

# Fortus Materials Overview



Fortus 3D Production Systems use a variety of production-grade thermoplastics to manufacture functional parts direct from digital data. Fortus thermoplastics are environmentally stable, so overall shape and part accuracy don't change with ambient conditions over time, unlike the powders in competitive processes. Materials are easy to change on Fortus systems, with no mess or complicated processes. When combined with Fortus systems, Fortus thermoplastics give you production-quality thermoplastic parts that are ideal for concept modeling, functional prototyping, manufacturing tools or end-use parts.

Materials	ABS - M30	ABS - M30i	ABS - ESD7	PC - ABS	ASA	PC - ISO	PC	NYLON 12	ST - 130	Nylon 12CF	Antero 800NA	FDM Nylon 12	FDM Nylon 6	FDM TPU 92A	ABSplus P430	PLA	ULTEM-9085 resin	ULTEM-1010 resin	
System Availability	Fortus 360mc Fortus 380mc Fortus 400mc Fortus 450mc Stratasys F170 Stratasys F270 Stratasys F370 Stratasys F900	Fortus 380mc Fortus 400mc Fortus 450mc Stratasys F900	Fortus 380mc Fortus 400mc Fortus 450mc Stratasys F900	Fortus 360mc Fortus 380mc Fortus 400mc Fortus 450mc Stratasys F370 Stratasys F900	Fortus 360mc Fortus 380mc Fortus 400mc Fortus 450mc Stratasys F170 Stratasys F270 Stratasys F370 Stratasys F900	Fortus 380mc Fortus 400mc Fortus 450mc Stratasys F900	Fortus 360mc Fortus 380mc Fortus 400mc Fortus 450mc Stratasys F900	Fortus 360mc Fortus 380mc Fortus 400mc Fortus 450mc Stratasys F900	Fortus 450mc F900	Fortus 450mc Stratasys F900	Fortus 450mc	Fortus 450mc Stratasys F900	Stratasys F 900	Stratasys F170 Stratasys F270 Stratasys F370	uPrint SE Plus	Stratasys F170 Stratasys F270 Stratasys F370	Fortus 400mc Fortus 450mc Stratasys F900	Fortus 400mc Fortus 450mc Stratasys F900	
Layer Thickness:																			
0.010 inch (0.254 mm)	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X <sup>3</sup>	X	
0.013 inch (0.330 mm)									X			X	X		X		X		
0.007 inch (0.178 mm)	X	X	X	X	X	X	X	X				X			X				
0.005 inch (0.127 mm)	X <sup>1</sup>	X <sup>1</sup>		X <sup>1</sup>	X		X												
Support Structure	Soluble	Soluble	Soluble	Soluble	Soluble	BASS	BASS, Soluble	Soluble	Breakaway	Soluble	Breakaway	Soluble	Soluble	Soluble	Soluble	Breakaway	BASS	BASS	
Available Colors	Ivory White Black Dark Gray Red Blue	Ivory	Black	Black	Ivory Black Dark Gray Light Gray White Red Orange Yellow Green Dark Blue	White Translucent Natural	White	Black	Natural	Black	Natural	Black	Black	Black	Ivory White Black Dark Gray Red	Black White Light Gray Medium Gray Red Blue	Tan Black	Natural	
Tensile Strength	XY: 4,650 psi (32 MPa) Z: 4,050 psi (28 MPa)	XY: 4,650 psi (32 MPa) Z: 4,050 psi (28 MPa)	5,200 psi (36 MPa)	XY: 5,000 psi (34 MPa) Z: 4,000 psi (30 MPa)	XY: 4,750 psi (34 MPa) Z: 4,300 psi (30 MPa)	8,265 psi (57 MPa)	9,800 psi (68 MPa)	XY: 7,000 psi (48 MPa) Z: 6,400 psi (44 MPa)	N/A	XZ: 10,960 psi (75.6 MPa) Z: 4,990 psi (34.4 MPa)	XZ: 13,504 psi (±57 psi) Z: 6,650 psi (±765 psi)	XZ: 6,650 psi (46 MPa) Z: 5,600 psi (38.5 MPa)	XZ: 9,800 psi (67.6 MPa) Z: 5,300 psi (36.5 MPa)	XZ: 2519 psi (17.4 MPa) XY: 2432 psi (16.8 MPa)	XZ: 4,700 psi (33 MPa)	XZ: 6,990 psi (48 MPa) Z: 3,830 psi (26 MPa)	10,390 psi (72 MPa)	XY: 11,735 psi (81 MPa) Z: 4,209 psi (29 MPa)	
