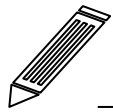


## General Industry

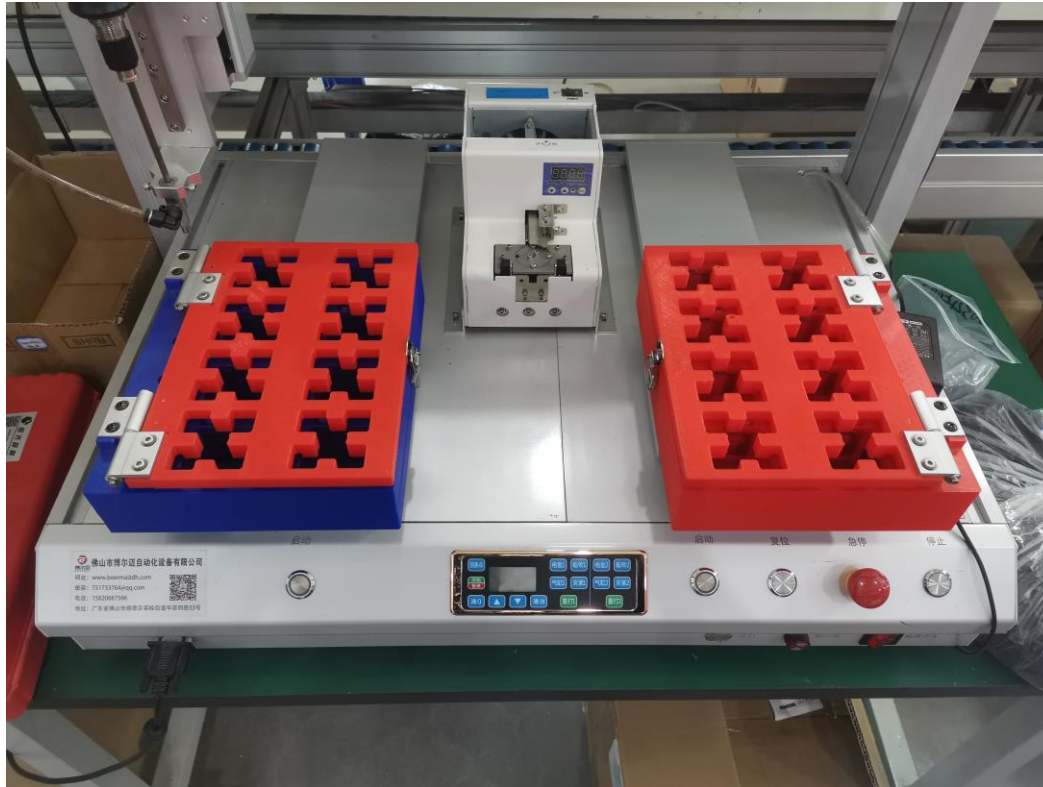
**Unique:** Compared with other 3D printing technologies, professional FDM technology has a leading advantage in the molding and manufacturing of jigs and fixtures used in assembly line, automation and other industries.

**Advantages of FDM equipment:** General industrial applications are characterized by diversified demands and auxiliary production, so it requires multiple materials, low cost and simple implementation; FDM has almost no rivals in these aspects, and only competes with traditional jig manufacturers or small steel-structure manufacturing enterprises.

Our domestic traditional manufacturing industry is increasingly developed and features low costs, and the popularity of 3D printing is slow. However, the trend of 3D printing for jigs and fixtures has become very common in the case of high labor costs and environmental requirements abroad. Through the Ultimaker's PowerPoint presentation of application cases, it demonstrates all about applications of jigs and fixtures, except for one functional design verification example of a electric power tool, which proves the above mentioned phenoemon.



# Application case of 3D printing in general industry -- equipment fixtures



## Special tooling for the automatic screw locking machine

**Description:** To meet the requirements of products and equipment, the special clamping fixture for the equipment is designed and manufactured through 3D printing, which not only improves efficiency but also guarantees quality.

