MAPTEC

COMPOSITE 3D PRINTING

MAPTEC

Markforged X7 Uncompromising power and precision.

With the Markforged X7 3D Printers, you can produce industrial-grade and highly stable components: Your most affordable skilled worker in the company!

Large components, high resolution

The large working space on X7 printer is ideal for robotics, automotive parts, functional prototypes and prosthetics. With a layer thickness of 0.05 mm*, your components receive a perfect surface finish and the look and feel of an injection molded component.

The **X7** prints industry-standard manufacturing equipment, jaws and tools. It is specially designed for use in machine shops. Its parts exceed the stability of aluminum parts, while the cost is only a fraction of the same. In addition, the X7 guarantees unmatched surface quality, size and reliability.

Turbo print mode

Print your components on the X7 in up to 2x faster printing speed with constant surface quality. Print prototypes in Turbo-Print, optimize your component and then print your final part with fiber reinforcement.

With the X7's laser-assisted process control, selected print layers can be scanned during printing to ensure that all requirements are met.

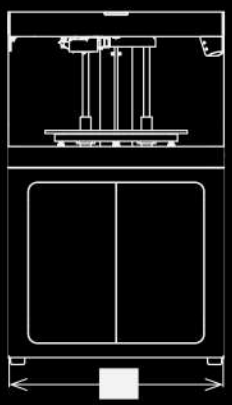
PRODUCT SPECIFICATIONS

X7

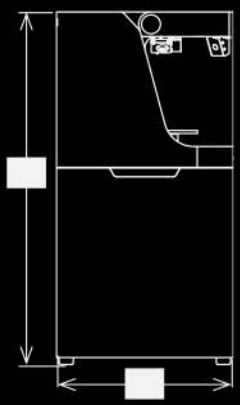
The X7 prints industrial-grade manufacturing jigs, jaws, tools, fixtures, and end-use parts. Designed from the ground up to survive the production floor environment and capable of printing parts stronger than machined aluminum for a fraction of the cost, the X7 delivers unparalleled surface finish, build size, and reliability. Accelerate part production with Turbo Print, our fastest print mode — only available on the X7.

Printer Properties	**Process**	Fused filament fabrication, Continuous Filament Fabrication
	Build Volume	330 x 270 x 200 mm (13 x 10.6 x 7.9 in)
	Weight	48 kg (106 lbs)
	Machine Footprint	584 x 483 x 914 mm (23 x 19 x 36 in)
	Print Bed	Kinematic coupling — flat to within 80 µm
	Laser	In-process inspection, active print calibration, bed leveling
	Extrusion System	Second-generation extruder, out-of-plastic and out-of-fiber detection
	Power	100–240 VAC, 150 W (2 A peak)
	RF Module	Operating Band 2.4 GHz Wi-Fi Standards 802.11 b/g/n
Materials	**Plastics Available**	Onyx, Onyx FR, Onyx ESD, Nylon White
	Fibers Available	Carbon fiber, fiberglass, Kevlar®, HSHT fiberglass
	Tensile Strength	800 MPa (25.8x ABS, 2.6x 6061-T6 Aluminum) *
	Tensile Modulus	60 GPa (26.9x ABS, 0.87x 6061-T6 Aluminum) *
Part Properties	**Layer Height**	100 µm default, 50 µm minimum, 250 µm maximum
	Infill	Closed cell infill: multiple geometries available
Software	**Supplied Software**	Eiger Cloud (Other options available at cost)
	Security	Two-factor authentication, org admin access, single sign-on

FRONT VIEW



SIDE VIEW



* Continuous carbon fiber data. **Note:** All specifications are approximate and subject to change without notice.

Success Plan

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Print high-quality parts easily and reliably with Markforged 3D Printers. Secure yourself against wear and accidental damage with the success plan.

