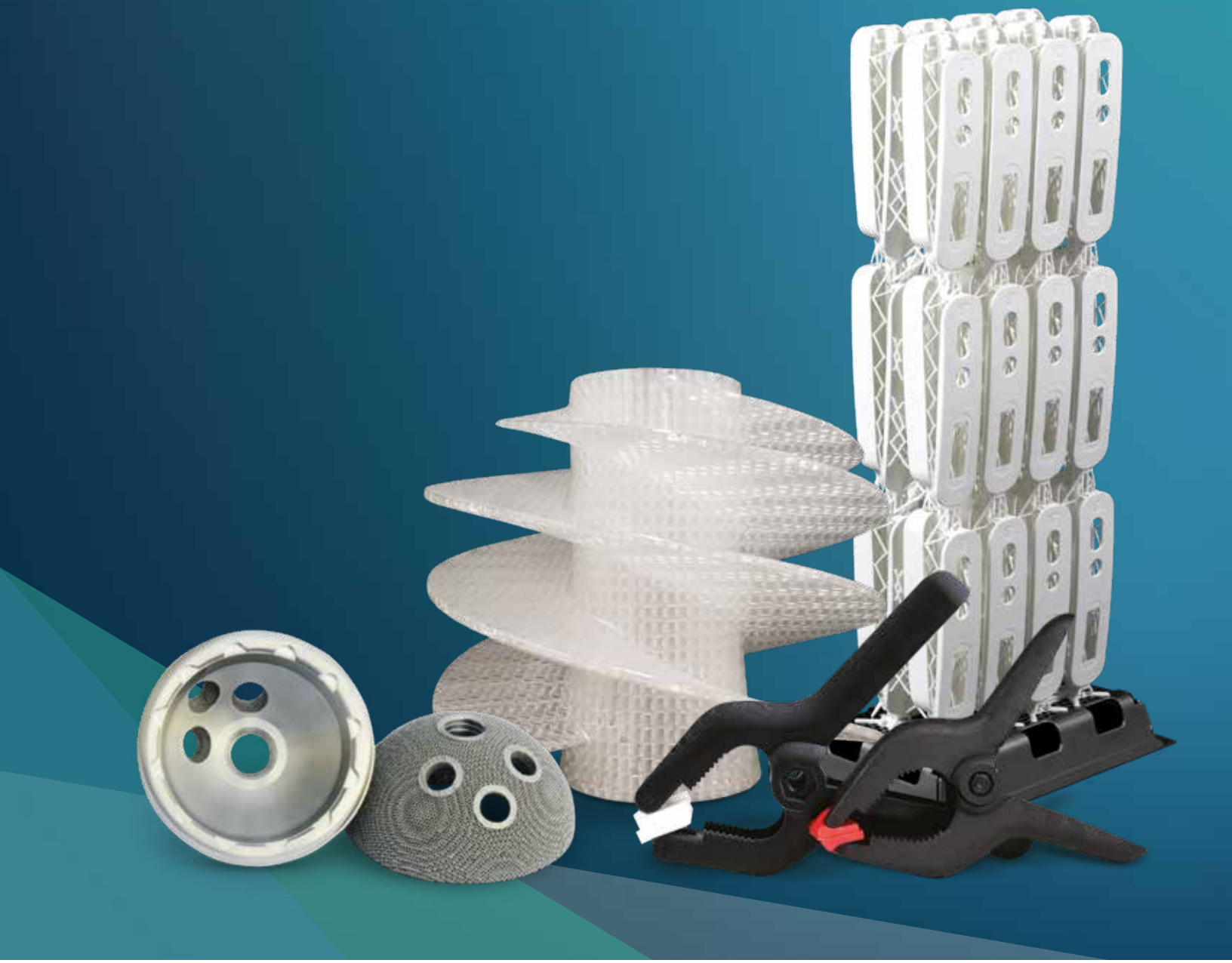
3D PRINTER BUYER'S GUIDE 2022

Insights to Help You Choose the Right 3D Printing Solution for Your Needs



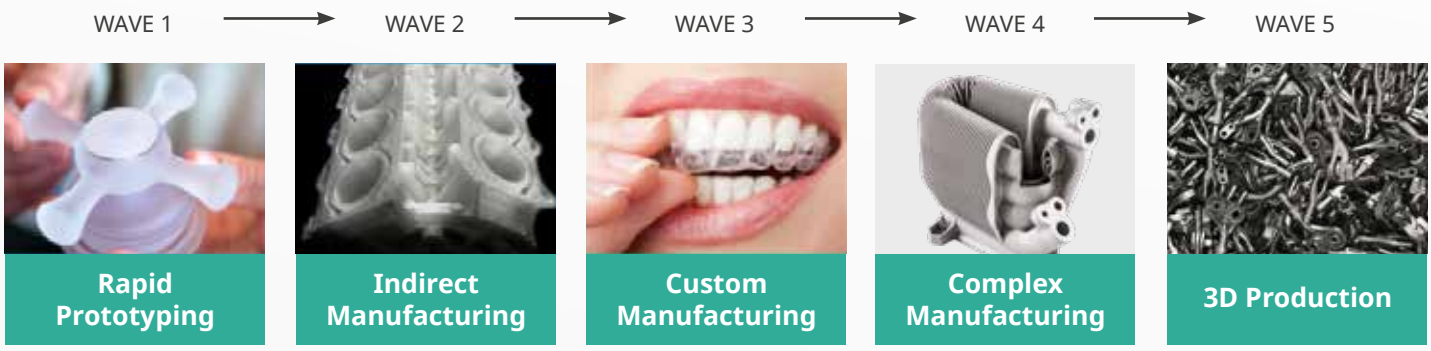
3D SYSTEMS
Additive Manufacturing Solutions

Contents

3D printing has become a critical part of manufacturing

3D printing is among the most important advancements in manufacturing since the Industrial Revolution.

Once used strictly for prototyping, 3D printing now offers transformative advantages at every phase of product creation, from initial concept design to production of final products and every step in between. The rapidly growing selection of materials, new approaches to automation and increases in speed are allowing for growth in applications for 3D printing across industries, ranging from aerospace and automotive to durable goods, healthcare, dental and jewelry.



Leveraging 3D printing effectively requires answering both business and technical questions.

This guide will help you define what's most important to you and weigh the pros and cons of different approaches to 3D printing.

Business considerations

Three key questions to ask yourself:

1.

WHAT ARE THE EXPECTED BENEFITS TO YOUR BUSINESS?

3D printing can offer a variety of business benefits, and it's important to clearly define the specific benefits you're seeking.

