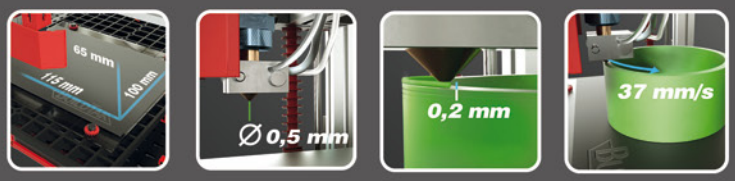
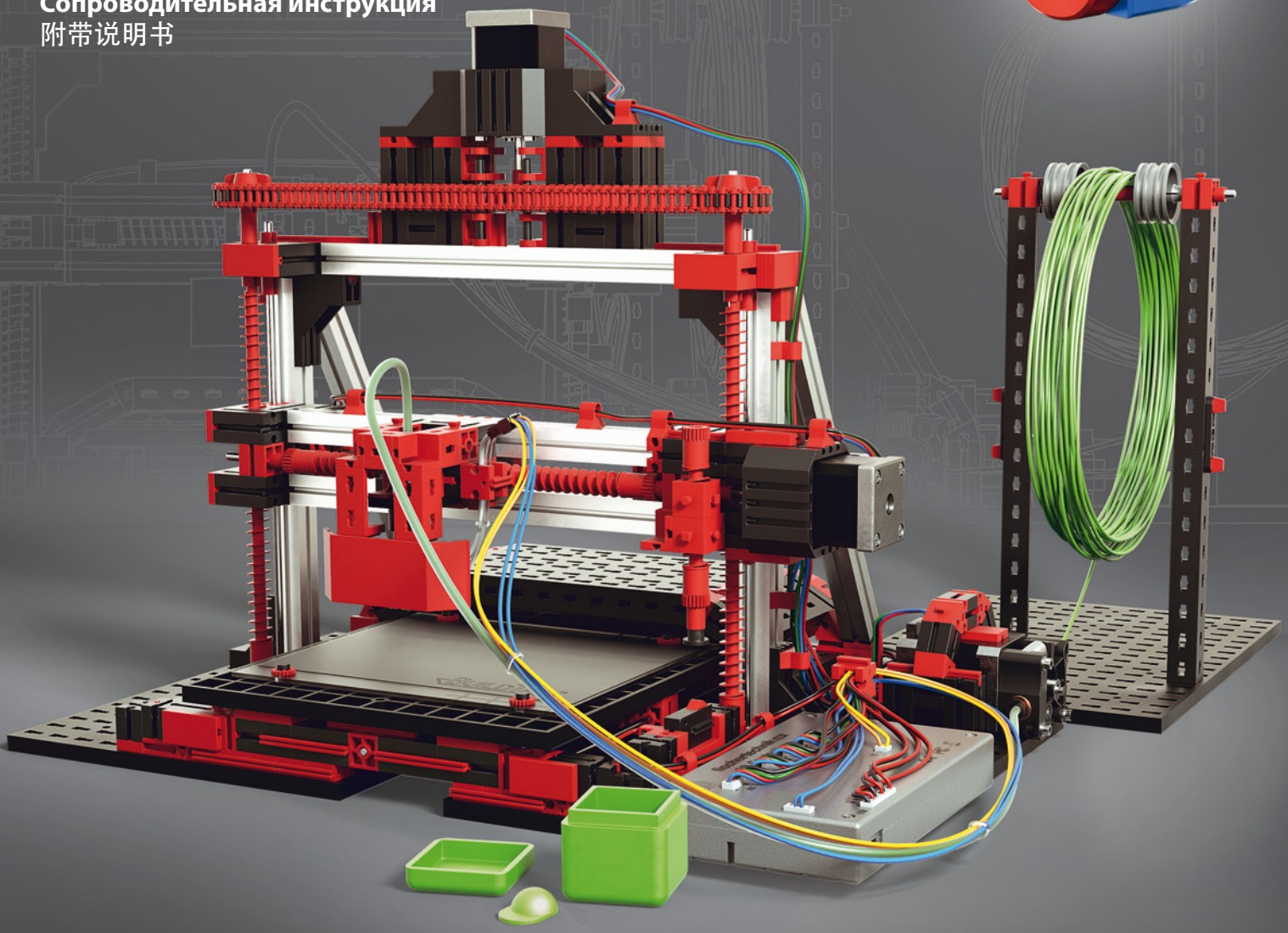


fischertechnik

Begleitheft
Activity booklet
Manual d'accompagnement
Begeleidend boekje
Cuaderno adjunto
Folheto
Libretto di istruzioni
Сопроводительная инструкция
附带说明书

3D



3D Printer

powered by
German RepRap

Contents

Introduction

We are pleased you have decided on the 3D printer kit from fischertechnik. With this kit, you will learn the basic principles of a 3D printer and how it functions. Reading this educational material will take you step by step through the subject of 3D printing, also referred to as “additive fabrication”. Please read all sections carefully and completely! Thorough reading will help prevent damage to your printer and most importantly, injuries and burns (safety information). Also, be absolutely certain to assemble the fischertechnik 3D printer carefully, with the assistance of the accompanying assembly instructions. This will guarantee that after it is assembled, your printer will function perfectly. You will also avoid damaging your fischertechnik 3D printer.
In any case, we wish you a lot of fun and success with this fascinating new technology.

Basic information

How did 3D printing come to be?
The first attempts at 3D printing began as early as 1980. The American inventor Charles “Chuck” Hull is known as the originator of the “stereolithography” process, in which a light-sensitive liquid plastic is cured by a UV laser. But he did not register his invention for patent until 1986. The company 3D Systems, still active worldwide today, arose from these beginnings. Yet it is generally agreed that the fundamental process was actually discovered and further developed by Hideo Kodama, of the Nagoya Municipal Industrial Research Institute.
Shortly thereafter Carl Deckard invented the laser sintering process, without which today’s industrial 3D printing would be inconceivable. At the same time, the entrepreneurs Langer and Steinbichler founded the company EOS GmbH in Germany, which still exists today.
Nowadays a week does not go by without the emergence of more new ideas, printing processes, technologies and products involving 3D printing. Especially on the startup scene – the companies of young entrepreneurs and founders – 3D printing is indispensable and is the basis for numerous innovations. The fischertechnik 3D printer puts this technology in your hands and gives you insight into how it functions.

FDM is born!

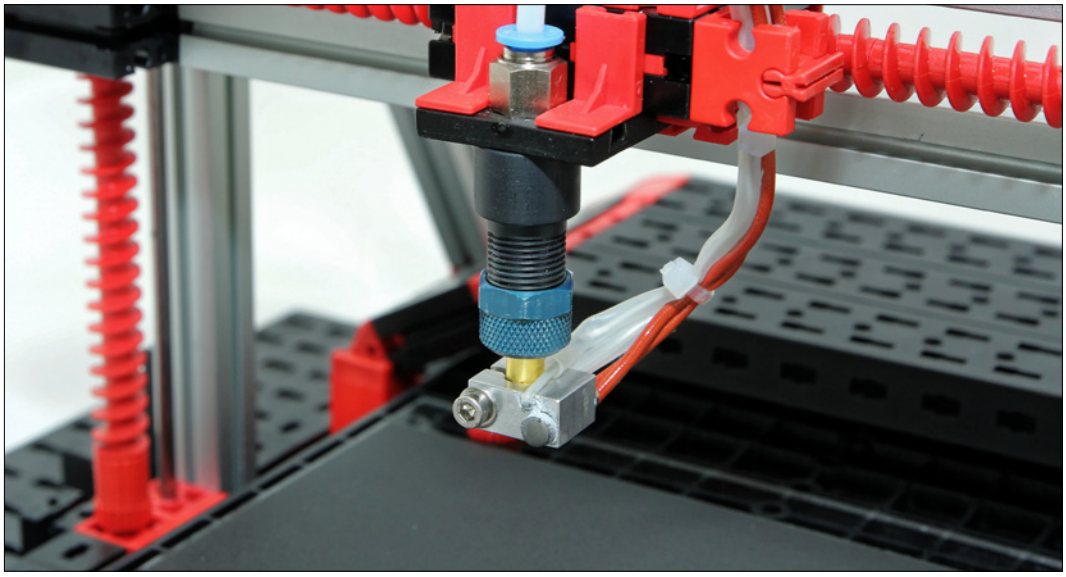
As Scott Crump experimented with a glue gun in his hobby room during the 80's, he was surely not aware of how greatly his new invention would change the world. After he had deposited several layers one atop the other, his daughter came into the room and appraised his creation. "That looks like a frog!" This "frog" was the birth of the FDM 3D printing process (Fused Deposition Modeling). Scott patented this idea, thus laying the cornerstone for his company, Stratasys Ltd., a globally operating market leader which has become an integral part of today's 3D printing.

Your fischertechnik 3D printer also works with the FDM process. In one of the following sections, we will look at exactly how it functions. Just like Scott Crump, with this printing technology you are able to realize your creative ideas and objects in three dimensions, at home, at school, in the university or in your office. And you can do so easily and intuitively – with the fischertechnik 3D printer, you are the creator. This is because since 2009, tremendous strides have been made in 3D printing. For example, aircraft engineers at companies such as Airbus, have "additively" fabricated interior parts, model designers have developed functional clothing, and manufacturers of athletic shoes have produced individualized shoes. As a result of these and other developments, 3D printing has finally arrived in the private sphere.

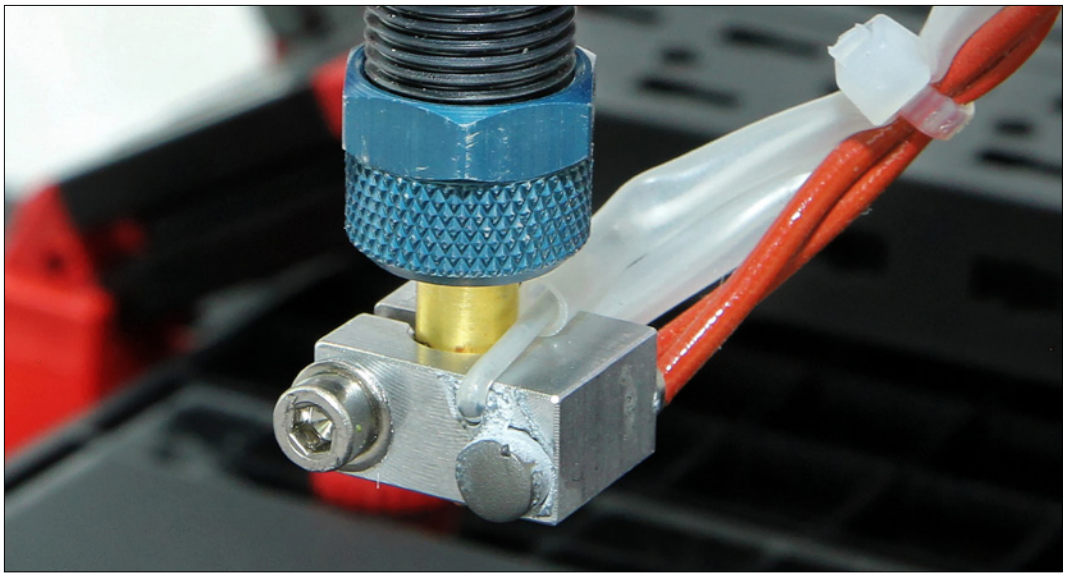
Before you enter the world of 3D printing, we will briefly explain the most essential components – and then you can get started!

Components

Extruder
The extruder is the main component of the 3D printer. Its task is to melt the print material (filament) and press it through a nozzle (needle nozzle). The temperature control is monitored by a “thermistor”. Thermistors are temperature-dependent resistors, which can change their resistance value depending on the surrounding temperature.



Printing nozzlee
The printing nozzle is located at the front end of the extruder. These nozzles can have different diameters to influence the thickness of the extruded filament. Your fischertechnik 3D printer has a nozzle with a diameter of 0.5 millimeters and is designed to achieve the best printing results.

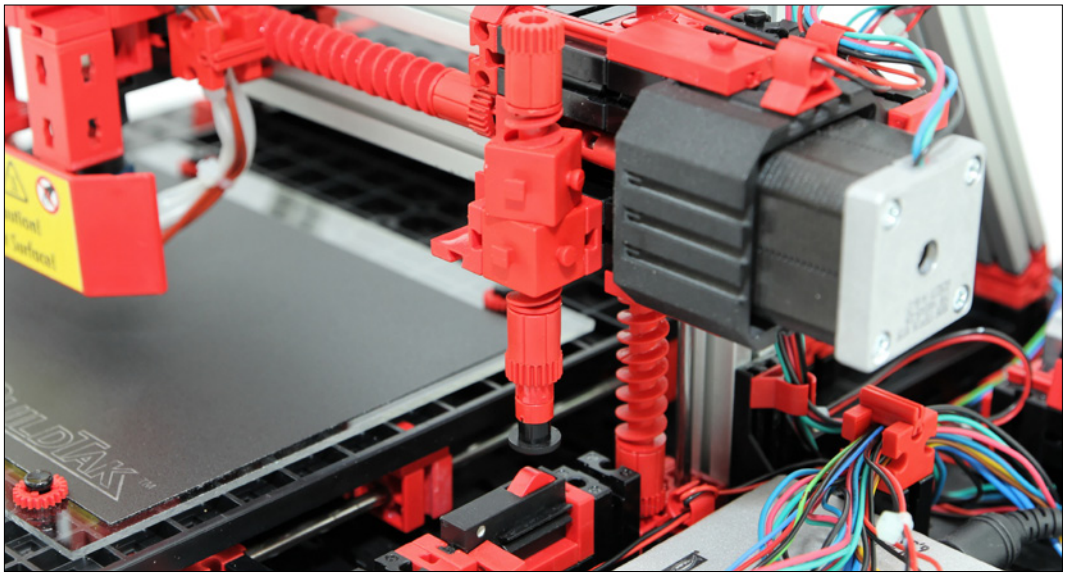


Printing bed

On the printing bed – also known as the printing platform – the extruder builds up the 3D object layer by layer. On the fischertechnik 3D printer, the printing bed is fixed and moves forward and backward along the Y-axis. When this motion is combined with that of the X- and Y-axes, the print object is created.

