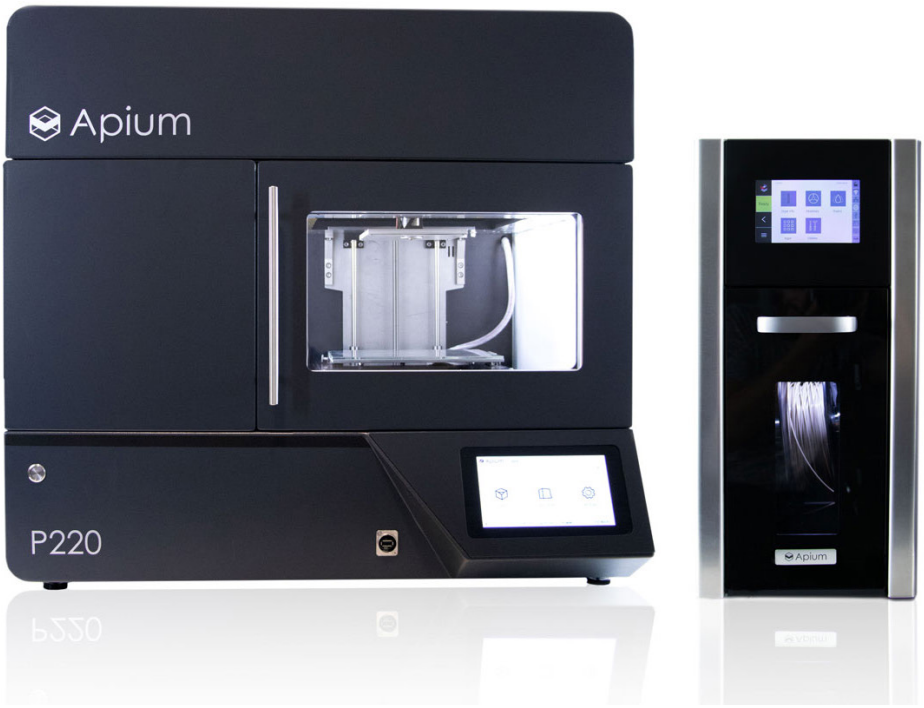
Apium
Additive Technologies GmbH

HIGH PERFORMANCE POLYMERS AND METAL

3D PRINTING SOLUTIONS

Apium P220 Series

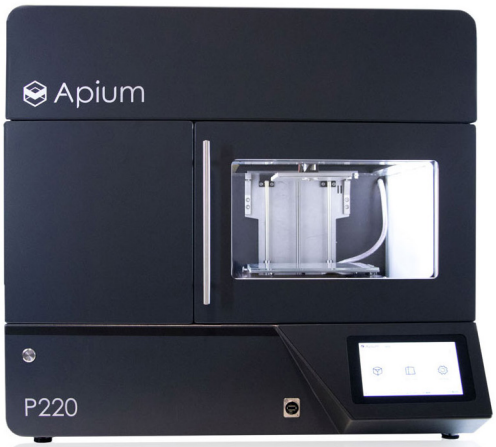


High Performance Polymers and Metal 3D Printing

Apium P220 Series

Best-in-class FFF Technology

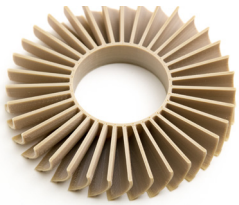
Apium P220 Series 3D Printers are equipped with the latest generation of FFF 3D printing technology. This latest generation offers higher speeds, accuracy, design freedom, material options and agility. Apium P220 Series 3D Printers build high quality functional prototypes, custom and small series production parts.



Apium P220 Series 3D Printer

Efficiency and High Reproducibility

The optimized material profiles (printing parameters individually developed for each material) enable the highest quality processing of high performance polymers with high reproducibility and reduce fabrication costs by more than 30%.


PEEK


PEEK CF30

Easy to set-up

Apium P220 Series 3D Printers are specially designed as professional 3D printing solution. You can install an Apium P220 3D Printer comfortably in any well ventilated room.


PEI ULTEM™


316 L

Easy to maintain

Apium P220 Series 3D Printers are operated with integrated Apium Control Software, which enables many self maintenance and service functions for the end-users with a user-friendly interface. This prevents the misuse of the machines and provide guidance for machine maintenance.

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High Performance Polymers and Metal 3D Printing

Apium P220 Series

Adaptive Heating System

Patent pending intelligent thermal moderator technology for specific material characteristics to achieve the best temperature distribution possible in the part. Adaptive Heating System shortens the machine set up time, improves the layer adhesion and eliminates the need for annealing for semi-crystalline materials.

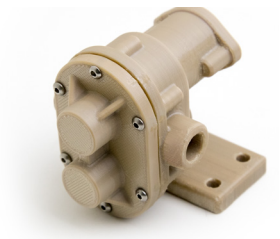
Apium Advanced Extruder

Apium`s 3D printers are equipped with next generation Bowden Extruders, Apium Advanced Extruder technology, to process higher filled and hard polymers. Apium`s Advanced Extruder Technology provides faster printing speeds, higher accuracy and precision.

