Creality Sermoon V1 Pro

An uncompromisingly easy-to-use printer to unlock your creativity.

Review

Engineer's Report - June 2022 - INTERNAL USE ONLY

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I. Introduction - claims

The **Sermoon V1 Pro** is an **FFF** 3D printer designed by **Creality**, a Chinese (Shenzhen, China-based) company founded in **2014**. The company provides a wide range of 3D printers and is known as a leader in prosumer additive manufacturing in the world. Its best-known models are the **Ender** series. This model is more developed and has all the necessary attributes to become a very good choice for any individual wishing to start FFF 3D printing. Creality develops 3D printers with ease of use and versatility in mind, to offer high-quality 3D printing to a variety of users. The proposed range is suitable for beginner and prosumer users and can also print almost any type of filament. Creality is now well-known in the 3D printing solutions market thanks to its CR-10 and Ender 3 printers.

The Sermoon V1 Pro is **the latest** addition and is made for desktop use. It has a medium-sized build volume with **one extruder** FFF. The workspace is a **175x175x165 mm³** cuboid. Other key features claimed by the 3D printer, to be discussed in this report, are as follows.

Features:

- Single extruder with a direct drive extrusion system
- Print out of the box
- Fast printing with silent stepper motor drivers
- Filament Compatibility: PLA, ABS, TPU, PETG

Specifications:

- **Printing**

- Print Technology: FFF (Fused Filament Fabrication)
- Build Volume: 175mm x 175mm x 165mm (6.89” x 6.89” x 6.50”)
- Layer Thickness: 0.10-0.40mm
- Nozzle Diameter: 0.4mm
- Filament Diameter: 1,75mm
- Max. Extruder Temperature: 245°C (473°F)
- Heated Build Plate Temp.: up to 80°C (176°F)
- Print precision: 0.10mm

- **Mechanical & Dimensions**

- Extruder Quantity: One
- Printer Dimensions: 400mm (W) x 380mm (D) x 430mm (H) (15.75” x 14.96” x 16.93”)
- Printer Weight: 11.5kg (24.25 lb)

- **Software & Electrical**

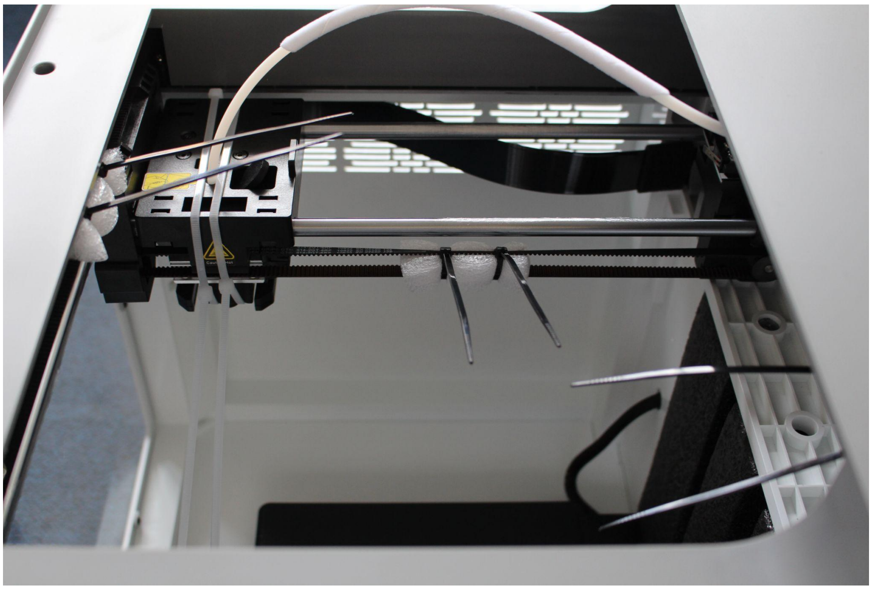
- Software: Creality Slicer
- Connectivity: SD card / WiFi
- File output: .gcode

II. Packaging

1. Unboxing

The Creality Sermoon V1 Pro is very **well packaged**. The printer is placed in a cardboard box. Unboxing is easy and is done step by step. Each part is **properly protected** so that the printer does not get damaged during transport. Knowing that Creality is a Chinese company, this is really important because it can suffer many shocks during transport to Europe for example.

Fig.1: Unboxing



As we can see in this photo, all axis are well protected with zip ties and foam so they do not move during transport. It's a really good point for Creality, the packaging is totally flawless.

Fig.2: Zip ties and foam to protect axis

2. Kit content

The Creality Sermoon V1 Pro printer comes with several interesting accessories. The kit contains items including 200g of PLA for the first prints, a spare nozzle, and a few tools to maintain the printer. Normally the printer is supposed to come with an SD card, a USB card reader, a glue stick, and some grease.

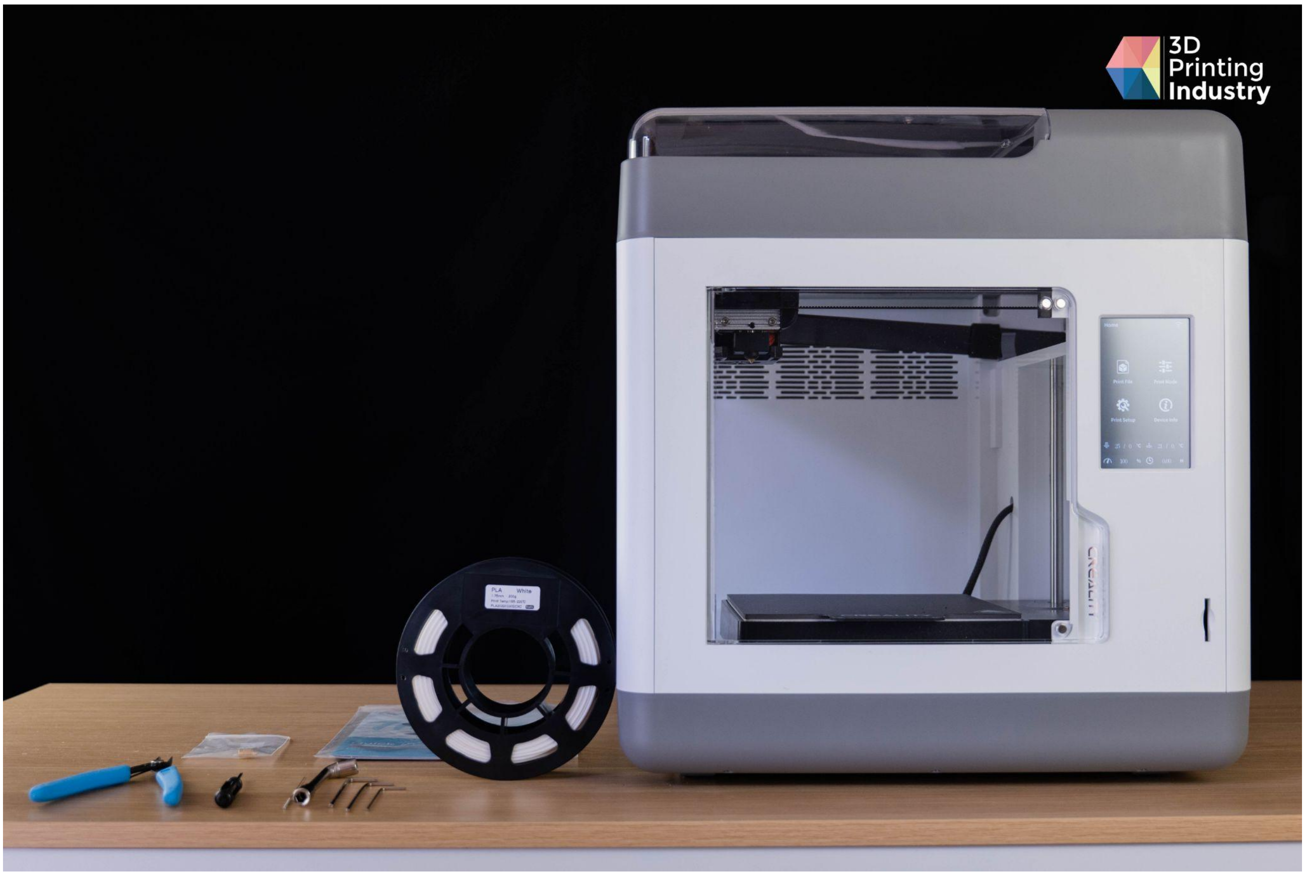


Fig.3: Kit content

3. List of parts

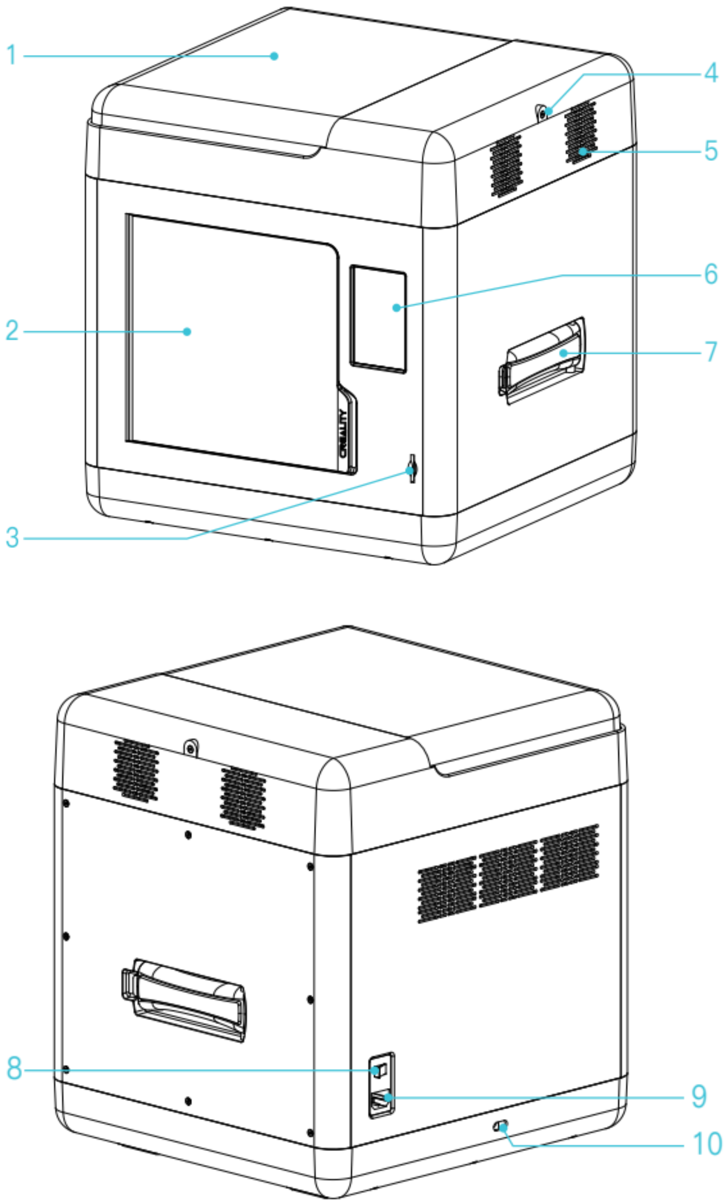


Fig.4: Nomenclature

1. Cover	6. Display screen
2. Front door	7. Spool holder
3. SD card slot	8. Power switch
4. Filament entrance	9. C14 power socket
5. Case fan	10. Voltage adjustment port

Tab.1: Nomenclature

III. Hardware

1. Architecture

The **Creality Sermoon V1 Pro** is an FFF 3D printer with a **full metal chassis**. It is based on a **cartesian axis system**, a configuration known to be more rigid but slower than a delta or CoreXY system. This is an enclosed printer, which means there is an enclosure to keep the build area temperature controlled during printing.

The **print head moves on the X and Y axis**, whereas the **bed moves on the Z**. This setup is easy to build but does not allow fast printing. Indeed, the bed is quite heavy and has a lot of inertia when it moves. This configuration is very common to low-cost printers. This adds weight to the moving assembly and makes it **less precise than a Core XY configuration**.

The workplace is a **5.05-liter cuboid** which is smaller than the average FFF printer (typically between 10 to 15 liters). Moreover, the build area is well optimized compared to the overall size of the machine. The machine is small with a volume of **400x380x430 mm.** It will be perfect for any maker or desktop user for prototyping operations.

2. Components

a. Print head

The Sermoon V1 Pro is a **single extruder** 3D printer. It is able to print only one material per print from a variety of compatible materials: PLA, ABS, TPU, and PETG.