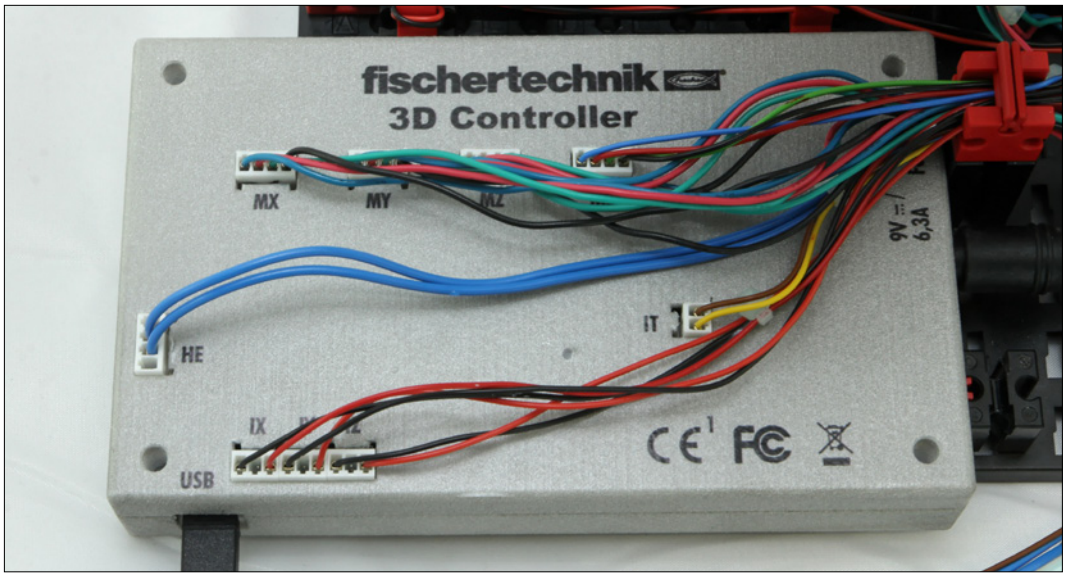
Limit switch

On your fischertechnik 3D printer, the limit switch serves as a sensor. The limit switch prevents the extruder from colliding with the printing nozzle and the printing bed. The limit switch is adjusted with the adjustment screw. The exact adjustment procedure is explained in the section „Calibrating printing bed and printing platform“.



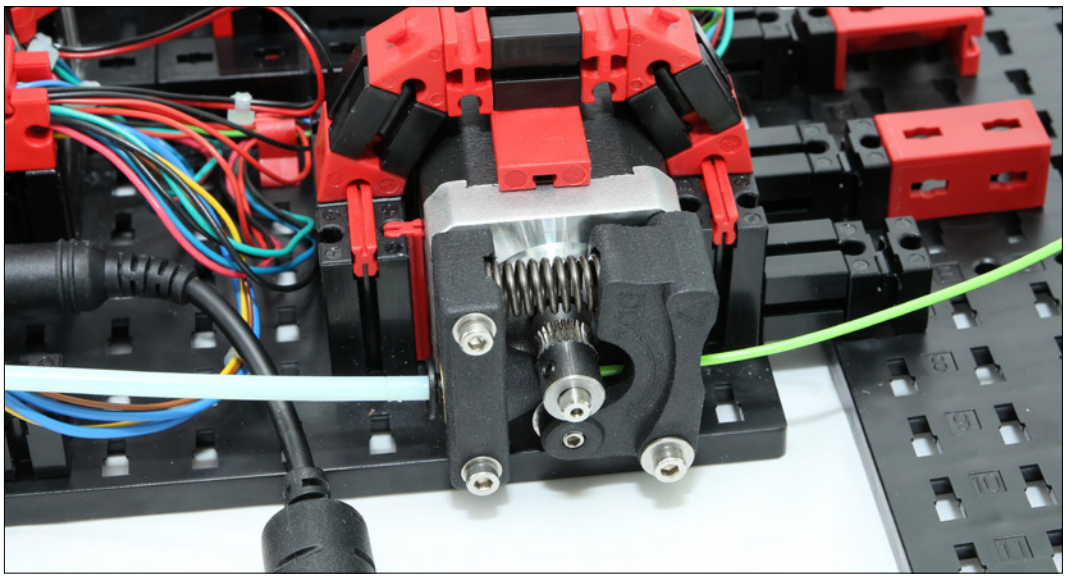
3D-Controller

The controller of your 3D printer controls not only all system components and stepper motors, but also the movement of the extruder in the Cartesian coordinate system (X-, Y- and Z-axes). All stepper motors are connected with the programmable microprocessor (Atmel) on the controller. In addition, the USB cable is connected to both the PC and the power supply unit here.



Extruder / material transport

The material transport ensures the filament is transported to the extruder (printing head). This is where you can control the contact pressure on the filament. In addition, the filament is loaded or unloaded via the material transport. The exact transport procedure is explained in the corresponding section of this supporting information.



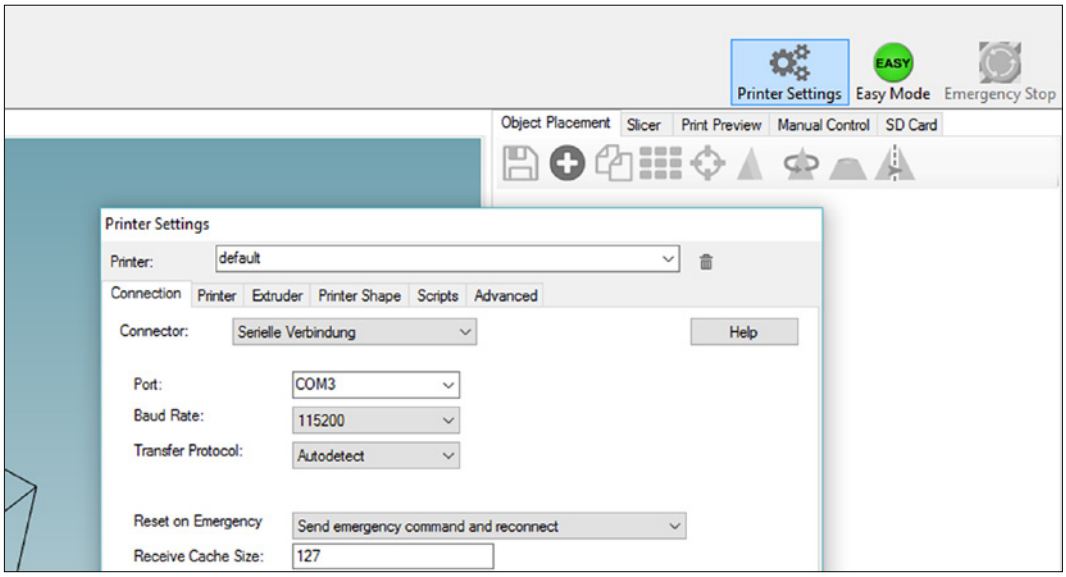
Commissioning / brief instructions

Software installation

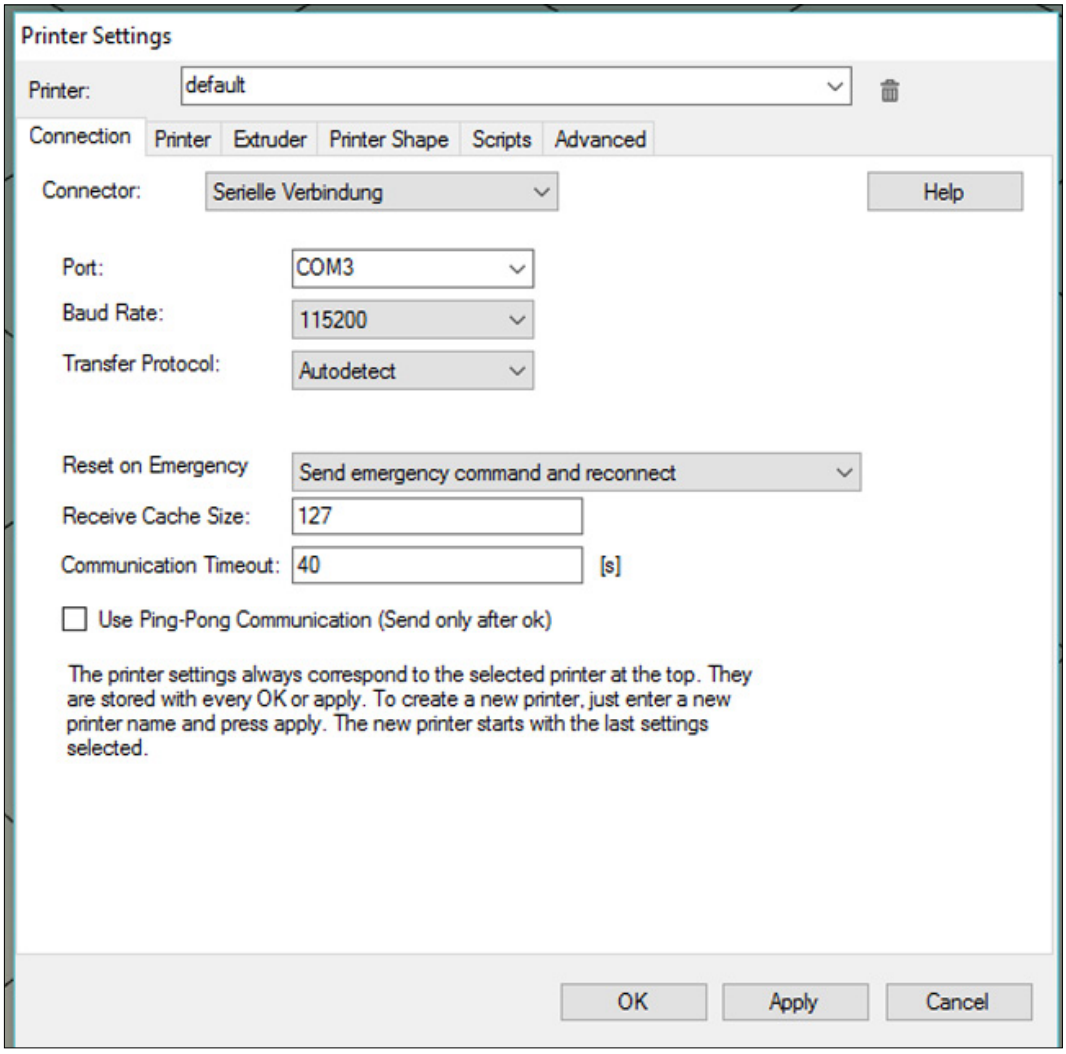
Before you can begin to set up the printer, the necessary printer driver and printer software "3D Print Control" must be installed on your Windows PC (Versions 7, 8 and 10). To do so, start the installation program from the CD provided with your printer. It automatically takes care of the first steps and copies the required USB driver, application software and several printing examples onto your hard drive – but more about that later.

Once the installation has finished, please restart your PC. Then all drivers and software components will be recognized and initialized by your Windows operating system. Now use the delivered USB cable to connect the printer controller to the PC and then connect only the power supply provided with your printer. Now go to the Device Manager in the Windows system settings and select the item "COM & LPT". Please note that this setting step may be different depending on Windows version. After "COM & LPT" is clicked, the Device Manager indicates the COM port used (e.g., COM3). Please remember or make a note of this port. You will need it for the final configuration of the 3D printer.

