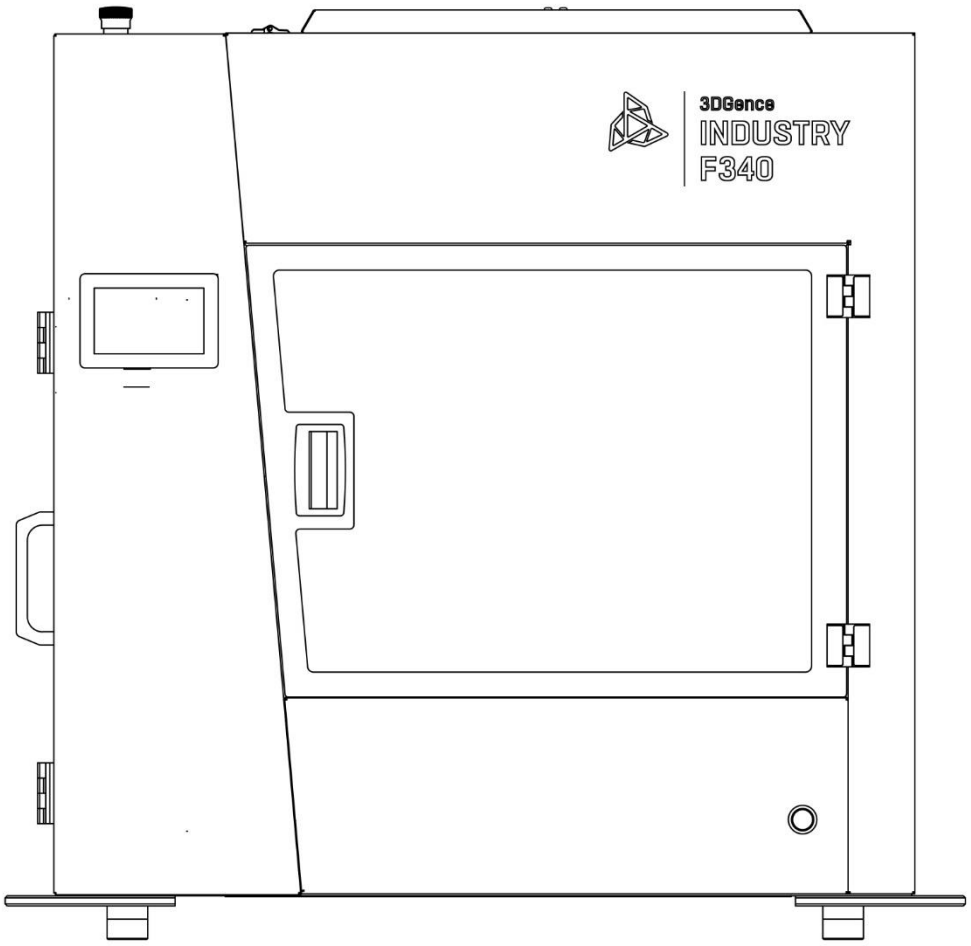
USER'S MANUAL

3DGence INDUSTRY
F340



Contents

I INTRODUCTION

1. INTRODUCTION

Thank you for choosing 3DGence INDUSTRY F340 printer. This User's Manual provides clear and legible information on this professional 3D printer in order to guarantee the highest quality of printing as well as long-term repeatable and safe operation of the printer. The mission of 3DGence is to provide only top-class professional equipment and solutions.

The User's Manual contains information necessary for proper and safe use of the printer. Read the entire User's Manual carefully before using the printer. The supporting document for the User's Manual is the technical documentation available on our website: www.3dgence.com.

The persons who have not read the User's Manual must not use the printer. Wrong use may damage the printer or cause bodily injuries or even endanger the life of the operator.

On the last pages of this User's Manual there is the dictionary of terms and concepts connected with 3D printing. The dictionary will facilitate understanding the professional terminology and explain some terms appearing in this User's Manual.

Before starting the operation of 3DGence INDUSTRY F340 printer, the user must read the entire User's Manual and accept the instructions, exceptions and warranty conditions included in the User's Manual.

2. PRINTING MATERIALS

FFF technology (Fused Filament Fabrication) used by 3DGence INDUSTRY F340 printer consists in depositing plasticized thermoplastic material (plastic) layer by layer. This plastic is the printer's operating material. The thermoplastic material is used in the form of a filament with a precisely defined diameter, wound on a spool (fig. 1). 3DGence INDUSTRY F340 printer uses only the filament with the diameter of 1.75 mm.

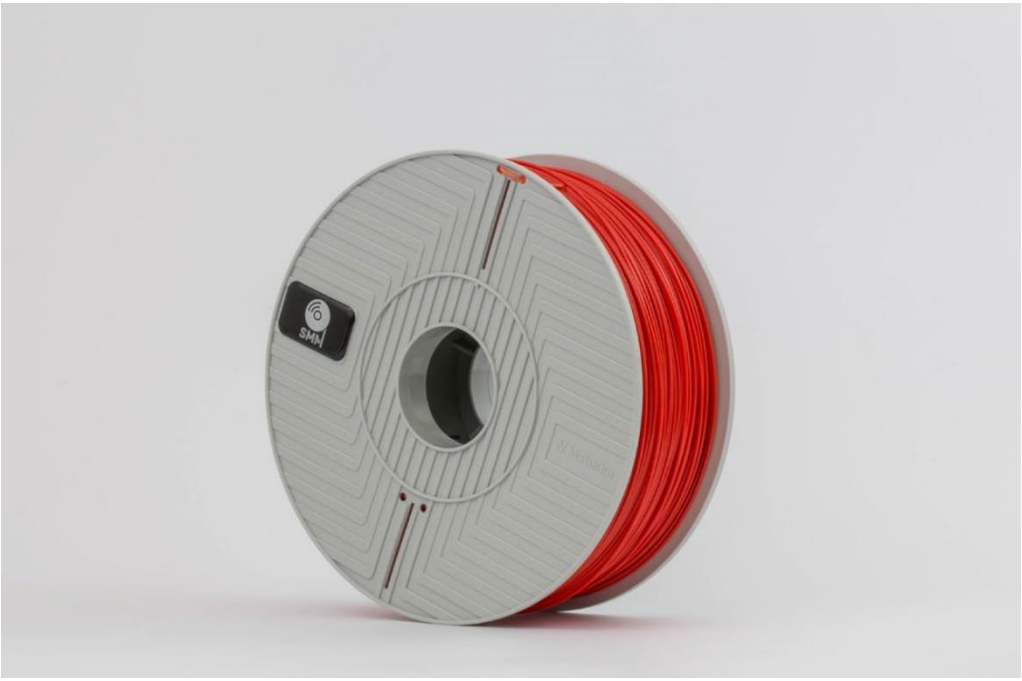


Fig. 1 Filament spool

3DGence INDUSTRY F340 printer is equipped with two extruders and two hotends. Thanks to this, two materials can be used in one printed model. This solution makes it possible to:

- print two-colour models,
- to print functional models that combine characteristics of two specific materials in the required manner,
- print geometrically complex models that require soluble support structures.

With its extensive range of temperatures achieved, 3DGence INDUSTRY F340 printer can use a wide range of printing materials available in many colours. The Certified Material Base, available at www.3dgence.com, has been created for 3DGence INDUSTRY F340 printer. The Base contains the list of all materials supported by the Smart Material Manager (SMM) and their typical applications.

3DGence recommends that the materials from the Certified Material Base should be used. These materials are supported by the SMM system and they make it possible to achieve accurate print parameters, ensure automatic detection of material type and, consequently, guarantee the highest print quality. More information on the SMM system can be found in chapter IV, point 4. 3DGence does not limit the use of non-certified materials. However, the application of such materials prevents the use of SMM system.

3DGence is not responsible for the quality of printouts made of the materials other than those included in the Certified Material Base and for damage caused by the use of such materials as well as it does not provide support for the quality of the printouts made of the filaments other than those included in the Certified Material Base.

3. SYMBOLS

There are warning symbols placed on 3DGence INDUSTRY F340 printer to warn about potential hazards. The following symbol indicates high temperature occurring in a given place:

Take special care when working in zones marked with the above symbol and use protective gloves. Failure to comply with safety rules may result in severe burns.

3DGence INDUSTRY F340 printer is equipped with an emergency stop button that stops the printer operation immediately when pressed. The red emergency stop button is located at the top of the printer's housing (fig. 2).

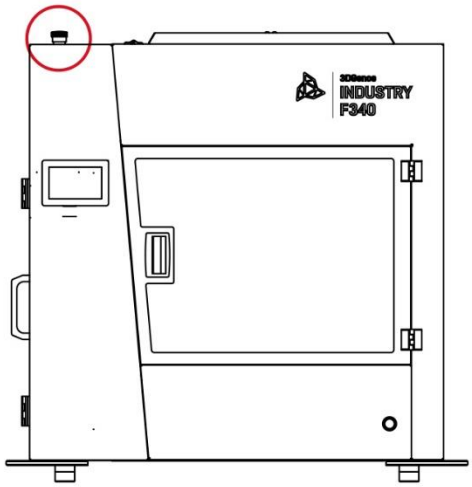


Fig. 2 Location of the emergency stop button as seen from the printer's front

3.1. Auxiliary symbols used in the User's Manual

Throughout this User's Manual the following symbols are used. They identify the activities and situations that are potentially dangerous to health or may cause damage to the printer. Applicable rules must be followed – negligence may result in damage to the printer.

DANGER:

The situation or procedure described is potentially dangerous. In the case of inappropriate behaviour, it may cause injury to the operator or damage to the printer. Exercise care.

ATTENTION:

The situation or procedure described is potentially dangerous and it may result in damage to the printer. Exercise care.

PROTECTION:

Protective gloves, delivered with the printer, must be worn when performing the activities described.

4. SAFETY MEASURES

The information below describes the correct operating conditions of 3DGence INDUSTRY F340 printer. Failure to comply with the indications and contraindications may significantly reduce the life of the printer, violate the warranty conditions or endanger the health of users.

4.1. General information

The printer must not be installed:

- in open space, outdoors,
- in damp places or in places at risk of flooding,
- in the vicinity of volatile and flammable substances,
- near concentrated acids, caustic vapours or corrosive substances,
- in places easily accessible to children,
- using the network without a protective earth lead (PE),
- using the network without a fuse or the network protected with a fuse with a rated current intensity below 16A.

Do not:

- touch the printed model, heatbed or hotends during printing,
- open the working chamber door and filament chamber door during printing,
- insert any body parts or objects into the printer's working area during printing – the printer may get damaged or the operator may get injured,
- touch the heated nozzle with your hands, even with protective gloves,
- bend over the heated printer's chamber,
- touch live parts,
- touch linear guides and ball screws during printer operation,
- operate the printer with wet hands,

- put any objects on or under the printer's table – during the printer operation or when the printer is at standstill,
- put containers with liquids on the printer,
- leave the working printer without the control of an adult who is able to take appropriate steps in the event of a failure,
- leave the working printer in a room with children or animals,
- disassemble the printer or the printing module, as well as make unauthorized repairs - it may damage the printer and the printing module.

Adhere to the following instructions:

- use only earthed power sources (to avoid electric shock),
- ensure enough free space around the printer so that you can always open the door to its full width,
- when disconnecting the plug from the power source, pull the plug by its housing not by the cable,
- disconnect the printer from the power source before any repair or maintenance activities,
- make sure that the mains voltage corresponds with the printer's specifications,
- protect the power lead and plug against damage,
- disconnect the power plug before relocating the printer,
- disconnect the power plug if the printer will not be used for a longer period of time,
- periodically remove external contaminations from both nozzles (using non-flammable material),
- always wear protective gloves when operating the printer,
- ensure the possibility of quick response in the event of a break-down/print failure – access to the emergency stop button must be always ensured.

Heated heatbed, hotends and chamber remain hot even after completed printing (fig. 3). Check their temperature on the display before touching them or wait at least 30 minutes after switching the printer off (e.g. in order to clean, remove the model, etc.)

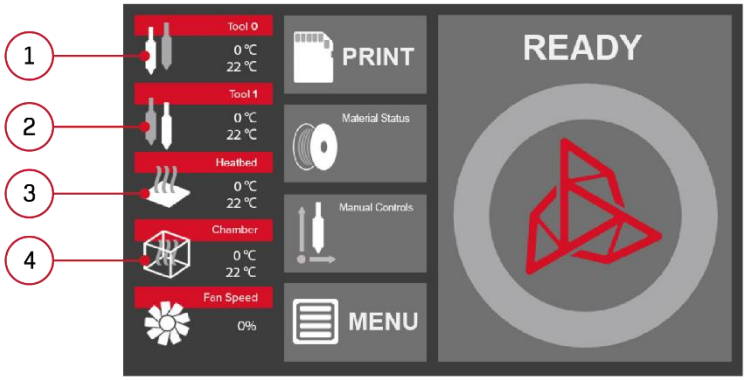


Fig. 3 Temperature indications for: 1, 2. hotends | 3. heatbed | 4. chamber

4.2. Relocating the printer

To ensure the safety of the user and to avoid accidental damage to the printer, the following rules must be followed when relocating the printer:

- before relocating the printer, switch it off and disconnect it from the power source,
- the printer should be cooled down, the operating material and all loose elements and accessories should be removed from the printer,
- the printer should be lifted only by the holders designated for this purpose (fig. 4, 5). Do not lift the printer by any other elements.
- the printer should not be carried by children and the elderly due to its significant weight (140 kg). It is recommended that the printer should be carried by at least 4 persons.

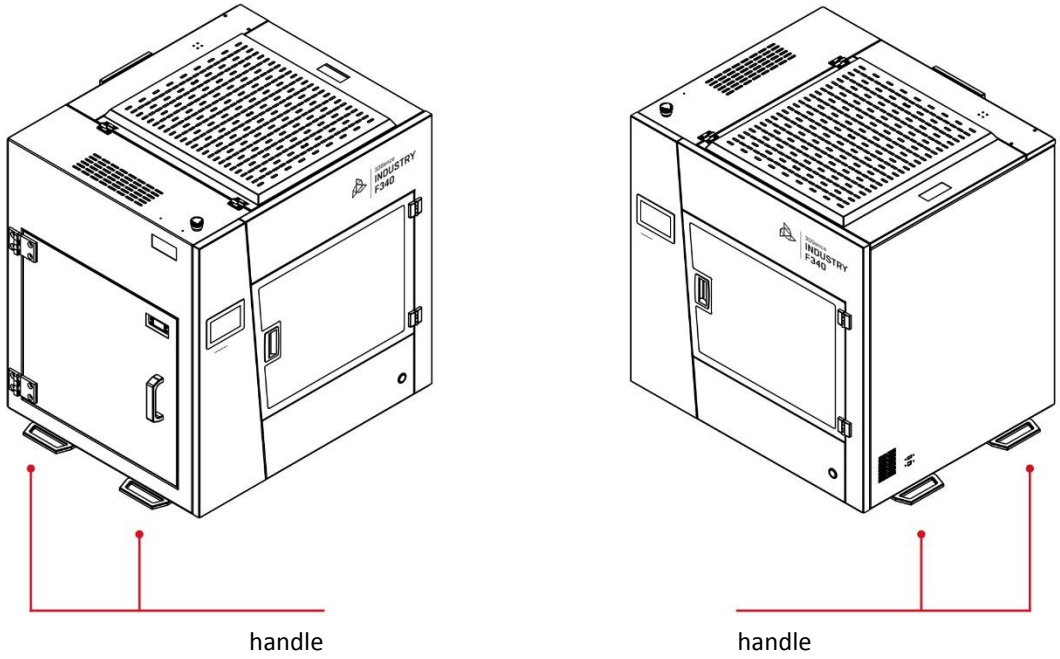


Fig. 4 Locations of handles for printer handling

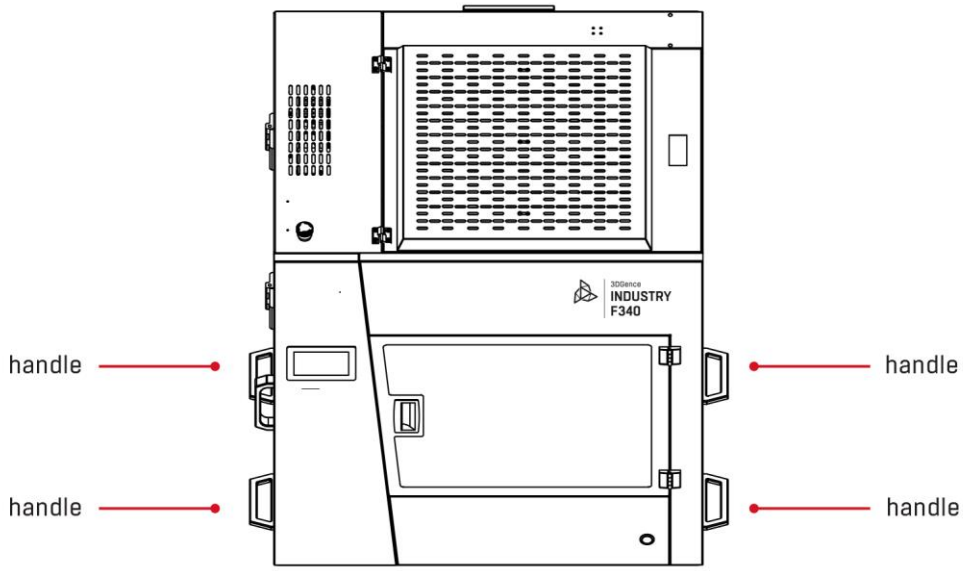


Fig. 5 Locations of handles for printer handling

4.3. Choosing proper installation place for the printer

The printer installation place should meet the following conditions:

- the printer should work at room temperature,
- the printer is not designed for work in a dusty environment,
- ventilation suitable for a room size should be ensured,
- the printer should be installed on a hard and stable ground,
- the printer should not be exposed to direct sunlight,
- ensure sufficient free space around the printer based on the printer's external dimensions (fig. 6 and fig. 7); ensure access to all sides of the printer for maintenance purposes,
- keep the printer away from other heat sources, direct long-term exposure to sunlight should be avoided,
- the printer's installation place should be equipped with a 230V ~ 11A/50Hz mains socket;
- uninterruptible power supplies (UPS) should be used in order to ensure that the printing process is not stopped in case of instantaneous current decay.

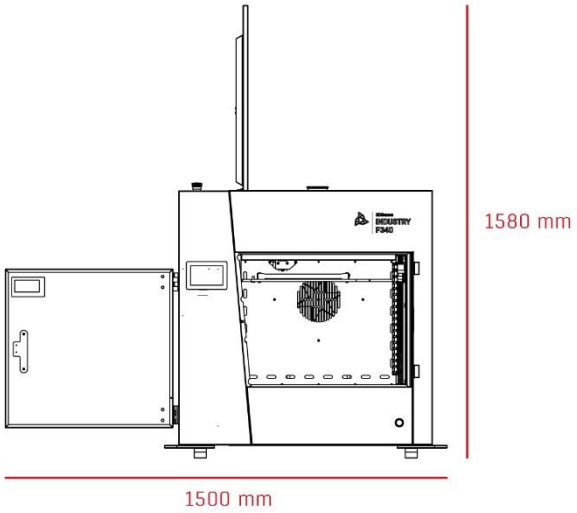


Fig. 6 Maximum dimensions of 3DGence INDUSTRY F340 printer – front view

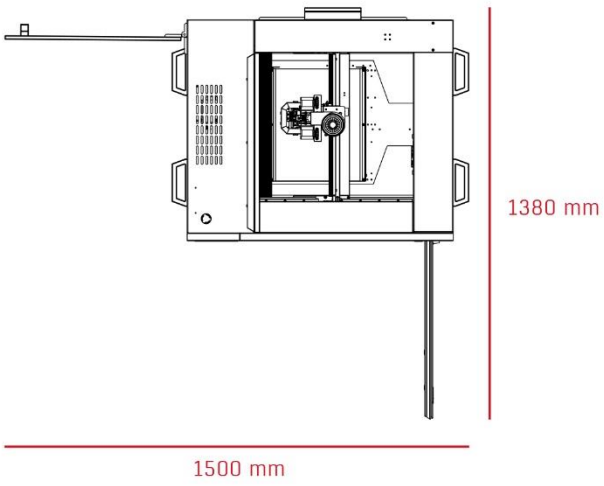


Fig. 7 Maximum dimensions of 3DGence INDUSTRY F340 printer – overview

4.3.1. Specification of connection

The suitable connection for 3DGence INDUSTRY F340 printer should have the following parameters:
Voltage: 230V~;
Frequency: 50Hz
Network with a protective earth lead (PE), protected with a fuse of a rated current intensity not less than 16A;
Max. power consumption: 2700W (2.7kW);
Current intensity: ~11A.

4.4. Before starting the printer

Each time before starting the printer, make sure that the following conditions are met and the following actions have been performed:

- check the conduits for abrasion or other visible defects. If the conduits are damaged, notify the 3DGence technical service department immediately using the problem notification form at www.3dgence.com/support. Do not connect the printer to power supply and/or make repairs on your own;
- confirm that filament is not contaminated, broken, bent or tangled on the spool;
- confirm that in the printer's working area there are no objects or remains of printouts that could cause a jam or damage to the machine;
- check X axis and Y axis, confirm that their movements are not blocked by moving the module manually forwards, backwards, to the left and to the right;
- confirm that the breaker of the optical beam of the Z axis endstop (fig. 8) is not damaged, broken or bent and that it coincides with the Z axis endstop (is aligned with the endstop notch);
- confirm that thermistors (temperature sensors) of hotends, chamber and table work properly (chapter II, point 3.1) To do this, start heating the hotends, heatbed and chamber and check that temperature indications on the LCD screen increase. A problem exists if def value is displayed;
- immediately before starting, make sure that there are no undesirable or dangerous objects inside or in direct vicinity of the printer.

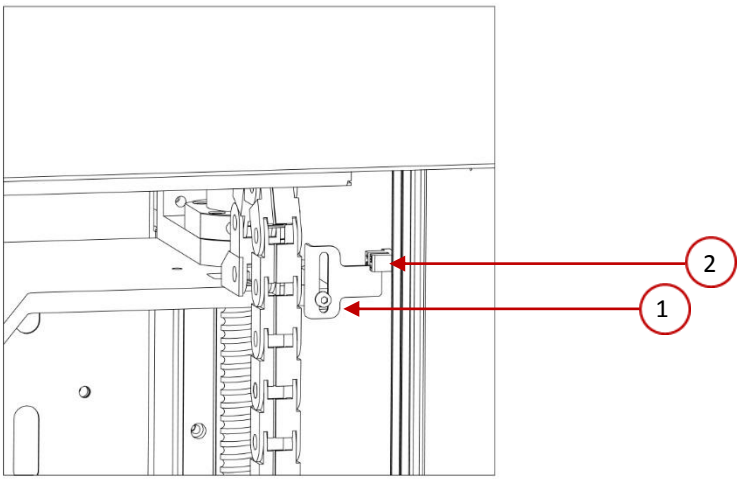


Fig. 8 1. Z axis breaker | 2. Z axis endstop

II PRINTER DESCRIPTION

1. DESIGN OF PRINTER

The figures (fig. 9–15) together with the descriptions of the major printer's components are presented below in order to facilitate the operation of 3DGence INDUSTRY F340 printer and make it easy to understand the instructions included in the User's Manual. Please, refer to the figures and descriptions in order to better understand the 3D printing terminology.