Is your number one priority to reduce costs in R&D, product development, or manufacturing? Or are you looking to generate more revenue by getting products to market faster or creating entirely new product lines made possible by additive manufacturing? Or perhaps you're new to this technology and need to explore 3D printing's potential with a well-rounded approach that offers maximum flexibility. Understanding your business priorities will help you select the right 3D printing approach for your needs now and in the future.

2.

WHAT IS THE TOTAL COST OF OPERATION?

It's important to look at total cost of operation (TCO) when it comes to 3D printing.

As you evaluate different approaches – including competing vendors, print technologies and in-house versus outsourced – keep the following in mind:

Capital cost of the printer(s)

Consumables (including materials and supplies like print heads)

Warranties

Labor time, especially as it relates to post-processing parts

Facilities (some 3D printers have plumbing, ventilation, or other requirements) and floor space

3. HOW CAN YOU ACCELERATE YOUR ADOPTION OF ADDITIVE MANUFACTURING?

3D printing offers unique advantages over traditional manufacturing technologies and can be used to solve your most difficult design and production challenges. 3D Systems takes a consultative approach to help our customers accelerate development and adoption of 3D printing, collaborating from concept to commercialization.

EXPLORE
Strategic consulting to identify your needs

INNOVATE
Joint applications development and design for additive manufacturing for specific needs