Apium Control Software

Apium P220 Series 3D Printers are operated with Apium Control Software (CS). Apium CS ensures the reliability, safety and easiness of the printing process and offers innovative safety, service and maintenance functions for advanced customer experience.

TECHNICAL SPECIFICATIONS			
Build Envelope (X,Y,Z)	205 mm x 155 mm x 150 mm		
System Size and Weight	850 mm x 685 mm x 675 mm, 65 kg		
x/y Resolution	Product Resolution: 0.5 mm* Machine Resolution: 0.0125 mm		
z Resolution	Product Resolution: 0.1 mm Machine Resolution: 0.05 mm		
Reproducibility	0.1 mm		
Minimum Layer Thickness	0.1 mm	Maximum Layer Thickness	0.3 mm*
Minimum Wall Thickness	0.5 mm*		
Number of Extruders	1	Type of Extruder	Bowden extruder
Nozzle Diameter	0.2 mm, 0.4 mm	Filament Diameter	1.75 mm
Apium Adaptive Heating System	up to 180°C	Full Metal Hot End	up to 540°C
Print Bed	up to 160°C	Print Bed Material	Glas
Power Consumption	max 0.700 kW	Noise Emission	<70 dB(A)
Materials	PEEK, PEEK CF30, PEI ULTEM™, PP, Smart ABS, 17-4PH, 316L and open system for other high performance materials		
Compatible with	Windows/ Mac/Linux	Connection	WLAN, Ethernet
Regulatory Compliance	CE		



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*Dependent on the nozzle diameter

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High Performance Polymers

Apium Filament Dryer

Extrusion Quality

Molten dry filament will not exhibit bubbles, which cause poor optical properties and melt path discontinuity.

Oozing and Stringing

3D printed parts from dried materials typically show little or no oozing and stringing.

Interlayer Adhesion

Dry filament usage will avoid hydrolysis, which deteriorates mechanical properties of polymers and can lead to delamination during printing.

Mechanical Properties

3D printed parts from dried filaments exhibit stronger mechanical properties and less structural failures.

Cosmetic Defects

Dry filament usage eliminates a number of moisture-related 3D printing defects such as uneven surfaces and blister effects.

High Performance Polymers

Apium Filament Dryer

Air Filtering

HEPA and active carbon air filter reduce the exhausting fumes and small particles. An open door sensor and overheating protection ensures security for the user.

Thermally Insulated Walls

Thermally insulated walls reduce heat loss inside the drying chamber and guarantee process stability.

Filament Feeding Automation

Feed your filament directly to your 3D printer via teflon tube. This ensures that the filament does not get exposed of atmosphere while drying and printing.

Open System

Apium Filament Dryers are compatible with most open Material Extrusion (FFF) 3D Printers and filaments up to a diameter of 3 mm. Software Updates are free and easy to install.

TECHNICAL SPECIFICATIONS			
Supported Spool Size	Diameter: 200 mm Width: 80 mm		
System Size and Weight	24 cm x 43 cm x 49 cm, 18 kg		
Temperature Range	Min Temp. 40°C Max Temp. 80°C		
Sensors	Temperature Humidity Air Pressure		
Air Filtering	HEPA & Active Carbon Filters		
Door Safety Switch	Yes	Overheating Protection	Yes
Operating Ambient Temperature	15 - 35 °C, 10 - 90 % RH		
Material and Machine Compatibility	All Apium Filaments and Apium P220 Series Custom Filaments and Custom FFF 3D Printers: • Chamber Temperature Range: 40 - 80 °C • Max. Spool Weight 1.5 kg • Filament Diameter up to 3 mm		
Connection	USB 2.0 and Ethernet Jacks, Wi-Fi		

How it works

Metal 3D Printing with Apium P220 Series

01 Part Preparation

Prepare your CAD model for 3D printing and use Slicing software to upload Apium`s material profile and generate your g-code with optimized parameters for your material of choice.

02 Metal 3D Printing with Apium P220

Apium offers metallic filled filaments for processing with the Apium P220 Series.

The parts are constructed in layer by layer fashion. This enables the production of components with closed cavities and different infill options resulting in significant weight reduction.

03 Debinding and Sintering

Apium Debinder prepares the 3D printed green-bodies for sintering by dissolving the binder material. Apium offers three different sinter oven options for different size and temperature requirements of the 3D printed parts.

Apium`s extensive debinding and sintering solutions are available in a most cost-efficient way for all users with different in-house equipment and experience level.

04 3D Printed Metal part

After debinding and sintering process, you have 100% metal parts ready for use. 3D printed metal parts can be post-treated as any other metal part.

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Metal 3D Printing with Apium P220 Series

Debinder

Solvent Debinding

Offers advanced clean technology and closed system. The Apium Debinder solution provides the safest option in the 3D printing industry and requires the lowest investment cost for infrastructure.

Small Batches

Apium Debinder enables flexibility in production and is specially suitable for research, prototyping and small batch production.