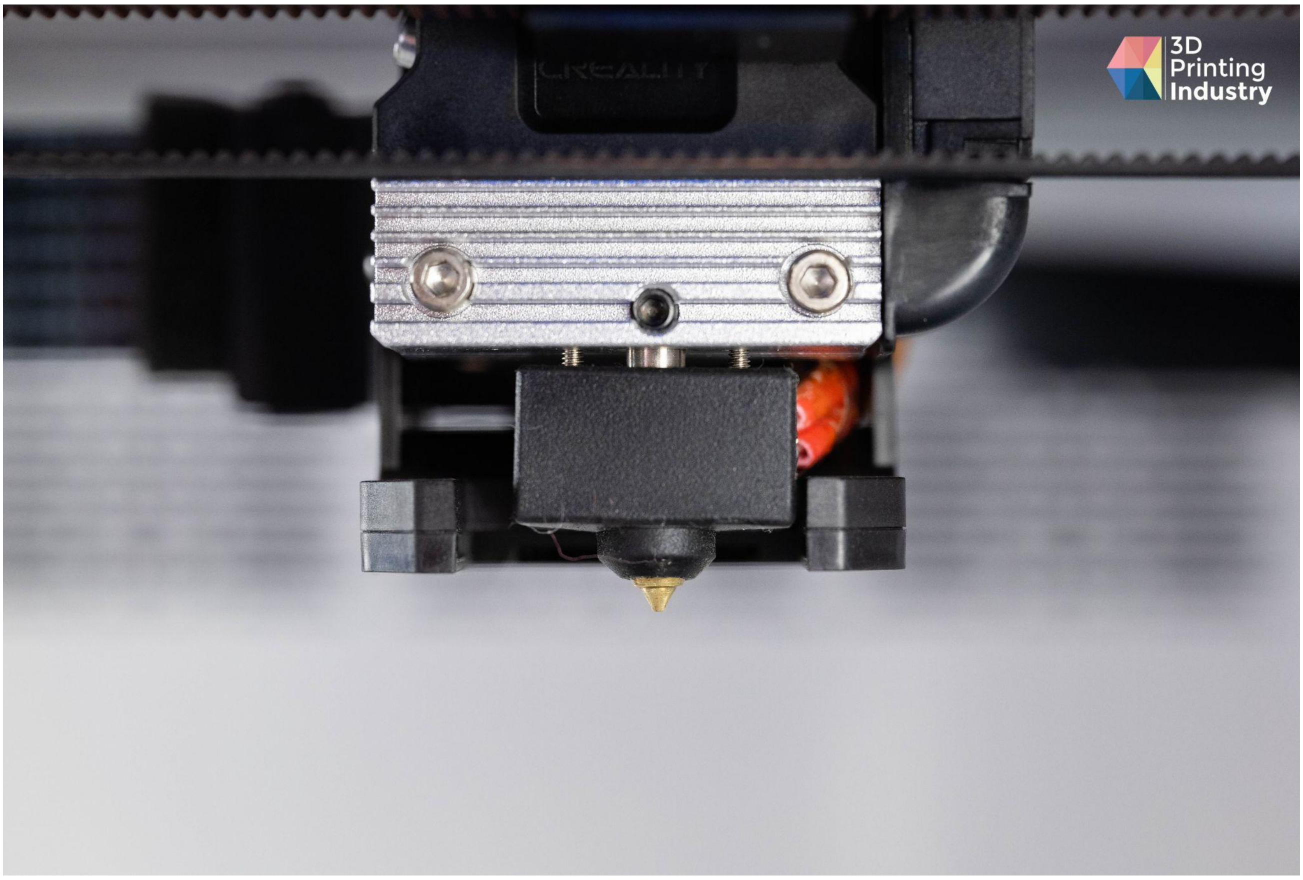


Fig.5: Print heads

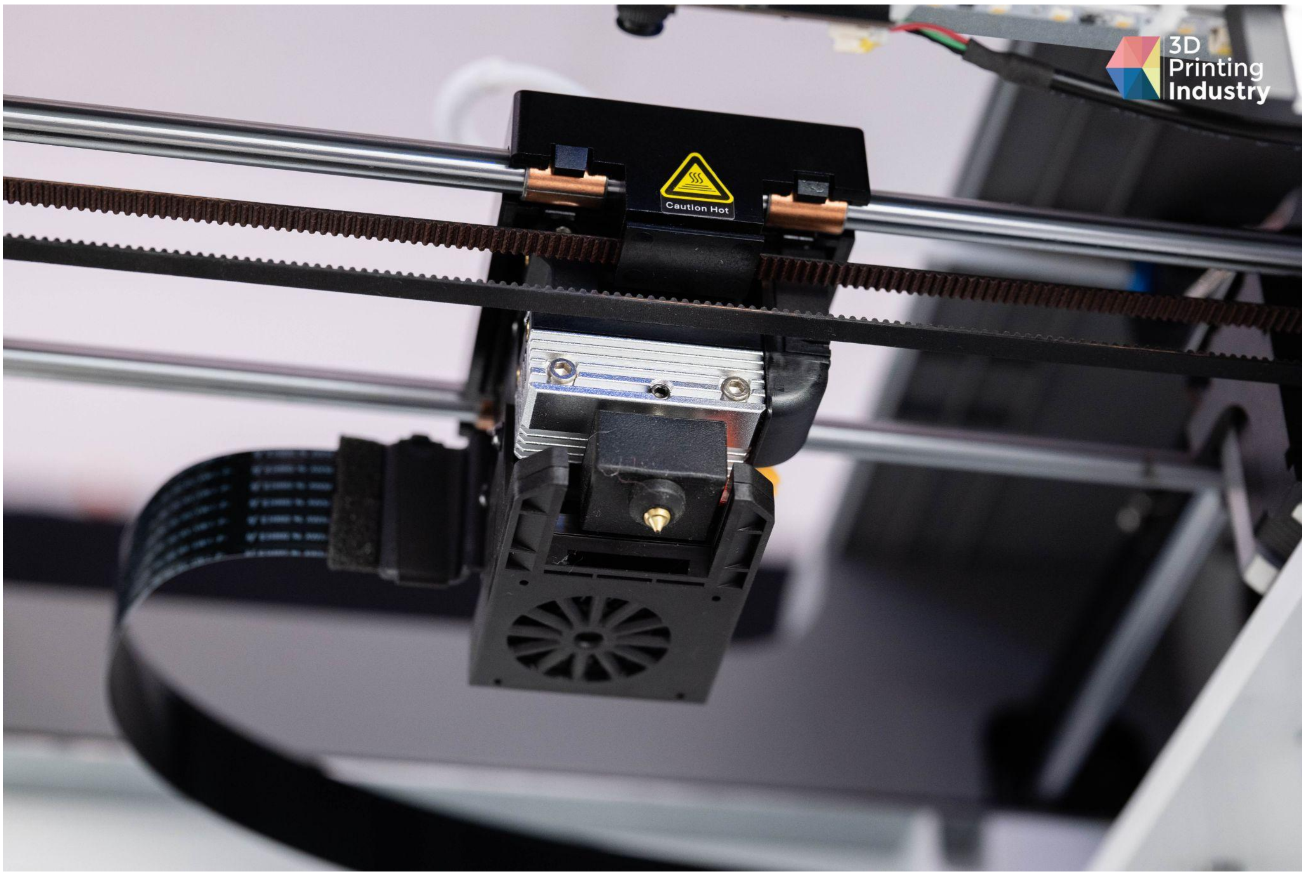


Fig.6: Print heads

The print head is a **direct drive** system. It means that the motor which supplies the filament to the nozzle is directly mounted on the print head. This configuration is common across many 3D printers (due to ease of setup) but this is not the most accurate system. Indeed, as the motor is mounted on the print head, the overall weight is higher. This explains why the maximum printing speed is lower (due to the inertia of the head). The printer will in any case have a slow printing speed. In addition, the print head seems to be larger than other comparable 3D printers found in this section of the industrial market. A Bowden extrusion system might be more suitable if the company wants to increase the printing speed, but this is not a problem in view of the bed configuration and what the company targets. The Bowden configuration includes mounting the extrusion motor away from the print head. A Bowden system can improve productivity and accuracy but is not compatible with flexible filament. Direct Drive configurations make it easier to print complex filaments and perform better on industrial machines. It is, therefore, a very good choice on the part of Anycubic.

This printer is very well equipped with aftermarket parts. It comes with a **4010 fans** to cool the plastic once it has been applied to the part. Moreover, this head is equipped with well-designed **extruders**, and one **hotends** with **0.4mm nozzles**.

b. Bed

The bed is heated. Heating the bed is very important to prevent warping. Indeed, keeping the temperature of the bed higher than ambient temperatures allows users to keep the lower surface of the print hot and to avoid retraction of the plastic if the temperature drops.

The build surface is **175x175mm**. A magnetic flexible build plate is placed on the heating bed. The bed heats up to **80C°**. The bed heater has a quick climb and descends time which aids the user's experience. The printer is equipped with a magnetic build plate which can facilitate the detachment of parts once printed.

Fig.7: Flexible build plate

Fig.8: Bed without build plate

c. The casing

The Creality Sermoon V1 Pro is a **fully enclosed** machine. This is very important in order to keep the temperature of the workspace higher than the ambient temperature outside, especially for more complex materials. Doing so helps avoid delamination and warping issues on prints due to shrinkage of the material in a cold airflow. Moreover, the enclosure adds to Creality's user-friendliness claims, preventing accidental contact with moving parts or heated components. But an enclosed machine will logically have an overall size larger than an open one. The user has to plan enough space in the area. Moreover, the price range isn't the same as an open machine. The printer is made of white and grey plastics and a transparent acrylic door on the front of the printer which allows you to see inside the printer during printing. The top of the printer can also move. Simply lift it up and the user can access the inside of the machine. it. It is very convenient to be able to reach the print via the top as sometimes the print is non-accessible from the front door but even more if the user has to do some maintenance.

Fig.9: The casing

d. Electronic components

The 3D printer is equipped with:

- A 4.3-inch full-color touchscreen multilingual user interface. It allows us to calibrate the bed, load the filament, and begin prints. The interface is very intuitive and easy to use. The position of the screen on the front right of the printer is very convenient for the user;
- Communicates on your terms via USB cable or MicroSD card;

Fig.10: Screen and USB port

e. Spool holder

The printer is equipped with an external spool holder for the spool loaded into the machine. This system doesn't enable users to keep the spool inside the machine, in a dry area, something more commonly seen on higher-end systems.

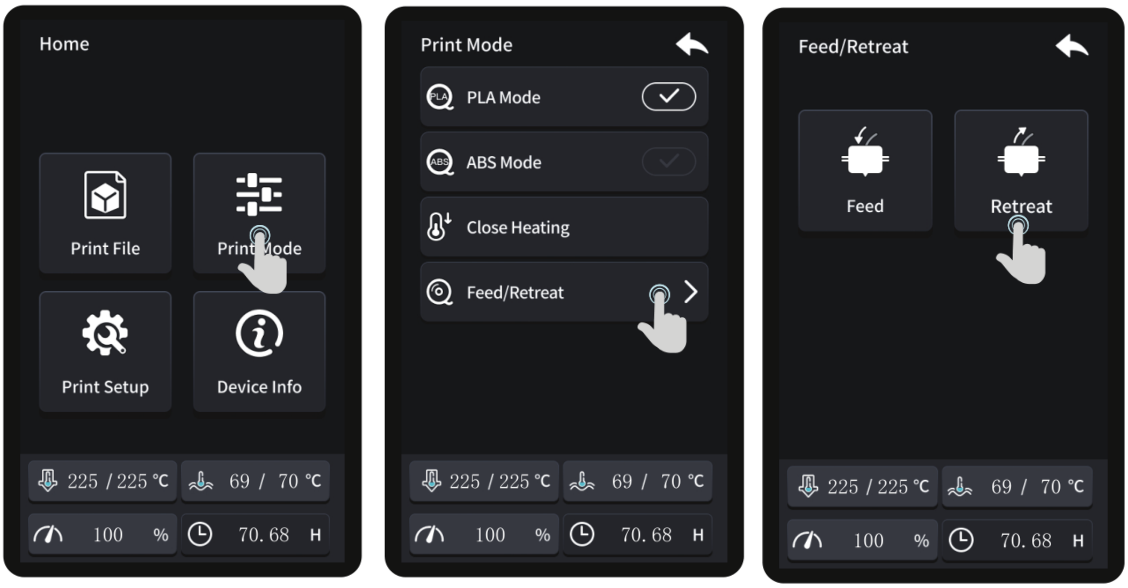
Fig.11: Spool holders

V. Use of the printer

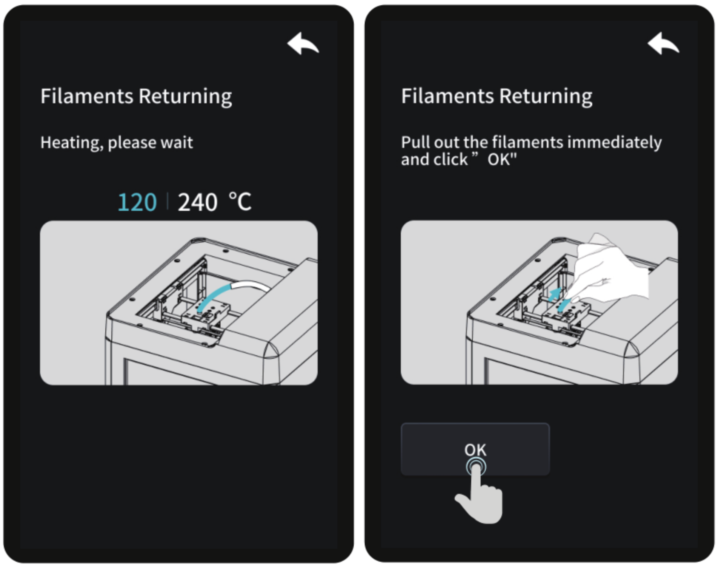
1. Set-up

a. Loading/unloading filament (5 min)

1. First, place the spool in the right place on the spool holder. Then, feed the filament through the extruder until you can't push it in any further.



2. Then, on the screen, click on the "***Print mode***" button. Press the "***Feed/Retract***", and click on the "***Feed***" button, and the printer will begin to heat.



3. When the target temperature is reached, push the filament through the nozzle. Click on "***OK***" when you see a filament of the right color coming out of the nozzle.

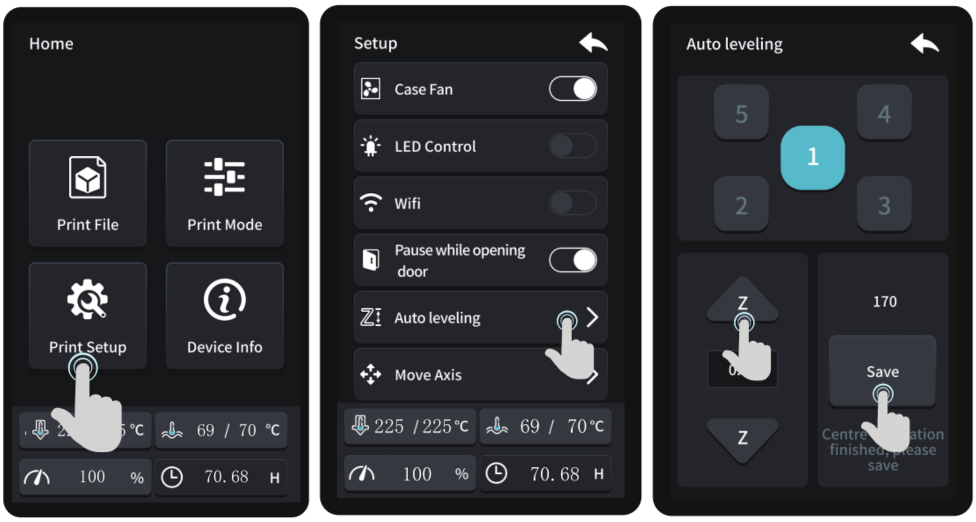
If you want to **unload** filament, you need to repeat the same step and from step 2, touch the "***Feed/Retract***" button, then select "***Retract***". As for the loading process, the printer will begin to heat. Just follow these steps and wait for the extruder to heat up to the target temperature. The extruder will alert you when it is at the target temperature. Take the spool out.

b. Bed calibration (15 min)

A properly leveled build plate is required for high-quality 3D prints. If you have any problems printing an object, you should first check whether the build plate is properly leveled or not. The X, Y, and Z-axis must be calibrated correctly to ensure that the printer works properly. The purpose of calibrating the Z-axis is to save the correct Z Offset for the nozzle.

A general rule of thumb is to leave a gap that is the thickness of a piece of paper. However, for printing finer objects (300 microns and lower), use a feeler gauge to level the build plate as it requires a lesser gap between the nozzle and the build plate.

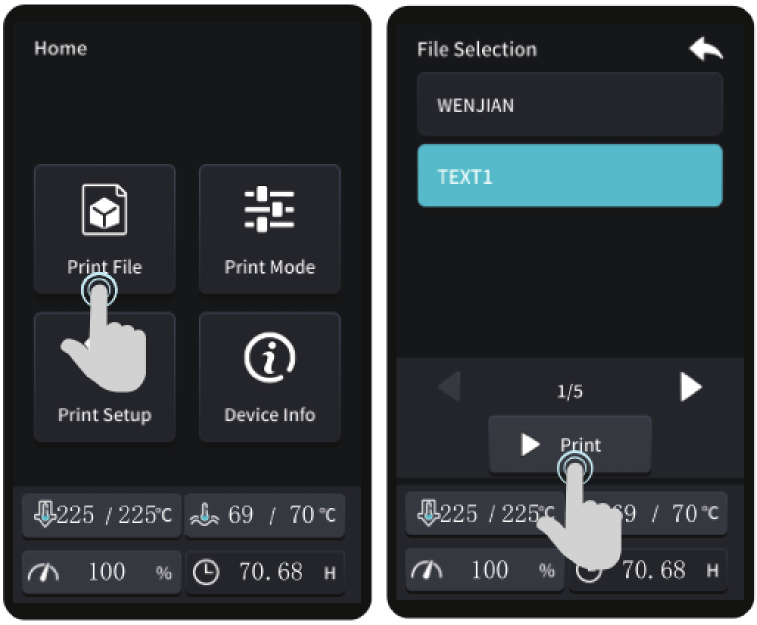
This machine isn't equipped with an automatic bed leveling sensor, which is quite a shame for a printer that is supposed to target beginners. The user will have to use a piece of paper to calibrate the right Z-Offset on 5 different points on the bed. Then, the printer will create a mesh and determine by itself the relative position of the printing platform and the XY plane and will perform a real-time compensation by raising or lowering the Z-axis in the printing process. Even if the printing platform has a certain angle of inclination, printing can also be performed by compensation.



1. First, click on the "***Print Setup***" button. Next, click on the "***Auto leveling***" button and wait for the printer to be ready. After entering the leveling interface. The next step is to calibrate the optimal distance between the tip of the nozzle and the printing platform. Place a piece of paper between the nozzle and the build plate. Click the "Z***+***" or "Z-" button to adjust the up/down movement of the Z-axis, so that the distance between the nozzle and the build plate matches the thickness of the piece of paper. Take out the piece of paper, and click on the "***Save***" button. Repeat this step on each other four points.

2. Printing

The 3D printing step is very intuitive. Once the g-code is ready, the user can either plug a MicroSD containing the file into the printer or use the Creality cloud the send the file remotely.



1. Open the "***Print file***" tab, and select your file. Press "***Print***" to start printing the test file.
During printing, you can check the status on the interface on the touchscreen, including the printing time and other parameters. You can also modify the print setting by opening the "***Setup***" tab.

3. Areas for consideration

This section contains ideas and feedback which could be interesting for future developments.

- We really enjoyed the user experience of the software and firmware, we have nothing to complain about.
- It could be nice to add a leveling sensor, at least on the pro version.
- t could be nice to add a live Z-Offset adjustment button as well

VI. Printing tests

1. Basic test

This section contains the test results used to understand the performance of the printer.

a. 3D Benchy

3D Benchy is a well-known model which can be used as a benchmark for accuracy testing. Indeed, the model has a lot of overhangs, circular trajectories, bridges, and holes which often lead to printing issues if not addressed correctly. The dimensions of the print can be measured and compared to the original model to test the accuracy of the machine.

