Fortus
3D Production Systems

FORTUS SYSTEMS OVERVIEW

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Fortus 3D Production Systems

Advancements in additive manufacturing

Fortus® 3D Production Systems offer unparalleled versatility and capability to turn your CAD files into real parts. These parts are tough enough to be used as advanced conceptual models, functional prototypes, manufacturing tools and production parts. Engineers can produce a wide variety of products just by loading different files and materials. No traditional machining process can do that. And no other additive manufacturing system delivers the same advanced performance and production-grade parts as a Fortus 3D Production System.

Nothing less than durable parts

Whether it's a functional prototype or production part, everything a Fortus system produces is a real part. That's because they're built with the same durable thermoplastics as traditional injection molded plastic parts. Only with Fortus systems can production thermoplastic parts be produced directly from CAD files without expensive tooling.

Meet the demands of production

Fortus systems are as versatile and durable as the real parts they produce. They boast the largest build envelopes and material capacities in their class, delivering longer, uninterrupted build times, bigger parts and higher production run quantities than other additive manufacturing systems. Plus, they're true production workhorses, delivering the high throughput, duty cycles and utilization rates that make digital manufacturing not only possible, but practical.

Opening the way for new possibilities

Fortus 3D Production Systems can streamline processes from design through manufacturing, reducing costs and eliminating traditional barriers along the way. With Fortus, you can build CAD designs, streamline production with custom fabrication and assembly tools and tooling masters, and eliminate tooling costs for short runs. Breakthrough designs, process innovations, just-in-time manufacturing — whatever you can imagine, Fortus can make it real.

See the Results.

Advanced prototypes:
For sprinkler projects at Toro, Fortus systems helped reduce product development time by 283 weeks — and saved $500,000.

Advanced manufacturing tools:
At BMW, costs for producing manufacturing tools dropped significantly when engineers started producing tools with Fortus systems.

Advanced production parts:
Klock Werks used digital manufacturing to build custom motorcycle parts on their Fortus system, saving nearly $13,000. FDM parts cost less than a quarter of the price to injection mold or cast them.

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	FORTUS 250mc™	FORTUS 380mc™	FORTUS 450mc™	FORTUS 900mc™
Build Envelope	254 x 254 x 305 mm (10 x 10 x 12 in)	355 x 305 x 305 mm (14 x 12 x 12 in)	406 x 355 x 406 mm (16 x 14 x 16 in)	914 x 610 x 914 mm (36 x 24 x 36 in)
System Size/ Weight	838 x 737 x 1143 mm (33 x 29 x 45 in) 148 kg (326 lbs.)	1270 x 901.7 x 1943.1 mm (50 x 35.5 x 76.5 in) 601 kg (1325 lbs.)	50 x 35.5 x 76.5 in (1270 x 901.7 x 1943.1 mm) 601 kg (1325 lbs.)	2772 x 1683 x 2027 mm (109.1 x 66.3 x 79.8 in) 6325 lbs. (2869 kg)
Material Options	ABS*plus*™	ABS-M30™ ABS-M30i™ ABS-ESD7™ ASA PC-ISO™ PC FDM® Nylon 12™	ABS-M30 ABS-M30i ASA ABS-ESD7 PC-ISO PC FDM Nylon 12 ULTEM® 9085 resin ULTEM 1010 resin	ABSi™ PC-ISO ABS-M30 PC ABS-M30i FDM Nylon 12 ABS-ESD7 ULTEM 9085 resin PC-ABS PPSF ULTEM 1010 resin ASA
Throughput Comparison	1.0 x	2.3 x	2.3 x	2.1 x
Achievable Accuracy[1]	Parts are produced within an accuracy of: ± .241 mm (± .0095 in)	Parts are produced within an accuracy of: ±.127 mm (.005 in) or ± .005 mm/mm (.005 in/in), whichever is greater.	Parts are produced within an accuracy of: ±.127 mm (.005 in) or ± .005 mm/mm (.005 in/in), whichever is greater.	Parts are produced within an accuracy of: ±.127 mm (.005 in) or ± .005 mm/mm (.005 in/in), whichever is greater.[2]
Software	**Insight™** Insight software prepares 3D digital part files (output as an STL) to be manufactured on a Fortus system by automatically slicing and generating support structures and material extrusion paths in one push of a button. If necessary, users can override Insight's defaults to manually edit parameters that control the look, strength and precision of parts as well as the time, throughput, expense and efficiency of the FDM process. **Control Center™** Control Center is the software that communicates between the user workstation(s) and the Fortus system(s), managing jobs and monitoring the production status of Fortus systems. This software application provides the control to maximize efficiency, throughput and utilization while minimizing response time. Control Center is included with Insight software.			