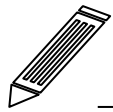
**Machine Model:** Creator 3 (Creator 4)

**Material:** ABS

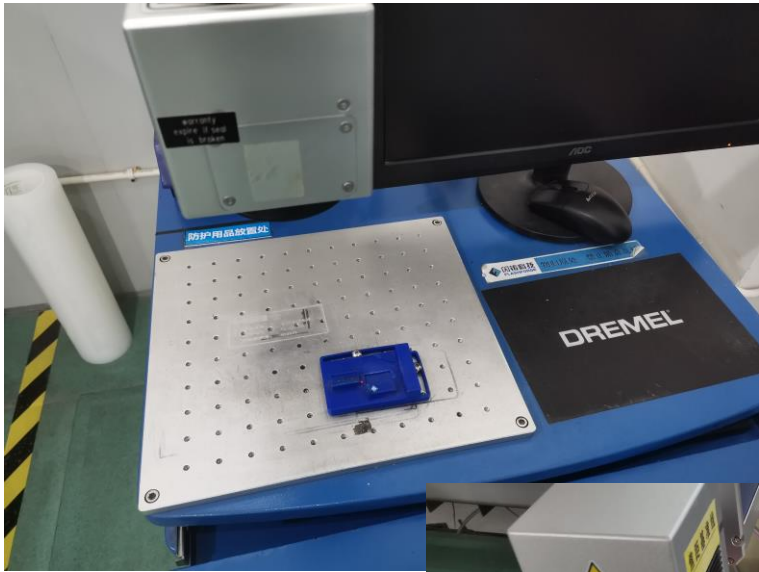
### Advantages:

1. Compared with the traditional process, the design and production cycle is shortened by 87%.
2. The production cost is reduced by 76%.
3. The tooling features high strength and wear resistance with the service life of 10 weeks.
4. The strong flexibility realizes that the tooling can be designed at will according to requirements.
5. The high printing precision ensures the consistency of multiple toolings.
6. With Creator 3's dual-extruder and mirror mode printing, the needs of two stations at one time can be easily met, thus improving the printing efficiency.

**Remark:** It can be used for assembly line factories.



# Application case of 3D printing in general industry -- equipment fixtures



## Special tooling for the laser marking machine

**Description:** According to the shape of the product, the special positioning tooling for the equipment is designed and manufactured through 3D printing, which not only improves efficiency but also guarantees quality.

**Machine Model:** Creator 3 (Creator 4)

**Material:** ABS

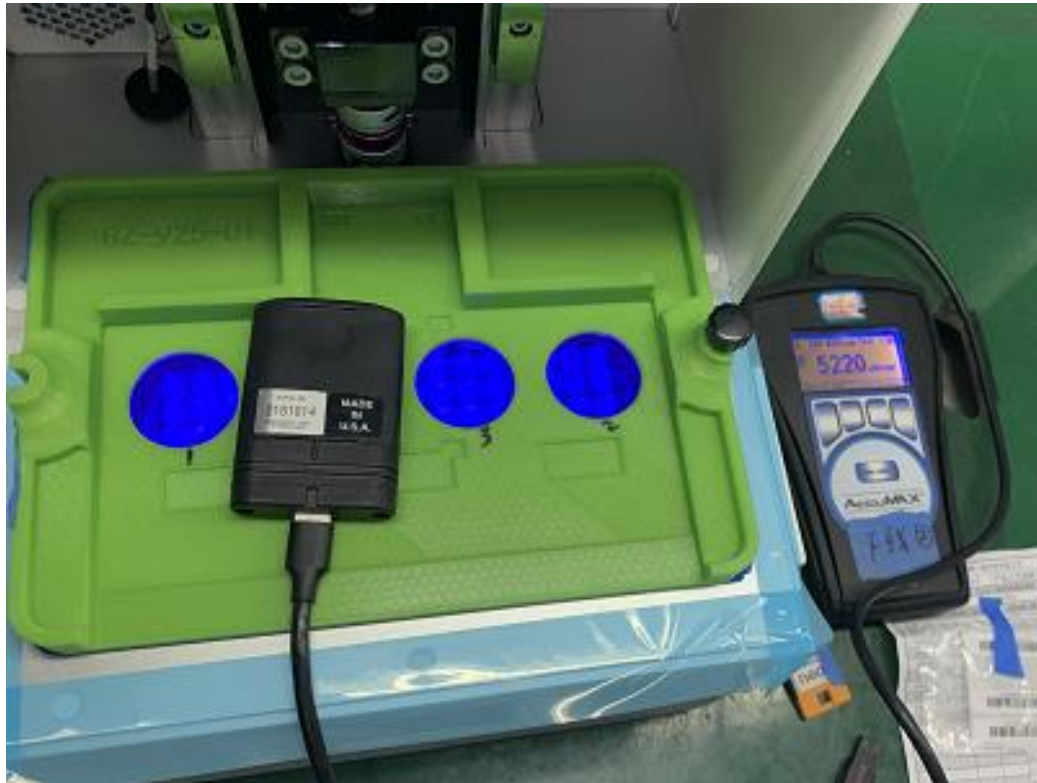
## Advantages:

1. Compared with the traditional process, the design and production cycle is shortened by 95%.
2. The production cost is saved by 80%. The reduction of production costs making the storage and inventory costs well in control.
3. The tooling features high strength and wear resistance.
4. The strong flexibility realizes that the tooling can be designed at will according to requirements.
5. More lightweight finished product; convenient storage

**Remark:** It can be used for laser engraving, marking and other industries.



# Application case of 3D printing in general industry -- checking fixtures



## Light intensity calibration tooling

**Description:** The outer frame of tooling is designed and manufactured through 3D printing, and is assembled with special inspection tools to realize inspection and testing.

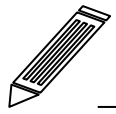
**Machine Model:** Guider IIs/Creator 3/Creator 4

**Material:** ASA

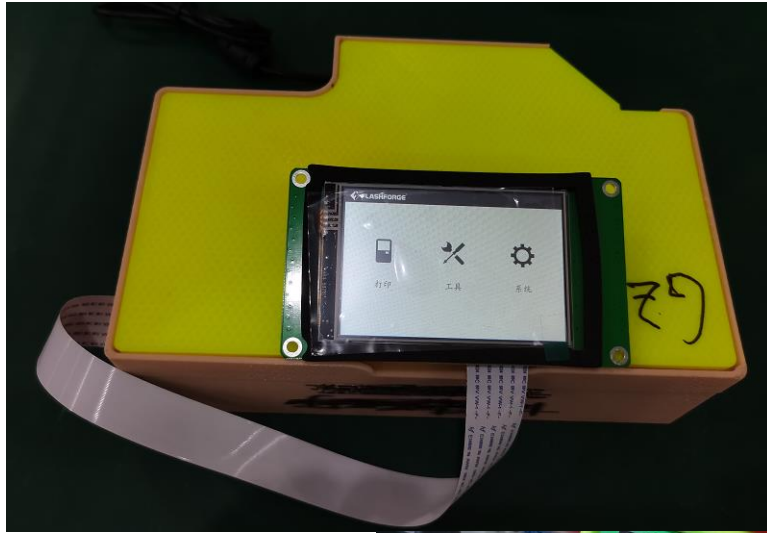
### Advantages:

1. The design and production cycle is shortened by 90%.
2. The production cost is saved by 85%.
3. ASA material meets the requirements of strength, wear resistance, ultraviolet resistance and long-term use.
4. It is more lightweight with a 50% reduction in weight.
5. The strong flexibility realizes that the tooling can be designed at will according to requirements.
6. Guider IIs/Creator 4 with the large format and one-time forming can be used for printing toolings for light intensity calibration of large-size equipment.

**Remark:** It can be used for various screen manufacturers and electronics factories.



# Application case of 3D printing in general industry -- checking fixtures



## Motherboard inspection tooling

**Description:** The outer frame of tooling is designed and manufactured through 3D printing, and is assembled with special inspection tools to realize inspection and testing.

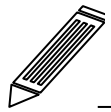
**Machine Model:** Creator 3 (Creator 4)

**Material:** ABS

## Advantages:

1. The design and production cycle is shortened by 90%.
2. The production cost is saved by 85%.
3. The tooling features high strength and wear resistance.
4. Produced with insulating material, it is safer and lighter to use.
5. The high printing precision ensures the consistency of printing multiple identical toolings.

