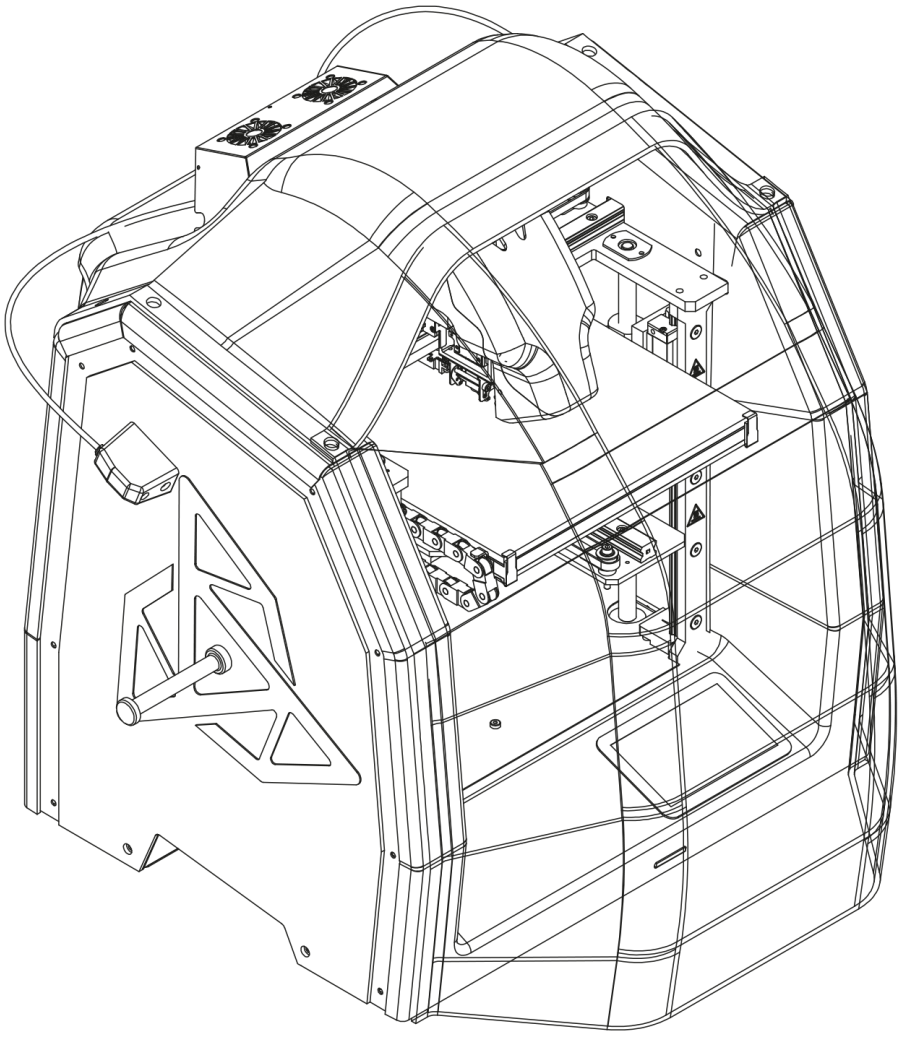
USER'S MANUAL

3DGence DOUBLE P255



Contents

I INTRODUCTION

1. INTRODUCTION

Thank you for choosing 3DGence DOUBLE P255 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 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 DOUBLE P255 printer, the user must read the entire User's Manual and accept the instructions and exceptions included in the User's Manual.

2. PRINTING MATERIALS

FFF technology (Fused Filament Fabrication) used by 3DGence DOUBLE P255 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 DOUBLE P255 printer uses the filament with the diameter of 1.75 mm.