1.1. General description

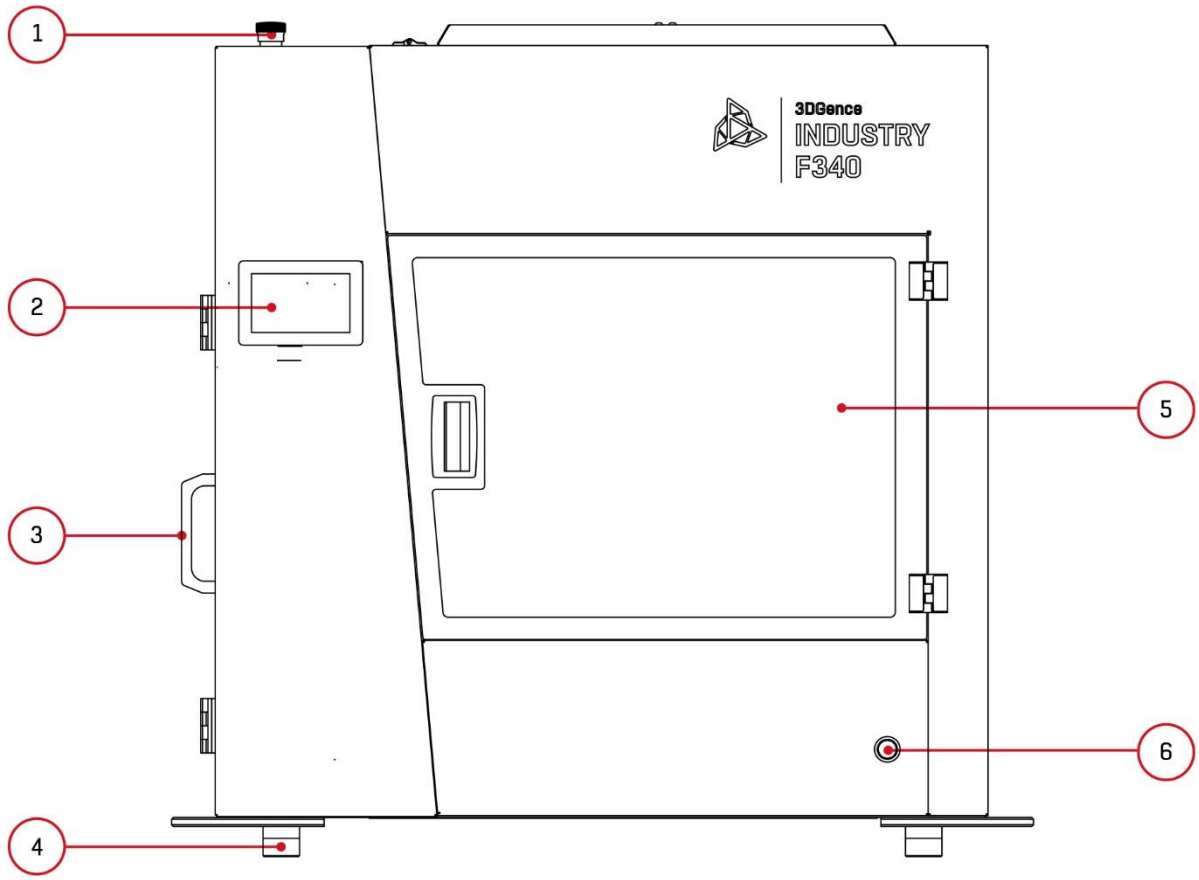


Fig. 9 3DGence INDUSTRY F340 printer – front view
1. Emergency stop button | 2. Display | 3. Filament chamber handle
4. Vibro-insulators | 5. Working chamber door | 6. Printer switch

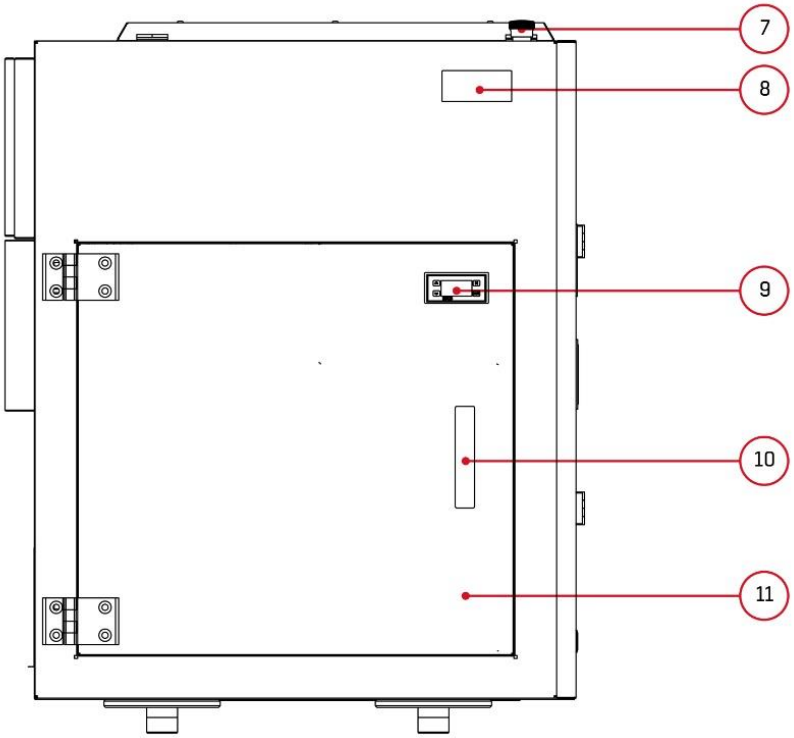


Fig. 10 3DGence INDUSTRY F340 printer – left side view
7. Emergency stop button | 8. NFC reader | 9. Thermostat display
10. Filament chamber handle | 11. Filament chamber door

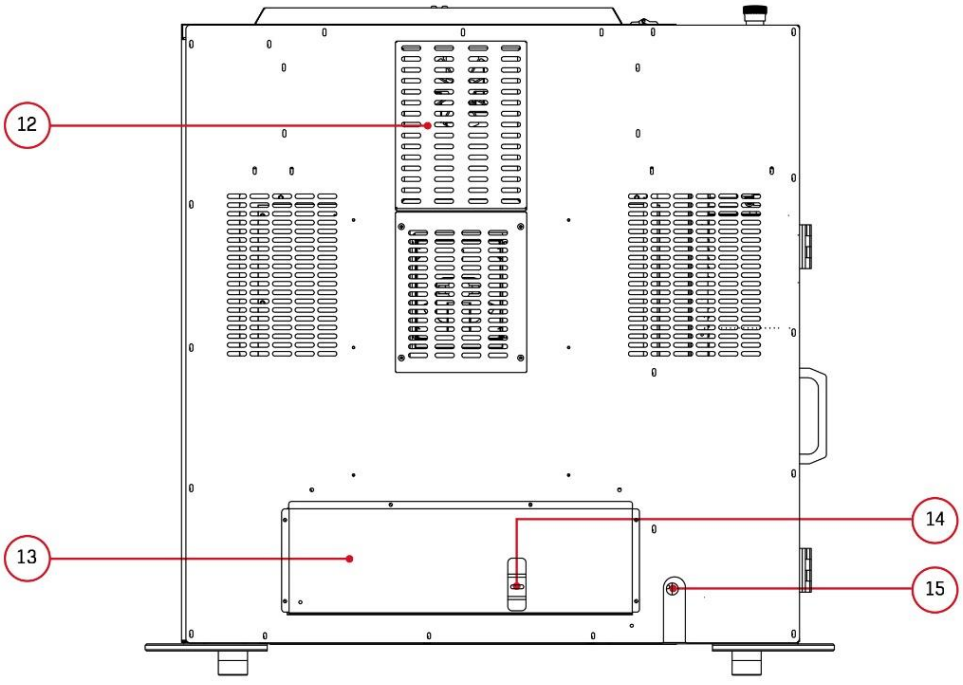


Fig. 11 3DGence INDUSTRY F340 printer - rear view:
12. Air filter | 13. Service cover
14. Main Switch | 15. Power lead socket

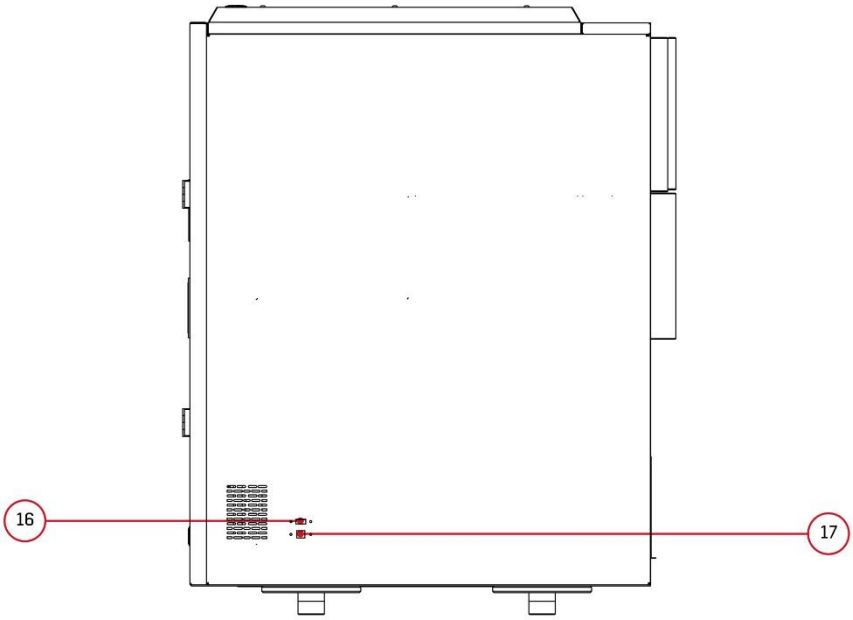


Fig. 12 3DGence INDUSTRY F340 printer – right side view
16. USB port A | 17. USB port B

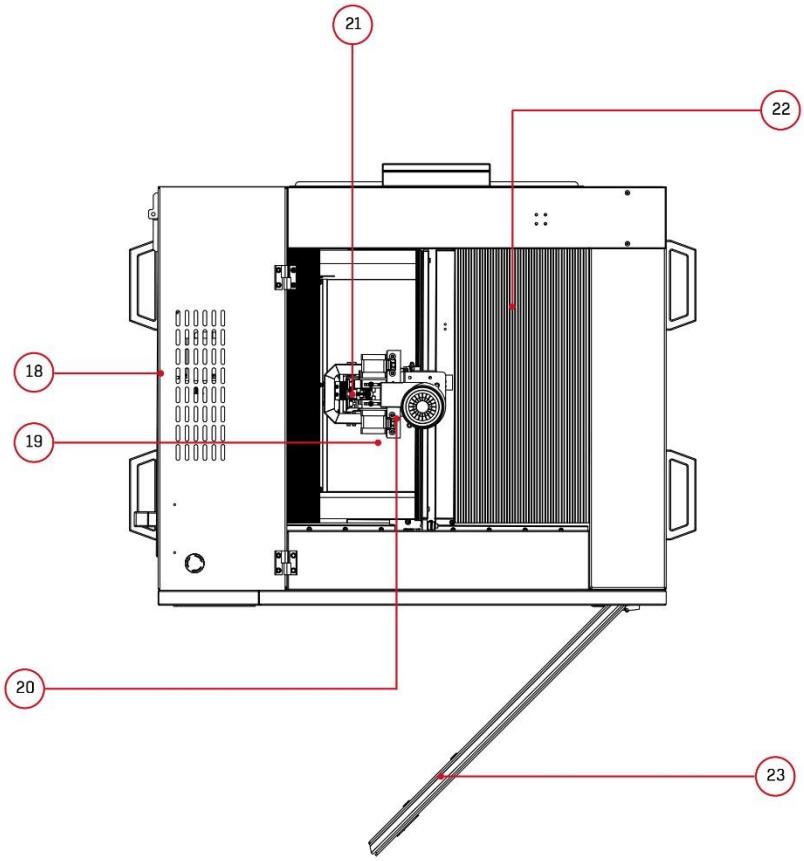


Fig. 13 3DGence INDUSTRY F340 printer – overview, raised top cover
18. Filament chamber cover | 19. Heatbed | 20. Extruder
21. Dual hotend module | 22. Bellows guard | 23. Working chamber door

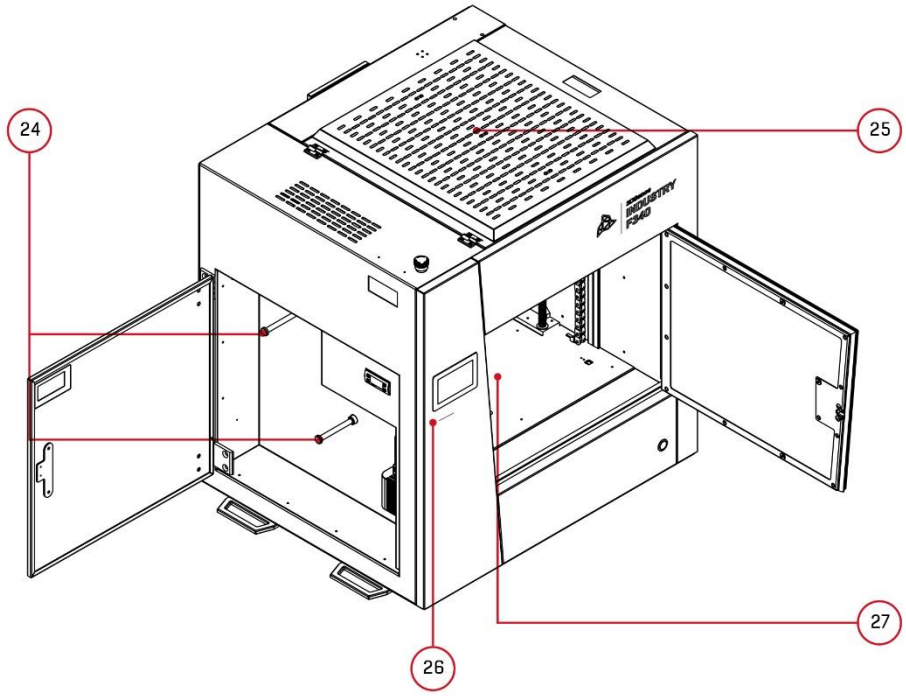


Fig. 14 3DGence INDUSTRY F340 printer - isometric projection:
24. Filament spool holders | 25. Top cover | 26. SD card port | 27. Chamber

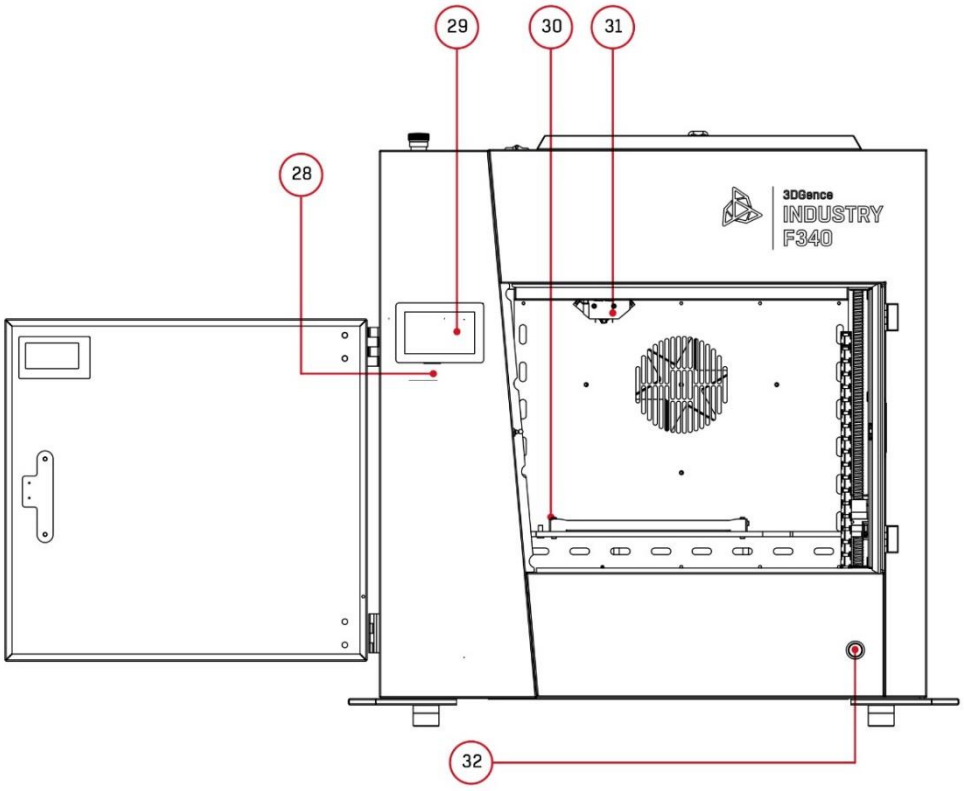


Fig. 15 3DGence INDUSTRY F340 printer - front view, open door:
28. SD card port | 29. Touch screen 30. Heatbed
31. Dual hotend module | 32. Printer switch

1.2. Kinematic system

The printer works in the Cartesian robot's kinematics. The axes described as X and Y move the hotend in horizontal plane; Z axis moves the printer's hotend vertically (fig. 16). Dimensions of available printer's working space:
X: 260 mm,
Y: 300 mm,
Z: 340 mm.
Printed object must not exceed the above dimensions. The printer's software will prevent an attempt to generate a file that exceeds the maximum dimensions, but these dimensions must be considered when designing the model for printing.

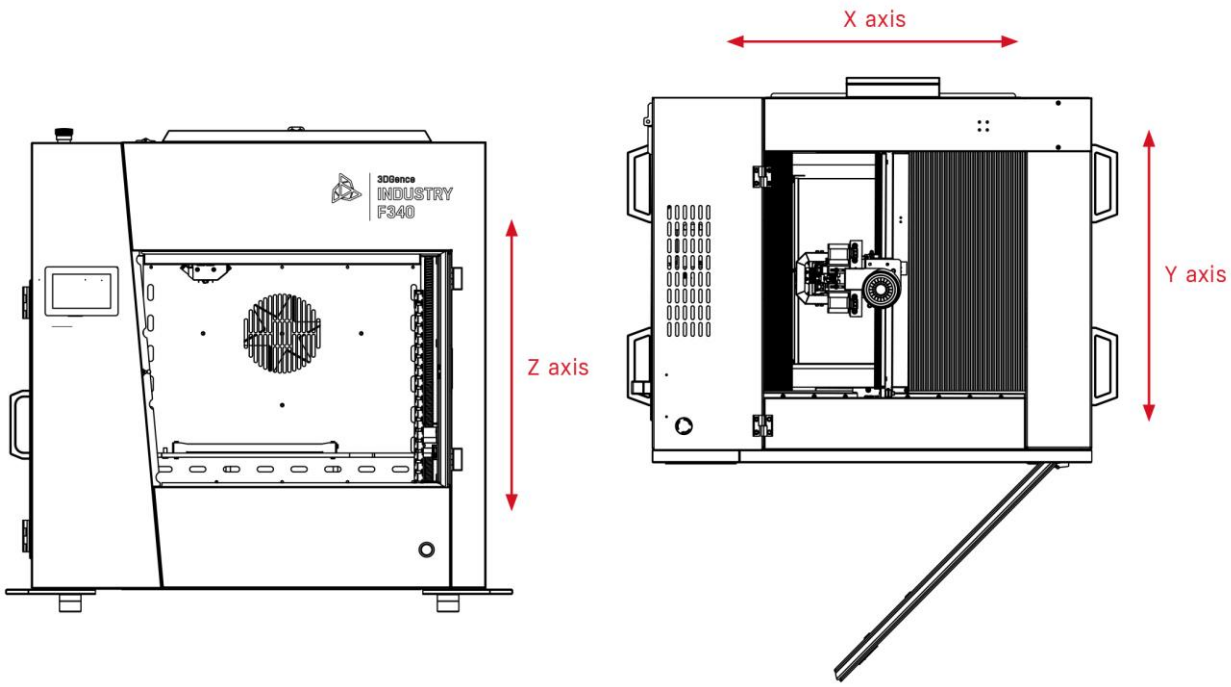


Fig. 16 Designation of printer axes

1.3. Heatbed

The printer's heatbed moves along Z axis. The heatbed is shown in fig. 17. The entire mobile heatbed is marked with a lighter colour. The darker colour marks the actual printing area. Made of ceramic plate, the heatbed guarantees good printout adhesion even for several dozen hours of continuous operation of the printer.

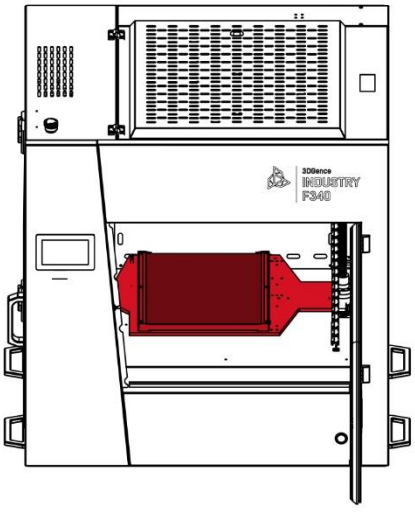


Fig. 17 Heatbed of 3DGence INDUSTRY F340 printer

1.4. Filament chamber

3DGence INDUSTRY F340 printer is equipped with a heated filament chamber. The purpose of the filament chamber is to keep filaments in an increased temperature environment. This prevents moisture and change of filament parameters and dimensions. Closed housing protects the filaments against direct exposure to sunlight, contamination and accidental damage.

Inside the filament chamber there are two holders for filament spools. They are connected to a measuring system that makes real-time measurements of the weight of available material. In addition to the spool holders, there is a heater in the chamber that regulates the temperature inside the filament chamber.

1.4.1. Adjustment of filament chamber temperature

The filament chamber temperature is adjustable by means of the thermostat located on the right side inside the filament chamber. This option can be very important when using the printing materials with a very low softening temperature. The temperature adjustment is made using the keys on the left side of the thermostat (fig. 18). The manufacturer recommends setting the temperature in the filament chamber at 65°C. For PLA printing, the temperature should be set to 40°C.

Fig. 18 Filament chamber thermostat

ATTENTION:
Under no circumstances should you touch the chamber heater during printer operation or lean any objects against it. The filament chamber must not be used for storing objects other than filaments!

1.5. Extruder modules

3DGence INDUSTRY F340 printer is equipped with two material extruding systems - hereinafter referred to as extruders (fig. 19). They are located in the working chamber, above the dual hotend module, and connected with the filament chamber by means of the feeding system. Extruder 0 (Tool 0) is responsible for feeding the base material to hotend T0, while extruder 1 (Tool 1) is responsible for feeding the supporting material to hotend T1. Tool 1 is located closer to the user facing the printer (fig. 19). More information on loading the materials and operation of extruders can be found in chapter III, point 4.

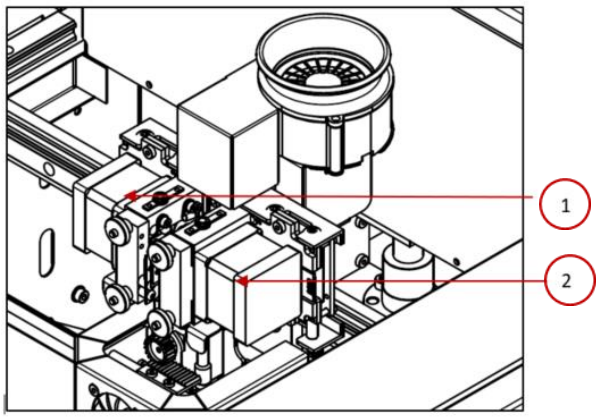


Fig. 19 Arrangement of extruders: 1. Extruder T0 | 2. Extruder T1

1.6. Dual hotend module

3DGence INDUSTRY F340 printer is equipped with two hotends installed in the dual hotend module (fig. 20). The module containing the hotends can be quickly and easily dismounted from the printer and replaced with another module designed for printing with other materials. The module contains also the printout cooling system.

The dual hotend module contains moving, sharp and hot elements. Do not touch the module during printer operation! The module may be dismounted only after the printer has cooled down completely.

Detailed description of the module is included in chapter VI, point 1.

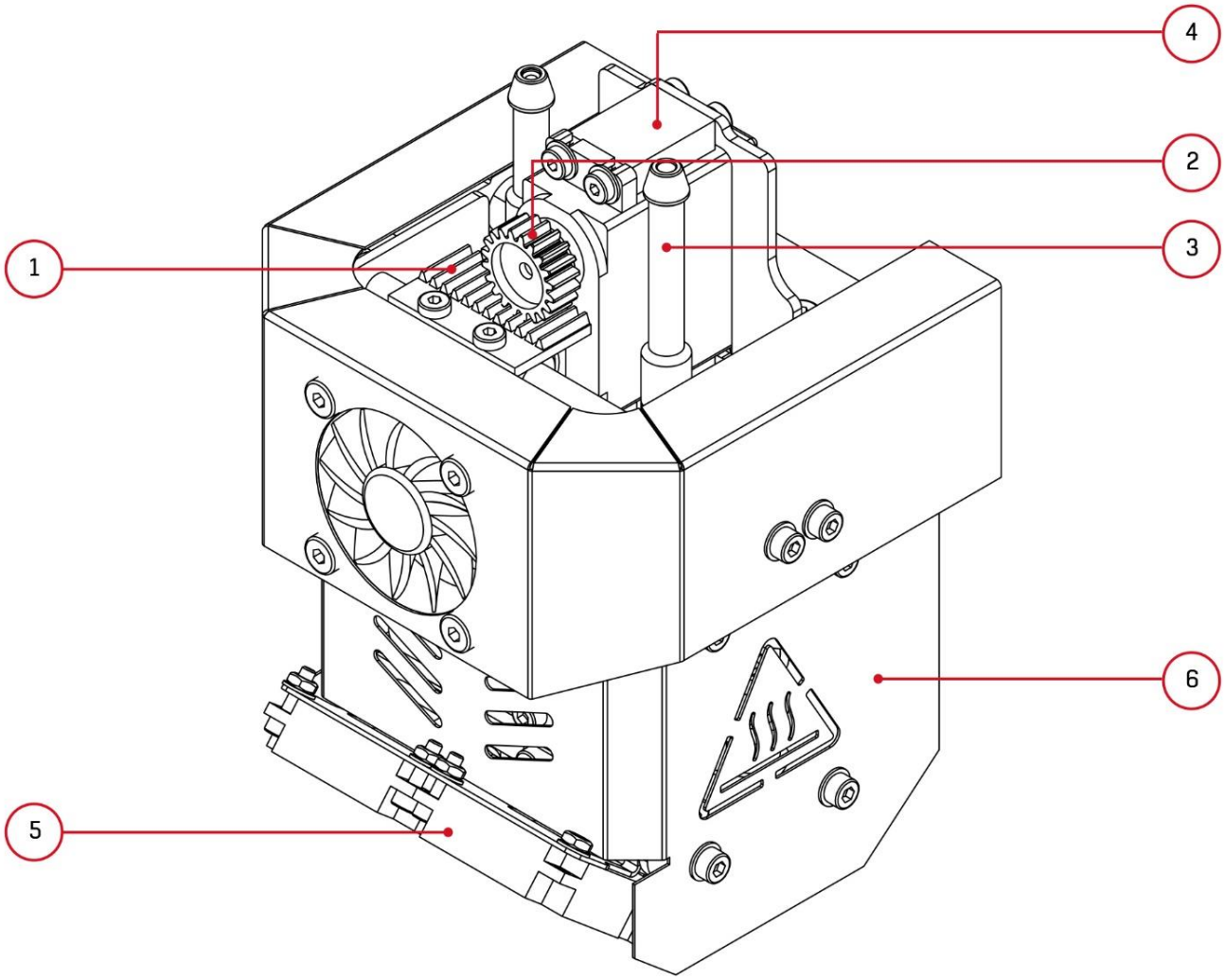


Fig. 20 Dual hotend module:
1. Toothed bar | 2. Drive gear wheel | 3. Hotend guiding sleeve | 4. Servo-mechanism
5. Printout cooling fans | 6. Casing of dual hotend module

1.7. Printer's power supply management

1.7.1. Main switch

The printer's main switch surge protector is located at the rear of the printer (fig. 11, point 14)

1.7.2. Printer switch

The operating switch of the printer is located at the right lower corner of the printer's front (fig. 21). After switching the printer on, the printer's display will be activated, the working field lights will turn on and T0 hotend will be set in working position. More information on starting the printer can be found in chapter III, point 2.