**Remark:** It can be used for various screen manufacturers and electronics factories.



# Vehicle Engineering

**The second most widely used industry:** Besides metal 3D printing, FDM technology has the most common applications in vehicles or consumer products such as automobiles, electric vehicles, bicycles, scooters and drones.

**Advantages of FDM equipment:** The professional FDM equipment's material compatibility, apparent quality, mechanical properties and precision basically meet the requirements of design or manufacturing verification. Therefore, it is used in the functional verification of jigs and fixtures in vehicle assembly lines, and R&D parts, and now increasingly popular personalized modification (materials with certain strength and temperature resistance are required).

**Material selection:** Materials such as ABS, PA-CF, PP are the main materials used.



# Application case of 3D printing in vehicle engineering -- automobile fixtures

## Automobile (Dongfeng Dana Axle) fixture

**Description:** The tooling for clamping automobile parts is manufactured through 3D printing, which takes the place of traditional steel plate welding tooling.

**Machine Model:** Creator 4/Creator 3/Guider 3

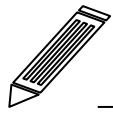
**Material:** ABS/PA-CF

### Advantages:

1. Compared with the traditional CNC machining, the design and production cycle is shortened by 80%. Print the prepared model to be printed before going off duty, and it will be taken out for direct use the next day.
2. The labor cost is saved by 85%.
3. In order to meet the requirements of temperature resistance and wear resistance and improve the rigidity of the material, it can be replaced with nylon carbon fiber material to prolong the service life.
4. The service life of the sample is 8-10 weeks, leading to convenient update and iteration.
5. The strong flexibility realizes that the tooling can be designed and manufactured at will according to requirements.

**Remark:** It can be used for producing jigs and fixtures in various industries such as automobile and electric power tools as the technical realization is not too difficult.





# Zhejiang PanGood Power Technology Co., Ltd. -- functional design verification

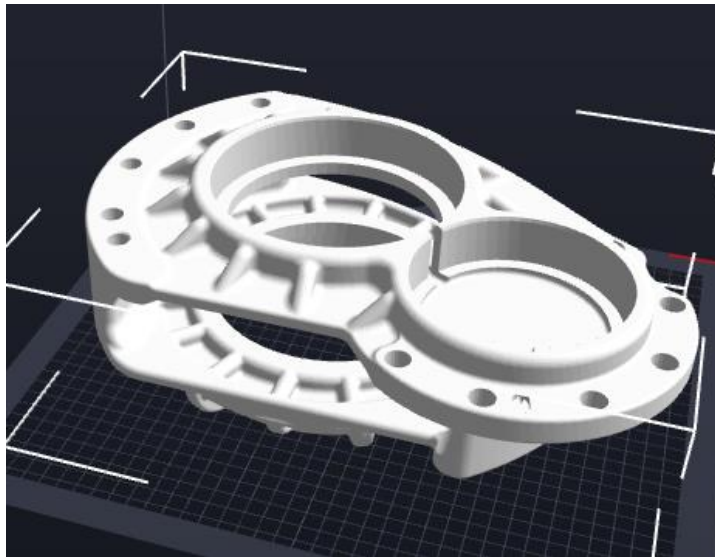
**Application Background:** Zhejiang PanGood Power Technology Co., Ltd. mainly researches and develops disc-type motors, integrates and optimizes reduction gearboxes, controllers and other related parts, and is currently the largest batch production enterprise of disc-type motors in China.

**Machine Model:** Creator 4

**Material:** ABS/PA-CF

**Case Description:** The large size of the customer's product sample and the long manufacturing time of the traditional processing method make it difficult to control the delivery time, which will affect the project. Flashforge uses Creator 4, ABS material and nylon carbon fiber material to help our customer quickly complete the iterative process of new product development, greatly reduce the research and development costs and delivery time of samples.

