

DELIVERING ADVANCED PRODUCTION  
CAPABILITIES TO HIGH-TECH  
INDUSTRIES WORLDWIDE



PRODUCT CATALOG

**zortrax**

INDUSTRIAL  
ADDITIVE  
MANUFACTURING  
TECHNOLOGIES





# zortrax

## INDUSTRIAL ADDITIVE MANUFACTURING TECHNOLOGIES

Zortrax mission in building industrial equipment boils down to technological edge, modularity, and efficient management. Each of our industrial products brings significant innovations to the table, is capable of working as a part of a larger, fully scalable ecosystem, and can be managed remotely from anywhere in the world through Zortrax inCloud, a simple, secure cloud-based service.

This way, our customers can build additive manufacturing systems tailored exactly to match their specific requirements in various fields like advanced engineering, supporting traditional manufacturing lines, or bringing mass-customized products to the market.

Maximum extruder temp. 480 °C

Maximum chamber temp. 200 °C

Maximum platform temp. 220 °C



## CUTTING EDGE RESEARCH PLATFORM

Zortrax Endureal works in a number of advanced research projects. We are developing a capability to 3D print composite models out of two high-performance materials at once and working on covering PEEK parts with metals for the European Space Agency. And we are just warming up.

### DUAL EXTRUSION

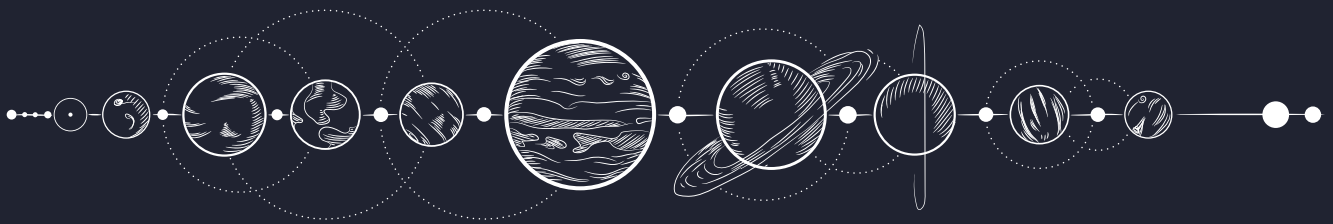
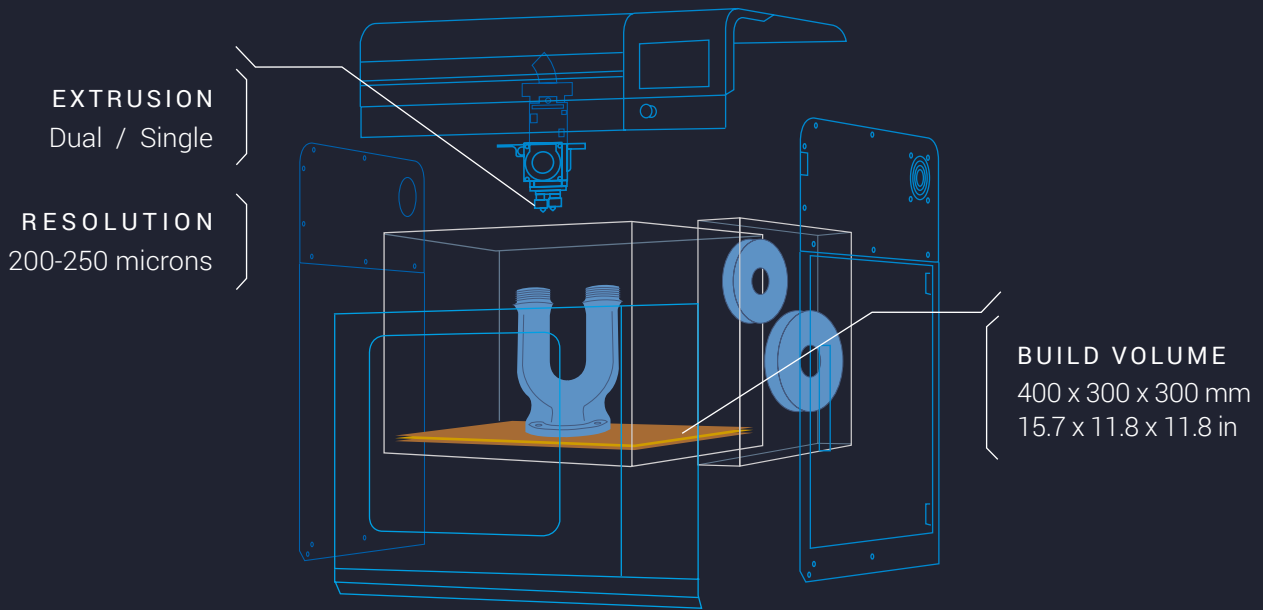
The LPD Plus dual extrusion technology used in the Zortrax Endureal has been traditionally used to print support structures out of different material than the model itself. But we wanted it to do way more than that, recognizing that there is an increasing demand for advanced composite parts 3D printed out of two high-performance polymers. This is exactly what we have achieved. Zortrax engineers used ESA's experimental blend of electrically conductive PEEK in combination with standard Z-PEEK to print space-ready parts with power and data transfer capabilities.

### ELECTRICALLY CONDUCTIVE PEEK

ESA engineers working at the European Space Research and Technology Centre have invented a blend of electrically conductive PEEK. This has been achieved by adding carbon nanotubes and graphite nano plates to standard poly ether ether ketone. What ESA ended up with was a 3D printing material that had all the mechanical and thermal characteristics of PEEK which at the same time could be used for printing data and power transferring lines or provide ESD protection functionalities.

### COTS HARDWARE

In the space industry, COTS stands for commercial-off-the-shelf-components which are widely available and more cost-efficient than custom made solutions used for space exploration in the past. The Endureal 3D printers in is all ESA projects have the same hardware configuration as commercially available machines. Customers can rest assured that the Endureal 3D printers they order come fully equipped to do all the amazing things achieved by our research teams.



**COVERING Z-PEEK PARTS WITH METALS**

Developing a technology to apply metallic coatings and reinforcing structures to parts 3D printed with Z-PEEK on the Zortrax Endureal is the aim of the research project realized by Zortrax under ESA contract with Astronika, a company specializing in space mechanisms, and Crido R&D, who are responsible for electroplating solutions. Z-PEEK parts covered with various metals are expected to provide high-quality, lightweight alternative to pure metals alloys.

**FIRST RESEARCH PAPER CO-AUTHORED WITH ESA**

After nearly two years of research, Zortrax engineers published the first research paper co-authored with ESA's team led by dr Ugo Lafont, an expert on space-grade polymeric materials. Composite models 3D printed on the Zortrax Endureal passed tests in thermal vacuum chambers and their mechanical properties were found to be among the highest ever reported in scientific literature. The paper passed peer-review process and was presented at the IEEE Aerospace Conference in Big Sky, Montana, USA.



One of the first Z-PEEK samples 3D printed on the Zortrax Endureal successfully covered with metallic coating.

## THIRD GENERATION 3D PRINTER



Zortrax Endureal is a third generation 3D printer enabling advanced model manufacturing with high-temperature PEI- and PEEK-based polymers, as well as metallic powder filaments. The machine incorporates many technological solutions which make it a unique tool aimed at high-tech industries and specialized fields.

### THERMAL MANAGEMENT

The Endureal has been designed to create and withstand printing conditions necessary to process some of the most challenging high-temp filaments. During the printing process, the materials can be extruded in temperatures reaching 480 °C, whereas model building is supported with temperatures as high as 200 °C in the enclosed chamber and 220 °C on the PEI platform. Such thermal parameters are crucial for model adhesion to the platform and for reducing possible shrinkage when printing sizable objects.

### ISOLATED COMPARTMENTS

The Endureal has been designed around three thermally isolated zones: the printing chamber, the extruder's compartment, and the filaments compartment. Temperature maintained in one of these zones have a minimal impact on the other two thanks to the insulating materials which are equivalent to those used in aerospace applications. The difference in temperatures between the chamber and the extruder's compartment may reach more than 100 °C and this level of thermal isolation is crucial when printing with high-temp polymers. In addition, there are moisture absorbers in the filaments compartment which prevent moisture from deteriorating the quality of filaments during the printing process.

### TWO OPERATION MODES

Being equipped with two separate hotends, the Endureal can facilitate the printing process in both single- and dual-extrusion modes. These methods allow the machine to use breakaway or soluble support materials, depending on the used model material. Dual-extrusion mode makes it possible to print complex geometries, movable mechanisms, or shapes which single-extrusion mode printers would not be able to fabricate. The printer's potential is supplemented with a large build-space.

### HIGH OPERATION SAFETY

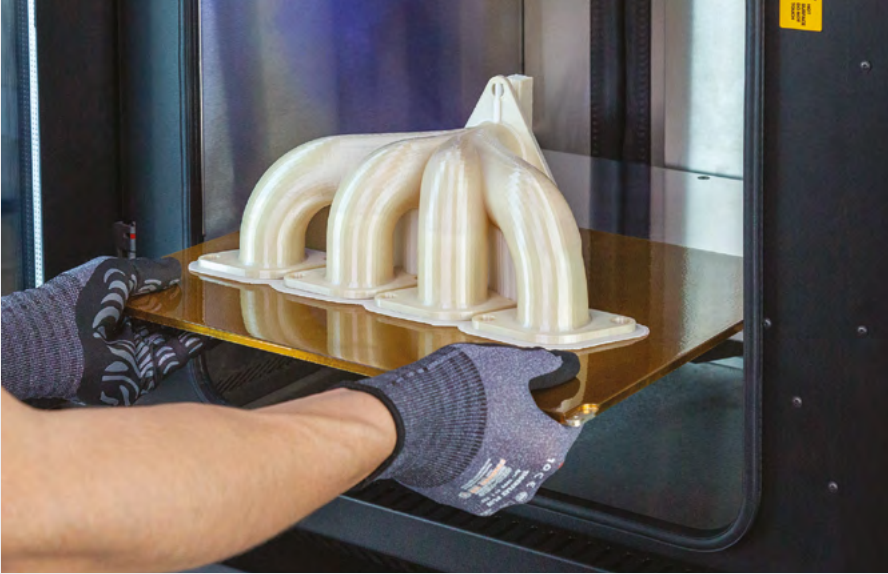
The Endureal maintains full control over the printing process and key modules at every stage of model building. The unit is equipped with an array of sensors which tightly control the position of hardware components and can detect issues with overheating, filament shortages, or a power outage. At all times, it is possible to display a live footage from the heat-resistant camera installed in the main chamber and remotely check the printing progress. In the case of an emergency, the unit can immediately be switched off with the emergency button placed on the front.

### MAINTENANCE FACILITATED

With the innovative design, the Zortrax Endureal proves to be a versatile machine that can perform all procedures required for processing the most challenging filaments. Its ease of use is also ensured, as most of maintenance can be completed by in-house operators without voiding the warranty. The unit comes with a Maintenance Kit which contains tools and parts necessary to ensure uninterrupted operation. This significantly minimizes downtime as there is no need to wait for qualified service technicians.

### MATERIAL DRYING

Work with high-performance filaments is supported before the printing with a special treatment procedure. The Endureal has an option for material drying which can be performed in the main chamber. This pre-printing step removes moisture from filaments to enhance thermal and mechanical properties of prints.



**EASY MAINTENANCE OF EXTRUSION SYSTEM**

The Endureal's extrusion system has a modular design which enables easy maintenance when needed.

**HIGH-PERFORMANCE COMPONENTS**

Key components in Zortrax Endureal are designed for high-operating temperatures.



**INTUITIVE INTERFACE**

The printer can be operated with a simple touchscreen. In emergencies, printing can be stopped by hitting a clearly visible red safety button.



