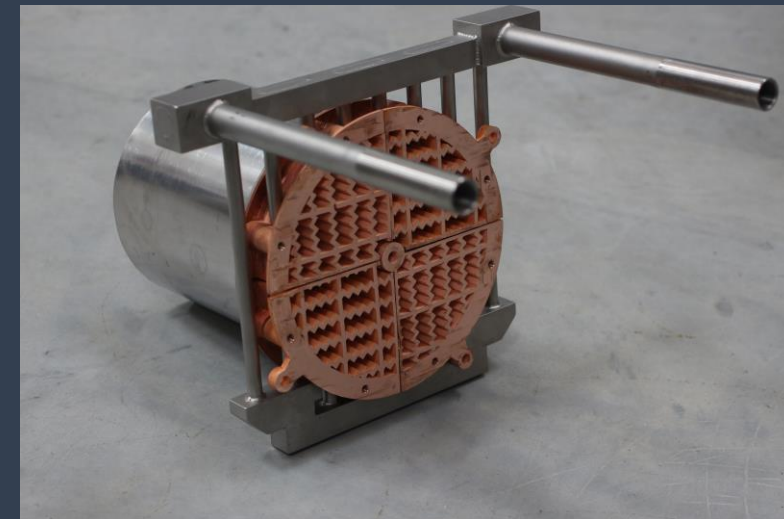
Density 98 ... 99%

Conductivity (el. / therm.)

