

# ROBOZE PEEK 3D PRINTING

METAL REPLACEMENT  
UPGRADING GLOBAL  
ADDITIVE  
MANUFACTURING



ROBOZE TECHNICAL AREA



# METAL REPLACEMENT UPGRADING GLOBAL ADDITIVE MANUFACTURING

## Industry Overview

As we embark to the journey of digitizing manufacturing with diverse of 3d printing technologies, there is a need to examine how would that be possible,

In which industries and for which applications. The most important requirement to make this possible is to have the ability to product 3d metal replacement parts.

Since the early 90s, PEEK was available for these type of purposes but not in 3d printing. Until now.



## Needs



MATERIALS



DESIGN FREEDOM



ACCURACY



SAVING MONEY



REDUCING WASTE

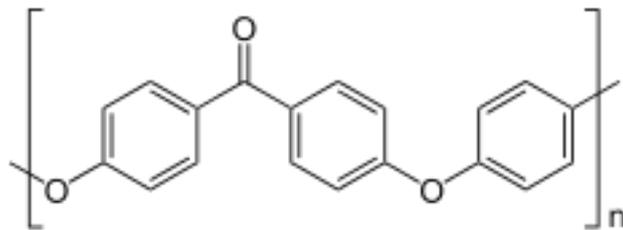
# METAL REPLACEMENT UPGRADING GLOBAL ADDITIVE MANUFACTURING

## What is PEEK?

PEEK (Polyaryletheretherketone) is known as one of the highest performing semi-crystalline thermoplastics available today.

It comes from a family of materials that are semi-crystalline, high purity polymers comprising of repeating monomers of two ether groups and a ketone group.

It is characterized mostly by excellent mechanical properties maintained to high temperatures.



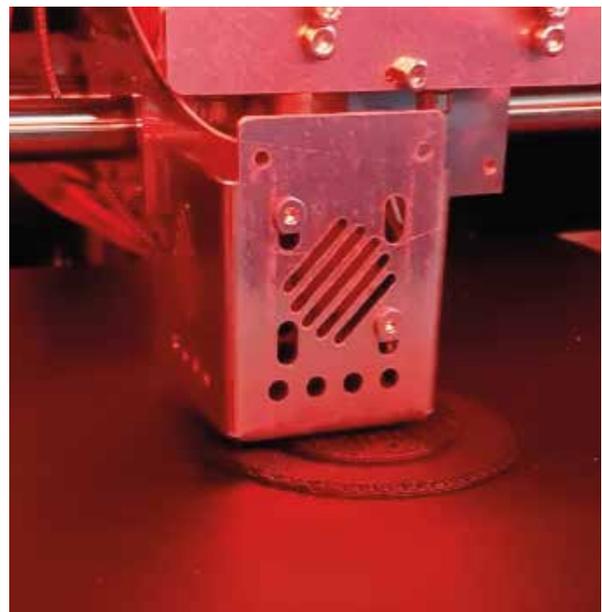
## 3D Printing PEEK

Thanks to his unique properties, using PEEK on a 3d printer is very challenging.

Roboze managed to enable this material on the company's industrial 3d printer.

The Roboze One+400.

A tailor-made material, in a standard spool, and breaking through extrusion technology in high temperatures, made this possible.



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## What is it good for?

PEEK is a rigid opaque material with a unique combination of properties, which include: exceptional chemical, wear, electrical and temperature resistance.

This linear aromatic polymer is semi-crystalline and is widely regarded as the highest performance thermoplastic material currently available.

PEEK™ polymer is widely regarded as a material with superb chemical resistance.

## Main Applications

PEEK polymer is used typically as a replacement for machined metals in a wide variety of high performance end-use applications.

These range in diversity from components for:

### *Motorsport*

It is often used to substitute metal in gears, seals and supporting rings in various motorsport applications. The use of PEEK facilitates weight reduction, lower fuel consumption, lower CO2 emissions, and reductions in noise, vibration and harshness.



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## *Aeronautics*

PEEK polymers may successfully replace metals such as aluminum, titanium, magnesium, brass, corrosion-resistant (CRES) or stainless steel and specialty alloys because it offers a unique combination of mechanical, thermal and tribological properties, combined with excellent chemical resistance and electrical performance, for use in aircraft components including wing, engine and fuel systems.



## *Oil&Gas*

PEEK solutions replacing metals to improve component lifetime in hot, highly-corrosive environments and extend operating cycles by reducing dependency on lubricants.



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## *Jigs & Fixtures*

With the possibility to produce custom parts in a short time, Roboze PEEK optimize economically the production and ensure conformity and interchangeability across the production cycles.

With flexibility and ability to internally produce own tooling and jigs, each manufacturing enterprise can adapt its processing cycles to ever-changing market. Roboze 3D printing technology substantially decrease lead time, offering a powerful solution to digitize manufacturing.



## *Other Applications*

The exclusive PEEK properties make this material suitable for a wide range of applications:

- Automotive
- Aerospace
- Defense

As the demand grows, more applications are likely to come up in the near future.

# PEEK - Properties Focus

PEEK is a high strength alternative to fluoropolymers with an upper continuous-use temperature of 250°C (480°F). PEEK exhibits excellent mechanical and thermal properties, chemical inertness, creep resistance at high temperatures, low flammability, hydrolysis resistance, and radiation resistance.