**CONTROLLED FILAMENTS' COMPARTMENT**

Filaments are stored in a secure, closed environment at temperatures optimal for both high-performance and standard polymers the Endureal is designed to work with.

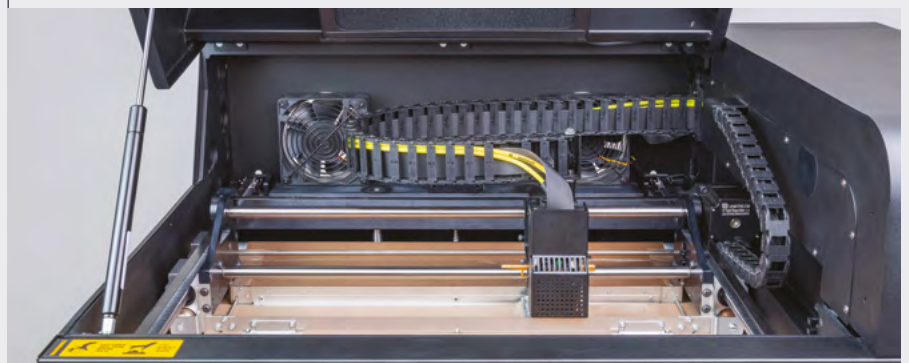


**ISOLATED EXTRUDER'S COMPARTMENT**

The extruder's compartment in the Endureal is thermally isolated from the printing chamber right beneath it.

**ADDITIONAL STORAGE SPACE**

The Endureal Station, a mobile stand for the Endureal 3D printer, offers additional storage for tools and materials.





## TECHNICAL SPECIFICATION OF ZORTRAX ENDUREAL

DEVICE	
Build volume	400 x 300 x 300 mm (15.7 x 11.8 x 11.8 in)*
Nozzle diameter	0.4 mm (0.016 in)
Extruder	Dual material
Extruder cooling system	Two fans cooling the extruder; radial fan cooling the print
Hotend	High-temperature dual hotend
Platform	Heated, aluminum plate coated with PEI
Material Sensors	2 x mechanical endstop, 2 x material weight sensor
Connectivity	Wi-Fi, Ethernet, USB
Operating system	Android
Processor	Quad Core
Touchscreen	7" IPS 1024 x 600
Camera	Yes

TEMPERATURE	
Maximum printing temperature (extruder)	480 °C (896 °F)
Maximum platform temperature	220 °C (428 °F)
Maximum build chamber temperature	200 °C (392 °F)
Ambient operation temperature	17-30 °C (63-86 °F)
Storage temperature	0-35 °C (32-95 °F)

PRINTING	
Technology	LPD Plus (Layer Plastic Deposition Plus) advanced technology depositing melted thermoplastics with breakaway and dissolvable support structures
Layer resolution	200-250 microns (for 0.4 mm nozzle)
Minimal wall thickness	450 microns (for 0.4 mm nozzle)
Platform levelling	Automatic measurement of platform points' height

ELECTRICAL	
AC Input	120 V ~ 13 A 50/60 Hz 200 - 240 V ~ 9.5 A 50/60 Hz
Maximum power consumption	120 V - 1600 W 200-240 V - 2300 W

SOFTWARE	
Software bundle	Z-SUITE
Supported input file types	.stl, obj, .dxf, .3mf, .ply
Supported operating system	Mac OS Mojave and newer versions / Windows 7 and newer versions

FILAMENTS	
Dedicated for single extrusion	Z-PEI 9085
Dedicated for dual extrusion	BASF Ultrafuse® 17-4 PH, BASF Ultrafuse® 316L, BASF Ultrafuse® Support Layer, Z-ABS, Z-PEEK, Z-PEI 1010, VICTREX AM™ 200, Z-PEI 9085, Z-SUPPORT ATP, Z-SUPPORT ATP 130, Z-SUPPORT High-Temp, Z-ULTRAT
External materials	Applicable
Support	Mechanically removed - printed with the same material as the model; Breakaway - printed with a different material than the model; Soluble - printed with a different material than the model
Filament container	spool
Filament diameter	1.75 mm (0.069 in)

IN THE BOX	
3D printer, Z-SUITE, starter kit, maintenance kit, spool of model material, spool of support material, spool of high-temperature model material, spool of high-temperature support material, USB memory stick	

MAINTENANCE KIT CONTENTS	
material endstop (2 pcs.), extruder filament gear (2 pcs.), extruder, filters set (carbon & HEPA) (2 pcs.), PEI plate (2 pcs.), high-temperature hotend module (2 pcs.), extruder cable	

\* In dual-extrusion mode project's dimensions cannot exceed 390 mm (15.35 in) in the X axis and/or 290 mm in the Y axis.





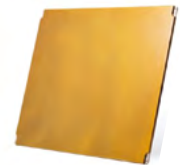
EXTRUDER



EXTRUDER FILAMENT GEARS



HEPA & CARBON FILTERS



PEI PLATE



HIGH-TEMPERATURE HOTEND MODULE



EXTRUDER CABLE



FILAMENT ENDSTOP

ADDITIONAL PARTS & ACCESSORIES DELIVERED IN A MAINTENANCE KIT

PARTS & ACCESSORIES	DESCRIPTION
HEPA & Carbon Filters	2 sets of spare HEPA and carbon filters
Extruder	a dual-extrusion module designed to process filaments in a wide range of temperatures
Extruder Cable	the cable connecting the extruder with the motherboard
Extruder Filament Gears	2 spare gears facilitating filament feeding
Filament Endstop	2 optical sensors detecting the presence of filament
High-temperature Hotend Module	2 heating modules designed to process high-temperature polymers
PEI Plate	2 spare PEI plates to install on the heatbed

3D PRINTING THERMOPLASTIC FILAMENTS COMPATIBLE ZORTRAX ENDUREAL 3D PRINTER

FILAMENTS	DESCRIPTION
Z-ABS	the most popular and most cost-efficient plastic that's best for early prototypes
Z-Ultrat	a mechanically stronger blend of Z-ABS great for prototypes intended for light functional testing
Z-PEEK	very strong, radiation-resistant high-performance polymer with excellent thermal properties
Z-PEI 1010	a highly rigid and thermally stable filament with resistance to chemicals
Z-PEI 9085	a highly durable and flame-retardant filament widely used in aerospace industry
Z-SUPPORT ATP	soluble support filament designed with high thermal stability in mind
Z-SUPPORT ATP 130	soluble support filament dedicated for 3D printing with high-temperature conditions
Z-SUPPORT High-Temp	a breakaway support filament designed to withstand high temperatures
BASF Ultrafuse® 17-4 PH	metallic powder filament included in the Zortrax Full Metal Package 17-4 PH which enables manufacturing magnetic 17-4 PH steel parts in a BASF proprietary process
BASF Ultrafuse® 316L	metallic powder filament included in the Zortrax Full Metal Package 316L which enables manufacturing non-magnetic 316L steel parts in a BASF proprietary process
BASF Ultrafuse® Support Layer	special filament designed to work with BASF Ultrafuse® metal materials

# Z-PEEK

Resistant to high levels of UV radiation and atomic oxygen bombardment

Widely adopted and flight-tested in space applications

PEEK components have been flown to Jupiter onboard the JUNO spacecraft



Strength-to-weight ratio comparable to stainless steel

Resistant to high temperatures reaching over 250 °C

Resistant to cryogenic temperatures reaching -196 °C

Highly resistant to abrasion

Radio-translucent, do not cause artifacts in radio imaging equipment

## HIGH-PERFORMANCE SPACE-GRADE MATERIAL

Z-PEEK is one of the strongest polymers on the planet. The material has a strength-to-weight ratio comparable to stainless steel, withstands extreme temperatures, radiation, and exposure to low-earth orbit environment.

### MECHANICAL PERFORMANCE

Z-PEEK has excellent wear resistance and can be used in polymer-metal gear pairs and polymer-metal sliding systems. Gears made out of Z-PEEK interlocked with gears made of stainless steel endured over 22 million cycles at 1600 rpm under 1 Nm load. Sliding performance of Z-PEEK has been tested in both atmospheric and vacuum conditions. The material performed very well with low debris accumulation. Samples printed with Z-PEEK have been found to consistently score well over 90 MPa in tensile strength tests.

### THERMAL PERFORMANCE

Models printed with Z-PEEK on the Endureal 3D printer have successfully passed space qualification tests in thermal vacuum chambers performed at the European Space Agency's ESTEC research center. The samples endured over 500 cycles ranging from 100 °C to -100 °C. The material, however, is capable of withstanding even more extreme temperatures. The heat deflection temperature at 66 psi is as high as 250 °C. The material has also withstood 10 cycles of cooling it down to cryogenic temperatures reaching -196 °C without cracking.

### RADIATION RESISTANCE

Z-PEEK exhibits excellent radiation resistance. As part of the MPAC & SEED experiment, samples made out of the same blend of polyether ether ketone have been sent to the International Space Station where they were exposed, unshielded, to the low-earth orbit environment for over 46 months. No significant signs of degradation have been found once the samples were returned to Earth. Prior to the test, PEEK had passed extensive ground testing which included atomic oxygen bombardment and extreme UV irradiation.



### 3D PRINTED PEEK GASKETS

Seals for piping in oil industry 3D printed with Z-PEEK on the Zortrax Endureal 3D Printer.



### PUMP HOUSING

Housing for a pump used in oil industry 3D printed on the Zortrax Endureal with Z-PEEK. The material has been chosen to achieve resistance to high pressures.

**OUTGASSING PROPERTIES**

Low outgassing is mandatory for materials used in vacuum technology. Z-PEEK, unlike most other polymers, exhibit excellent outgassing performance. At tests performed by ESA, the material achieved an outgassing rate of  $5 \times 10^{-7}$  mbar l/cm<sup>2</sup>s<sup>-1</sup> which is enough for high vacuum applications. Annealing at 150 °C for 18 hours, a process that can be performed by the Endureal once the 3D printing is done, brings this value further down to  $4.1 \times 10^{-11}$  mbar l.cm<sup>2</sup>s<sup>-1</sup> which meets the specification for ultra-high up to extreme vacuum technologies. Z-PEEK outgassing properties also make it possible to use this material onboard the International Space Station.

PROPERTY	VALUE	STANDARD
TML (%)	0.31	ECSS-Q-ST-70-02C
CVCM (%)	0.000	ECSS-Q-ST-70-02C
RML (%)	0.14	ECSS-Q-ST-70-02C

**RADIATION-RESISTANT RINGS**

Radiation-resistant bearing ring for a spacecraft gimbal 3D printed with Z-PEEK on the Zortrax Endureal.



**DURABLE GEARS**

Abrasion-resistant gears 3D printed with Z-PEEK to operate in polymer-metal gear pairs.