ATTENTION: If the printer switch does not activate the printer, the emergency stop button may be depressed (chapter II, point 1.7.3).

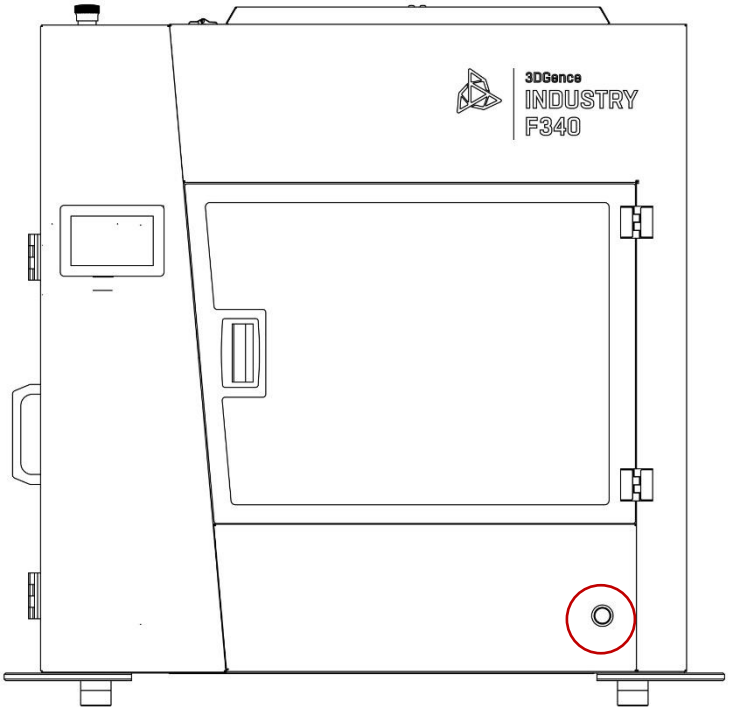


Fig. 21 Location of the printer switch

1.7.3. Emergency stop button

Emergency stop button is located on the top of the printer (fig. 22). When pressed, the emergency stop button immediately cuts off the power supply of motors, heaters and controller (except the filament chamber thermostat). The emergency stop button remains in the locked position until it is turned clockwise. The printer can not be used before the emergency stop button has been released.

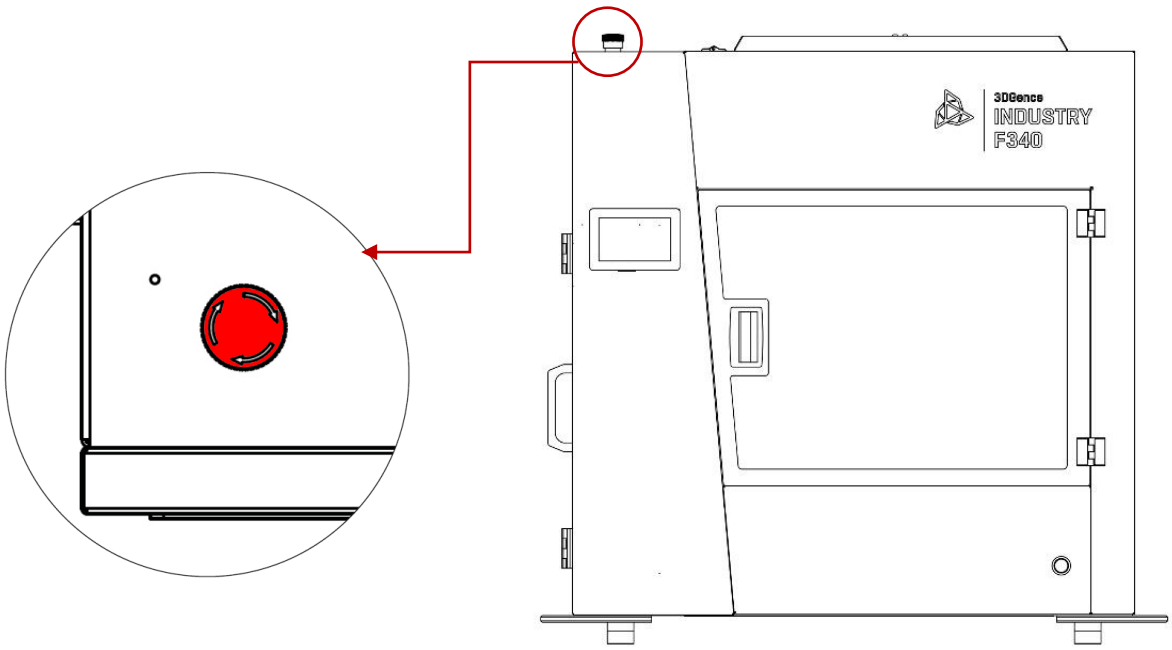


Fig. 22 Location of the printer's emergency stop button

1.8. Memory card

3DGence INDUSTRY F340 printer should work with SDHC Class 10 memory cards. SD cards of a lower class can slow down the printer or generate errors in printouts. The card's capacity should not exceed 8GB.

1.9. Smart Material Manager system

Smart Material Manager system is used for controlling and monitoring the loaded materials. The system's task is to determine:

- net material weight,
- material type,
- material colour,
- printer's working parameters for a given filament,
- spool weight.

The SMM system consists of six key components:

1. NFC reader located on the printer's left side;
2. NFC reader label located on the spool of a material from the Certified Material Base;
3. Scales located in the filament spool holders;
4. Measuring system that continuously controls the amount of material fed;
5. Material depletion sensor;
6. Automatic material loading system;

More information on SMM system operation can be found in chapter IV, point 4.

2. SET OF PRINTER'S ACCESSORIES

3DGence INDUSTRY F340 printer is delivered together with the set of consumables and the set of necessary accessories. The set includes:

- a spatula for removing printouts,
- tweezers,
- protective gloves,
- SDHC Class 10 memory card,
- USB flash drive,
- Dimafix adhesive stick,
- USB cable.

3. USER INTERFACE

3DGence INDUSTRY F340 printer is equipped with a 5-inch colour touch screen (fig. 15, point 29). This is the printer's communication interface with a transparent graphic menu. The printer's menu differs depending on whether the printer is idling or working.
The menu structure is described in chapter II, point 4.

3.1. Idle state menu

After connecting the printer to power supply and starting it, the start screen is displayed to indicate that the printer is preparing for operation (fig. 23).

Fig. 23 Start screen

Then, the display shows the printer's main menu in idle state (fig. 24).

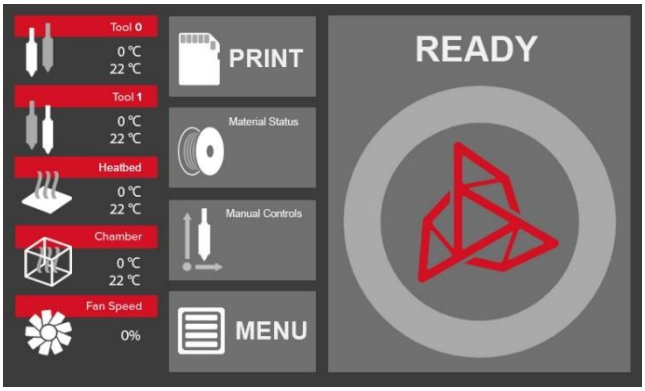


Fig. 24 The printer's main menu in idle state

On the left side of the main menu, there are fields containing information on temperatures and status of the printout cooling fans (fig. 25).

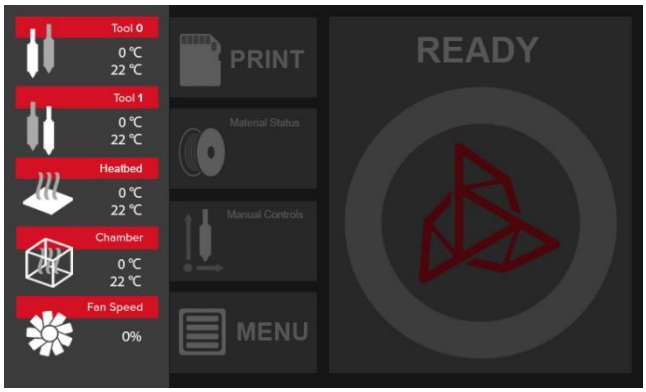


Fig. 25 Control panel for temperatures and status of cooling fans

Tool 0 – temperatures for extruder 0 hotend:

preset temperature (at the top)

current temperature (at the bottom)

Tool 1 – temperatures for extruder 1 hotend:

preset temperature (at the top)

current temperature (at the bottom)

Heatbed – temperature of the printer's heatbed:

preset temperature (at the top)

current temperature (at the bottom)

Chamber – temperature of heated chamber

preset temperature (at the top)

current temperature (at the bottom)

Fan Speed – percentage of current power of printout cooling fans.

The central panel of the main idle state menu contains 4 function keys (fig. 26).

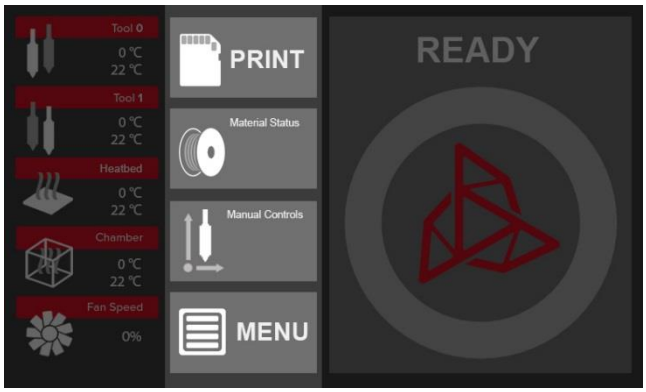


Fig. 26 The central panel of the main idle state menu

PRINT – displays the screen of the SD card manager, in which the files for printing (G-code) saved on the card are available - .gcode (fig. 27).

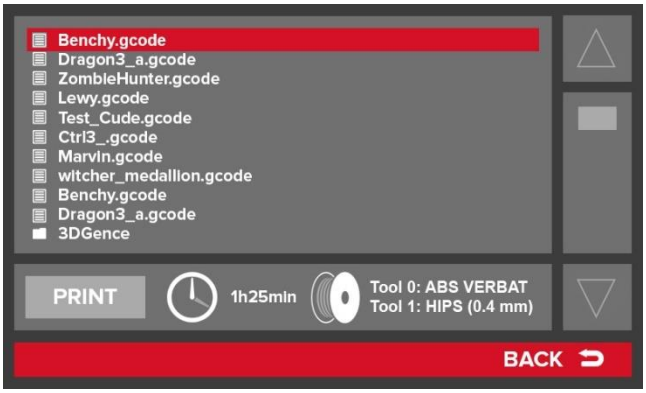


Fig. 27 SD card manager screen

To navigate the list of files, use the arrows on the right. Alternatively, a file can be selected by pressing directly on its name The background of the indicated file is highlighted in red. When a file is selected, the information on the printing time and demand for consumables for the given project is available. When the PRINT key is pressed, the process of printing the indicated file starts.

MATERIAL STATUS - displays the screen with information and options related to loading, unloading and change of consumables (fig. 28).

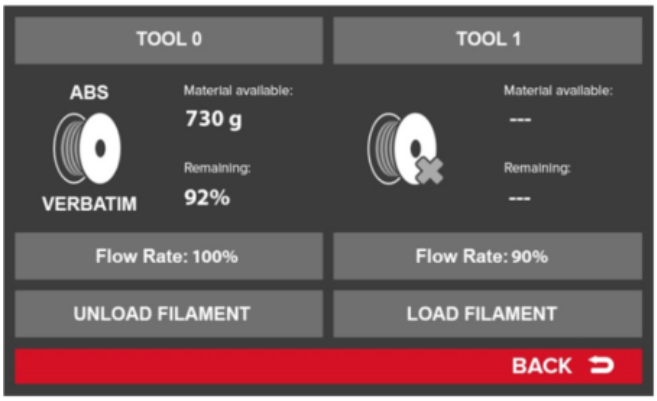


Fig. 28 Material status screen

Information available on the above screen is presented separately – the information for extruder 0 is shown on the left side; the information for extruder 1 is shown on the right side. The description below is for the material from the 3DGence Certified Material Base. Other cases are considered in chapter IV, point 4.

Material available – net weight of material on the spool,

Remaining – percentage of remaining material,

Flow rate – the parameter showing the comparison of the assumed material consumption with the actual material consumption. The parameter makes it possible to diagnose the problems connected with material feeding,

Load filament/Unload filament – if a material is loaded on the given extruder, the Unload filament option will be available. If this option is selected, the procedure of filament unloading will start. If the extruder is empty, the Load filament option is available that starts the procedure of a new material loading.

MANUAL CONTROLS - activates the screen for manual control of the printer's functions (fig. 29).

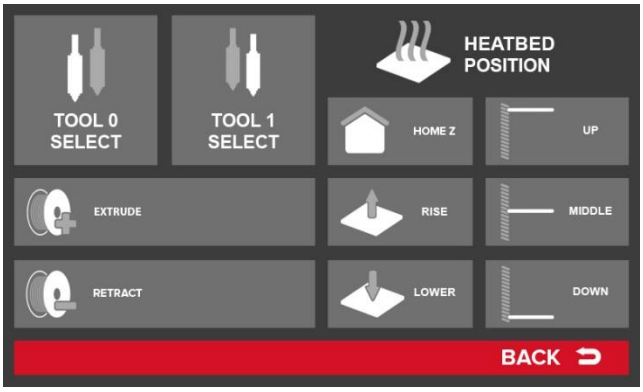


Fig. 29 Manual Controls menu screen

Tool 0 Select – setting the hotend corresponding to extruder 0 in working position.

Tool 1 Select – setting the hotend corresponding to extruder 1 in working position.

Extrude – activates the material extrusion movement. This option applies only to the hotend in working position and can be activated only after the hotend has reached the minimum operating temperature.

Retract – activates the material withdrawal movement. This option applies only to the hotend in working position and can be activated only after the hotend has reached the minimum operating temperature.

Home Z – referencing (setting in zero position) the printer's Z axis. The heatbed is positioned at the top of the printer. If referencing of the printer has not been performed, no other movements are possible.

Rise Bed – press the key once to move the printer's heatbed to the hotend by 0.025 mm. The key is useful when adjusting the adhesion of the first printout layer.

Lower – press the key once to move the printer's heatbed from the hotend by 0.025 mm. The key is useful when adjusting the adhesion of the first printout layer.

Up – this key sets the printer's heatbed below the zero position the printer’s Z axis, limited by the Z axis endstop.

Middle – this key sets the printer's heatbed in the middle of the Z axis movement range.

Down – this key sets the printer's heatbed in the lower position.

ATTENTION: Up/Middle/Down and Home Z fields should not be used when there is a previous printout or another object in the chamber. In some cases, the use of the above options will cause the Z axis to be referenced first and only then relocated to the desired position. This may cause damage to the printer!

3.1.1. MENU screen

MENU - enables access to advanced options of 3DGence INDUSTRY F340 printer in idle state (fig. 30).

Fig. 30 Advanced options screen

PREPARE - activates the menu of the printer's preparation activities (fig. 31).

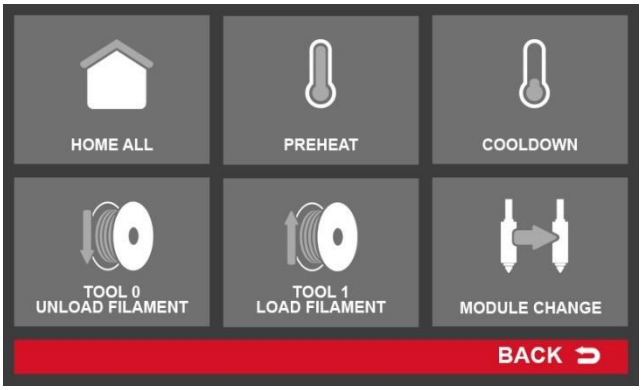


Fig. 31 Prepare menu screen

Home All – referencing (setting in zero position) all 3 axes of the printer. Point X = 0, Y = 0, Z = 0 is located at the right rear corner of the printer's heatbed.

Preheat – press this key to start printer preheating. The hotends are heated up to temperatures resulting from the data read from SMM system (that is, appropriate for the recognized material). For ABS it will be 245°C. At the same time, the heatbed and the working chamber will be heated to the temperatures suitable for the combination of materials. The preheat option is active only when at least one material is loaded.

Cooldown – press this key to switch off all printer's heaters (except the filament chamber).

Tool 0/Tool 1 Load Filament – press this key to start the assisted procedure of filament loading. More information on the filament loading procedure can be found in chapter III, point 4.1.

Tool 0/Tool 1 Unload Filament – press this key to start the assisted procedure of filament unloading. More information on the filament unloading procedure can be found in chapter III, point 4.2.

Module Change – press this key to start the assisted procedure of printing module change.

PRINT - using this menu, the user can access the SD card file manager that makes it possible to start printing a selected model saved on SD card (fig. 32). The PRINT menu has been described in the preceding sections of this User's Manual.

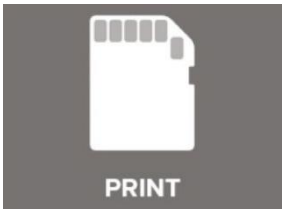


Fig. 32 Print menu icon

TUNE - enables precise modifications of basic printing parameters (fig. 33, 34).

Fig. 33 Tune menu icon

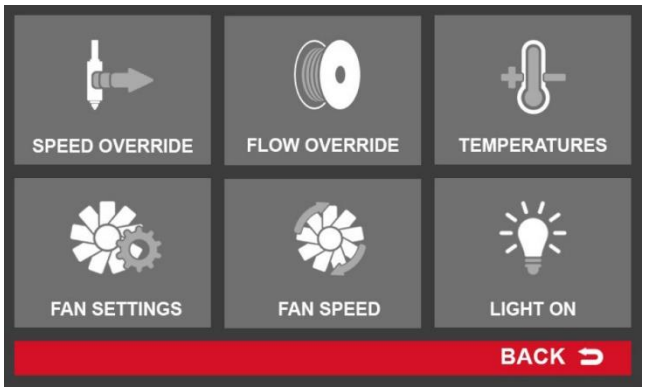


Fig. 34 Tune menu screen

Speed Override – percentage value of printing speed. 100% is the default printing speed. Press +/ – keys to increase or decrease printing speed. Press (RESET) key to restore the default value of 100%.

Flow Override – percentage value of amount of fed material. 100% is the default amount of extruded material. Press +/ – keys to increase or decrease the amount of fed material in order to improve quality of printed elements. The values should not be changed by more than +/- 5%.

Temperatures – activates the screen for controlling the temperature of all heaters of the printer, except the filament chamber (fig. 35).

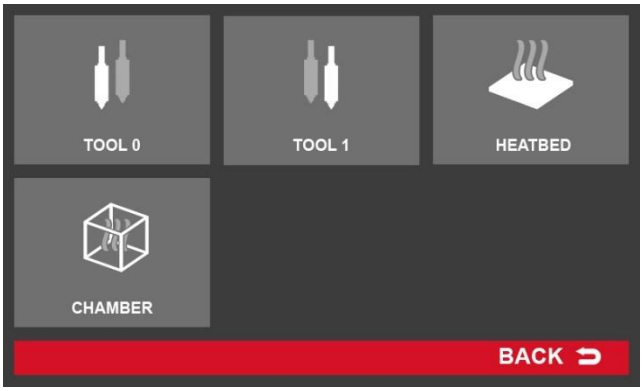


Fig. 35 Temperatures menu screen

Tool 0 – this key allows you to set any temperature for the hotend of extruder 0. The achievable temperature is closely related to the dual hotend module version.

Tool 1 – this key allows you to set any temperature for the hotend of extruder 1. The achievable temperature is closely related to the dual hotend module version.

ATTENTION: do not leave the hotends heated to high temperatures for more than 15 minutes if there is no material flow. Otherwise, the material may degrade and block the hotend.

Heatbed – this key makes it possible to set any temperature for the printer's heatbed within the range of 40-160°C.

Chamber – this key makes it possible to set any temperature for the printer's working chamber within the range of 20-85°C.

Fan Settings – this menu makes it possible to define the settings of the printout cooling fans. The two available options are:
- Fan Override On/Off – if this option is activated (ON), the setting of the fans will be in compliance with the power set in the printer. The commands resulting from the machine code will be ignored;
- Fan Enabled/Disabled – this option makes it possible to completely switch off the printout cooling fans.

Fan Speed – this screen enables smooth adjustment of current power of the printout cooling fans. +/- keys are used for making adjustments; RESET restores default values.

Light On/Off – makes it possible to switch on/off the LED lights in the printer.

CALIBRATION - contains the settings and parameters connected with the printer calibration process (fig. 36, 37).

Fig. 36 Calibration menu icon

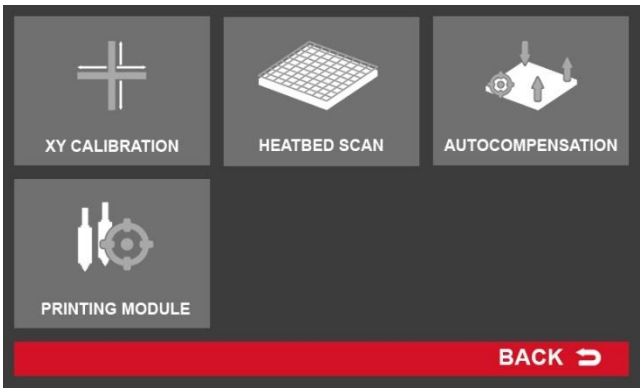


Fig. 37 Calibration menu screen

XY Calibration – calibration of measuring conformity along X and Y axes. The process is described in detail in chapter VIII, point 2.1.

Heatbed Scan – this key starts the automatic heatbed calibration procedure. The procedure takes about 90 minutes. During this time, the hotend will be positioned above approximately 150 measuring points in succession. The strain gauges installed on the dual hotend module detect the heatbed surface and their readings are saved in the form of a calibration matrix in the printer memory.

Printing Module – menu of dual hotend module calibration (fig. 38).

Fig. 38 Printing Module menu screen

Tool 1 X Offset – the difference of position of extruder 1 nozzle with regard to nozzle 0 in axis X. Correct value (more information in chapter VIII, point 2.2) eliminates offset that may occur between nozzle tips in working position. Offset value is shown in fig. 39.

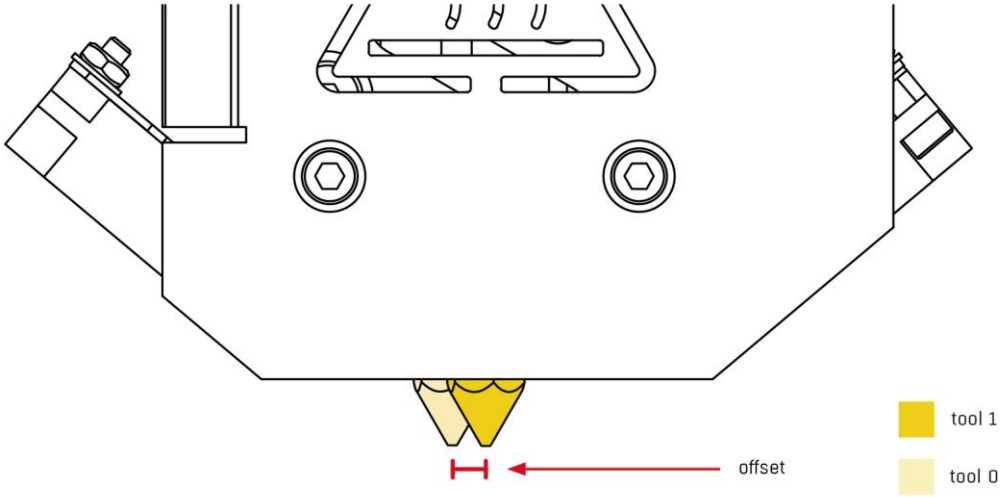


Fig. 39 Diagram showing differences of the hotend working positions (offset)

ATTENTION: the value of Offset X,Y and Z is always the reference of T1 hotend position to the absolute position of T0 hotend.

Tool 1 Y Offset – similarly to X Offset; Y Offset is the difference of position of extruder 1 nozzle with regard to nozzle 0 along Y axis in working position.

Tool 1 Z Offset – similarly to X Offset; Z Offset is the difference of position of extruder 1 nozzle with regard to nozzle 0 along Z axis in working position. Correct calibration of deviations along Z axis is crucial for proper functioning of the support structures. The calibration of nozzle height differences is performed using the tool described below, Measure T1 Offset.

Measure T1 Offset – the option used for checking and setting the correct value of Z Offset. After pressing the Measure T1 Offset key, the printer will examine the position of T0 hotend tensometrically. Next, in the same place, the printer will make the same measurement for T1 hotend position. The difference resulting from the measurement will be recorded in Tool 1 Z Offset field. The Save key must be pressed in order to confirm the measurement.

Reset to default – restores the default deviation values.

Save – saves the changes made to the printer memory.

Autocompensation – menu of printer autocompensation settings (fig. 40).