DEVELOP
QA and process characterization from pre-prototype through prototype

VALIDATE
Training, validation and certification

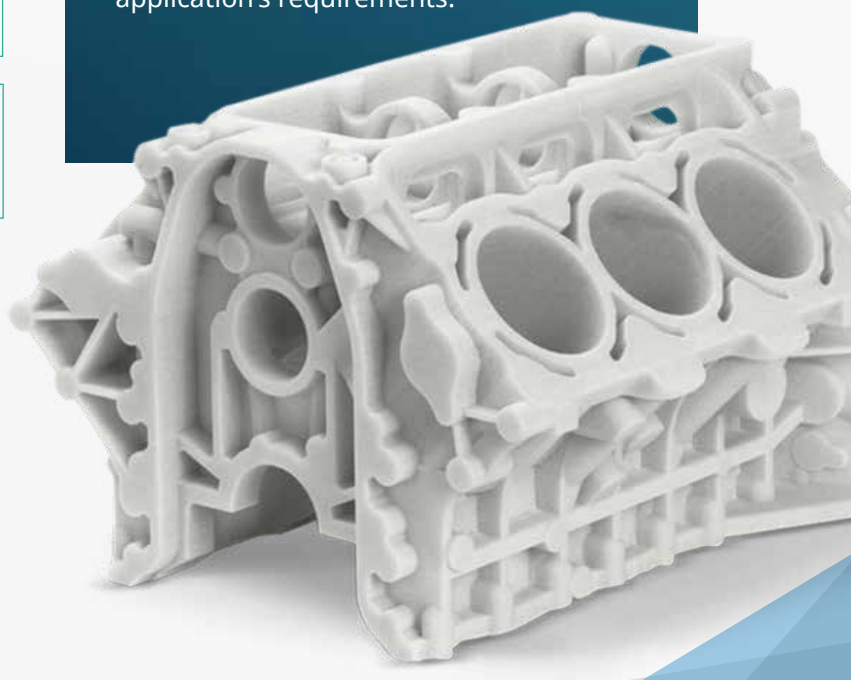
PRODUCE
Production and manufacturing services

SCALE
Scale up and technology transfer

Unlock greater performance with help from our Application Innovation Group

We draw on deep domain expertise to create additive manufacturing solutions that give you a competitive edge, from identifying your needs all the way through validating and scaling your manufacturing flow.

Experts within our Application Innovation Group will help you unlock benefits like increased capacity and reduced manufacturing time while also improving part performance. Together we'll identify your needs, work with you to optimize your designs and define the manufacturing flow to achieve your application's requirements.



Technical considerations

No single 3D printing technology can do it all.

There are many different 3D printing technologies, each with strengths and weaknesses that make them great for some applications and unsuitable for others. Each offers unique materials—from elastomers to plastics to metals and more – and uses different methods to create parts. Some make tough, production-grade parts that stand up to years of demanding service, while others make parts intended for short-term use. Some make large batches of parts at one time, while others are optimized to get small batches printed as quickly as possible.

Depending on the 3D printing technology and solution, the different levels of required experience, ease-of-use and automation from file to finished part should be considered, as well as the environment it is compatible with—office, lab, workshop, or factory.

Rather than go into specific detail about each technology, this guide will help you make the critically important step of matching the right technology to your application.

Beware the printer manufacturer that claims one print technology can address all of your needs.

No one offers as many print technologies as 3D Systems

We offer the largest portfolio of best-in-class solutions because we know that one size does not fit all. With seven different technology platforms across more than two dozen printers tailored to specific industry and application needs, we have the right solution for you.

SEE THE ENTIRE LINEUP OF 3D SYSTEMS PRINTERS

Getting the support you need

We're here to help.

There is a lot to learn when getting started with a new technology. Working with experts is an efficient way to evaluate your options, adopt best practices, flatten your learning curve and de-risk your investment.

APPLICATION INNOVATION GROUP

Whether you're just starting out or need ongoing support, the dedicated team of engineers, technicians and designers in 3D Systems' Application Innovation Group are here to help. Together we'll identify your needs, work with you to optimize your designs and define manufacturing flow to achieve your application's requirements. If you need production support we gladly provide manufacturing services through our ISO certified facilities, and we also offer technology transfer and training to enable production at your facilities at any time.

CUSTOMER INNOVATION CENTERS

3D Systems offers global facilities to provide comprehensive access to our full line of 3D printing solutions. These facilities offer the capability to deliver proof of concepts, develop your applications and run small size production to prove out our solutions.

Evaluation guide

Find the right 3D printer for your application.

This guide will provide you with an evaluation framework that will help you clearly define your 3D printing needs.

Your answers to the following questions will help 3D Systems experts identify the right 3D printing approach for your application.

Fill in your answers for your specific application so you can share it with the 3D Systems expert who will reach out to you soon.