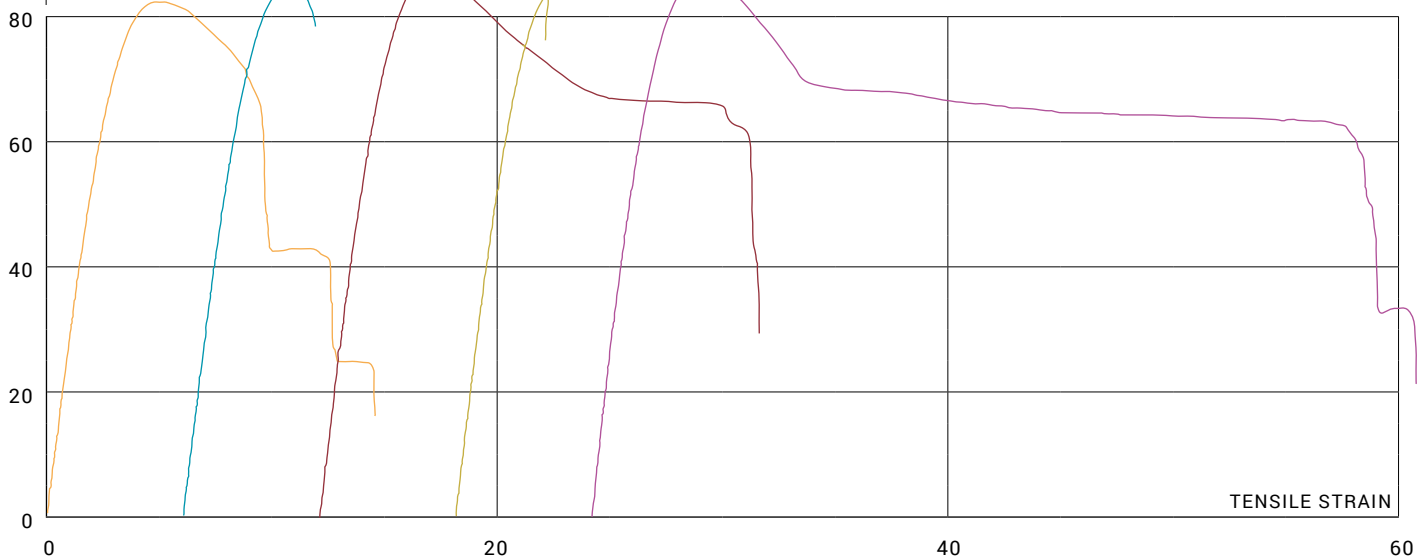
**PRESSURE-RESISTANT PUMP**

Breakaway support structures enable printing partially trapped volumes with Z-PEEK.



**Z-PEEK TENSILE STRENGTH**

Five ASTM samples printed with Z-PEEK on the Zortrax Endureal consistently scored over 83 MPa in tensile strength tests. Tensile strain on the X axis, tensile stress on the Y axis.



### HEAVY-DUTY GEARS

Z-PEEK is strong enough for gears operating at high speeds under significant loads.

## INDUSTRIES USING Z-PEEK

Resistance to radiation, abrasion, and extreme temperatures makes Z-PEEK suitable for components operating in various challenging environments in multiple industries. Here are some examples of what can be 3D printed with Z-PEEK.

### SPACE

- Bearing rings for gimbals mounted on spacecraft operating in high-radiation environment like the JUNO probe.
- Cubesat frames designed for operating on the Low Earth Orbit.

- Advanced components with data or energy transferring features (printed in combination with the ESA conductive blend of PEEK).



PEEK rings designed to withstand high doses of radiation have been flown to Jupiter onboard the JUNO spacecraft.

### MECHANICAL ENGINEERING

- Polymer-metal gear pairs, because the material is particularly resistant to abrasion.
- Polymer-metal sliding systems, because Z-PEEK generates little debris in sliding scenarios, and less debris accumulation means longer lifespan of the system.
- High-temperature parts, because Z-PEEK is one of the most thermally stable polymers available.

High resistance to abrasion and relatively low debris accumulation makes Z-PEEK a good match for sliding systems.





#### OIL INDUSTRY

- Gas separation systems since Z-PEEK has very low permeability.
- Housings for pumps because the material retains structural integrity in pressures reaching 200 MPa.
- Other down-hole equipment because 3D printing ensures lead times shorter than traditional manufacturing technologies and oil extraction must be performed in an uninterrupted manner.

Gas separation components printed with Z-PEEK have low permeability and withstand high temperatures.



Low permeability and resistance to high pressures make Z-PEEK a perfect choice for gaskets.



## Z-PEI 1010

Thermally stable up to 208 °C

Rigidity is higher than Z-PEI 9085

Elongation at break is lower than Z-PEI 9085



Used in metal cleaning and cooling systems as it is resistant to halogenated hydrocarbons

One of the most dimensionally accurate high-performance polymers

## Z-PEI 1010: ROBUST INDUSTRIAL POLYMER

Z-PEI 1010 is a translucent industrial material with high heat deflection temperature and rigidity. It has V-0 flammability rating.

### TEMPERATURE RESISTANCE

Z-PEI 1010 is an excellent choice wherever resistance to high temperatures is required. Compared to Z-PEI 9085, this blend has significantly higher heat deflection temperature standing at 208 °C. This means Z-PEI 1010 has one of the highest operating temperatures in our range.

### DIMENSIONAL STABILITY

Parts printed out of Z-PEI 1010 expand and contract very little in response to changing temperatures. This means the material can be used for tightly fitted, interlocked components made to work in a broad range of temperatures.

### BROAD CHEMICAL RESISTANCE

Z-PEI 1010 withstands contact with both automotive and aircraft fluids. It can also work exposed to aliphatic hydrocarbons, alcohols, acids, and aqueous solutions. The material is therefore a good match for tools and mechanisms intended to work with greases or lubricants.

### HIGH RIGIDITY

Compared to Z-PEI 9085, Z-PEI 1010 has higher rigidity. Parts 3D printed with this material can withstand relatively high loads and impacts without bending. The material would rather break than give in under critical load which is a behavior opposite to the one found in Z-PEI 9085



### CHEMICALLY RESISTANT PARTS

Z-PEI 1010 is perfect for chemically resistant parts that can withstand high temperatures like thermostat housings.



### RIGID HEAT-RESISTANT PARTS

Z-PEI 1010 is perfect for 3D printing rigid components that have to retain their mechanical properties under significant loads in high temperatures.

### INDUSTRIAL MACHINERY COMPONENTS

Z-PEI 1010 can withstand high temperatures, vibrations, abrasion, and exposure to chemicals, so it works great in components of various industrial machinery.



### THERMOSTAT HOUSING

Z-PEI 1010 is one of the most thermally stable polymers which means it works well in tightly fitted components operating in a wide range of temperatures.



### AIR COMPRESSOR HOUSING

High rigidity means Z-PEI 1010 can be used to print housings for machinery causing vibrations like air compressors.



### AUTOMOTIVE THROTTLE HOUSING

Broad chemical resistance of Z-PEI 1010 means the material is a good match for parts working in contact with automotive fluids like housings for throttles.





## THERMOSTAT HOUSING

Resistance to alcohols, lubricants and halogenated hydrocarbons makes Z-PEI 1010 a good choice for chemical industry components.

## INDUSTRIES USING Z-PEI 1010

Z-PEI 1010 is an industrial material with high rigidity, mechanical strength, high heat deflection temperature, and excellent resistance to chemicals. This makes it perfect for applications in the chemical industry, automotive, or manufacturing equipment. Here are some examples.

### CHEMICAL

- Gaskets and connectors, because the material has broad chemical resistance.
- Pumps and components of heating systems, because Z-PEI 1010 is thermally stable up to 208 °C.

- Housings for auxiliary devices and measuring equipment since the material exhibits high rigidity.



Chemical industry piping printed with Z-PEI 1010 operates in exposure to various chemicals and retains structural integrity under high pressures in changing temperatures.

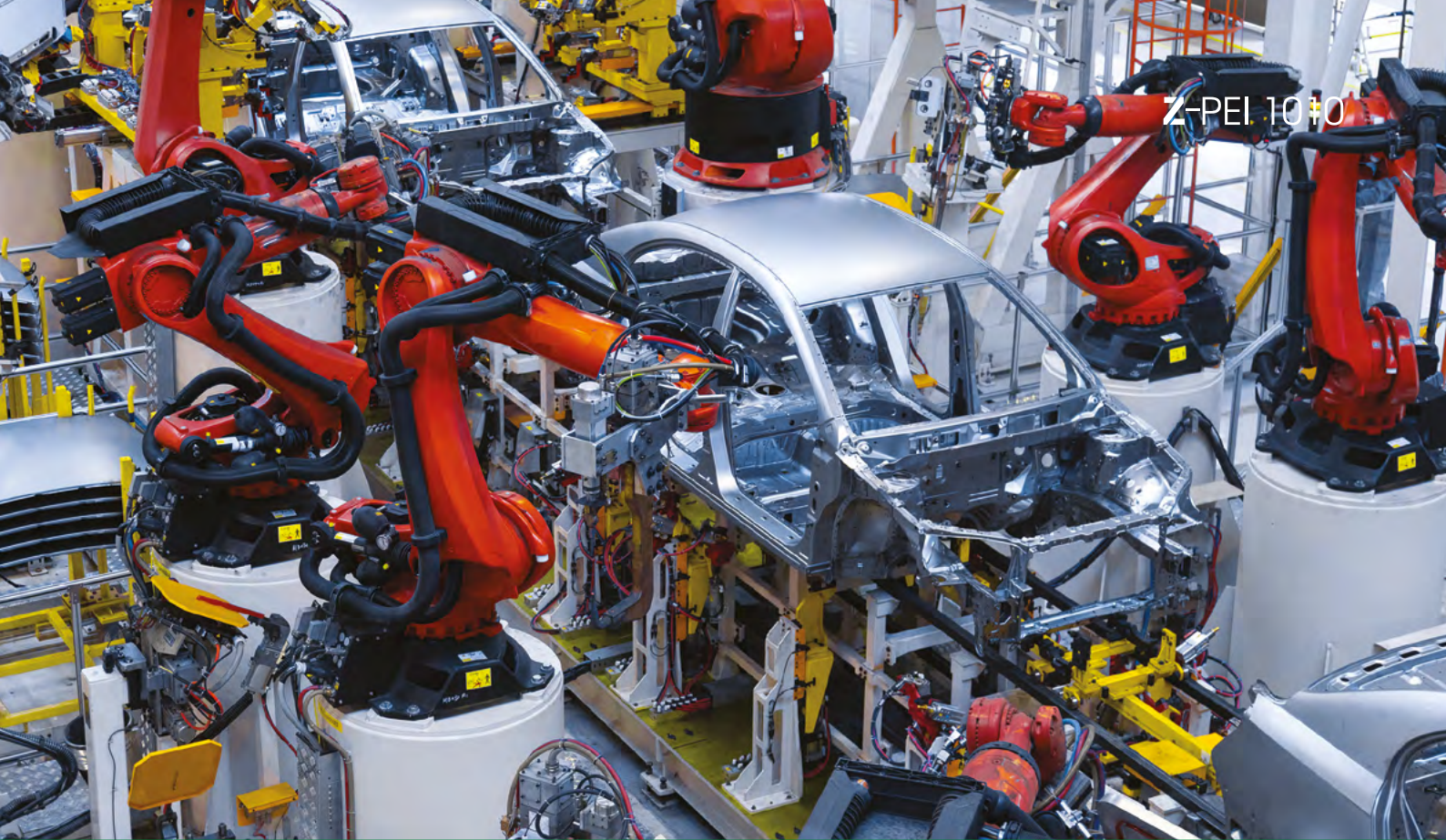
### MANUFACTURING EQUIPMENT

- End-use heavy-duty parts like throttle bodies since Z-PEI 1010 can withstand high levels of vibrations and mechanical stress.
- Manipulators and robotic arm frames, because this material has strength-to-weight ratio comparable to aluminium 6061.
- Components for metal-cleaning and degreasing machinery, as Z-PEI 1010 is resistant to halogenated hydrocarbons.

Z-PEI 1010 is one of the strongest high-temp polymers with strength-to-weight ratio comparable to aluminum 6061. This makes it perfect for heavy-duty parts like robotic arms.







## AUTOMOTIVE INDUSTRY

- Housings for machinery working in high temperatures and pressures like air compressor housings.
- Assembly jigs designed for operating with lubrication because Z-PEI 1010 is resistant to automotive fluids.
- Manufacturing fixtures since Z-PEI 1010 is one of the most dimensionally accurate materials among high-performance polymers.