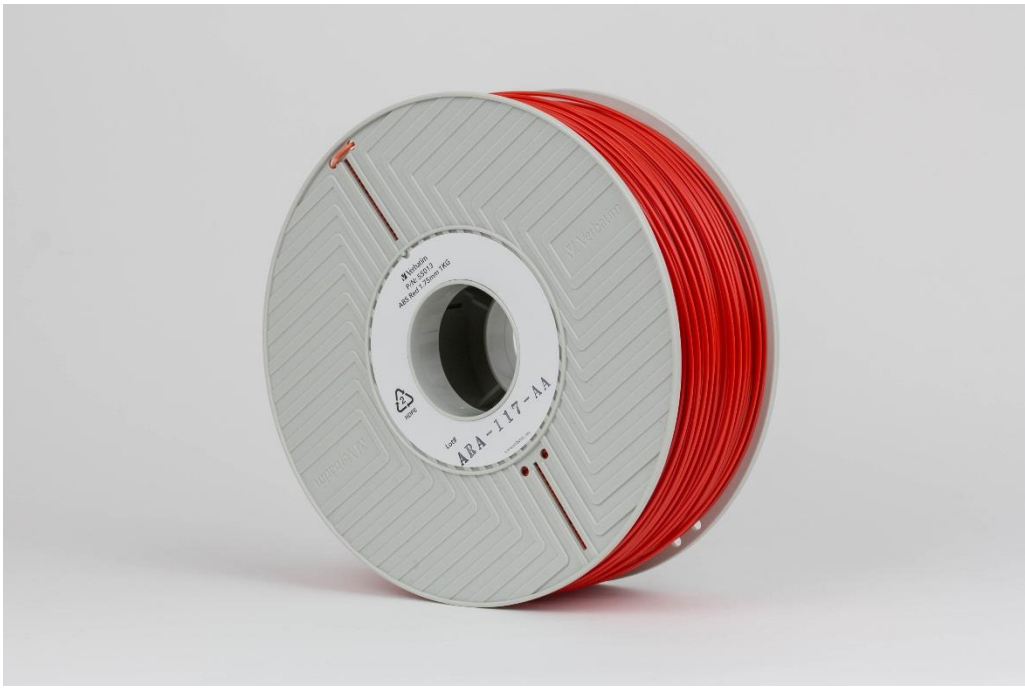


Fig. 1 Filament spool

3DGence DOUBLE P255 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 geometrically complex models that require soluble support structures,
- print two-colour models,
- print functional models that combine characteristics of two specific materials in the required manner.

3DGence DOUBLE P255 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 DOUBLE P255 printer.

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 DOUBLE P255 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.

3.1. Auxiliary symbols used in the User's Manual

Throughout this User's Manual the following symbols are used. They identify the situations that are potentially dangerous to health or may cause damage to the printer. Always adhere to the warning symbols. Negligence may cause the printer's damage excluded from the guarantee cover as well as bodily injuries.

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

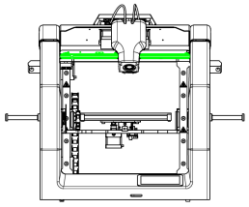
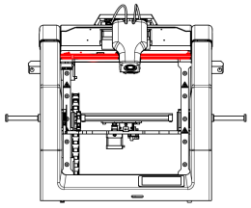
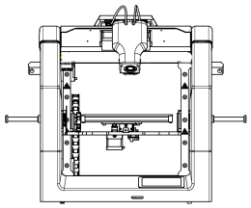
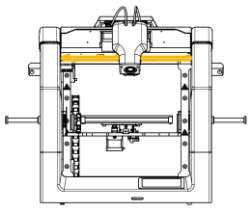
ATTENTION:
The situation or procedure described is potentially dangerous and it may result in damage to the printer. Exercise care.

PROTECTION:
Protective gloves, delivered with the printer, must be worn when performing the activities described. Put on protective gloves before performing these activities.

3.2. The printer's backlight indications

3DGence DOUBLE P255 printer is equipped with LED backlight located under the printer's upper plate. The LED backlight illuminates the printout during the printer operation and is also a form of signalling device. The description of all backlight colours and their meanings is given below (table 1).

Tab. 1 Meaning of backlight colours in 3DGence DOUBLE P255 printer

COLOUR	MEANING
Green 	Safe temperature of the heatbed (below 40°C). After completed printing, the printout can be safely unloaded.
Red 	Heatbed temperature exceeds 40°C. Do not touch the heatbed – there is a risk of burns. After completed printing, do not remove the printout from the heatbed until the backlight turns green.
White 	The printer is working. The heatbed is hot - do not touch it. There is a serious risk of burns.
Yellow 	Failure of the heating devices. If the hotend has been installed correctly, immediately disconnect the printer from power supply and contact the service department.

The backlight colour indicates the heatbed temperature not the hotend temperature! The hotend temperature is shown only on the display!