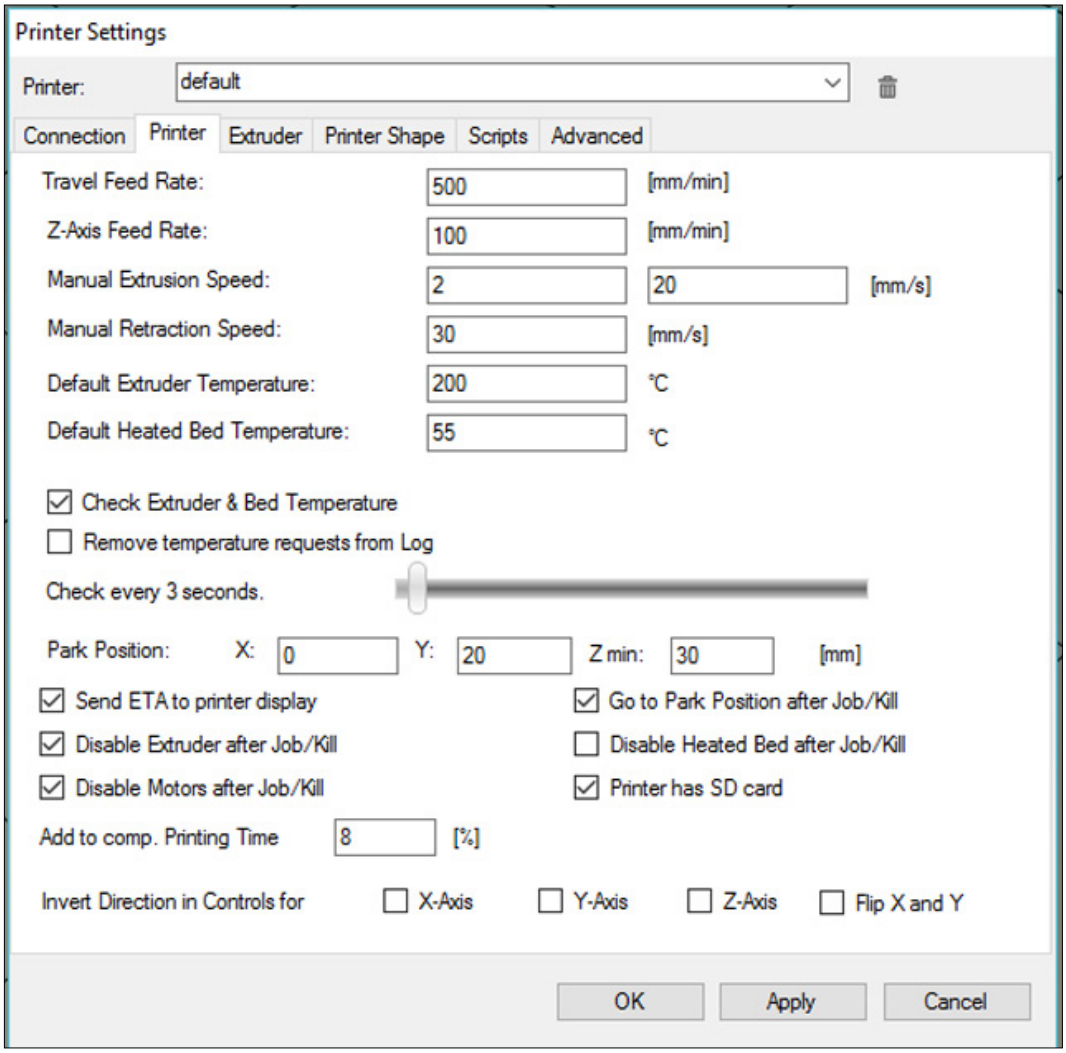
Next, start "3D Print Control" and click the item "Printer Settings" in the upper right of the menu bar.



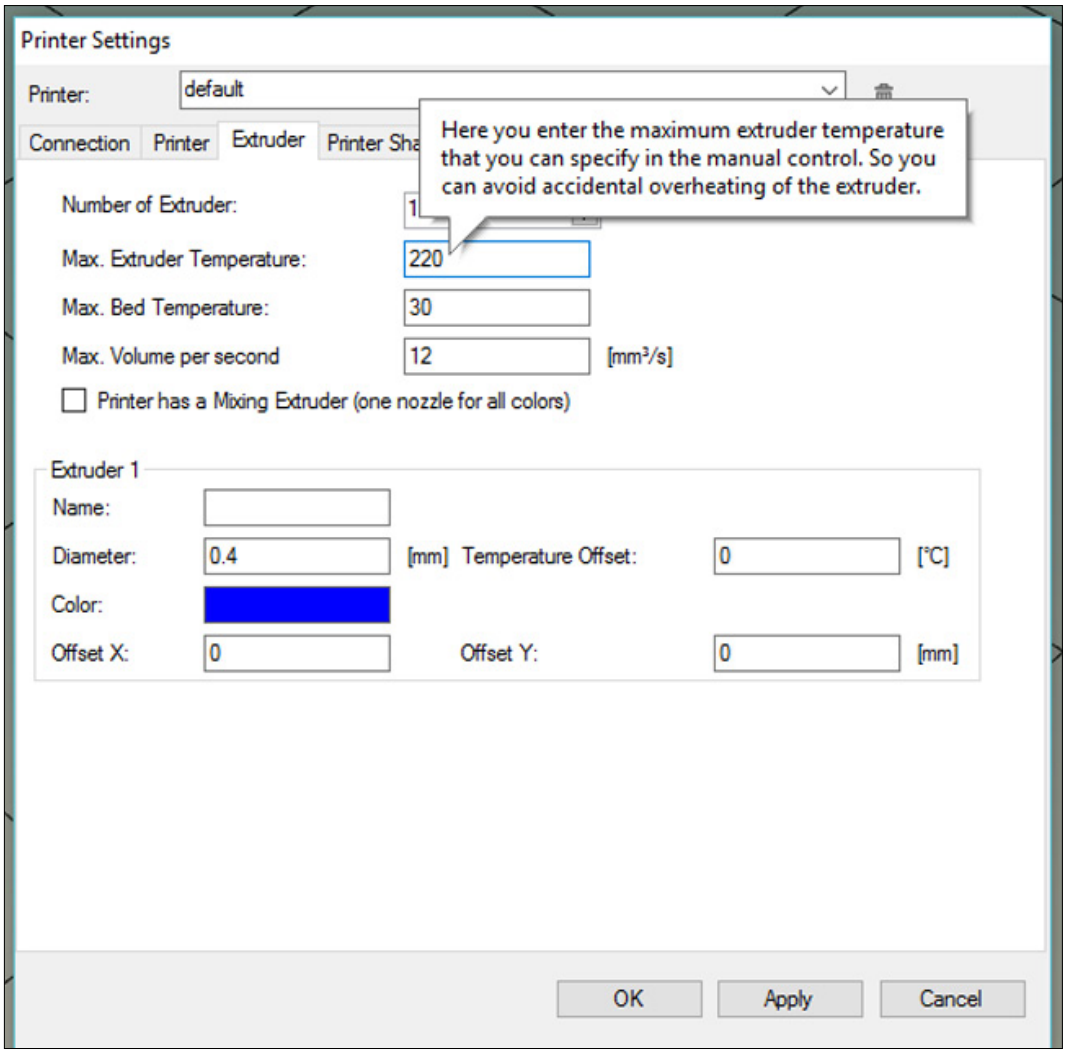
This opens a new window with additional tabs. Please click the first tab, “Connection”. You control the 3D printer from your PC via this menu item. The necessary settings are presented in the following illustration. Before all else, make sure you enter the correct COM port which you made a note of previously!



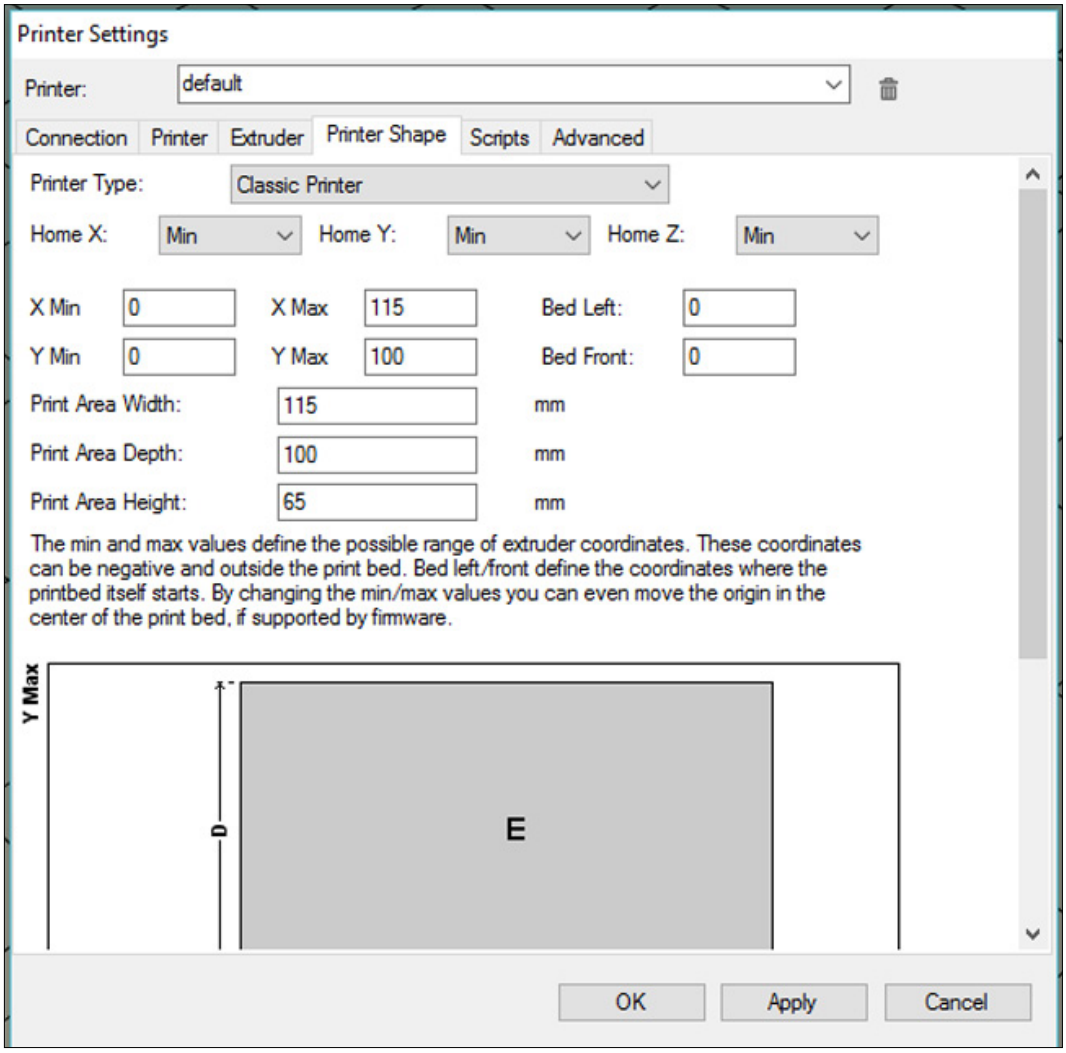
All other parameters were already automatically set by Windows during installation of your 3D printer. If this is not the case – for example, if the parameters were accidentally changed after installation – you will find the correct parameter settings for a manual installation below.
To do so, go to the next tab “Printer”. Set all parameters according to the illustration below. Please pay special attention to the item “Default Extruder Temperature”. The value here should be 200 °C.



Specify the maximum printing head temperature under the tab “Extruder”. The temperature should be 220 °C.



Specify the last settings under the tab “Printer Shape”. Here, pay special attention to the values for items “X Max” and “Y Max”. X Max must be set to the value 115; Y Max to 100. These values then designate the dimensions of the usable surface on the printing bed in millimeters. Please specify the height of the printing area as 65 millimeters.



Now close the settings via the item “Apply” and close the printer settings. To connect the 3D printer with the PC, click the item “Connection” at the upper left of the menu bar again.

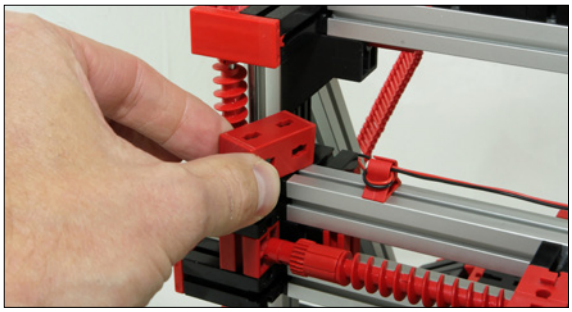
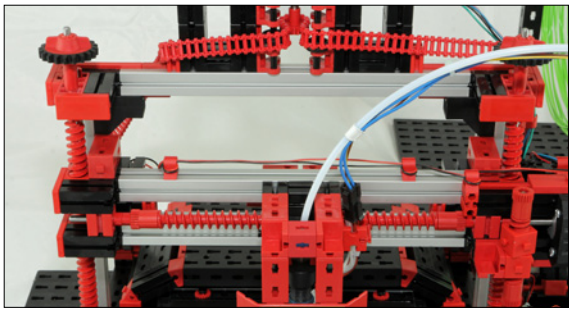
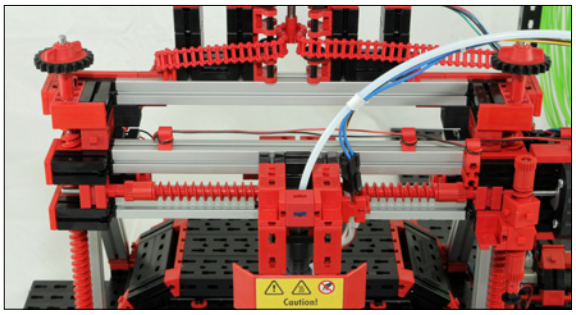
Congratulations! You have just made the essential settings for using your 3D printer. In the next step, we will calibrate the printing bed and printing head.