### AUTOMOTIVE ASSEMBLY JIG

Z-PEI 1010 is one of the most dimensionally accurate materials among high-temp polymers. It can be used for 3D printing durable and very precise assembly jigs.



# Z-PEI 9085

An inherently flame-retardant high-performance polymer

Widely adopted in the aerospace industry for aircraft interiors

Airbus uses over 1000 parts 3D printed with PEI in each A350 XWB airliner.



Properties similar to aluminum 6061 with better strength-to-weight ratio

Very low FST (Flame, Smoke, Toxicity)

Great thermal stability

Great heat resistance (heat deflection temperature at 167 °C)

Resistant to automotive fluids and alcohols

## FLAME-RETARDANT FILAMENT

The material can be used for printing various parts like ductwork, electrical enclosures, or interior elements in aircraft and ground vehicles. It is also suitable for printing industrial components.

### Z-PEI 9085 AEROSPACE-GRADE FLAME-RETARDANT POLYMER

Z-PEI 9085 is a high-performance 3D printing filament made with a durable blend of polyetherimide commonly used in the aerospace sector. It has strength-to-weight ratio comparable to aluminum 6061 but with much better thermal shock resistance.

### F.A.R. 25.853 CERTIFICATE

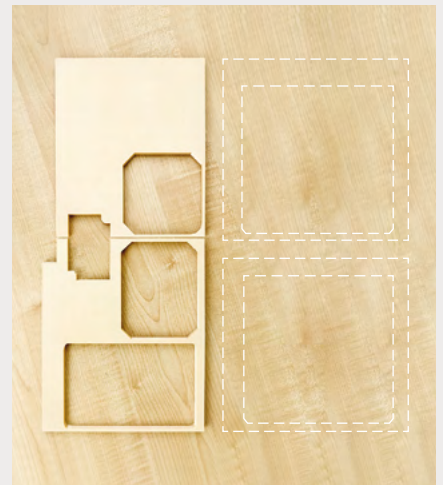
This certificate means that Z-PEI 9085 has very low FST (Flame/Smoke/Toxicity). The material does not release toxic fumes while burning which is particularly important in safety-critical closed spaces. Both NASA and ESA have also performed numerous outgassing tests with this blend of polyetherimide and qualified it for use onboard the International Space Station.

### UL94-V0 FLAMMABILITY RATING

The material has successfully passed tests to obtain a commercial UL94-V0 flammability rating which means it can be safely used in aircraft interiors. This certificate guarantees that a vertically oriented sample of Z-PEI 9085 has extinguished within 10 seconds from when fire had been applied to it.

### EXCELLENT STRENGTH-TO-WEIGHT RATIO

Polyetherimide used to make the Z-PEI 9085 filament has been proven to be strong enough for structural frames of nano satellites. The frame 3D printed with this material successfully passed demanding vibration, impact, and stress tests designed to simulate the launch onboard a rocket. It was also 46.77% lighter than an aluminum frame with the same geometry.



### COCKPIT PANELS

Flame-retardant panels for an airliner.

### GREAT THERMAL PERFORMANCE

Z-PEI 9085 can withstand high temperatures reaching 167 °C which makes its thermal performance on par with aluminum 6061. This means Z-PEI 9085 can be used to 3D print components working in direct contact with automotive engine blocks which typically operate at temperatures between 90 °C and 120 °C. Moreover, the material withstands rapid temperature changes much better than aluminum.

**AIR INTAKE MANIFOLD**

A turbo air intake manifold designed to work in contact with an engine block heating up to 120 °C.



**FLAME-RETARDANT AEROSPACE COMPONENTS**

Z-PEI 9085 has been tested in accordance with the stringent FAR 25.853 procedures.



**HEAT-RESISTANT**

The material's heat resistance is equal to aluminum 6061 which means Z-PEI 9085 retains its mechanical properties up to 167 °C.



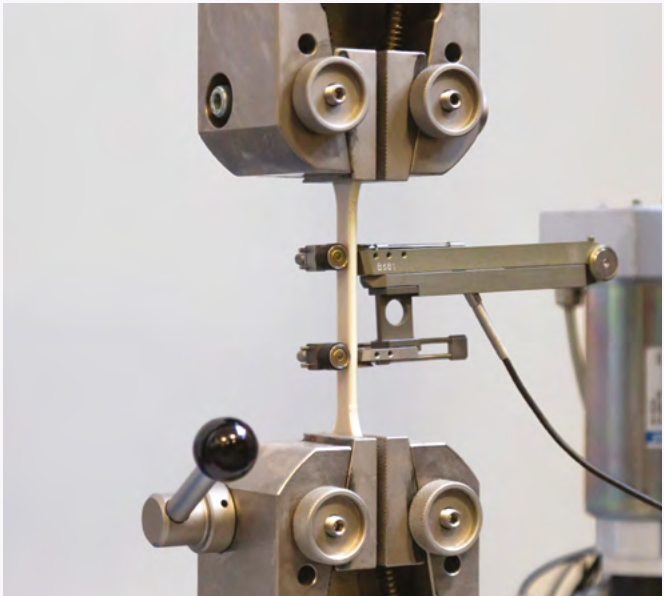
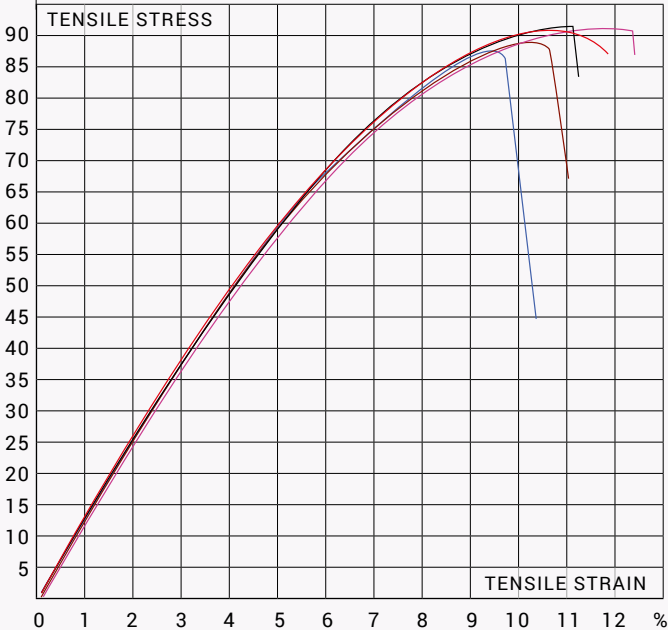
**AEROSPACE-GRADE**

Components exhibit properties comparable to their counterparts made with aluminum 6061.



**FIVE SAMPLES ARE MARKED WITH DIFFERENT COLORS**

All five samples have been 3D printed on the Zortrax Endureal out of Z-PEI 9085 and exhibited exceptional tensile strength values between 86.29 MPa to 90.23 MPa.



## Z-PEI 9085

### AIRBUS COCKPIT PANELS

End-use flame-retardant airliner cockpit panels 3D printed with Z-PEI 9085 on the Zortrax Endureal 3D printer.



## INDUSTRIES USING Z-PEI 9085

Excellent thermal and mechanical properties of Z-PEI 9085 makes the material perfect for heavy-duty applications. Aviation, space industry, and railroad are among fields where components 3D printed out of Z-PEI 9085 are already saving costs and keep the businesses running smoothly.

### AVIATION

- Ducting: Z-PEI 9085 can be used to make elements of ducting and ventilation systems working onboard airplanes.
- Seats: Z-PEI 9085 is suitable for printing spare parts for airplane seats like armrests.

- Typically, seats are serviced during the heavy maintenance procedure which in most airliners is done every 18 months.
- Cockpit panels: mechanical strength, flame-retardancy, and proven outgassing properties make Z-PEI 9085 an excellent material for printing cockpit panels.



Enclosure for a docking port for SPHERES robots operating onboard the ISS 3D printed with Z-PEI 9085 on the Zortrax Endureal 3D printer.

### RAILROAD

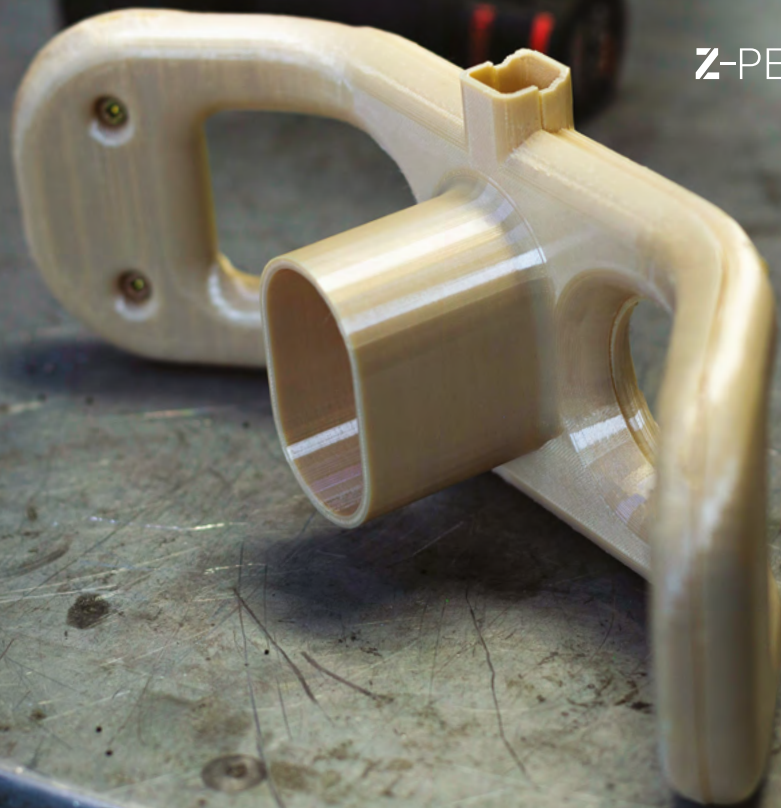
- Air ventilation systems: Z-PEI 9085 combined with a large build space in the Endureal can be used to print huge components for air ventilation systems in trains.
- Seat components: Armrests and handles are components that are often damaged on trains. Z-PEI 9085 can be used to 3D print the spare parts on an on-demand basis.

Grab handles for train seats 3D printed with Z-PEI 9085 on the Zortrax Endureal 3D printer.



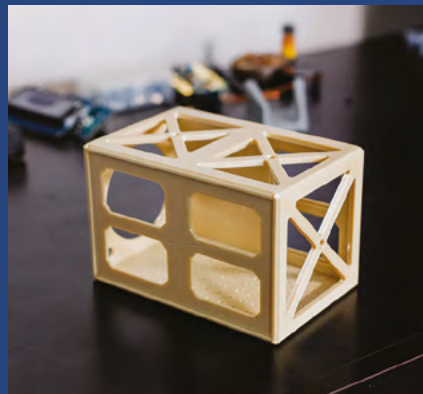


A 3D printed protective bumper for the SPHERES robot operating onboard the International Space Station.  
Photo source: NASA.



## SPACE

- ISS onboard equipment: Z-PEI 9085 is cleared for use onboard the ISS where it can serve to make casings and manipulators for various devices.
- CubeSat structural frames: Z-PEI 9085 is strong enough to replace aluminum as a materials for structural frames of satellites. Such 3D printed frame has already passed pre-launch tests.



Cubesats 3D printed with Z-PEI 9085 are strong enough to pass pre-flight qualification tests for the PSLV launch system.



Vibration-resistant cubesat frame 3D printed on the Zortrax Endureal with Z-PEI 9085.