URL: https://www.myminifactory.com/fr/object/3d-print-3dbenchy-the-jolly-3d-printing-torture-test-6544

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	195	60	PLA	No

Tab.1: Benchy setting

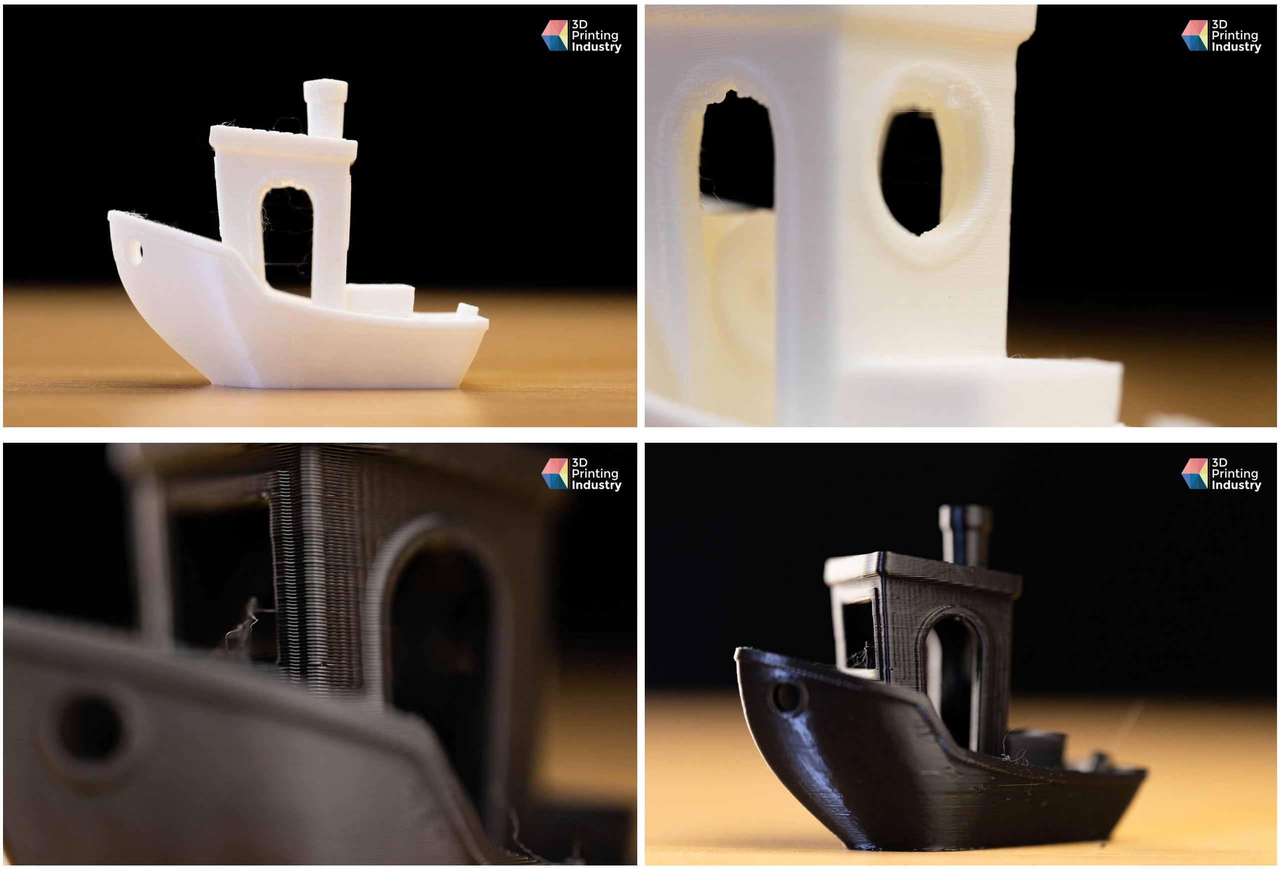


Fig.12: Benchy boat

As we see in figure 25, the quality of the print is really good. There is no stringing, the part is almost perfect. The layers are not too visible, and the shape of the hull is very good. This is a very good print.
Of course, the quality will improve with a cleaning process: some artifacts could be removed by hand or with simple tools (scalpel, cutter, grit paper, etc...).
The measures are given in the table below. Every dimension is found on the website: http://www.3dbenchy.com/dimensions/

Rating name	References (mm)	Dimensions (mm)	Differences (mm)
Bridge roof length	23	22.99	0.01
Chimney Øext	7.00	6.97	0.03
Chimney Øint	3.00	2.69	0.31
Horizontal overall-width	31.00	30.99	0.01
Vertical overall-height	48.00	47.95	0.05
Vertical overall box height	15.50	15.50	0.00
Box length inside	8.00	7.95	0.05
Box width inside	7.00	6.94	0.06
Box length outside	12.00	11.95	0.05
Box depth	9.00	9.19	0.19
Hawsepipe diameter	4.00	3.89	0.11
Front window width	10.50	10.55	0.05
Bridge rear window	9.00	8.96	0.04
		Mean of differences (mm):	**0.0738**

Tab.2: 3D Benchy dimensions

The mean of the differences between the measure and the reference is **0.0738 mm**. This is an excellent result considering the price of the printer. The average of our tests on the Benchy Boat is about **0.15mm** between the measurements of the printed model and the measurements of the 3D model. So this printer is over the average.

b. Repeatability test

Repeatability is the capacity of the printer to produce **multiple parts with the same or very similar dimensions**. The test is composed of three different parts which were all printed many times. As the reference dimensions are known from the original 3D model, we were able to determine the discrepancy between measured dimensions and original dimensions, and the dispersion between them. The parts are printed in groups of 3 (1 square, 1 polygon, 1 tube) with the following settings.

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	195	60	PLA	No

Tab.3: Repeatability setting

The normal distribution is studied - when the **mean of difference is under 0.1mm** and the **standard deviation is under 0.05mm**, the printer can be said to have had a **successful** repeatability test. After checking our measuring equipment, the accuracy of our measurements for this test is **±0.015mm** for our caliper and **±0.004mm** for our micrometer.

- Squares

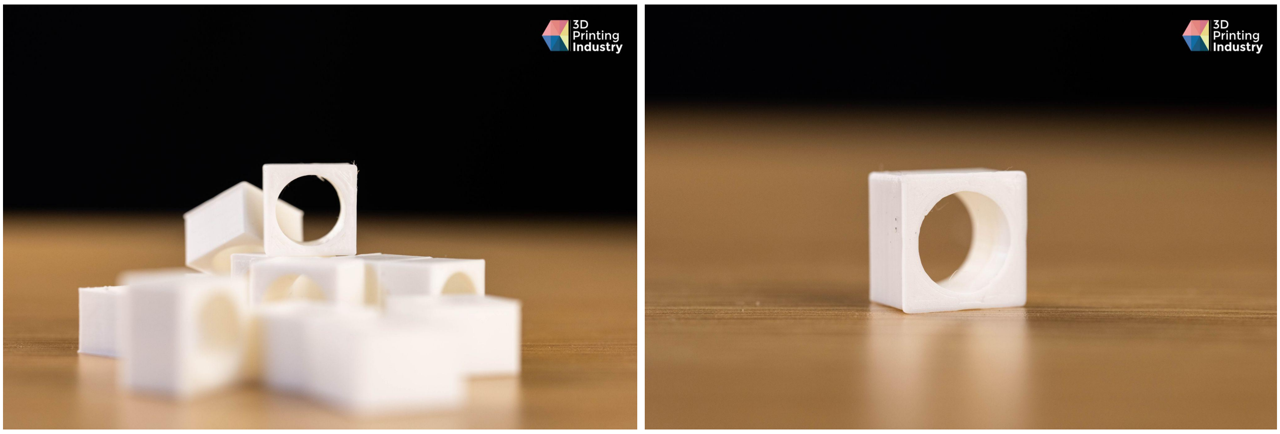


Fig.13: Repeatability testing of the square model

The measures are given in the table below. [Excel Database – Basic test – Creality Sermoon V1 Pro]

SQUARES	Hole ϕ (mm)	Height (mm)	Length (mm)
Reference	12	10	15
Print 1	11.96	10.211	14.954
Print 2	11.91	10.191	14.930
Print 3	11.97	10.159	14.926
Print 4	11.91	10.223	14.947
Print 5	11.87	10.174	14.939
Print 6	11.93	10.118	14.956
Print 7	11.93	10.192	14.942
Print 8	11.95	10.131	14.919
Print 9	11.99	10.239	14.943
Print 10	11.90	10.135	14.926
Print 11	11.93	10.242	14.942
Print 12	11.96	10.138	14.931
Mean of differences	0.065833333	0.179416667	0.062083333
Mean of real values	11.93416667	10.17941667	14.93791667
Standard deviation (σ)	0.033698755	0.043596202	0.011602965
Estim. Stand. Dev. (s)	0.035197201	0.045534747	0.012118901
Mean + 3.σ	12.03526293	10.31020527	14.97272556
Mean - 3.σ	11.8330704	10.04862806	14.90310777

Tab.4: Squares dimensions

Explanations:

- The "mean of differences" is the mean of the differences between the measurements and the reference. We commonly say that a difference between reference and measure under 0.1 is good for an FDM 3D printer.
- The standard deviation represents the dispersion of the sample.
- If we assume that the process follows a normal dispersion law, we can say that 99.6% of the part will belong to the interval [mean - 3σ ; mean + 3σ].
- In our case, we use samples of 12 parts. When estimating the dispersion around the mean of a statistical character in a large population from a sample of size "n", we use the following value for the standard deviation: $S = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \overline{x})^2} = \sigma\sqrt{\frac{n}{n-1}}$

To illustrate the table, the following graphs represent the dispersion of the hole diameter, the height, and the length (first measure). 99.6% of the hole diameters will be between [**Mean - 3 x σ**]mm and [**Mean - 3 x σ**]mm. Moreover, as we can see, most of the hole diameters will be near the mean which is [Mean]. **12mm** is the targeted dimension.

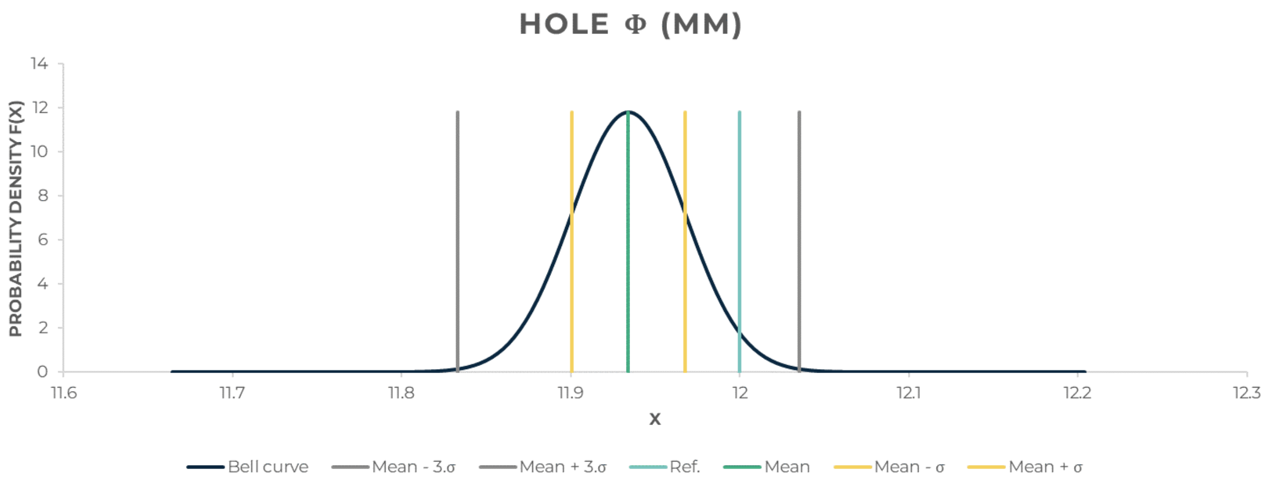


Fig.14: Normal distribution of the hole's diameter

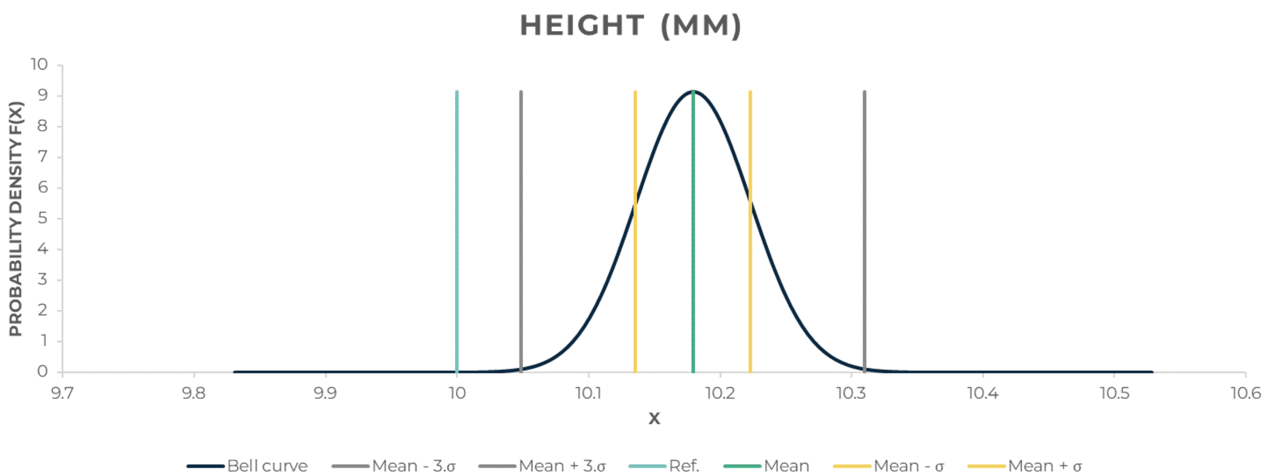


Fig.15: Normal distribution of the height

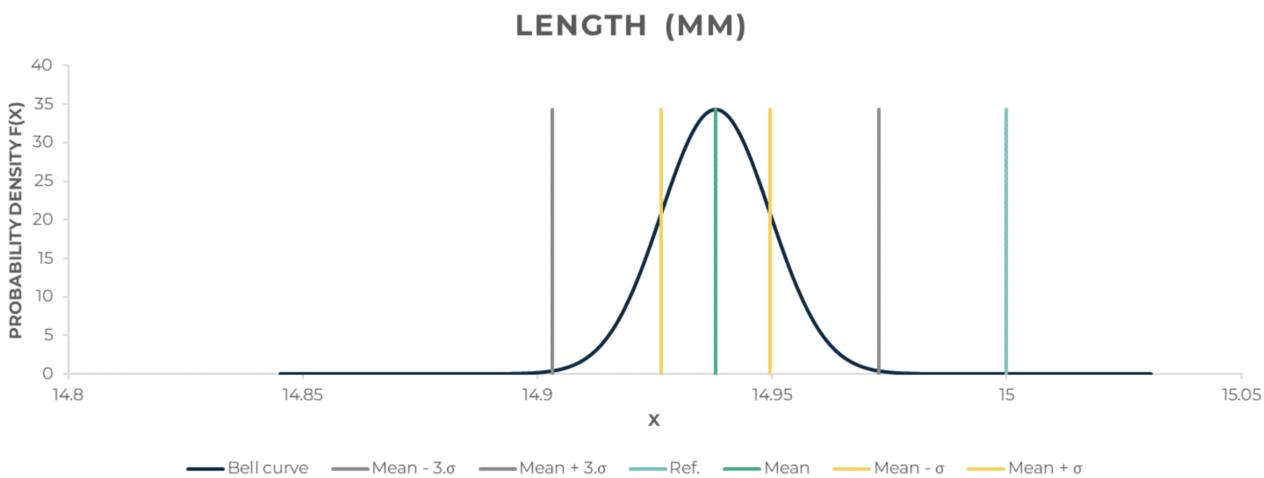


Fig.16: Normal distribution of the length

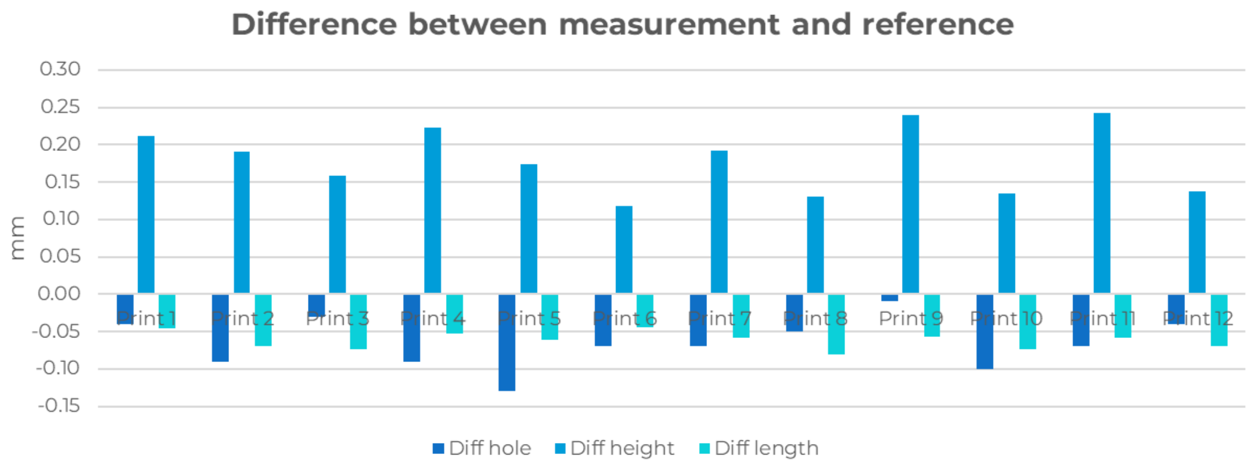


Fig.17: Difference between measurement and reference

The mean of difference for all three ratings of the square part test is **0.1024mm** (over 0.1 mm) and the standard deviation is **0.0296mm** (under 0.05mm). The results are really good and the only test that is quite bad is the height. The standard deviation is higher for the height (**0.0436mm**) than the other measured spacing. Same for the mean of the difference (**0.1794mm**). Besides that, the results are excellent, especially the hole as for a cartesian machine it is more difficult to print a circle.