Safety

Apium Debinder is explosion-proof according to ATEX Directive 2014/34/EU. Apium Debinder comes with low infrastructure investments but requires an exhaust system.*

Made in Germany

Apium Debinders have high quality functionalities with fully automatic distillation, PLC-automated process and process chamber made of stainless steel.

TECHNICAL SPECIFICATIONS	
Batch Loading Volume (W x H x D)	200 mm x 216 mm x 380 mm
Batch Loading Volume	~ 16 litres
Max. Heating Temperature	120°C
System Size (W x H x D)	525 mm x 780 mm x 955 mm

*Apium will provide more detailed information upon request regarding the infrastructure requirements for post-processing equipment.

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Metal 3D Printing with Apium P220 Series

Sinter Oven - FHA 13/80/500

Universal Tube Furnace

The FHA, single zone, tube furnaces have maximum operating temperature of 1350°C and offers the flexibility to be used vertically and horizontally.

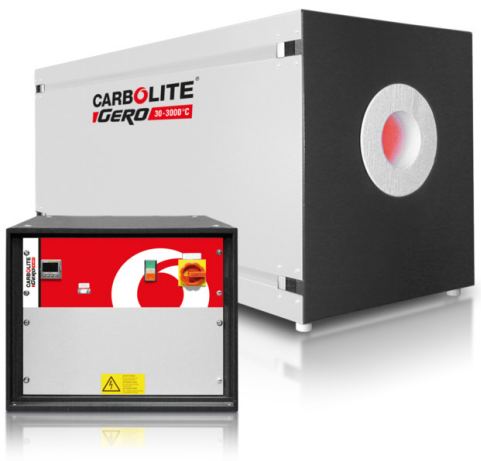
Many Application Possibilities

FHA 13/80/500 can be used for sintering, MIM, CIM, annealing, ageing, drying, tempering, thermocouple calibration and many other applications.

Safety

FHA 13/80/500 is delivered with safety and operation accessories such as programmable controller and overtemperature protection (OTC) for the best user experience. The sinter oven FHA 13/80/500 comes with low infrastructure investments but requires an exhaust system. *

TECHNICAL SPECIFICATIONS	
Max Outer Diameter Accessory Tube	80 mm
Heated Length	500 mm
Max. Temperature	1350°C
System Size (H x W x D)	420 mm x 700 mm x 350 mm
System Weight	40 kg
Tube Length for Use in Air	690 mm
Tube Length for Use with Modified Atmosphere	1225 mm
Control Module Dimensions (H x W x D)	480 mm x 560 mm x 500 mm
Control Module Weight	60 kg
Uniform Length ±5 °C	200 mm
Power	5.2 kW
Power Supply	b (3 phase (16A)+N)



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*Apium will provide more detailed information upon request regarding the infrastructure requirements for post-processing equipment.

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Metal 3D Printing with Apium P220 Series

Sinter Oven - FHC 13/110/750

Universal Tube Furnace

The FHC, 3-zone, tube furnaces have maximum operating temperature of 1350°C and offers the flexibility to be used vertically and horizontally.

Many Application Possibilities

FHC 13/110/750 can be used for sintering, MIM, CIM, annealing, ageing, drying, tempering, thermocouple calibration and many other applications.

Safety

FHC 13/110/750 is delivered with safety and operation accessories such as programmable controller and overtetmperature protection (OTC) for the best user experience. The sinter oven FHC 13/110/750 comes with low infrastructure investments but requires an exhaust system. *

TECHNICAL SPECIFICATIONS	
Max Outer Diameter Accessory Tube	110 mm
Heated Length	750 mm
Max. Temperature	1350°C
System Size (H x W x D)	590 mm x 950 mm x 520 mm
System Weight	70 kg
Tube Length for Use in Air	940 mm
Tube Length for Use with Modified Atmosphere	1475 mm
Control Module Dimensions (H x W x D)	850 mm x 560 mm x 500 mm
Control Module Weight	90 kg
Uniform Length ±5 °C	500 mm
Power	11.4 kW
Power Supply	c (3 phase (32A)+N)

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*Apium will provide more detailed information upon request regarding the infrastructure requirements for post-processing equipment.

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Metal 3D Printing with Apium P220 Series

Sinter Oven - HTK 8 MO/16-1G

Vacuum Chamber Furnace

HTK 8 MO/16-1G is a high temperature furnace and consists of metallic furnace made of Molybdenum. Molybdenum enables the best possible purity of inert atmosphere and final vacuum level in the high vacuum region.

Many Application Possibilities

HTK 8 MO/16-1G can be used for sintering, MIM, metallization and carbon free atmosphere.

High Quality

HTK 8 MO/16-1G offers the best possible vacuum and provides a precisely defined atmosphere with the highest purity. It comes with a data recording functionality for quality management.