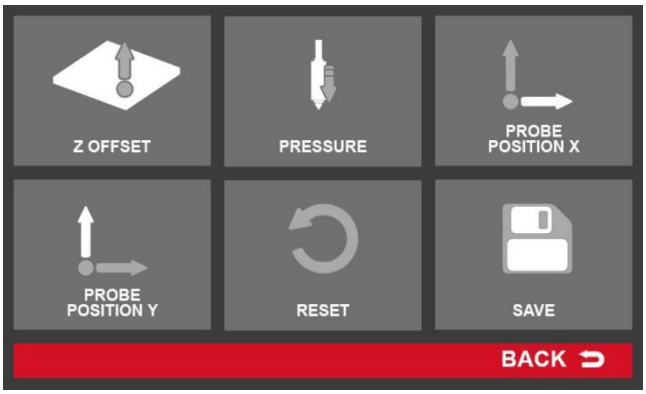


Fig. 40 Autocompensation menu screen

Z Offset – manual correction of distance along Z axis. This option makes it possible to add (or subtract) a specific value to the point measurement (autocompensation) along Z axis. In practice, if Z offset is set to 0.1mm, printing will start at a height increased by this value.

Example
height of the first layer: 0.2 mm
0.2 mm + Z Offset: 0.1 mm = actual print start height: 0.3 mm

This option may prove useful when using adhesive tapes or pads. If such a solution is used, Z-offset should be set to the value corresponding to the pad thickness. This parameter can have negative values. Then, the print starting point will be set lower (closer to the heatbed).

ATTENTION:
negative values of Z offset may never exceed the thickness of the first layer!

Pressure – sensitivity of point measurement of Z axis autocompensation. It allows you to determine the value of the hotend's pressure force during height measurement. Sensitivity can be regulated within the range from 10 to 150. In the case of more flowable materials, it may be necessary to increase the pressure force to reduce the risk that the hotend will be referenced to the material flowing out during the measurement. Otherwise, printing may start too high due to the fact that the thickness of the material flowing to the area under the hotend has been taken into account.

Probe Position X – defines the distance between the autocompensation measuring point and the referencing point along X axis. Modifying this value, you can move the measuring point along X axis.

Probe Position Y – defines the distance between the autocompensation measuring point and the referencing point along Y axis. Modifying this value, you can move the measuring point along Y axis.

Example of autocompensation measuring point is shown in fig. 41.

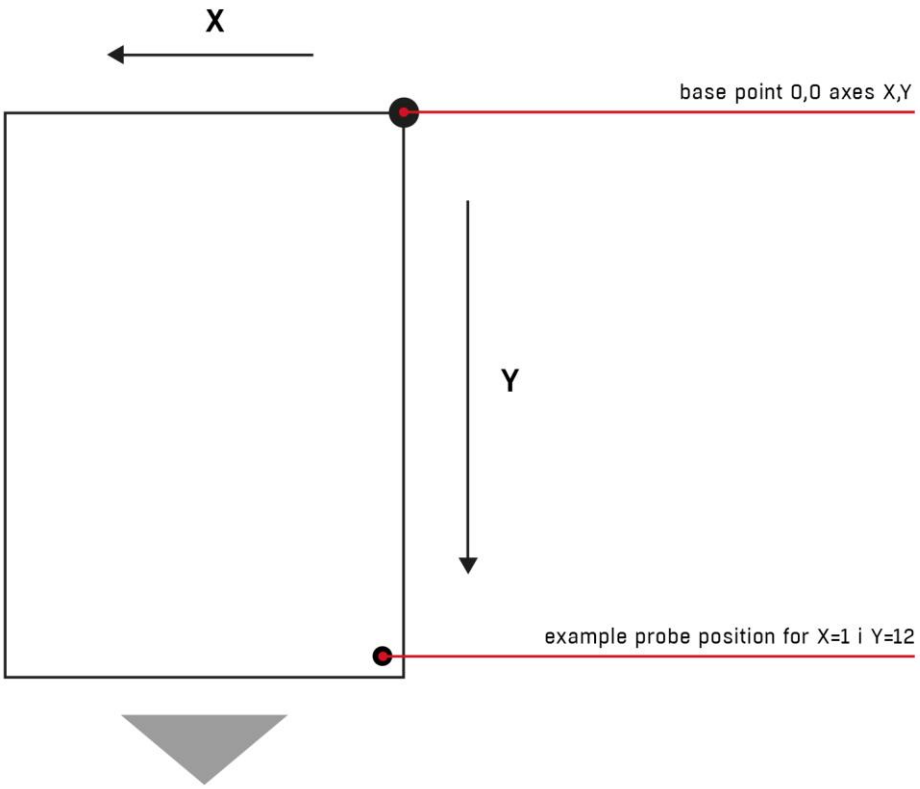


Fig. 41 Example of autocompensation measuring point

Reset – press this key to restore default values for this menu.

Save – saves all changes made to the printer's memory.

CONFIGURATION – used for configuring 3DGence INDUSTRY F340 printer (fig. 42, 43).

Fig. 42 Configuration menu icon

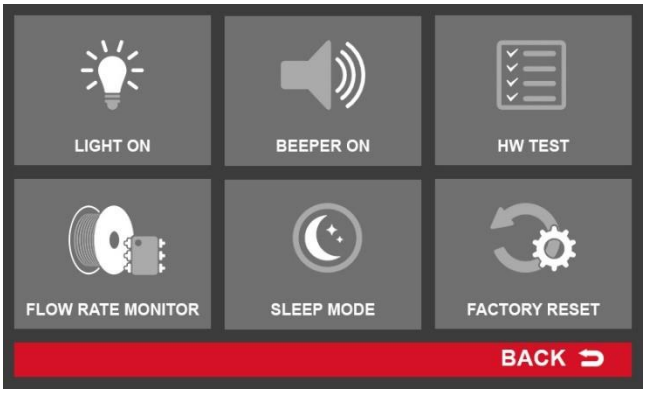


Fig. 43 Configuration menu screen

Light On/Off – settings of the lights of the printer's working field. By default, the lights, i.e. 2 LED strips located in the printer chamber, are turned on all the time. The exception is the sleep mode described below. The Light On/Off option makes it possible to switch on/off the working field lights.

Beeper On/Off – the printer is equipped with a beeper that informs the operator that, for example, the chamber has reached the preset temperature or the heatbed scanning procedure has been completed. The beeper also indicates errors that are described in detail in chapter VIII, point 4. The Beeper On/Off key makes it possible to switch on/off the sound signal.

HW test – activates the screen with the information on the condition of the hardware installed in the printer (fig. 44).

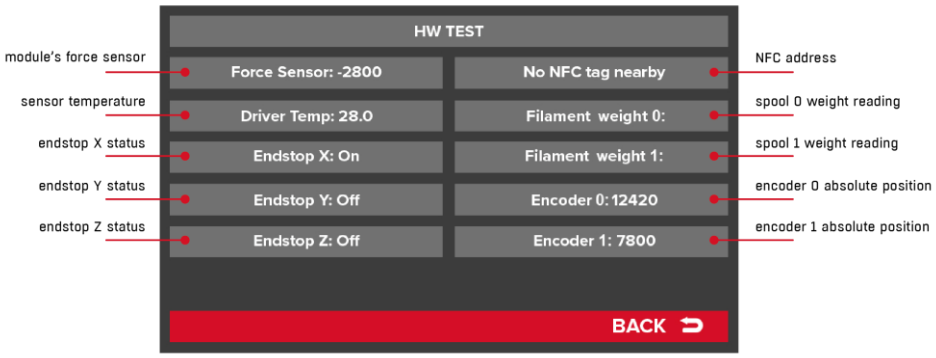


Fig. 44 HW Test menu screen

Flow rate monitor – one of the information provided during printing is the Flow rate parameter mentioned above. If the Flow rate value falls below the threshold value defined in the Flow rate monitor, the following message will be displayed: 'Material feed malfunction detected'. Printing will be stopped until the problem is solved by the operator, after which printing can be resumed (chapter VIII, point 4).

Sleep Mode – settings of the printer's sleep mode. The time, set with the +/- buttons, determines the period of inactivity after which the printer will go into the sleep mode. To switch off the sleep mode option, press OFF key. In the sleep mode, the reduced power consumption mode is active, the working lights are off and the display looks as shown below (fig. 45).

Fig. 45 Sleep mode screen

To restore the status of printer readiness, touch the display. The main menu will be displayed again.

Factory reset – restores all factory set values and variables. The changes introduced and cancelled by the FACTORY RESET command can not be restored - they must be entered again.
Attention! Factory Reset does not cancel the calibration of XY dimensions.

INFO - displays the information on the printer (fig. 46).

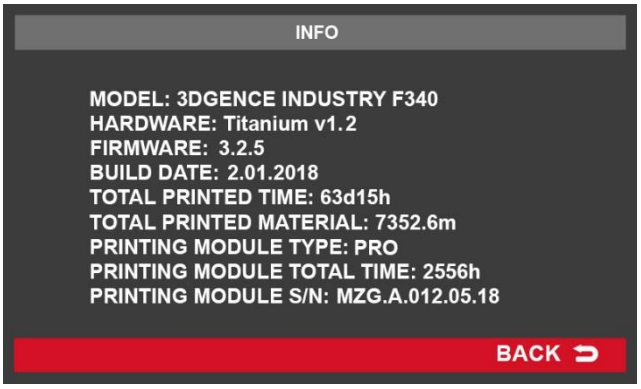


Fig. 46 Info menu screen

Model – printer model.

Hardware – hardware version.

Firmware – installed version of drivers.

Build date – date of release of the installed version of the drivers.

Total printed time – total operating time of the printer.

Total printed material – total length of material used by both extruders.

Printing module type - version of dual hotend module installed in the printer.

Printing Module Total Time – total working time of the module.

Printing Module S/N – serial number of dual hotend module.

3.2. Menu during operation

The menu of 3DGence INDUSTRY F340 printer changes during printing process. Some menu options available in the idle state are not available during printing. All the aspects connected with the menu during operation are described below.
The main menu of the working printer is shown in fig. 47.

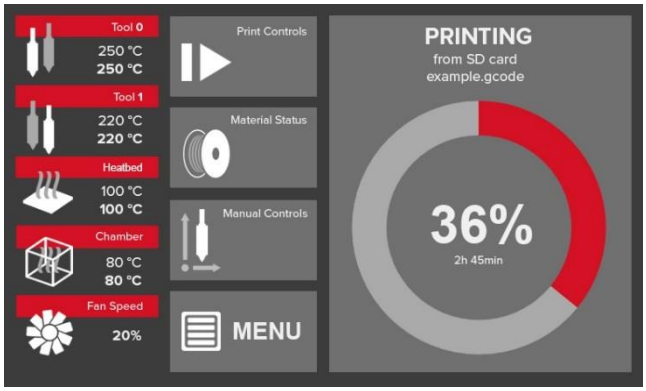


Fig. 47 Main menu screen in working mode

The left side of the menu is the same as in the idle mode. The menu displays the information on preset and current temperatures of all heating elements and current power of the printout cooling fans.

The middle column contains the following menus:

PRINT CONTROLS – pause/cancel menu of the ongoing printing process. Available options include Pause and Abort Print commands.

Pause – the command that suspends the printing process. When the Pause command is used, the printer will move the hotend to the X axis home position and the maximum position of Y axis. Temperature of hotends will be lowered to protect the material in the nozzle from drying. During the pause, the operator can comfortably change the material, install a new spool or make a visual inspection of the printed model. When the printing process is stopped, the Pause command is replaced by the Resume command that restarts the printing process. When changing the material to another one, the printing process should be stopped when printing the filling to reduce the risk of potential defects on the external (visible) part of the model.

Abort Print – the command that cancels the ongoing printing process. Use this option if printing process must be aborted for any reason, for example, the model has been damaged or the machine code has been incorrect. The printing is not aborted immediately – it is stopped after the last commands in the printer buffer have been executed.
ATTENTION: the Abort Print command is irreversible - the interrupted process can not be resumed.

MATERIAL STATUS – displays the screen with information and options related to loading, unloading and change of consumables (fig. 48).

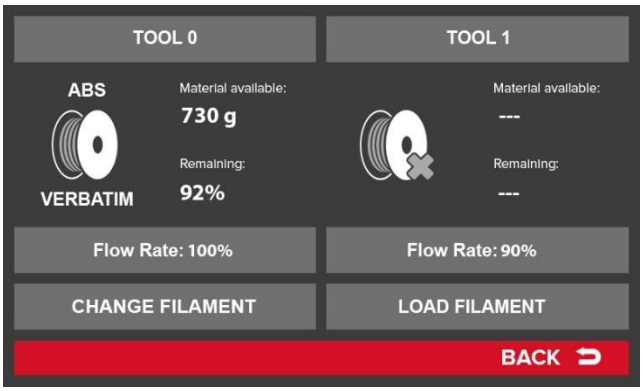


Fig. 48 Material Status menu screen in working mode

All information available on the above screen is presented separately – the information for extruder 0 is shown on the left side; the information for extruder 1 is shown on the right side.

Material available – net weight of material on the spool.

Remaining – percentage of remaining material.

Flow rate – the parameter showing the comparison of the assumed material consumption with the actual material consumption. The parameter makes it possible to diagnose the problems connected with material feeding.

Change filament/Load filament – if a material is loaded on the given extruder, the Change filament option will be available. If this option is selected, the procedure of filament unloading will start. If the extruder is empty, the Load filament option is available that starts the procedure of a new material loading.

MANUAL CONTROLS – activates the screen for manual control of some printer's functions. It is described in the section concerning the idle state menu. During operation, the Rise and Lower commands can be often used in order to adjust the height of the first printout layer.

MENU – the functions available from the menu key level change during 3DGence INDUSTRY F340 printer operation and apply only to the settings that affect the ongoing printing process (fig. 49).

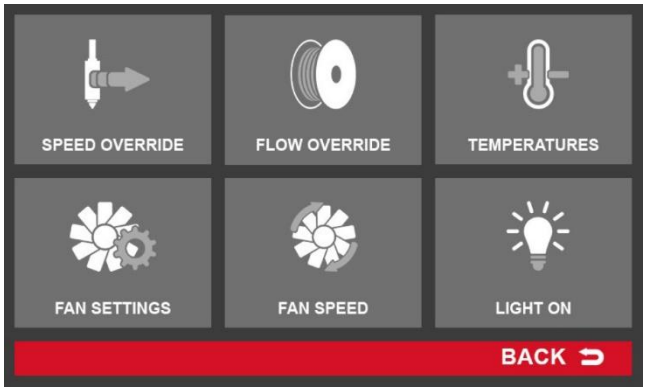


Fig. 49 Menu screen in working mode

Speed Override – makes it possible to change printing speed. This means that the material feeding speed and the speed of the printer movements will be increased. The layer height, for example, remains unchanged. The increased printing speed may have adverse influence on printing quality. If the speed is increased considerably, the material extrusion temperature should be carefully increased (~ 5°C).

Flow Override – makes it possible to change the amount of material fed. If the value is increased, the material feeding speed will be increased but the hotend movement speed will remain unchanged. The reduction will have the opposite effect. The nominal value is 100% - that is the material feeding speed resulting from the machine code.

Temperatures – this option makes it possible to edit temperatures during printer operation. When changing temperatures for T0 and T1 hotends, keep in mind that after the hotend change, the temperature resulting from the machine code settings will be restored. In addition to the hotend temperature, the temperatures of the heatbed and the printer's working chamber can be also edited.

Fan Settings – settings connected with operation of printout cooling fans.

Fan Override On/Off – if this option is activated (ON), the setting of the fans will be in compliance with the power set in the printer. The commands resulting from the machine code will be ignored.

Fan Enabled/Disabled – Fan Disabled option stops the printout cooling fans. No command concerning the operation of the printout cooling fans contained in the machine code will be applied when this command is enabled.

Fan Speed – this command enables smooth adjustment of current power of the printout cooling fans. Increased power of the fans may cause cracks in printouts - avoid excessive cooling of the printouts. The power of the fans should be increased when printing very small elements or when curling of the printout corners occurs.

Light On/Off – settings of the lights of the printer's working field.

4. MENU STRUCTURE

The hierarchical structure of the menu is shown and its individual functions are described below. The menu differs depending on whether the printer is working or not.

The idle state menu is shown only in fragments because the interface is significantly developed. The following menus are shown below:

- main menu in idle mode (MAIN) – fig. 50,
- tune menu (TUNE) – fig. 51,
- calibration menu (CALIBRATION) – fig. 52,
- configuration menu (CONFIGURATION) – fig. 53,
- main menu in working mode (MAIN) – fig. 54.

The PRINT and PREPARE menus are shown in the MAIN menu diagram – they contain only the commands that do not refer to subsequent screens. The commands are marked with dark grey colour – if a field marked in this way is pressed, the printer will react in a specific manner. The light grey fields lead to the following menu levels.

MAIN MENU (IDLE)