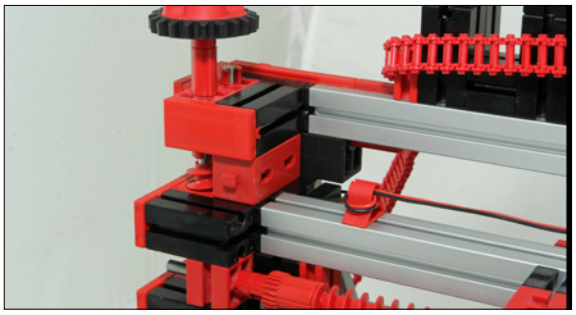
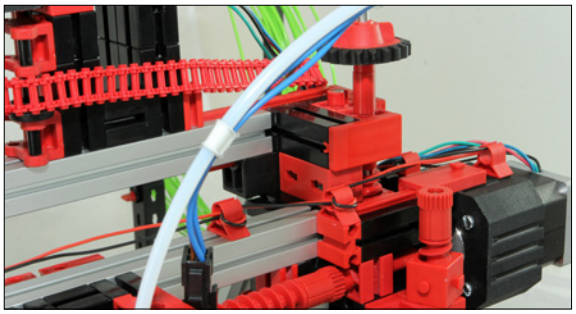
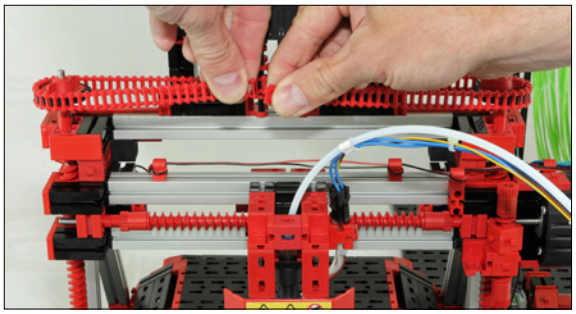
Calibrating printing bed and printing head

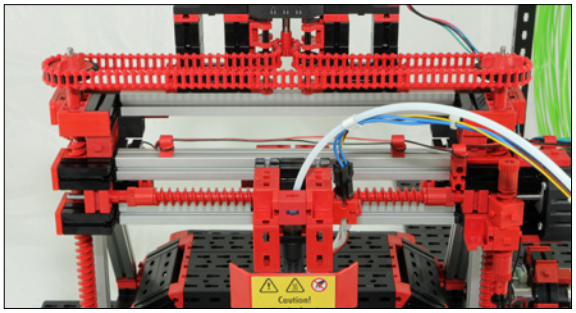
Before calibrating the printer, please see if all components were correctly assembled and the X-, Y- and Z-axes are free and run smoothly. If they is not, adjust them as follows:

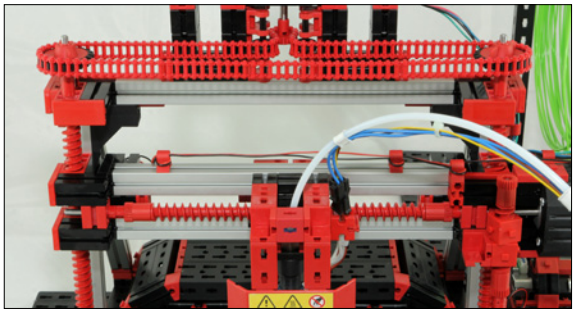
Adjusting the Z-axis

Open the upper drive chain and adjust both sides so the height is the same on both sides. To do so, move the axle upward and clamp a fischertechnik building block at the left and right between the fixed and movable parts. When these blocks are clamped with the same pressure, the X-axis is optimally aligned in the horizontal plane. Now close the drive chain without rotating the two spindles against each other.

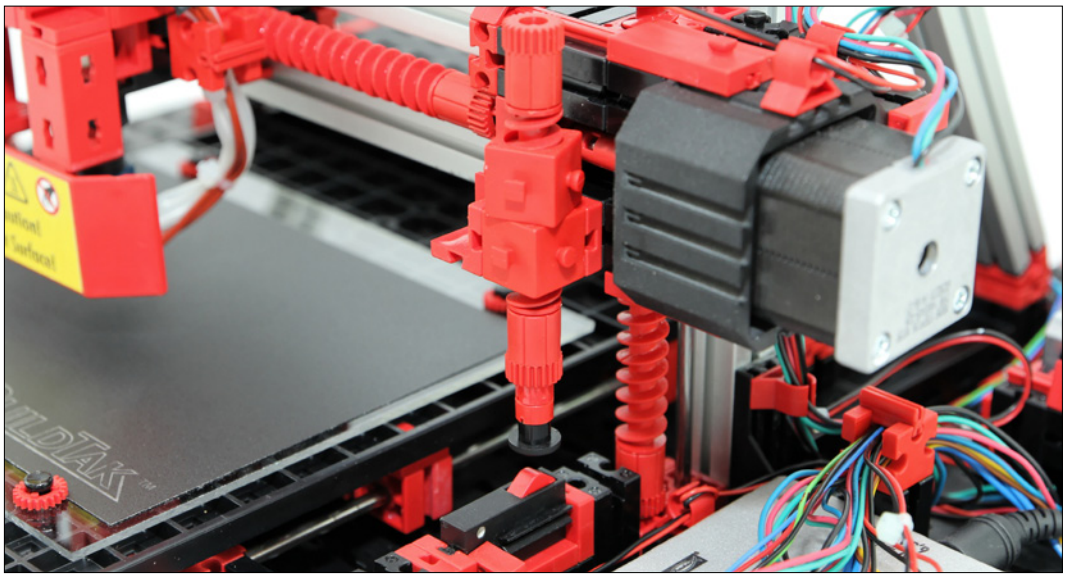




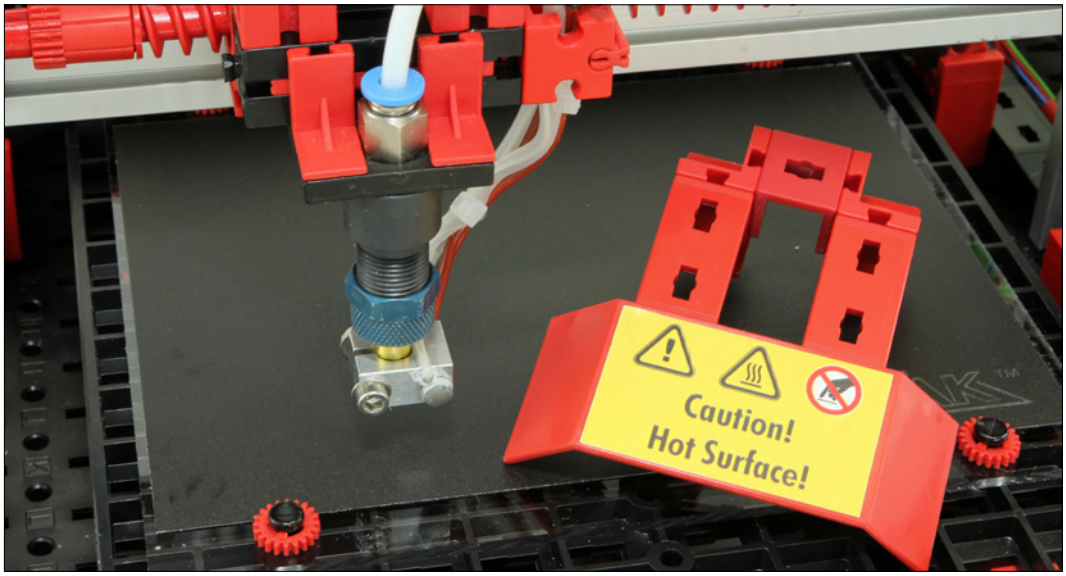




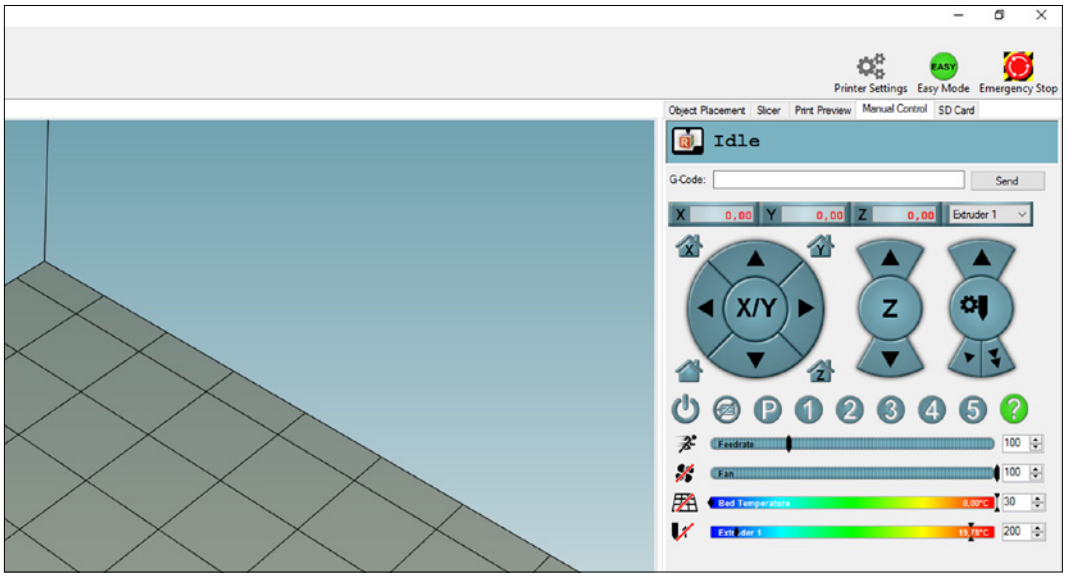
Before starting the first print job, the printing bed and printing head must be aligned. This is the only way to ensure a perfect printing result! The goal of the calibration is to set the distance between the printing bed and the needle tip of the printing head to about 0.2 millimeters by using the adjustment card provided, so the first layer of filament – the print material – adheres to the printing bed. The limit switch on the right side of the printer below the X-axis takes on an important function here (see illustration).



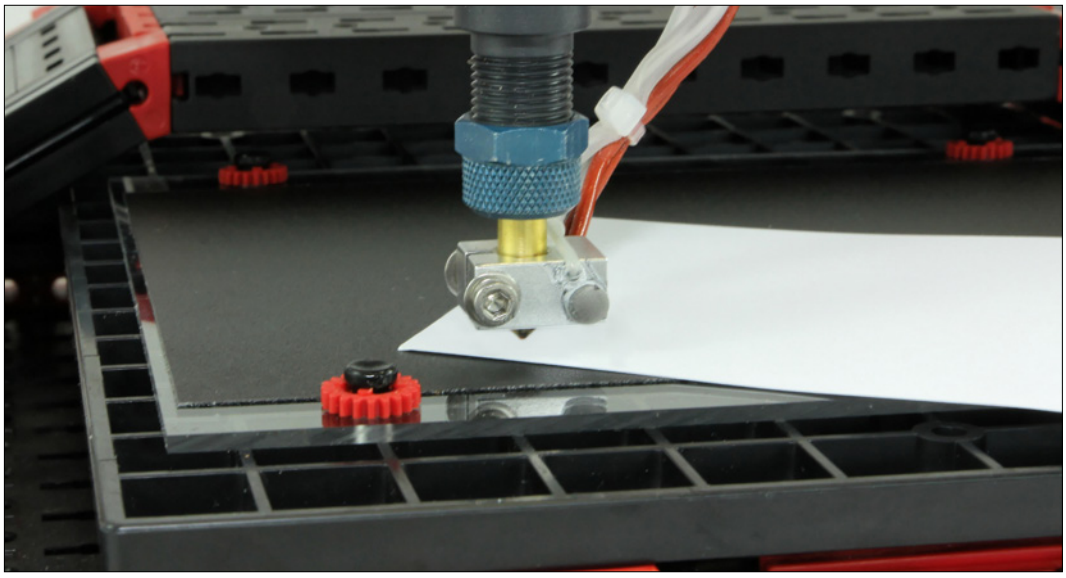
The limit switch is used to control the lowering of the printing head to the printing bed in the end position. As this happens, the needle tip must not be permitted to strike the printing bed, or damage will result! Carry out this step with especial care. To do so, it is best to carefully remove the protective cover from in front of the printing head as show in the following illustration.



Now change to the item “Manual Control” in the printing software “3D Print Control”. Here you will find the “Home” icon for the printing head start position.

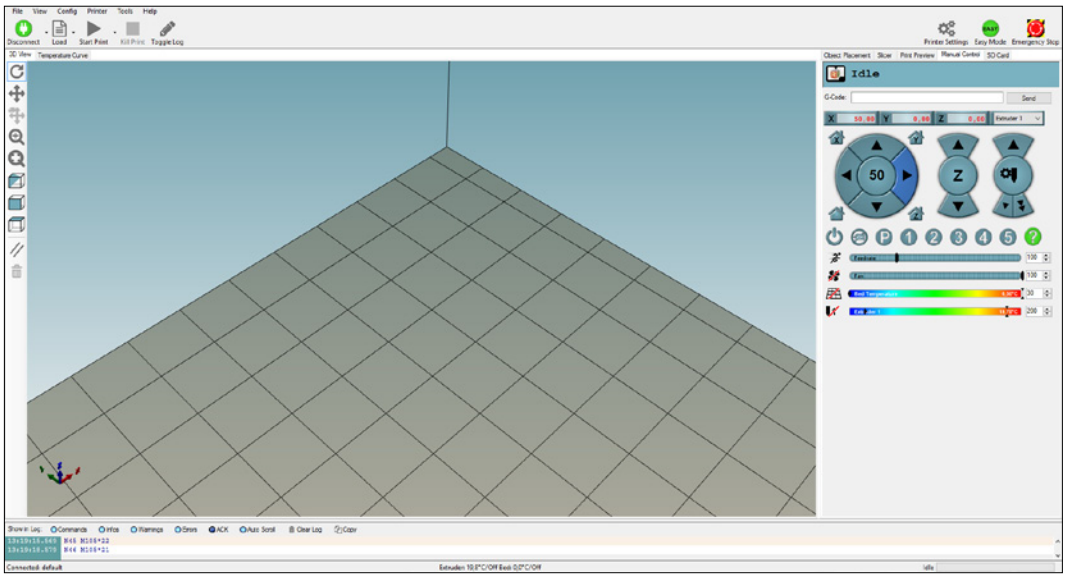


Now use the included adjustment card to check the distance between the needle tip of the printing head and the printing bed. The adjustment card should just fit between the nozzle and the printing bed and be pulled through easily.