Safety

The sinter oven HTK 8 MO/16-1G comes with low infrastructure investments but requires an exhaust system. *

TECHNICAL SPECIFICATIONS			
Exterior Dimensions (H x W x D)	2700 mm x 1700 mm x 1700 mm		
Maintenance Space Around	1000 mm		
Transport Weight	1200 kg		
Effective Volume	~ 8 litres		
Usable Space within Retort (H x W x D)	190 mm x 170 mm x 190 mm		
T_{max} (vacuum)	1600°C		
T_{max} (atmospheric pressure)	1600°C		
-Delta-T betwen 500 and 1500°C according to DIN 17052	±5 K		
Maximum Heat-Up Rate	10 K/min		
Cooling Down Time Empty Furnace	6 h		
Thermocouple Type	Type S		
Thermocouple Mantle Material	Molybdenum Mantel		
Connecting Values			
Power	30 kW	Voltage	3x400 V
Current	3x75 A	Pre Fuse	100 A

*Apium will provide more detailed information upon request regarding the infrastructure requirements for post-processing equipment.

Metal 3D Printing with Apium P220 Series

Apium Sinter Oven - HTK 8 MO/16-1G

TECHNICAL SPECIFICATIONS			
Water Supply			
Consumption	40 l/min		
Max. entry temperature	23°C		
Advance Flow	max. 4 bar	Return Flow	~ 0-2 bar
Temperature Difference between Advance and Return Flow	20 K		
Max. Chloride Content	100 ppm		
Water Hardness	14 dH	PH Value	7-9
Gas Supply			
Gas Type	Ar or N_2		
Flow Rate	50 - 600 l/h		
Intake Pressure	~ 10 bar		
Compressed Air	~ 6 bar		
Compressed Air for Active Afterburner	1300 l/h		
Propane or Methane Gas	50 - 100 mbar		
Propane / Methane Gas for Active Afterburner	130 / 390 l/h		
Operation Pressure: (furnace clean, cold, dry and empty)			
With a double stage rotary pump	$5x10^{-2}$ mbar	With a turbo pumping system, ccde	< $5x10^{-6}$ mbar
Leakage Rate	< $5x10^{-3}$ mbar l/s		

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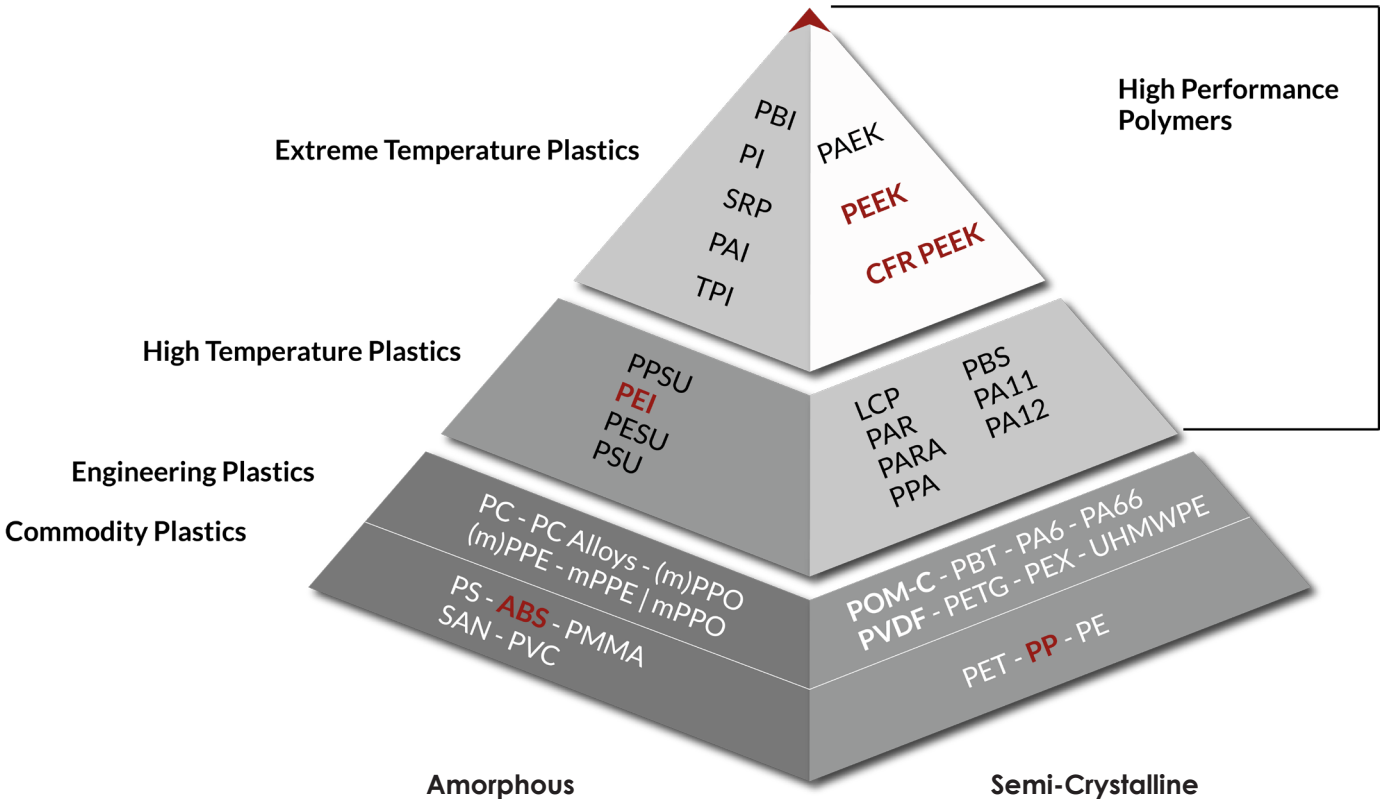
TECHNICAL GRADE MATERIALS