[1]Accuracy is geometry-dependent. Achievable accuracy specification derived from statistical data at 95% dimensional yield.
[2]See Fortus 900mc accuracy study white paper for more information.

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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 production parts.

Material:	ABS*plus*	ABSi	ABS-M30	ABS-M30i	ABS-ESD7	PC-ABS	ASA
System Availability	Fortus 250mc	Fortus 400mc™ Fortus 900mc	Fortus 360mc™ Fortus 380mc Fortus 400mc Fortus 450mc Fortus 900mc	Fortus 380mc Fortus 400mc Fortus 450mc Fortus 900mc	Fortus 380mc Fortus 400mc Fortus 450mc Fortus 900mc	Fortus 360mc Fortus 400mc Fortus 900mc	Fortus 360mc Fortus 380mc Fortus 400mc Fortus 450mc Fortus 900mc
Layer Thickness:							
0.013 inch (0.330 mm)	X	X	X	X		X	X
0.010 inch (0.254 mm)	X	X	X	X	X	X	X
0.007 inch (0.178 mm)	X	X	X	X	X	X	X
0.005 inch (0.127 mm)		X[1]	X[1]	X[1]		X[1]	X[1]
Support Structure	Soluble	Soluble	Soluble	Soluble	Soluble	Soluble	Soluble
Available Colors	Ivory White Black Dark Grey Red Blue Olive Green Nectarine Fluorescent Yellow Custom Colors	Translucent Natural Translucent Amber Translucent Red	Ivory White Black Dark Gray Red Blue	Ivory	Black	Black	Ivory Black Dark Gray Light Gray White Red Orange Yellow Green Dark Blue
Tensile Strength (Ultimate)[2]	4,700 psi (33 MPa)	5,400 psi (37 MPa)	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)
Tensile Elongation[2]	6%	4.4%	XY: 7.0% Z: 2%	XY: 7% Z: 2%	3.0%	XY: 5.0% Z: 2%	XY: 9% Z: 3%
Flexural Stress	XY: 8,450 psi (56 MPa) Z: 5,050 psi (35 MPa)	8,980 psi (62 MPa)	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: 6,000 psi (41 MPa)	XY: 8,720 psi (59 MPa) Z: 6,900 psi (48 MPa)
IZOD Impact, notched	2.0 ft-lb/in (106 J/m)	1.8 ft-lb/in (96 J/m)	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)
Heat Deflection at 264 psi	82°C (180°F)	73°C (163°F)	82°C (180°F)	82°C (180°F)	82°C (180°F)	96°C (205°F)	91°C (196°F)
Unique Properties	Variety of color options	Translucent material	Variety of color options	ISO 10993 USP Class VI[4]	Static dissipative, target surface resistance of 107 ohms[7]	Strong (impact)	UV stable with the best aesthetics of any FDM material

[1] 0.005 inch (0.127 mm) layer thickness not available for Fortus 900mc.
[2] See individual material spec sheets for testing details.
[3] 0.013 inch (0.330 mm) layer thickness for PPSF not available on Fortus 900mc.
[4] 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.
[5] PC can attain 0.005 inch (0.127mm) layer thickness when used with SR-100 soluble support.
[6] Annealed
[7] Actual surface resistance may range from 109 to 106 ohms, depending upon geometry, build style and finishing techniques.

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Material:	PC-ISO	PC	FDM Nylon 12	ULTEM 9085 resin	ULTEM 1010 resin	PPSF
System Availability	Fortus 380mc Fortus 400mc Fortus 450mc Fortus 900mc	Fortus 360mc Fortus 380mc Fortus 400mc Fortus 450mc Fortus 900mc	Fortus 360mc Fortus 380mc Fortus 400mc Fortus 450mc Fortus 900mc	Fortus 400mc Fortus 450mc Fortus 900mc	Fortus 400mc Fortus 450mc Fortus 900mc	Fortus 400mc Fortus 900mc
Layer Thickness:						
0.013 inch (0.330 mm)	X	X	X	X	X	X[3]
0.010 inch (0.254 mm)	X	X	X	X	X	X
0.007 inch (0.178 mm)	X	X	X			
0.005 inch (0.127 mm)		X[1,5]				
Support Structure	Breakaway	Breakaway, Soluble	Soluble	Breakaway	Breakaway	Breakaway
Available Colors	☐ White ▒ Translucent Natural	☐ White	■ Black	▒ Tan ■ Black	▒ Natural	▒ Tan
Tensile Strength (Ultimate)[2]	8,265 psi (57 MPa)	9,800 psi (68 MPa)	XY: 7,000 psi (48 MPa) Z: 6,400 psi (44 MPa)	9,950 psi (72 MPa)	XY: 11,735 psi (81 MPa) Z: 4,209 psi (29 MPa)	8,000 psi (55 MPa)
Tensile Elongation[2]	4.3%	4.8%	XY: 30% Z: 5%	5.8%	XY: 3.3% Z: 1.3%	3.0%
Flexural Stress	13,089 psi (90 MPa)	15,100 psi (104 MPa)	XY: 10,000 psi (69 MPa) Z: 8,600 psi (59 MPa)	16,200 psi (112 MPa)	XY: 20,835 psi (144 MPa) Z: 11,184 psi (77 MPa)	15,900 psi (110 MPa)
IZOD Impact, notched	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)	2.0 ft-lb/in (106 J/m)	XY: 0.8 ft-lb/in (41 J/m) Z: 0.4 ft-lb/in (24 J/m)	1.1 ft-lb/in (59 J/m)
Heat Deflection at 264 psi	127°C (260°F)	127°C (261°F)	82°C[6] (180°F)[6]	153°C (307°F)	213°C (415°F)	189°C (372°F)
Unique Properties	ISO 10993 USP Class VI[4]	Strong (tension)	Fatigue-resistant, high elongation at break	Flame, smoke, toxicity (FST) certified	Food-safety and bio-compatibility certification	Highest heat and chemical resistance

