eBook

Stereolithography 2.0

for Ultrafast Prototyping and Series Production

nexa3D®

CONTENTS

INTRODUCTION

Today's product companies of all sizes are looking for design agility, supply chain resiliency and sustainability throughout their entire product life cycle.

At Nexa3D, we are delivering a new class of ultrafast production-grade polymer 3D printers that for the first time, makes it possible for you to use the same technology throughout your product life cycle from rapid design and prototyping iterations all the way through series production at scale. As a product company ourselves, we experienced first-hand the pain points that have held back adoption of production 3D printers for the past two decades – low productivity, inconsistent performance and poor yields. So, we developed a new class of ultrafast photopolymer printers that take current AM speeds from 'dialup internet' to 'broadband' printing, providing up to 20X productivity gains across the entire design to manufacturing cycle.

As product engineers, we know first-hand, that it's all about getting parts at scale fast, cost effectively and with the desired mechanical properties. So, we developed a disruptive open platform model, analogous to Google's Android, attracting all the leading polymer suppliers. We successfully formed collaborations with the world's leading material suppliers including Henkel, BASF, DSM, Evonik, and Arkema, unlocking the full potential of performance polymers tailored for faster, more economical design cycles and series production. Our printers deliver process stability with built-in quality assurance for production scaling with unmatched yields print after print. We combine process and geometry algorithms with sensor data and validated workflows that together open the aperture of photopolymer resins speed and performance achieving economics comparable to injection molding minimizing supply chain and part count complexities, lead-times and the substantial costs typically associated with tooled plastics.

PP-Like Functional

xMED412

Tough and durable clear material with the aesthetics of molded PP. Passes necessary ISO 10993 tests for short and long-term skin contact.

CHARACTERISTICS

- HDPE or PE-like stiffness
- Tough and durable
- Passes cytotoxicity, sensitization and irritation tests necessary for short and long-term skin contact (ISO 10993)
- Autoclavable

USES

- Functional prototypes
- End-use parts
- Skin contact medical devices including wearables
- Nasopharyngeal nasal swabs

Property/Test	Value
Ultimate Tensile Strength/ASTM D638	38 MPa
Tensile Elongation at Break/ASTM D638	141%
Flex Modulus/ASTM D790	1022 MPa
Flex Strength/ASTM D790	38 MPa
Hardness (Shore D)/ASTM D2240	75
Notched Izod/ASTM D256	43 J/m
HDT @0.45 MPa/ASTM D648	40°C
Water Absorption/ASTM D570	0.36%

PP-Like Functional

xPP405 Black

A tough, impact-resistant material with a modulus similar to molded unfilled polypropylene. Exhibits excellent weathering characteristics and UV stability making it suitable for end-use part applications.

CHARACTERISTICS

- Semi-rigid with modulus and good toughness like unfilled polypropylene
- Good weathering
- Smooth black surface finish

USES

- Design verification models
- Functional prototypes
- End-use parts including packaging, piping and consumer and industrial applications, including large housings and enclosures

Property/Test	Value
Tensile Modulus/ASTM D638	1580 MPa
Ultimate Tensile Strength/ASTM D638	42 MPa
Tensile Elongation at Break/ASTM D638	87%
Flex Modulus/ASTM D790	1180 MPa
Flex Strength/ASTM D790	50 MPa
Hardness (shore D) ASTM D2240	80
Notched Izod/ASTM D256	62 J/m
HDT @0.45 MPa/ASTM D648	53°C
Water Absorption/ASTM D570	1.00%

PP-Like Functional

xPP405-Clear

A tough, impact-resistant material with a modulus similar to molded unfilled polypropylene. Exhibits excellent weathering characteristics and UV stability making it suitable for end-use part applications.