As shown in the figures below, the build volume of the reduction gearbox is 341\*273\*111mm; ABS+ self-supporting; excellent surface quality

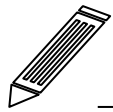


Automobile reduction gearbox



Shifting fork





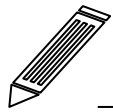
# German independent auto repair company: application of automobile maintenance and modification (1)

**Case Description:** In automobile maintenance services, customized modification is a huge market, especially for the special vehicle assembly needs of public institutions. Flashforge's FDM equipment has assisted Degeling company to successfully complete a number of major automobile modification projects, which was recognized and praised by customers.

"Usually, we do one-off refit work. Because of refit requirement's particularity, accessories are always unique," Matthias said, "according to our cases before, customers came up some requirements, which is significant for our company to meet all these needs."



Display of the printed placing bracket of the radio equipment controller and its practical application

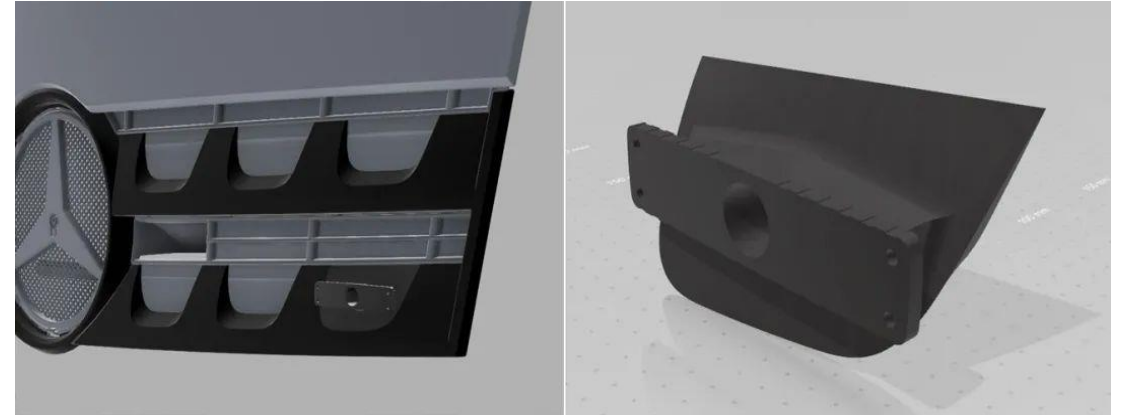


# German independent auto repair company: application of automobile maintenance and modification (2)

"Obviously, the advantage is the less time. Moreover, all processes can be finished inside the company. In the past, even though the blueprint has been finished by the company, we still need to bring it to the manufacturer and make the sample. Wait time of producing and shipping decrease efficiency," Matthias then introduces his new machine, "by using Guider IIs, we can directly produce original-size accessories after the test print."



When printing, customers will usually choose ASA material, which is more heat-resistant, aging-resistant and weather-resistant than ABS, and is suitable for use both inside and outside the car.



Directional beacon project for fire trucks



## German independent auto repair company: application of automobile maintenance and modification (3)

"As an alternative manufacturing method for a few parts, FDM is becoming more and more important." The company has decided to use FDM technology as an alternative to traditional metal cutting manufacturing such as milling, turning and drilling. Matthias has proved that this technology has economic advantages, such as reducing the cost of engineering documents, storage and manufacturing.



Instrument panel modification case: emergency light system handheld operating equipment bracket (test piece and final product)



## Consumer electronics, power tools and other industry products: assistant R&D & manufacturing engineers

# Consumer Electronics & Power Tools

The main application of FDM in the consumer electronics industry is functional Garage Kits + fixtures in the assembly line production; In terms of electric power tools, it mainly assists R&D engineers in functional development and verification; The materials used are generally ABS, PA, PA-CF, and electrostatic materials.

**Functional verification:** The requirements of matching precision and strength are the keys, which is also crucial to the subsequent development and cooperation with customers; Competitors give priority to the use of SLS and MJF technologies. It is important to find the right customer decision-makers from the aspects of cost, diversity and so on.

**Jigs and fixtures:** The electrostatic grade requirements and electrostatic materials are the difficulties. Take the Huawei electronic fixture for example, the printing process is very simple. However, the electrostatic requirements can only be met by ABS-ESD7 of 3Dstratasys.