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[7] Actual surface resistance may range from 109 to 106 ohms, depending upon geometry, build style and finishing techniques.

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Material	Highlights
 **ABS-M30, ABSplus** (acrylonitrile butadiene styrene)	• Versatile material: good for form, fit and functional applications • Familiar production material for accurate prototyping
 **ABS-ESD7** (acrylonitrile butadiene styrene - static dissipative)	• Static-dissipative with target surface resistance of 10^7 ohms (typical range 10^9 – 10^6 ohms)[2] • Makes great assembly tools for electronic and static sensitive products • Widely used for functional prototypes of cases, enclosures and packaging
 **ABS-M30i** (acrylonitrile butadiene styrene - ISO 10993 USP Class VI biocompatible)	• Biocompatible (ISO 10993 USP Class VI)1 material • Sterilizable using gamma radiation or ethylene oxide (EtO) sterilization methods • Best fit for applications requiring good strength and sterilization
 **ABSi** (acrylonitrile butadiene styrene - translucent)	• Translucent material available in natural, red and amber colors • Good blend of mechanical and aesthetic properties • Ideal for automotive design and monitoring fluid movement such as in medical-device prototyping
 **PC-ABS** (polycarbonate - acrylonitrile butadiene styrene)	• Superior mechanical properties and heat resistance of PC • Excellent feature definition and surface appeal of ABS • Hands-free support removal with soluble support
 **ASA** (acrylonitrile styrene acrylate)	• Build UV-stable parts with the best aesthetics of any FDM material • Ideal for production parts for outdoor infrastructure and commercial use, outdoor functional prototyping and automotive parts and accessory prototypes
 **PC** (polycarbonate)	• Most widely used industrial thermoplastic with superior mechanical properties and heat resistance • Accurate, durable and stable for strong parts, patterns for metal bending and composite work • Great for demanding prototyping needs, tooling and fixtures
 **PC-ISO** (polycarbonate - ISO 10993 USP Class VI biocompatible)	• Biocompatible (ISO 10993 USP Class VI)1 material • Sterilizable using gamma radiation or ethylene oxide (EtO) sterilization methods • Best fit for applications requiring higher strength and sterilization
 **ULTEM 9085 resin** (polyetherimide)	• FST (flame, smoke, toxicity)-certified thermoplastic • High heat and chemical resistance; highest tensile and flexural strength • Ideal for commercial transportation applications such as airplanes, buses, trains and boats
 **ULTEM 1010 resin** (polyetherimide)	• Food safety and bio-compatibility certification • Highest heat resistance, chemical resistance and tensile strength • Outstanding strength and thermal stability
 **PPSF/PPSU** (polyphenylsulfone)	• Highest heat and chemical resistance of all Fortus materials • Mechanically superior material, greatest strength • Ideal for applications in caustic and high heat environments
 **FDM Nylon 12** (polyamide 12)	• The toughest nylon in additive manufacturing • Excellent for repetitive snap fits, press fit inserts and fatigue-resistance applications • Simple, clean process – free of powders

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info@stratasys.com
STRATASYS.COM

HEADQUARTERS

7665 Commerce Way Eden Prairie, MN 55344, USA
+1 888 480 3548 (US Toll Free)
+1 952 937 3000 (Intl)
+1 952 937 0070 (Fax)

2 Holtzman St., Science Park, PO Box 2496 Rehovot 76124, Israel
+972 74 745-4000
+972 74 745-5000 (Fax)

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