X7	1 Year	3 Years	5 Years
Price	AED 30,000	AED 70,000	AED 100,000
Cover of wear and tear accidental damage	✓	✓	✓
On-site repair*	✓	✓	✓
Free same day priority support (phone or email)	✓	✓	✓

Component	Wear and Tear	Damage
Bearings	×	
Belts	×	×
Build plate	×	×
Cables	×	×
Circuit boards	×	
Drybox	×	×
Drybox adaptor	×	
Drybox spool holder		×
Fiber bowden tube*	×	×
Fiber extruder worn component*	×	
Fiber feed tube*	×	×
Fiber spool tensioner*	×	
LCD display	×	×
Leveling shims	×	×
Plastic extruder worn component	×	
Plastic filament bowden tube		×
Print head	×	
Sensors	×	
Servo motor	×	
Spool holder and accessories		×
Stage flexures and fastening		×
Stepper motor	×	
Wire harness	×	×
Visor		×

MAPTEC

Produce highly stable components thanks to the innovative Markforged materials:

Basic material Nylon White (PA 6) –
stable, flexible and paintable plastic

Basic material Onyx (PA6 with short Carbon fibre) –
extreme stable plastic with excellent appearance

Basic material Onyx FR –
extreme stable plastic with self-extinguishing properties

Basic material Onyx ESD –
Onyx ESD is a static dissipative safe variant of Onyx

Carbon fibre – highest strength-to-weight ratio

Kevlar fibre – highest shock resistance

Fibreglass – best strength-cost ratio

High-Temperature Fibreglass – ideal for automotive, aerospace and other industries where materials with high heat distortion resistance are required

Material Description – Composite Materials

Printing Methods

Plastic matrix

In the process called Fused Filament Fabrication (FFF) the printer heats the thermoplastic filament to near its melting point and extrudes it through a die, thereby forming a plastic matrix layer by layer. Markforged prints all thermoplastics using this method.

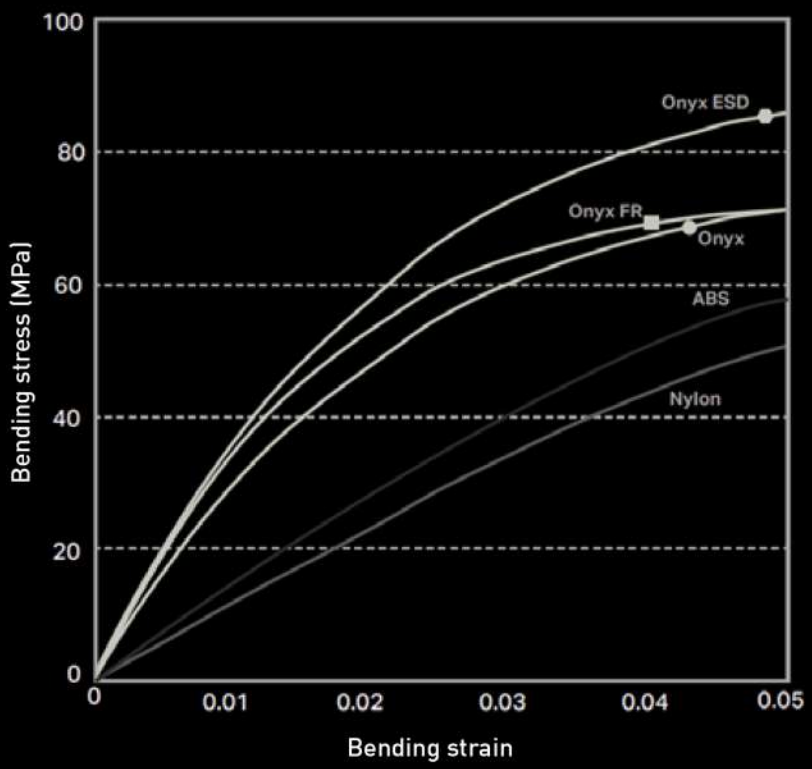
Onyx Nylon

Fibre reinforcement

Continuous Filament Fabrication (CFF) is a proprietary technology developed by Markforged to reinforce printed parts through fibers.
Using a proprietary technology, Markforged places long-fibre continuous fibres in a thermoplastic matrix. Users can control the amount, orientation and type of reinforcing fibres in each layer.

Fibreglass Carbon fibre
Kevlar® HSHT Fibreglass

Plastics in comparison



Onyx Plastic

Thermoplastic for demanding technical purposes

Onyx can be used to produce bending resistant, strong and precise parts. Onyx is already 1.4 times stronger and stiffer than ABS and can be reinforced with continuous fibres of every kind. Onyx sets new standards for surface quality, chemical resistance and heat resistance.