4. SAFETY MEASURES

The information below describes the correct operating conditions of 3DGence DOUBLE P255 printer. Failure to comply with the indications and contraindications may significantly reduce the life of the printer, violate the guarantee 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) and residual – current device to avoid electric shock in the event of a malfunction of the device,

- 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 hotend 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 hotend or the hotend area during the printer operation - there is a risk of facial burn injuries,
- touch live parts,
- touch linear guides and trapezoid bolts during the 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 in a room with children or animals,
- disassemble the printer or hotends; make unauthorized repairs – the printer or hotends may get damaged.

Adhere to the following instructions:

- use only earthed power sources (to avoid electric shock),
- 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 the hotend 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,
- each time before starting the printer, carefully inspect the direct vicinity of the printer and remove all obstacles and contaminations with which the printer could collide or which could in any way hinder the free movement,
- guarantee free access to the printer for the operator, throughout the printer operation.

Heated heatbed and hotends remain hot even after completed printing. Check their temperature on the display before touching them (fig. 2) or wait at least 30 minutes after switching the printer off (e.g. in order to clean or remove the model, change the hotend, etc.)

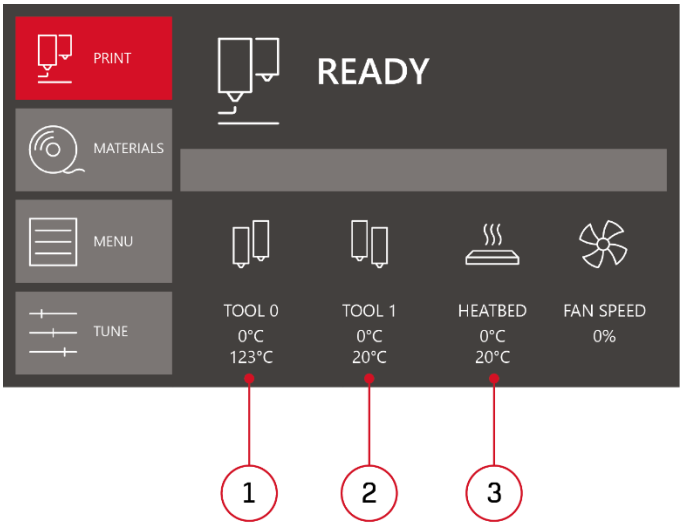


Fig. 2 Temperature indications for: 1, 2. hotends | 3. heatbed

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 handles designated for this purpose (fig. 3); 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 (about 25 kg).