Apium Specialty Filaments - PEEK



High Performance Solutions

PEEK - Material Properties

Semi-Crystallinity of PEEK

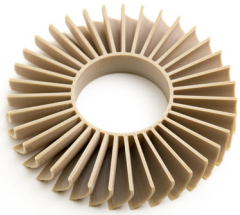
PEEK is a semi-crystalline material. Semi-crystalline materials have distinct characteristics compared to amorphous materials. Semi-crystalline materials have well-defined melting point, good chemical, fatigue and wear resistance. Proper attention must be paid to the temperature control during printing to ensure it is regulated well to produce parts of consistent crystallinity with good properties.

Apium P220 Series 3D printers allow the printing of PEEK parts with 29-32% crystallinity, the closest ratio in the 3D printing industry to 35% crystallinity of injection moulded PEEK parts.

PEEK Filament - High Performance Semi-Crystalline Material

Characteristics of 3D Printed Semi-Crystalline PEEK

The professional PEEK 3D printers of Apium are capable of processing industrial grade PEEK filaments with the highest quality in 3D printing industry.

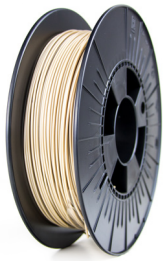


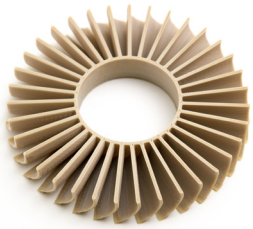
Characteristics of 3D printed PEEK with Apium`s technology:

- High mechanical strength
- Good chemical resistance
- High temperature resistance
- Flame Retardant
- Lightweight
- Excellent wear resistance
- Good fatigue resistance

High Performance Solutions

PEEK - Applications





Aerospace

PEEK is your lightweight material solution where manufacturing costs, durability in harsh environments and processing flexibility play a significant role. It offers great benefits for landing gear hubcaps, aircraft door handles, cable ties, composite fasteners, as housing for fire prone components and many more applications.

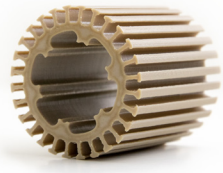
Automotive

PEEK exhibits an excellent combination of strength, durability and heat resistance. PEEK is the material solution where system weight, energy efficiency and a wide range of operating temperatures (-196°C to 260°C) play a significant role in your operations.

Oil & Gas

PEEK is the material of choice for your oil and gas applications which require high quality equipment and tool systems to extreme temperatures, corrosive fluids and gases, and high pressures. For antenna sleeves, valve seats, electrical connectors, primary seals, impellers and many more system components, benefit from the outstanding characteristics of PEEK.

Semiconductors and Electronics



For the two main properties requirements -electrical insulation and mechanical function- of your electronics applications being contact sockets, insulators, wafer carriers, chemical cleaning systems, etc., PEEK is the material of choice with its outstanding properties.