Flexural Strength 71 MPa
Flexural Modulus 3.0 GPa

Onyx FR Plastic

Thermoplastic with self-extinguishing properties

Onyx FR achieves UL94 flammability rating V-0 and has similar mechanical properties to Onyx. It is best suited for applications where low weight, high strength and self-extinguishing properties are desired.

Flexural Strength 71 MPa
Flexural Modulus 3.6 GPa

Onyx ESD Plastic

Thermoplastic with static dissipative properties

Onyx ESD is a static dissipative safe variant of Onyx - meeting stringent ESD safety requirements while offering excellent strength, stiffness, and surface finish. It's best used in applications that require ESD safe materials.

Flexural Strength 83 MPa
Flexural Modulus 3.7 GPa

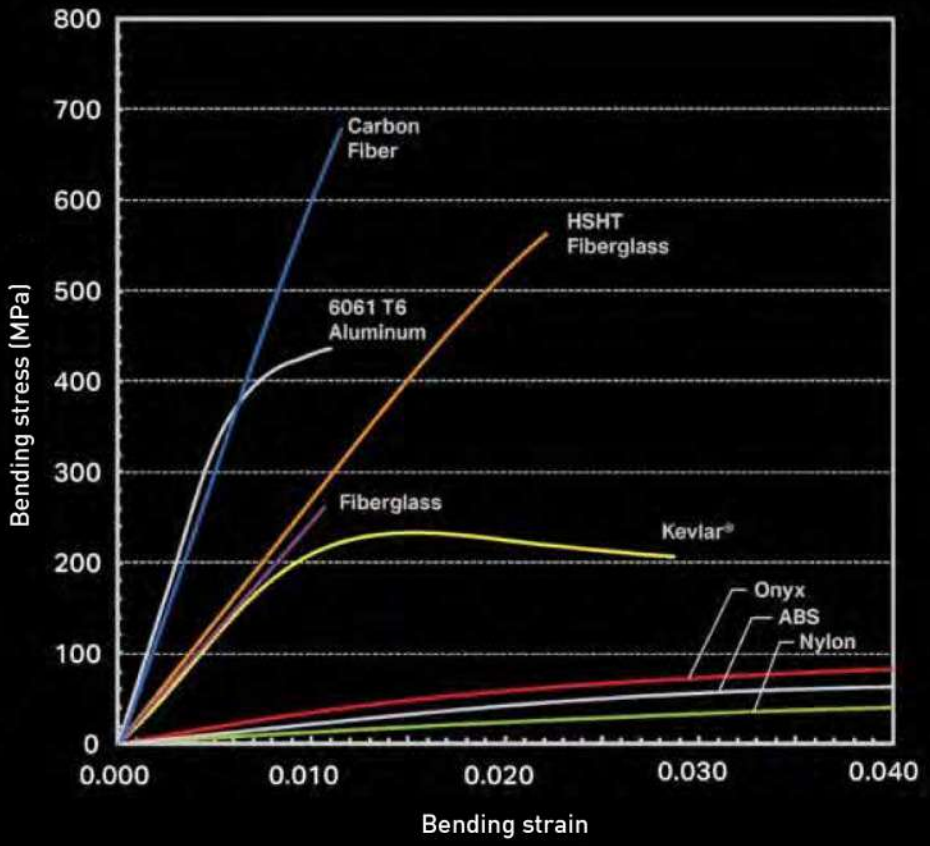
Nylon White Plastic

Tough, flexible thermoplastic

Nylon parts are flexible, impact resistant and can be reinforced with any continuous fibre from Markforged. The material is best suited for applications that require more flexibility or low friction. Nylon White is also paintable.

Flexural Strength 50 MPa
Flexural Modulus 1.4 GPa

Fibre materials in comparison



Fibreglass Fibre

Reinforced fibre strength

As continuous fibre for the entry we recommend Fibreglass. This offers high strength at an affordable price. Fibreglass has 2.5 times the strength and 8 times the rigidity of Onyx and allows the production of robust tools.