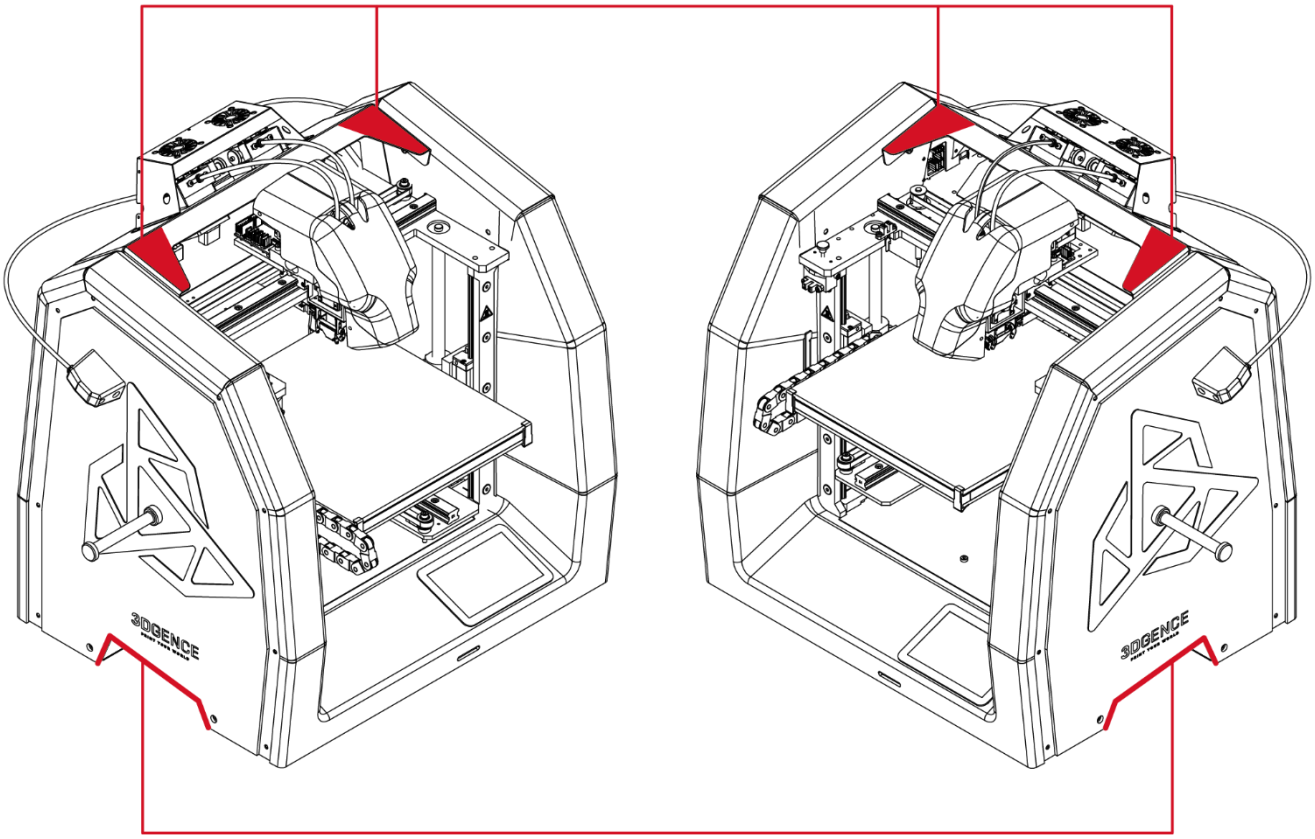


Fig. 3 Locations of handles for printer handling

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 and working range of the axes (fig. 4, 5),
- keep the printer away from other heat sources and draughts,
- the printer's installation place should be equipped with a 230V/50Hz mains socket (110V version for the USA market),
- uninterruptible power supplies (UPS) should be used in order to ensure that the printing process is not stopped in case of instantaneous current decay.

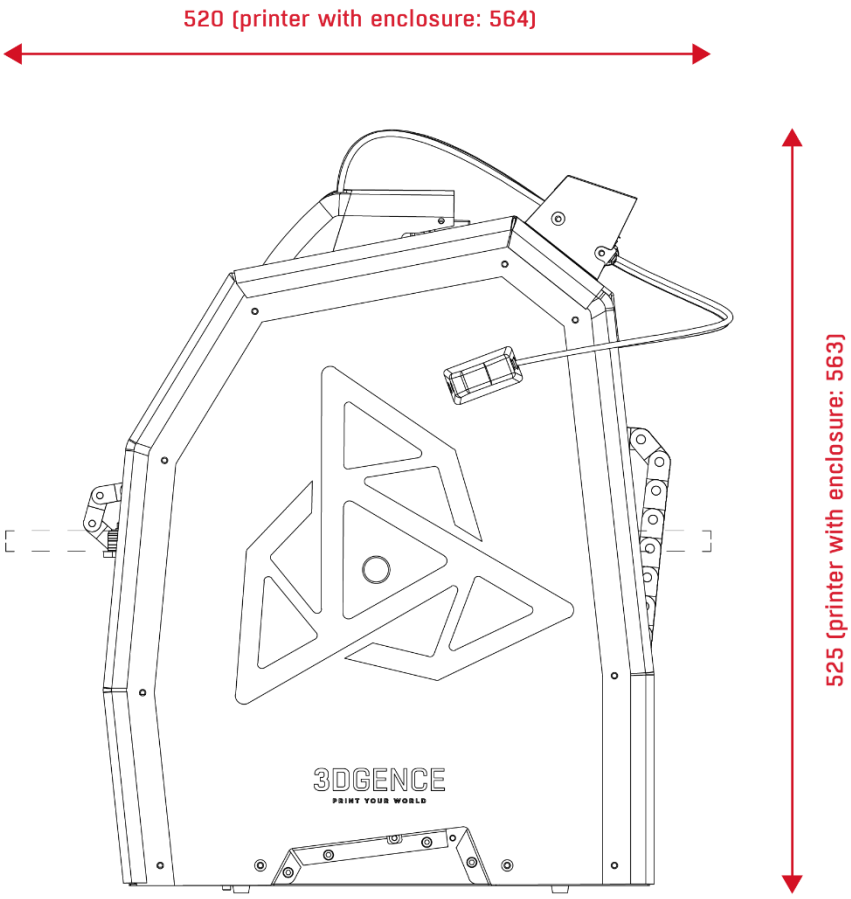


Fig. 4 The maximum dimensions of the printer taking into account the extreme positions of the heatbed – right side view