CHARACTERISTICS

- Semi-rigid with modulus and good toughness like unfilled polypropylene
- Good weathering
- Attractive frosted clear finish that can be finished to high optical clarity

USES

- Design verification models especially where clarity is desirable
- Functional prototypes especially where clarity is desirable
- Fluid flow evaluation models where clarity is essential
- End-use parts including packaging, piping and consumer and industrial applications, including large housings and enclosures

Property/Test	Value
Tensile Modulus/ASTM D638	1620 MPa
Ultimate Tensile Strength/ASTM D638	39 MPa
Tensile Elongation at Break/ASTM D638	92%
Flex Modulus/ASTM D790	1500 MPa
Flex Strength/ASTM D790	69 MPa
Hardness (Shore D)/ASTM D2240	79
Notched Izod/ASTM D256	62 J/m
HDT @0.45 MPa/ASTM D648	53°C
Water Absorption/ASTM D570	2.00%

RAPID INNOVATION – COVID19 RESPONSE

Developed together with LOCTITE®, tens of thousands of parts produced weekly.

BACKGROUND

Today, under normal circumstances, face shields are used by millions of people. In addition to medical workers, they are utilized by dental providers, veterinarians, laboratory workers, emergency medical technicians, police, firefighters, and cleaning crews who deal with spills and contaminated waste. With the onset of the pandemic, they are also being worn by workers at utilities, logistics, retail and other essential businesses.

Faceshields have been shown to significantly reduce the risk of inhalation and other forms of contact with infectious pathogens. In fact, several studies have shown them to reduce specific types of viral exposure by 68% to as much as 96%. Further, they are typically more comfortable to wear and reduce the risk of autoinoculation by preventing the user from touching their face.

CHALLENGE

With depleting supplies of PPE (face shields) for front line workers during Covid-19 pandemic, the demand on supply grew resulting in significantly longer lead times and price increases globally. Supply Chain ability to respond to rapidly changing situation were limited.

SOLUTION

Nexa3D and Henkel/LOCTITE 3D Printing now jointly works on ultra-fast production and enable faster response to the COVID pandemic.

RESULTS

- Rapid print speed and large build volume (NXE 400)
- Resin high print accuracy & function (flexural & tensile)
- Great Printer/Great Resin + Validated Workflow = Creative Solution

> *Without proper facial protection, healthcare workers are at a higher risk of contracting the virus, which could place substantial strain on the healthcare workforce in the months ahead.*
>
> ***– Miko Enomoto, M.D.***
> ***Associate Professor of Anesthesiology and Perioperative Medicine***
> ***OHSU School of Medicine***

ABS-Like Functional

3843-xABS Black

Tough and durable material with the aesthetics of injection molded black ABS.

CHARACTERISTICS

- ABS-like stiffness
- Tough & durable
- Great feature detail

USES

- Design verification models
- Functional prototypes
- Snap fits
- Jigs and fixtures
- Patterns
- End use parts

Property/Test	Value
Tensile Modulus/ASTM D638	1620 MPa
Ultimate Tensile Strength/ASTM D638	60 MPa
Tensile Elongation at Break/ASTM D638	47%
Flex Modulus/ASTM D790	1860 MPa
Flex Strength/ASTM D790	81 MPa
Hardness (Shore D)/ASTM D2240	86
Notched Izod/ASTM D256	54 J/m
HDT @0.45 MPa/ASTM D648	80°C
Water Absorption/ASTM D570	2.35%

FLYER USES THE NXE400 TO QUICKLY PROTOTYPE NEW E-BIKES

Improved speed, better surface quality, and reliability.

BACKGROUND

The Swiss company FLYER develops and manufactures premium Swiss quality FLYER e-bikes, which have been on the market since 1995. Development at FLYER is based on innovation, a love of detail, painstaking care, and an eye for design. This e-bike pioneer offers e-bikes for every need: from classic low step-through frames, to city bikes and sporty e-mountain bikes. In a pioneering role, FLYER has amassed a wealth of solid experience, and has had a considerable impact on and contributed to the success of E-Bikes in Europe. This know-how is integrated into their products and services every single day.

CHALLENGE

In order to support the company's growth, FLYER saw a need to upgrade to an industrial stereolithography (SLA) style printer that could yield more parts, with a smooth, detailed surface finish, at faster speeds.