Tensile Elongation	XY:7.0% Z:2%	XY:7% Z:2%	3.0%	XY:5.0% Z:2%	XY:9% Z:3%	4.3%	4.8%	XY:30% Z:5%	N/A	XZ: 1.9% Z: 1.2%	XZ: 6.40 ± 1.05% Z: 1.22 ± 0.28%	XZ: 30% Z: 5%	XZ: 38% Z: 3.2%	XZ: 482% XY: 552%	XZ: 6%	XZ: 2.5% Z: 1.0%	5.9%	XY:3.3% Z:1.3%	
Flexural Stress	XY: 8,700 psi (60 MPa) Z: 7,000 psi (48 MPa)	XY: 8,700 psi (60 MPa) Z: 7,000 psi (48 MPa)	8,800 psi (61 MPa)	XY: 8,500 psi (59 MPa) Z: 6,900 psi (48 MPa)	XY: 8,720 psi (59 MPa) Z: 6,900 psi (48 MPa)	13,089 psi (90 MPa)	15,100 psi (104 MPa)	XY: 10,000 psi (69 MPa) Z: 8,600 psi (59 MPa)	N/A	XZ:20,660 psi (142 MPa) Z: 8,430 psi (58.1 MPa)	XZ: 20,548 ± 477 psi (142 ± 3 MPa) Z: 9,349 ± 1,514 psi (64 ± 10 MPa)	XZ: 9,700 psi (67 MPa) Z: 8,800 psi (61 MPa)	XZ: 14,100 psi (97.2 MPa) Z: 11,900 psi (82 MPa)	XZ: 351 psi (2.4 MPa) XY: 255 psi (1.8 MPa)	XZ: 8,450 psi (58 MPa) Z: 5,050 psi (35 MPa)	XZ: 12,190 psi (84 MPa) Z: 6,750 psi (45 MPa)	16,700 psi (115 MPa)	XY: 20,835 psi (144 MPa) Z: 11,184 psi (77 MPa)	
ZOD Impact, notched	2.4 ft-lb/in (128 J/m)	2.4 ft-lb/in (128 J/m)	0.5 ft-lb/in (28 J/m)	4.0 ft-lb/in (235 J/m)	1.2 ft-lb/in (64 J/m)	1.6 ft-lb/in (86 J/m)	1.0 ft-lb/in (53 J/m)	XY: 3.74 ft-lb/in (200 J/m) Z: 75.0 ft-lb/in (75 J/m)	N/A	XZ: 1.6 ft-lb/in (85 J/m) Z: 0.4 ft-lb/in (21.4 J/m)	XZ: 0.69 ± 0.12 ft-lb/in (37 ± 6 J/m) Z: 0.51 ± 0.09 ft-lb/in (27 ± 5 J/m)	XZ: 2.5 ft-lb/in (135 J/m) Z: 1 ft-lb/in (53 J/m)	XZ: 2.0 ft-lb/in (106 J/m) Z: 0.8 ft-lb/in (43 J/m)		XZ: 2.0 ft-lb/in (106 J/m) Z: 0.5 ft-lb/in (27 J/m)	XZ: 0.5 ft-lb/in (27 J/m)	2.0 ft-lb/in (106 J/m)	XY: 0.8ft-lb/in (41 J/m) Z: 0.4 ft-lb/in (24 J/m)	
Heat Deflection at 264 psi	180°F (82°C)	180°F (82°C)	180°F (82°C)	205°F (96°C)	196°F (91°C)	260°F (127°C)	261°F (127°C)	180°F <sup>7</sup> (82°C)	108°F (226°C)	143°C (289°F)	147 °C (297 °F)	82 °C (180 °F)	93 °C (199 °F)		82 °C (180 °F) 51 °C (124 °F)	51 °C (124 °F)	3070 F (1530C)	4150F (2130C)	
Unique Properties	Variety of color options	ISO 10993 USP Class VI <sup>5</sup>	Static dissipative, target surface resistance of 10 <sup>7</sup> ohms <sup>1</sup>	Strong (impact)	UV-stable with the best aesthetics of any FDM material	ISO 10993 USP Class VI <sup>5</sup>	Strong (tension)	Fatigue resistant, high elongation at break	Sacrificial tooling	Highest flexural strength of any FDM material	High strength, and heat and chemical resistance, low	Fatigue-resistant, high elongation at break	Very high strength and toughness combined		Variety of color options	Low cost, fast-draft printing	Flame, smoke, toxicity (FST) certified	Food-safety and biocompatibility certification	