- **Hexagons**

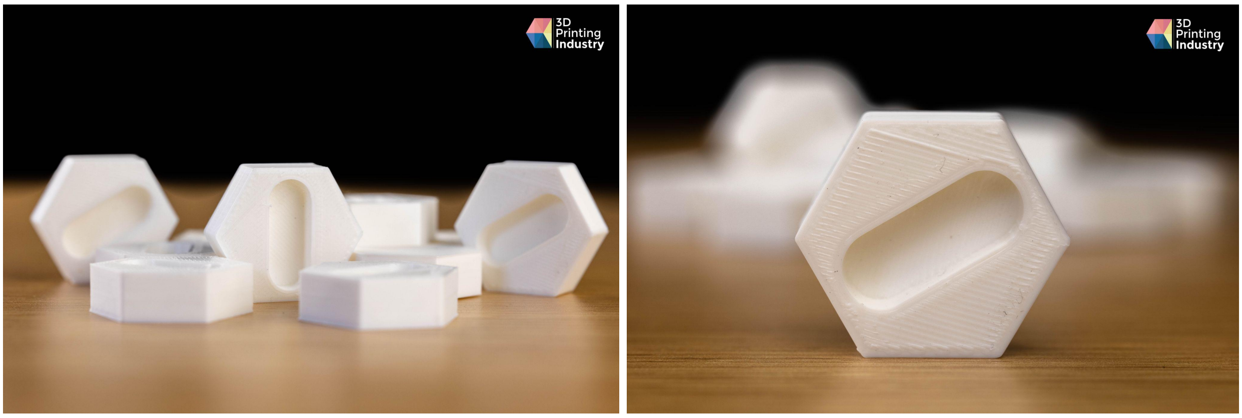


Fig.18: Repeatability testing of hexagons model

HEXAGONS	Length (mm)	Height (mm)	Groove depth (mm)	Groove width (mm)
Reference	30	10	5	10
Print 1	30.03	10.111	4.96	9.81
Print 2	30.03	10.154	5.01	9.86
Print 3	29.96	10.158	5.00	9.90
Print 4	30.02	10.150	5.01	9.91
Print 5	29.97	10.123	5.02	9.86
Print 6	29.92	10.083	4.97	9.92
Print 7	29.98	10.104	4.96	9.92
Print 8	30.01	10.097	4.97	9.92
Print 9	29.98	10.023	4.95	9.85
Print 10	29.95	10.085	4.97	9.89
Print 11	29.90	10.134	5.02	9.93
Print 12	29.97	10.110	5.00	9.90
Mean of differences	0.038333333	0.111	0.023333333	0.110833333
Mean of real values	29.97666667	10.111	4.986666667	9.889166667
Standard deviation (σ)	0.041414388	0.037781669	0.025702258	0.036545945
Estim. stand. dev. (s)	0.043255917	0.039461667	0.026845133	0.038170994
Mean + 3.σ	30.10090983	10.22434501	5.06377344	9.9988045
Mean - 3.σ	29.8524235	9.997654992	4.909559893	9.779528833

Tab.5: Hexagons dimensions

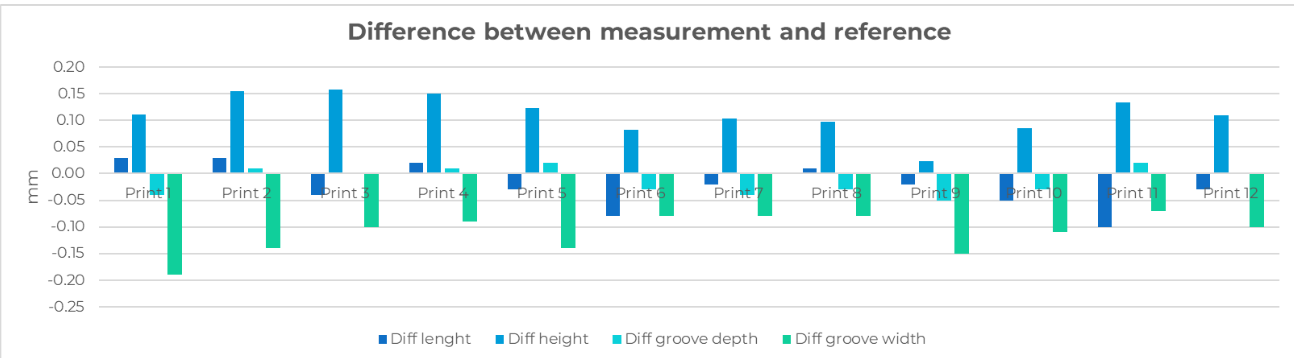


Fig.19: Difference between measurement and reference

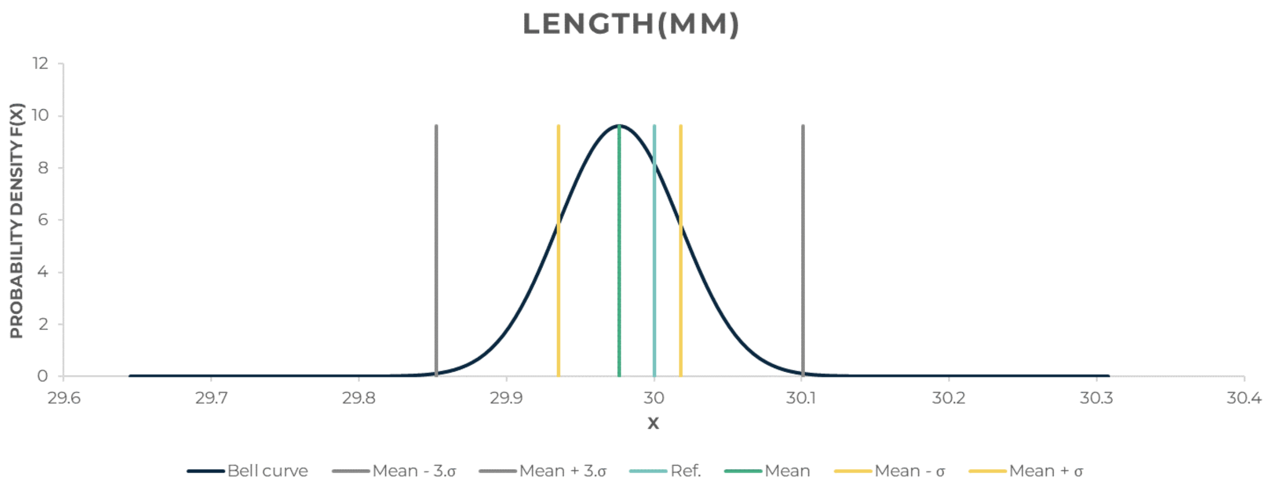


Fig.20: Normal distribution on the length

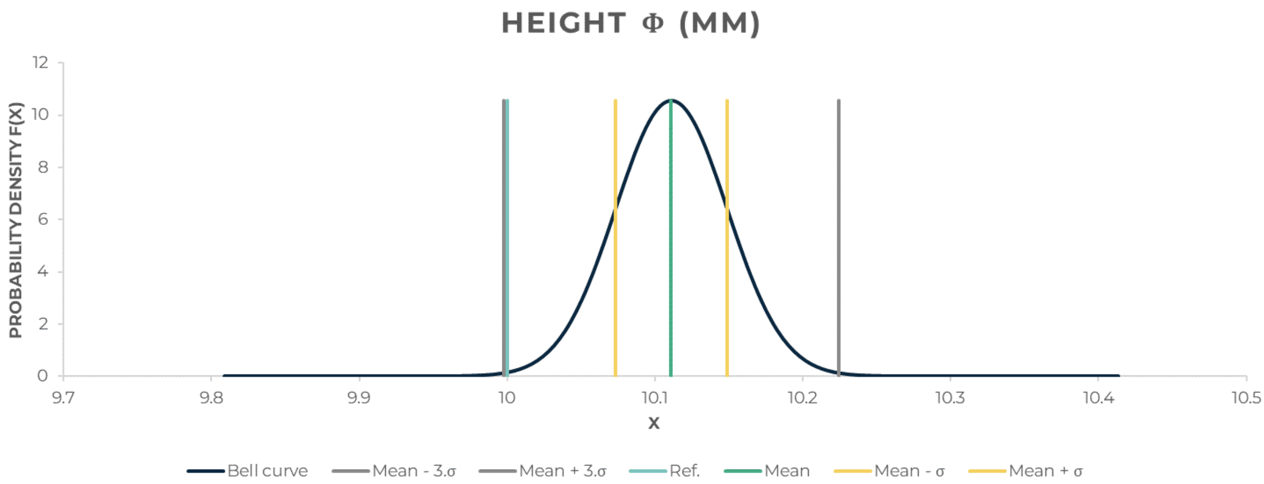


Fig.21: Normal distribution on the height

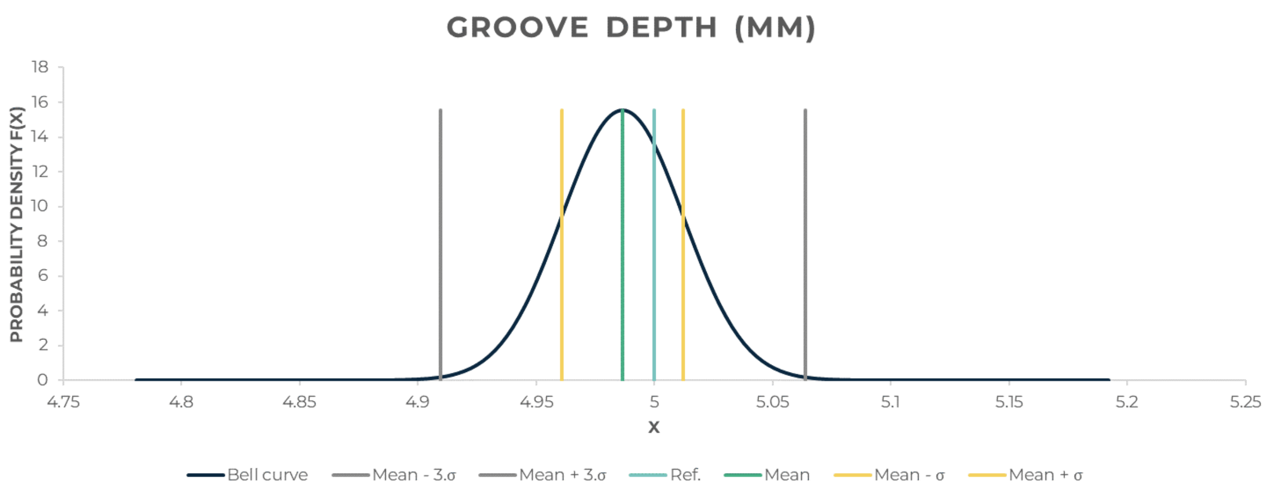


Fig.22: Normal distribution on the groove depth

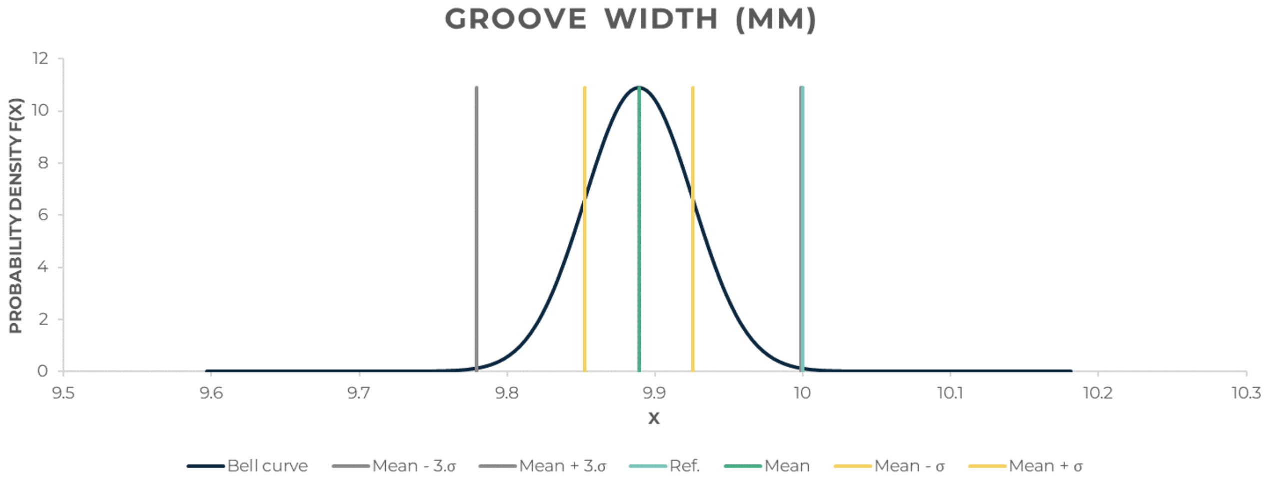


Fig.23: Normal distribution on the groove width

The results of the hexagon tests are good. The mean of difference for all ratings is **0.0709mm** (under 0.1mm) and the standard deviation is **0.0354mm** (under 0.05mm). This second study does confirm some of the findings from the square test. This time again, the worst one is the height with a mean of difference of **0.111mm** and a standard deviation of **0.0378mm**. The length is almost perfect. The groove depth is almost always the same (between **4.95mm** and **5.02mm**). However, the groove width has the same precision as the height and oscillates between **10.083mm** and **10.158mm**. The results are excellent and better than the square test.