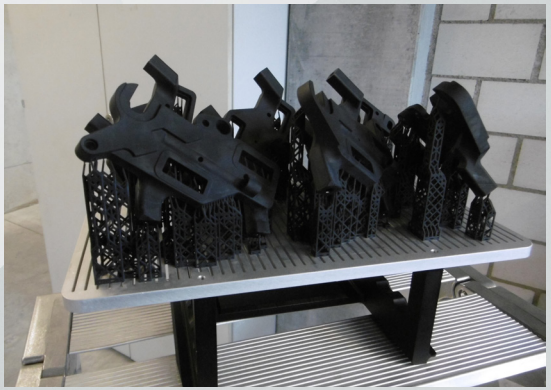
SOLUTION

Design and production time decreased by 48%. FLYER was also able to cost-effectively achieve faster design iterations and bring their innovative designs to market sooner.

RESULTS

- Design and production time decreased by 48%.
- Accurate prints with better surface resolution
- Accelerated time to market
- Faster design iterations

> *Our e-bike components have a lot of structural complexities to them. We needed a 3D printer that could reliably meet tight tolerances and help streamline our design process.*
>
> ***– Berthold Jonientz, FLYER***



Engineering Plastic Functional

xCE White & Black

High stiffness and temperature materials with the aesthetics of injection molded nylons, polyesters, polyamides and polyimides.

CHARACTERISTICS

- High-performance plastic stiffness
- High temperature
- Durable, resistant to chemicals

USES

- Functional prototypes subject to higher temperature evaluations
- Low volume injection molding inserts for lower temperature plastics
- End use parts

Property/Test	Value
Tensile Modulus/ASTM D638	1620 MPa
Ultimate Tensile Strength/ASTM D638	80 MPa
Tensile Elongation at Break/ASTM D638	8%
Flex Modulus/ASTM D790	3250 MPa
Flex Strength/ASTM D790	135 MPa
Hardness (Shore D)/ASTM D2240	90
Notched Izod/ASTM D256	20 J/m
HDT @0.45 MPa/ASTM D648	120°C
Water Absorption/ASTM D570	0.4%

Engineering Plastic Functional

xPEEK147

A stiff, heat-resistant material with a HDT of 230°C similar to many PAEK thermoplastics like PEEK. Exhibits excellent long-term stability at temperatures exceeding 100°C making it suitable for prototypes and end-use parts subjected to high temperatures and fast tooling for plastic molding.

CHARACTERISTICS

- High heat deflection temperature
- High stiffness with good dimensional stability
- Good surface finish

USES

- High performance prototypes or end use parts requiring high temperature capability and long-term thermal stability
- Tools and molds requiring good surface and long-term thermal stability >125°C

Property/Test	Value
Tensile Modulus/ASTM D638	3190 MPa
Ultimate Tensile Strength/ASTM D638	75 MPa
Tensile Elongation at Break/ASTM D638	3%
Flex Modulus/ASTM D790	2170 MPa
Flex Strength/ASTM D790	130 MPa
Hardness (Shore D)/ASTM D2240	94
Notched Izod/ASTM D256	15 J/m
HDT @0.45 MPa/ASTM D648	238°C
Water Absorption/ASTM D570	0.25%

OPTIMIZ3D USES THE NXE 400 TO DELIVER PROTOTYPES IN ONE DAY AND ELIMINATE TOOLING COSTS

Cost savings, a fast production start, and the flexiblity to implement later design modifications without expensive tooling changes.

ABOUT

Optimiz3D is a start-up contract manufacturer with the plan to not only offer traditional CNC machining services, but to also offer higher value manufacturing and fast turnaround times. They do this by specializing in both 5-axis CNC manufacturing and 3D printing services.

Their services include on-demand production of prototypes, short-run manufacturing as well as custom production applications.

CHALLENGE

To maximize productivity and yield while also producing high-quality parts in less time with high machine utilization.

SOLUTION

We used xCE-Black material which has excellent mechanical properties and high temperature resistance. The main benefit of 3D printing is the zero tooling cost, thus lifetime project cost is smaller than in the case of injection molding.

RESULTS

- Over €7,500 cost savings when compared to injection molding
- Lead time reduced from weeks to days
- Small series production with ultra-fast print speeds

> *The NXE 400 has given our business and our customers a real advantage. They are able to evaluate their designs faster, modify their designs easier, and even run small series production with us at record speeds.*
>
> – ***Miha Koprivec, Director, Optimiz3D***

General Purpose

xGPP Translucent, Gray

General purpose materials offering fast build speeds and good accuracy and detail.