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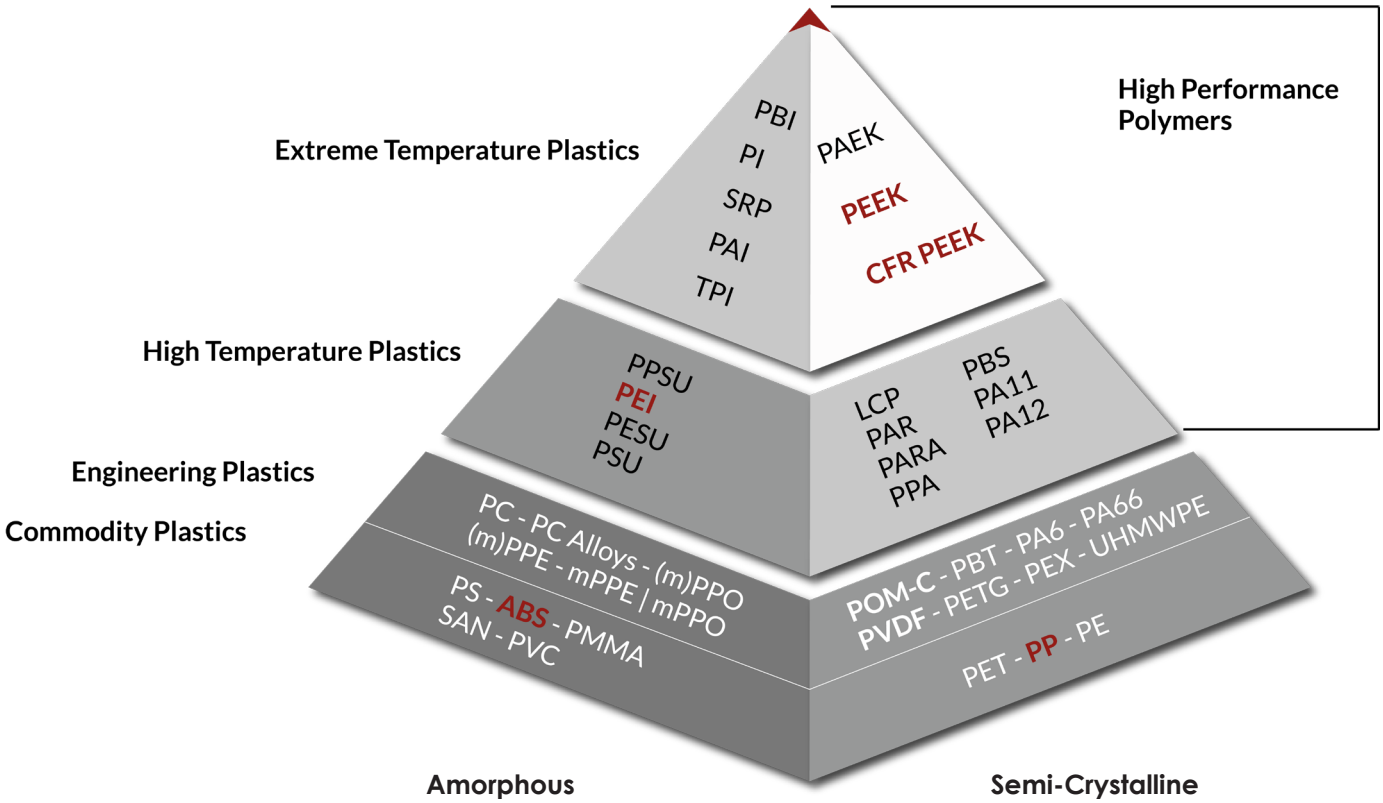
TECHNICAL GRADE MATERIALS

Apium Specialty Filaments - CFR PEEK



High Performance Solutions

CFR PEEK - Material Properties

Role of Carbon Fiber Reinforcement

CFR PEEK is 30 wt. % carbon fiber reinforced PEEK. It is a high performance specialty polymer. CFR PEEK exhibits the excellent material properties of PEEK with improvement. It has higher stiffness, better abrasion resistance and better temperature resistance compared to neat PEEK.

Apium P220 Series 3D printers are equipped with Apium Advanced Extruders which enable the processing of higher filled materials such as CFR PEEK. Having the highest reinforcement degree in the material, Apium`s 3D printed CFR PEEK shows functionalities similar to metals in terms of stiffness, abrasion resistance and temperature resistance, and therefore can be used in a variety of applications including metal replacement.

PEEK CF30 Filament - High Performance Material

Characteristics of 3D Printed CFR PEEK

The professional CFR PEEK 3D printers of Apium are the only 3D printers which are capable of processing industrial grade CFR PEEK filaments with the highest quality.

Characteristics of 3D printed CFR PEEK with Apium:

- High Stiffness
- Good Wear Resistance
- High Temperature Resistance
- Good Chemical Resistance
- Lightweight
- High Compressive Strength
- Good fatigue resistance

High Performance Solutions

CFR PEEK - Applications

Aerospace

With its excellent thermal properties, CFR PEEK is the best solution for several aircraft applications such as interior fittings (tables and fasteners) and other equipment (hydraulic cylinders and C/C brakes). In addition, Apium's CFR PEEK can be used in door brackets and motor casings as well as for satellites, which include antennas and tube truss structures.

Automotive

CFR PEEK's uncompromising strength-to-weight ratio is essential for high-performance automotive applications. High operating temperatures as well as a good fatigue performance in combination with the ability to easily produce individual parts, make it imperative to benefit from 3D printed CFR PEEK while working in the Automotive Industry. Possessing following characteristics CFR PEEK is the suitable material to manufacture drive shafts, engine parts, body-panel parts and more.

Oil & Gas

CFR PEEK represents a promising alternative material for several application in this industry, either for offshore oil excavation where it can be used as risers, impellers, antenna sleeves or for pressure vessels like compressed gas cylinders. Various oil and gas processing equipment can be realized using CFR PEEK especially regarding the ability to withstand extreme operating conditions.

Semiconductors and Electronics

CFR PEEK is applicable for purposes like electrical insulators, valve components, wafer handling parts or bearings and bushings due to its long-term temperature capabilities, high tensile strength and very good chemical resistance.