- Tubes

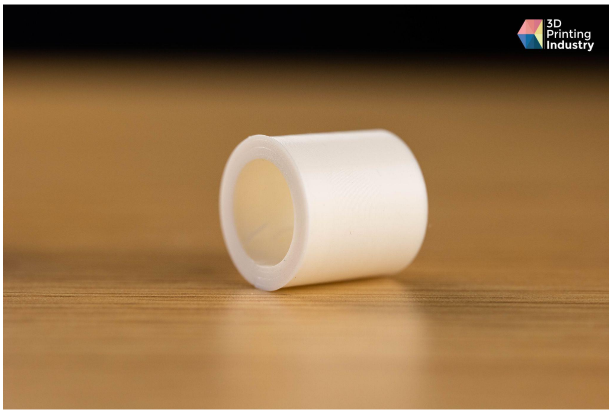


Fig.24: Repeatability testing of tubes model

TUBES	Ext ϕ (mm)	Total height
Reference	20	20
Print 1	19.925	20.222
Print 2	19.928	20.173
Print 3	19.939	20.208
Print 4	19.970	20.021
Print 5	19.970	20.145
Print 6	19.923	20.112
Print 7	19.960	20.076
Print 8	19.955	20.057
Print 9	19.926	20.111
Print 10	19.913	20.108
Print 11	19.957	20.069
Print 12	19.955	20.104
Mean of differences	0.056583333	0.117166667
Mean of real values	19.94341667	20.11716667
Standard deviation (σ)	0.019961136	0.06055626
Estim. stand.dev. (s)	0.020848727	0.063248951
Mean + 3.σ	20.00330008	20.29883545
Mean - 3.σ	19.88353326	19.93549789

Tab.6: Tubes dimensions

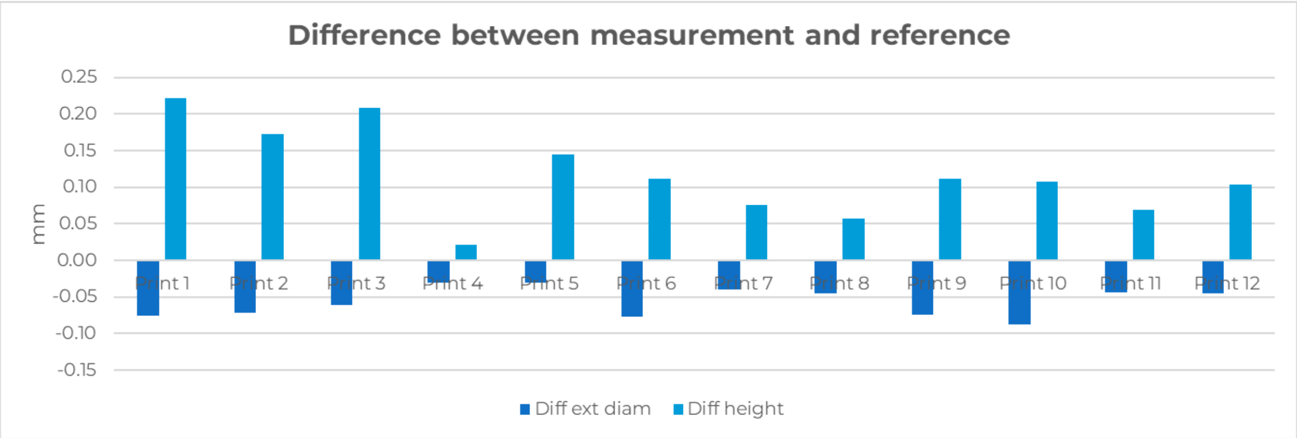


Fig.25: Difference between measurement and reference

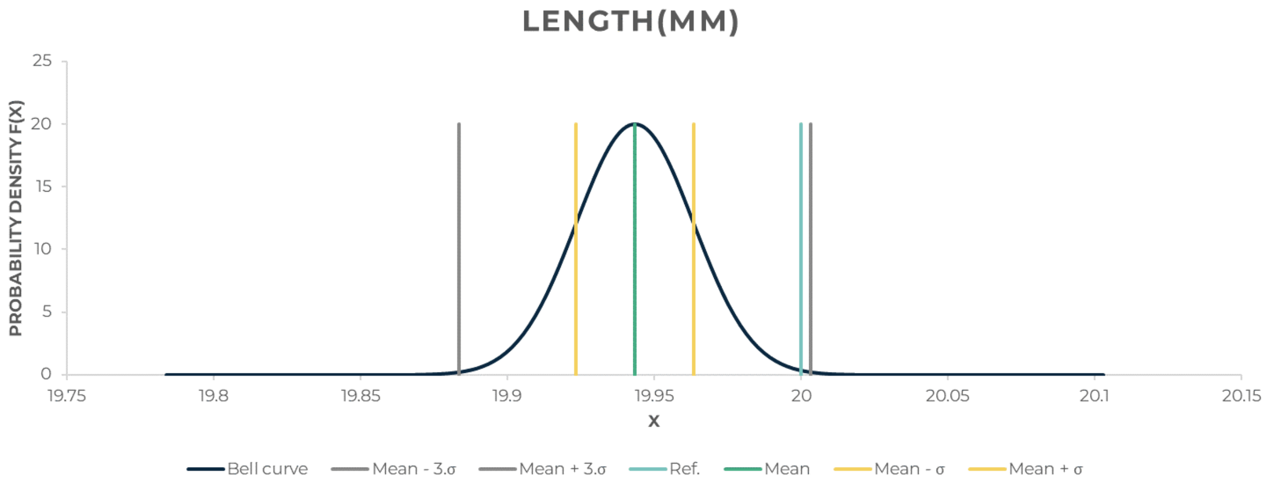


Fig.26: Normal distribution on the external diameter

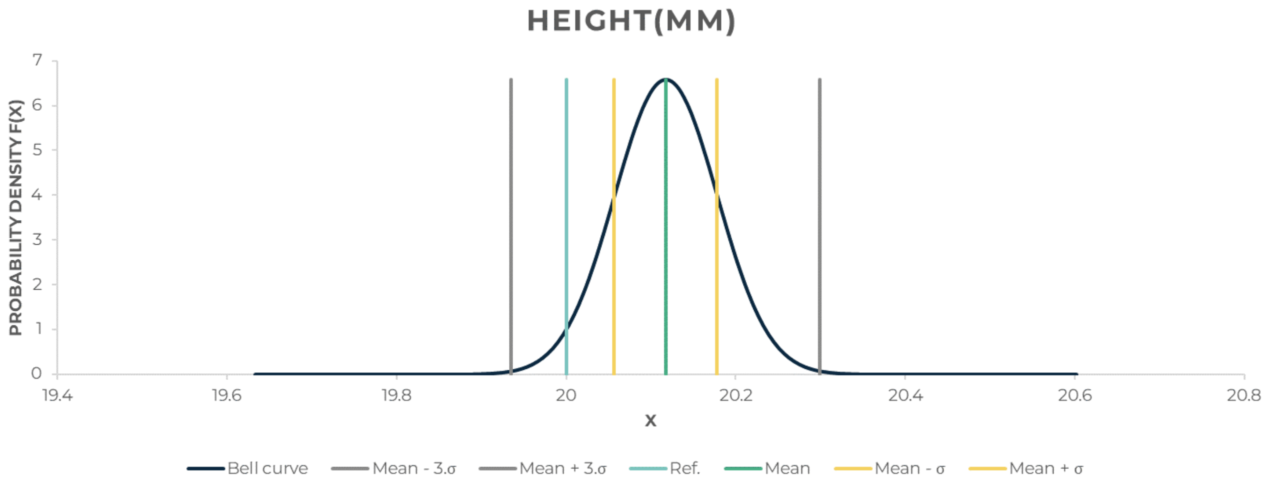


Fig.27: Normal distribution of the total height

The mean of difference for all two ratings of the tubes part test is **0.0869mm** (under 0.1 mm) and the standard deviation is **0.0403mm** (just over 0.05mm).
Regarding the diameters, the results on the tubes are near the target diameter and as good as the hole from the square test. Values range from **19.913mm** to **19.970mm**. This is a result better than the average. Indeed, they can be hard to manage for cartesian 3D printers: circles are not perfect but closer to oval. Depending on where the measurement is taken on the oval, it can be far from the targeted dimension.

- <u>Conclusion</u>

In terms of repeatability, Creality Sermoon V1 Pro is better than the average in its price range. Indeed, the mean of the difference for all dimensions is **0.0867mm**, which is under the reference (0.10mm). And the standard deviation for all dimensions is **0.0351mm**, which is under the reference (0.05mm).
The standard deviation can reach 0.01mm which is a good performance in view of the printer. But some differences between measures and targeted dimensions can be higher than usual. In our case, the test that was the worst and that lowers the average is the height of the square test.
This part shows results on the diameter are less consistent from the repeatability point of view because circles are less suitable than other shapes for printing on this type of system.

c. Bridges test

The bridging test is designed to determine if the printer is able to handle a print **without any support**. The bridges are printed in the void. This is a good test to evaluate the **cooling ability** of the printer as the faster the cooling is, the better the surface finish will be under the bridge. The small bridge lengths range from **5mm to 25mm, 5 per 5**. Whereas the larger one is from **20mm to 60mm, 10 per 10**.

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	195	60	PLA	No

Tab.7: Bridge setting

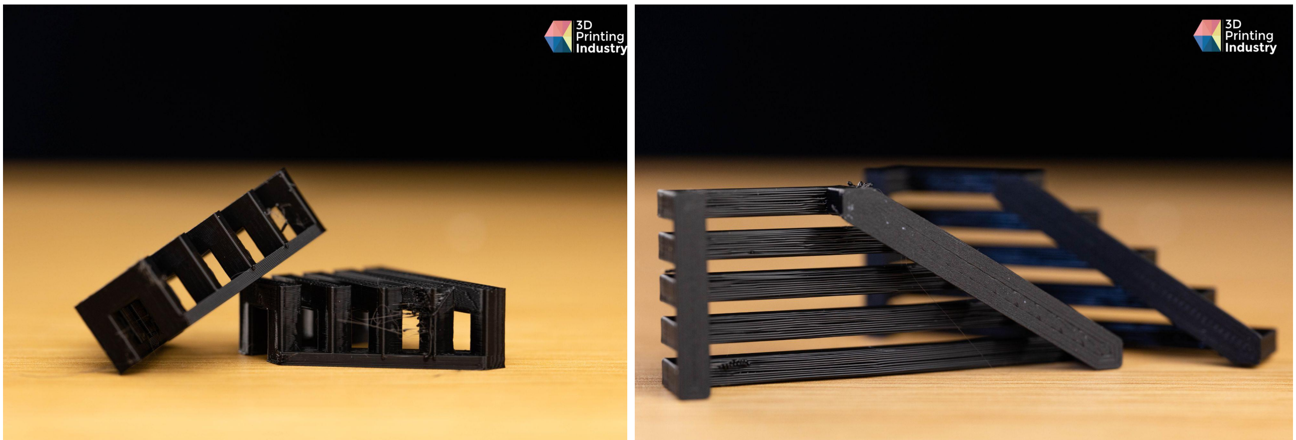


Fig.28: Bridge test

All the bridges were printed successfully. The quality of the bridges remains very good **until the 25mm length bridge**. After this limit, the bridges were still printed but they were curved and the surface underneath was not very smooth. This is a normal phenomenon as the bridges were printed without support.

The printer was able to print correctly up to the **25mm** bridge on the **X-axis**, and up to **20mm** on the **Y-axis**. The **15mm limit** is the common limit for an FFF printer. So, this printer is slightly better than the 3D printer in the same market range. The cooling system is highly efficient thanks to the **4010** fans. In order to further improve the cooling, it would be good to install a **360° blowing fan duct**.

d. Tower test

The goal of this test is to determine if the printer is able to realize tall and thin parts. This can be an issue for cartesian 3D printers with a bed moving on the Y-axis as the inertia from the movement on the bed will cause a shake/vibration in tall models. The test print is a rectangular-based tower with the following dimensions (20x20x165). The **165mm height** limit was reached on this print.

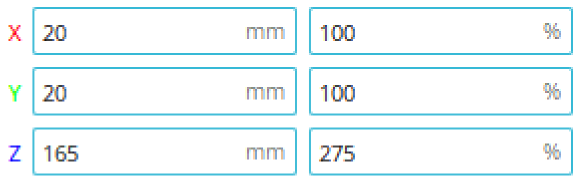
Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	195	60	PLA	No

Tab.8: Tower setting

Fig.29: Tower test

The result of this test is very good. The length measured at the top of the tower is **19.98 x 20.08 mm** and the height is **164.8mm**. In addition, the quality of the print is good:

- no shift between the layers
- the angles of the tower are well printed.



The only fault is the alignment of the Z-axis, there are a few places where you can see marks but nothing too serious. So the max usable workspace is validated on the Z-axis. Also, the slicer does accept parts up to 165mm high. That's great! It's quite common for manufacturer's slicers not to accept parts at the limits of the printer's build volume, and the user can easily lose 5mm. Personally, I prefer the actual print height to be displayed in the specifications. We can say that the Creality Sermoon V1 Pro can print at its maximum height.

e. Width test

This test has a similar goal as the tower test. But this time, the width limits of the build area are tested. The model is a rectangular shape that is very close to the boundaries of the bed.

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	195	60	PLA	No

Tab.9: Width setting

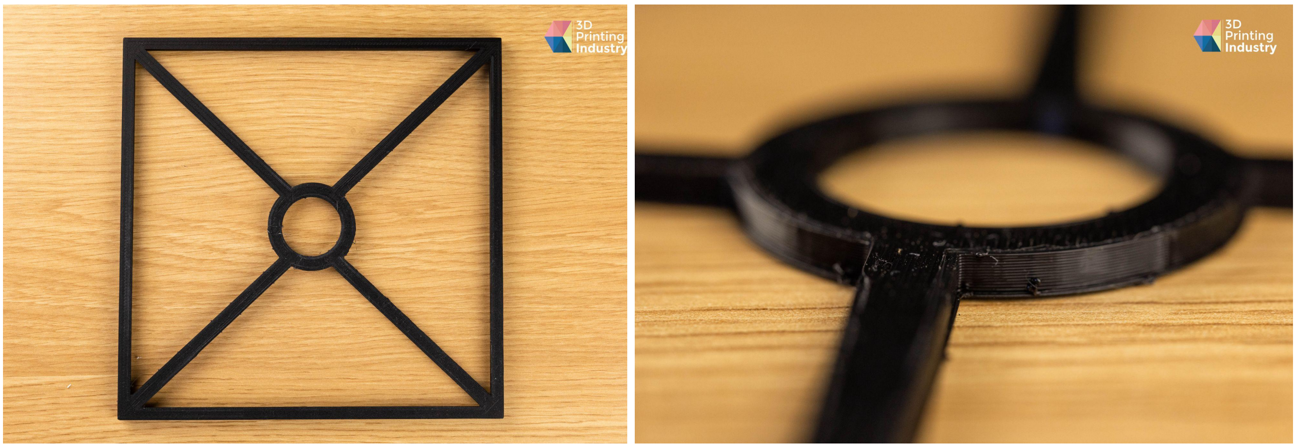
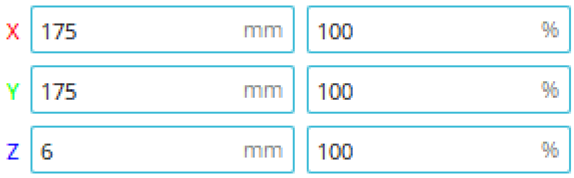


Fig.30: Width test

The slicer does accept the model which is sized to the limits of the workspace (**175x175mm**). On the printout, the measured length is **175.01x174.98mm**. The printer is, therefore, able to print close to its boundaries. In addition, the print quality is very good:

- no stringing
- no warping
- the sides are flat



So the max usable workspace is validated on the X and Y-axis.

f. Overhang test

The overhang test allows us to determine whether the printer can print in an overhang configuration and what the **maximum possible overhang angle** is printable **without support**. The model is composed of 6 walls printed in an increasing overhang configuration. The first overhang angle is **40 degrees**. The following ones are **shifted by 5 degrees until 65**.

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	195	60	PLA	No

Tab.10: Overhang setting

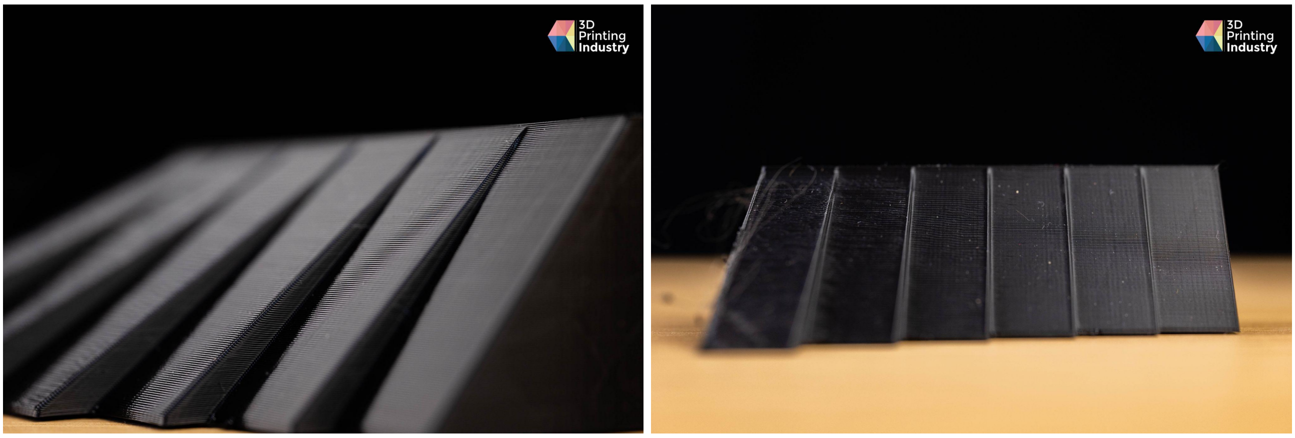
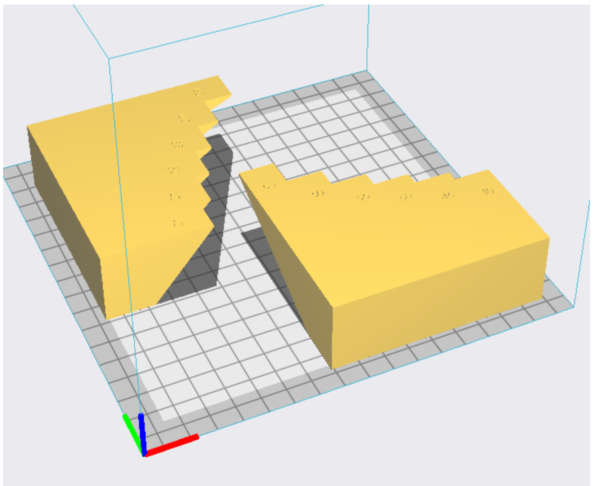


Fig.31: Overhang test



The results of this test is good as the overhangs **under 55°** are perfectly printed. However, on **the final tests above 55°,** there are some artifacts. The 55°, 60°, and 65° are not as smooth as it was before. The **overhang limit for this printer seems to be 55°** thanks to the 4010 fan. We printed the model in both directions to observe a possible difference in orientation. In both cases and with both nozzles, the results are identical.