Flexural Strength 200 MPa
Flexural Modulus 22 GPa
Layer height 0,1 mm

HSHT Fibreglass Fibre

Strength at high temperatures

HSHT (High Strength High Temperature) fibreglass provides the strength of aluminium and high heat tolerance. It has 5 times the strength and 7 times the rigidity of Onyx and is preferred for parts exposed to high operating temperatures.

Flexural Strength 420 MPa
Flexural Modulus 21 GPa
Layer height 0,1 mm

Carbon fibre Fibre

As strong as aluminum, at half the weight

Carbon fibre has the highest strength to weight ratio among our reinforcing fibres. In comparison with Onyx, 6 times the strength and 18 times the rigidity can be achieved by reinforcing with Carbon fibres. This type of fibre reinforcement is widely used for parts that replace machined aluminium parts.

Flexural Strength 540 MPa
Flexural Modulus 51 GPa
Layer height 0,125 mm

Kevlar® fibre Fibre

Lightweight, durable and strong

Kevlar® fibre offers excellent durability, and is therefore ideal for parts subjected to repeated and sudden stress. Kevlar is as rigid as Fibreglass, but much easier to mould and is best suited for „End of Arm Tooling".

Flexural Strength 240 MPa
Flexural Modulus 26 GPa
Layer height 0,1 mm

Material Specification – Composite Materials

Plastic matrix	Norm (ASTM)	Onyx	Onyx FR	Onyx ESD	Nylon White
Tensile Modulus (GPa)	D638	2,4	3,0	4,2	1,7
Tensile Stress at Yield (MPa)	D638	40	41	52	51
Tensile Stress at Break (MPa)	D638	37	40	50	36
Tensile Strain at Break (%)	D638	25	18	25	150
Flexural Strength (MPa)	D790[1]	71	71	83	50
Flexural Modulus (GPa)	D790[1]	3,0	3,6	3,7	1,4
Heat Deflection Temp (°C)	D648 B	145	145	138	41
Flame Resistance	UL94	-	V-0	-	-
Impact Strength (J/m)	D256-10 A	330	-	44	110
Surface Resistance (Ω)	ANSI/ESD STM11.11	-	-	10^5-10^7	-
Density (g/cm³)	-	1,2	1,2	1,2	1,1

Dimensions and structure of the plastic test samples:

- Tensile specimens: profiles according to ASTM D638, type IV
- Bending test specimen: 3-point bending test, 4,5" (L) x 0,12" (H) x 0,4" (W)
- Heat deflection temperature at 0,45 MPa, 66 psi (ASTM D648, Method B)

All machines from Markforged are suitable for printing Onyx. Nylon is a special material that can only be printed on Mark Two and X7.

Markforged parts are primarily formed from the plastic matrix. Users can add fibre reinforcement to each layer to improve material properties.

[1]Measured using a method similar to ASTM D790. Parts made of pure thermoplastic only break at the end of the bending test.

Fibre reinforcement	Norm (ASTM)	Carbon fibre	Kevlar® fibre	Fibreglass	HSHT Fibreglass
Tensile Strength (MPa)	D3039	800	610	590	600
Tensile Modulus (GPa)	D3039	60	27	21	21
Tensile Strain at Break (%)	D3039	1,5	2,7	3,8	3,9
Flexural Strength (MPa)	D790[1]	540	240	200	420
Flexural Modulus (GPa)	D790[1]	51	26	22	21
Flexural Strain at Break (%)	D790[1]	1,2	2,1	1,1	2,2
Compressive Strength (MPa)	D6641	320	97	140	192
Compressive Module (GPa)	D6641	54	28	21	21
Compressive Strain at break (%)	D6641	0,7	1,5	-	-
Heat Deflection Temp (°C)	D648 B	105	105	105	150
Impact Strength (J/m)	D256-10 A	960	2000	2600	3100
Density (g/cm³)	-	1,4	1,2	1,5	1,5

Dimensions and construction of fibre sompositesTest plates used in this data are unidirectionally fibre-reinforced (0° layers)