CHARACTERISTICS

- Mid-range stiffness
- Fast build speed
- Excellent accuracy and aesthetics
- Lower part cost

USES

- Quick design verification models
- Display models
- Models where accuracy and resolution are critical

Property/Test	Value
Ultimate Tensile Strength/ASTM D638	30-60 MPa
Tensile Elongation at Break/ASTM D638	4-5.5%
Hardness (Shore D)/ASTM D2240	84 - 88
HDT @0.45 MPa/ASTM D648	59 - 61°C
Water Absorption/ASTM D570	0.4%

MOTOROLA SOLUTIONS: PROTOTYPES PRODUCED WITHIN MINUTES

How Motorola Solutions is Speeding Things Up with the NXE400

BACKGROUND

As a global leader in mission-critical communications and analytics, Motorola Solutions utilizes 3D printers for the design and development of highly sophisticated communications devices for professional and mission-critical markets in the commercial, government and industrial segments. Their AM capabilities are an essential part of their product development process and allow for thedesign flexibility they need for a wide range of parts.

CHALLENGE

When it came to their larger, complex designs, such as a housing enclosure, they were running into several issues. First, their build time was increasing due to the limited amount they could yield in one build. Secondly, some of their larger designs couldn't fit their current build platforms. Lastly, their FDM machines produced stair-stepped surfaces that required additional steps to removelayer lines.

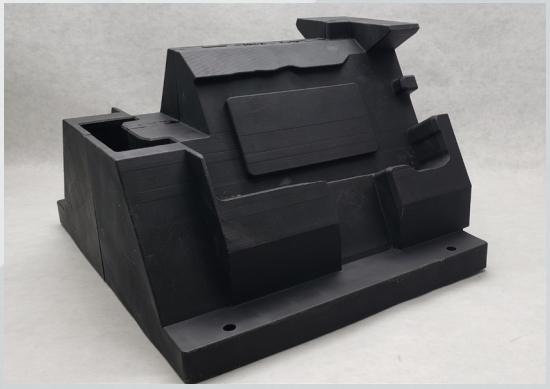
SOLUTION

Motorola Solutions identified several industrial-sized SLA printers to test against their size requirements, materials, and design. At the end of their evaluation, none were able to match the speed, durability, accuracy, and build area of the NXE 400. The cost of ownership for the NXE 400 was straightforward and was going to ultimately help them remain profitable and reduce costs.

RESULTS

- Highest Speed in the Industry
- Smooth Surface Finish
- Large Build Volume
- Optimized Production Processes

> *We have been working with the Nexa3D team for almost a year now, and they have taken a lot of feedback and implemented lots of very positive changes to the machine and software in a really short period of time. The machine and software get better with every update. The speed and quality of parts still blows my mind every time I run it. I am extremely pleased with the NXE 400, and it is a great addition to our in-house capabilities.*
>
> ***– Peter Edwards, Lead AM Technology Manager, Motorola Solutions***



General Purpose

xPRO410

General purpose materials offering fast build speeds and good accuracy and detail.

CHARACTERISTICS

- Mid-range stiffness
- Fast build speed
- Excellent accuracy and aesthetics
- Lower part cost

USES

- Quick design verification models
- Display models
- Models where accuracy and resolution are critical

Property/Test	Value
Tensile Modulus/D638	2365 MPa
Ultimate Tensile Strength/D638	41 MPa
Tensile Elongation at Break/D638	5.5%
Hardness (Shore D)/D2240	79
Notched Izod/D256	25 J/m
HDT @0.45 MPa/D648	61°C
Water Absorption/D570	0.46%

DMM: LARGEST 3D PRINTING SERVICE BUREAU IN JAPAN DRASTICALLY REDUCES LEAD TIME BY 50%

Previous lead times of 1-2 weeks were now being quoted at just 2-3 business days.

