Ultimaker

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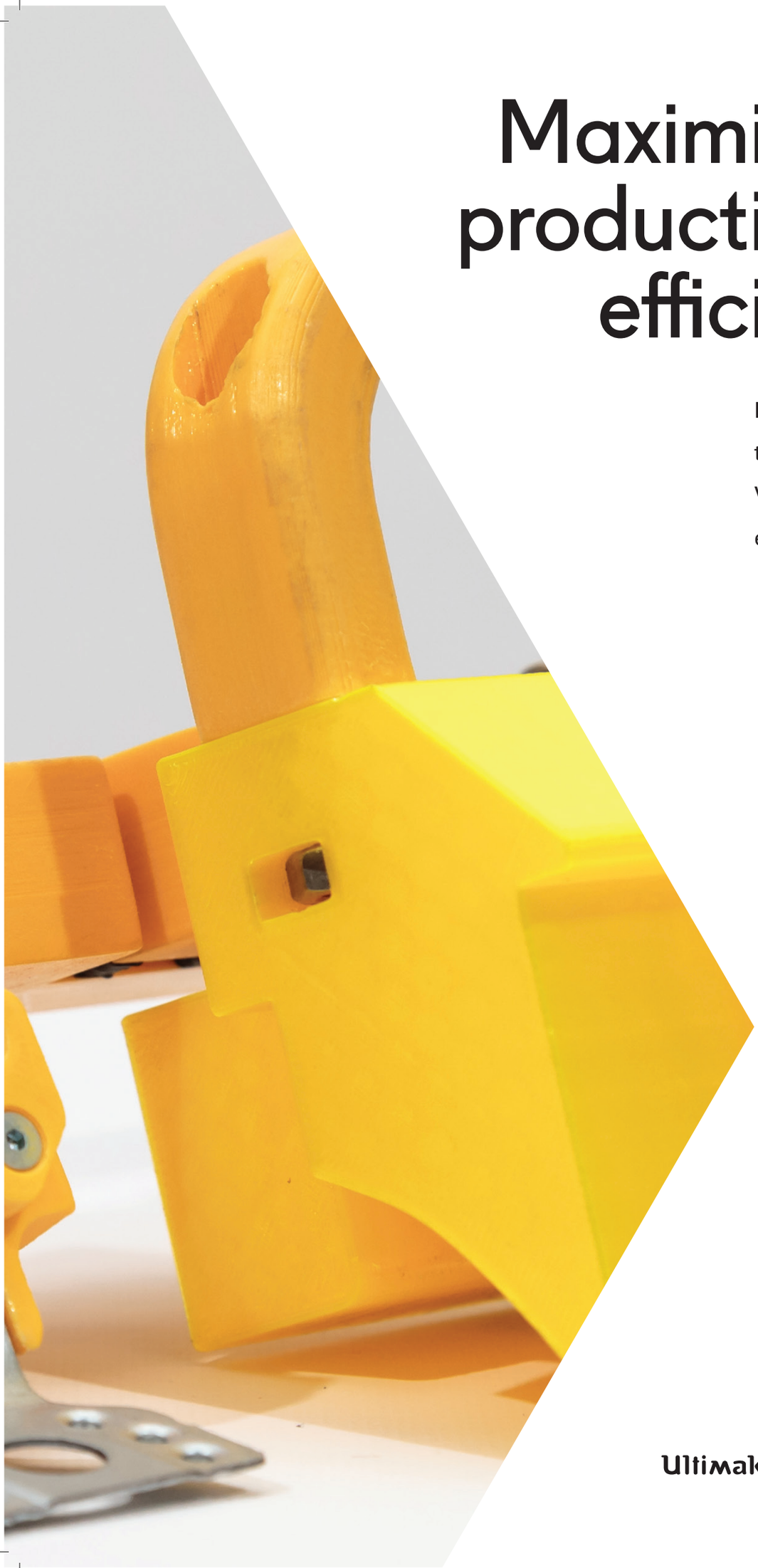


Maximizing production efficiency

High-quality 3D printed tools, jigs, and fixtures save Volkswagen Autoeuropa an estimated €150,000 per year

Ultimaker

Volkswagen

3D printed manufacturing aids

Interest in 3D printing used to largely focus on functional prototyping and component creation. However, for manufacturing businesses, its true value lies in another important area: 3D printed tool production, jigs, fixtures, and other manufacturing aids.