# Shanghai UPUN Electric (group) Co., Ltd.: functional verification

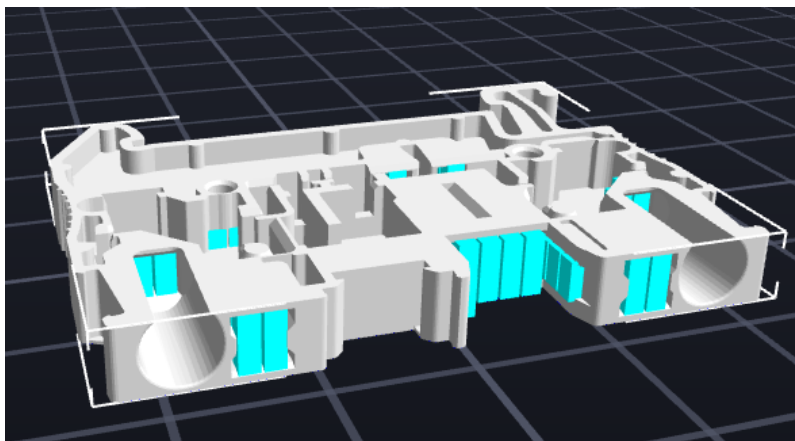
**Application Background:** The customer's business covers industrial wiring technology, industrial automation, industrial control, electric attachments, etc. There are many kinds of industrial wiring and automation products developed every year, while industrial products have relatively strict requirements for reliability and stability. Therefore, in the development process of each product, there are high test requirements for mechanical strength, durability, reliability, thermal performance and electrical performance.

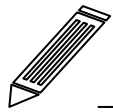
**Machine Model:** Creator 3 (Creator 4)

**Material:** ABS/PBT/HIPS

**Case Description:** The sample provided by the customer for printing test is small in size, complicated in internal structure, thin-walled, with buckle(s), etc. After printing, it is necessary to install some small electronic components and wiring inside to meet the functional test. We use Creator 4 to print ABS material, HIPS material and PBT material to do proofing tests for our customer; The thinnest part of the customer's sample has a wall thickness of 1mm, and the ABS and HIPS materials completely solve the customer's worry about the thin-walled printing effect. After receiving the printed sample, the customer has done many assembly tests, all of which meet the requirements.

**Customer Evaluation:** The comprehensive evaluation of the surface effect and material properties printed by ABS material is the best, meeting all requirements.





# Brazilian water conservancy equipment company printing equipment enclosures: R&D verification

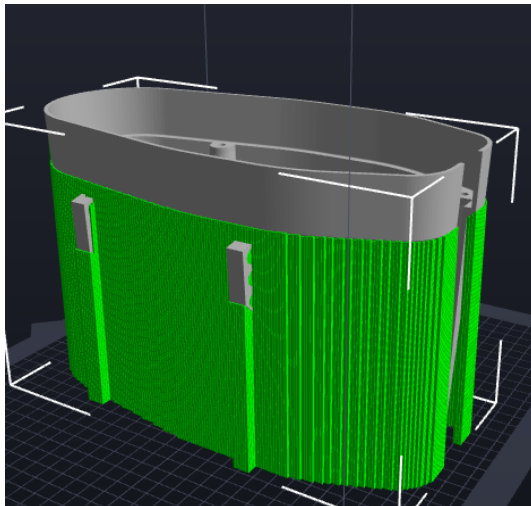
**Application Background:** The customer is a Brazilian company that produces and develops water conservancy equipment. The printed sample is the reinforced cover plate of the mechanical equipment, which has certain requirements for mechanical strength and durability and also has requirements for waterproofness. Compared with nylon material, ABS material has lower water absorption and stable physical properties, making it suitable for the functional verification of enclosures with mechanical strength requirements.