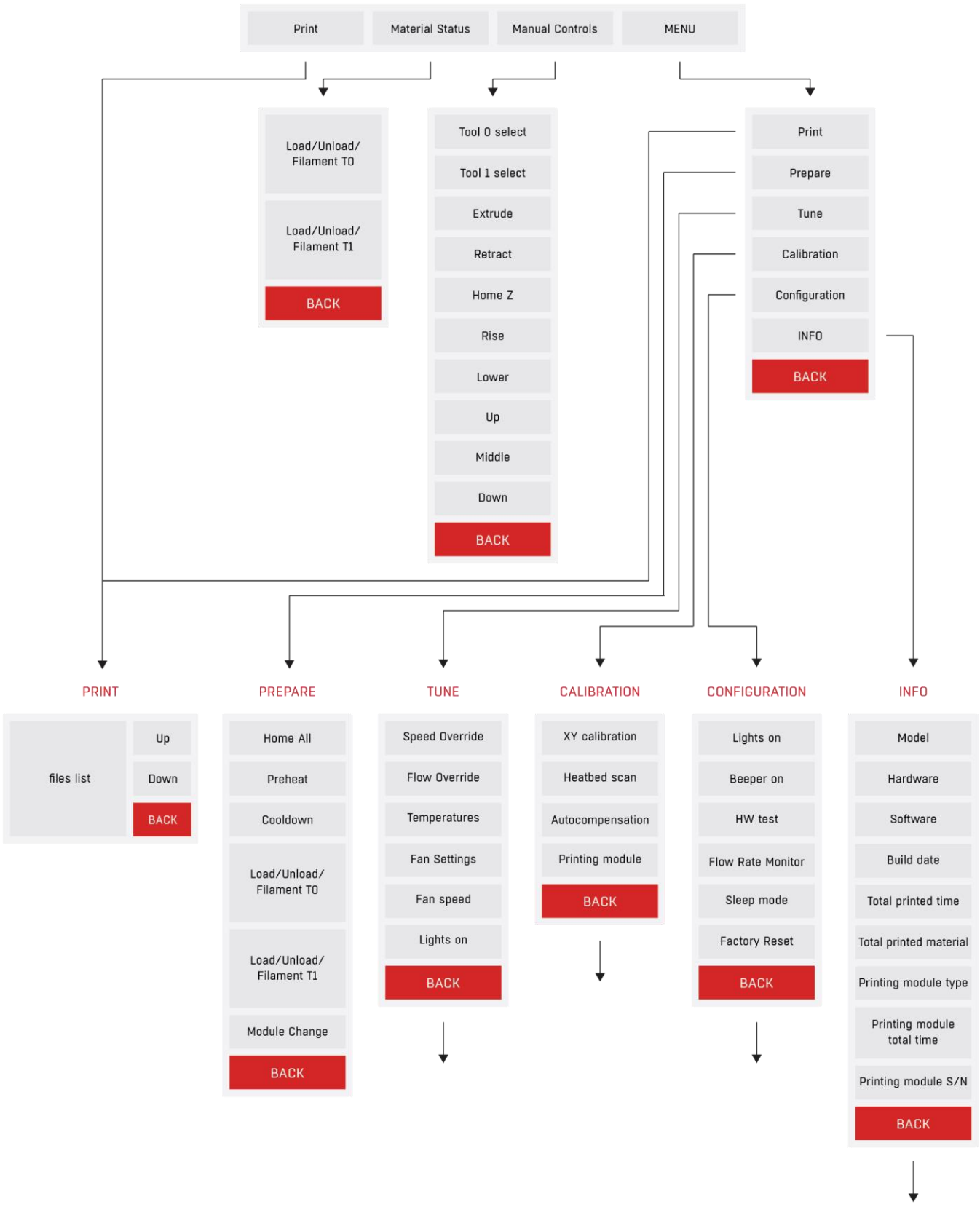


Fig. 50 Main menu structure in idle mode

TUNE

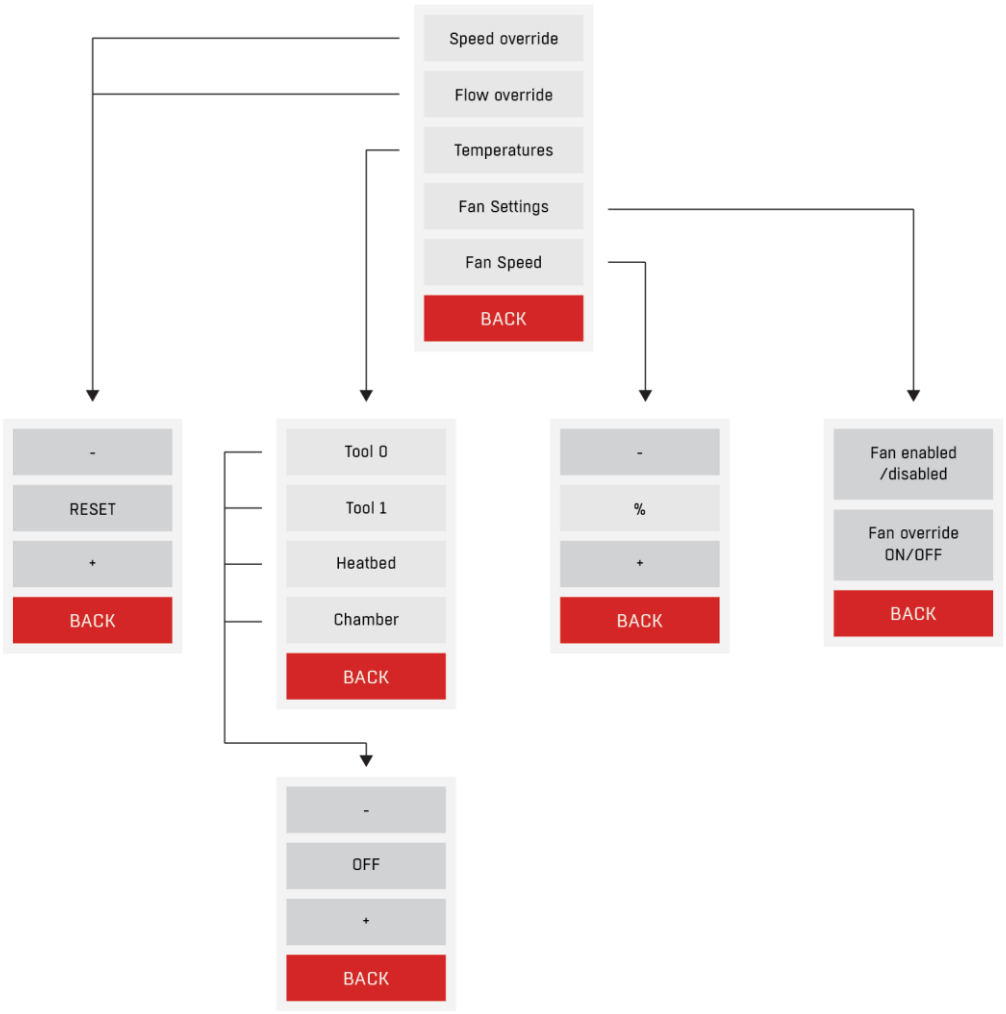


Fig. 51 Tune menu structure

CALIBRATION

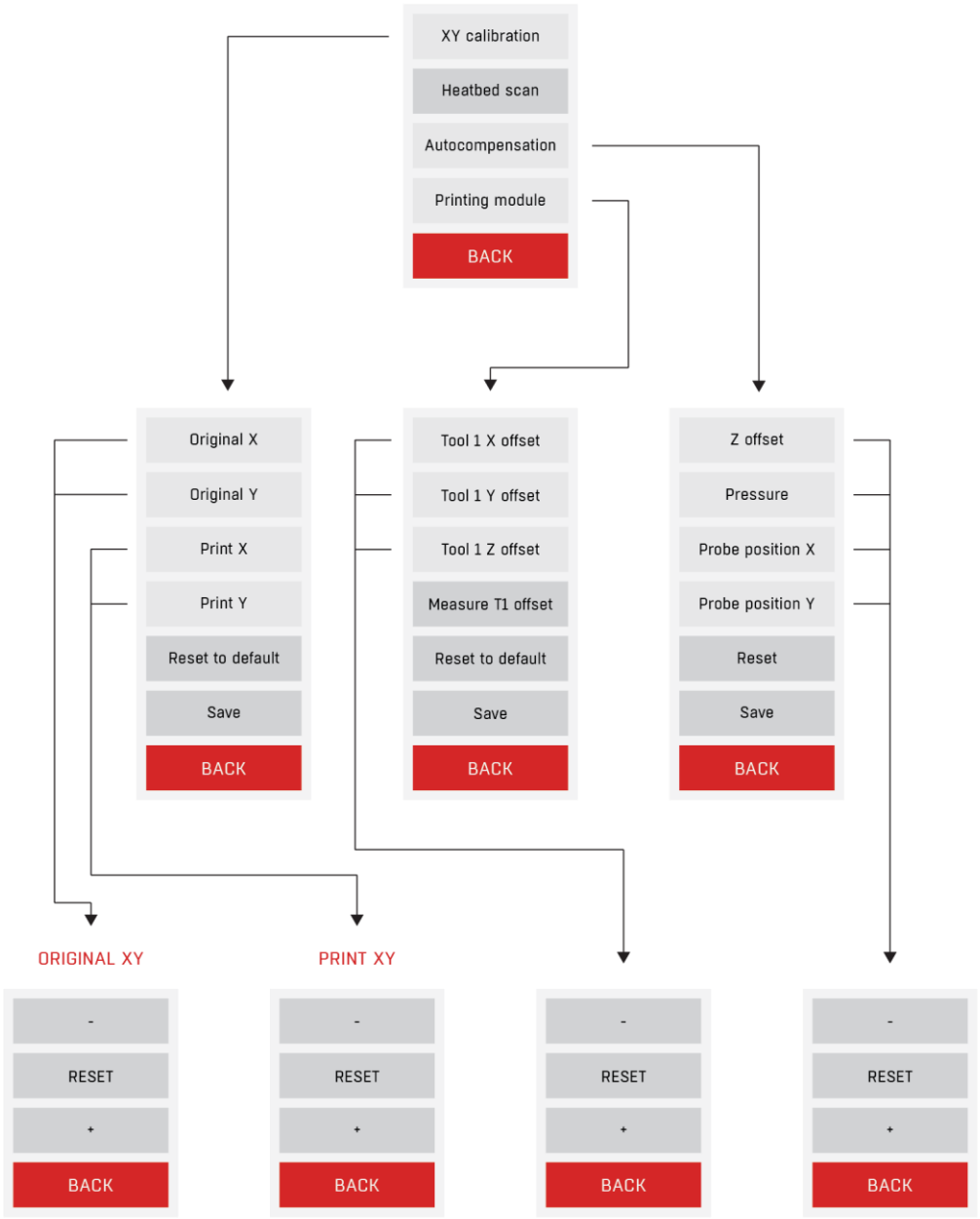


Fig. 52 Calibration menu structure

CONFIGURATION

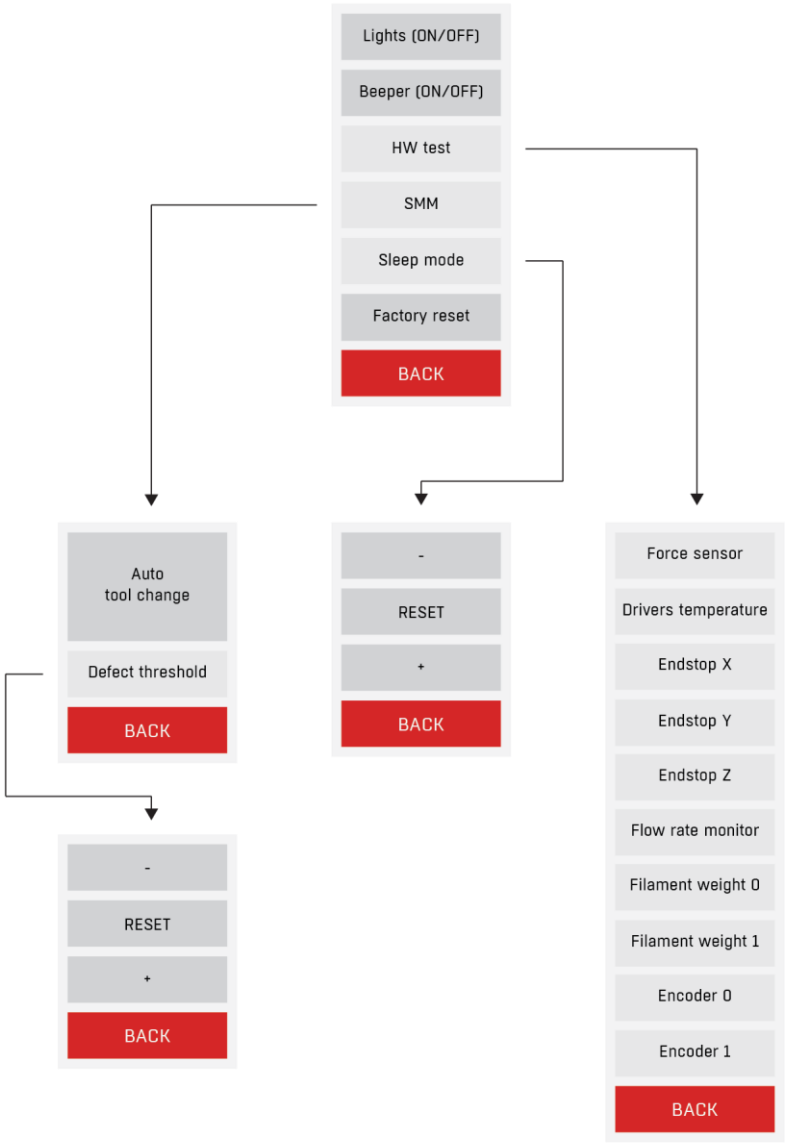


Fig. 53 Configuration menu structure

MAIN MENU (ACTIVE)

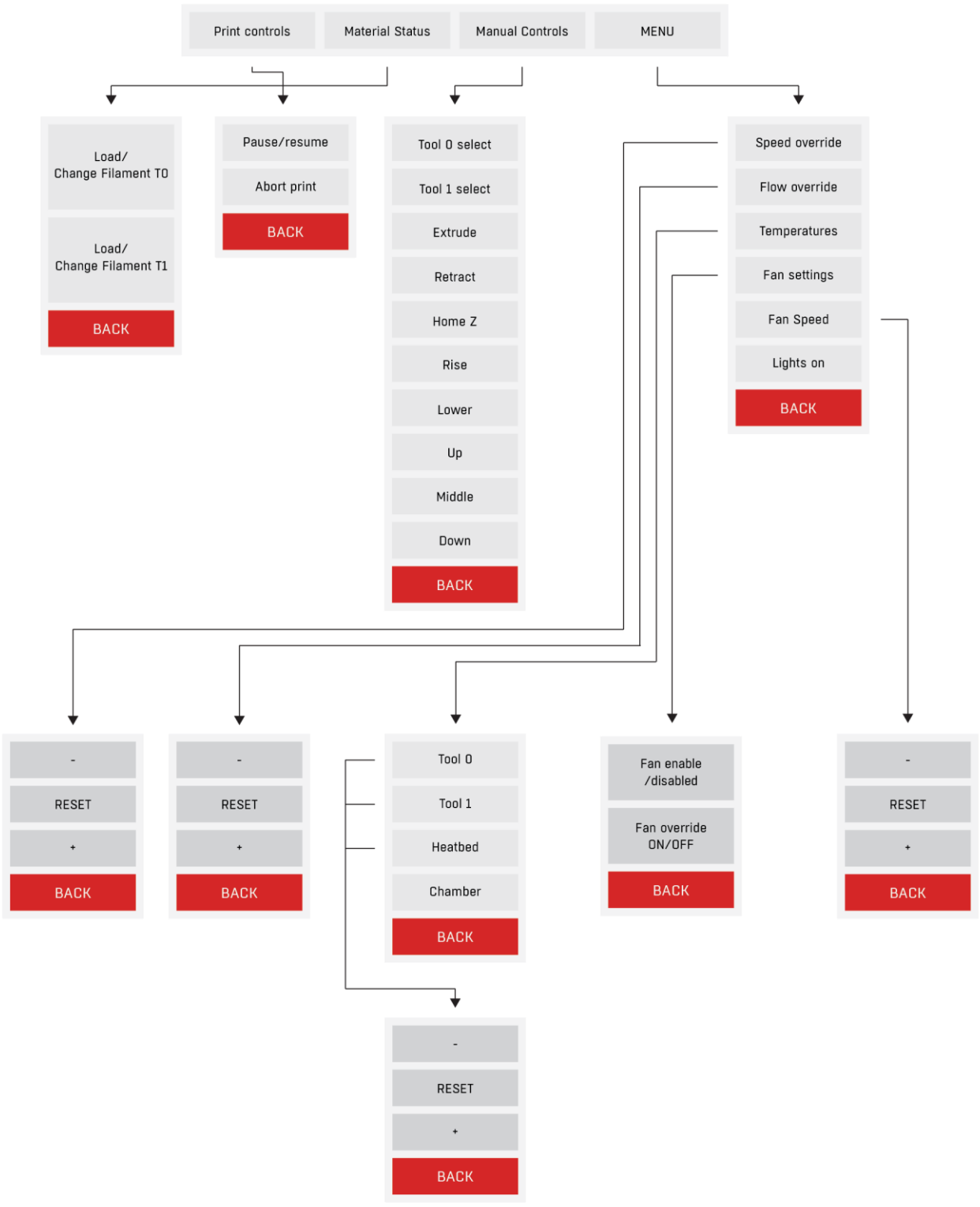


Fig. 54 Main menu structure in working mode

III PREPARATION FOR WORK

1. INSTALLATION OF DRIVERS

No additional drivers are required to be installed for 3DGence INDUSTRY F340 printer. The only program required to operate the printer is 3DGence Slicer that generates the machine code. More information on the 3DGence Slicer program can be found in chapter V.

1.1. Firmware update

The printer's firmware is periodically updated. It is important to ensure that the firmware is always updated to the latest available version.

The latest printer's firmware is available at: www.3dgence.com/support in Firmware category (the Firmware category is available after creating an account and registering the device).

The firmware update procedure is as follows:

1. Download the firmware file from the website mentioned above (the folder contains the firmware with .hex extension, free Xloader program that allows you to upload the firmware to the printer's controllers and the user manual).
2. Connect USB cable to USB B port on the printer.
3. Connect USB cable to USB port on the computer.
4. Switch the printer on.
5. Wait for the new firmware installer to finish working if it was automatically started. Pay attention to and remember the port number assigned to the printer, for example COM4.
6. In the Xloader program, in the Hex file field, indicate the newly downloaded firmware file.
7. In the field Device, set the Mega(ATMEGA2560) option.
8. In the COM port field, indicate the port assigned to the printer. In order to check Port COM enter: Windows Control Panel -> System and Protections -> System -> Device Manager -> Ports (COM and LPT) -> USB Serial Port (COM...). The rest of the information should remain unchanged.
9. Press Upload key. The new firmware upload may take several minutes. When uploading the firmware, coloured noise may appear on the display, but this is completely normal. Successful update will be confirmed by the message on the computer screen: '… bites uploaded'.
10. Now, you can disconnect the USB cable from the printer and switch the printer off.
11. Switch the printer on and perform Factory Reset; to do this, select from the printer's menu: Menu -> Configuration -> Factory reset and confirm by clicking "YES".
12. Perform heatbed scan; to do this, select from the printer's menu: Menu -> Calibration -> Heatbed Scan.

2. CONNECTING AND STARTING THE PRINTER

ATTENTION: The printer may be connected only to a supply network that meets the requirements described in chapter I, subpoint 4.3.1.

UNPACKING THE PRINTER

For transport, 3DGence INDUSTRY F340 printer is protected with square timber, oriented strand board (OSB) (at the front), expanded polystyrene corners and cover, cardboard and wrapping tapes, integral with the pallet. To transport the box with the printer to the place of installation, use a pallet truck, preferably with a lift.

ATTENTION: due to a considerable weight of the printer (140 kg) be careful when installing and handling the printer! The printer should be installed and handled by at least 4 persons. Failure to follow the installation instructions may result in serious injuries or equipment damage! The printer must be positioned on even and stable surface!

Unpacking the printer:

1. Using a pallet truck, transport the printer to the place of its installation;
2. Cut and remove the wrapping tapes;
3. Remove the cardboard cover and slide the cardboard sides out;
4. Using a drill-driver with a Phillips head bit or a Philips screwdriver, remove the screws that secure the OSB board to the square timber;
5. Remove the screws connecting the square timber;
6. Remove the expanded polystyrene cover and unwind the stretch film;
7. Remove the expanded polystyrene corners and all loose elements – printing materials and a cardboard box with accessories (inside the working chamber);
8. Slide down the film protecting the printer;
9. Using a pallet truck, transport the printer to the place of its final installation and position it as close as possible to the installation place. The subsequent activities should be performed by 4 persons. Ensure that all these persons have free access to the printer's holders and can move freely in the installation place after positioning the printer;
10. Using a drill-driver or screwdriver, remove the belts securing the printer's holders to the OSB board;
11. Hold the printer by the handles – one person by one handle. Position the printer in the final installation place.

STARTING THE PRINTER:

1. Make certain that all the printer packing elements have been removed.
2. Screw the cable gland on the printer side onto the thread.
3. Lead the feeder cable to a protected mains socket and connect.
4. Switch the fuse located on the printer's back wall to the ON position (fig. 55).

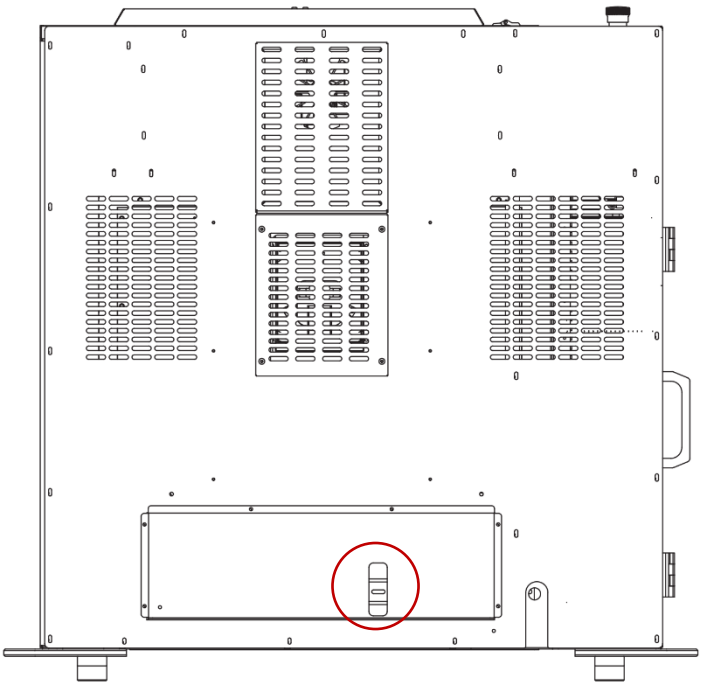


Fig. 55 Location of main switch (fuse)

5. Make certain that the emergency stop button is in the unlocked position. If the emergency stop button is pressed (locked), turn it clockwise (fig. 22).
6. To start the printer, press the switch located at the lower right corner at the printer's front (fig. 21). The working field lights will light up and the printer's display will be switched on. When the printer's main menu is displayed, the printer is ready to start working.

3. HEATBED PREPARATION

3DGence INDUSTRY F340 printer has a ceramic heatbed. Such a solution guarantees good adhesion of the first printout layer and easy removal of the model after the printing process. After transport, the surface of the printer's heatbed may be contaminated with traces of grease or dust and should be cleaned. The heatbed cleaning procedure is described in chapter IV, point 5.2.

ATTENTION: There are OHS instructions on the packaging of the solvents used for cleaning. The instructions must be strictly observed – the solvent vapours may be harmful. Good ventilation must be ensured.

3.1. Heatbed calibration

3DGence INDUSTRY F340 printer is equipped with an advanced, extremely sensitive system of automatic calibration of the heatbed. This system facilitates the printer operation. The correct calibration procedure of the printer's heatbed is described below. The printer has been calibrated prior to transport, but it may have become decalibrated during transport. Therefore, the following actions should be performed in order to avoid problems with the first printout.

The heatbed calibration procedure is always the same. There is no need to perform the calibration before each printout. It is enough to perform it once every few dozen hours of printing or if there are problems with the adhesion of the first layer of printout.

In order to perform calibration:

1. Check the power leads and the printer's leads for abrasion wear and defects. Check the cogged belts for defects and abrasion wear. Confirm that the breaker of the optical beam of the Z axis endstop (fig. 56) is not damaged, broken or bent and that it is aligned with the endstop notch.
2. If there is a filament in the hotend, unload it (chapter III, point 4.2), and then cool down the hotend to a temperature below 50°C (Menu -> Tune -> Temperatures).
3. Gently remove all dirt and material residues from the nozzle of T0 hotend and the heatbed using a spatula (this does not apply to the first start-up).
4. From the printer's MENU, "Prepare" submenu, choose "Home All" option and confirm with "OK" key. At this point, all axes will return to home position.

ATTENTION: observe carefully the movement of all axes. When the Z axis reaches the endstop and stops, check the distance between the nozzle and the heatbed using a feeler gauge. The distance should be about 0.8 - 1.5 mm. If the distance is larger, the heatbed scanning may be aborted and the "Heatbed scan aborted" error message may be displayed. If the distance exceeds 1.5 mm, adjust it manually. **To do this, loosen the adjusting bolt (fig. 56) and adjust the distance manually. If the breaker is raised, the distance between the nozzle and the heatbed will be increased; if the breaker is lowered, the nozzle will be moved closer to the heatbed. After the adjustment, tighten the adjusting bolt lightly and check the nozzle position with a feeler gauge, using the "Home Z" command available in Manual Controls menu.**

5. In the printer's menu, choose Calibration option and then Heatbed Scan option. At this point, the process of heatbed scanning starts.
6. Wait until the scanning is completed – it will take about 90 minutes. After completed scanning, HEATBED SCAN COMPLETED message appears on the display. The printer's heatbed has been successfully calibrated and the printer is ready for further work.

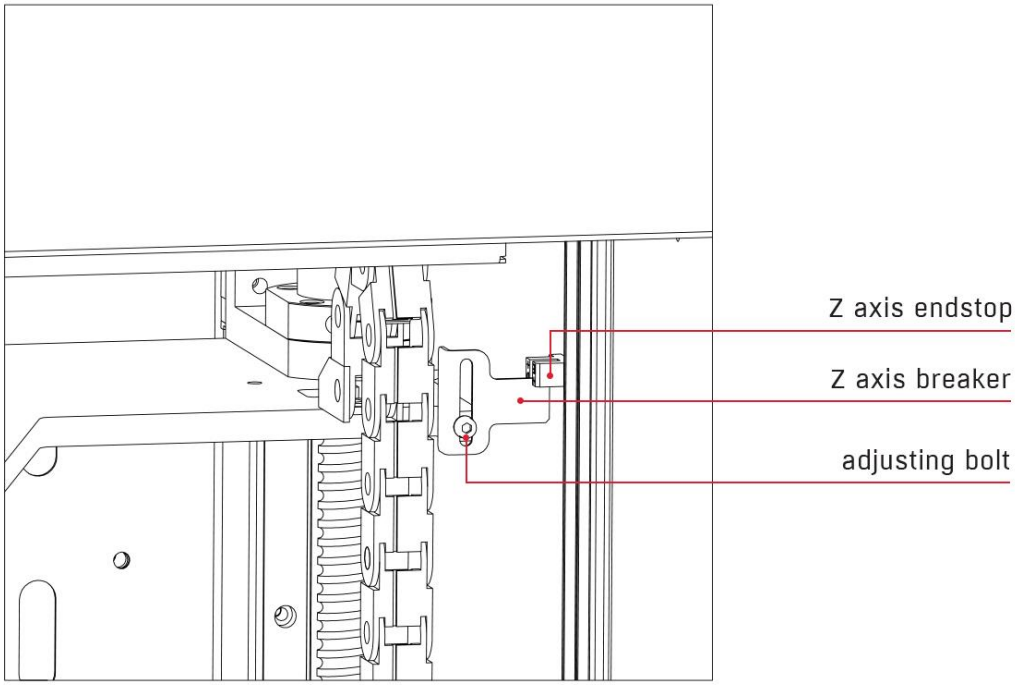


Fig. 56 The endstop and the endstop breaker located on the right side of the heatbed

4. ACTIVITIES CONNECTED WITH PRINTING MATERIAL

3DGence INDUSTRY F340 printer is equipped with the material control system (Smart Material Manager) that significantly facilitates printing with a variety of materials. The filament loading and unloading procedures for the recommended materials included in the Certified Material Base are described below. However, it is possible to manually indicate the material to be loaded, so the instructions below must be strictly followed.

4.1. Material loading

1. Make sure that there is no material installed on the filament spool holder you want to install the new material on. Also, make sure that there is no filament in the material feeding system and in the extruder (this does not apply to the first material loading). If the material is installed, first use the "Unload filament" option (material unloading) – the procedure is described below.
2. If there are no fragments of material on the holder and in the feeding system, the material loading procedure can be continued. From the MATERIAL STATUS level, choose the LOAD FILAMET option located under corresponding extruder TOOL 0 or TOOL 1. The load filament assistant will start in order to display the sequence of commands and guide the user through the next steps of the process.
3. The first step of the wizard is to indicate the right type of material. This can be done in two ways:
   a) The material is from the Certified Material Base:
   bring the SMM label on the spool close to the SMM reader on the side wall of the printer. Wait until the confirmation
   of successful loading of the material is shown on the display.
   b) The material is not from the Certified Material Base:
   select from the list presented the type of polymer that corresponds to the material being installed.
4. After selecting the material, make sure that the spool holder is empty. If not, the printer will display the following message: "Please remove the previous spool before starting the material loading process".
5. Cut the filament end at the angle of 45° and place the spool with material on the holder.

6. Slide the filament end into the input opening (marked with a red circle in fig. 57). The printer will start the procedure of initial filament loading and the heating of the suitable printer's hotend will start simultaneously.
7. When the hotend reaches the nominal extrusion temperature, the loading process will start automatically.
8. Observe the nozzle of the active hotend carefully. The printer will perform a test-extrusion of a short section of the material.
9. Confirm successful installation of the new material with the "Finish" key and remove the rest of the extruded filament.

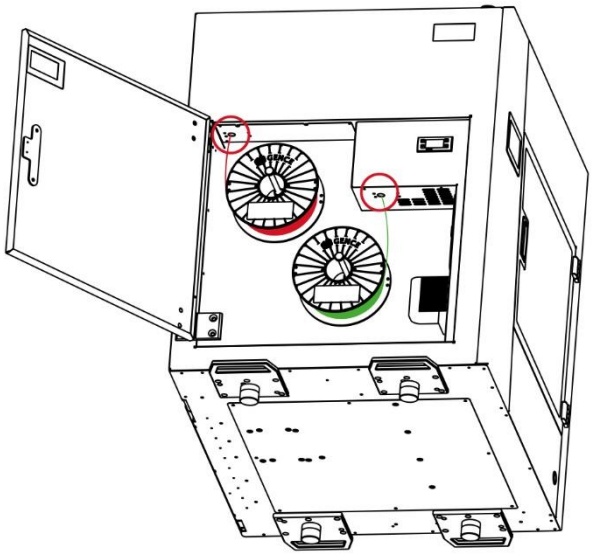


Fig. 57 Correct loading of material for Tool 0 and Tool 1

4.2. Material unloading

1. From the MATERIAL STATUS level, choose the UNLOAD FILAMET option located under corresponding extruder TOOL 0 or TOOL 1. The unload filament assistant will start in order to display the sequence of commands and guide the user through the next steps of the process.
2. Cut the material about 5 cm in front of the input opening (fig. 58) and remove the spool from the holder. Remember to keep the filament in a dry place protected against direct sunlight.

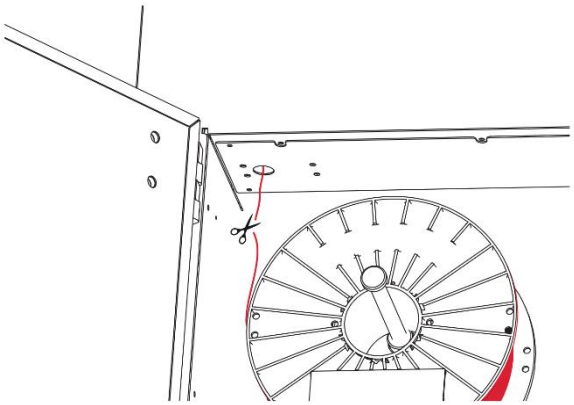


Fig. 58 Material cutting place

3. After pressing the "Continue" key, the printer will start heating the active hotend. When the correct temperature is reached, the material unloading process will start automatically. Initially, the extrusion of the material will be performed in order to facilitate its subsequent withdrawal.
4. Confirm successful unloading of the new material by pressing the "Continue" key and manually remove the rest of the filament from the input opening (fig. 57).

4.3. Failure to load/unload material

Case 1: the material does not exist in the printer's memory (MATERIAL STATUS), although it is actually loaded to the printer. Such a case may be caused by choosing the Factory Reset option without first unloading the material. Then only the LOAD FILAMENT option is available, even though the material is already installed. When you try to load the material automatically, the printer will display a message that the material must be unloaded manually.

In such a case, unload the filament manually and load it again. In order to unload the material manually, make certain that the heatbed is empty and perform referencing of all printer's axes (Home All option in PREPARE menu). Next, choose hotend Tool 0 or Tool 1 (Manual Controls), heat the hotend to nominal temperature (for example 245°C for ABS) and press Retract in Manual Controls menu while gently pulling the material at the input opening and remove it from the feeding system. Next, start the material loading procedure.

Case 2: failure to load material
The printer will automatically withdraw the material to the filament chamber. Cut the material end at the angle of 45 degree and repeat the material loading procedure.

Case 3: failure to load the material due to blockage of the filament in the feeding system
If the printer can not withdraw the filament automatically and the filament has not exceeded the encoder threshold, the message "Material blocked in the feeding system" will be displayed. The loading manager will be switched off and the hotend will be cooled down. Pull the material manually and slide it out of the input opening.

If the filament is strongly blocked in the feeding system, it will be necessary to remove the material feeding system from the extruder. To do this:

1. Open the printer's top cover to gain free access to the extruder;
2. Slide the C-shaped lock out (fig. 59, step 1) from the pipe connector;
3. Press the pipe connector lock (fig. 59, step 2) and simultaneously remove the feeding pipe from the pipe connector by pulling it up (fig. 59, step 3);
4. Pull the material manually and slide it out of the opening;
5. Slide the feeding pipe back into the pipe connector opening until resistance is felt – about 2 cm (fig. 59, step 4), and then, slide the C-shaped lock in (fig. 59, step 5);
6. After removing the material from the feeding system, repeat the material loading procedure from the start.