Complete customization
Traditional manufacturing rules don't apply, as the 3D printing technology can build complex geometries with cavities, undercuts, and overhangs. A previously impractical jig or fixture design is now a viable option; and function and performance become the main drivers of design, not cost or time.

Accelerated delivery
Machining a manufacturing tool takes several weeks, especially if there are multiple designs or assemblies. Printing parts on demand in-house accelerates the build and delivery process. Manufacturers using Ultimaker 3D printers often see a 40% to 90% lead time reduction.

Unlimited revisions
No tooling or machining is required to build a model. If an issue with a current tool is identified or an enhancement suggested, building a replacement simply involves revising the CAD file and printing the updated part. The cost is far less than traditional manufacturing methods, and results can be tailored to match exact requirements. Function and design can be verified with the actual part and new iterations can be made within hours without cost penalties.

Cost-effective

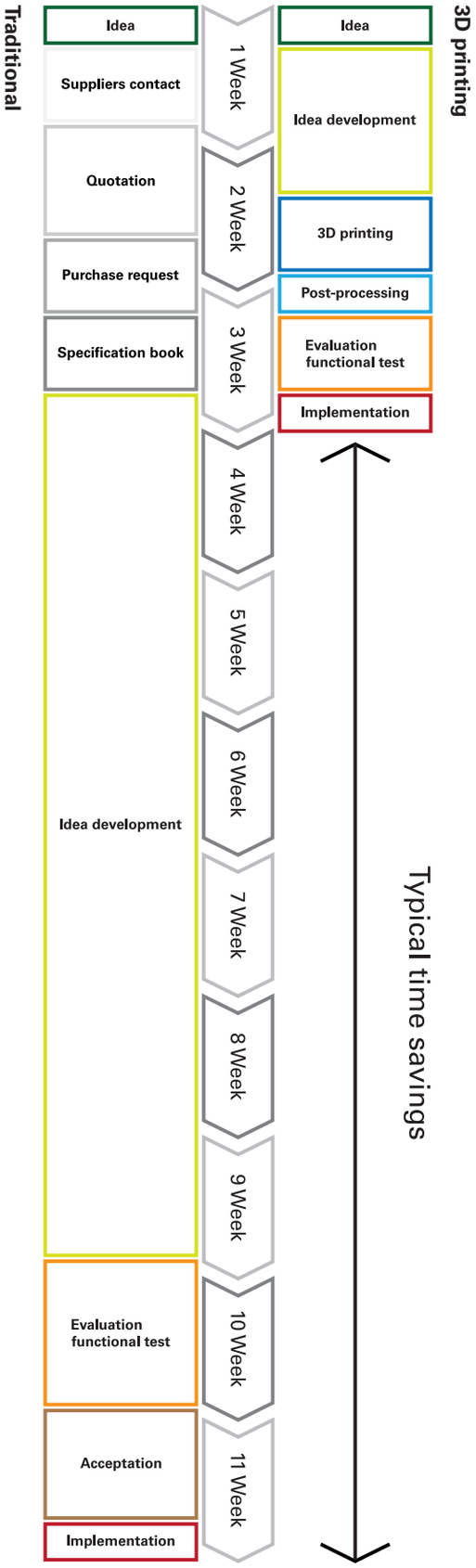
"Now we have way more tools, with better fit and for far less money. Just by printing a handful of tools we can get back the initial investment."

—Luis Pascoa, Pilot Plant Manager at Volkswagen Autoeuropa

The innovative way to build tools

Cost: €3,000/part
Project: 60 days

Cost: €187/part
Project: 6 days



The Ultimaker 3D printed tool has enhanced design performance. Tool lead time is 54 days less and costs are decreased by €2,813. The tool is ergonomically pleasing, tough, and lightweight.