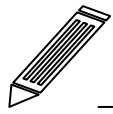
**Machine Model:** Creator 4

**Material:** ABS

**Case Description:** The sample is built at one time, with delicate model surface and easy support removal. A number of tests including strength, structure, temperature resistance, vibration were carried out on the sample, which helped our customer quickly complete the necessary tests in the product development stage and accelerated the development progress of new products. Our company's Creator 4 and ABS material perfectly realized the printing of high-strength thin-walled parts, and effectively simulated the mechanical properties of actual products.

**Remark:** If it is for long-term outdoor use, ASA material can also be used. The mechanical and physical properties of ASA material are similar to those of ABS, and it has weather resistance such as ultraviolet resistance.





# Zhejiang Royal Garden Tools Manufacture Co., Ltd. printing the shells of lawn mowers

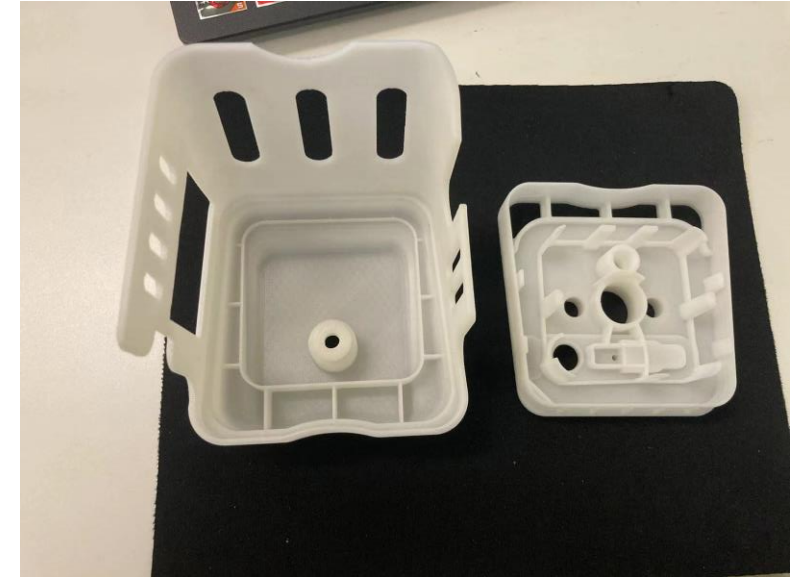
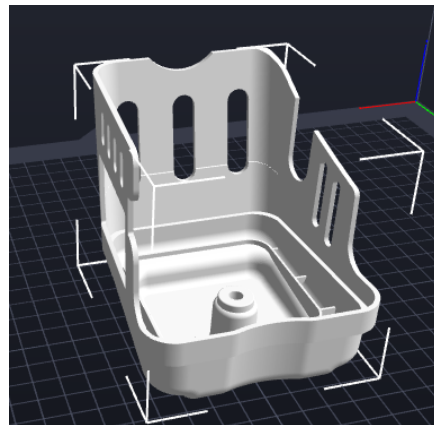
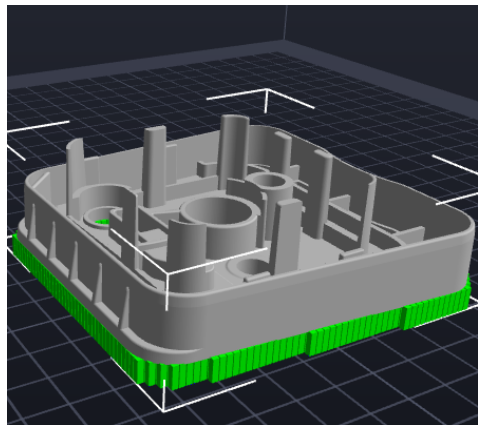
**Application Background:** There are many kinds of electric power tools. The iteration of prototypes is fast in the R&D stage, which requires assembly testing and functional verification. The complex structure of the prototype determines that 3D printing is more suitable for prototyping than CNC machining.

**Machine Model:** Creator 4/Guider 3

**Material:** ABS/PA-CF/HIPS

**Case Description:** Our customer has used nylon carbon fiber material, ABS material and HIPS material successively, and finally the surface effect of HIPS material was the most recognized.

**Remark:** The shell function part has high strength requirements. Through good design and optimization of printing layout, our company's Creator 4 and ABS material can meet the material requirements, provide smooth and delicate surface effect, and well simulate the performance and appearance of the final product.