BIOPRINTERS

DENTAL PRINTERS

EXTRUSION PRINTERS FOR HEALTHCARE

COLORJET PRINTERS

MULTIJET PRINTERS

DIRECT DIGITAL PRINTERS

SELECT LASER SINTERING PRINTERS

STEREOLITHOGRAPHY PRINTERS

DIRECT METAL PRINTERS

LARGE FORMAT EXTRUSION PRINTERS

1. SIZE OF SINGLE LARGEST PART

3D printers come in many different print volumes, and bigger does not necessarily equal better.

You'll want to balance maximum print volume with accuracy and printer cost. 3D printers that can both print large parts and achieve high levels of accuracy generally have the highest upfront investment.

We recommend selecting the largest part size you plan to print most of the time. If you have an occasional need to print parts larger than that, outsourcing those big parts through an on-demand 3D printed parts provider may be the most cost-effective approach.

What is the size of the single largest part you expect to 3D print?	
Your typical largest part *(select one)*:	
Fits in the palm of your hand Approximately 4in x 4in x 4in (10cm x 10cm x 10cm)	☐
Fits in a shoebox Approximately 12in x 8in x 5in (30cm x 20cm x 13cm)	☐
Fits on your desk Approximately 20in x 15in x 10in (50cm x 38cm x 25cm)	☐
Large Approximately 60in x 30in x 20in (150cm x 75cm x 50cm)	☐
Very large Approximately 50in x 50in x 72in (127cm x 127cm x 183cm)	☐

2. 3D PRINTED PART STRENGTH REQUIREMENTS

Fundamentally, finding the right 3D printing technology boils down to one question: do the parts you print do what you need them to do?

Do they have the mechanical properties your application needs? While there are many nuances and specific requirements in terms of how you need 3D printed parts to perform, it's helpful to define in very general terms what performance you expect from parts for your intended application.

Which category best describes how you need 3D printed parts to perform?	
Part strength and durability requirements *(select one)*:	
Production strength and durability Performs similarly to molded plastics (in the case of plastic printers) or cast metals (in the case of metal printers) for long-term use (e.g. production parts, functional prototypes subject to high mechanical stress).	☐
Functional prototype/limited-use strength Performs similarly to molded plastics for short-term use (e.g. functional prototypes subject to low mechanical stress, one-time use products, short-run tooling, injection molds, RTV molds, carbon fiber molds, jigs, fixtures).	☐
Appearance Specific mechanical properties are not important. Parts must be robust enough to be handled and shipped, but no mechanical loads will be applied (e.g. visual prototypes, sales models, artistic objects).	☐
Sacrificial patterns Printed objects will serve as sacrificial patterns for investment casting of metals (e.g. wax or resin patterns).	☐
Production tools, molds or patterns Printed objects will serve as tooling or molds for large-scale production parts, or as patterns for sand casting or investment casting.	☐

3. QUANTITY OF PARTS PER MONTH

Knowing how many parts you expect to print per month will help you select the optimal printer for your needs and neither overspend nor be stuck with a printer that can't keep up with your anticipated part quantities.

How many parts per month do you anticipate printing?	
Number of parts per month *(select one)*:	
1-50	☐
51-500	☐
501+	☐

It's important to note that "raw" print speed (time to get one part from the 3D printer) and throughput (productivity of the printer) are not the same thing. Many 3D printers can print parts in batches. For example, one part might take two hours to print, but 10 of the same part can be printed in two and a half hours on the same printer.

4. TIME-TO-PART OR THROUGHPUT

There is a significant difference between "raw" print speed and throughput, or productivity. This is one of the trickiest concepts in 3D printing, and often vendors will only publish raw print speed, which can lead to selecting the wrong printer for your needs.

Some 3D printers are optimized to print a single part very quickly but slow down when you try to print multiple parts simultaneously. Others are slower to print one part but can print 10, 50, or 100 parts simultaneously in only slightly more time. Similarly, some 3D printed parts need to be post-processed one-by-one, whereas others can be post-processed in batches.

Defining which is more important for your application—getting a single part printed and post-processed as fast as possible (time-to-part), or printing as many parts as possible per day, week, or month (throughput)—is important to making the right choice in printers.

Which is more important for your application?	
Speed or productivity (select one):	
Time-to-part is most important	☐
Throughput is most important	☐

Expert tip: When comparing 3D printers, make sure you understand the total time for your typical parts at your typical volumes. Ask for an explanation of all the steps involved in getting parts in hand, such as part cleaning, thermal curing, or cool down times.