<sup>1</sup>Actual surface resistance may range from 10<sup>9</sup> to 10<sup>6</sup> ohms, depending upon geometry, build style and finishing techniques.

<sup>1</sup>0.005 inch (0.127 mm) layer thickness not available for Fortus 900mc.

<sup>2</sup>See individual material spec sheets for testing details.

<sup>3</sup>0.013 inch (0.330 mm) layer thickness for ULTEM not available on Fortus 400mc.

<sup>4</sup>0.013 inch (0.330 mm) layer thickness for PPSF not available on Fortus 900mc.

<sup>5</sup>It is the responsibility of the finished device manufacturer to determine the suitability of all the component parts and materials used in their finished products.

<sup>6</sup>PC can attain 0.005 inch (0.127mm) layer thickness when used with SR-100 soluble support.

<sup>7</sup>Annealed

# Fortus

## Materials Overview

Material	Highlights
 ABS-M30 (acrylonitrile butadiene styrene)	<ul style="list-style-type: none"> <li>Versatile material: good for form, fit and functional applications</li> <li>Familiar production material for accurate prototyping</li> </ul>
 ABS-ESD7 (acrylonitrile butadiene styrene static dissipative)	<ul style="list-style-type: none"> <li>Static dissipative with target surface resistance of <math>10^7</math> ohms (typical range <math>10^9</math> — <math>10^6</math> ohms)</li> <li>Makes great assembly tools for electronic and static sensitive products</li> <li>Widely used for functional prototypes of cases, enclosures and packaging</li> </ul>
 ABS-M30i (acrylonitrile butadiene styrene - ISO 10993 USP Class VI biocompatible)	<ul style="list-style-type: none"> <li>Biocompatible (ISO 10993 USP Class VI) <sup>1</sup> material</li> <li>Sterilizable using gamma radiation or ethylene oxide (EtO) sterilization methods</li> <li>Best fit for applications requiring good strength and sterilization</li> </ul>
 ST - 130 (Sacrificial Tooling)	<ul style="list-style-type: none"> <li>Designed specifically for hollow composite parts</li> <li>Fast, hands-free dissolution time</li> <li>High heat and autoclave pressure resistance</li> </ul>
 PC-ABS (polycarbonate - acrylonitrile butadiene styrene)	<ul style="list-style-type: none"> <li>Superior mechanical properties and heat resistance of PC</li> <li>Excellent feature definition and surface appeal of ABS</li> <li>Hands-free support removal with soluble support</li> </ul>
 ASA (acrylonitrile styrene acrylate)	<ul style="list-style-type: none"> <li>Build UV-stable parts with the best aesthetics of any FDM material</li> <li>Ideal for end-use parts for outdoor infrastructure and commercial use, outdoor functional prototyping and automotive parts and accessory prototypes</li> </ul>
 PC (Polycarbonate)	<ul style="list-style-type: none"> <li>Most widely used industrial thermoplastic with superior mechanical properties and heat resistance</li> <li>Accurate, durable and stable for strong parts, patterns for metal bending and composite work</li> <li>Great for demanding prototyping needs, tooling and fixtures</li> </ul>