Traditionally, it would have been precision machined in metal, with the associated costs, time, weight and storage. In some cases, manufacturers often managed without them - to the detriment of their process control.

Case study: Volkswagen Autoeuropa

Using 3D printing to reduce cost, time, and labor of manufacturing tools, jigs, and fixtures

By using 3D printed tools, jigs, and fixtures, Volkswagen Autoeuropa reduces cycle time operation, labor, scrap, and the need for reworking, while improving tool ergonomics. Furthermore, they achieve this at a tenth of the usual cost.

Production volumes:
Volkswagen Autoeuropa currently produces the Volkswagen Sharan (53,423 units), Scirocco (16,251 units), Eos (4,559 units), and the Seat Alhambra (27,925 units).

Challenge
Before working with Ultimaker, Volkswagen Autoeuropa was using 3rd party suppliers to manufacture their tools. This meant more paperwork, quotations, and the adoption of a trial-and-error approach, all of which were holding up the tool manufacturing process – at additional cost.

Solution
Volkswagen Autoeuropa introduced Ultimaker 3D printers in 2014. Within 2 years, they increased savings from 70% up to 95% in assembly tooling costs. Ultimaker enabled Volkswagen Autoeuropa to test solutions without having to contact suppliers, saving an average of 8 weeks.

Results and ROI
After having validated the concept in 2014, Volkswagen Autoeuropa now has **7 Ultimaker 3D printers** in operation, and 93% of all externally manufactured tools are created in-house. External parts only comprise 7% of their total tool production and the investment is covered after printing just a handful of tools. Overall, the company estimates that they saved **€150,000** in 2016 with a target to save **€250,000** in 2017.

"3D printing developments result in a 91% cost reduction and 95% reduction in tool development time. Ultimaker makes it possible to improve tool ergonomics by 28% and the final product quality by 35%."

— Helena Trincheiras, Pilot Plant Engineer at Volkswagen Autoeuropa

"With Ultimaker, we have more autonomy and this status allows us to be fast on product optimization and the creation of production support tools."

— Luís Reis, Pilot Plant Engineer at Volkswagen Autoeuropa

Implementation

Ultimaker's integrated ecosystem of hardware, software, and materials means production can commence as soon as the machines are installed on-site.

1. Review production processes
Production engineers, CAD designers, and technicians review production and quality processes. They brainstorm potential opportunities for 3D printed jigs, fixtures, and gauges.

2. Shop floor operator involvement
Shop floor operators who routinely use the equipment become actively involved. Their input is invaluable, based on their daily operation. Positioning 3D printers next to the assembly line means that operator feedback, verification, and review can be implemented much faster.

3. Design to manufacture
Once the design is conceptualized, a CAD file is prepared, sliced in Cura, then sent to the 3D printers to run overnight. Next morning, the new set of tools is ready for use.

4. Installation and revision
Additive manufacturing allows for a "just-in-time inventory", where digital design files are stored and replacement parts modified and printed when required. Incorporating 3D printers with production floor operations improves quality, ergonomics, and uptime; saving money and increasing efficiency.

3D printed assembly portfolio by Volkswagen Autoeuropa *

Average cost savings: 91%

Average time savings: 95%

**Please note that the parts featured in this brochure are used daily in the production process, and, therefore, may show signs of use.*

Wheels protection
Poka-Yoke

Used during the positioning and screw assembly to prevent scratches /damage to the wheels. Without this protection, scrap cost can be huge.

	External suppliers	Ultimaker 3D printers
Cost	€800/part	€21/part
Project	56 days	10 days

Triangular window gauge
Gauges

Achieves the best accuracy for rear quarter window positioning, ensuring an accurate, consistent finish.