# BASF ULTRAFUSE® 316L METALLIC POWDER FILAMENT



Contains 80% steel and 20% polymer

Works only with BASF Ultrafuse® Support Layer

Made for printing 316L stainless steel



3D printed parts made on the Endureal with BASF Ultrafuse® 316L become functional steel after BASF-developed post-processing stage.

## ZORTRAX FULL METAL PACKAGE 316L

Zortrax Full Metal Package 316L enables 3D printing 316L stainless steel parts using Zortrax Endureal 3D printer and a proprietary BASF post-processing technology.

### WORKING WITH REAL STEEL

Parts made on the Zortrax Endureal 3D printer with Zortrax Full Metal Package 316L behave like standard steel. They can be polished, sanded and welded.

### NO CORROSION

The 316L steel contains high percentage of chromium which, in contact with oxygen, creates a thin protective layer on the surface of parts that protects them from corrosion.

### AESTHETICALLY PLEASING

Stainless surgical steel is often used in decorative applications, especially after polishing. Parts 3D printed on the Zortrax Endureal with Zortrax Full Metal Package 316L can be post-processed to achieve same stunning looks.

### BASF METALLIC FILAMENT

Zortrax Full Metal Package 316L relies on the BASF Ultrafuse® 316L metallic powder filament which contains 80% of 316L steel metallic powder and 20% of a polymer binder. After appropriate post-processing, parts 3D printed with BASF Ultrafuse® 316L turn into real stainless steel.

### ACCURACY AND PRECISION

316L steel parts made on the Endureal 3D printer can be surprisingly small and precise.



Zortrax Full Metal Package 316L is a kit with everything needed to start making steel parts.



### CUSTOM PRECISION MECHANISMS

Metal parts printed in 3D can be used e.g. in precision mechanisms for highly specialized industry. Like in this model of a space-grade single dipole antenna unit made for the JUICE (Jupiter Icy Moons Explorer) mission by Astronika, a space industry manufacturer.

### FINISHING TOUCHES

Parts made with Zortrax Full Metal Package 316L can be sanded and polished like standard steel.



### ADVANCED GEOMETRIES

Metal 3D printing on the Zortrax Endureal makes it possible to build advanced, task-specific one-off parts.



### CORROSION RESISTANCE

The 316L steel has excellent resistance to corrosion which makes it a great choice for parts working in contact with salts or fluids.



The 316L stainless steel offers excellent resistance to corrosion but is relatively soft and would rather bend than break under critical load.

#### THIS TYPE OF STEEL IS USED FOR:

- Corrosion-resistant automotive parts
- Parts exposed to chemicals and liquids
- Decorative parts like trims and grills
- Hydraulic systems' components
- Food containers
- Medical equipment
- Corrosion-resistant precision mechanisms



### WELDING CAPABILITY

Parts 3D printed with the Zortrax Full Metal Package 316L and properly post-processed can be welded to build more advanced components.

# BASF ULTRAFUSE® 17-4 PH METALLIC POWDER FILAMENT



Contains precipitation hardened stainless steel

Exceptionally stiff and strong

Magnetic properties



17-4 PH steel is harder and stiffer than the 316L type but also slightly more brittle and prone to corrosion.

## ZORTRAX FULL METAL PACKAGE 17-4 PH

Zortrax Full Metal Package 17-4 PH enables 3D printing 17-4 PH hardened steel parts using Zortrax Endureal 3D printer and a proprietary BASF post-processing technology.

### HARD AND RIGID METAL

A precipitation hardening process makes the 17-4 PH steel particularly hard and strong but also limits its elongation at break. This type of steel would therefore rather break than bend under critical load.

### CORROSION RESISTANCE

The 17-4 PH type qualifies as stainless steel, although it contains less chromium and more carbon than 316L surgical grade which makes it slightly more prone to corrosion.

### REAL STEEL PROPERTIES

Steel parts made on the Zortrax Endureal 3D printer with Zortrax Full Metal Package 17-4 PH can be polished, sanded and welded. They have martensitic micro-structure which means they have magnetic properties.

### BASF METALLIC FILAMENT

Zortrax Full Metal Package 17-4 PH relies on the BASF Ultrafuse® 17-4 PH metallic powder filament which contains 80% of 17-4 PH steel metallic powder and 20% of a polymer binder. After appropriate post-processing, parts 3D printed with BASF Ultrafuse® 17-4 PH turn into real precipitation hardened steel.



### HIGH TENSILE STRENGTH

17-4 PH steel has exceptionally high tensile strength which makes it great for rotors and other components working under significant loads.



Zortrax Full Metal Package 17-4 PH is a kit with everything needed to start making steel parts.



## INDUSTRIAL HARDENED STEEL

Precipitation hardening process makes 17-4 PH steel work great in industrial wear-resistant components.



### HIGH STIFFNESS

17-4 PH steel works well in industrial brackets and positioning jigs due to its very high stiffness.



### COMPLEX SHAPES

Zortrax Full Metal Package 17-4 PH can be used to build precise complex and dimensionally accurate shapes.



### THREADING AND POLISHING

Components made with Zortrax Full Metal Package 17-4 PH can be polished, sanded, and threaded to achieve their target features.



17-4 PH steel is significantly stronger and harder than the 316L type. Its tensile strength reaches 1004 MPa, which is twice the strength of 316L steel and more than ten times than that of PEEK.

#### THIS TYPE OF STEEL IS USED FOR:

- Petroleum industry parts
- Paper processing machinery
- Aerospace parts
- Structural frames
- Turbine blades

### REPEATABLE RESULTS

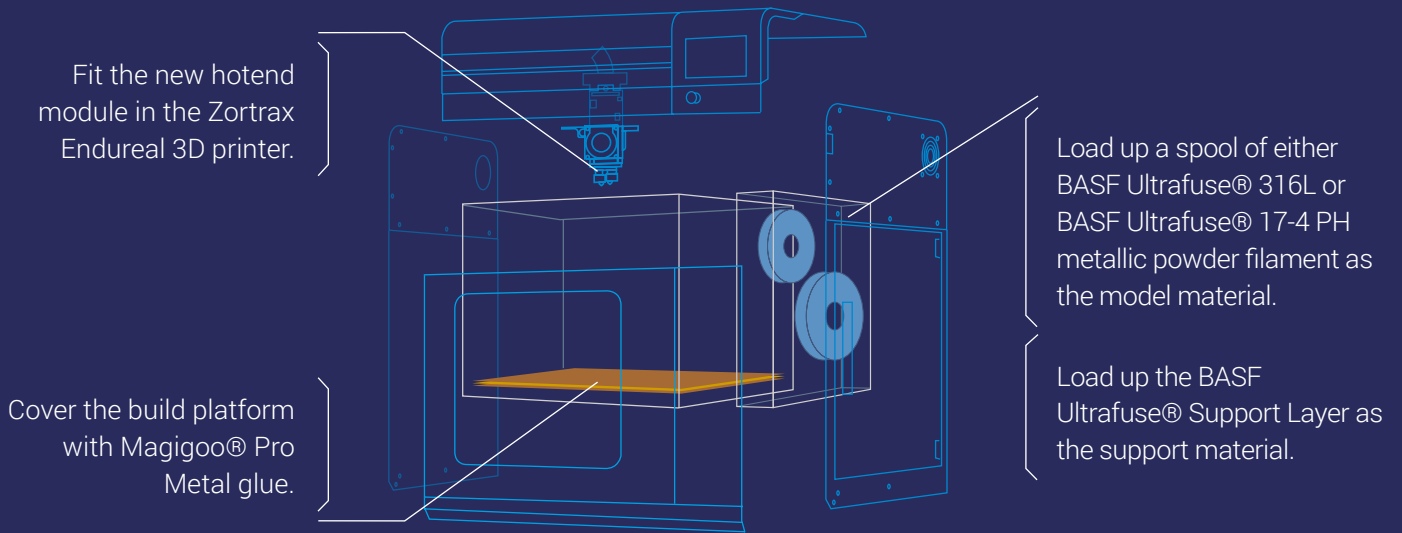
Using Zortrax Full Metal Package 17-4 PH is a controllable, predictable process which translates into high repeatability of results.



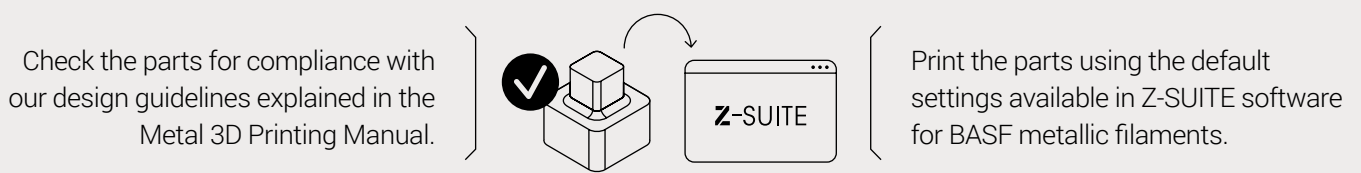
# HOW TO USE ZORTRAX FULL METAL PACKAGES

Using Zortrax Full Metal Packages is simple. Here's how it all works:

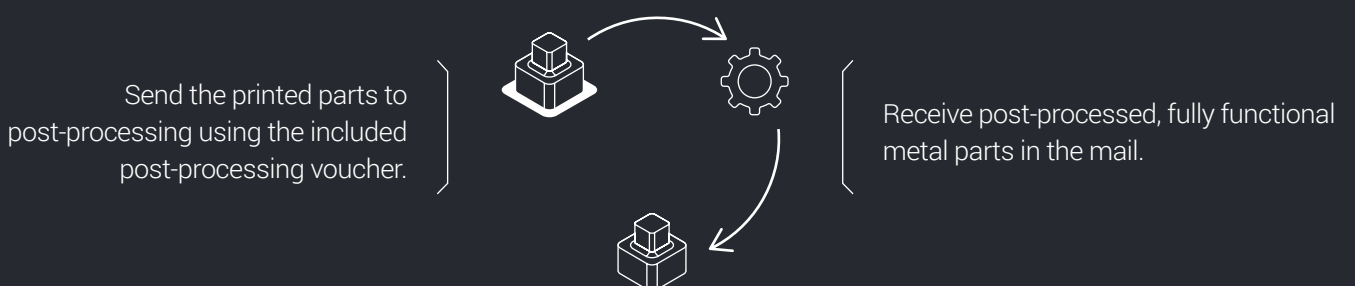
## STEP 1 PREPARE YOUR 3D PRINTER



## STEP 2 CHECK & PRINT YOUR MODELS



## STEP 3 POST-PROCESSING



# HOW 3D PRINTED PARTS TURN INTO METAL

Parts 3D printed on the Endureal using Zortrax Full Metal Packages turn into metal in an elaborate post-processing stage developed by BASF and performed by Elnik Systems GmbH.



## DEBINDING

At this stage the 20% of polymer binder present in the parts is separated from the metallic powder using high temperature and chemical treatment.



## SINTERING

At this stage the temperature is further increased to fuse the metallic powder together into a fully-functional metal part.

## THINGS TO REMEMBER

- Models sent to post-processing must conform to size limitations. Larger parts won't fit into Elnik Systems' furnaces.
- Using BASF Ultrafuse® Support Layer is mandatory to preserve the parts' geometry at the post-processing stage too - not just the 3D printing stage.
- Using Magigoo® Pro Metal glue is necessary to maintain proper build platform adhesion.
- Using a new hotend module supplied in the Zortrax Metal Package for metal 3D printing is highly recommended to prevent contamination of the printed parts which may lead to unsatisfactory results.



## MATERIAL COMPARISON

BASF Ultrafuse® 316L and BASF Ultrafuse® 17-4 PH are two available metallic powder filaments corresponding to two types of steel. Here's how they are different.