70 ... 80% IACS

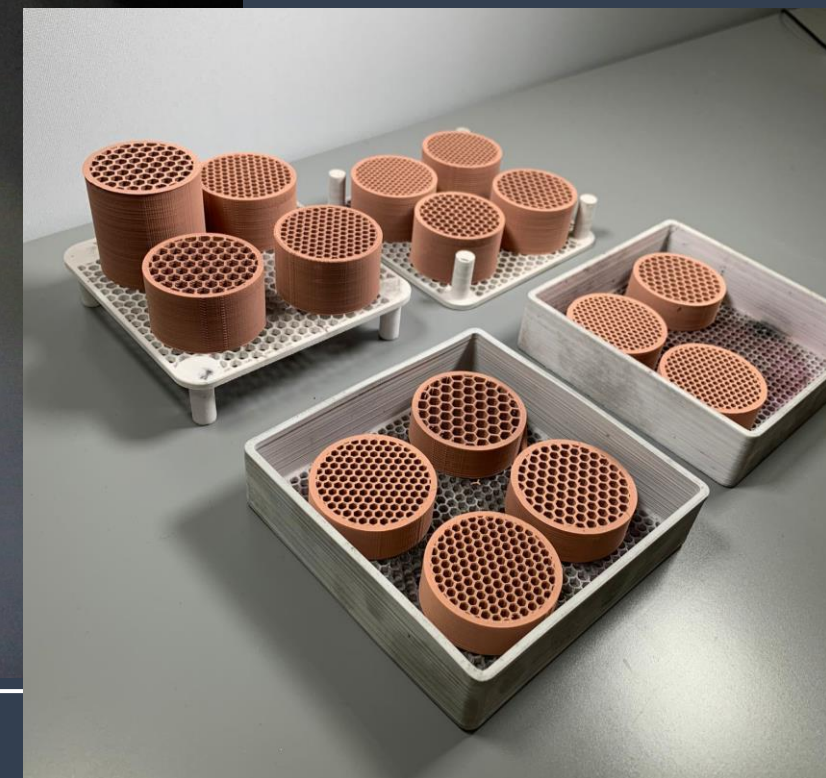
XERION

Heat exchanger
for fast cooling system
In Vacuum Hardening furnace



XERION

Copper inlets
For cooling trap
debinder / sinter furnace



ADDITIVE MANUFACTURING