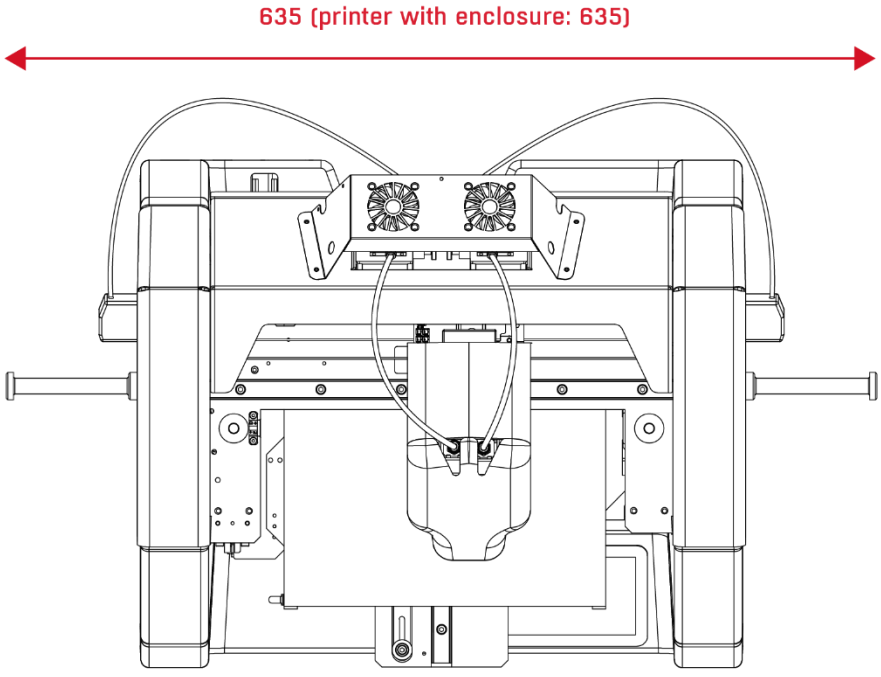


Fig. 5 The maximum external dimensions of the printer – overview

4.3.1. Specification of connection

The electrical characteristics of the 3DGence DOUBLE P255 are shown below (tab.2.3). The connection should be adapted to the given values.

- **DOUBLE P255 printers with a serial number that begins with the symbol: DOUB**

(the printer's serial number is located on a sticker located on the back of the printer and it is preceded by the symbol: S/N).
Voltage: 220-230V AC;
Frequency: 50-60 Hz;
Network with a protective earth lead (PE), protected with a fuse of a rated current intensity not less than 16A;
Rated power consumption: 600 W (maximum instant power consumption: 1.9kW);
Current intensity: ~2,6 A (8 A).

Tab. 2 Electrical characteristics of devices with a serial number beginning with the "DOUB" symbol

Working condition	Power consumption of the device
Standby	4 W
Warming up	500 W
Printing	120 W
Maximum instant power consumption	1900 W

- **DOUBLE P255 printers with a serial number that begins with the symbol: DOUBA**

(the printer's serial number is located on a sticker located on the back of the printer and it is preceded by the symbol: S/N).
Voltage: 110V AC;
Frequency: 50-60 Hz;
Network with a protective earth lead (PE), protected with a fuse of a rated current intensity not less than 16A;
Rated power consumption: 600 W;
Current intensity: ~5 A.

Tab. 3 Electrical characteristics of devices with a serial number beginning with the "DOUBA" symbol

Working condition	Power consumption of the device
Standby	4 W
Warming up	500 W
Printing	120 W
Maximum instant power consumption	600 W

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 printing module manually to the left and to the right and by moving the heatbed manually forwards and backwards;
- confirm that the Z axis breaker (fig. 6) 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 and heatbed properly. To do this, start heating the hotends and heatbed and check that temperature indications on the LCD screen increase. A problem exists if **def** value is displayed;
- immediately before starting the printer, make certain that no person or undesirable object is within the printer's working range.