TYPE OF STEEL	CORROSION RESISTANCE	STRUCTURE	MECHANICAL PERFORMANCE
316L	High resistance	Austenitic	Medium hardness / high elongation
17-4 PH	Medium resistance	Martensitic	High hardness / low elongation

SCAN THIS QR CODE TO READ THE FULL METAL 3D PRINTING MANUAL:



[www.support.zortrax.com/full-metal-package](http://www.support.zortrax.com/full-metal-package)



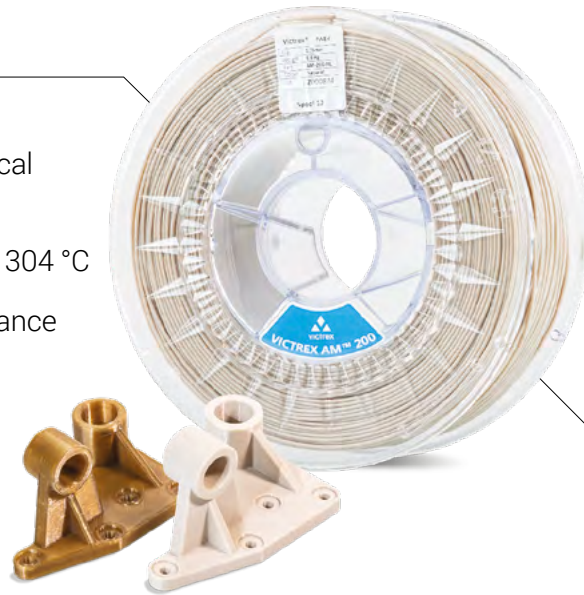
# VICTREX AM™ 200 FIL



Highly isotropic mechanical properties

Thermal resistance up to 304 °C

Excellent chemical resistance



VICTREX AM™ 200 has been designed for 3D printing from the ground-up. It is the most versatile, all-rounder high performance polymer on the market.

## VICTREX AM™ 200 HEAVY-DUTY POLYMER MADE FOR 3D PRINTING

VICTREX AM™ 200 is a high-performance PAEK polymer that has been designed for extrusion-based 3D printing from the ground up.

### HIGHLY ISOTROPIC

VICTREX AM™ 200 is a slow crystallizing material which means there is plenty of time for strong bonds to form between subsequent layers of a 3D printed model. In consequence the yield strength measured along the Z axis can exceed 60% of the strength measured along the X and Y axes in a 3D printed model. With PEEK filaments this value rarely tops 30%.

### VERY PRECISE

Because the VICTREX AM™ 200 was made specifically for extrusion-based 3D printers its properties are fine-tuned to limit warpage and shrinkage as much as possible. That's why it can be used to 3D print highly precise small parts without compromising mechanical strength nor thermal resistance.

### MECHANICALLY STRONG

Mechanical performance of VICTREX AM™ 200 is comparable to Z-PEEK which means it one of the strongest polymers in the world. It is slightly weaker along the X and Y axes than Z-PEEK but way stronger along the Z axis. Its tensile strength is as high as 70 MPa.

### THERMALLY STABLE

The VICTREX AM™ 200 has thermal properties comparable to Z-PEEK with slightly lower melting temperature of 304 °C and slightly higher glass transition temperature set at 156 °C. The parts printed with VICTREX AM™ 200 retain their mechanical properties in a wide range of temperatures.



### DIMENSIONAL ACCURACY

VICTREX AM™ 200 works great in 3D printing heavy-duty detailed parts with challenging geometries.

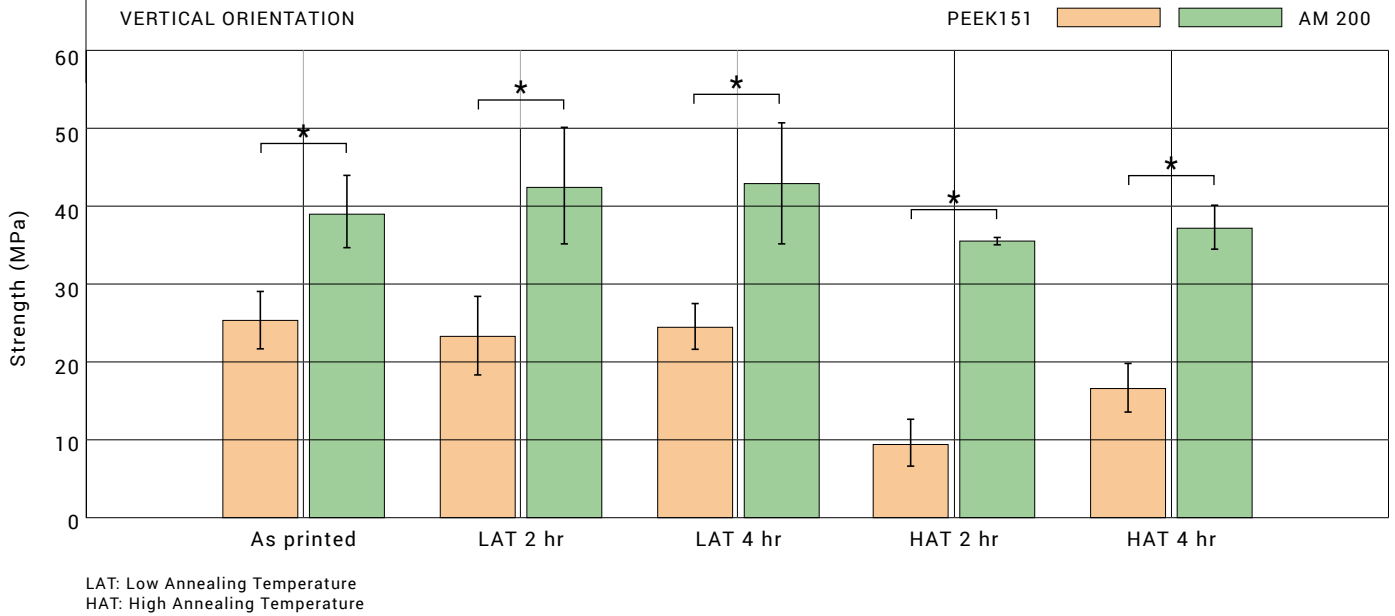


### Z AXIS STRENGTH

High isotropy of mechanical properties makes it possible to 3D print components exposed to forces acting from different directions.

## EXCEPTIONAL Z AXIS STRENGTH

VICTREX AM™ 200 can be used to achieve better isotropy of mechanical properties in 3D printed parts. Here's how its Z axis strength measured against PEEK in a Victrex study with various annealing times and temperatures.



## ADVANCED DESIGNS

Excellent mechanical properties, dimensional accuracy, and exceptional Z axis strength make VICTREX AM™ 200 a great choice for manufacturing parts designed with advanced mathematical methods like topology optimization..

## VICTREX AM™ 200 vs. Z-PEEK

There are multiple factors to take into account when choosing between the Z-PEEK and VICTREX AM™ 200.

- Z-PEEK is a more specialized material with outgassing certificates better XY strength and higher melting point.
- VICTREX AM™ 200 is a more versatile option with better chemical resistance, higher isotropy of mechanical properties. It is also easier to print, offering better repeatability and dimensional accuracy.



## THERMAL RESISTANCE

VICTREX AM™ 200 can endure over 300 °C and has high glass transition temperature.

## zortrax apoller

**BUILD VOLUME**  
300 x 250 x 250 mm  
11.8 x 9.8 x 9.8 in



## AUTOMATED POST-PROCESSING DEVICE

Zortrax Apoller is an innovative device developed around a proprietary Smart Vapor Smoothing (SVS) technology with the EU ATEX certification, which smoothes the surface of FDM prints. This effect is achieved through vaporization of solvents that react with the thermoplastic used for 3D printing. The Apoller is compatible with filaments based on ABS, HIPS, and ASA, regardless of the manufacturer.

### AUTOMATIC SMOOTHING PROCESS

The SVS technology revolves around automatic circulation of solvent vapors inside the chamber to post-process 3D printed items. Depending on the material of prints, the Apoller uses either pure acetone or pure butanone (MEK) during the procedure. Post-processing is fully automated and involves several stages, including solvent vaporization and condensation. Every stage is thoroughly managed in terms of temperature, pressure, and concentration of the solvent's vapors in the smoothing chamber. What users performed manually on their own can now be successfully substituted with the powerful capabilities of the machine.

### DESIGNED FOR SAFE OPERATION

The Apoller is a desktop device offering industrial class performance with technologically advanced features introduced in its design. Solvent processing, which leads to the smoothing effect, is fully secured in the double-sealed chamber to provide safe operation. The device thoroughly retains used solvent vapors as well as entirely controls pressure differences that are induced at the beginning of the process. In addition, smoothed models are ready to be taken out of the chamber only when the device has fully decontaminated the chamber.

### SMART MANAGEMENT

Each smoothing process takes place in a sequence of specially arranged cycles and lasts about three hours. During this period, the liquid solvent transitions into vapors, which are then atomized in the chamber, and finally distributed on models. Vapors circulate and partially cover the models placed in the chamber to ensure an equal smoothing effect that does not damage fragile and intricate details. For environmental and safety reasons, the solvent vapors are then effectively retracted and condensed. This way, the liquid can be regained and used for the next smoothing processes.

### EU ATEX CERTIFICATION

The Zortrax Apoller has a certificate of compliance with the EU ATEX directive. The machine has been designed to incorporate safety systems that would meet the highest standards for the electrical equipment working with explosive chemicals. Moreover, the production process has undergone precise examination and each used component has gone through quality control tests to prevent the risk of explosions and maximize the device's safety. Every unit, however, requires an annual inspection conducted by the Zortrax Authorized Service to keep the ATEX certification valid and ensure the continuation of safe performance.



# INDUSTRIAL POST-PROCESSING

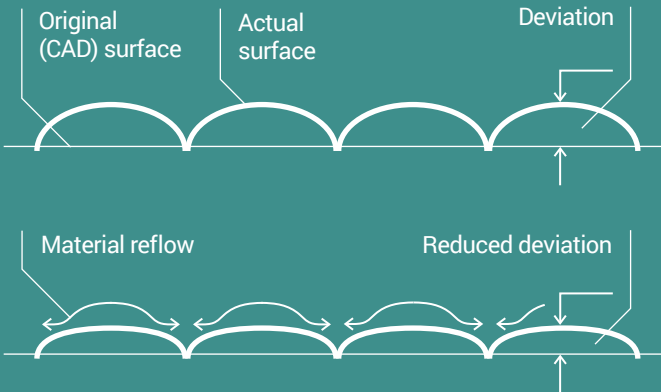
## COST-EFFICIENCY THROUGH AUTOMATION

Zortrax Apoller has been designed as a support device for additive manufacturing systems working in low to medium series production. In one 8-hour long working day, the Apoller can post-process models made on 6 polymer extrusion 3D printers with typical build volumes measuring 200 x 200 x 200 millimeters.

## INDUSTRIAL POST-PROCESSING WITH ZORTRAX APOLLER

With Zortrax Apoller, vapor-smoothing is a controlled, industrial process with high results repeatability and low sensitivity to human error. It is also faster and more cost-efficient than human labor. Here is a post-processing cost breakdown done for a series of 500 computer fan covers:

POST-PROCESSING METHOD	TOTAL TIME	COSTS
Human labor	54 hours	Cost of 54 man-hours dependent on average wages
Zortrax Apoller	6 hours	\$3 including costs of energy, acetone solvent, and amortization of the device



## REDUCING LABOR

Each post-processing session in Zortrax Apoller lasts 3 hours. In one go, the Apoller can smooth 256 computer fan covers. This is why the entire batch of 500 units can be smoothed within one working day. Because the process is mostly automated, there is no need for human supervision apart from taking the models in and out of the smoothing chamber.