# Architecture, furniture, film and television creativity: assistant creative and R&D engineers

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## Creative Styles

In a word, in this field, there is no lack of realization, there is a lack of discovery.  
It is clearly demonstrated when compared with Raise.





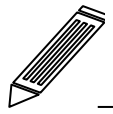
# ShelterLogic China(Ningbo) Co., Ltd.: design verification and creativity

**Ningbo ShelterLogic:** It focuses on the development and production of outdoor products, and its products are mainly exported.

**Case Description:** Our customer's products can be typically divided into handrail components, connector components (three-way pipes, etc.), rollers and other related plastic parts; Our customer is very demanding on product quality. Therefore, in the process of product development, the testing of new products is a very important part of quality control. Every new product has to undergo strict tests such as lifespan and aging, and the testing process must meet the real load-bearing and sunshine conditions, which results in higher requirements on the materials of samples. Our company's Creator 4 and diverse materials can meet the needs of our customer in this aspect; At present, Creator 4 has been purchased to print almost all products for functional verification.

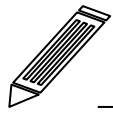
**Remark:** Outdoor and indoor furniture industry enterprises can be recommended for functional verification, at the same time, design creativity and development can also be realized.





# Scientific Research & Medical Field

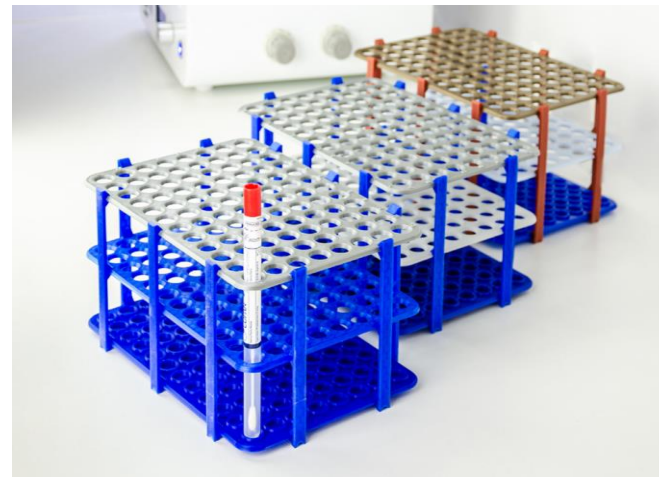
The application requirements of scientific research in education, especially in higher education and vocational education, are not high; However, through reasonable channels, the sales volume is quite large; Medical applications are mainly in two aspects: preoperative model training and postoperative auxiliary device design; Here we introduce them together, instead of demonstrating them separately.



# Genomics Laboratory of Warsaw University

**Background:** During the outbreak of COVID-19, researchers in Genomics Laboratory of Warsaw University had to test the virus as many as 2,000 times a day. With such a huge demand for test tubes, how to store and place them regularly became a problem.

With the help of the Flashforge's 3D printer characterized by **large format and stable and reliable long-term operation**, the laboratory can print and assemble 15 complete test tube racks in one day. Until August 2021, the laboratory has been equipped with 460 test tube racks for testing and research. A complete test tube rack holds 13-14 assembly parts. After the assembly, 96 test tubes can be placed at one time for storage and stability, which greatly improves the efficiency of virus testing in the laboratory.



"Using 3D printing technology to make test tube racks is low in cost, and the finished printouts can also be directly assembled and put into use, which can greatly save money. Dreamer's stable output and Guider II's large-area build plate help the laboratory greatly shorten the printing time and improve productivity."

—— A laboratory researcher



# 3D Print medical goggles to help prevent and control the epidemic

**Flashforge's FDM equipment Guider II/Creator 3 for mass production of goggles**

Compared with the traditional injection molding process, 3D printing has the characteristics of short design cycle and better capacity expansion. In the special situation of the urgent epidemic, the advantages of 3D printing in solving difficult problems are more obvious. At the same time, 3D printed goggles are light in weight and lighter to wear, which can better ensure a sealed state and prevent goggles from fogging up when worn for a long time.