BACKGROUND

DMM is the largest 3D printing service bureau in Japan. They are a full-service agency that offers a variety of solutions including, cloudbased contract modeling services, 3D printing consultation, rental services, and complete operation. They print more than 1.5 million parts a year on a fleet of 50+ industrial printers that utilize a wide range of materials such as advanced plastics, resins, and metals.

CHALLENGE

Although DMM has a vast network of industrial 3D printers with a variety of capabilities, their current selection of printers could not meet the turnaround time and quality requirements of some of their customers.

SOLUTION

Ultra-fast speed and reliable quality were DMM's top two requirements when it came to evaluating potential printers. They turned to their trusted 3D printer supplier Brulé, to help them with their search. With Brulé's extensive 3D printer experience and knowledge, they were able to confidently recommend Nexa3D's NXE 400 3D printer as the best contender for their needs.

RESULTS

- Reduced lead times by more than 50%
- Reliable quality parts
- Significant productivity gains
- Improved competitiveness

> *We have been tracking Nexa3D's development for more than a year, and we are still wowed when watching its remarkable speed. Nexa3D's speed is analogous to the introduction of 5G wireless–it will enable engineers to develop new applications and workflows that would have been unachievable in the past. And, watching detailed parts get created in minutes definitely feels like the future.*
>
> ***– Douglas Krone, Founder Brule***

Casting

xCast

Expendable casting pattern material for metal investment casting.

CHARACTERISTICS

- Hollow shell build style minimizes pattern material
- Low thermal expansion
- Low ash content

USES

- Fast production quality prototypes
- Low-volume tooless manufacturing

Property/Test	Value
Tensile Modulus/ASTM D638	1620 MPa
Ultimate Tensile Strength/ASTM D638	9.5 MPa
Tensile Elongation at Break/ASTM D638	8.5%
Flex Modulus/ASTM D790	255 MPa
Flex Strength/ASTM D790	13 MPa
Hardness (Shore D)/ASTM D2240	59
HDT @0.45 MPa/ASTM D648	32°C
Water Absorption/ASTM D570	1.65%

HAUX-LIFE-SUPPORT USES THE NXE 400 TO BREAK THE SPEED AND SIZE BARRIERS

6 times the speed and 2.5 times the volume compared to all other comparable 3D printers on the market.

BACKGROUND

Since its founding in 1980, HAUX-LIFE-SUPPORT has stood for outstanding technical performance, innovation, quality and reliability. The company develops and manufactures state-of-the-art systems and equipment, provides tailor-made solutions for customers, and has more than 1,500 hyperbaric HAUX systems delivered worldwide. Over the past almost 4 decades, HAUX-LIFE-SUPPORT has become the world market leader in the fields of medical, tunneling, and diving technology.

CHALLENGE

The company had a set of standard parts, but needed many individual parts (1-500) to finish the project, and many of these parts were very complex and needed to be 3D printed.

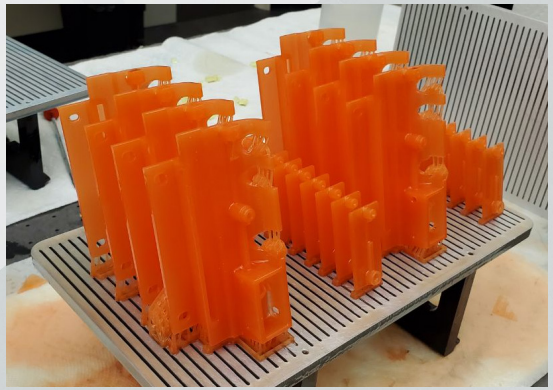
SOLUTION

Nexa3D's unique LSPc technology breaks the speed barrier by actively overcoming the traditional speed limiting factors of traditional SLA without compromising accuracy and resolution.

RESULTS

- Highest Speed in the Industry
- Injection Molded-Like Accuracy
- Surface Resolution
- Ease of Use

> *With Nexa3D's innovative NXE 400, we were able to produce functional end use parts at a very high speed with great precision and reliability.*
>
> – ***Mr. Paul Ziegenhagel, HAUX-LIFE-SUPPORT***



Dental

KeyModel Ultra

Model material for thermoforming and removal die and model application.

