

# WINDFORM® **FX BLACK**

**CLASS OF MATERIAL:** Polyamide based Material

**TECHNOLOGY:** Selective Laser Sintering

Windform® FX BLACK is a new generation polyamide based material with a dark black color. Windform® FX Black's mechanical characteristics make it particularly suited for Additive Manufacturing applications. It guarantees consistent performance on repeatable jobs. Windform® FX BLACK is characterized by exceptional resistance to repeated bending and torsion. The material shows excellent impact resistance even at low temperatures. Its consistency and behaviour are similar to polypropylene and ABS injection moulded parts.

Windform® FX BLACK is perfect for creating accurate, reliable, and long lasting prototypes. No post-production treatments are needed, as the material has an excellent surface finish in its sintered state. Any additional manual finishing improves its polish. It can be considered a highly valuable material in various functional applications.

## **APPLICATIONS:**

Applications include: flexible components and functional parts with living hinges or clip fittings. It is also suitable for ducting of complex shapes, or for thin walled connectors with snap-fit systems.

Improvements in detail reproduction make Windform® FX BLACK suitable for applications which require accurate and superior definition.

Windform® FX BLACK is the material of choice for flexible components with fine details.

These applications indicated are just examples. The versatility of the product combined with the technology used, allows for near endless possibilities.

## **WHERE TO FIND WINDFORM® PRODUCTS**

CRP Technology produces items in Windform® FX BLACK and distributes the material in Europe and ROW. CRP USA produces items in Windform® FX BLACK and distributes the material in the US and North America. Both CRP Technology and CRP USA offer individually customized services for timing and method of delivery depending on the needs of the customer, anywhere in the world.

## **HOW TO GET WINDFORM® PRODUCTS**

For any further information, requests for quotation, or to check delivery times, please visit our website [www.windform.com](http://www.windform.com) or send an inquiry to [info@windform.com](mailto:info@windform.com) (for Europe and ROW markets) or [info@crp-usa.net](mailto:info@crp-usa.net) (for US market). We will be in contact to answer all inquiries.



Courtesy of Sport Egger: Windform 3D-printed Easystand skiboot

# WINDFORM® FX BLACK

WINDFORM® FX BLACK	Test Method	SI Unity	Windform® FX BLACK
<b>GENERAL PROPERTIES</b>			
Density (20° C)		g/cc	1,022
Colour			BLACK
<b>THERMAL PROPERTIES</b>			
Melting point	ISO 11357	°C	198,7
HDT, 1.82 Mpa	ASTM D 648 TYPE B	°C	52,1
Vicat 10N	ASTM D1525-09	°C	190,5
<b>MECHANICAL PROPERTIES</b>			
Tensile Strength	UNI EN ISO 527-1	Mpa	50,74
Tensile Modulus	UNI EN ISO 527-1	Mpa	1908,00
Elongation at break	UNI EN ISO 527-1	%	50,30
Flexural Strength	UNI EN ISO 14125	Mpa	67,60
Flexural Modulus	UNI EN ISO 14125	Mpa	1820,00
Impact Strength Unnotched (Charpy 23°C - Partial broken specimens)	UNI EN ISO 179-1	KJ/m²	254,35
Impact Strength Unnotched (Charpy 23°C - Completely broken specimens)	UNI EN ISO 179-1	KJ/m²	217,55
Impact Strength Notched (Charpy 23°C)	UNI EN ISO 179-1	KJ/m²	21,69
Impact Strength Notched (Charpy -40°C)	UNI EN ISO 179-1/ 1eA	KJ/m²	4,22
<b>ELECTRICAL PROPERTIES</b>			
Resistivity, Volume	ASTM D257	ohm * cm	3,7x10 <sup>15</sup>
Resistivity, Surface	ASTM D257	ohm	9,7x10 <sup>15</sup>
<b>SURFACE FINISH</b>			
After SLS Process		Ra µm	5,00
After manual finishing		Ra µm	1,60
After CNC machining		Ra µm	0,80
<b>PROPERTIES PER DENSITY UNIT</b>			
UTS per density unit		Mpa/(g/cc)	49,65
Tensile Modulus per density unit		Mpa/(g/cc)	1866,93
Flexural Strength per density unit		Mpa/(g/cc)	66,14
Flexural Modulus per density unit		Mpa/(g/cc)	1780,82

**Note: these are all indicative values.** Data was generated from the testing of parts produced with Windform® FX BLACK material under optimal processing conditions.

**Standard Technical Details for Accuracy versus Tolerance:**

For parts up to 6" (150 mm) the standard tolerance is: +/- 0.012 inches (0,3 mm)

For parts more than 6" (150 mm) the standard tolerance is: +/- 0.002 inches per inch (0,05 mm per 25 mm)

Example: For a 9" (229 mm) part, the standard tolerance would be: +/- 0.018 inches (0,46 mm).

# WINDFORM® FX BLACK

WINDFORM® FX BLACK	Test Method	US Unit	Windform® FX BLACK
<b>GENERAL PROPERTIES</b>			
Density (68° F)		g/cc	1.022
Colour			BLACK
<b>THERMAL PROPERTIES</b>			
Melting point	ISO 11357	°F	389.66
HDT, 1.82 Mpa	ASTM D 648 TYPE B	°F	125.78
Vicat 10N	ASTM D1525-09	°F	374.90
<b>MECHANICAL PROPERTIES</b>			
Tensile Strength	UNI EN ISO 527-1	psi	7357.30
Tensile Modulus	UNI EN ISO 527-1	ksi	276.66
Elongation at break	UNI EN ISO 527-1	%	50.30
Flexural Strength	UNI EN ISO 14125	psi	9802.00
Flexural Modulus	UNI EN ISO 14125	ksi	263.90
Impact Strength Unnotched (Charpy 73.4°F - Partial broken specimens)	UNI EN ISO 179-1	ft-lb/in²	120.94
Impact Strength Unnotched (Charpy 73.4°F - Completely broken specimens)	UNI EN ISO 179-1	ft-lb/in²	103.45
Impact Strength Notched (Charpy 73.4°F)	UNI EN ISO 179-1	ft-lb/in²	10.31
Impact Strength Notched (Charpy -40°F)	UNI EN ISO 179-1/ 1eA	ft-lb/in²	2.00
<b>ELECTRICAL PROPERTIES</b>			
Resistivity, Volume	ASTM D257	ohm * cm	3.7x10 <sup>15</sup>
Resistivity, Surface	ASTM D257	ohm	9.7x10 <sup>15</sup>
<b>SURFACE FINISH</b>			
After SLS Process		Ra µm	5.00
After manual finishing		Ra µm	1.60
After CNC machining		Ra µm	0.80
<b>PROPERTIES PER DENSITY UNIT</b>			
UTS per density unit		psi/[g/cc]	7198.92
Tensile Modulus per density unit		ksi/[g/cc]	270.70
Flexural Strength per density unit		psi/[g/cc]	9591
Flexural Modulus per density unit		ksi/[g/cc]	258.22

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**Standard Technical Details for Accuracy versus Tolerance:**

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For parts more than 6" (150 mm) the standard tolerance is: +/- 0.002 inches per inch (0,05 mm per 25 mm)

Example: For a 9" (229 mm) part, the standard tolerance would be: +/- 0.018 inches (0,46 mm).



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*Courtesy of Sport Egger: Windform 3D-printed Easystand skiboot*



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