

Description of IEMAI 3D MAGIC-HT-PRO

IEMAI high-performance material 3D printer MAGIC-HT-PRO is a 3D printing device designed for fused filament fabrication (FFF) technology. It has a printing temperature of 450 °C, hot bed temperature of 180 °C and chamber temperature of 120 °C and supports most popular polymer based 3D printing filaments in the market, including specialty engineering plastic such as PEEK, PEKK, PPSU and PEI, etc. It is equipped with a detachable dual printing head which enables easy maintenance and two-color printing. The printing head is equipped liquid cooling system with improved heat dissipation and heat insulation. The tool drawer and moisture-proof material cabinet are integrated at the pedestal. The machine can move freely by wheels. In addition, MAGIC-HT-PRO also has functions such as material-shortage reminder, power failure recovery, WIFI control and Snap-on bed plate.



IEMAI 3D together with Evonik conducted a comprehensive printing test of the high-performance material INFINAM® PEEK 9359 F. Please refer to the attached table for printing settings and test results.

Printing Settings

Layer Thickness	Printing Temperature	Hot bed Temperature	Chamber Temperature	Printing Speed	Cooling Fan
0.2 mm	410 °C	120 °C	120 °C	20 mm/s	No

Pretreatment:

The filament was dried at 130°C for 2 hours before using.

Profile:

Infill density 100%, Wall thickness 0.8 mm, Wall line count 2. Infill pattern is linear, 45° and 135° alternately layer by layer.

Evonik Specialty Chemicals (Shanghai) Co., Ltd.

Wang Yaodi

Tel: +86 21 6119-1099

Mobile Phone No.: +86 138 1704-6372

Email: yaodi.wang@evonik.com

68 Chundong Road, Xinzhuang Industrial Zone, Shanghai

Dongguan IEMAI Intelligent Technology Co., Ltd.

Jiang Zicong

Tel: +86 769 3332-9120

Mobile Phone No.: +86 135 8073-3807

Email: yimai3d@foxmail.com

No. 10, Jiling Gongye Road, Lianping Administrative District, Dalingshan Town, Dongguan City, Guangdong Province

This information and any technical or other suggestions are provided in good faith and are correct as it may be at the date of compiling. The person receiving this information and suggestions must at its own discretion determine whether they are fit for the purpose. In no event shall Evonik be liable for damages or losses of any kind or nature arising from the use of or reliance on this information and suggestions. Evonik expressly rejects any representation and warranty of any kind, expressed or implied, in terms of the accuracy, completeness, non-infringement, merchantability and/or applicability of the particular purpose of any information and suggestion as provided (even if Evonik understands such use). Reference to any product name used by other companies is neither a recommendation nor approval of the associated product, but it does not mean that product in similarity cannot be used. Evonik reserves the right to modify the information and/or suggestion at any time without further notice.

® = Registered Trademark

01/2021

Evonik & IEMAI

3D Printing of Industrial Grade PEEK Filament Integrated Solutions White Paper



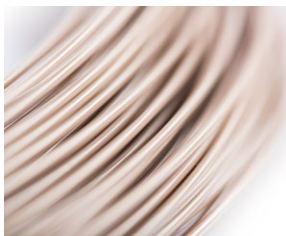
INFINAM® PEEK 9359 F

Evonik, one of the world leaders in specialty chemicals, has over 40 years of experience in the development and production of high-performance polymers. Its diversified product portfolio covers the solutions to almost all industrial applications. With its new 3D printing material brand INFINAM®, Evonik converges 20 years of experience, highest quality standards and innovation ability, so as to turn high-performance polymers and additives into ready-to-use 3D printing materials.

INFINAM® PEEK 9359 F is a high-performance, industrial grade PEEK filament that is easy to process in FFF (FDM) printers. Its unique properties make it suitable for fields of aerospace, transportation, oil and gas, etc. to manufacture lightweight and high-performance parts.

PEEK produced by Evonik is distinguished with the following properties:

- Excellent performance in heat resistance and chemical resistance
- Good warpage resistance
- Unique crystallization which gives significantly improved adhesion between layers in the vertical direction
- Compared to 3D printed stainless-steel parts, it is 80% lighter in weight and 30% tougher with excellent fatigue resistance making it an ideal substitution to 3D printing metal
- Superior wear resistance and low sliding friction which makes it suitable for producing lightweight structural parts
- Long-term temperature resistance at 250 °C and short-term temperature resistance at or above 300 °C
- Resists most organic and inorganic chemicals and only dissolves in concentrated sulfuric acid and nitric acid
- Inherently flame retardant with low smoke and toxicity
- Resistant to gamma radiation, 250C steam and hydrolysis
- Excellent wave transmission performance than metal does



Test Data Summary (Filament: INFINAM® PEEK 9359F; Printer: MAGIC-HT-PRO)

Thermal Properties	Testing Method	Unit	Test Result	
			Directly Print	Post Heat Treatment (200 °C/4 hrs)
Melting Point DSC, 2nd Heating	ISO 11357-1/-3	°C	343	342
Glass Transition Temperature	ISO 11357-1/-2	°C	157	156
Temp. of Deflection under Load A, 1.80 MPa	ISO 75-1/-2	°C	152	164
Temp. of Deflection under Load B, 0.45 MPa	ISO 75-1/-2	°C	179	220
Mechanical Properties ¹⁾				
Tensile Modulus	ISO 527 -1BA	MPa	2930	3140
Yield Stress	ISO 527 -1BA	MPa	76	86
Yield Strain	ISO 527 -1BA	%	4.7	5.2
Stress at Break	ISO 527 -1BA	MPa	58	79
Strain at Break	ISO 527 -1BA	%	10.1	6.9
Tensile Modulus	ISO 527 -1A	MPa	2960	3060
Yield Stress	ISO 527 -1A	MPa	75	79
Yield Strain	ISO 527 -1A	%	5.0	5.4
Stress at Break	ISO 527 -1A	MPa	71	77
Strain at Break	ISO 527 -1A	%	7.3	7.0
Flexural Modulus	ISO 178	MPa	2560	3050
Maximum Flexural Stress	ISO 178	MPa	119	134
Strain at Maximum flexural Stress	ISO 178	%	6.7	7.0
Charpy Impact Strength, 23 °C	ISO 179/1eU	kJ/m ²	91C ²⁾	56C
Charpy Impact Strength, -30 °C	ISO 179/1eU	kJ/m ²	62C	46C
Charpy Notched Impact Strength, 23 °C	ISO 179/1eA	kJ/m ²	7.7C	5.3C
Charpy Notched Impact Strength, -30 °C	ISO 179/1eA	kJ/m ²	5.5C	4.6C

1) Sample Printing Direction: XY axis

2) C=Completely Fractured