	External suppliers	Ultimaker 3D printers
Cost	€180/part	€35/part
Project	8 days	6 days

2.0 Sharan liftgate badge
Badges

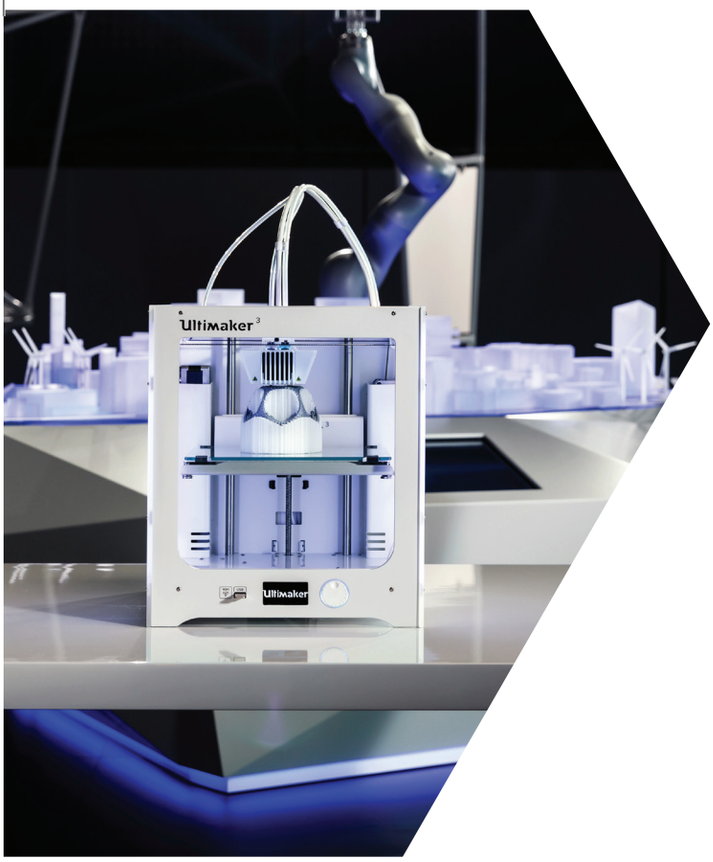
Ensures correct positioning of the 2.0TDI emblem, repeatedly and efficiently.

	External suppliers	Ultimaker 3D printers
Cost	€400/part	€10/part
Project	35 days	4 days

Pre-assembly fuel filler cap
Components

Used during fuel filler cap pre-assembly; supports the operator during the assembly process and prevents scratches /damage on the fuel filler cap.

	External suppliers	Ultimaker 3D printers
Cost	€600/part	€12/part
Project	49 days	7 days



Meet Ultimaker

Ultimaker's desktop 3D printers offer a low-cost, effective alternative to industrial manufacturing. The user-friendly operation makes it accessible to all users, and no advanced training is necessary. Experience industrial-grade 3D printing results, hassle-free maintenance, designed to empower your business.

Ultimaker 3 — delivering accuracy and consistency

Featuring seamless hardware, software, and material integration, the Ultimaker 3 and Ultimaker 3 Extended enable designers, engineers, and manufacturers to innovate in a completely new way. Create complex geometries and astonishing design intricacy with the most reliable dual extrusion on the market.

Higher uptime, faster changeovers

Ultimaker 3 is engineered for high uptime, fast changeovers, and reliable, industrial-grade results.

- Custom inner nozzle geometry matches the material for high-quality output.
- Swappable print cores let you switch materials in a matter of seconds.
- Print core LED lights intuitively notify the user if any interaction is required.

Remote 3D printing and connectivity

Integrated Wi-Fi support enables wireless access and monitoring abilities for multiple users.

- Send print projects quickly and easily to your Ultimaker 3 via Wi-Fi or Ethernet.
- Ethernet and USB connection ensure connectivity at all times.
- Remote live camera monitoring of every stage of your 3D printing project, via Ultimaker 3's Wi-Fi network.

Complete design freedom

Create complex geometries with the most reliable dual extrusion on the market.