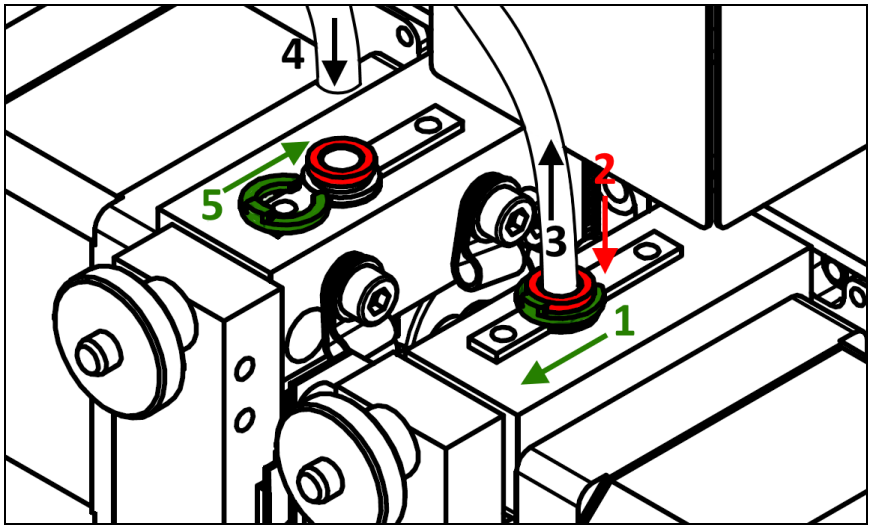


Fig. 59 Removing the material feeding pipe from the extruder

Case 4: failure to load the material due to blockage of the filament in the extrusion system (extruder)
If the printer can not withdraw the filament automatically and the filament has exceeded the encoder threshold, the message "Material blocked in the extrusion system" will be displayed. The loading manager will be switched off and the hotend will be cooled down. Heat the hotend to the temperature of plasticization of the given polymer (ABS 250°C) and then,

using the Retract key in the Manual Control menu, withdraw the material from the extruder and, while pulling the material manually, slide it out of the input opening.

If the filament is strongly blocked in the extrusion system, it will be necessary to remove the material feeding pipe from the extruder (see above, case 3), unscrew the thumbscrew (fig. 60, red colour) and deflect the extruder clamp (fig. 60, yellow colour). Figure 60 shows extruder T0. In the case of extruder T1, the clamp deflects the other way round. Make sure that the piece of Teflon located under the extruder does not fall out of the socket (fig. 60, grey colour). If the material still can not be removed manually, the blocked extruder has to be dismounted:

1. Switch the printer off.
2. Slide out the extruder from the guiding sleeve of the dual hotend module by pulling the extruder's clamp (fig. 70, step C, yellow colour) and pulling the extruder up.
3. Slide the material feeding pipe out of the extruder (see above, Case 3, fig. 59)
4. Unscrew two extruder fixing screws securing the extruder to the extruder seat, located above and under the extruder (fig. 61)
5. Dismount the extruder (fig. 62).

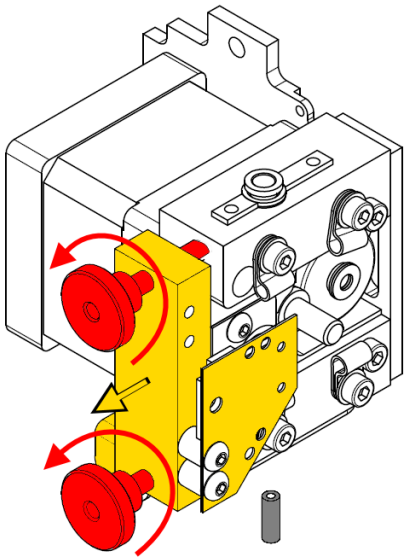


Fig. 60 Deflecting the extruder clamp

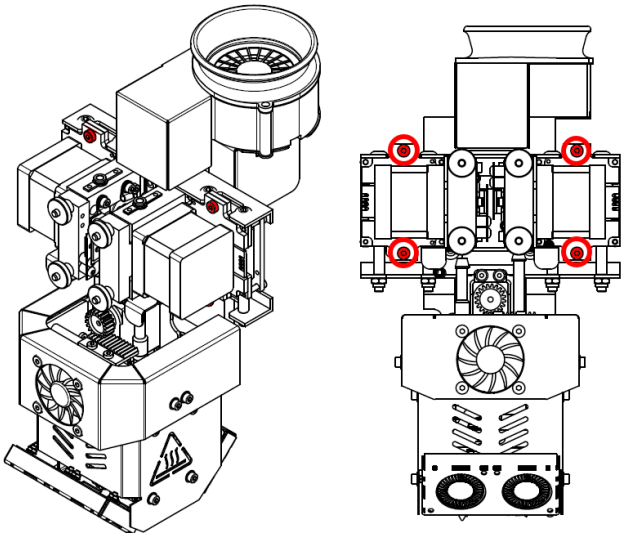


Fig. 61 Locations of the extruder fixing screws

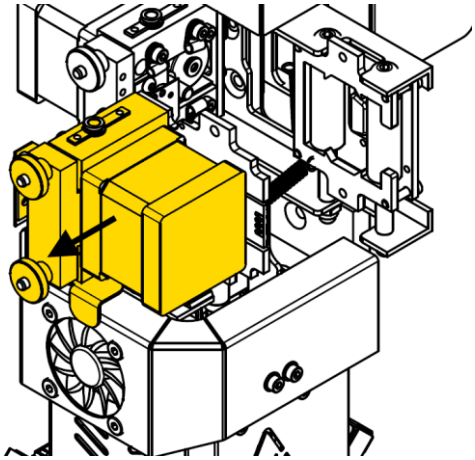


Fig. 62 Sliding the extruder out

Remove the remaining material from the dismounted extruder (pay special attention to the knurl) and then reinstall the extruder in the printer. Remember to tighten the screws, install the material feeding pipe correctly and slide the extruder into the dual hotend module. When the problem has been solved, repeat the material loading procedure.

IV PRINTER OPERATION (FIRST PRINTOUT)

1. STARTING A CODE FROM SD CARD

The 3DGence INDUSTRY F340 printer is equipped with a SD memory card. The procedure of starting the printing process from SD card is easy and quick.

Prepared .stl and .gcode models are available at www.3dgence/support in the Your files tab (the tab is available after creating an account and registering the device).

In order to start printing:

1. Start the printer if it was switched off.
2. Insert the SD card into the SD card slot located directly below the display.
3. Select the PRINT option from the main menu.
4. Select the file to be printed from the file manager. To navigate the files, use the arrows on the right side of the menu. A file can be selected by pressing directly on its name.
5. Confirm your selection by pressing the PRINT key.
6. The printer will automatically start the heating procedure. When the correct temperatures are reached, the printing process will start automatically.
7. When the printing process is completed, the printer will start the automatic process of cooling the chamber and heatbed. Do not remove the printout before the cooling process is completed. Otherwise, the model printed may get deformed.
8. When the cooling process is completed, you can gently separate the printout from the ceramic heatbed using a spatula.

2. ASSESSMENT OF THE PRINTER OPERATION QUALITY

After the first printout, the printer operation quality can be preliminarily assessed. Pay attention to the following elements:

1. shape of model base (elephant foot),
2. seam,
3. general geometry,
4. quality of side walls and top wall.

Another factor to be considered is the heatbed position when printing the first layer. Examples with descriptions are shown in figures 63, 64, 65.

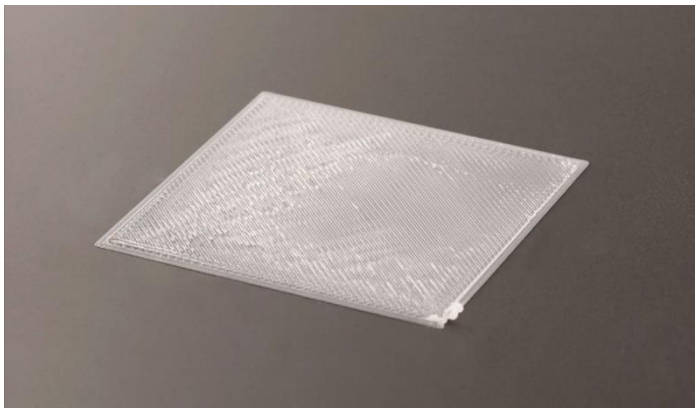


Fig. 63 Example of a too high position of the heatbed

Heatbed is too high

The material is pushed outside the nozzle when printing the first layer. This leads to deformation of the printed model base. This indicates that the heatbed recalibration is required (chapter III, point 3.1).

The distance between the nozzle and the heatbed can be adjusted also during printing. To do this, choose Manual Controls option on the display and lower the heatbed by clicking Lower (one click moves the heatbed by 0.025mm along Z axis).

Fig. 64 Example of correct heatbed position

Heatbed positioned correctly

The material is laid regularly. The entire surface of the model base is covered with plastic and the upper surface of the first layer is a regular, flat and solid surface.

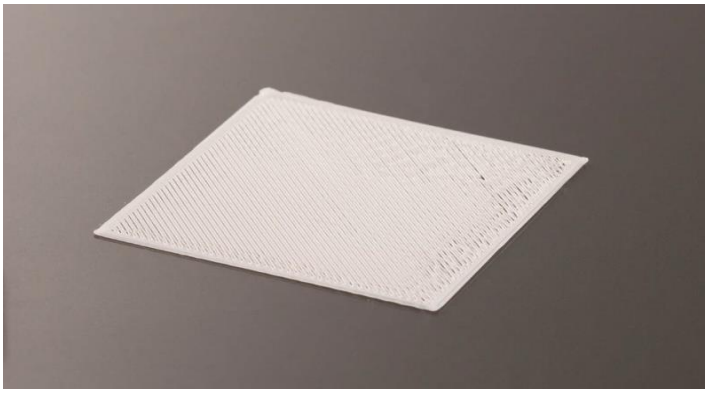


Fig. 65 Example of a too low position of the heatbed

Heatbed is to low

The distance between the heatbed and the nozzle is too large. Consequently, the adhesion of material to the heatbed is weak and there is a threat that the model may get unstuck during printing. This indicates that the heatbed recalibration is required (chapter III, point 3.1).

The distance between the nozzle and the heatbed can be adjusted also during printing. To do this, choose Manual Controls option on the display and rise the heatbed by clicking Rise (one click moves the heatbed by 0.025 mm along Z axis).

3. REMOVING PRINTOUTS FROM THE PRINTER

When the printing process is completed, the cooling sequence will start automatically. The display will show the progress pie chart of the cooling process. When the printer reaches a safe temperature, the display will return to the main MENU.

Always use gloves when performing any operations connected with removing the model from the printer!

ATTENTION: after finished printing, the Skip Cooling option is available in the printer's menu. This option makes it possible to skip the cooling process. However, it may be used only by the users who have considerable experience in the printer operation. Make sure that the hotend is cooled and positioned at the X axis zero position (maximally on the right) to prevent burn injuries.

Remove the printout from the heatbed using a spatula delivered together with the printer. To do this, gently lever the printout on its sides (fig. 66). Do not use sharp corners of the spatula but only its flat edge. Do not remove the printout by force as it may cause damage to the heatbed. In case of problems when separating the printout from the heatbed, it is recommended that the heatbed should be heated and cooled down again. This process may be repeated and it is recommended for printouts with a large base surface. Always use the spatula to lever the printout.

Fig. 66 The correct procedure for removing the model from the printer

ATTENTION: Do not touch the heatbed surface with bare hands. Otherwise, the heatbed surface will be soiled and there will be problems with adhesion of next printouts to the heatbed surface. Use clean protective gloves.

4. SMART MATERIAL MANAGER

Smart Material Manager is a system developed by 3DGence in order to facilitate the 3D printer operation by using the system of NFC tags (Near Field Communication) on dedicated printing materials, the scales built into the spool holders, the subsystem measuring material consumption and appropriate software functions.

Among other things, the system makes it possible to:

- load automatically the optimal print settings for a given material,
- monitor the amount of material remaining on the spool,
- inform the user about possible problems (use of material unsuitable for a given .gcode file, lack of filament, material jamming on the spool),
- check the quality of material flow during printing,
- detect that the material has finished.

The system is fully autonomous and normally invisible to the user. However, the system operating parameters can be viewed on the "Material Status" screen. Type of material, estimated (net) amount of material remaining on the spool and quality of extrusion can be checked on this screen.

The extrusion quality is the parameter informing about the material feeding efficiency, expressed as a percentage. This information is generated on the basis of the actual material feed in the encoder and compared with the expected value resulting from the code. The values in the range of 50%–100% should be interpreted as correct - minor fluctuations result from the retraction occurring during printing. This parameter is used to monitor the quality of the material feeding and to trigger the reaction in the event of an error.

The error notification threshold (50% by default) can be changed to any other value in the range of 1–100%. However, the threshold should not be set higher than 50%, as this may lead to unnecessary printer stoppages.

To change the error notification threshold:

1. Go to MENU→Configuration→Flow rate monitor;
2. Use the +/- keys to set the required value.

If a materiel feeding error is detected, for example, in the event of damage, breakage or lack of material, the printer will stop printing and display the error message connected with feeding the material to the specific hotend.

4.1. Change of material during printing

The printer makes it possible to change the material during printing. This option is designed for changing the material when it is finished or when you want to change the colour of the printed model from a certain height. This option is not recommended for multiple-material printouts (e.g. when the bottom of the model is made of ABS and the top of PLA).

1. Press the Material Status key on the touch screen.
2. Choose the Change Filament option for Tool 0 or Tool 1 from the menu.
3. The printer will automatically stop printing and display the message to cut the filament 5 cm from the output opening and remove the spool from the holder. Confirm the completed activities with the Continue key.
4. The printer will start heating the hotend to the nominal extrusion temperature and then withdraw the material from the extruder and slide out the material remaining in the system.
5. Slide the end of the material out from the input opening manually.
6. Put the spool with the new material to the SMM module or choose the material from the list.
7. After selecting the material, make sure that the spool holder is empty. If not, the printer will display the following message: "Please remove the previous spool before starting the material loading process".
8. Cut the filament end at the angle of 45° and place the spool with material on the holder.
9. Slide the filament end into the input opening (marked with red colour in fig. 57). The printer will start the procedure of initial filament loading and the heating of the suitable printer's hotend will start simultaneously.
10. When the hotend reaches the nominal extrusion temperature, the loading process will start automatically.
11. Observe the nozzle of the active hotend carefully. The printer will perform a test-extrusion of a short section of the material.
12. Confirm successful installation of the new material with the "Finish" key and remove the rest of the extruded filament.

4.2. Depletion of material during printing

The printer's system controls the condition of the material depletion sensor on an ongoing basis. If the material is depleted on one of the spools of T0 or T1, the printing process will be stopped and the module will move to a safe position. Next, the remaining filament will be unloaded automatically from the feeding system and the message "Material T0/T1 depleted" will be displayed. At this point, the user can load a new material or finish printing.

In order to load a new filament, choose the "Load filament" option. The printer will start the material loading manager (described in detail in chapter III, point 4.1).

5. CLEANING

5.1. Hotend cleaning

Each time after completed printing, clean the hotends by removing the remaining molten/burnt material that may be on the outside of the nozzle.

To do this:

1. Using the printer's menu, start Preheat option. The heatbed will be also heated – exercise caution.
2. Ensure good access to the hotends using the Manual Controls Middle or Down options.
3. Using a non-flammable material or tweezers, gently remove the remaining molten/burnt material.
4. After cleaning the hotends, switch the heating off (using the Cooldown function in the printer's menu).

5.2. Heatbed cleaning

Dirty or greasy heatbed may seriously hinder or make printing impossible. It is recommended that the heatbed should be cleaned before each new printout. Clean the printer's heatbed by following the instructions below:

1. Set the printer's heatbed in a position that makes it possible to clean the heatbed easily (Manual Controls Middle or Down).
2. Switch off all heating elements of the printer and wait until they are cooled down completely. The "Cooldown" option available in the menu may be useful.
3. Switch the printer off using the main switch and disconnect the printer from the power source.
4. Put protective gloves on.
5. Remove any residual plastic from the heatbed surface using the spatula. Next, soak a cotton (non-synthetic) cloth with a solvent:
   - 10% spirit vinegar,
   - acetone,
   - nitro cleaner,
   - extraction naphtha

or clean the heatbed using a sponge soaked in detergent.

When degreasing, pay special attention not to expose the printer components made of plastic and painted components to action of a solvent as it may damage them.

6. Wait for the solvent to evaporate completely.

ATTENTION: There are OHS instructions on the packaging of the solvents. The instructions must be strictly observed – the solvent vapours may be harmful.

6. SLEEP MODE

The 3DGence INDUSTRY F340 printer has the sleep mode function that ensures considerable reduction in power consumption when the printer is in the idle state for a specified time.

Sleep mode (fig. 67):

- switches off all heaters except the filament chamber heating,
- switches off the working chamber backlight,
- reduces the power consumption of the display.

Fig. 67 Sleep mode screen

The user can set the time that has to elapse from the last command given to the printer (by the machine code or using the display) before the sleep mode is activated. The default setting is 60 minutes.

To set the time that has to elapse before the sleep mode is activated:

1. Go to MENU→Configuration→Sleep Mode.
2. Using the keys +/- set a new time (maximum 120 minutes).
3. The sleep mode can be switched off completely using Off key.

7. SWITCHING THE PRINTER OFF

As described above, the 3DGence INDUSTRY F340 printer is equipped with 3 switches. To safely switch the printer off:

1. Wait until the heaters of the heatbed and hotends cool down.
2. Switch the printer off using the switch located in the right lower corner of the front panel (fig. 21). The power supply of the controller, motors and heaters will be cut off, but the heating of the filament chamber will be maintained. This solution makes it possible to avoid problems with material degradation if a highly hygroscopic material is used, such as, for example, nylon.
3. Switch the printer off completely using the main switch located at the bottom of the printer's rear panel. The power supply of all subsystems of the INDUSTRY F340 printer will be cut off.
4. Disconnect the power plug from the socket.

ATTENTION: if the printer is to be transported, both materials should be removed using the UNLOAD FILAMENT option (Menu Material Status) before switching the printer off.

V SOFTWARE

1. INTRODUCTION

The dedicated 3DGence Slicer software containing the ready-made print settings for dedicated materials has been prepared for 3DGence printers. The software is used for preparing machine codes - .gcode - from files describing spatial geometry in STL format. The manufacturer ensures full support concerning the use of the prepared printing profiles in the software and recommended printing materials.

The option for changing the print settings is available for advanced users. Due to the character of parameter modifications, the manufacturer does not guarantee the quality and repeatability of printouts prepared in this way.

1.1. Quality guarantee

The manufacturer guarantees the highest possible quality of models printed using dedicated software and materials. However, if you find imperfections in the printed model or errors while using the software, please contact us by the application form at www.3dgence.com/support (the form is available after creating an account and registering the device) and attach a photo and description of the defect and, if possible, the .gcode and .stl files. Each model sent in this way to the manufacturer will be assessed and/or printed at the manufacturer's premises. The manufacturer will suggest how to solve the problem - by advising, starting service actions (if necessary), preparing the .gcode executable file or updating the printout profiles.

2. INSTALLATION

The software together with the user manual should be downloaded from the manufacturer's website: www.3dgence.com/support. The recommended system requirements to run the program are as follows:

- Windows 7 or higher,
- screen resolution: 1920×1080 pixels,
- 4 GB of RAM,
- Intel Core i3 dual core processor or a newer one.

It is possible to run the software on hardware that does not meet these requirements, however, the comfort of work and the speed of processing of the models may deteriorate. The manufacturer does not provide support for equipment that does not meet the system requirements, especially older versions of operating systems.

At the first start of the program, the user will be asked for permission to automatically update the printing profiles. We recommend that this option should be enabled to get the best possible model quality. This option can be enabled or disabled at any time. Updates take place every time the program is started. The profiles can also be updated manually.

VI DUAL HOTEND MODULE

1. DETAILED DESCRIPTION OF THE MODULE

The dual hotend module is a replaceable element of the 3DGence INDUSTRY F340 printer. Its key elements are shown below (fig. 68, 69). The module is equipped with two hotends. The complete mechanism, thanks to its driving servomechanism, is able to automatically switch the printer to printing with one of the two materials in less than 1 second. Additionally, the module has an integrated strain gauge system responsible for autocalibration measurements and a printout cooling system. The module is also equipped with EEPROM memory. The offset calibration values for this module are saved in the memory. Thanks to such a solution, the module replacement does not involve recalibration of the printer and the printer can be restarted immediately after the module change. Materials to be selected from Select Material menu (when loading the filament) depend on the dual hotend module used.