Use Cases: Ceramics

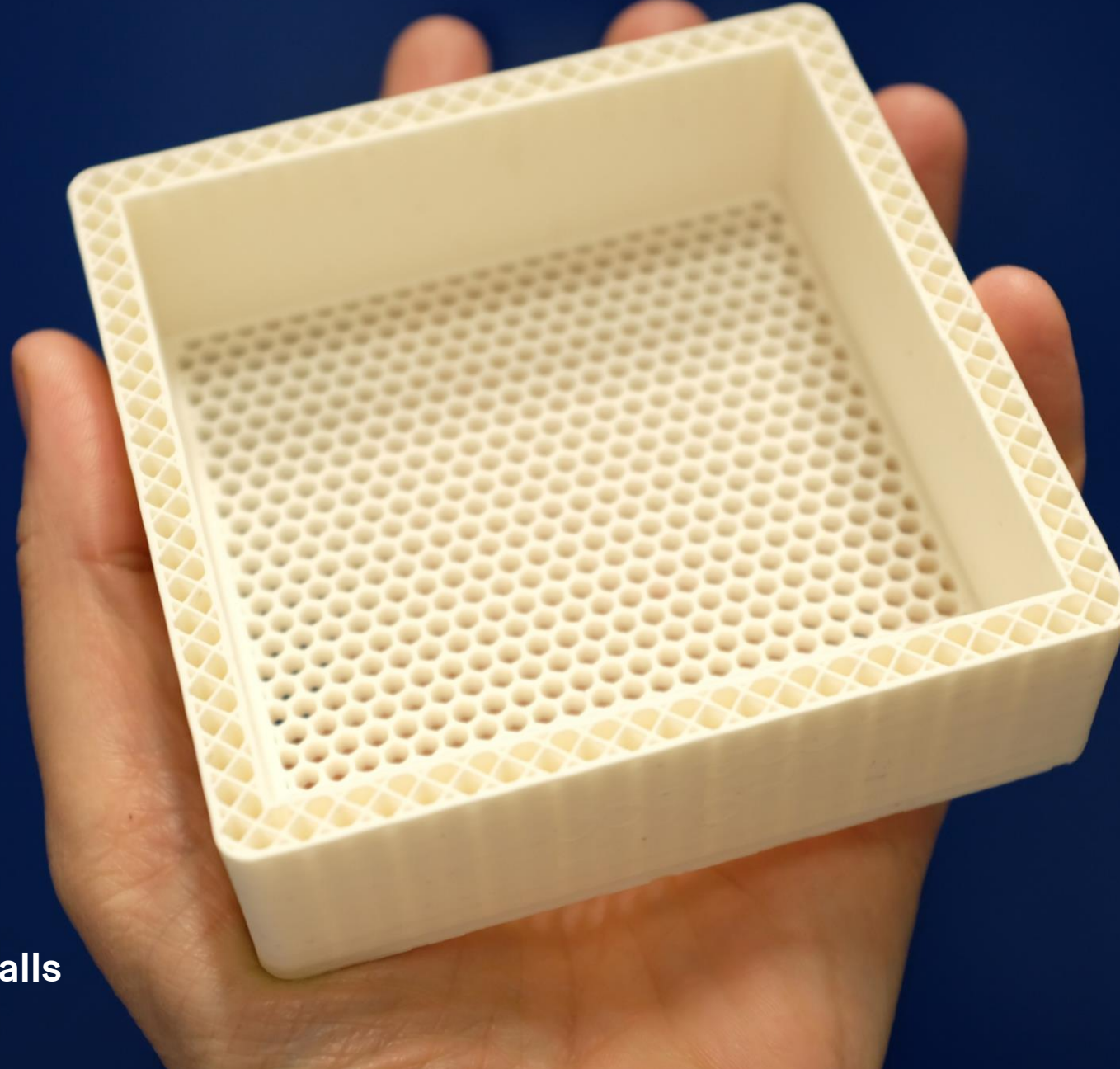
Furnace furniture

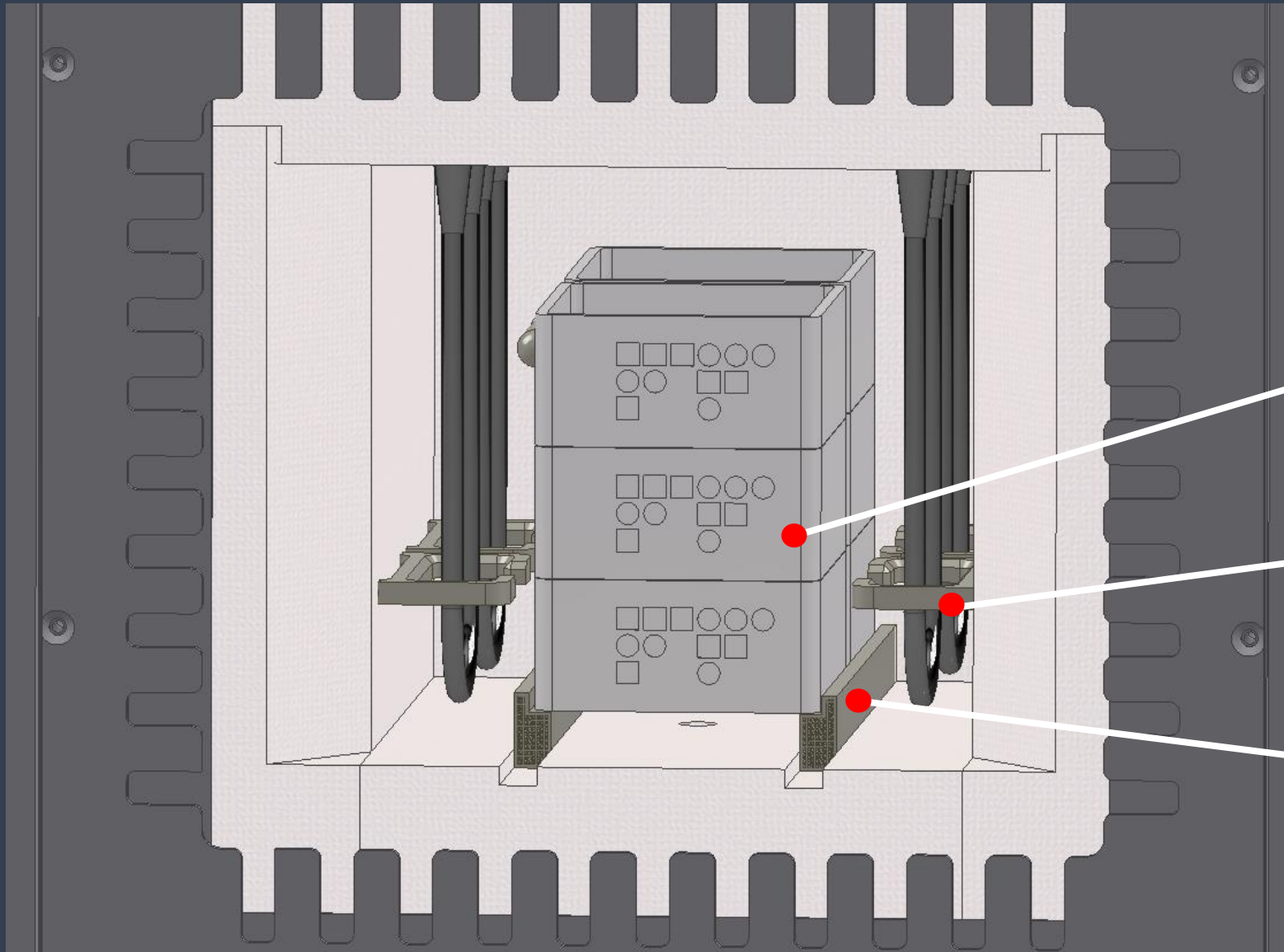
Sinter box

Al₂O₃ 99,5%

100 mm x 100 mm

Perforated bottom and walls



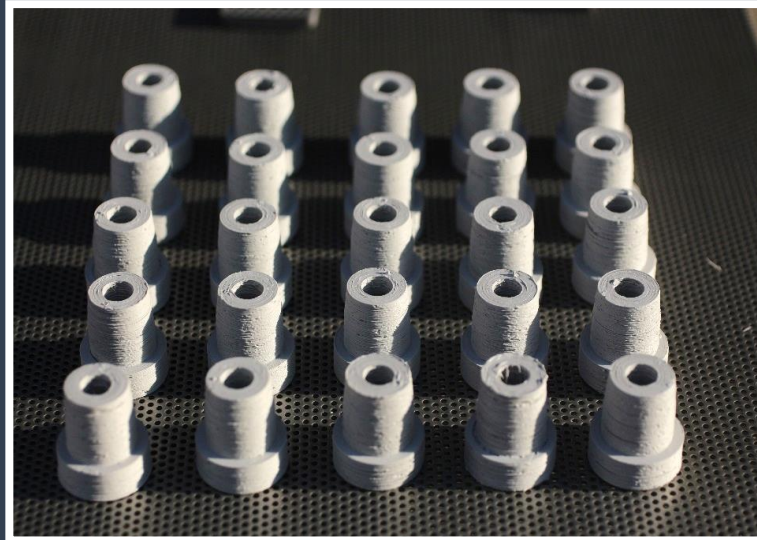