5. ACCURACY, PRECISION, REPEATABILITY

Accuracy, precision and repeatability are complex topics that have many nuances and are dependent on a variety of factors including part size, material, geometry, post-processing, print orientation and more. 3D Systems' experts will help you determine the best approach for your specific needs, but in very general terms, defining your typical part tolerances will help us narrow the selection of 3D printers for your application.

What are your typical part tolerances for printed parts?	
Part tolerance (select one):	
Part tolerances tighter than 0.100mm / 0.004in My parts must fit in tight tolerances (for example, less than 0.1mm/0.004in). My parts need to be extremely accurate to the CAD model.	☐
Part tolerances tighter than 0.500mm / 0.020in My parts must fit in moderate tolerances (for example, less than 0.5mm/0.02in). While we may need tighter tolerances on individual features, global tolerances are moderate.	☐
Part tolerances above 0.500mm / 0.020in Time-to-part, throughput, or durability are more important.	☐

Many 3D Systems printers can print parts with tighter tolerances than those noted above. Identifying tolerance thresholds is a convenient starting point for more in-depth conversations about accuracy, precision and repeatability with a 3D Systems expert.

Note that certain accuracy requirements can also be met with secondary processing. 3D Systems offers advanced software that combines the best of additive and subtractive manufacturing. You can, for example, print extra stock for secondary machining, taking advantage of the speed and design freedom of 3D printing with the precision of CNC machining.

6. PART AESTHETICS

Some applications require printed parts that are visually appealing or have specific look and feel requirements. Other applications are purely functional, and part appearance doesn't matter as long as it performs as expected.

While there are many ways to get the exact look and feel you need for a given part, including post-processing techniques such as sanding and painting, you'll want to choose the printer that best fits your application's aesthetic requirements.

How important is each of the following aesthetic qualities?					
Aesthetic quality	Not very important				Very important
Smooth surface finish	☐	☐	☐	☐	☐
Fine feature detail and sharp edges	☐	☐	☐	☐	☐
Full color parts	☐	☐	☐	☐	☐
Clear/transparent parts	☐	☐	☐	☐	☐

7. FLEXIBILITY OF PRINT OPTIONS

Each 3D printing technology has a unique set of material options. An important consideration is how frequently you anticipate switching the materials you're using. Some 3D printers are configured to run one material most or all of the time with infrequent changeovers, whereas others make it easy to swap materials with little downtime or wasted material. Still others can print in multiple materials simultaneously. A 3D Systems expert will be able to advise you on the selection of materials and how easy it is to switch between them.

How frequently do you anticipate needing to print in different materials?	
Material capability (select one):	
One material all or most of the time All of our parts can be printed in the same material, with switching materials maybe once or twice per **year**.	☐
Occasional switching of materials We may need to switch materials a few times **monthly** to print parts with different properties (color, stiffness, flexibility, temperature resistance, etc.)	☐
Frequent switching of materials We need to be able to swap materials **weekly** or daily, so quick changeovers with minimal downtime is important.	☐
Multi-material in a single part or build We need to print in multiple materials simultaneously within a single print to achieve different properties and aspects (rigid or flexible, clear or opaque).	☐

8. INITIAL INVESTMENT AND TOTAL COST OF OPERATION

Depending on your application and how your company decides to adopt additive manufacturing, you may prioritize a low cost of entry so that you can experiment and test how 3D printing will benefit your business. On the other hand, if you have an additive manufacturing strategy in place and know how 3D printed parts fit into your business strategy, making the higher initial investment in a production 3D printer with support from 3D Systems' experts will result in a lower total cost of operation.

Which budget/ROI priority is more important?	
Budget (select one):	
Low initial investment is most important We expect to use 3D printing less frequently, and are willing to trade off part properties, higher per-part costs and lower throughput for a lower initial investment.	☐
High throughput and/or production-grade parts is most important We are willing to make the upfront investment to print in high volumes and/or print production-grade parts, and enjoy a low per-part cost when printing in high volumes.	☐

9. SPECIFIC PART PROPERTIES

Many applications require specific part qualities. Check the box next to each property required for your 3D printed parts, or write in specific part properties that are not listed.