## SUPERIOR SURFACE QUALITY

Surfaces with visible layering have always been a tell-tale sign that the component has been 3D printed. Now, with automated post-processing technology available in Zortrax Apoller, the quality of 3D printed models can be quickly and efficiently set on par with mass-produced, injection-molded products. All without compromising any of the versatility nor customization that come with manufacturing operations based on 3D printers.

## FLAWLESS CONSISTENCY



## ADVANCED GEOMETRIES



## VARIABLE SURFACE FINISH





# STUNNING LOOKS WITH SVS TECHNOLOGY



**TOURIST LAMP BEFORE & AFTER**

Tourist lamp is an end-use product where vapor-smoothing has been applied to achieve desired appearance.

## TECHNICAL SPECIFICATION OF ZORTRAX APOLLER

DEVICE	
Build volume	300 x 250 x 250 mm (11.8 x 9.8 x 9.8 in)
Connectivity	Wi-Fi, Ethernet, USB
Operating system	Android
Processor	Quad Core
Touchscreen	4" IPS 800 x 480
Solvent compatibility	Pure acetone or pure MEK only
Available materials	Z-ABS, Z-ASA Pro, Z-HIPS, Z-ULTRAT
External materials	ABS, ASA, HIPS

PROCESS	
Maximum working temperature	90 °C (194 °F)
Minimum working temperature	- 20 °C (-4 °F)
Minimum gauge working pressure	- 0.6 bar
Ambient operation temperature	15-30 °C (59-86 °F)
Storage temperature	0-35 °C (32-95 °F)

ELECTRICAL	
AC Input	110 V ~ 13.6 A 50/60 Hz; 240 V ~ 6.3 A 50/60 Hz
Power supply parameters	24 V DC @ 21 A, 500 W
Maximum power consumption	1500 W

IN THE BOX	
Device, Starter Kit	



## COMPATIBLE MATERIALS

This table specifies Zortrax Materials that are prone to the smoothing process in the Zortrax Apoller, compatible solvents, and final effect of the surface finish.

	ACETONE	MEK
<b>Z-ABS</b>	Glossy finish, layers on vertical surfaces are invisible	Glossy finish, layers on vertical surfaces are invisible
<b>Z-ASA Pro</b>	Semi-matte finish, layers on vertical surfaces are invisible	Semi-matte finish, layers on vertical surfaces are invisible
<b>Z-HIPS</b>	No reaction	Glossy finish, layers on vertical surfaces are invisible
<b>Z-ULTRAT</b>	Glossy finish, layers on vertical surfaces are invisible	Glossy finish, layers on vertical surfaces are invisible

## RAMPING UP MASS PRODUCTION

A Zortrax modular additive manufacturing system can be configured to cost-efficiently produce

600 lamps  
HIGHLY-CUSTOMIZED  
per month.

This capability can be achieved with no costs for retooling and minimal investment in storage, compared to traditional manufacturing technologies.

## PRODUCING END-USE LAMPS

There are a few defining features of manufacturing systems built for fabricating end-use, customizable lamps.

- Relatively high production output is needed.
- Quality on par with injection-molding has to be maintained consistently.
- Products need to be customized on a per-unit basis.
- Low maintenance costs have to be kept.
- The system has to have low running costs.



\$1 per component  
under \$10 per final product

Investment:  
30x Zortrax M200 Plus 3D printers,  
3x Zortrax Apoller SVS devices  
Monthly output:  
600 units



### SUGGESTED SYSTEM CONFIGURATION

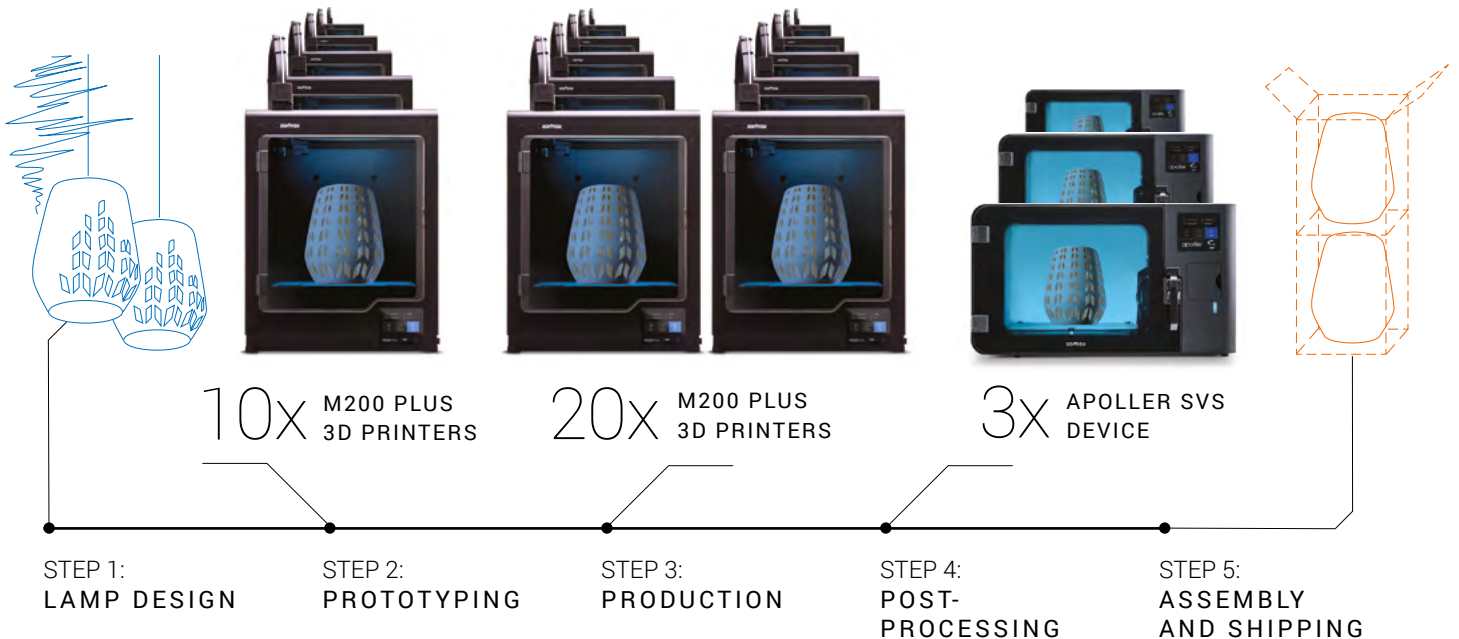
An example of Zortrax industrial system configured to meet these requirements consists of:

#### THIRTY ZORTRAX M200 PLUS 3D PRINTERS

The M Plus Series has been designed to offer high quality of prints, low maintenance and running costs, and industrial-grade reliability. Ethernet and Wi-Fi connectivity means that the entire 3D printing farm can be managed remotely.

#### THREE ZORTRAX APOLLER SVS POST-PROCESSING DEVICES

Zortrax Apoller SVS devices ensure that repeatable, high-quality vapor-smoothing can be performed on a daily basis. The process is mostly automated which brings the labor costs down. The Apoller meets the requirements specified in the EU ATEX directive which means it can be safely used in office spaces.



The idea for a new lamp originates internally or from the customer input.

All components for newly designed lamps are fabricated in a prototyping cluster of 10 M200 Plus 3D printers.

If everything works fine in a new lamp, the design is manufactured using a production cluster of 20 M200 Plus 3D printers.

Manufactured components are post-processed in 3 Apoller devices working in a post-processing cluster to achieve smooth surfaces and quality finish.

Post-processed components are assembled into end-use lamps and shipped to customers.



## SUPPORTING ASSEMBLY LINES

Zortrax 3D printing systems can be configured in a setup efficiently supporting traditional assembly lines in large factories. Based on experience of Toyota and Bosch, our key industrial customers, we propose an additive manufacturing system for a large factory.

### DIVERSITY OVER VOLUME

Building a 3D printing system for an assembly line has to be done with key requirements in mind.

- There is a wide spectrum of thermal and mechanical standards the 3D printed parts have to meet.
- Fabricating jigs and fixtures at a factory is more about diversity and flexibility than volume.
- System-wise cost-efficiency has to be achieved in both standard and high-performance components.

### SUGGESTED SYSTEM CONFIGURATION

With all these requirements in mind, we have configured an example 3D printing system designed to support large factories.



**ZORTRAX M300 DUAL**

The M300 Dual is a dual-extrusion machine with large build-space capable of fabricating geometrically advanced jigs and fixtures intended for use in less challenging environments.



**TWO ZORTRAX M300 PLUS**

The M300 Plus machines are made for cost-efficient fabrication of less geometrically advanced tools and spare parts.



**ZORTRAX ENDUREAL**

The Endureal has been made for fabricating high-performance components out of durable and chemically resistant PEI and PEEK-based polymers or metallic powder filaments.



**ZORTRAX APOLLER**

The Apoller SVS post-processing device can vapor-smooth components intended for use with oils and greases as the process performed in the Apoller reduces permeability of surfaces.