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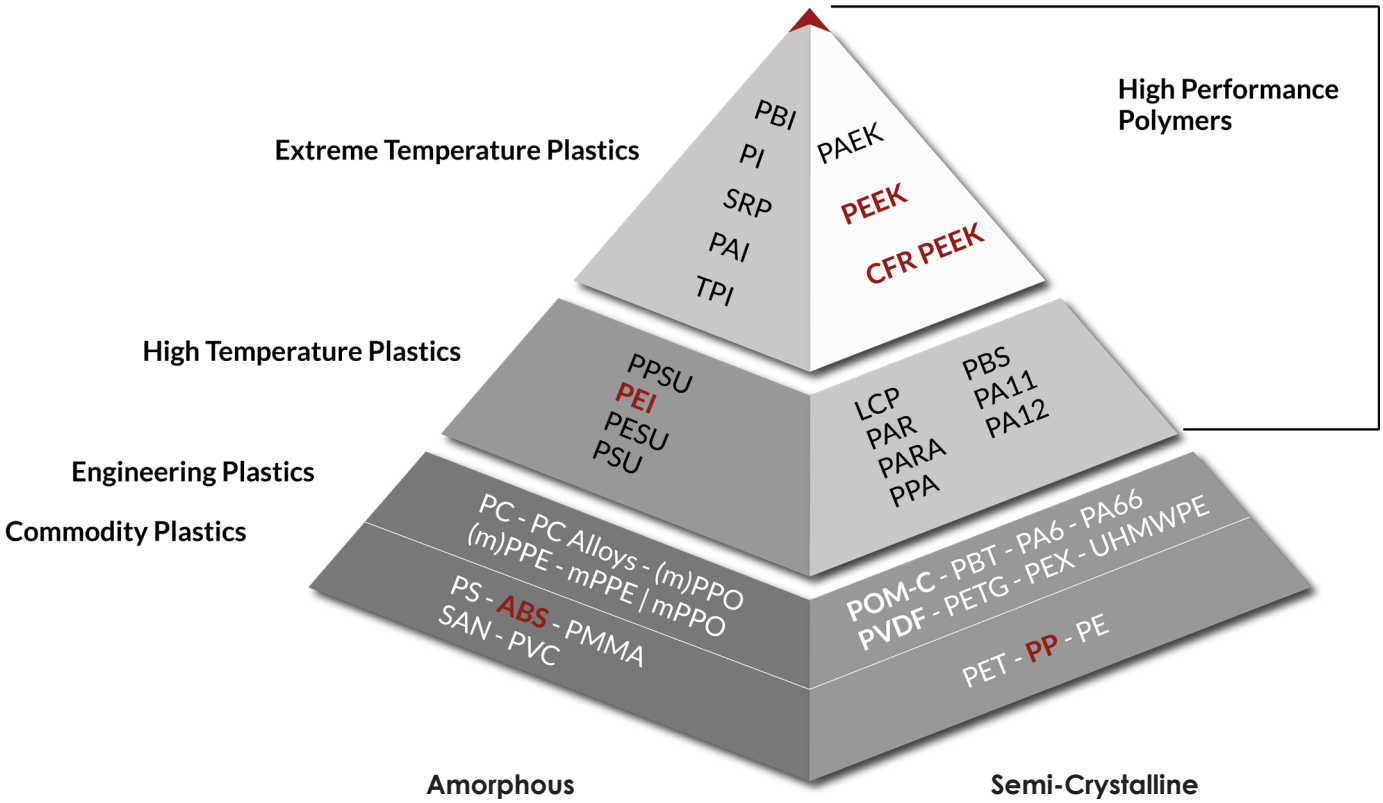
TECHNICAL GRADE MATERIALS

Apium Specialty Filaments - PEI ULTEM™



High Performance Solutions

PEI ULTEM™- Material Properties

Flame Retardant High Performance

PEI ULTEM™ is an amorphous flame retardant high performance thermoplastic. Its high strength-to-weight ratio and FST (flame, smoke and toxicity) rating make it ideal especially for the transportation industry.
Apium`s professional 3D printers are capable of printing amorphous PEI ULTEM™ to the highest quality due to the advanced material profiles (a set of pre-defined parameters for printing process) while overcoming the common challenges with oozing, stringing and warping.

PEI ULTEM™ Filament - High Performance Amorphous Material

Characteristics of 3D Printed Amorphous PEI ULTEM™

Apium advanced temperature management system in combination with Apium`s material profiles eliminates commonly occuring printing failures and ensures the highest print quality.

Characteristics of 3D printed PEI ULTEM™ with Apium:

- High Mechanical Strength
- Inherent Flame Resistance
- High Dielectric Strength
- Heat Resistance
- Lightweight
- Low Smoke Output

High Performance Solutions

PEI ULTEM™ - Applications

Aerospace

PEI ULTEM™ is the solution for aircraft components such as electronics mounting brackets with high creep resistance over a wide range of temperatures and flame resistance. It offers you significant advantages with its excellent characteristics.

Automotive

PEI ULTEM™ is your material solution for automotive applications which require consistent dielectric properties, high strength and the ability to withstand high temperatures, such as ignition components and thermostat housings.

Semiconductors and Electronics

With its excellent material properties, PEI ULTEM™ is your material solution for challenging applications such as connectors and insulators.