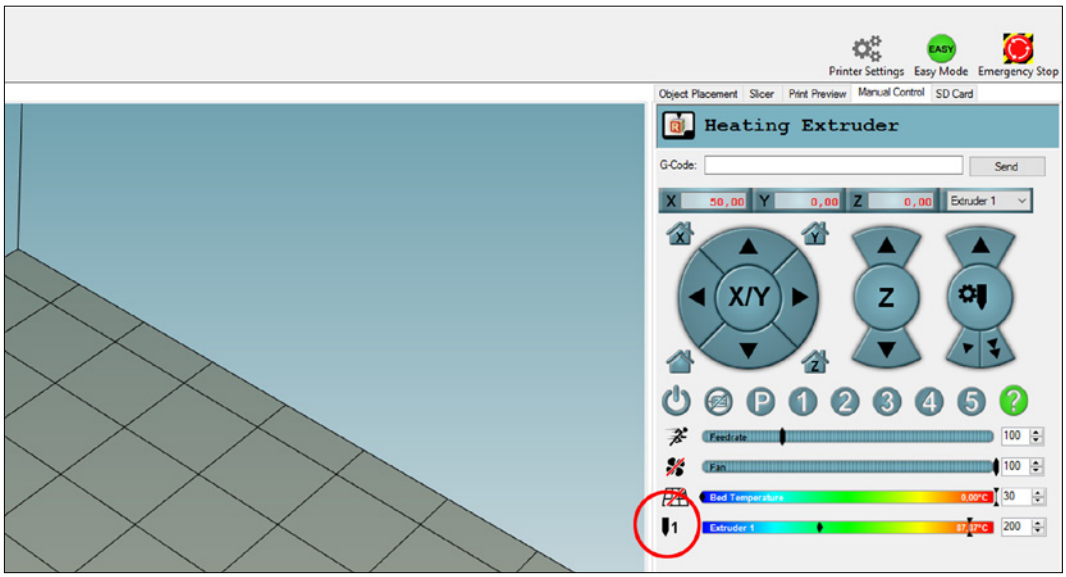
If the distance is not set correctly, adjust it as follows: Move the printing head by turning the upper spindles (Z-axis) upward or downward far enough that the needle tip touches the card. Then turn the adjustment screw for the limit switch far enough that the switch is pressed with an audible “click”. Now you have adjusted the stop position of the printing head. Next, please lock the adjustment screw. Then press “Z-Home”. The Z-axis moves upward slightly and then returns to the limit switch. Now you can recheck with the adjustment card to see if the nozzle distance is correct; readjust it as necessary.

Next, make the following setting at all corner points of the printing bed. First, use the right arrow button to manually move the printing head to X-position “100”. Use the adjustment card to recheck the distance at this position. If the distance is not correct, readjust it at this position as described above by opening the drive chain and correcting one of the spindles so the distance from the nozzle to the printing bed is correct. Now re-close the chain. Move in the Y-direction to the value “100” and check the nozzle distance. If there is a deviation in this direction, you can use one of the delivered hole reinforcements to raise the printing plate slightly and then simply adhere the reinforcement beneath the printing plate.

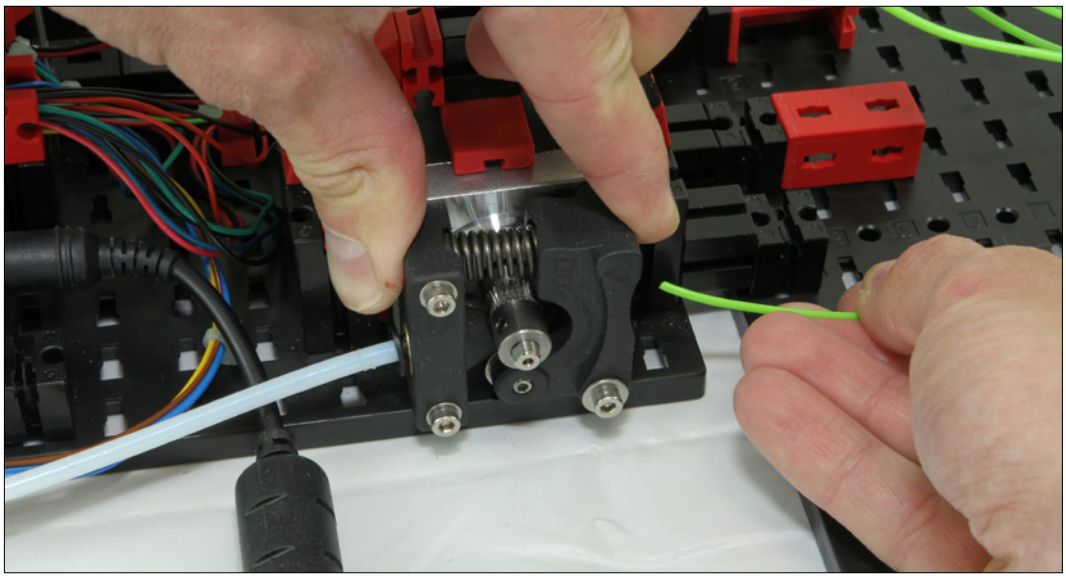


Loading print material (filament)

To insert the filament (print material), first heat the 3D printer to operating temperature (200 °C). To do so, click the “Heat Extruder” icon at the lower left of the “Manual Control” tab and wait a minute until the printing head heats up.



Then the filament can be inserted up to the printing nozzle by strongly pushing the lever on the material feed. To make it easier to insert the filament, carefully bend the first centimeter to straighten it. The filament is correctly inserted when molten material is discharged from the nozzle. Additional options to control the extruder and the filament transport are available in the operating field “Manual Control”.



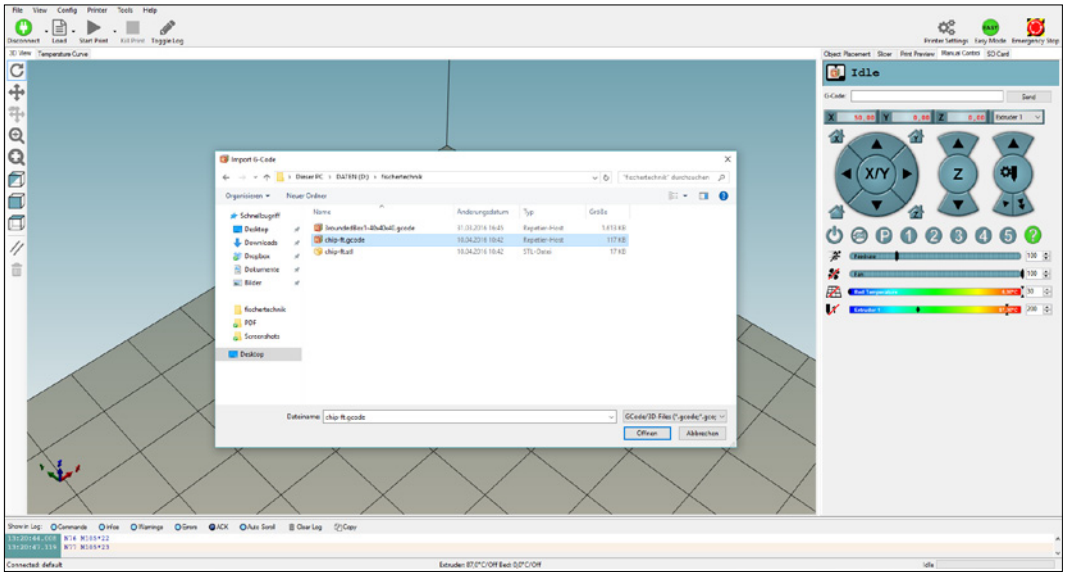
Exchanging or removing print material (filament)

To change the filament, repeat the above steps in reverse order. First preheat the extruder and let the material transport move backward until you can pull out the filament by hand. Remember to switch off the printing head heat when finished to prevent overheating!

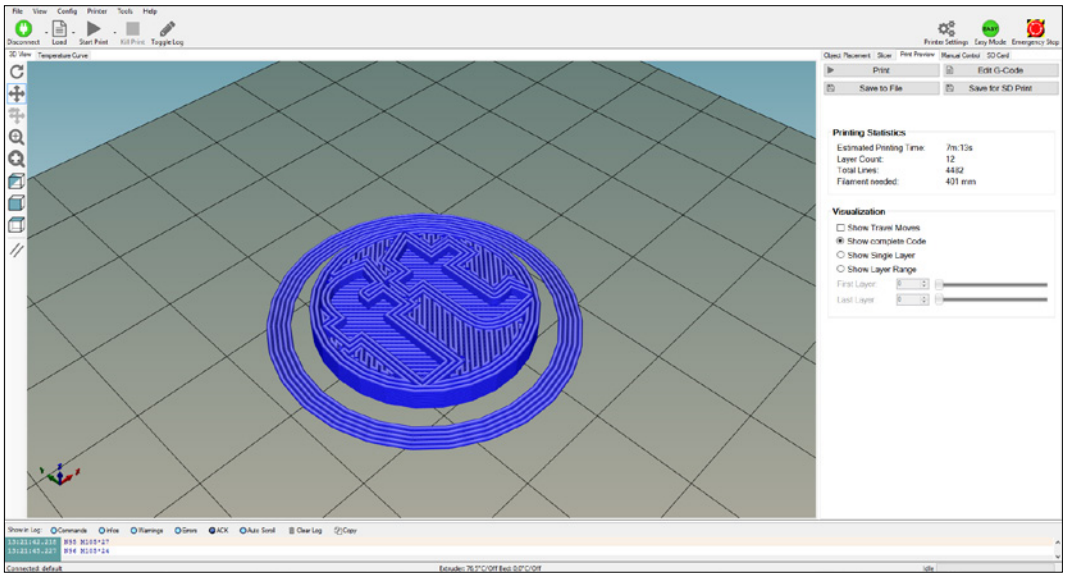
Start printing example

Printing G-code objects

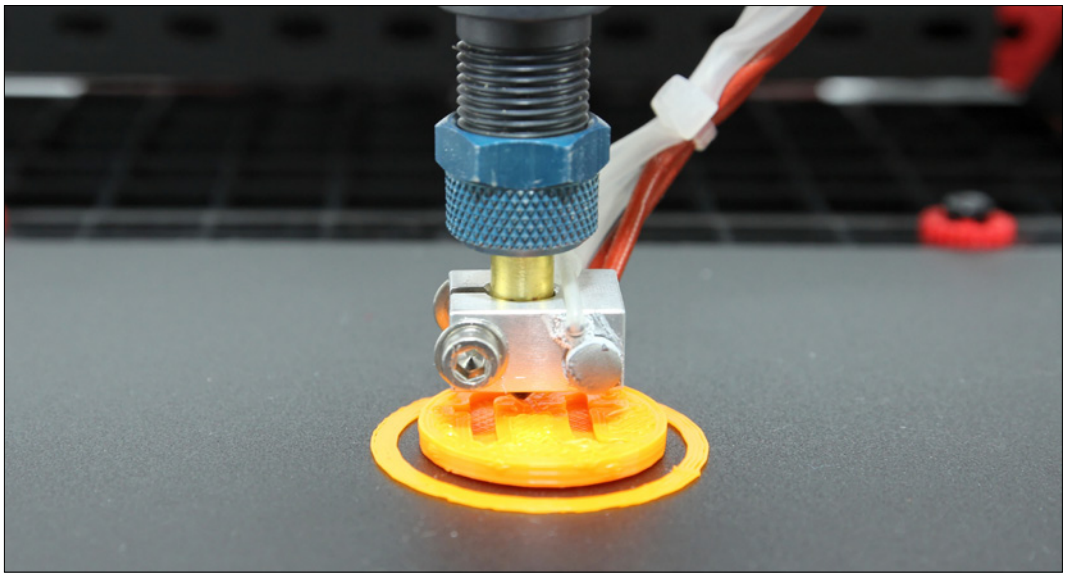
Now that your 3D printer has been adjusted and the filament is loaded, we begin the first print. In “3D Print Control”, open the tab “Open” and select the print example “chip-ft.gcode” from the directory c:\Programme\3D-Print-Control\Samples.



Then the print object is opened and is displayed in the print preview. You can use the program functions on the left edge of the window to place the object on the printing bed, move it or change the display in the print view. You will also find the “Printing Statistics” for the object on the right side of the window. The estimated printing time or filament consumption, for example, are displayed here.



Now you only have to click “Print” and the fischertechnik 3D printer starts printing the example file.



First a ring around the actual object is printed. This ensures that the filament is flowing properly when the actual object is printed.
If the filament does not adhere to the printing plate, the needle tip is set too high above the printing plate. If the filament is pressed completely flat or it cannot be discharged from the nozzle at all, the printing head needle tip is set too low. In both cases, you can manually readjust the height during printing by slightly raising or lowering the Z-axis at one of the drive chain gears to correct the distance (without removing the chain). Ideally, the filament will be pressed lightly to the printing plate (see illustration).