Furnace furniture

**6 x Sinter boxes with
perforated bottom**

**Protective brackets for
heating elements**

Rails for sinter boxes



XERION



Nozzles for steel casting
Inner diameter 10 mm
Material Spinel
Open and closed porosity



XERION



**Test in
Steel casting simulator**



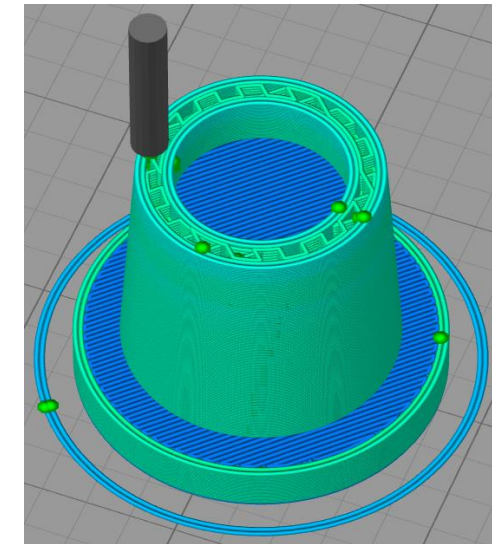
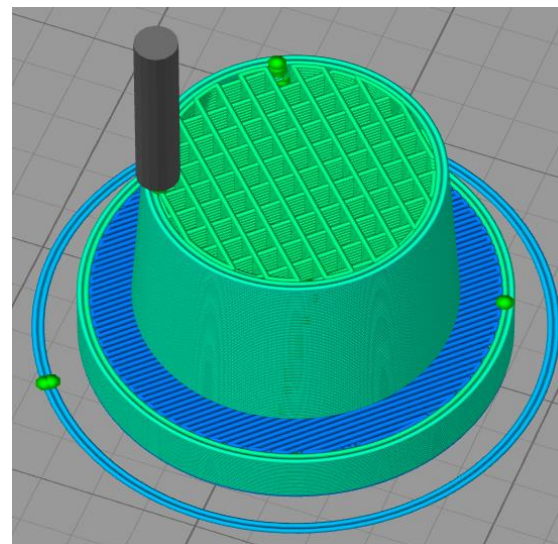
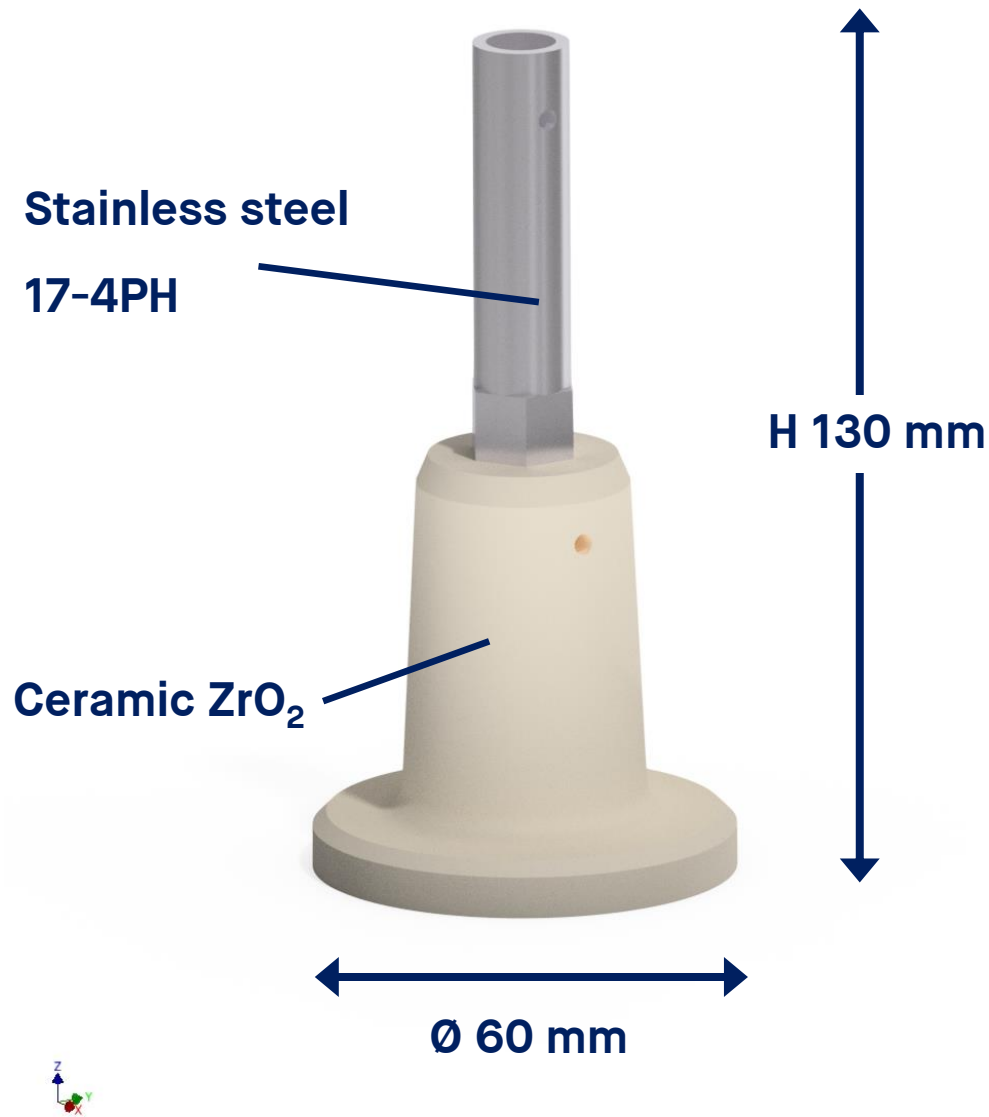
ADDITIVE MANUFACTURING