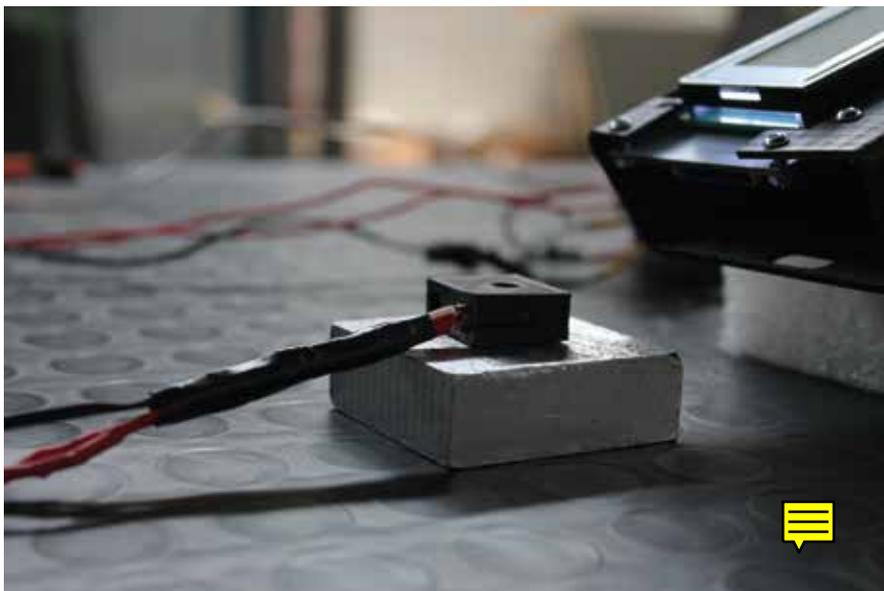
These properties make PEEK a preferred product in the aircraft, automotive, semiconductor, and chemical processing industries. PEEK is used for wear and load bearing applications, such as, valve seats, pump gears, and compressor valve plates.

## *Thermal properties*

PEEK is considered between best polymers for Thermal properties. PEEK has a glass transition temperature of around 143 °C (289 °F) and melts around 343 °C (662 °F).

Some grades have a useful operating temperature of up to 250 °C (482 °F).

Excellent mechanical properties even with high temperature:  
Tensile strength around 70MPa on printed parts and HDT around 150°C with a load of 1.82MPa



# PEEK - PROPERTIES FOCUS

## Mechanical Properties

The main features are:

- high mechanical strength, stiffness and hardness
- excellent abrasion and wear resistance
- good balance between stiffness, strength and toughness
- low coefficient of linear expansion

MECHANICAL PROPERTIES		Test Method	BUILD ORIENTATION		INFILL DENSITY
			XZ	XY	
TENSILE	Tensile Strength, Ultimate	ASTM D638	75 MPa	78 MPa	75%
	Tensile Modulus	ASTM D638	3.3 GPa	3.3 GPa	
FLEXURAL	Flexural Strength	ASTM D790	110 MPa	110MPa	75%
	Flexural Modulus	ASTM D790	3.1 GPa	3.1 GPa	

## Chemical Properties

Please check on the Appendix at the end of the white paper

# HVP ROBOZE EXTRUDER

*Patent Pending*



The HVP Roboze Extruder ( High Viscosity Polymers) developed and produced by Roboze represents an engineering jewel coming from knowledge and skills of Roboze R&D department and CNC machines capabilities of Roboze Facility.

The HVP Roboze Extruder presents a tightening in the internal channel of extrusion which accelerates the speed of high viscosity polymers during the extrusion process , that together with the right temperature, decrease its viscosity and control the die-swelling phenomenon, increasing the printing speed of such polymers like PEEK.

The result is a print quality of engineering plastics, such as PEEK, absolutely unrivaled, with an impressive detail and incredible mechanical properties.

# APPENDIX

## *PEEK chemical properties*

Focus on the PEEK chemical resistance to the most interesting solvents

### Table Codes

**HR** - High Resistant

**LR** - Low Resistance

**NR** - Not Recommended

Chemical	Resistance	
	30°C	100°C
Acetaldehyde	NR	HR
Acetone	HR	HR
Acetylene	HR	HR
Acetyl salicylic acid	-	-
Acid fumes	HR	HR
Alcohols	HR	HR
Aliphatic esters	HR	HR
Alkyl chlorides	-	-
Ammonia, aqueous	HR	HR
Aromatic solvents	HR	HR
Benzene	HR	HR
Carbonic acid	HR	HR
Caustic soda & potash	HR	HR
Chlorobenzene	HR	HR
Copper salts (most)	HR	HR
Cyclohexane	HR	HR
Detergents, synthetic	HR	HR
Esters	-	-

# APPENDIX

## PEEK chemical properties

Chemical	Resistance	
	30°C	100°C
Ether	HR	HR
Ferric chloride	HR	HR
Ferrous sulphate	HR	HR
Formaldehyde (40%)	HR	HR
Glycol, ethylene	HR	HR
Iso-butyl-acetate	-	-
Mercury	HR	HR
Methanol	HR	HR
Methylene chloride	-	-
Moist air	HR	HR
Napthalene	HR	HR
Nickel salts	HR	HR
Oils, diesel	HR	HR
Oils, lubricating + aromatic additives	HR	HR
Oils, mineral	HR	HR
Oils, vegetable and animal	HR	HR
Phosphoric acid (95%)	HR	HR
Sea water	HR	HR
Silicone fluids	HR	HR
Silver nitrate	HR	HR
Sodium carbonate	HR	HR
Sulphates (Na, K, Mg, Ca)	HR	HR
Sulphites	HR	HR
Sulphuric acid (70%)	HR	HR
Sulphuric acid (95%)	NR	NR
Urea (30%)	HR	HR
Water, distilled	HR	HR

Want to discover how Roboze solutions could help your work?

# LET'S MOVE ON

## CONTACT US

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