 pc-ISO (polycarbonate - ISO 10993 USP Class VI biocompatible)	<ul style="list-style-type: none"> <li>Biocompatible (ISO 10993 USP Class VI) I material</li> <li>Sterilizable using gamma radiation or ethylene oxide (EtO) sterilization methods</li> <li>Best fit for applications requiring higher strength and sterilization</li> </ul>
 ULTEM™ 9085 resin (polyetherimide)	<ul style="list-style-type: none"> <li>FST (flame, smoke, toxicity)-certified thermoplastic</li> <li>High heat and chemical resistance; highest tensile and flexural strength</li> <li>Ideal for commercial transportation applications such as airplanes, buses, trains and boats</li> </ul>
 UI-TEM 1010 resin (polyetherimide)	<ul style="list-style-type: none"> <li>Food safety and bio-compatibility certification</li> <li>Highest heat resistance, chemical resistance and tensile strength</li> <li>Outstanding strength and thermal stability</li> </ul>
 FDM Nylon 12CF™ (polyamide 12CF)	<ul style="list-style-type: none"> <li>Carbon-filled thermoplastic with excellent structural characteristics</li> <li>Highest flexural strength</li> <li>Highest stiffness-to-weight ratio</li> </ul>
 Antero™ 800NA (polyetherketoneketone)	<ul style="list-style-type: none"> <li>High heat and chemical resistance</li> <li>Low outgassing and high dimensional stability</li> <li>Excellent strength, toughness and wear-resistant properties</li> </ul>
 FDM Nylon 6 (polyamide 12CF)	<ul style="list-style-type: none"> <li>Combines strength and toughness superior to other thermoplastics</li> <li>Produces durable parts with a clean finish and high break resistance</li> </ul>
 ABSplus P430 (polyamide 12CF)	<ul style="list-style-type: none"> <li>Versatile material: good for form, fit and functional applications</li> <li>Familiar production material for accurate prototyping</li> </ul>
 PLA (polyetherimide)	<ul style="list-style-type: none"> <li>Fast printing</li> <li>Good tensile strength</li> <li>Economical and user-friendly</li> <li>Ideal for concept models</li> </ul>
 FDM TPU 92A (thermoplastic polyurethane)	<ul style="list-style-type: none"> <li>Elastomer material with Shore A value of 92</li> <li>Flexible, resilient material</li> <li>Compatible with soluble support</li> <li>Accelerates elastomer prototyping without the need for molds</li> </ul>
 FDM Nylon 12 (polyamide 12)	<ul style="list-style-type: none"> <li>The toughest nylon in additive manufacturing</li> <li>Excellent for repetitive snap fits, press fit inserts and fatigue-resistance applications</li> <li>Simple, clean process — free of powders</li> </ul>

<sup>1</sup> Actual surface resistance may range from  $10^9$  to  $10^6$  ohms, depending upon geometry, build style and finishing techniques.

<sup>2</sup> It is the responsibility of the finished device manufacturer to determine the suitability of all the component parts and materials used in their finished prod

ALTEM TECHNOLOGIES (P) LTD

Ph: +91 0841506070 | [www.altem.com](http://www.altem.com) | [www.printmyCAD.com](http://www.printmyCAD.com) | [enquiry@altem.com](mailto:enquiry@altem.com)  
Sales office: Bangalore | Ahmedabad | Chennai | Mumbai | Delhi | Hyderabad | Kolkata | Pune