The **55° limit** is the common limit for an FFF printer when it prints **overhang**. So the Creality Sermoon V1 Pro could be improved to achieve better results in the overhang test.

g. Retraction test

This test enables users to determine the retraction limits of the printer. The model used is a retraction test model downloaded from MyMiniFactory. It is composed of **3 rows of 3 spikes**. If the printer has good retraction capacities, there shouldn't be any stringing between the spikes.

URL: https://www.myminifactory.com/fr/object/3d-print-3x3-spike-for-retraction-testing-74952

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	195	60	PLA	No

Tab.11: Retraction setting

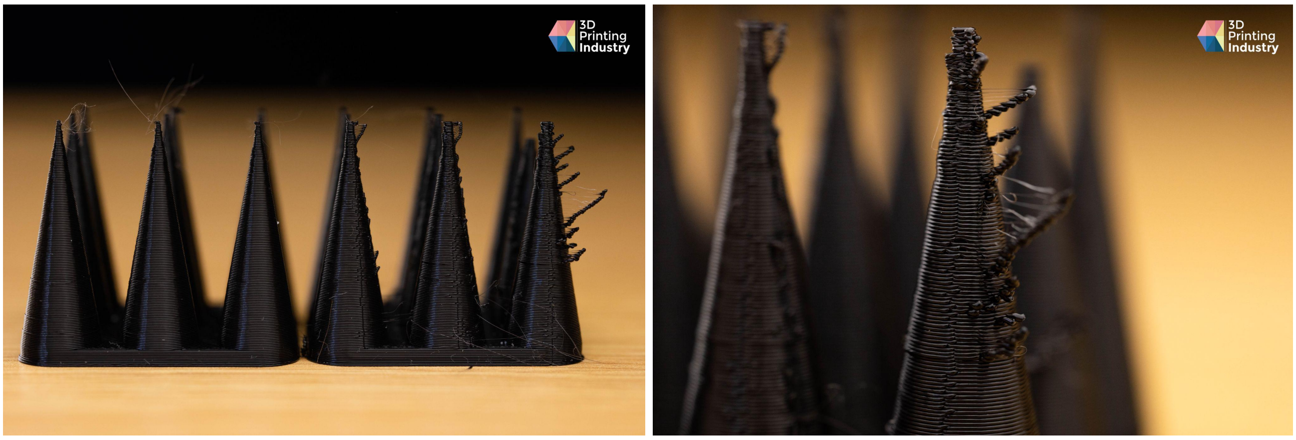


Fig.32: Retraction test

The retraction on this printer is **perfect**. There is no stringing between the spikes. There are just artifacts on the top of the spikes which can be removed easily with some post-processing. Again, the Creality Sermoon V1 Pro is well above average.

h. 3DPI test PETG

The purpose of this test is to determine if the Creality Sermoon V1 Pro scores well with our benchmark. In this section, we will test the limits of the printer with the 3DPI test. This test gives us an idea of how the printer behaves with the material. In this case, we will use a PETG filament.

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	235	80	PETG	No

Tab.12: PETG setting

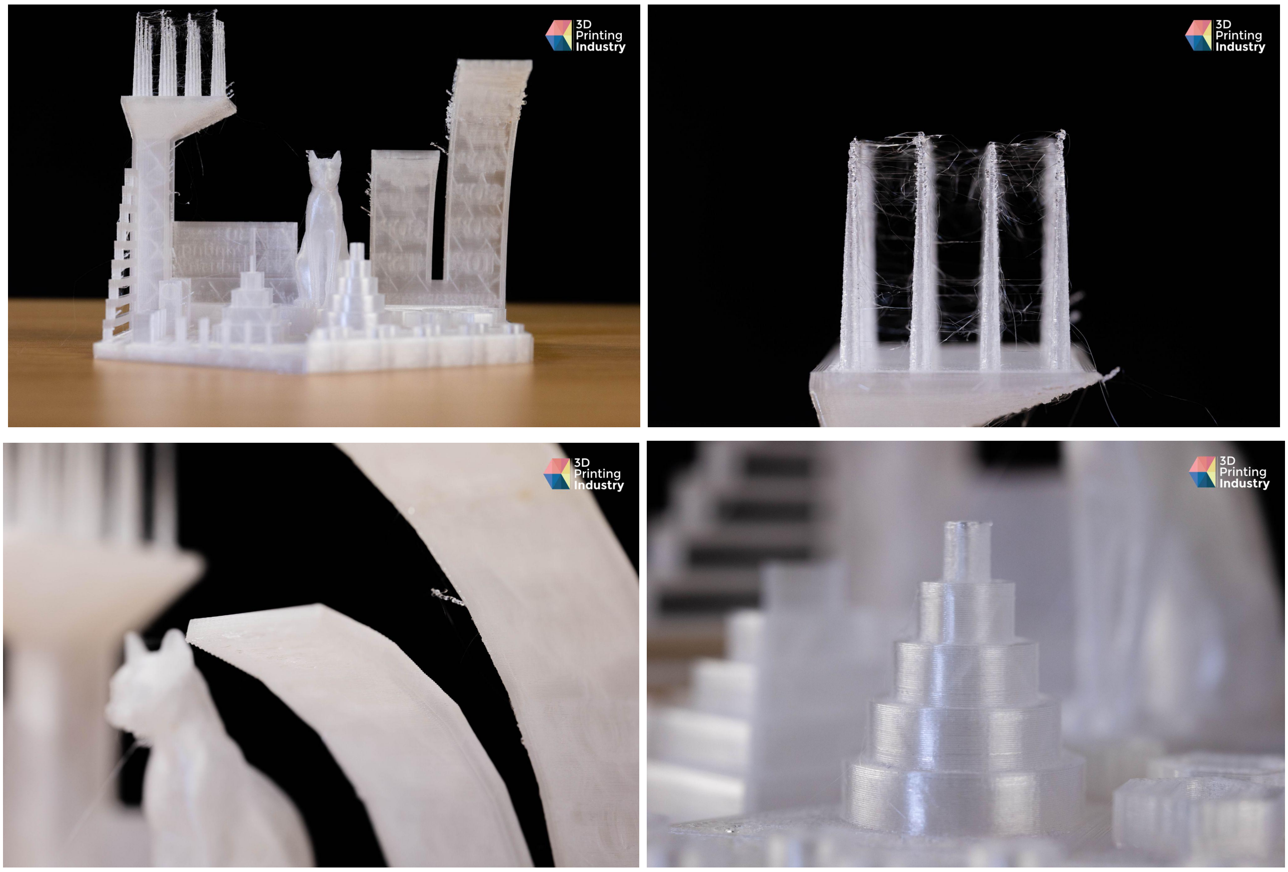


Fig.33: PETG 3DPI test

This test printed pretty well. Overhangs can be printed up to 50° without any problem, which is under the average with this kind of material. The average is 55° - 60° for all materials on a good printer, but PETG is a lot easier to print than ABS, so 50° isn't enough. There is some stringing on the top of the tower. But the peaks are pretty high, so the printer does handle stringing very well with PETG. The bridge test is alright. They are printed without bending, up to 35mm. In addition, on the negative precision test, the tubes can be easily removed. We can remove five tubes easily which is really good compared to other printers in the same market range. For this print, the Sermoon V1 Pro got a grade of **76.14/100**, which is a good score for a $399 desktop printer with PETG.

You will find a detailed result of the 3DPI Benchmark below:

Accuracy test					
Target		Measured X	Measured Y	X diff.	Y diff.
X	Y				
25	35	25.03	35.09	0.03	0.09
19	29	19.05	29.06	0.05	0.06
13	23	13.14	23.03	0.14	0.03
7	17	7.04	17.00	0.04	0
1	11	0.97	11.03	0.03	0.03
Average				**0.058**	**0.042**
X and Y average diff.				**0.05**	
Diff. between X&Y		**0.016**			
Score (10pt)		7			

Circular test				
Target	Measured X	Measured Y	X diff.	Y diff.
25	24.99	24.95	0.01	0.05
20	20.06	19.99	0.06	0.01
15	15.01	14.95	0.01	0.05
10	10.02	10.03	0.02	0.03
5	4.98	4.98	0.02	0.02
Average			**0.024**	**0.032**
X and Y average diff.			**0.028**	
Diff. between X&Y	**0.008**			
Score (10pt)	10			

Overhang test				Negative precision test	
Angle	**Quality**	**Angle**	**Quality**	**Target**	**Does it move**
10°	3	50°	3	0.10	0
15°	3	60°	2	0.15	0
20°	3	70°	1	0.20	0
30°	3	75°	1	0.25	0
40°	3	80°	0	0.30	1
45°	3	Score (10pt)	7.58	0.35	1
Retraction				0.40	1
Stringing		0		0.45	1
Size (mm)		32.58		0.50	1
Score (10pt)		10		**Score (5pt)**	2.78

Brirdg test					
50	0	35	1	20	1
45	0	30	1	15	1
40	0	25	1	10	1
Score (5pt)			3.33		

Thickness test					
X-axis			**Y-axis**		
Target (mm)	**Measure**	**Diff.**	**Target**	**Measure**	**Diff.**
0.80	0.88	0.08	0.80	0.89	0.09
1.20	1.23	0.03	1.20	1.28	0.08
1.60	1.69	0.09	1.60	1.78	0.18
2.00	2.09	0.09	2.00	2.10	0.1
2.40	2.49	0.09	2.40	2.52	0.12
Average		**0.08**	Average		**0.11**
Diff. between X&Y		**0.038**	X and Y average		**0.10**
Score (5pt)			2.5		

Repeatability				Ringing test	
HEXAGONS	**Length (mm)**	**Groove depth (mm)**	**Groove width (mm)**	**X-axis**	1
Reference	15	3	5	**Y-axis**	1
Print 1	15.153	3.03	4.99	**Score (5pt)**	2.5
Print 2	15.155	3.03	4.78	**Final score**	
Print 3	15.143	3.07	4.95		
Print 4	15.096	3.05	4.94	**Score**	76.14
Print 5	15.158	3.05	4.77		
Print 6	15.199	3.05	4.81		