CHARACTERISTICS

- Accurate.
- Easy thermoforming release
- Flawless detail
- Carve-able without chipping

USES

- Dental thermoforming application(100µm)
- Dental removal die and model application (50µm)

Property/Test	Value
Tensile Modulus/D638	1700 MPa
Ultimate Tensile Strength/D638	50 MPa
Tensile Elongation at Break/D638	5%
Flex Modulus/D790	1940 MPa
Flex Strength/D790	70 MPa

Dental

KeySplint Soft

Splint material for splints, night guards and bleaching trays.

CHARACTERISTICS

- Biocompatible
- Strong
- Flexible
- Easy to polish
- Easily Cleaned

USES

- Splints, night guards and bleaching trays (100µm)

Property/Test	Value
Tensile Elongation at Break/D638	110%
Flex Modulus/ASTM D790	1100 MPa
Flex Strength/ASTM D790	44 MPa
Flex Modulus/ISO 20795-2	135 MPa
Flex Strength/ISO 20795-2	2.6 MPa
Hardness (Shore D)/ASTM D2240	80
HDT @0.45 MPa/ASTM D648	32°C
Sorption/ISO 20795-2	<18 µg/mm³
Solubility/ISO 20795-2	<4.8 µg/mm³
Free Monomer Extraction	<2.2%
Cytotoxicity/ISO 10993	Pass
Irritation/ISO 10993	Pass
Sensitization/ISO 10993	Pass

Dental

KeyGuide

Guide material for surgical guides.

CHARACTERISTICS

- Biocompatible
- Strong
- Easy to Polish
- Autoclavable

USES

- Surgical guides (100µm)

Property/Test	Value
Flex Modulus/ASTM D790	2400 MPa
Flex Strength/ASTM D790	105 MPa
Biocompatibility/ISO 10993-5	Pass
Biocompatibility/ISO 10993-10	Pass

Dental

KeyTray

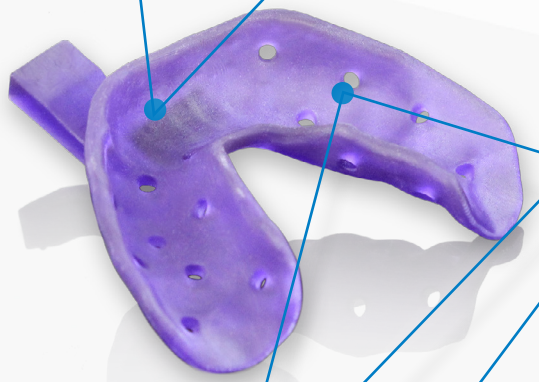
Tray resin for creating customized impression trays.