- Tensile Specimens:
  with Carbon: 9,8" (L) x 0,5" (H) x 0,048" (W),
  with Fibreglass and Kevlar®: 9,8" (L) x 0,5" (H) x 0,08" (W)
- Pressure Specimens:
  with Carbon: 5,5" (L) x 0,5" (H) x 0,085" (W),
  with Fibreglass and Kevlar®: 5,5" (L) x 0,5" (H) x 0,1" (W)
- Bending Specimens (3-point-bending):
  with all composite materials: 4,5" (L) x 0,12" (H) x 0,4" (W)
- Heat distortion temperature at 0,45 MPa, 66 psi (ASTM D648-07 Method B)

Tensile, compressive, deformation at break and heat

The resistance temperature data was obtained from an accredited third-party test centre provided. The bending data was provided by Markforged, Inc. The above specifications have been met or exceeded. Markforged test plates are specifically designed to maximize test performance. The fiber test panels are completely filled with unidirectional fibers and printed without walls. The plastic test plates are printed with full filling. Contact a Markforged representative to learn more about specific test conditions or to request test items for internal testing. Part and material performance varies depending on fiber layout, component design, specific load conditions, test conditions, build conditions, and the like. These representative data were tested, measured or calculated by standard methods and are subject to change without notice. Markforged makes no warranties, express or implied. This excludes, among other things, any warranty of merchantability and fitness for a particular purpose or any warranty of non-infringement. In addition, Markforged assumes no liability in connection with the use of this information. The data presented here should not be used to establish design, quality control or specification limits and shall not be used as a substitute for user testing for suitability for specific uses. Nothing in this data sheet is to be construed as a license to operate in violation of any intellectual property rights or to infringe the rights of third parties.

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EIGER Software*: Powerful. Flexible. Secure.

With Markforged's high strength and composite fibre printers, we deliver the innovative, smart EIGER software compatible with all our printers.

Powerful

The strength of Markforged printers is the stability of the part and the precise surface finish. EIGER software makes it easy to increase sub-stability with our unique Continuous Fibre Reinforcement. In addition, EIGER offers the possibility of accessing and managing all printers and print jobs with just one program.

Achieve 10-fold stability with just one click

EIGER adds selected fibre reinforcement to your component. Simply select the option "Use fibre". You retain full access to the process and can intervene at desired points and make manual adjustments.

Continuous improvement

Cloud-based, EIGER always provides the latest version. Once a new update has been deployed, it will be displayed the next time you log in to EIGER. Large files can easily be processed in the background, while you can continue working in other programs.

Control all printers from one place

With EIGER you can easily access all your organization's printers and print files. Whether you use one or a hundred printers, our networked system collects all data clearly arranged in one place.

Each printer from Markforged can be connected via Ethernet or WiFi. Distances do not matter. You will receive important status messages by e-mail and, for example, be informed in good time about low material stocks and completed print jobs.

User-friendly

To print the most stable parts, you do not need any special training. Simply upload and slice your STL file into EIGER for a high strength part.

Data is never lost

Projects can be created in EIGER. There you can organize your print files, find them quickly and reuse or revise them. Since everything is stored in the cloud, your files will be kept in case of a computer crash. The version history can also be used to restore accidentally overwritten files.

Intuitive user interface

Our software regulates all temperature, speed and monitoring settings to optimize print performance and reduce the user's workload.

Collaboration

EIGER works organizationally. Each team member can get access to the program. This allows files to be shared, discussed, edited and improved with colleagues even across distances.

*The services described here refer to the Eiger Cloud Software.

Markforged takes the security and privacy of your data very seriously.