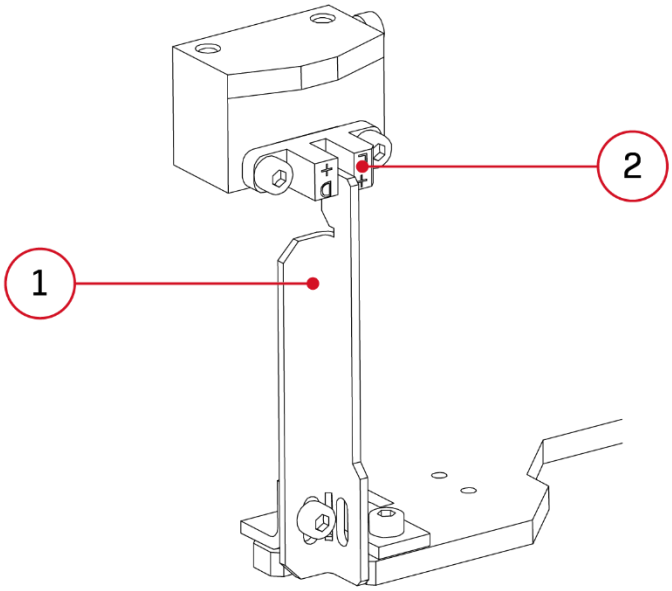


Fig. 6 1. Z axis breaker | 2. Z axis endstop - in its correct home position

II PRINTER DESCRIPTION

1. DESIGN OF PRINTER

The figures together with the descriptions of the major printer's components are presented below in order to facilitate the operation of 3DGence DOUBLE P255 printer and make it easy to understand the instructions included in the User's Manual (fig. 7-10). Please, refer to the figures and descriptions in order to better understand the 3D printing terminology.

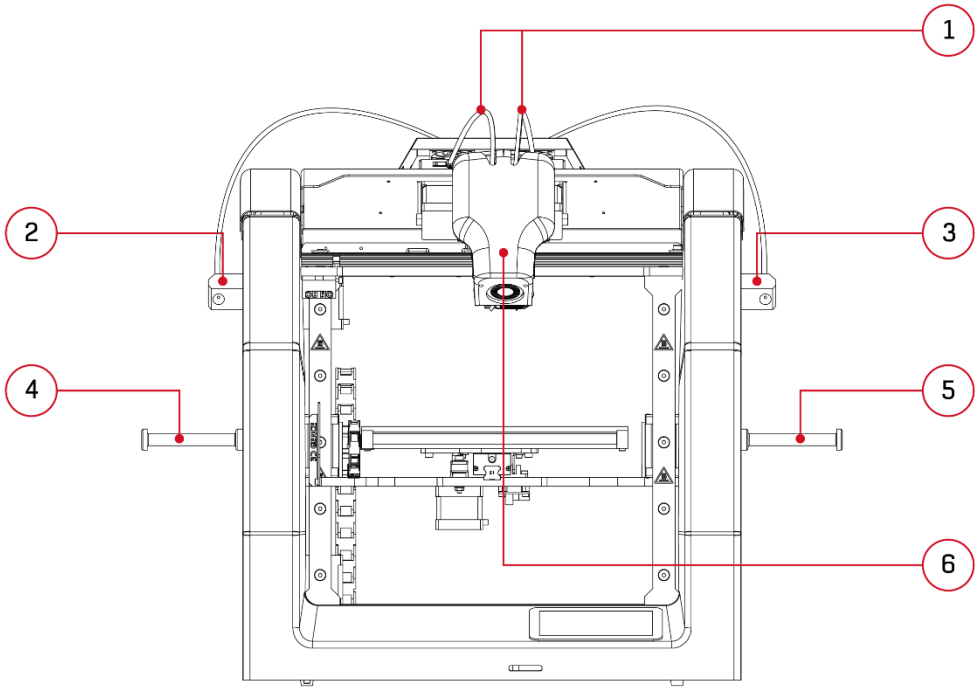


Fig. 7 3DGence DOUBLE P255 printer – front view.
1. Bowden tubes | 2. Filament sensor T0 | 3. Filament sensor T1
4. Spool holder T0 | 5. Spool holder T1 | 6. Printing module