CHARACTERISTICS

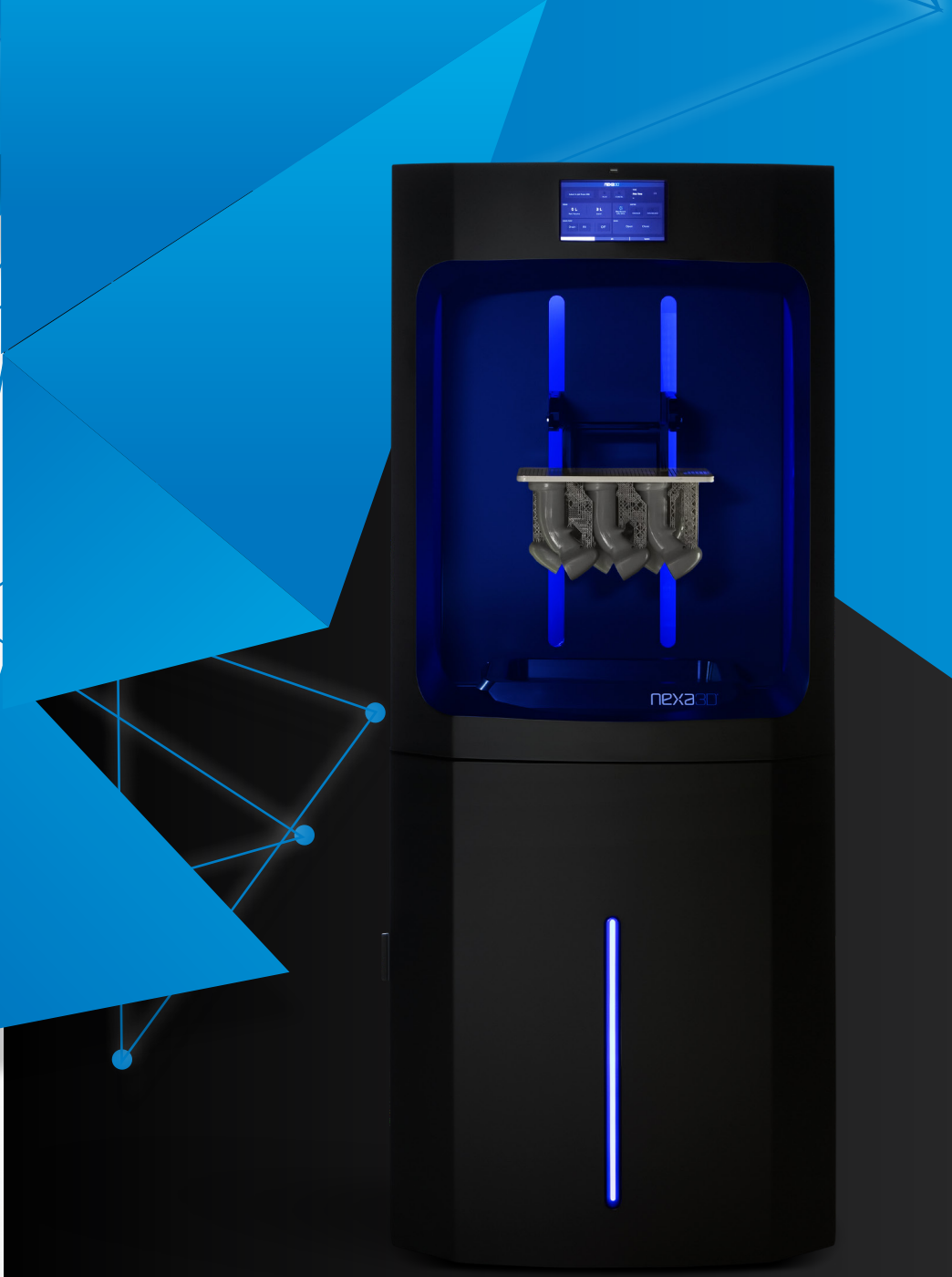
- Biocompatible
- Strong
- No preliminary casting required
- Improved impression accuracy
- Compound waxes and border molding materials will adhere to tray

USES

- Customized impression trays (100µm)



Property/Test	Value
Tensile Modulus/ASTM D638	2056 MPa
Ultimate Tensile Strength/ASTM D638	62 MPa
Tensile Elongation at Break/ASTM D638	26%
Flex Modulus/ASTM D790	1913 MPa
Flex Strength/ASTM D790	85 MPa
Hardness (Shore D)/ASTM D2240	86



PHOTOPLASTIC PRINTER

NXE 400

With an unprecedented 16L build volume measuring 10.8 in x 6.3 in x 15.7 in (27.5 cm x 16 cm x 40 cm), intelligent optimization, and Nexa3D's revolutionary patented LSPc technology, the NXE 400 is the perfect printer for any application.

2.5x Larger Build Volume
The NXE 400 features more than double the build volume compared to currently available technologies, allowing for much larger parts, higher part throughput, and ultimately lower part cost, all with the higher-resolution pixels (75 µm) and isotropic prints.

Manufacturing Ready + Modular Design
In addition to our highly reliable LSPc technology, the NXE 400 is crafted to be completely modular in design for easily interchangeable parts and technology upgrades eliminating hardware obsolescence.

Next-Gen Software + Predictive Service
Nexa3D's internally developed intelligent software connects our hardware and materials together into a powerful, user friendly system while providing a new era of predictive and prescriptive service. It's as simple as pressing CRTL+P.

NEED HELP CHOOSING THE RIGHT MATERIAL FOR YOUR APPLICATION?

Our experts are here to support you.
Get in touch today - we will be right with you.

GET IN TOUCH

www.nexa3D.com