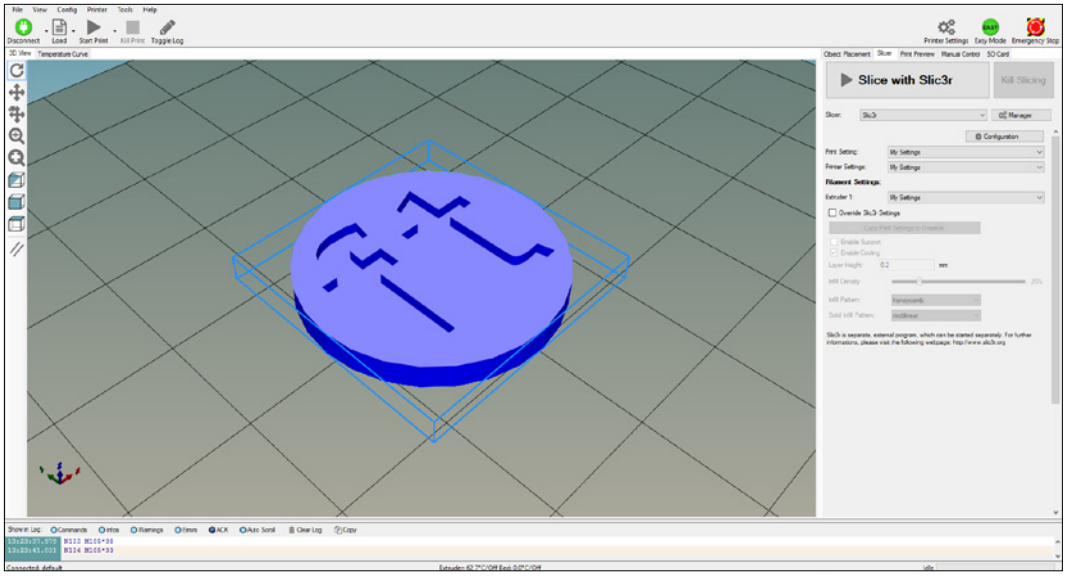
Note:
If the printing does not function as expected or the print result is flawed, possible errors and how to remedy them are presented in the section “Troubleshooting”!

Removing printed object

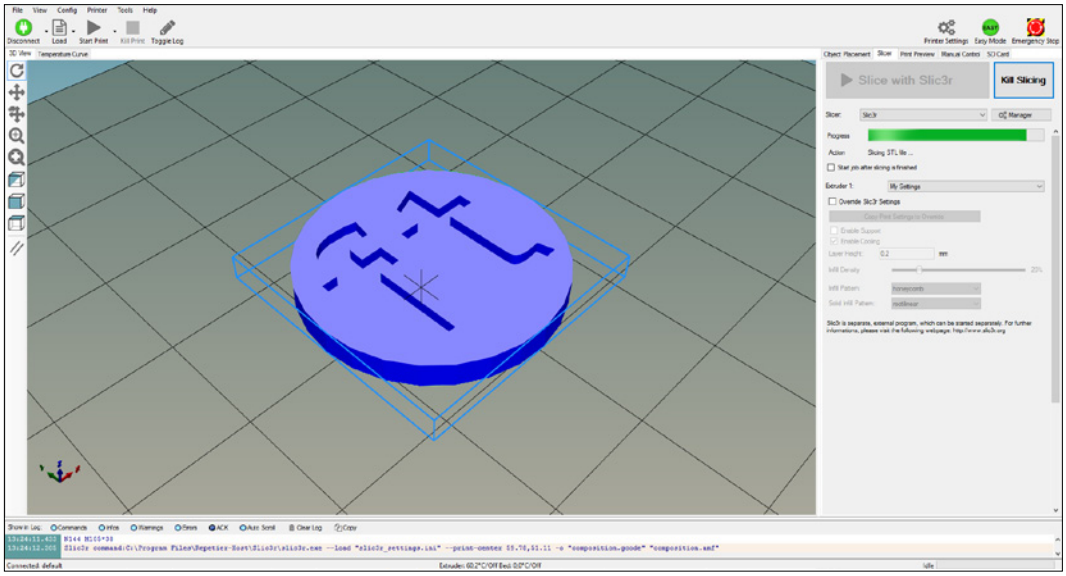
To remove your object after printing, first let it cool down and then try to carefully loosen it by hand. If it is too difficult to move the object, please use a spatula to carefully loosen it from the printing bed.

Printing STL objects

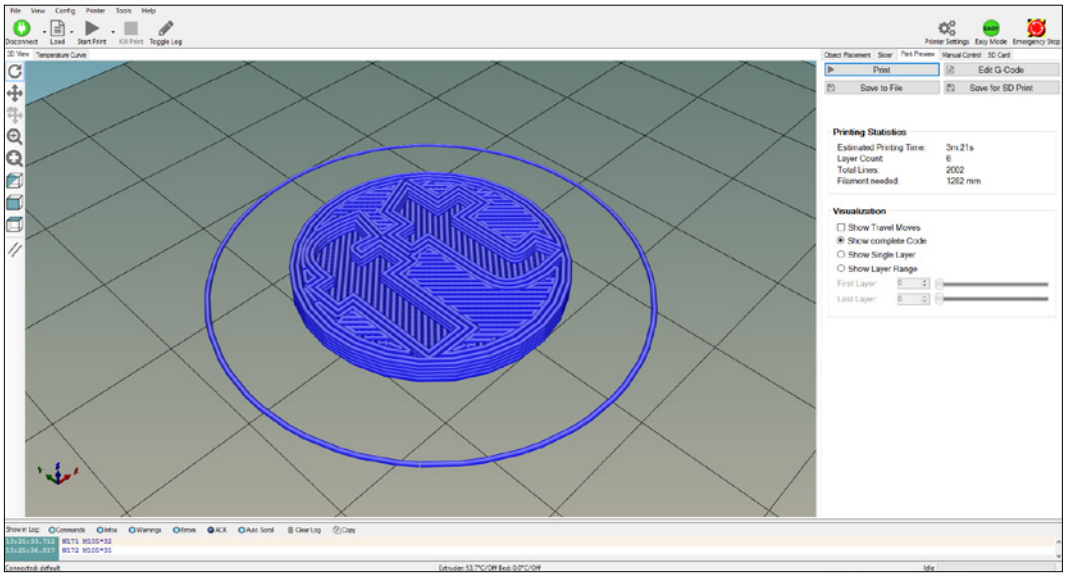
To open an STL file, go to the tab “Open” in “3D Print Control” and select the print example “chip-ft.stl” from the delivered CD. Before you can print the STL file, first it has to be prepared with a “slicer”.



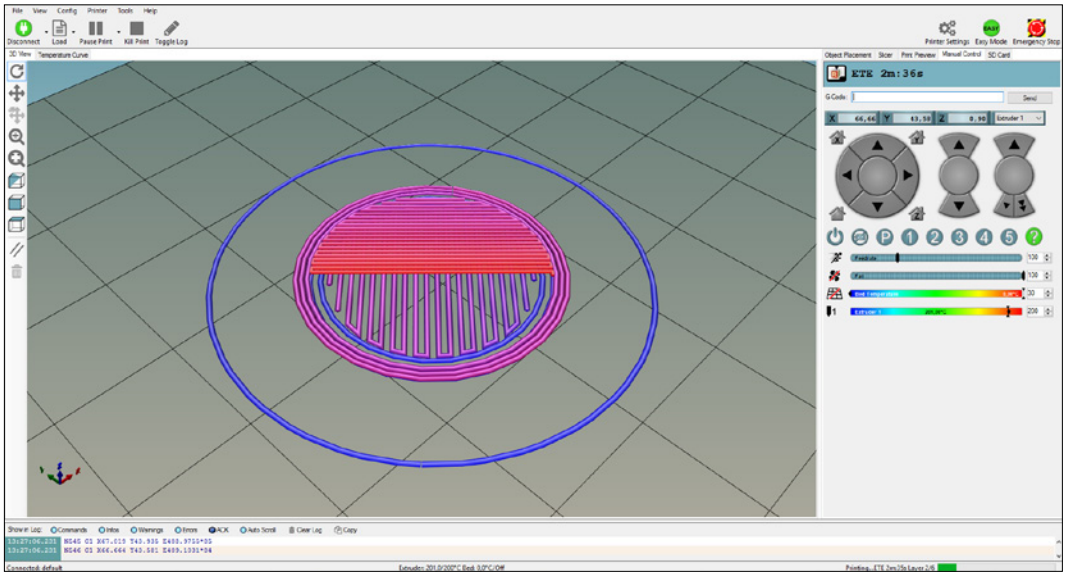
This slicer divides the object into thin slices and saves them as G-code. To start the slicing process, click the tab “Slicer” and then the item “Slice with Slic3r” at the right of the program window.



Then the “3D Print Control” begins to convert the STL file and displays it in the preview window shortly thereafter. As with the G-code, now you only have to click “Print” and the fischertechnik 3D printer starts printing.



Now you can see the current progress of the printing process in the “Print Preview” and can follow the printing head in the preview window.



3D printing process

As explained above, 3D printing – or, in technical language, "Additive Fabrication" – refers to the additive fabrication process. As implied by the name, consecutive layers are deposited to build up the object, as opposed to subtractive processes (milling, turning, etc.) in which the object is formed by removing the respective material.
In addition to the FDM processes (Fused Deposition Modeling) used by the fischertechnik 3D printer, several other 3D print fabrication processes currently exist. These are briefly explained as follows.

FDM (Fused Deposition Modeling) / FFF (Fused Filament Fabrication)
The FDM process, often referred to as FFF process (Fused Filament Fabrication) for reasons pertaining to patent law, is widespread in home environments as well as in industrial sectors. It offers a decisive advantage compared to the other processes. Its application is uncomplicated, the consumption materials are inexpensive and it can also be used by beginners with no special prior knowledge.
In the FDM process the filament, generally in the form of a wire, is melted in an extruder and deposited on the printing platform in layers by a nozzle. This fusing of the layers continues until the print object is completely constructed on the printing platform. The printing head, also referred to as the extruder, is guided above the printing platform in all three dimensions of the print object – the Y-direction (forward, backward), X-direction (left, right) and the Z-direction (up, down). As the printing head is moving, the extruder continues to press the molten material through a nozzle. The filament cools and solidifies after leaving the nozzle, thus building up the desired object layer by layer.

SLS (Selective Laser Sintering)
In selective laser sintering, the print material is fused with pinpoint accuracy by a laser instead of being melted in an extruder. The SLS process is primarily used for industrial applications and offers a significant advantage. Specifically, with SLS even extremely detailed print objects can be realized with high precision and without additional support structures. Furthermore, different materials such as plastic or even metal powders can be used.
In contrast to the FDM process, SLS printers contain a "printing bed". This bed contains the respective powder. The powder is deposited layer by layer by a spreader and then fused at the desired points by a laser. Additional powder is added after each layer and is also fused by the laser and the print object emerges step by step. At the end of the print process, the entire printing bed is filled with

material. Now the object is freed from the powder by compressed air and the excess, unused material is supplied to the next print process.
Because of the enormous hardware effort involved and the high cost of the print powder, the SLS process is only intended for industrial application. Nonetheless, anyone who wishes to realize his or her projects (e.g., prototypes) with the SLS process can turn to corresponding suppliers on the Internet.

SLA (Stereolithography)
The SLA process was invented over 30 years ago by Charles Hull in the USA and was initially used in university and industrial settings. In stereolithography, the print material is a liquid epoxy, the photopolymer. This photopolymer is contained in a “printing tray” and is exposed point by point by a laser or bundled UV radiation. After each layer is exposed, the printing tray lowers; then the exposed points cure immediately and become solid. The surrounding epoxy remains fluid and can be re-used. One decisive advantage of stereolithography is the extremely high print resolution, down to a few micrometers. This is why the SLA process is primary used in manufacture of finely detailed prototypes or in medical technology.

File formats

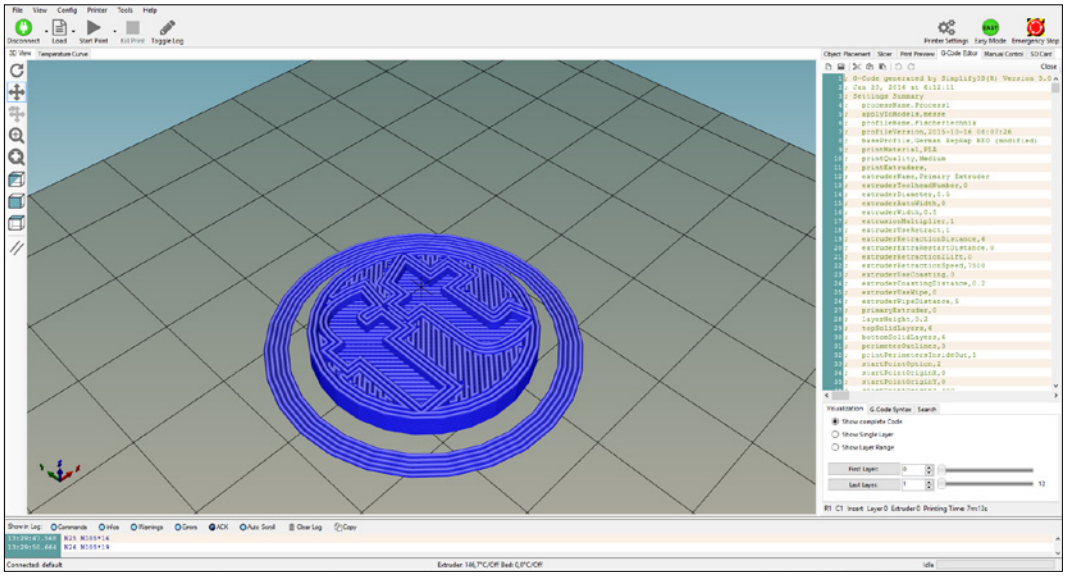
In order for the fischertechnik 3D printer to even begin to print objects, it needs control data prepared especially for this purpose. These data are translated into the requisite movements by the controller, which functions as brain and control unit of the printer. Whether the printing head now moves to the left, backward, or upward, etc. – all these commands are controlled through the print data.