What are the requirements for your 3D printed parts?	
Part property *(check all that apply)*:	
Metal	☐
Strong, rigid (ABS)	☐
Durable, tough (Polypropylene)	☐
Elastomeric	☐
Nylon	☐
Fiber and filled reinforced	☐
True thermoplastics	☐
Castable	☐
Biocompatible	☐
High temperature resistance	☐
Flame retardant	☐
Transparent	☐
Dental	☐
Other: _____	

Save your answers in this PDF and share it with your 3D Systems representative. They will review your answers and discuss them with you to recommend the best 3D printer for your needs.

3D Systems' materials

3D Systems offers materials for each of the requirements listed above. With the industry's most extensive and versatile portfolio of metal, plastic, elastomer, composite, wax, metal, and other material types, our printer and material combinations can meet the performance characteristics your application needs.

LEARN MORE ABOUT 3D SYSTEMS MATERIALS

3D Systems' 3D printers

Solutions for prototyping to production, in plastics and metals.

With the broadest scope of 3D printing technologies, we offer you a perfect combination of process, material and application expertise to integrate the right solution into your specific workflow.

Direct Metal Printing (DMP) printers

Rethink metal part design and produce products, components and tools with reduced weight, increased functionalities and simplified assemblies. Save time, cost and part weight with high quality, precision metal manufacturing solutions comprised of integrated software, metal additive technology, certified materials and expert application support.

DMP PRINTERS

Stereolithography (SLA) printers

With exceptional surface finish, accuracy and precision, these 3D printers offer an expanded range of plastic materials and operate with minimal waste to deliver the most productive and reliable operation, including large build volumes.

SLA PRINTERS

Selective Laser Sintering (SLS) printers

Suitable for tough prototypes and end-use production parts, 3D Systems' selective laser sintering platforms offer a wide range of nylon materials that meet almost any need: high durability, heat and impact resistance, elongation, glass- or aluminum-filled, flame retardant, certified Class VI for medical, chemical resistance and ISO 10993 for food contact.

SLS PRINTERS

Direct Digital printers

The industry's first scalable, fully-integrated 3D printing platform with ultra-fast speed. Figure 4 solutions deliver accurate parts in a diverse range of robust, production-grade materials for immediate part turnaround without the costs and delays of tooling. Figure 4 platforms are ideal for fast product iteration, mass-customization, bridge manufacturing and low volume production.

FIGURE 4 PRINTERS

ColorJet (CJP) printers

From educational settings to the most demanding commercial environments, 3D Systems' family of ProJet® CJP x60 3D printers provides unparalleled color capabilities at exceptional print speeds, efficiency and low operational costs.

CJP PRINTERS

MultiJet (MJP) printers

MultiJet Printing technology offers fast print times, easy operation and true-to-CAD accuracy for high productivity, from file to finished part. The wide range of advanced plastic, elastomeric, composite and wax materials for MJP printers produces high performance parts for concept models, functional prototypes, casting patterns, rapid tooling, jigs, fixtures and medical applications.

MJP PRINTERS

3D Systems' 3D printers

Solutions for prototyping to production, in plastics and metals.

With the broadest scope of 3D printing technologies, we offer you a perfect combination of process, material and application expertise to integrate the right solution into your specific workflow.

Large format extrusion printers

Ideal for large molds, patterns, tools and production parts up to 50in x 50in x 72in. Large-format, industrial scale Titan 3D printers are available in multiple pellet and filament configurations to deliver your preferred combination of high speed and low cost, with optional CNC part finishing via an integrated industrial CNC spindle.

LARGE FORMAT EXTRUSION PRINTERS

Extrusion printers for healthcare

The first fused layer manufacturing 3D printer built for medical device production, the Kumovis R1 is an open filament platform designed to enable manufacture of medical devices with implant- and medical-grade polymers like PEEK and PPSU. It is the only extrusion platform that features an integrated clean room and is validated by leading medical device manufacturers and hospitals worldwide.

EXTRUSION PRINTERS FOR HEALTHCARE

Bioprinters

The Allevi portfolio of bioprinters is optimized for research and experimentation using a wide range of biomaterials and cells, with geometrical freedom. A compressed air pneumatic system enables clean starts and stops in printing, with cooled and heated temperature control from 4°C to 160°C.

BIOPRINTERS

What's next?
Interested in learning more about 3D printing?

Get in touch today - we will be right with you.

CONTACT US

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