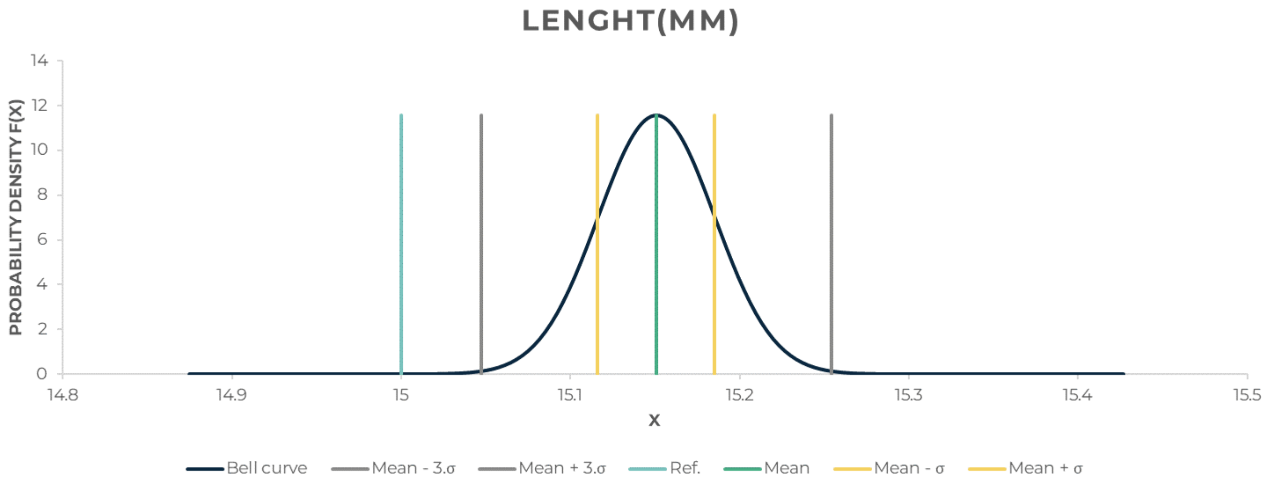


Fig.34: Normal distribution on the length

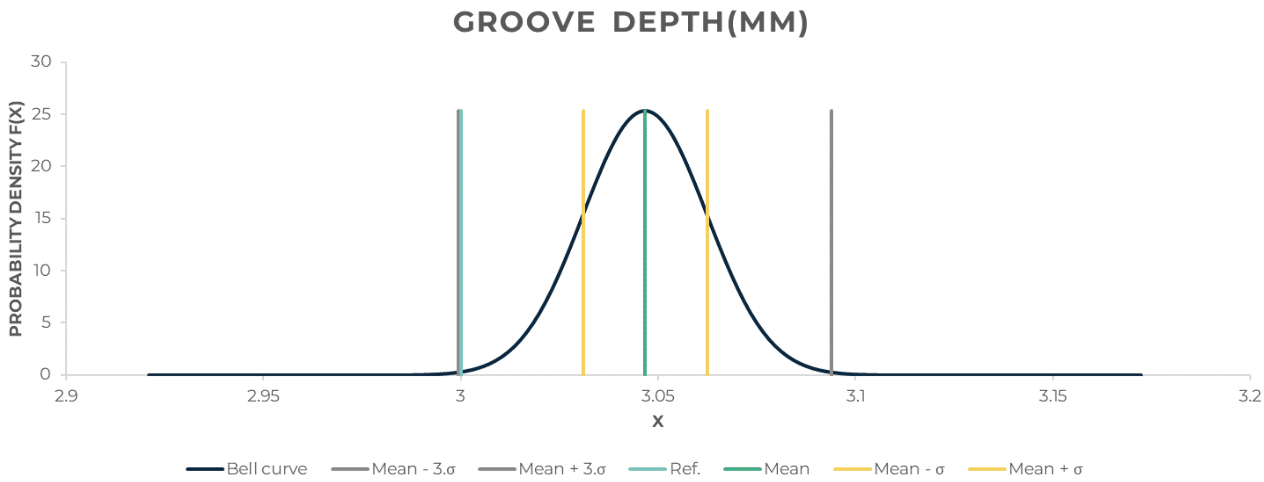


Fig.35: Normal distribution on the groove depth

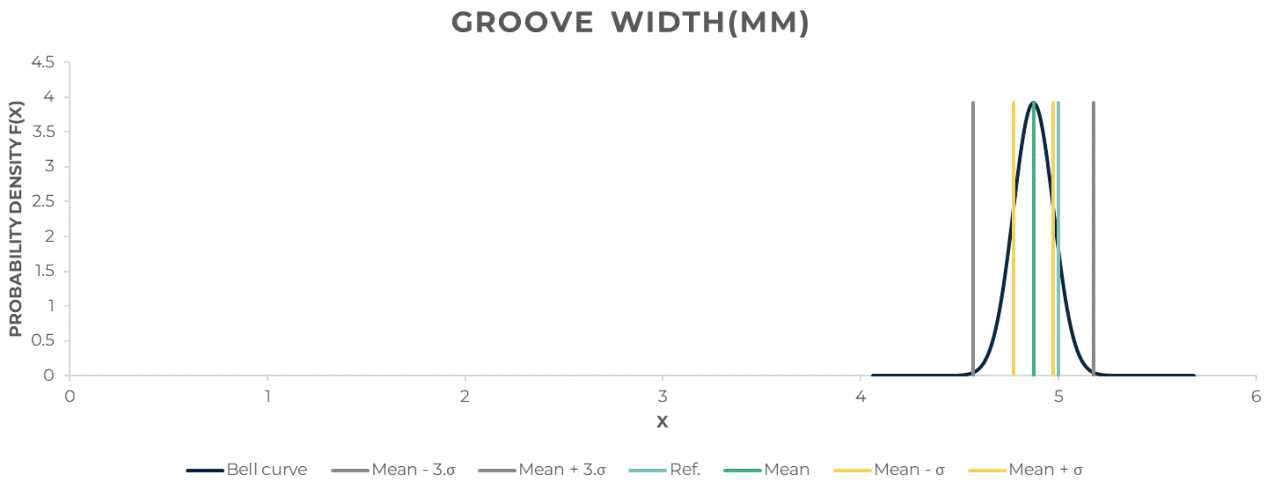


Fig.36: Normal distribution on groove width

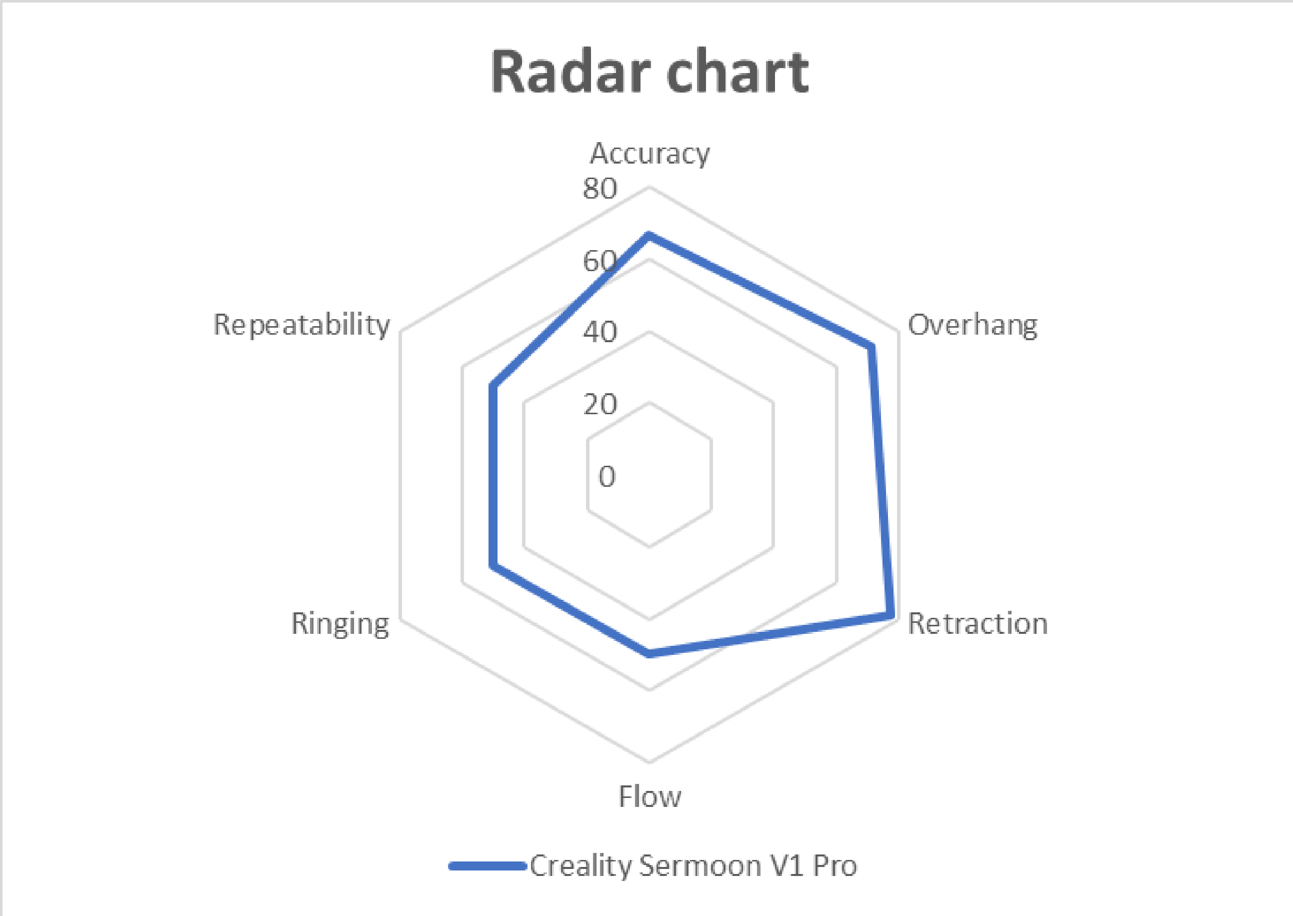


Fig.37: Radar chart

i. Small and precise parts test

This test aims to determine if the printer can manage a print with very small dimensions and tolerances. The model is a nut and bolt model which should be functional. The length of the screw is 28mm.

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	195	60	PLA	No

Tab.13: Small and precise setting

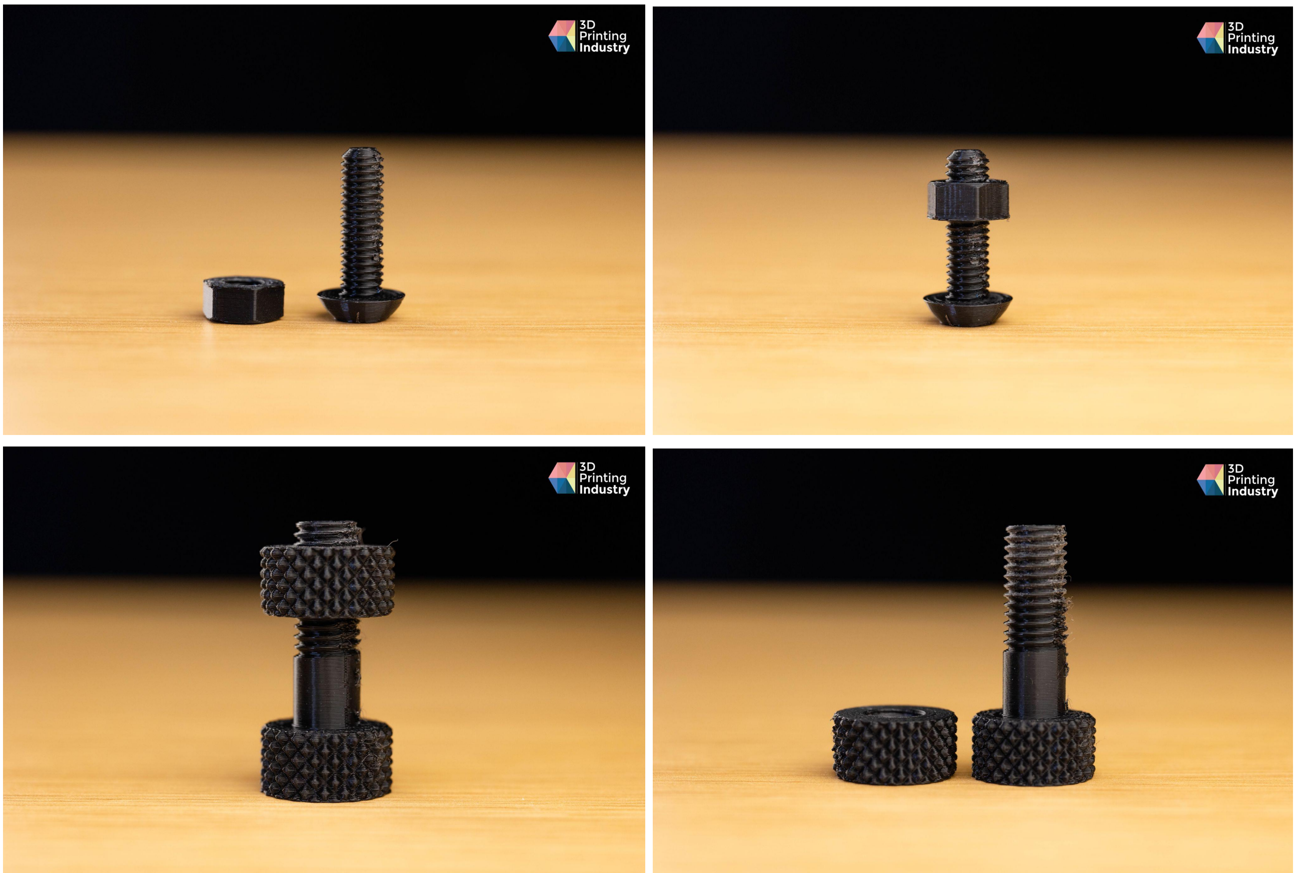


Fig.38: Small and precise parts test

The small parts were successfully printed in good detail. There are no defects on the thread. The parts can be easily screwed together. It works perfectly and it is possible to screw them in without forcing. So, the Creality Sermoon V1 Pro passes the small and precise parts test.

2. Real applications tests

This section contains some use case prints which enable us to understand what the printer can print day-to-day. The articles are printed in different materials (PLA, ABS, TPU, PA).

a. Cable ties (TPU)

With this test, we will test the printer's ability to print TPU. For this, we will use Z-Flex TPU from Zortrax. We will start with a rather simple print: a few cable ties.

Part file: https://www.thingiverse.com/thing:3961115/files

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	235	60	TPU	No

Tab.14: TPU print setting

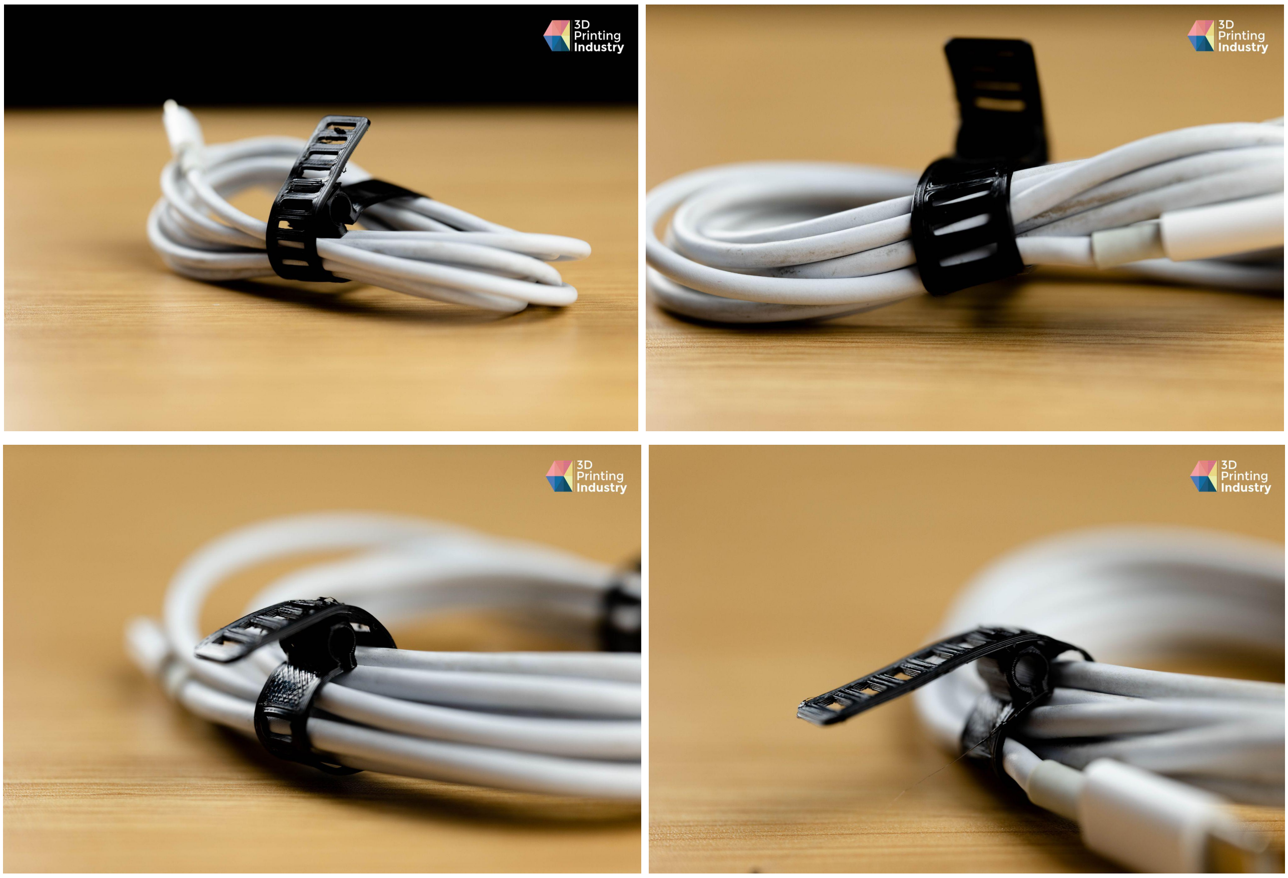


Fig.39: TPU cable ties

The printing went well. The surface quality is good, and we do not see any defects on any parts. We had no post-processing to do with this print. The only fault we had was that the adhesive plate worked too well. When we tried to remove the cables, they got slightly deformed, but that's a good point. They are still entirely usable. It is a success, and we can say that the Creality Sermoon V1 Pro can print flexible filament without any problems.

b. Waterproof box (PLA & TPU)

For this print, we wanted to test the combination of several parts together to create a complete system. We decided to print a waterproof PLA box, thanks to a TPU95 seal.

Part file: https://www.thingiverse.com/thing:4838803/files

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	200 235	60	PLA TPU95	No

Tab.15: Waterproof box setting

Fig.40: Assembled waterproof box

The printing went well. We didn't have to do any post-processing, and the part works perfectly. The surface is smooth, we didn't have warping or shifting between layers, and we had no problems printing this box. In addition, this waterproof box works perfectly

c. Pegboard boxes (ABS)

To push our tests a little further, we will try to print ABS. This filament is complex and is very prone to internal stress during printing and cooling of the part. For this test, we will print some Pegboard boxes.

URL: https://www.thingiverse.com/thing:4769785/files / https://www.thingiverse.com/thing:537516

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	240	80	ABS	No

Tab.16: ABS print settings

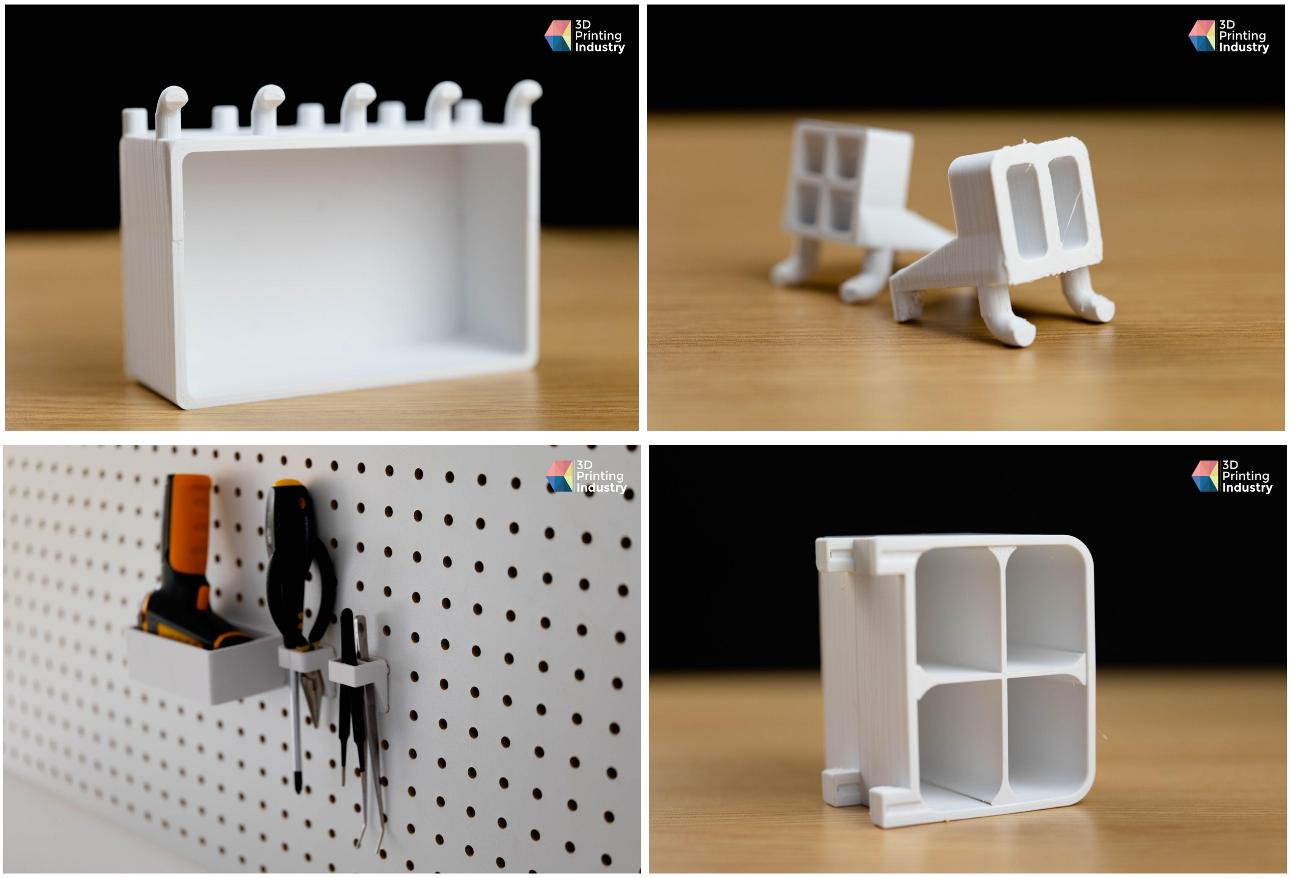


Fig.41: ABS Pegboard boxes

The print is perfect, we only had a bit of warping on some parts, but this is nothing to worry about with ABS. We can admit that the Creality Sermoon V1 Pro can print ABS correctly and without any problems.

d. Parametric bevel gear (PA6)

After successfully printing PLA, PETG, and TPU on the Sermoon V1 Pro, we decided to challenge the machine a little more by printing a parametric bevel gear with Nylon.