G-code

Your fischertechnik 3D printer use the file format "G-code". This format was originally developed for CNC machines, such as milling machines, to convey the respective control commands for tools or mill spindles. On the 3D printer, the extruder and the X/Y/Z-axes are moved by these control commands.
While most of these control commands begin with the letter "G" followed by a number (e.g., G28), the name "G-code" was evident. However, there are different commands starting with any letter of the alphabet from A-Z. Because the G-code is standardized, it can be run on almost all CNC machines or 3D printers. The G-code is composed of several "sentences". In turn, these sentences consist of one or more commands, as shown in the following examples.

Example G-code commands

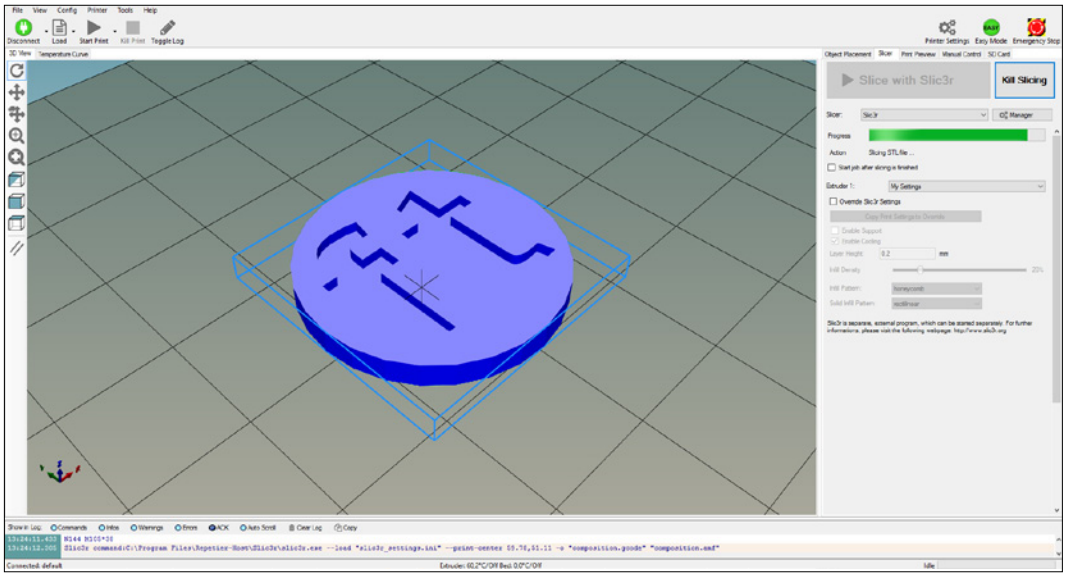
G00: Move axes in rapid traverse to a forward feed position
G01: Move to a position at normal speed (linear interpolation)
G02: Forward feed with clockwise arc (circular interpolation)
G03: Forward feed with counterclockwise arc
G04: Dwell time
G05: Spline definition
G06: Spline interpolation
G09: Precise stop
G14: Polar coordinate system, absolute
G15: Polar coordinate system, relative
G17: Select X/Y-plane
G18: Select Z/X-plane
G19: Select Y/Z-plane
G20: Select freely definable plane
G28: Move to HOME position



STL format

Another standard process in 3D printing is the STL format (Surface Tesselation Language). “Tesselation” refers to the description of the surface of 3D objects by means of triangular surfaces. More precisely, each of these triangles is described by three corner points and the corresponding triangle surface. These geometric values are needed in a special form for the further data preparation and the printing process.

One particular advantage of the STL format is that it can be further processed, rotated, enlarged or reduced in CAD programs without any problems. Before your fischertechnik 3D printer can print from STL data, first the data has to be converted to printable data with a “slicer”.



Materials science

PLA (bioplastics)
As explained above, your fischertechnik 3D printer works with the FDM process (Fused Deposition Modeling). As printing material, or "filament", it uses PLA (polylactic acid). PLA, manufactured on the basis of lactic acid molecules, is easy to handle and is harmless to the environment both when it is worked with and when disposed of. Nevertheless, to stay on the safe side, we recommend disposing of remaining material or faulty print objects through recyclable collection.
When the PLA filament is heated to between 190 °C and 220 °C, it becomes thermoplastic (malleable). At 60 °C, it resolidifies. One decisive advantage of PLA for 3D printing is that it can be processed on an unheated printing bed. This means that in contrast to other plastics, it adheres to the printing bed without requiring any additional effort. If the PLA does not adhere perfectly, just change the adhesion film – also referred to as "Buildtak" – on the printing bed. You can order the adhesive film through the fischertechnik online shop.

Please note: To prevent contamination or damage to your fischertechnik 3D printer, only use PLA quality filament from fischertechnik. This filament is available in different colors through the fischertechnik online shop http://www.d-edition.de/Spielwaren/Fischertechnik/.

Finding additional model templates

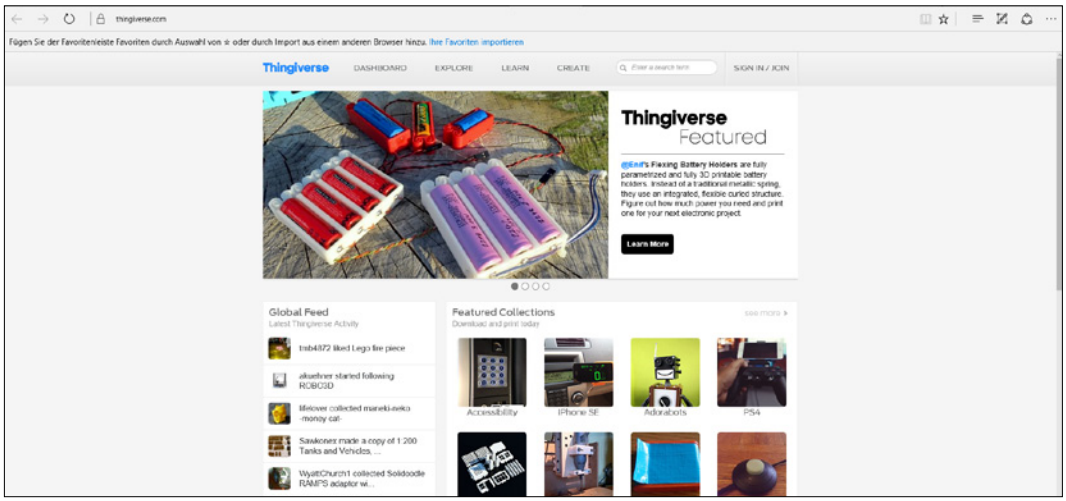
As you can see, your fischertechnik 3D printer can bring all your creative ideas to reality. If you do not want to design your print objects yourself, the Internet offers a great many platforms from which you can download model templates as a G-code or STL file either free or at cost. With these model templates, you not only expand your knowledge of 3D printing, but also gain practice for designing your own objects.
The software “3D Print Control” is also delivered with several examples as .gcode and .stl files. These files are found in the folder C:\Programme\3D-Print-Control\Samples after the software is installed.

Also, you will find a library with numerous additional examples on the fischertechnik e-Learning portal www.fischertechnik-elearning.com, where this supporting material can also be found. Note: To access the supporting material for the 3D printer and the library through the portal, you will need the access code from the assembly instructions.

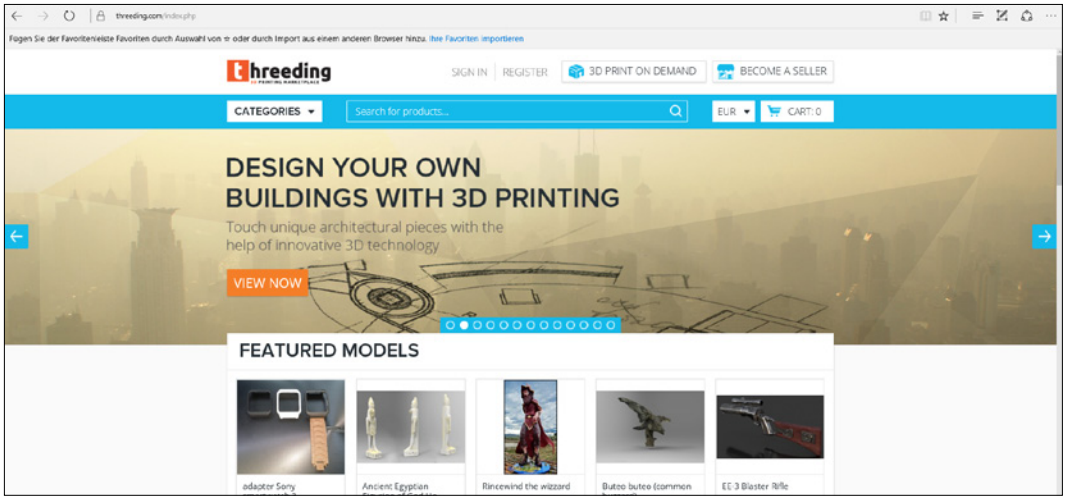
In the following, you will receive another brief overview with additional platforms, including the corresponding links.