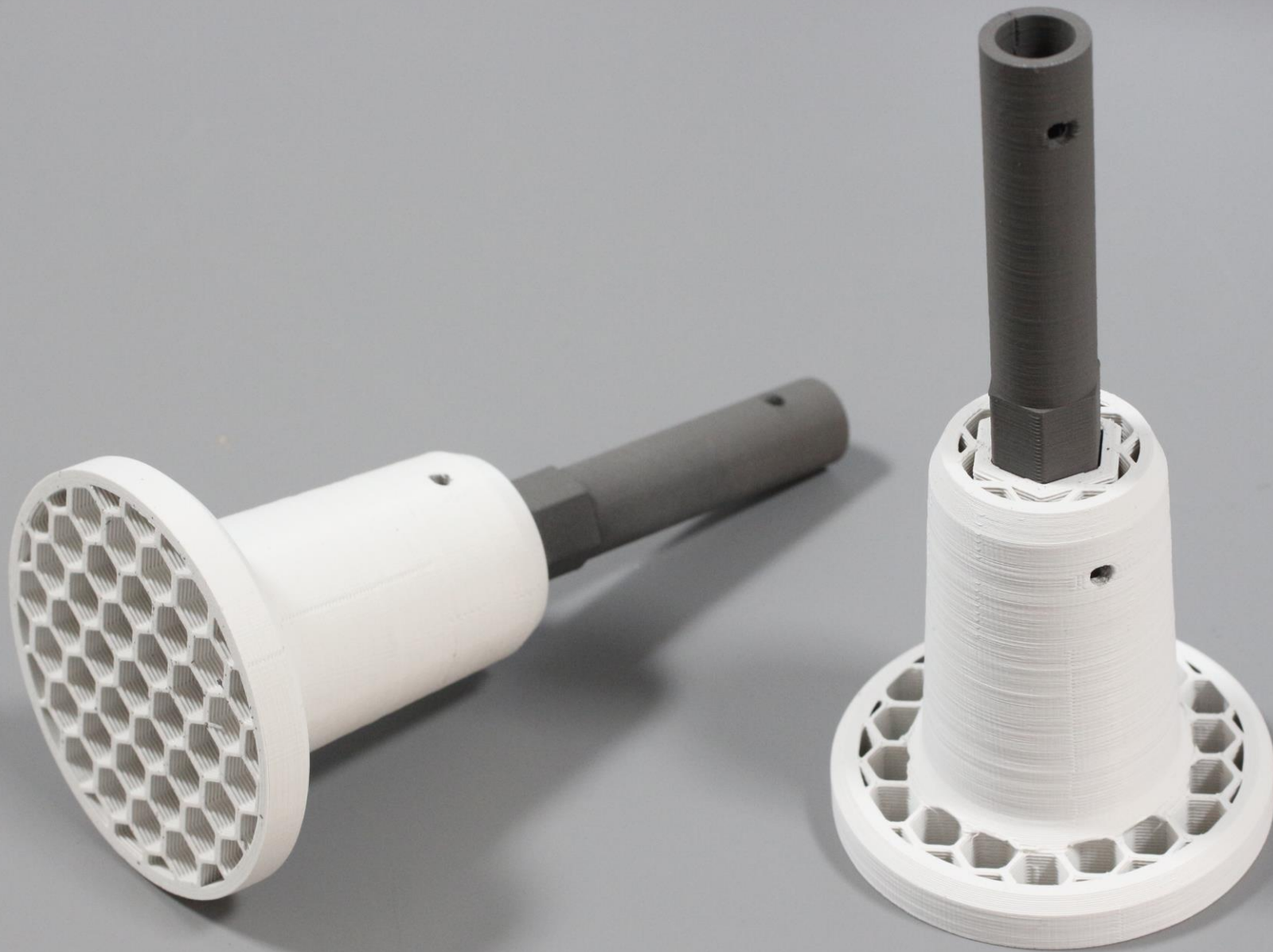
Use Cases: Anchor for Refractories

Multi Material anchor for refractories

→ Variation of materials

→ Variation of the inner and outer geometry





XERION



**Metal / Ceramic
Multi Material anchor
for refractories**

You go rough? We go tough.



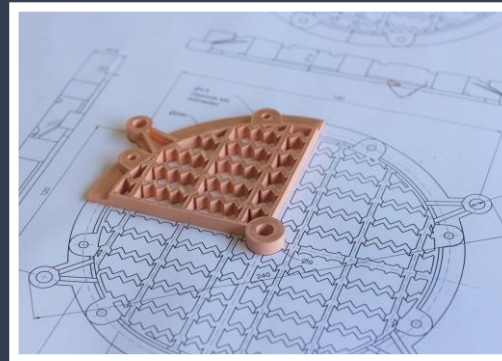
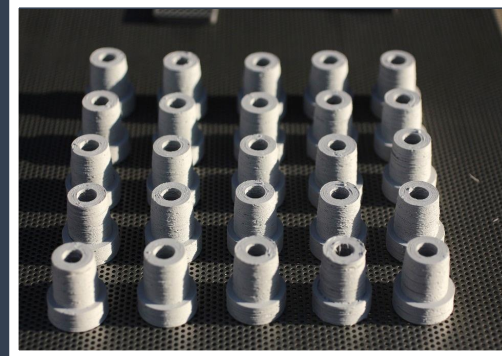
The Fusion Factory XS.
| Printer | Debinder + Sinter | Chiller |



Learn more at: XERION.DE



**Fusion
Factory
XS**



XERION

Einsatz additiv gefertigter Bauteile im Hochtemperaturofenbau

AM parts in high-temperature furnace construction

Uwe Lohse

XERION BERLIN LABORATORIES