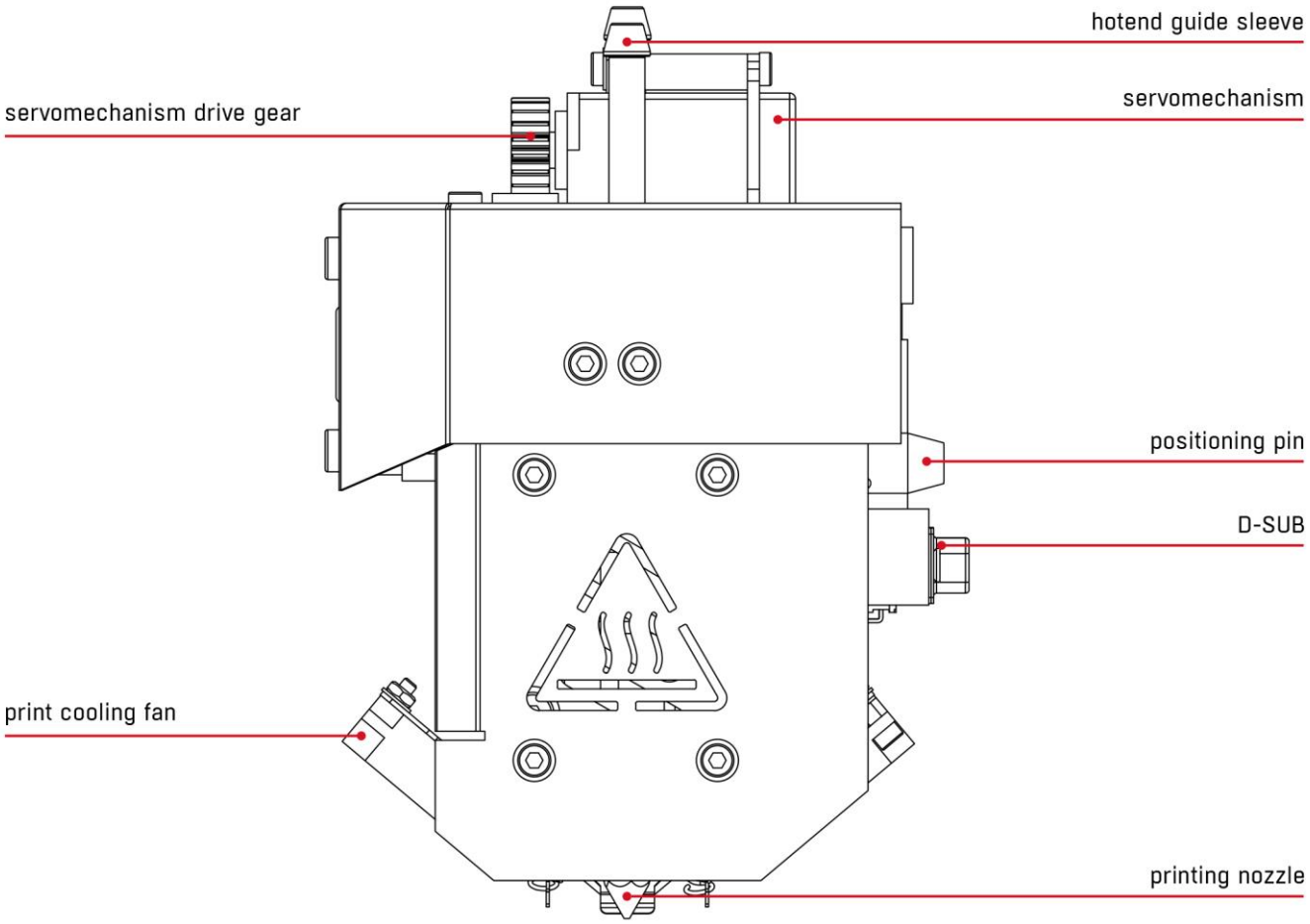


Fig. 68 Dual hotend module, left side

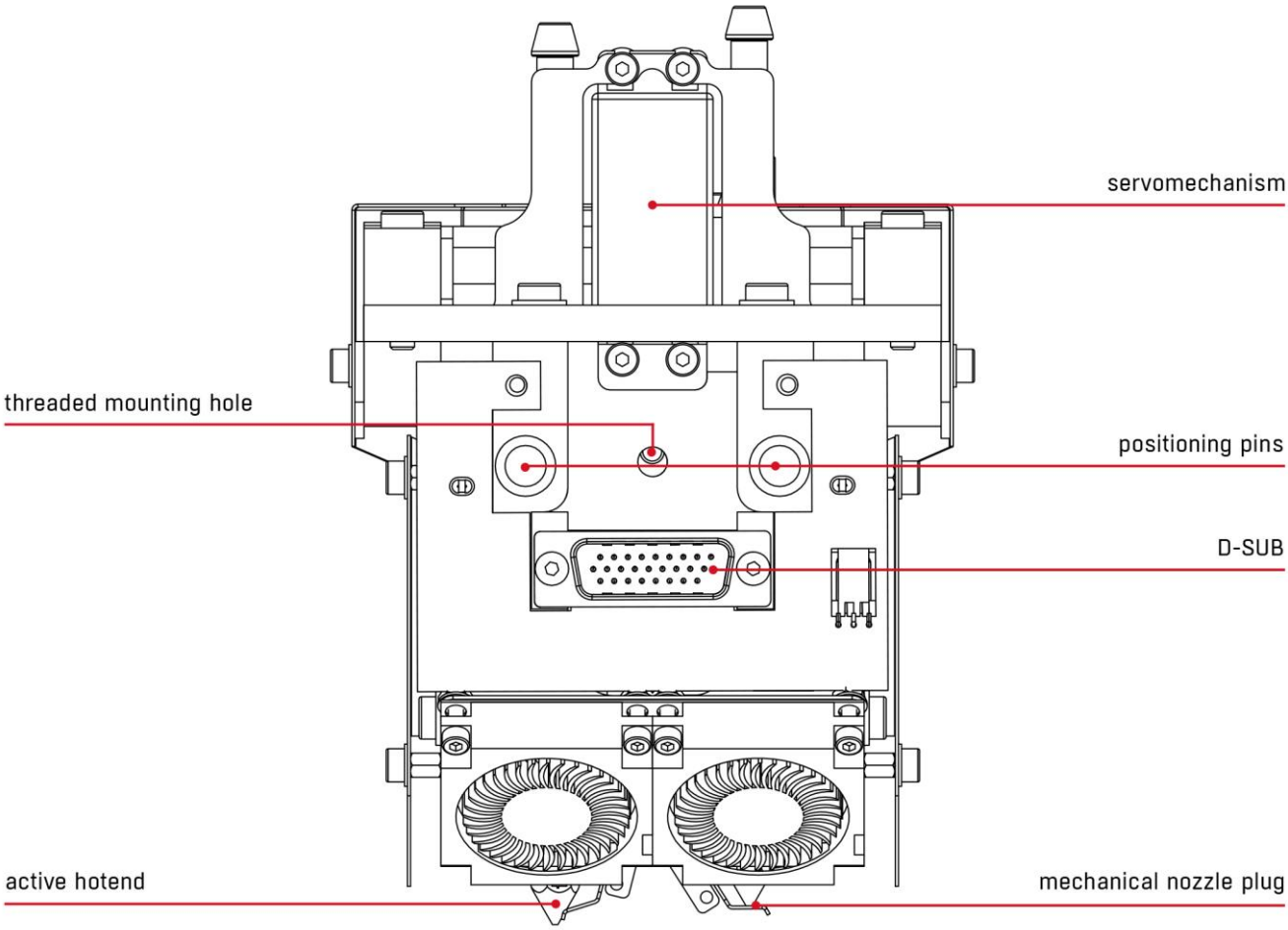


Fig. 69 Dual hotend module, rear side

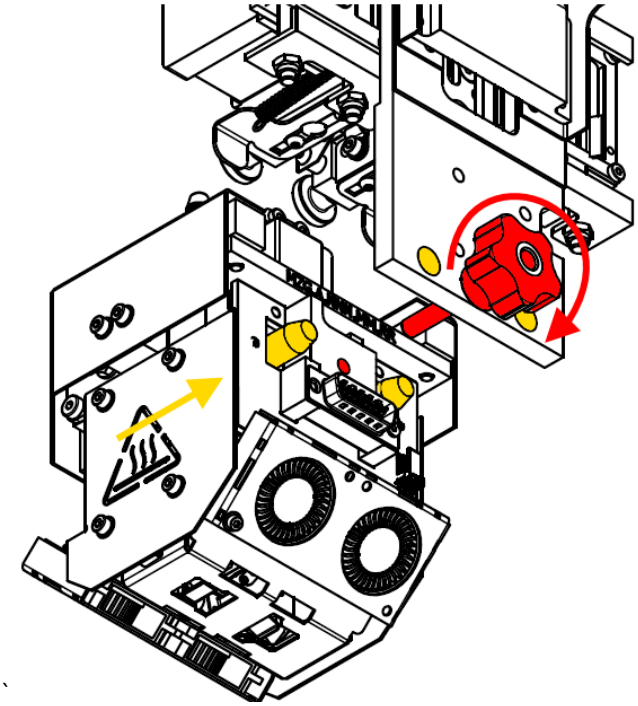
2. INSTALLATION AND CHANGE OF MODULE

ATTENTION: the module must not be installed and removed from the printer when power supply is on! Otherwise, the printer may get damaged.

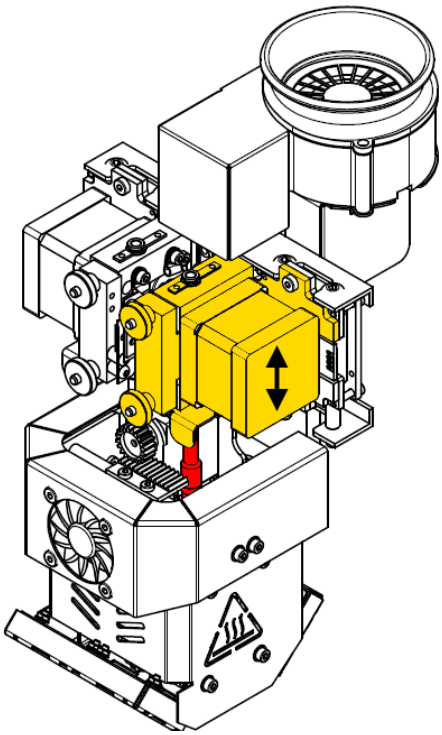
2.1. Installation of module

If the module is already installed in the printer, go to point 2.2 in this chapter.

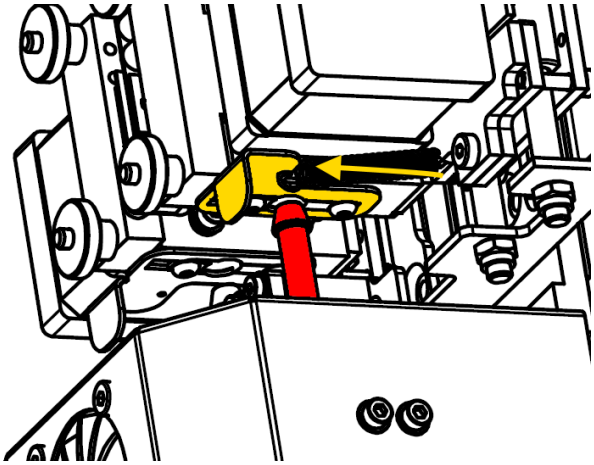
1. Before installation of the module, the printer must be switched off and cooled down.
2. Open the front door of the printer and set the carriage in a position that guarantees good access to it, and also uncover the left curtain.
3. Place the D-Sub port plug and socket next to each other and gently slide the plug into the socket. Do not drop the module. (fig. 70, step A).
4. Use your other hand to reach the opposite side of the carriage. Rotate the knob located there (fig. 70, step A, red colour), tighten the module to the carriage. Positioning pins (fig. 70, step A, yellow colour) will automatically set the module in proper position. The module should be tightened relatively strongly.
5. Lower extruder T1 (fig. 70, step B, yellow colour) so that it is located next to the tip of the guiding sleeve of hotend T1 (fig. 70, step B, red colour).
6. Pull the extruder's clamp (fig. 70, step C, yellow colour) to the open position (fig. 70, step D).
7. Slide extruder T1 into the guiding sleeve (fig. 70, step C, red colour) and release the clamp to the closed position (fig. 70, step D). The clamp should lock on the guiding sleeve flange.
8. Repeat the activities described in points 5-7 for extruder T0.



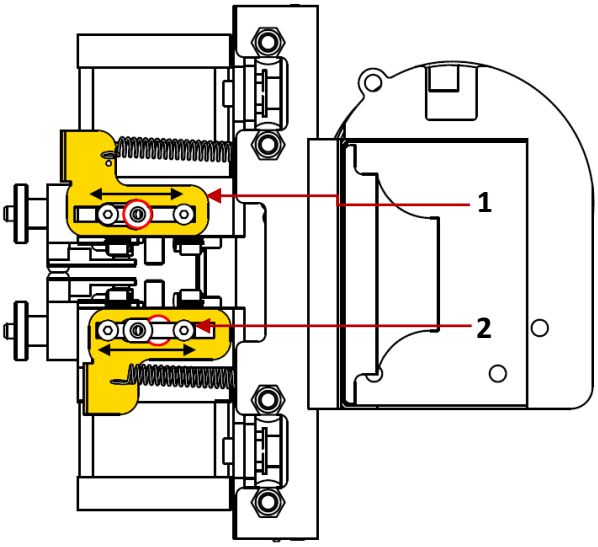
A. Sliding D-Sub plug into socket



B. Sliding extruder T1 into hotend T1



C. Pulling the clamp



D. Clamps in the positions: 1 - open, 2 - closed.

(bottom view)

Fig. 70 Dual hotend module change procedure

ATTENTION: After each dual hotend module installation Z axis offset measurement must be done. To do this select: Menu → Calibration → Printing Module → Measure T1 offset.

2.2. Module change

1. Start the printer.
2. In the MENU, go to the PREPARE submenu. Press the MODULE CHANGE key to start the printing module change assistant.
3. The printer will check whether materials are loaded. If not, it will go directly to point no. 5.
4. If materials are recognized, the printer will start their unloading according to the filament unloading procedure, respectively for T0 and then for T1. Follow the instructions displayed on the screen. If you want to unload materials, press the CONTINUE key.
5. The machine will start cooling the heating devices. The procedure can not be continued before the maximum safe temperature is reached.
6. Switch the printer off.
7. Open the front door of the printer and set the carriage in a position that guarantees good access to it, and also uncover the left curtain.
8. Remove extruder T1 from the guiding sleeve of hotend T1 by pulling the extruder's clamp (fig. 70, step C, yellow colour) and sliding the extruder out.
9. Repeat the same activities for hotend T0.
10. Release the knob on the other side of the carriage while holding the module.
11. Slide the dual hotend module out of the D-Sub socket.
12. Install a new module according to the instructions given in chapter VI, point 2.1. Make certain that the module is correctly tightened and the clamps of the extruders are locked.

VII COMPLEMENTARY INFORMATION

1. AUTOCALIBRATION AND AUTOCOMPENSATION

The heatbed scanning procedure is performed for each printer in the manufacturer's factory. To ensure the best possible print quality, it is recommended that the procedure should be repeated every several hundred working hours of the printer. The procedure should be also repeated in the case of problems with adhesion of printouts to the heatbed or when the material is laid unevenly by the printer while printing the first layers.

3DGence INDUSTRY F340 printer is equipped with advanced algorithm for autocalibration and autocompensation of the heatbed. The heatbed scanning procedure must be performed in order to ensure correct autocompensation. The procedure is described below.

Autocalibration of the heatbed is the automatic measurement of the heatbed surface in about 150 points with the use of a pressure sensor built into the printing module. Based on this measurement, the virtual map of the heatbed curvature is created, which is the basis for the autocalibration and autocompensation. The map is saved in the printer's memory and is modified only after performance of a next complete working scan (fig. 71).

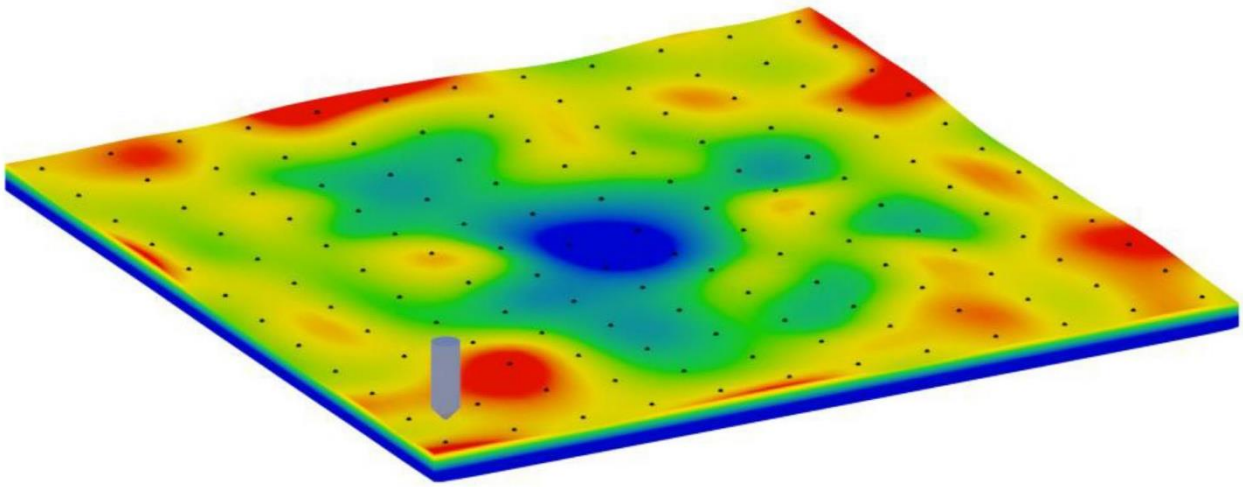


Fig. 71 The map of the heatbed curvature resulting from autocalibration

Autocompensation of the heatbed consists in one-point measurement of the distance to the heatbed and determining the correct distance to start work. This process takes place each time before printing. After setting the correct height above one point, the next part of the printing process is performed taking into account the heatbed curvature pattern saved in the printer memory – thanks to this, the distance between the nozzle and the heatbed is always the same and corrected on an ongoing basis along the Z axis.

VIII SERVICE ACTIVITIES

1. INDICATIONS FOR HEATBED CALIBRATION

The calibration process is not required every time the printer is started - it is enough to carry it out every few dozen to several hundred hours of printing. Before the calibration process is presented in detail, the indications for its performance are presented below.

Calibrate the heatbed if any of the below symptoms occur:

- the printer is to be started for the first time,
- one or more corners or edges of the printout get unstuck or do not adhere to the heatbed,
- one or more corners or edges of the printout are pressed into the heatbed surface (the impression of transparency of a too thinly applied layer, eventually, skipping, clicking of the extruder motor, accumulation of excess material between the hotend passages),
- the heatbed surface was unintentionally lifted,
- large force has been applied, for example, when removing the printout, and there is a reasonable suspicion that the heatbed has been relocated,
- the first layer seems to be unevenly distributed - one edge is correct while the opposite one is crushed or does not adhere to the heatbed strongly enough.

2. DUAL HOTEND MODULE CALIBRATION

2.1. Precise axes calibration

3DGence INDUSTRY F340 printer, as one of the few, is equipped with a unique system for precise dimensional correction of the printed model. The printer is factory calibrated for ABS material with the accuracy of 0.1 mm. During printing with the use of materials having various material shrinkage levels, the dimensional correction may be necessary. In the case of most printers, such a correction can be very troublesome or even impossible. Thanks to the innovative system, 3DGence INDUSTRY F340 printer allows you to make a precise dimensional correction in a simple and quick way. With just one calibration printout and simple measurements, this system makes it possible to achieve the accuracy of 0.02 mm.

ATTENTION: each material from which the filament is made has its own unique thermal shrinkage. To ensure the maximum precision of results, this calibration should be performed for the material from which the printout is to be made.

To begin the precise calibration of the XY axes, the special printout has to be made - Dimmension_Calibration.stl (fig. 72). .stl model is available at www.3dgence/support in the file tab (the tab is available after creating an account and registering the device). The printout will take about 1 hour.

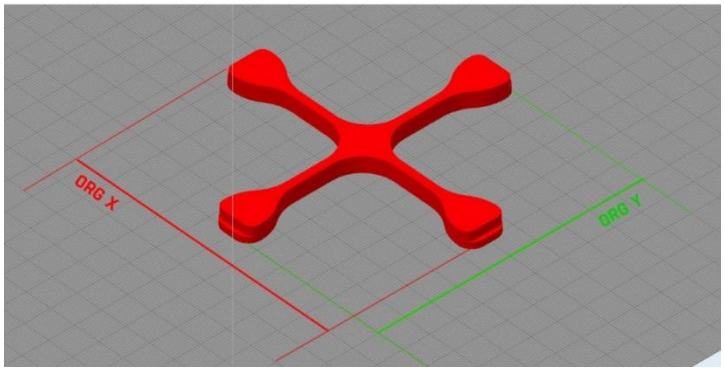


Fig. 72 Dimmension_Calibration.stl model

After printing, cooling down and removing the calibration cross carefully from the heatbed, measure the cross along X and Y axes. They are marked on the model. Different tools can be used to make the measurement, but their accuracy must be at least 0.05 mm:

- slide caliper,
- micrometer,
- coordinate measuring machine,
- optical tools.

The printout should be measured along X and Y axes. To increase the measurement certainty, follow the below instructions:

- the measuring point should be above the step located in the model. The step will make it easier to make the measurement at the same height on both sides of the model (fig. 73),
- measurements for X and Y axes should be made 5 times for each axis. Reject the highest and the lowest measurement result from each group. Other measurements should be averaged for each axis (fig. 74).

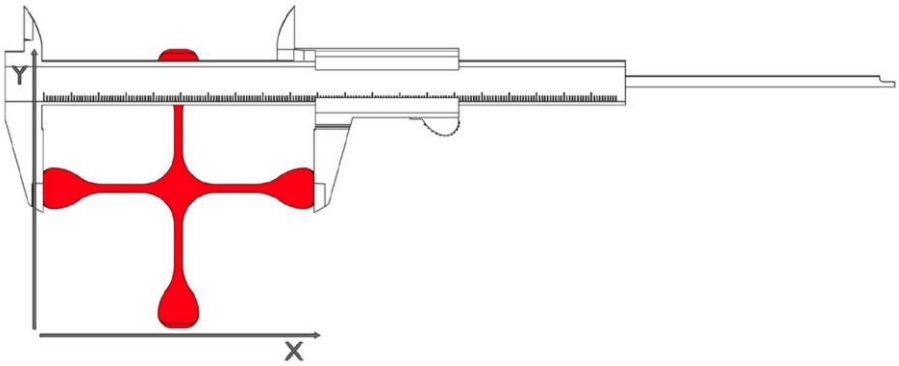


Fig. 73 3D model of the calibration cross

MEASUREMENT:	X:	Y:
	100.08	100.07
	100.06	100.06
	100.05	100.08
	100.04	100.06
	100.05	100.05
AVERAGE:	100.05	100.06

Fig. 74 Table of measurements for X axis and Y axis

The result of such action will be the basis for further operations:

1. Go to the Calibration menu and then to XY Calibration.
2. The Original X and Original Y fields should contain the X and Y dimensions of the model according to CAD design (100 mm in X axis and 100 mm in Y axis). If the compensation is for a different model than the calibration cross, enter the target values for the X and Y dimensions of the model according to the CAD design.
3. The Print X and Print Y fields contain the measurement results of the printed element for the corresponding axis. Remember to make the measurements always in the same way.
4. Using the +/– keys, set proper values for each field (Original X, Original Y, Print X and Print Y). After entering the values, press the Save key.

Thanks to this procedure, the next printout of the material for which calibration was performed will be printed with compensation of material shrinkage along the X and Y axes.

2.2. Calibration of the X, Y offset values for the dual hotend module

ATTENTION: After each change of the hotend, the Z offset should be calibrated, and then the offsets along the X and Y axis should be calibrated!

Calibration of Z axis offsets:
The Z offset between the T0 hotend and the T1 hotend is a key parameter for achieving high print quality. The correctly calibrated Z offset value allows to obtain high quality surfaces between the raft and the base material as well as between the support and the base material.

The measurement is carried out by strain gauges and it is determining the difference between the height of the hotend T0 and T1. To perform the measurement, select Menu → Calibration → Printing Module → Measure T1 offset.

Calibration of XY offsets:
In order to verify the offset along the X, Y axes, the calibration model should be printed for the appropriate printing module, eg: *Offset_Calibration_ABS_HIPS.gcode.* Prepared .gcode files can be found at www.3dgence/support in the *Your files* category (the category is available after creating an account and registering the device).
The model consists of two parts - part X (fig. 75) and part Y (fig. 76). Part X is used to set offset between hotends along the X axis. Part Y is used to set offset between hotends along the Y axis. Each part consists of two material layers - the bottom layer printed from support material (fig. 75, white) and the upper layer printed from model material (fig. 75, red).
Each part of the model is built of 11 lines. The middle line is point 0.00. The lines to the right from point 0.00 increase with the plus sign every 0.05 mm in the range from 0.05 mm to 0.25 mm, and the lines to the left from 0.00 point decrease with the minus sign every 0.05 mm in the range from -0.05 mm to - 0.25 mm (fig. 75, 76). Printed symbols: "+" on the right side and "-" on the left side are helpful in determining the character with which the read value will have to be entered into the printer (fig. 75, 76). With correctly calibrated offsets on the middle line (point 0.00), the model material coincides with the support material both along the X axis and along the Y axis.

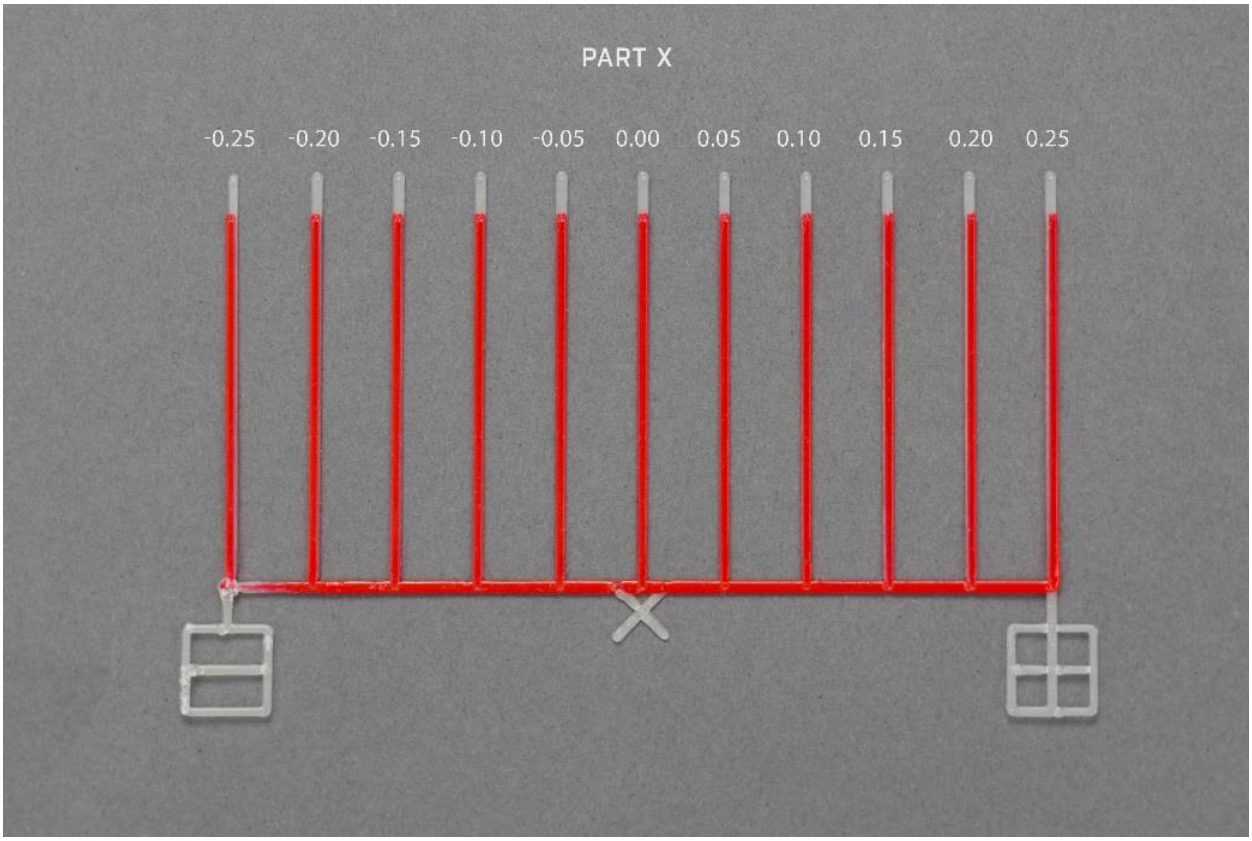


Fig. 75 Calibration model of offset along X axis

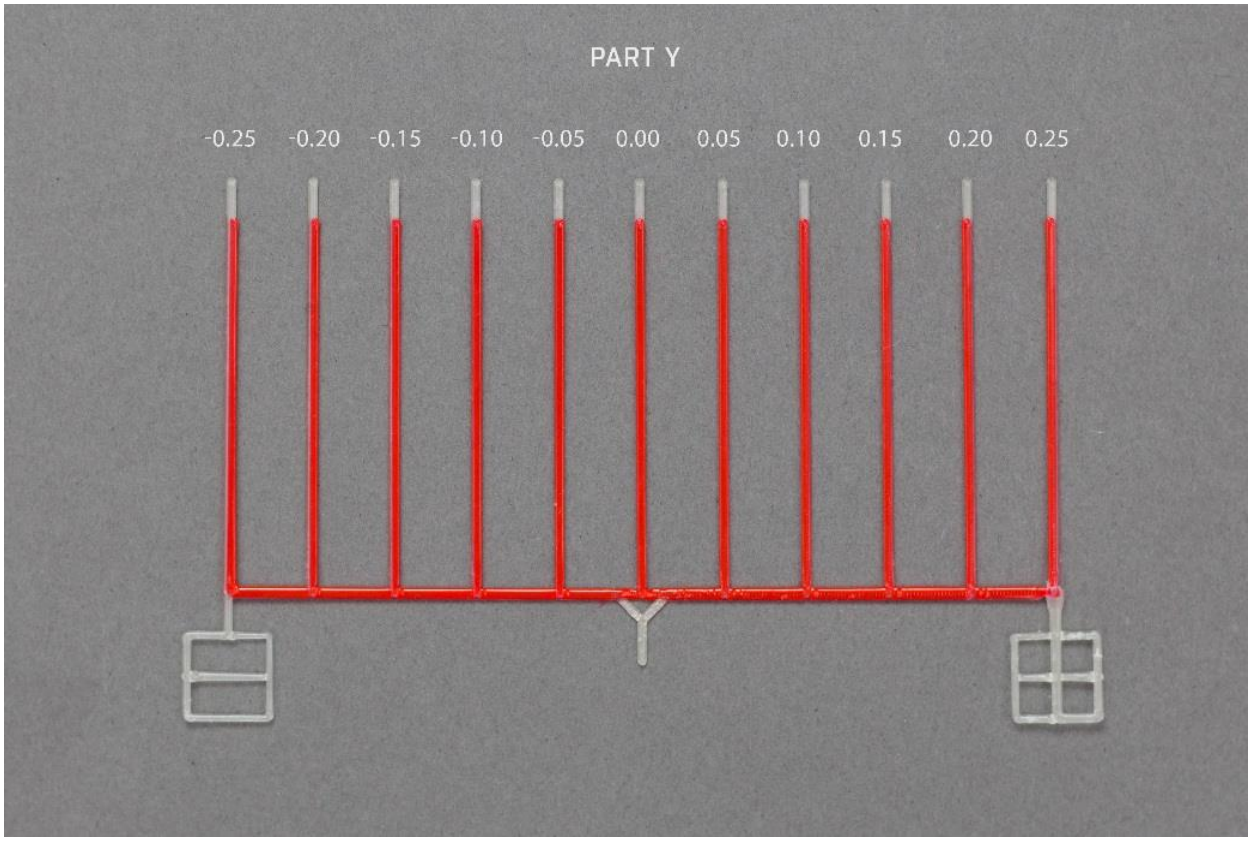


Fig. 76 Calibration model of offset along Y axis

Figure 77 presents two models Offset_Calibration_ABS_HIPS.gcode – part X.
The first one (at the top) has incorrect offset values along the X axis, while the second one (at the bottom) has correctly calibrated offset values along the X axis (fig. 77).
With correctly calibrated offsets on the middle line (point 0.00), the model material coincides with the support material both in the X axis and in the Y axis (Fig. 77, bottom model).