www.fischertechnik-elearning.com

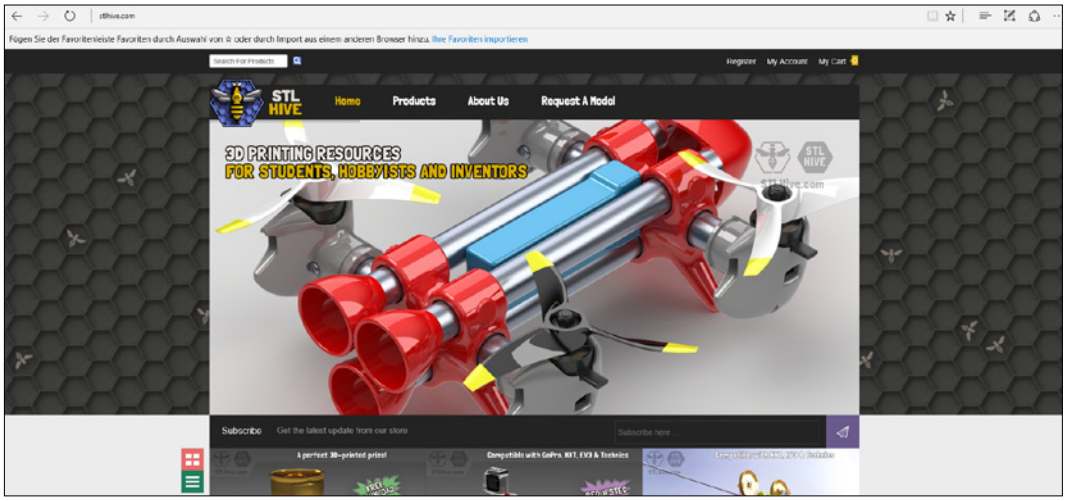
www.thingiverse.com



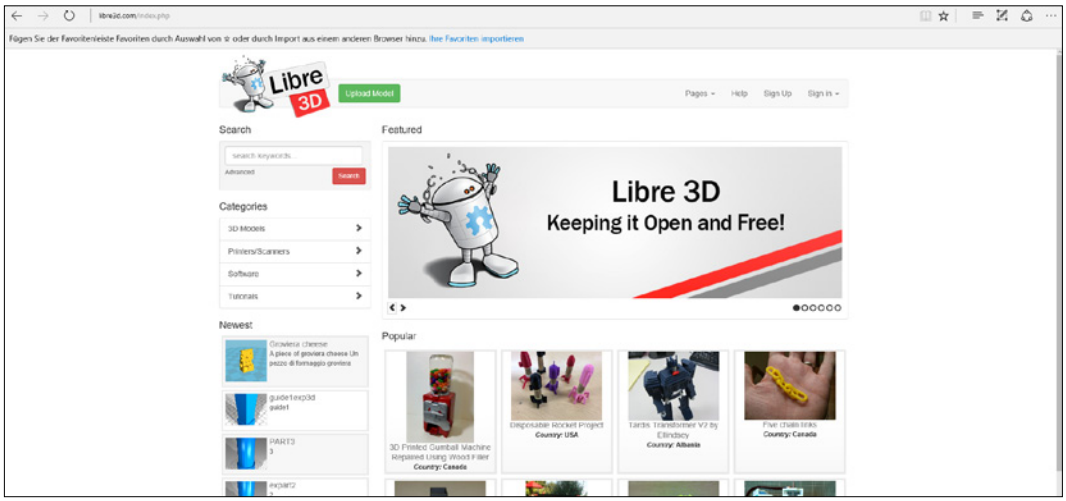
www.threeding.com



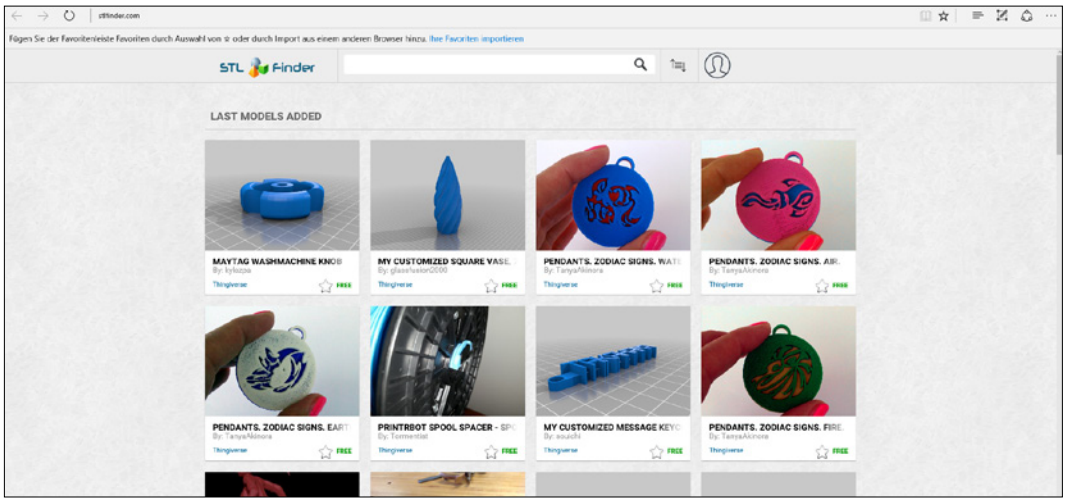
www.stlhive.com



www.libre3d.com



www.stlfinder.com

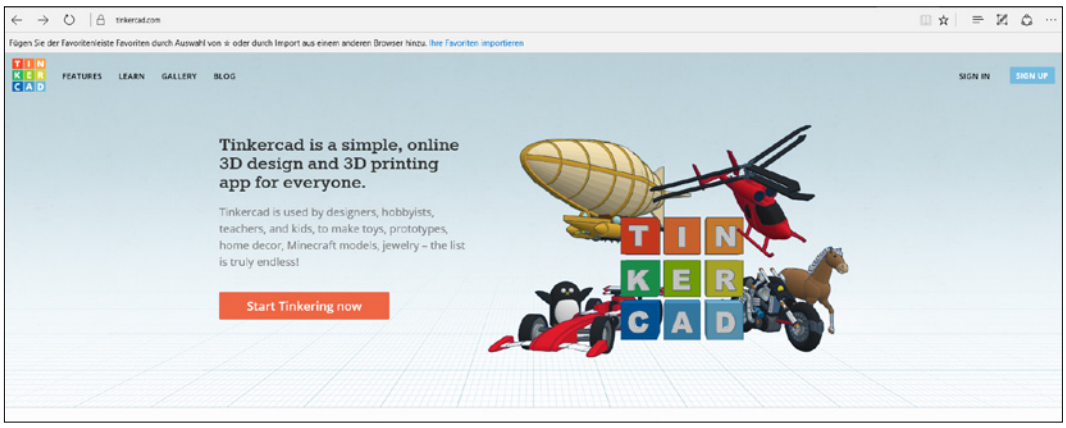


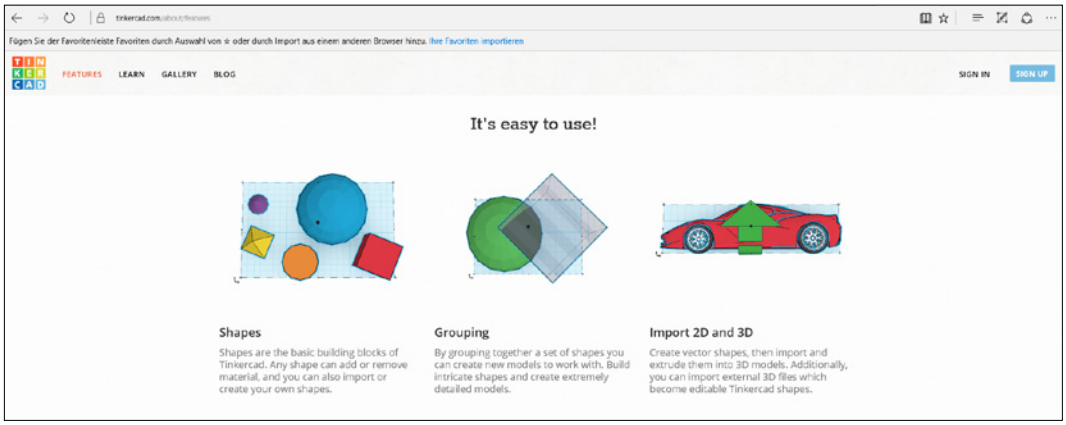
Design software

By now you have printed the example files and perhaps objects from the Internet as well. However, if you want to realize your own ideas and designs, you cannot do without a design program, also called a CAD program. With such a program, all approaches to the realization of your creative ideas are open. With Thinkercad and SketchUp Make, we introduce you to two ideal starter solutions. You will find further information, tips and tricks, as well as tutorials for the programs, on the Internet or under youtube.com.

Tinkercad

With Thinkercad, CAD Professional Autodesk offers an easy-to-operate, cloud-based design solution – after creating a user account, you can get started right away. Thinkercad is based on a small tool palette and six standard forms such as the circle, square, triangle, etc. These forms can be combined into 3D models, or simply removed. A quick solution for beginners: yet for advanced users, somewhat unwieldy. Still, after some practice, good results come quickly. The completed objects can then be saved as STL files and after conversion into G-code, can be immediately printed with the fischertechnik 3D printer.
www.tinkercad.com

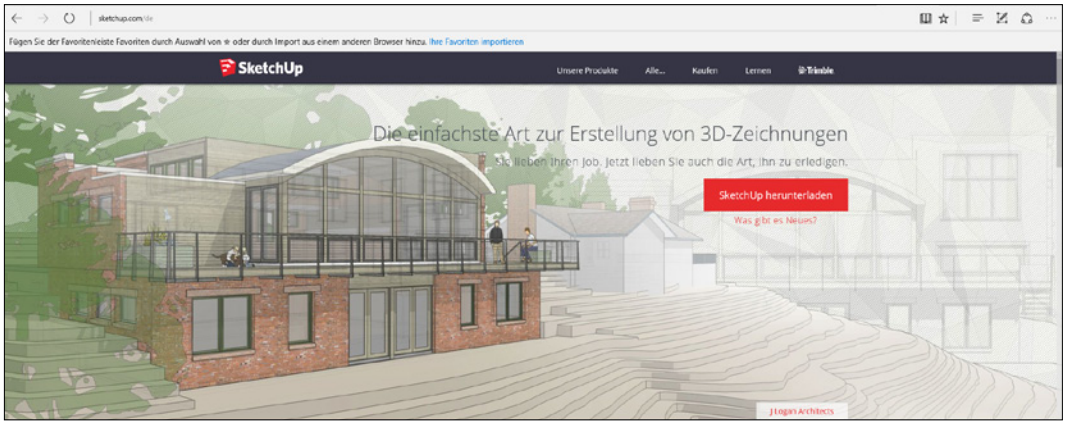


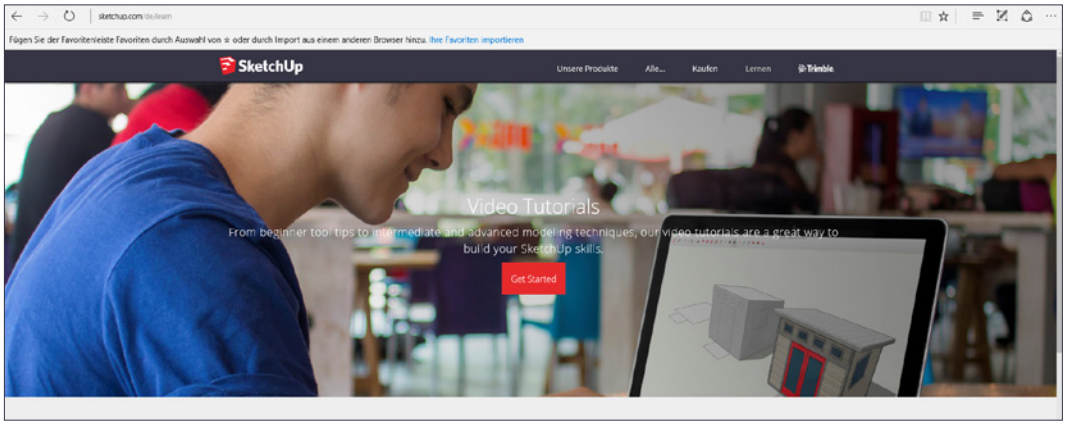


SketchUp Make

SketchUp Make is another no-cost design software (freeware) for designing your own models – plus, it is ideal for beginners. With SketchUp Make, you can quickly create or modify your own three-dimensional objects. Among other options, you can make the completed models public in Google Earth and Google Maps, or post them on the Internet in the 3D Gallery. And when your requirements mature, upgrading to the Pro version is possible at any time.

www.sketchup.com





Safety information

Please observe the following safety information when handling your fischertechnik 3D printer:

Adult supervision
The fischertechnik 3D printer is suitable for youth aged 14 years and older. If children under 14 years use the printer, make sure they are supervised! Make especially certain that small printed parts are not swallowed!

Extruder / printing nozzles
Keep in mind that the extruder and the printing nozzle can heat up to 250 °C (480 °F). Improper use or touching these parts can cause severe burns! For this reason, always leave the protective cover in place in front of the extruder and printing nozzle.

Movable parts
Make sure that a safe distance is maintained when operating the 3D printer and no hair or clothing is caught by the device. Furthermore, do not reach into the printing area (printing bed, material supply, X-/Y-/Z-axis, etc.) during operation. **Caution: Danger of injury!** Never operate the 3D printer without the provided protective covers.

Filament
The fischertechnik PLA filament was developed and tested especially for your 3D printer. This filament is available separately in different colors through the fischertechnik online shop. Using other filament can result in poor printing quality or even damage the printer. Using other filament voids the guarantee and warranty!

Operating conditions
A cool, well ventilated room is best for operating your fischertechnik 3D printer! Only operate the printer when it is completely assembled!

Electromagnetic interference
If operation of the 3D printer is disrupted by electromagnetic influences, it can continue to be properly used after the disruption ends. It may be necessary to briefly interrupt the power supply to the controller and the USB connection and restart the controller.

Proper disposal
Instructions on environmental protection: The electrical and electronic components of this kit do not belong in household waste. At the end of their life cycle, take them to a collection center for electrical and electronic devices. The symbol on the product, the packaging or the instructions refers to recycling.

Warranty
Fischertechnik GmbH guarantees that the device is free of faults corresponding to the current level of technology. We reserve the right to make modifications to the design or construction which detract from neither the functional capability nor the value of the device and which shall not constitute ground for complaint. Apparent deficiencies must asserted in writing within 14 days after delivery, otherwise warranty claims due to apparent deficiencies are excluded.

Insignificant defects do not validate warranty claims. Moreover, the customer is only entitled to claim subsequent performance, i.e., repair or replacement parts delivery. If the subsequent performance is unsuccessful, particularly if it is impossible, if we are unable to remedy the deficiency within an appropriate period or if we refuse, the performance or it is culpably delayed by us, the customer is entitled to withdraw from the contract or demand a reduction in the purchase price at his or her discretion. The warranty period is 24 months as of delivery. Material defects of the controller caused by improper use, normal wear and tear, deficient or negligent handling are also excluded from warranty, just as are the consequences of unsuitable modifications or repairs undertaken by the partner or third parties without our approval. This warranty is governed by German law.

Troubleshooting

Cleaning the nozzle / printing head
After some time, the nozzle of the printing head may become dirty. To clean it, move the printing head to a position that is easy to reach and heat it to 220 °C. Then clean the nozzle carefully with a small brass wire brush.

Printing bed
In order for the PLA to adhere well to the printing bed, clean it periodically with a glass cleaner to remove dirt or grease. If the self-adhesive print layer, the "Buildtak", is torn, a replacement can be easily ordered through the fischertechnik individual part service.

The printer cannot be switched on
Check if the plug of the delivered power supply unit is connected to the controller.

Printer stops during printing process
Please check the following points: Power supply, USB cable to PC, errors in G-code.

Filament transport
The extruder does not transport the filament during manual control. The feed function is only active when the nozzle heating element is switched on and the required temperature has been reached.

Filament does not adhere to printing bed
If the filament does not adhere to the printing bed when the first layer is printed, the needle tip of the printing head is set too high above the printing plate. If the filament is pressed completely flat or it cannot be discharged from the nozzle at all, the needle tip of the printing head is set too low. In both cases, you can manually readjust the height during printing by slightly raising or lowering the Z-axis at one of the drive gears to correct the height (without opening the chain).

Poor printing results

Form: If the form of the printed object does not correspond to the specified geometry (e.g., a cylinder is not perfectly round), it may be because there is play in the X- or Y-axis which distorts the print result when the printing direction changes. Adjust the axes so there is no play (see assembly instructions).

Surface: If the filament does not flow evenly or is not fed correctly, the cause could be a dirty nozzle (see above), or the filament might be moist or too old. Make sure the filament is stored in dry conditions (a sealable plastic bag with silica pouches) and is used within a year. Moist filament can be dried by placing it in an oven heated to about 40 °C for an hour.

What do I do when the print result is flawed?

In this case, the cause is stiff movement of the Z-axis, which does not move upward easily enough. To remedy stiff movement, please check that the Z-axis is correctly installed according to the assembly instructions (check for smooth movement and lubricate the bearings with the supplied grease as necessary).

Bad

Good

Extruder rattles and pinion skips
The printing nozzle may be dirty or clogged. Clean the nozzle, see above.

No connection to controller
Make sure the correct COM interface is selected in the printer settings. If it is, please close the printer software “3D Print Control” and disconnect the power supply and the USB cable from the controller. Wait a few seconds, reconnect the power supply and USB cable, restart the printer software and reestablish the connection.

FAQs

If a problem that is not listed here occurs, our FAQs will help you find a solution to the problem. You will find the FAQs under
www.fischertechnik.de/3DPrinter-FAQ
fischertechnik Service, reached under info@fischertechnik.de, would be happy to provide further assistance.