- Industrial-grade build and water-soluble support material combinations.
- Consistent, high-quality results with a unique automated nozzle lifting system.
- Open filament system to test the latest market developments or manufacture a custom solution to match requirements.

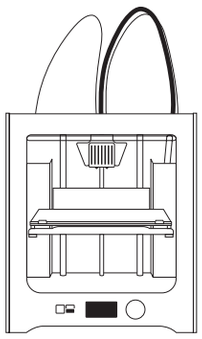
Cohesive 3D printing ecosystem

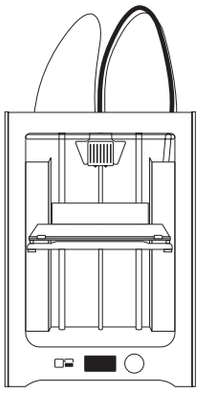
Enjoy a seamlessly integrated print experience - where hardware, software, and materials work in perfect harmony.

- 'First-time-right' setup with built-in material recognition system.
- Optimized Cura profiles auto-adjust settings for each print core and material.
- A new active bed leveling system for better build plate adhesion and more accurate leveling.

Specifications

Ultimaker 3 and Ultimaker 3 Extended





Printer and printing properties

Technology		Fused Deposition Modeling (FDM)	
Print head		Dual-extrusion print head with a unique auto-nozzle lifting system and swappable print cores	
Build volume	**Left nozzle:**	215 x 215 x 200 mm	215 x 215 x 300 mm
	Right nozzle:	215 x 215 x 200 mm	215 x 215 x 300 mm
	Dual material:	197 x 215 x 200 mm	197 x 215 x 300 mm
Filament diameter		2.85 mm	
Layer resolution		0.4 mm nozzle: 20 - 200 micron	
XYZ accuracy		12.5, 12.5, 2.5 micron	
Print head travel speed		30 - 300 mm/s	
Build speed		0.40 nozzle: up to 16 mm^3/s	
Build plate		Heated glass build plate	
Build plate temperature		20 - 100 °C	
Build plate leveling		Active leveling	
Materials	**Optimized for:**	Nylon, PLA, ABS, CPE, PVA	
	Future optimizations:	CPE+, PC, TPU 95A	
Nozzle diameter		0.4 mm	
Nozzle temperature		180 - 280 °C	
Nozzle heat up time		< 2 min	
Build plate heat up time		< 4 min (20 - > 60 °C)	
Operating sound		50 dBA	
Material recognition		Material recognition with NFC scanner	
Connectivity		Wi-Fi, LAN, USB port	
Monitoring		Live camera	

Physical dimensions

Dimensions	342 x 380 x 389 mm	342 x 380 x 489 mm
Dimensions (with bowden tube and spool holder)	342 x 505 x 588 mm	342 x 505 x 688 mm
Nett weight	10,6 kg	11,3 kg
Shipping weight	15,5 kg	16,8 kg
Shipping box dimensions	390 x 400 x 565 mm	390 x 400 x 680 mm

Power requirements

Input	100 - 240 V 4 A, 50 - 60 Hz 221 W max.
Output	24 V DC, 9.2 A

Ambient conditions

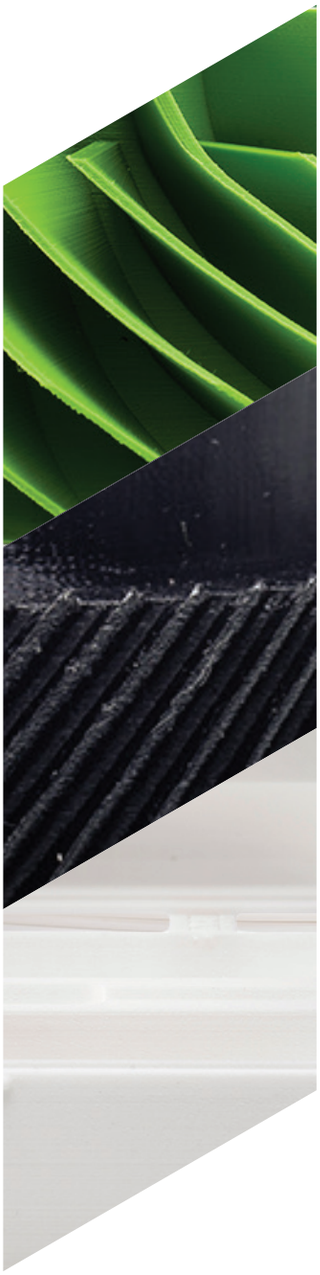
Operating ambient temperature	15 - 32 °C, 10 - 90% RH non-condensing See material specifications for optimal conditions
Non-operating temperature	0 - 32 °C