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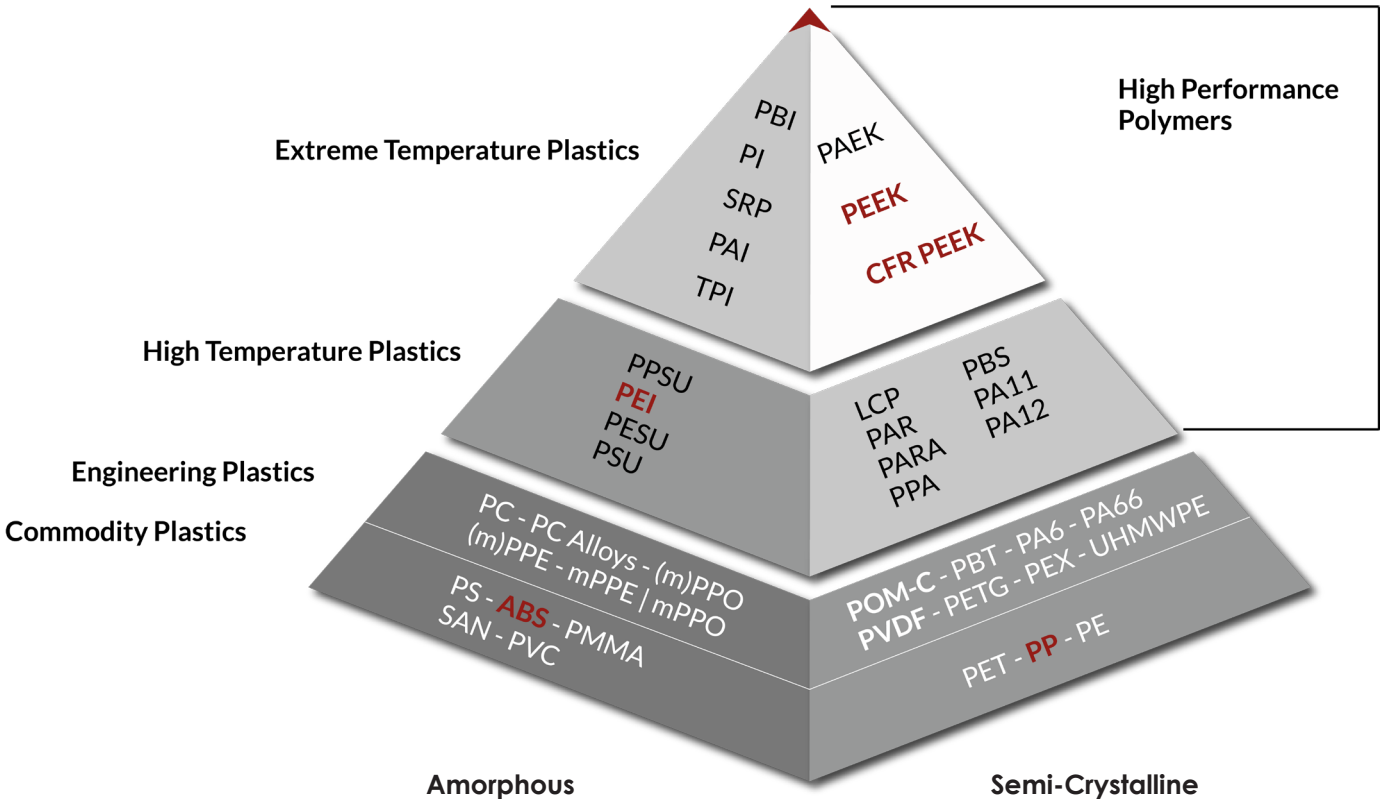
TECHNICAL GRADE MATERIALS

Apium Specialty Filaments - PP



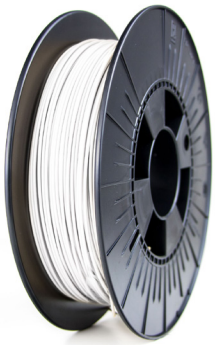
Commodity Solutions

PP- Material Properties

Transmissivity and Elasticity

PP (Polypropylene) is a thermoplastic polymer used in a wide range of applications worldwide due to its transmissivity, elasticity and fatigue toughness.

The professional 3D printers of Apium are capable of printing semi-crystalline PP with the highest quality due to the advanced material profiles (a set of pre-defined parameters for the printing process).



PP Filament - Semi-Crystalline Commodity Polymer

Characteristics of 3D Printed Semi-Crystalline PP

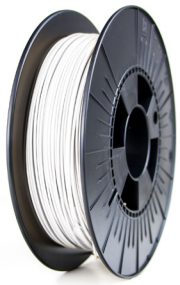
Apium advanced temperature management system in combination with Apium`s material profiles eliminates commonly occuring printing failures and ensures the highest print quality.

Characteristics of 3D printed PP with Apium:

- Good Chemical Resistance
- Elasticity and Toughness
- Fatigue Resistance
- Insulation
- Transmissivity

Commodity Solutions

PP - Applications



Automotive

PP is one of the mostly used thermplastics in automotive industry. Its good resistance to many chemical solvents, bases and acids make it suitable for automotive applications.

Semiconductors and Electronics

In the electronics industry the manufactures attempt to shift from heavy metals to low density materials. Polypropylene offers a low level of electrical conductivity which allows it to be highly effective in electronic products. With its water repellent and lightweight it is great for all electronical applications. Because of its high electric shock resistant it is used to many devices to act as an insulator to counteract high thermal conditions generated in the product.

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