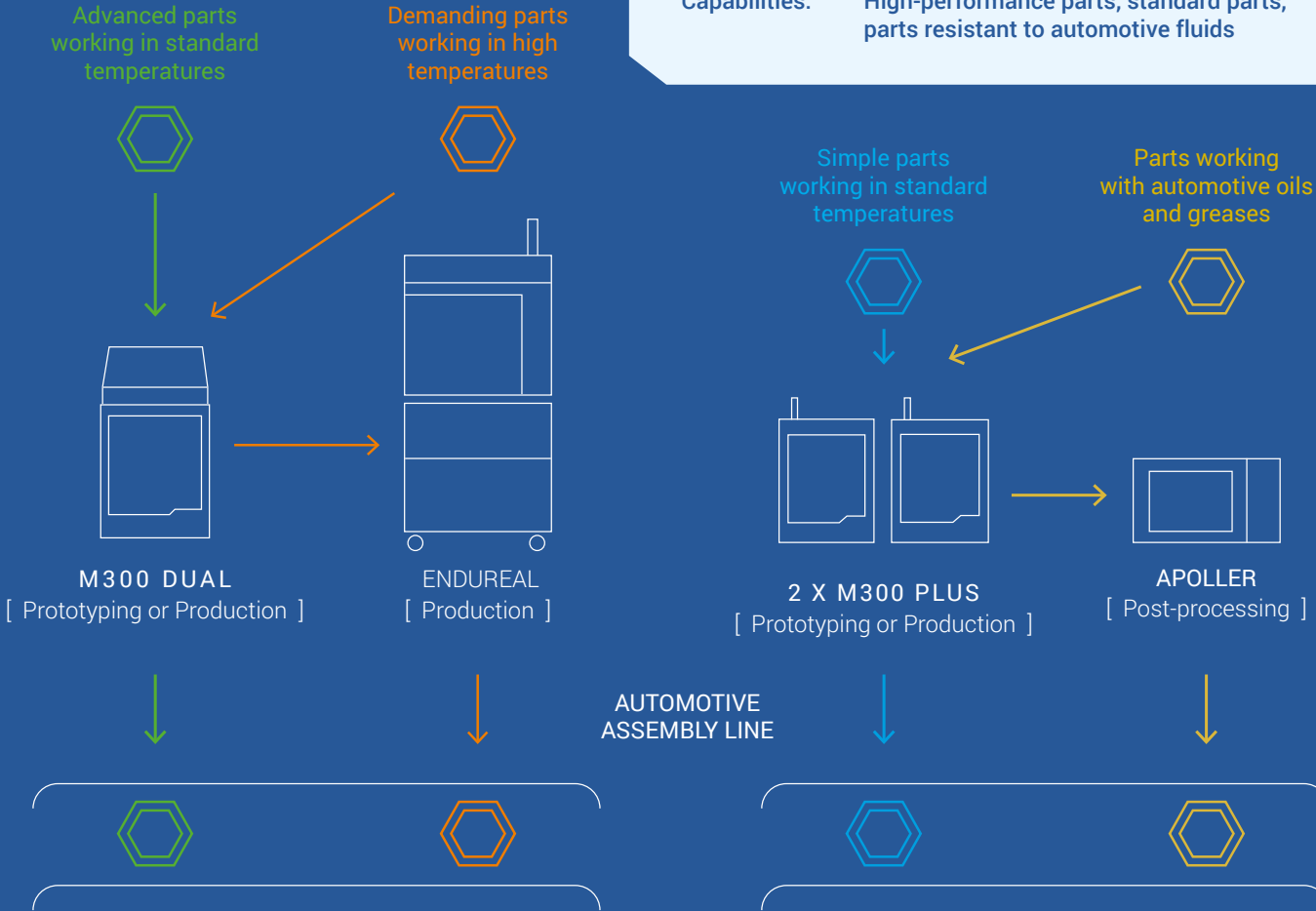


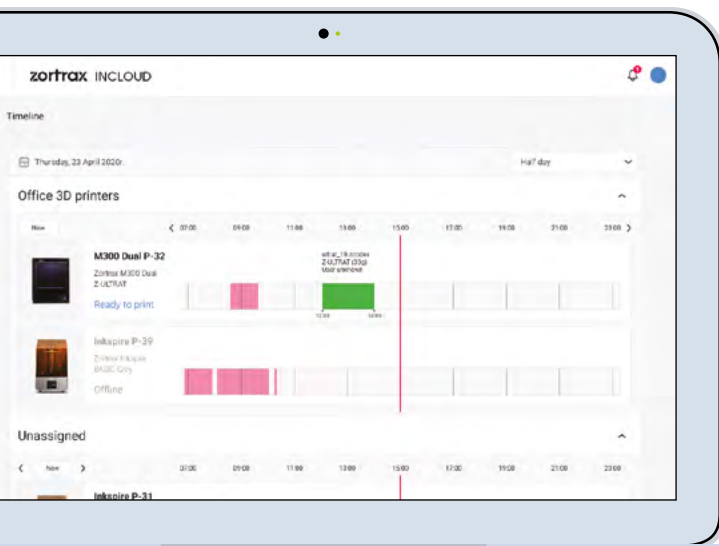
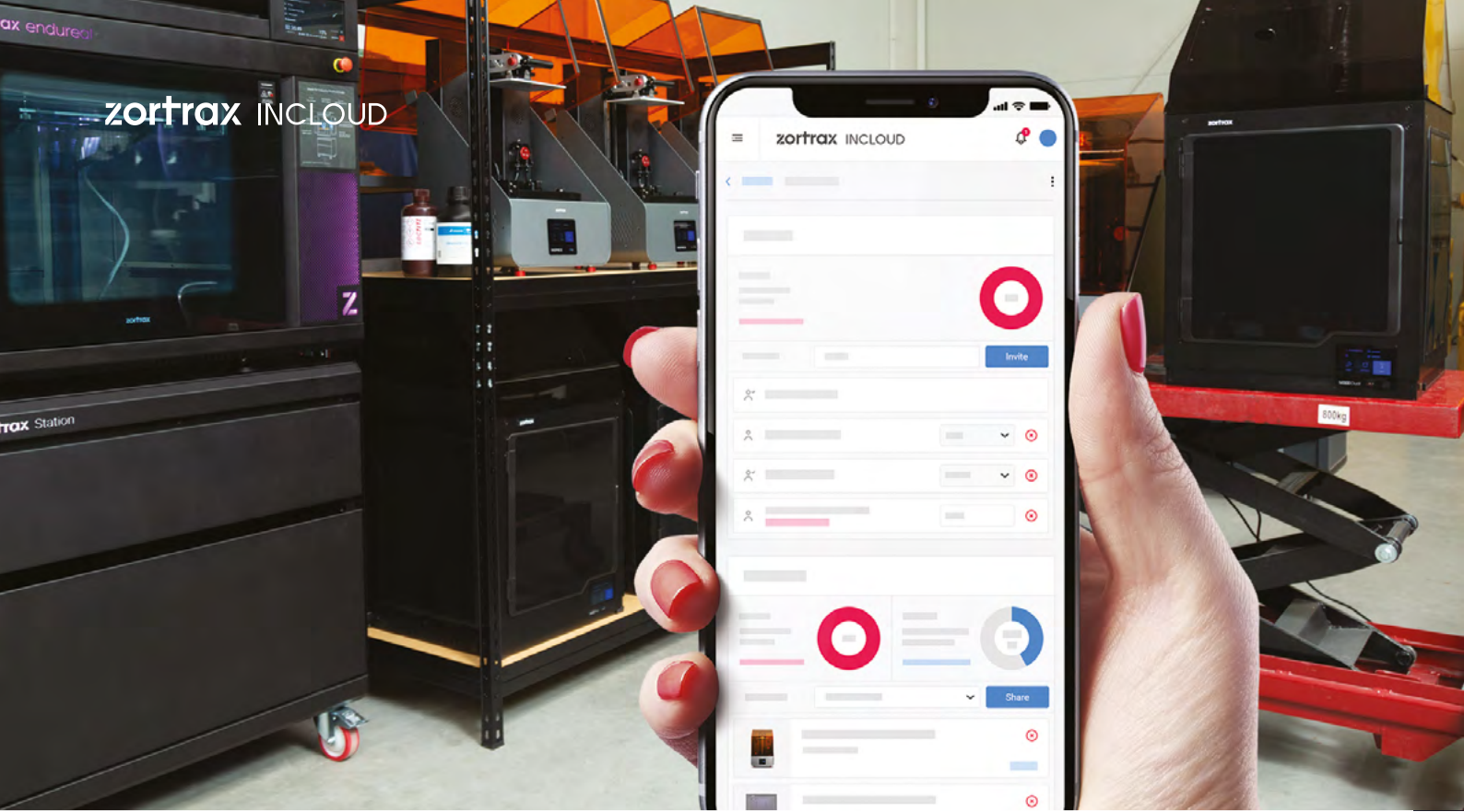
# 3D PRINTING AT A LARGE FACTORY

All 3D printers working in the system can be controlled remotely through the Zortrax inCloud service with an Enterprise subscription plan. They can also be used jointly to optimize costs. Here is how the system is arranged.

### COST BREAKDOWN:

Manufacturing process:	3D printing with automated post-processing when necessary
Cost per component:	\$1-3 for standard components, \$15-40 for high-performance components
Investment:	1x Zortrax Endureal, 1x Zortrax Apoller, 1x Zortrax M300 Dual, 2x Zortrax M300 Plus, Zortrax inCloud Enterprise subscription
Capabilities:	High-performance parts, standard parts, parts resistant to automotive fluids





## CLOUD-BASED MANAGEMENT

Zortrax 3D printers with network connectivity can be managed remotely through the Zortrax inCloud service.

### MANAGING RESOURCES

Zortrax inCloud enables adding multiple devices and users to the company's account. People can then be divided down into different teams. Finally, available 3D printers can be assigned to each team. This way it is possible to make sure that everybody in an organization has instant access to the right equipment for the job.

### INSTANT PRINTING

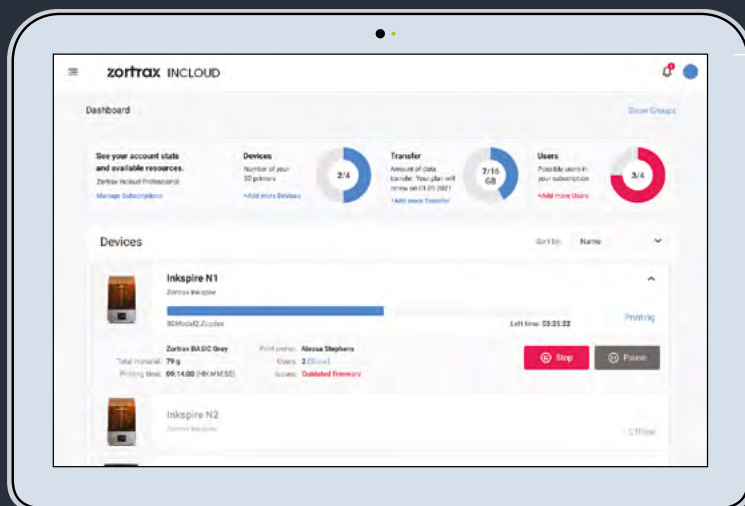
Multiprint option is a feature aimed at businesses looking for large production capacity. With just a few clicks, 3D printing a chosen model can be quickly initiated on all available 3D printers. Production can be therefore started immediately after the design is accepted by all the stakeholders.

### ACCESSIBLE DATA

All the information on how the 3D printers at the organization have been used and by whom is stored and organized neatly in the „Timeline“ panel. It is possible to quickly check when each of the printers worked, for how long, with what materials, and whether they completed the assigned prints.

### PRIVACY PROTECTION

The communication between users, Zortrax servers, and 3D printers is encrypted. Moreover, Zortrax do not store nor has access to the models sent through the inCloud service. Models are present on the servers only for the duration of transferring them to the printers. Once this is done, they are deleted automatically. This is particularly important for businesses with valuable intellectual property.



**DASHBOARD**  
All inCloud features can be easily accessed from the Dashboard screen.

**REMOTE MANAGEMENT**

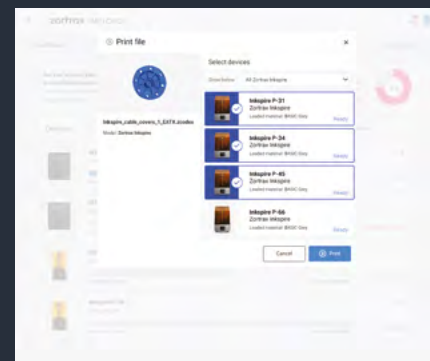
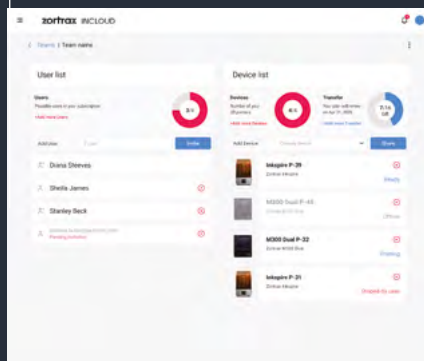
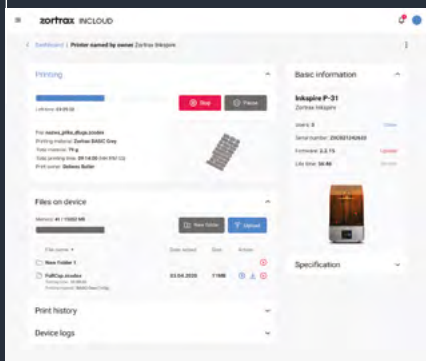
Every Zortrax 3D printer connected to the inCloud account can be managed remotely.

**BUILDING TEAMS**

Staff added to the inCloud account can be organized into teams assigned to different projects.

**INSTANT MULTIPRINT**

A single file can be instantly printed with multiple 3D printers added to the inCloud account.









# zortrax

A Zortrax-certified consultant or Authorized Reseller can help you set up an additive manufacturing system tailored to your needs and provide you with an individual offer.

[www.zortrax.com](http://www.zortrax.com)

[sales@zortrax.com](mailto:sales@zortrax.com)

Phone: +48 89 672 40 01





# zortrax

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