Software

Supplied software	Cura, our free print preparation software
Supported OS	macOS, Windows, and Linux
File types	STL, OBJ, and 3MF

Design freedom with industrial-grade materials

Ultimaker's range of materials are formulated to achieve superior results. Optimized Cura profiles offer the best print settings per material and recognize which print core and material you're using. The open filament system lets you experiment with new materials and test the latest market developments.



ABS:
Tough and durable
ABS (acrylonitrile butadiene styrene) is impact-resistant, dimensionally stable, and handles temperatures up to 85 ˚C - a good choice for mechanical parts.

Nylon:
Abrasion-resistant and durable
Our Nylon (polyamide) is strong, abrasion-resistant, durable, and engineered for flexibility and low moisture sensitivity. It can handle temperatures up to 80 ˚C.

TPU 95A:
Semi-flexible and resistant to wear and tear
With a Shore-A hardness of 95 and elongation of up to 580% at break, our TPU (thermoplastic polyurethane) is semi-flexible, durable, and chemical-resistant. It can handle temperatures up to 100 ˚C.

PLA:
Fast, safe, and reliable printing
PLA (polylactic acid) is ideal for fast, reliable printing of parts and prototypes, and offers excellent surface quality.

PVA:
Water-soluble
Our PVA (polyvinyl alcohol) is a water-soluble support material, designed to print complex geometries in dual extrusion with PLA or Nylon.

CPE:
Chemical-resistant and tough
CPE (copolyester) materials are chemical-resistant, tough, and dimensionally stable. CPE+ handles temperatures up to 100 ˚C, while CPE handles up to 70 ˚C.

PC:
Strong, tough, and heat-resistant
PC (polycarbonate) offers great print quality, mechanical strength, toughness, and temperature resistance of up to 110 ˚C.

Cura Software

The world's most advanced 3D printer software

Our free, open source slicing software helps you produce consistently impressive print results. Extensively tested preconfigured Cura profiles offer a seamless 3D printing experience; automatically adjusting the settings for each material and print core. With our open, flexible system, you can customize the values and enjoy a 3D printing experience that's tailored to your needs.

- **Powerful settings**
  200 settings ensure superior results, with the option to print multiple objects with different settings for each.
- **Optimized profiles**
  Extensively tested optimized profiles for Ultimaker materials, plus dual-extrusion printing, guarantees a seamless experience.
- **Easily customizable**
  Test the latest market developments, tweak print settings specifically for your model and save customized printing profiles to match your requirements.
- **Seamless dual-extrusion 3D printing experience**
  Optimized Cura profiles auto-adjust settings for each print core and material. A cohesive ecosystem delivers an improved user experience and the best results at all times.

Dedicated Ultimaker support

We care. We train. We collaborate.

We believe in delivering quality without exception. Ultimaker's market-leading 3D printers and software come with lifetime technical support and customer service, whenever you need it. Our dedicated service partners offer industry knowledge and technical expertise, and provide qualified support in your own language and time zone. With a global network of professionally trained, officially certified service partners, we deliver the best customer support possible.

- **Local warranty**
  This means you're well protected.
- **Professional support**
  All our resellers are fully trained and certified.
- **Quick response**
  Within 24 hours.
- **Official parts in stock**
  Always in stock so you don't have to wait.