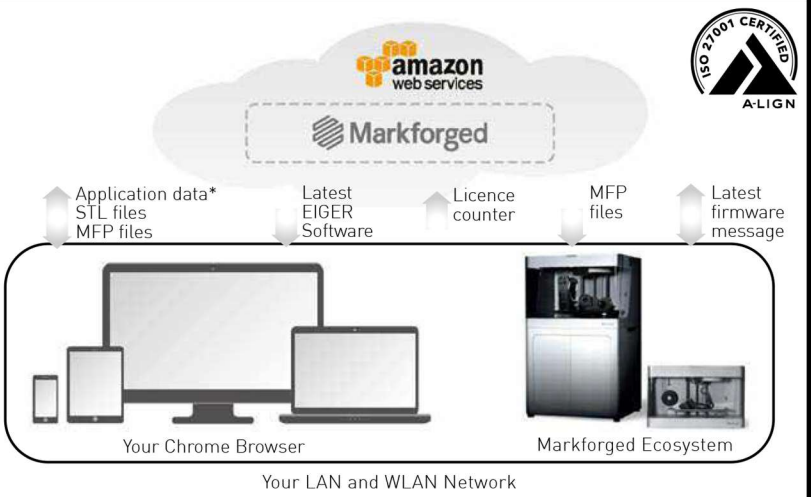
ISO 27001 – Safety certification

- Markforged is the only certified manufacturer in the additive field.
- The certification has been awarded by an external test centre.
- Your data is safe in the EIGER software!

EIGER Software Cloud Online Version

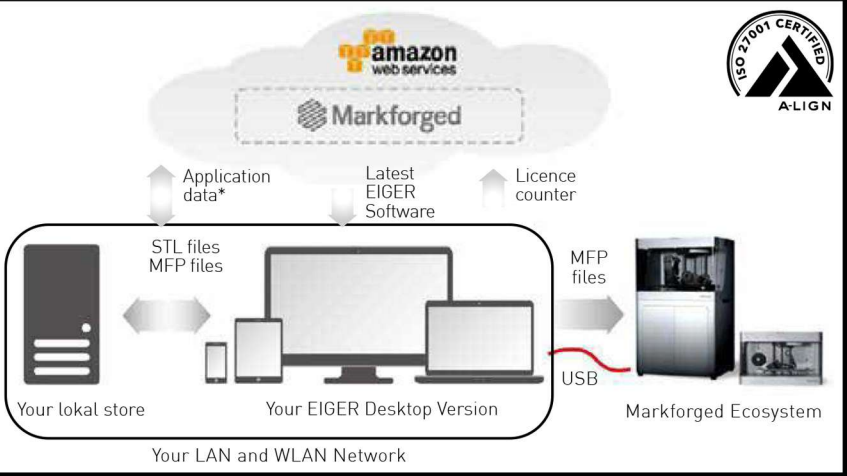
Only users of your organization can access your data. We take the best precautions, including SSL/TLS encryption of any communication with our servers, external backups of user data, and Amazon Web Services (AWS), which preserves the data for us.

Any communication with Markforged is encrypted.



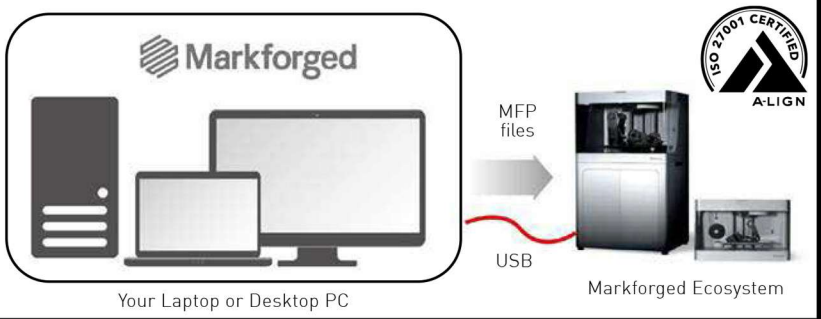
EIGER Software Desktop Online Version

For even greater security we offer an internally storable version from EIGER at no additional cost. The user stores his STL files, the internal slice data and MFP files 100% locally on his hard disk.
A permanent internet connection is required for application data, software updates, license verification.



Optional: EIGER Software Offline Version

In special cases we provide a limited version of EIGER offline for an additional fee.



***In the EIGER Software Desktop online version, your STL files, generated print files or specific geometrical information about your component will not be sent to our servers. We slice to local printing on your machine. Telemetry data sent to the server includes account information for the license server, folder structures, printer settings and used quantities of material/print volumes. These data are covered by the Markforged Privacy Policy.**

**MFP (Markforged Print) files are the raw output of EIGER software that the Markforged printers use to print the part.
Currently the printer can only be connected to the corporate network via a USB device server. To use the cloud version Google Chrome is required. The status of the printer can be viewed as soon as the printer has an Internet connection.**

MAPTEC

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