URL: https://www.thingiverse.com/thing:3336648/files

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	245	60	PA6	No

Tab.17: PA6 print setting

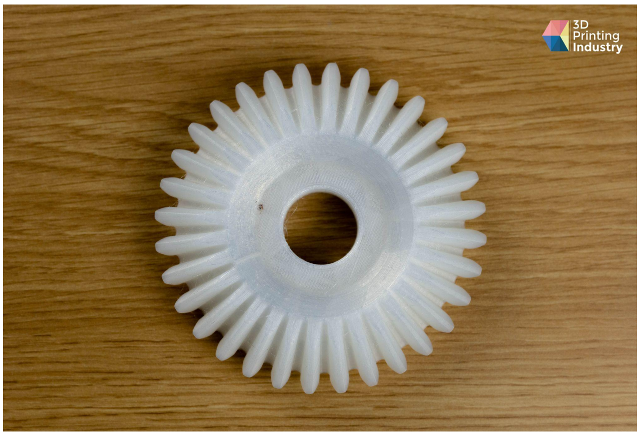


Fig.42: PA6 parametric bevel gear

The printing went well. The surface quality is good, and we can't see any defects on the part. We didn't have any post-processing to do. This is a success, and we can say that the Creality Sermoon V1 Pro can print complex PA6 parts with overhung surfaces without any problems.

e. Colosseum in Rome

The next print will demonstrate the capacity of the printer to print a really complex sculpture with all its details. To do so, the PLA filament is chosen. The model chosen is the Colosseum in Rome, Italy monument for the details and the overhang surfaces.

STL file: https://www.myminifactory.com/fr/object/3d-print-colosseum-10646

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.12	195	60	PLA	No

Tab.18: PLA setting

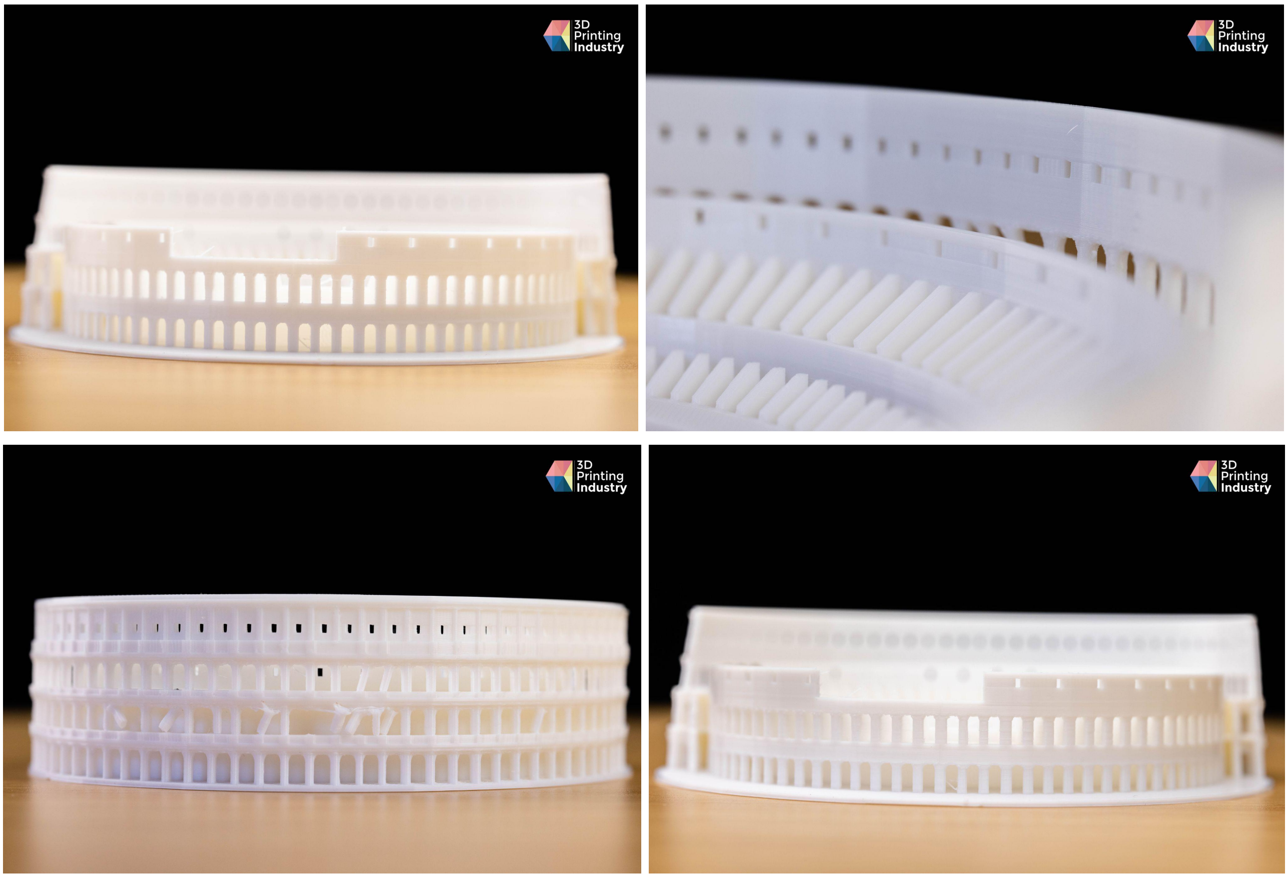


Fig.43: 3D printed Colosseum in Rome

On this print, the quality is impressive. There are a few artifacts on some overhung areas. The surfaces are smooth and it is difficult to see the different layers. This impression is simply perfect.

f. The Collingwood monument

The next print will demonstrate the capacity of the printer to print a more complex sculpture with all its details. To do so, the PLA filament is chosen. Indeed, this material is well known for printing parts with a lot of details. It is explained by its mechanical properties: ABS is stronger than PLA and needs a higher temperature to be printed, but PLA is easier to print. This print isn't a mechanical part, so it doesn't need to be strong. The 3D model chosen is the Collingwood monument in Tynemouth, England, for the details and the overhang surfaces.

Part link: https://www.myminifactory.com/object/3d-print-the-collingwood-monument-223646

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.12	195	60	PLA	No

Tab.19: The Collingwood monument PLA settings

Fig.44: 3D printed PLA The Collingwood monument

On this print, the quality is really good. The alignment of the Z-axis is almost perfect. The print is really beautiful, there is no stringing, warping, or layers shifting.

g. Mechanical system (PETG)

The model below is a planetary gear system. This test will enable us to determine if the printer is able to print mechanical models in one go. If the dimensions and tolerances of the original model are respected, the model should work well.

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	235	80	PETG	No

Tab.20: Mechanical system print setting

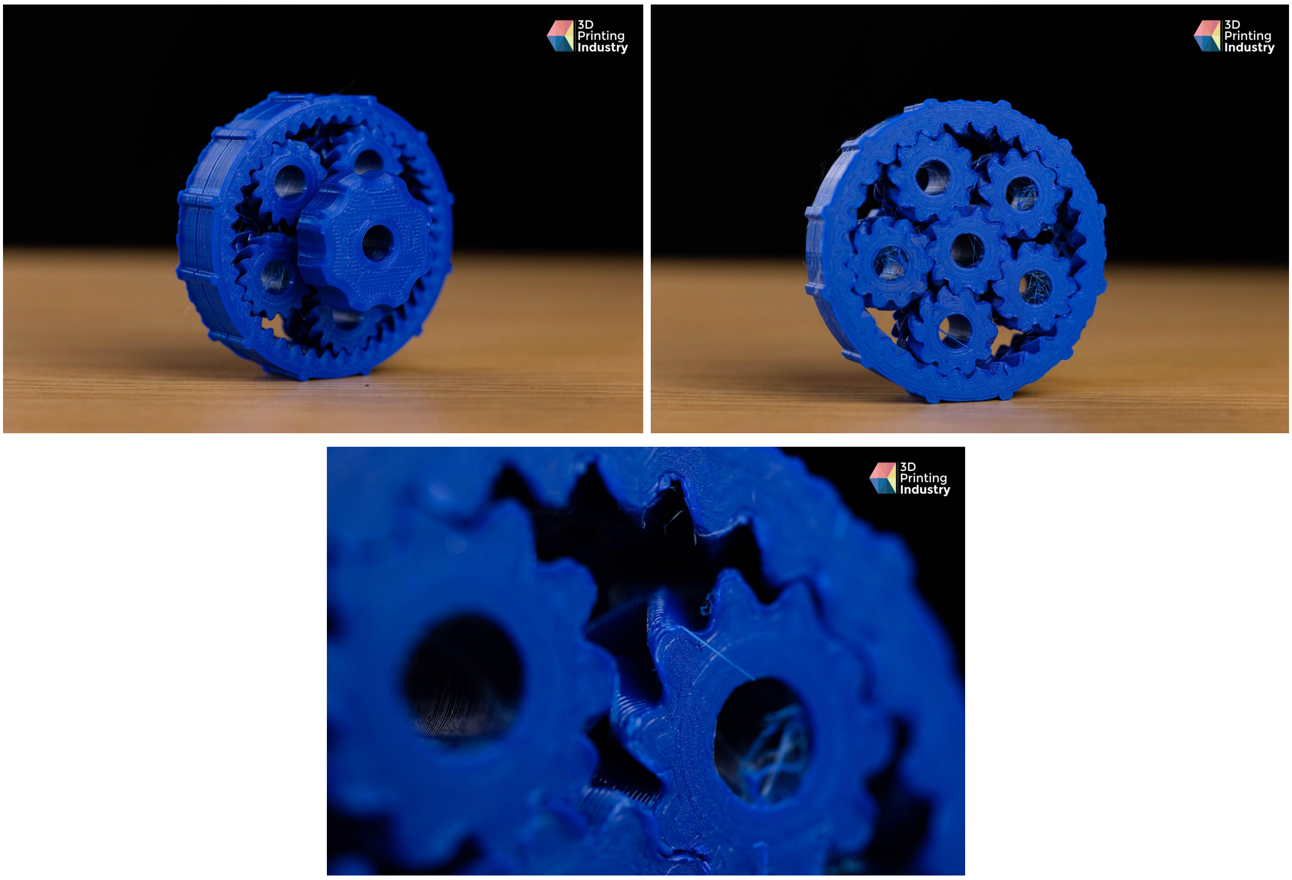


Fig.45: Planetary gearbox

Firstly, it is important to know that this is a one-shot design. This kind of mechanical model is very appreciated in order to know the performance of the machine because if the model prints correctly, and works, it means that the printer is accurate. For a planetary gear of this type, the tolerances are really small.

The print came out very well. The quality of the surfaces is good and we can't see any defects on any of the parts. We don't have to do any post-processing and it's a really good mechanical print. In addition, the mechanism works very well. There are only a few areas with some resistance, but the mechanism still works really well, and the Sermoon V1 Pro can print mechanical parts.

h. Air duster (TPU)

The purpose of this test is to put the Creality Sermoon V1 Pro to the test with a difficult TPU print. For that, we'll print an air duster suction cup with only two layers of walls, almost like a print in vase mode.

Part link: https://www.thingiverse.com/thing:3851805

Profile	Layer thickness (mm)	Nozzle temperature (°C)	Bed temperature (°C)	Material	Supports
Standard (50mm/s)	0.20	235	60	TPU	No

Tab.21: TPU settings

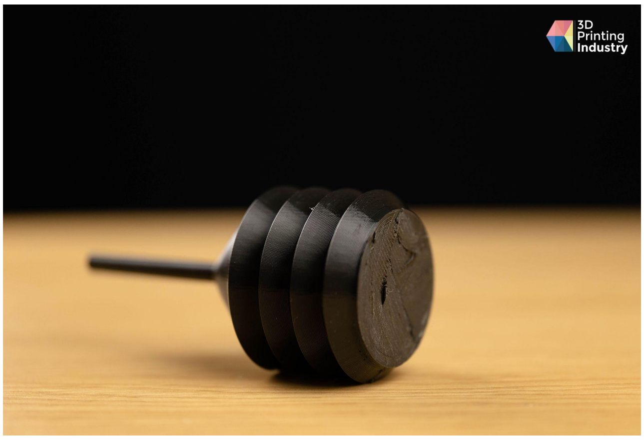


Fig.46: 3D printed air duster

Once again, there is nothing to say, it's a great success for this desktop printer. The print went out well, and the quality is good. The air duster works pretty well.

I. Conclusion

1. Strengths

To conclude the report, this section summarizes the key observations from our work with the **Creality Sermoon V1 Pro** printer:

- Hardware: The machine has a single nozzle and a heated bed. The bed is robust and permits very good adherence with but also without glue. Moreover, all the components are very well designed. All mechanical parts are well designed, which can improve the durability of the printer. Also, the workspace dimensions compared to the overall size are really optimized. This printer is totally closed, which does allow the use of complex filaments such as ABS, Nylon...
- Slicer: Creality provides profiles for printing PLA, ABS, PETG, and TPU for the Creality Slicer. However, users can use the slicer of their choice and develop their own profiles. Creality Slicer is optimized and easy to use for beginners, it's a rebadged version of Cura. It is easy to manipulate and print 3D models for a beginner. You can easily find all the profiles for ABS, PLA, and TPU.
- Use of the print: Thanks to the touchscreen and the way the menu is organized, all operations are simple to carry out. The user interface is very smooth, unlike some printers where there is a lot of latency.
- Basic tests: It was successful in all the basic tests. The precision is good, and the print quality is nice.
- Real application tests: The printer is able to print PLA, ABS, PETG, PA6, and TPU very well. All the filaments we have tried to print have been successful.

1. Weaknesses

However, some areas could be improved in future iterations of this 3D printer:

- Hardware: It would have been nice to implement a bed leveling sensor, at least for the pro version. Except that, there is no major defect to report. This kind of configuration has proven itself in the past and works perfectly for a printer in this price range.
- Slicer: We had no problems with the slicer. By the way, it's an open-source system so the user can should the slicer that he wants to use.
- Use of the printer: It could be nice to add a Z-Offset adjustment button during printing
- Real application tests: The Creality Sermoon V1 Pro is a little bit smaller than the average when it comes to the workspace dimensions.
- Bug: We have not had any bugs so far

2. Overall feeling

The **Creality Sermoon V1 Pro** is a very good printer. For a desktop user wanting a $550 medium-range build volume printer, it will be perfect. All is well thought out, and all options are working well. It’s really easy to use the printer.

Basic tests are printed very well. I would still like to see Creality develop a leveling sensor, at least for the pro version. All are useful following the need. The sticker on the removable bed allowing the adhesion of the parts is very effective with just a little bit of glue, depending on the material used. I still advise printing with a raft to avoid the “elephant's foot effect” with the first layers too squashed on the build plate because Creality has not added an option to adjust the Z-Offset. It allows to have a perfect first layer and to stop printing with a raft, it could be a good idea for a future update. Having an option to adjust the Z-Offset live during printing is a good idea because the bed can deform depending on the temperature at which it is heated.

This printer has no specific faults. It can be improved with future updates. The main point to be improved is the firmware by adding more options to manage the printer. This printer performed very well in terms of repeatability.

So the printer has a high potential for a desktop user wanting an entry-level printer. Some details could be fixed, and it could become one of the best desktop users printers in this price range. This printer is intended to become a printer for individual users. Personally, testing this printer was a pleasure. I tested the limits of the machine, and it totally meets my requirements very well or just with some setting modifications. Creality Sermoon V1 Pro is a good printer, around average in terms of accuracy compared to other printers in the same market range. If Creality continues to improve this printer, it will be perfect.