First of all, on the out of calibrated model find the line on which the model material (fig. 77, red) is best covered with support material (fig. 77, white). On the top model (fig. 77), the materials overlap best on the third line to the left of point 0.00. This line is distanced from point 0.00 at -0.15mm. This means that the X offset value is shifted by -0.15 mm and by this value the X offset value entered in the calibration menu must be corrected (the offset procedure in the X and Y axis is described below).

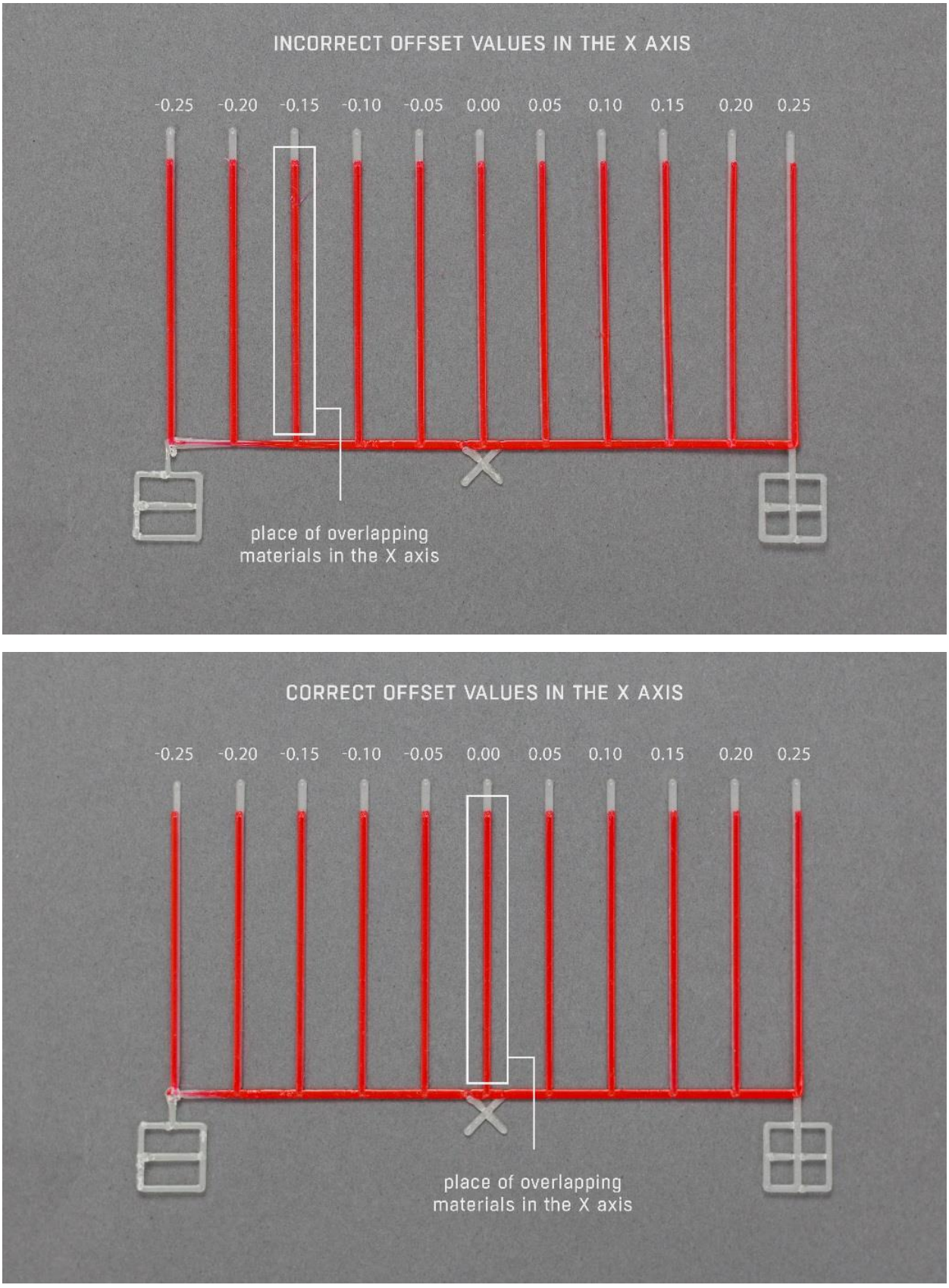


Fig. 77 Comparison of correctly calibrated offset values with incorrectly calibrated ones

Calibration of XY offsets:

1. Print the calibration model for the appropriate printing module eg: Offset_Calibration_ABS_HIPS.gcode downloaded from the website www.3dgence.com/support.
2. Select the line on which the model material with the support material is best covered in both part X and Y.
3. Check how far the selected line is away from point 0.00 in both part X and Y.
4. Add the read value in millimeters with the corresponding sign from part X to the currently value in *MENU → CALIBRATION → PRINTING MODULE → TOOL 1 X OFFSET* using the +/- keys.
5. Add the read value in millimeters with the corresponding sign from part Y to the currently value in *MENU → CALIBRATION → PRINTING MODULE → TOOL 1 Y OFFSET* using the +/- keys.
6. Confirm with the *SAVE* key.
7. Print the calibration model for the appropriate printing module again and visually check the offset calibration level:
   - if on the middle line the model material coincides with the support material both in the X axis and in the Y axis - the XY offsets of the dual hotend module are calibrated correctly,
   - if the model material does not coincide with the support material both on the X axis and in the Y axis on the middle line - the XY offsets of the dual hotend module are not calibrated correctly. Calibrate the offsets again in accordance with points 1 - 6.

3. AIR FILTER CHANGE

Air filter installed at the back of the printer protects the user from harmful vapours and smell. In order to ensure comfortable working conditions during printer operation, the air filter should be changed every six months/2000 working hours of the printer.

Filter change:

1. Switch the printer off and ensure access to the printer's back.
2. Remove the filter housing by pulling it up (fig. 78, step 1) and towards you (fig. 78, step 2).
3. Remove the old filter from the housing and insert a new one.
4. Install the housing with a new filter to the printer performing the actions described in step 2 but in the reversed order.

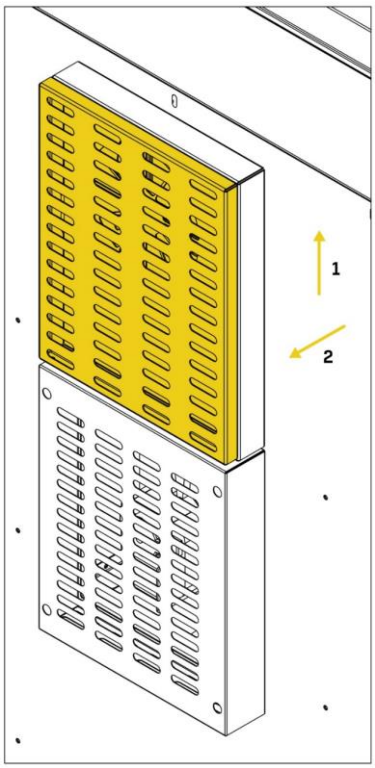


Fig. 78 Air filter change

4. SYSTEM ERRORS AND THEIR REMOVAL

E201 – problems with reading the indications of the printing module force sensor. The force value is outside the measuring range.

Confirm that:

- the printing module is correctly installed,
- the printing module has not been mechanically damaged,
- after Z axis referencing (Home Z option in Manual controls menu), there is no contact between any element of the printing module and the heatbed. If there is a contact, adjust the position of the Z axis endstop (chapter III, point 3.1),
- no considerable force is applied to the hotend by other printer's elements, e.g. pipes feeding the material to the hotend, i.e. by pressing the pipes against the elements under the printer's top cover.

INFORMATION: the correct force readout value should be within the range of -15500–15500 units. The value can be read by choosing Hardware Test option in Configuration menu. The force readout value is under the Force Sensor item.

E202 – wrong position of the Z axis endstop

Wrong position of the vertical axis endstop. The maximum value of the distance between the hotend and the heatbed has been reached. After Z axis referencing (Home Z option in Manual controls menu), the distance in any place above the heatbed should not exceed 1.5 mm. If this error occurs:

- if the distance is outside the range of 0.8 mm - 1.5 mm – adjust the position of the Z axis endstop (chapter III, point 3.1),
- if the distance is within the range of 0.8 mm - 1.5 mm – check whether the force sensor reacts to pressure. To do this, check whether the Force Sensor value changes when a force is applied to the printing nozzle tip (the value can be read by choosing HW Test option in Configuration menu). If the value does not change considerably after application of the force, contact the technical assistance department.

ATTENTION: The hotend and other elements inside the printer chamber may be hot and cause burn hazard. Be especially careful and use a metal object such as tweezers to apply pressure. Under no circumstances should you touch the printer parts with bare hands.

E203/Temperature Sensor Fail/def – temperature sensor error. Problem with measuring the temperature of one or more heating devices.

Turn off the main power supply of the printer immediately and make sure that:

- the printing module is correctly installed,
- the printing module or other printer's elements have not been mechanically damaged,
- the conduits inside the printer chamber and under the top service cover have not been damaged.

If the printing module has been installed correctly and/or one of the above defects has occurred, contact the technical assistance department.

E204 – problem with the minimum position of the Z axis endstop

Wrong position of the vertical axis endstop. The minimum value of the distance between the hotend and the heatbed has been reached. After Z axis referencing (Home Z option in Manual controls menu), the distance in any place above the heatbed should be at least 0.8 mm. In particular, there should be no contact between the printing nozzle tip and the heatbed. If the distance is incorrect, adjust the position of the Z axis endstop (chapter III, point 3.1).

E205 – measurement accuracy is outside the tolerance

The printer measures the tool height correction using a force sensor. The measurement is repeated in order to check repeatability and accuracy of measurement. If the accuracy is outside the tolerance range (0.02 mm), error E205 is signalled. Confirm that:

- the hotend and/or the heatbed are free from dirt and particles of material other than thermoplastic filament,
- the printing module is correctly installed,
- the printing module has not been mechanically damaged,
- after Z axis referencing (Home Z option in Manual controls menu), there is no contact between any element of the printing module and the heatbed. If there is a contact, adjust the position of the Z axis endstop (chapter III, point 3.1),
- no considerable force is applied to the hotend by other printer's elements, e.g. pipes feeding the material to the hotend, i.e. by pressing the pipes against the elements under the printer's top cover.

Material feed malfunction detected – the extrusion quality indicator value has exceeded the threshold value

If this error occurs, unload the material (Change Filament option). If this procedure is not completed successfully, unload the material manually (chapter III, point 4.3). Make sure that there are no material residues in the feeding system and load the filament again. If the problem persists, check that:

- the printer referencing takes place at a proper height (chapter III, point 3.1),
- material has been loaded correctly and there are no factors that can hinder its movement,
- the material is not damp (otherwise, characteristic air bubbles occur on the filament during extrusion),
- the feeding system pipe is not mechanically damaged.

If this error occurs repeatedly, contact the technical assistance department.

Encoder T0/T1 Communication Fail – error in communication with the T0/T1 extrusion quality sensor

If this error occurs, contact the technical assistance department.

Encoder T0/T1 Read Fail – error in reading the T0/T1 extrusion quality sensor position

If this error occurs repeatedly, contact the technical assistance department.

Encoder T0/T1 Magnitude Fail / Encoder T0/T1 Magnetic field Fail – problem with the position of the extrusion quality sensor's magnetic element

If this error occurs, contact the technical assistance department.

Strain Gauge Fail – communication error of the printing module force sensor

If this error occurs, contact the technical assistance department.

Weight T0/T1 Fail – communication error of the force sensor of the filament scales

If this error occurs, contact the technical assistance department.

NFC Reader Fail – error in communication with NFC reader

If this error occurs, contact the technical assistance department.

Printing Module EEPROM Fail – error in communication with the printing module memory

If this error occurs, restart the printer. If this error indication appears again, ensure that:

- the printing module is correctly installed,
- the printing module has not been mechanically damaged,
- the conduits inside the printer chamber and under the top service cover have not been damaged.

If the printing module has been installed correctly but the error message occurs each time the printer is started and/or mechanical damage has occurred, contact the technical assistance department.

LCD Fail – communication error of the controller of the printer's LCD control panel
If this error occurs, contact the technical assistance department.

UI Engine Fail – displaying error of the controller of the printer's LCD control panel
If this error occurs, contact the technical assistance department.

WLM T0/T1 Communication fail – no communication with the material loading assistance module
Switch the printer off and on again. If the error is still present, contact the technical assistance department.

WLM T0/T1 diagnostic fail – no diagnostics of the material loading assistance module
Switch the printer off and on again. If the error is still present, contact the technical assistance department.

IX DICTIONARY

ABS (Acrylonitrile Butadiene Styrene) – one of the main, together with PLA, printing materials for 3D printers. Characterized by high impact resistance, hardness and scratch resistance. Not resistant to UV radiation. It is soluble in acetone, which enables post-processing of printouts using the acetone vaporizing method. The printouts made of ABS can be also glued using ABS/acetone solution. ABS has considerable thermal shrinkage (up to 0.7%). A typical working temperature for printing with ABS is within the range of 220 - 250°C and about 100°C for the heatbed. Heating of working space is necessary to maintain dimensional conformity of printed elements.

Adhesion – in the context of 3D printing, adhesion of printout to the printer's heatbed. Insufficient printout adhesion may cause partial or complete separation of the printout from the heatbed during printing. The ceramic heatbed of 3DGence INDUSTRY F340 printer ensures good adhesion of basic printing materials. However, there is a wide range of commercially available solutions improving adhesion of printout to heatbed for difficult-to-print materials. Grease and dirt on the heatbed have detrimental impact on adhesion.

Autocalibration – the printer's ability to perform automated calibration of the heatbed. The purpose of this process is to generate the map of curvature and irregularities of the heatbed and, by introducing dynamic corrections, ensure constant height of the nozzle above the heatbed. This process usually takes from several to several dozen minutes and the user's intervention is limited to starting the process by means of the proper command.

Autocompensation – consists in one-point measurement of the distance to the heatbed and determining the correct distance to start work. This process takes place each time before printing. After setting the correct height above one point, the next part of the printing process is performed taking into account the heatbed curvature pattern saved in the printer memory – thanks to this, the distance between the nozzle and the heatbed is always the same and corrected on an ongoing basis along the Z axis.

Bridge – a part of the model printed in the air, suspended between two parts of the printout. The bridge is calculated in a special way when preparing the file for printing. If the bridge is too long, it may get deformed. In such cases, such printout element should be supported with support structures.

Brim – one of the methods of improving the adhesion of printouts to the heatbed. It consists in enlarging the adhesion surface of the printout to the heatbed by generating additional external outlines of the model proper at the level of the first printout layer. The more outline lines are added, the larger the adhesion surface will be. Usually, from 5 to 20 additional outlines (brim lines) are used. The brim should be used in the case of problems with separating the printout from the heatbed.

CAD (Computer Aided Design) – collective name of various computer-aided design processes. The CAD methodology is used, among others, in mechanical, electrical, medical and architectural engineering. The CAD methodology is based on geometrical modelling aimed at creating a two- or three-dimensional representation of the element being designed. Multiple CAD software packages are available, tailored to the needs and requirements of the user. Models in STL or OBJ formats are exported from these programs for the needs of 3D printing. The most popular CAD programs are: SolidWorks, Inventor, PTC Creo, CATIA, Rhino, SolidEdge – however, there are many other programs available.

Curling – negative phenomenon occurring during FFF 3D printing. Curling can be most often noticed when printing overhangs or sharply bent model elements. This consists in curling the printout corners up. In extreme cases, it may lead to printing failure and always adversely affects the appearance, especially of the bottom printout surfaces. It also leads to collisions of the working hotend with the printout. The basic method of preventing the curling phenomenon is active cooling of the printout. If activation of cooling fans does not help, it is worthy to reduce printing speed.

Model slicing (slicing) – the process aimed at generating paths and instructions for the printer (machine code, G code) from a three-dimensional model. At the slicer level, such settings as layer height, printing speed, filling density, solid wall thickness or temperatures for the nozzle and the heatbed are selected. In addition, the application and density of supports and one of the several methods of improving the adhesion of the printout to the heatbed (e.g. raft or brim) can be selected. 3DGence INDUSTRY F340 printer uses the 3DGence Slicer software in which settings for various modules and resolutions have been

defined. The final product of the slicers is the machine code representing a given 3D model in the form of a G code (g-code, *.GCODE), which is interpreted by the printer's electronic system.

Nozzle – the hotend's element in direct contact with the printout. The nozzle heated up to the temperature proper for the given material melts the material and forms a thread of plastic with the diameter equal to the nominal diameter of the nozzle. As standard, 3DGence INDUSTRY F340 printer is equipped with a 0.4 mm nozzles. The nozzle output diameter has influence on the available resolutions, speed and accuracy of printing.

Extruder – a component of a FFF 3D printer. Its task is to feed the filament at a precisely defined speed and, consequently, amount . 3DGence INDUSTRY F340 printer is equipped with the Direct type extruder. This means that the extruder motors are located directly above the dual hotend module and feed the material to the hotends through the sleeves.

Endstop (limit switch) – optoelectronic switch that restricts the 3D printer movements to the allowable limits. 3DGence INDUSTRY printer is equipped with 3 optical endstops – one for each axis. The optical endstop does not require the physical contact with the corresponding breaker, which guarantees its long life. However, attention should be paid to its sensitivity to sources of bright light, which can cause false activation.

Filament – popular name of the material for printing in FFF technology. Filament is a wire made of a thermoplastic (PLA, ABS, PVA, HIPS, PC, Nylon and others) within a specified tolerance. Filament is wound on spools. The important parameters for selecting a filament are as follows: manufacturing tolerance and the method of protection against moisture (optimally, the filament should be vacuum packed together with a moisture absorber). A large inner diameter of the filament spool guarantees that the entire length of the filament will be used – excessive bending of the filament (e.g. on a small inner diameter spool) may hinder the filament use. Once the filament package is opened, the filament should be stored in a dark, dry place with a moisture absorber.
ATTENTION: The use of materials other than those from the Certified Material Base prevents the use of SMM system.

Firmware – internal software of 3D printer. It is responsible for interpreting the commands contained in the machine code (G code). Firmware generates basic signals for heaters, motors and fans. It is responsible for the interpretation of accelerations, temperature correction tables and many other factors. Well-tuned firmware is an important element of the printer calibration, because it is responsible for the adjustment of pick-ups, accelerations and other parameters of key importance for good performance of the printer.

G-Code – standardized programming language for controlling the machines used in computer-aided manufacturing (CAM). Shortly speaking, a sequence of G code contains exact instructions for the machine - in which direction, how fast and along which axis it should move. The code for printers is generated by slicing software (slicers). The code contains all data on temperatures of subassemblies and motor rotations in the precise sequence for controlling the hotend movements and the extruder operation. The code commands are sent line by line to the processor of the printer's controller during printing. The processor, based on its firmware, interprets the code and sends appropriate signals to subassemblies.

Missing steps – in wrong working conditions of the printer's motor and controller (e.g. excessive temperature, mechanical resistance), the motor's steps may be missed. The symptom of this phenomenon is the print plane shifted on the axis whose motor has lost its steps. The visual effects of this fault depend on the path on which the hotend moves relative to the heatbed. To better imagine this, let's assume that the printout is a cube and the printer has lost steps in the middle of the printing process. The printed object would look as if it was cut halfway through on the XY plane and glued together with a displacement.

HIPS (High-Impact Polystyrene) – styrene polymer. It is used in 3D printing mainly as a material for printing support structures when printing with ABS. Soluble in D-limonene. Characterized by high impact resistance and low elasticity.

Normal – common name of the normal vector to a surface, used in 3D modelling. Normal vector is a vector perpendicular to the plane, or in the case of other surfaces perpendicular to the plane tangent to the surface at a given point. In 3D modelling, its sense defines the inside and the outside of the model. In most cases, it is assumed that the normal is correctly directed to the outside of the model.

Nylon – group of polyamides developed by DuPont. Currently, it is also used for manufacturing durable filaments for 3D printing. The main advantages of such printouts are: high mechanical and chemical resistance, the possibility of processing and dyeing with fabric dyes. The printouts are also characterized by some flexibility and tear resistance.

OBJ – popular format of 3D files. It may contain an additional MTL file (Material Template Library), which is irrelevant to FFF printing, containing information on material libraries defined for the model. Apart from the geometry definition, arrangement of vertices and the sense of the normals, the OBJ files contain the information on UV coordinates for textures. It is read by 3DGence Slicer program.

PLA (polylactide – polylactic acid) – produced in industrial quantities by ecological methods. The main sources of the raw materials for its production are cereals, e.g. corn starch or bacterial cultures. This is the basic material for FFF 3D printing. Thanks to its low cost, lack of thermal shrinkage, good adhesion to the heatbed and a multitude of filling variants and colours, PLA is the most universal and the most commonly used filament. During printing, it emits a weak, neutral smell, does not emit harmful substances and is fully biodegradable. Because it is more brittle and vulnerable to mechanical damage than ABS, its use for the production of functional prototypes of mechanical devices is limited.

Overhang – characteristic shape in a model printed during FFF 3D printing. This shape occurs where the model plane forms an overhang over the heatbed or another part of model. 3DGence Slicer software recognizes these surfaces and analyses the angle of overhang relative to the heatbed. If the angle exceeds the boundary angle defined in the software, 3DGence Slicer will automatically generate support structures under such a surface.

PVA (polivinyl alcohol) – a water-soluble synthetic polymer. It is used from making water-soluble filaments that are perfectly suitable for printing the support structures in dual-material printing. The model itself is printed using insoluble material (most frequently PLA) and can be thoroughly cleaned in water bath. The use of an ultrasonic cleaner significantly accelerates this process.

Raft – one of the methods of increasing the adhesion of printout to heatbed. Raft is a base (platform) consisting of several alternately laid layers, which is generated by the slicer under the model. Raft is larger than the outline of the model, which increases the adhesion of the printout to the heatbed and also prevents the effects of thermal shrinkage (plastic-plastic connection). Another advantage of the raft is that it levels small irregularities of the heatbed surface. Raft also makes it easier to print models that do not have a flat surface that would serve as the base. Brim, described earlier, and raft should not be used simultaneously.

Stepper motor – electric motor that can rotate at precisely defined step angles. This is possible thanks to the arrangement of pairs of electromagnets A and B around a gear-shaped iron rotor connected to the motor shaft. Due to the fact that they ensure very precise position control, the stepper motors are the main drive of 3DGence INDUSTRY F340 printer.

Skirt – additional material extruded at the very beginning of printing at a distance of several millimetres around the model that is being printed. Skirt is not an integral part of model. The purpose of this function is to initiate and stabilise the flow of plastic through the hotend. Observing how the printer lays the skirt on the heatbed, we can also assess whether the heatbed is properly levelled and the printout will adhere properly to it.

Support (supports) – a "support" added by the designer of the model or the slicing software (3DGence Slicer) on which parts of the model suspended in the air are based. Properly made support is not a part of the model and can be easily separated from the finished printout. 3DGence Slicer generates supports automatically. The support generated by 3DGence Slicer has two parts – loosely laid material and the so-called dense support layers that directly support the model.

STL (Surface Tessellation Language) – one of the basic 3D file formats. It describes only the arrangement of the vertices of the triangles creating the model and the sense of the normal of these triangles. It does not contain information on colour, materials, textures and other graphic elements included in other, more elaborate 3D file formats. Originally implemented by 3D Systems as a file format native to the stereolithography.

Knurl – part of extruder driven directly by stepper motor. It enables precise dosing of the plastic wire to the printer nozzle thanks to a concave and sharp serrated cavity that "bites" into the plastic wire. The clamp is the element that closely cooperates with the knurl and ensures proper contact of the knurl with the filament.

Warping – negative phenomenon occurring during FFF 3D printing and concerning mainly the materials with high thermal shrinkage. This causes the extreme elements of the printout, most frequently corners, to detach from the heatbed. Warping is prevented by heated heatbed and working chamber of the printer.

3DGence Sp. z o.o.
Przyszowice Office ul. Graniczna 66, 44-178 Przyszowice +48 32 438 98 64 support@3dgence.com