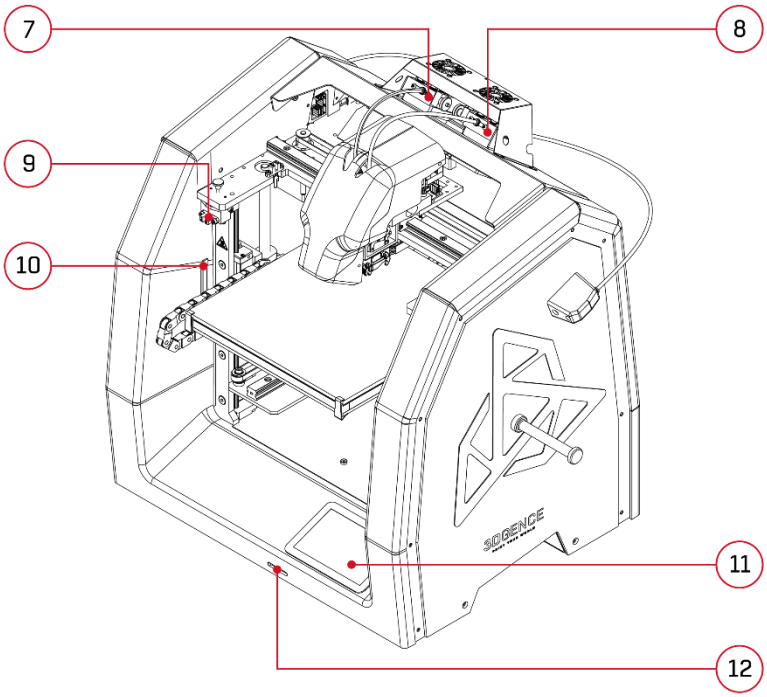


Fig. 8 3DGence DOUBLE P255 printer - front isometric projection:
7. Extruder T0 | 8. Extruder T1 | 9. Z axis endstop
10. Z axis breaker | 11. Display | 12. SD card slot

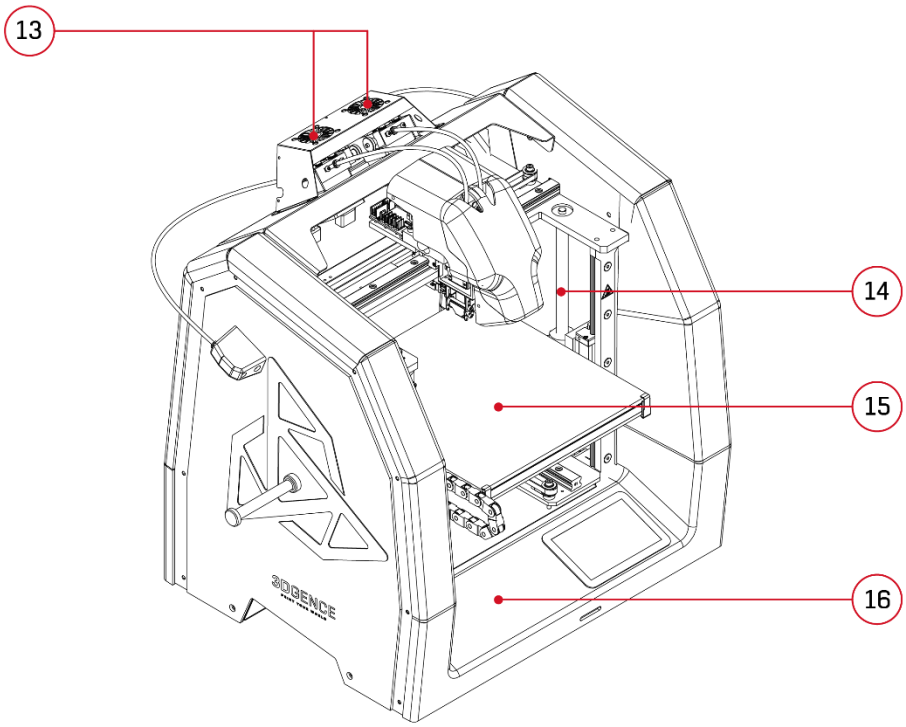


Fig. 9 3DGence DOUBLE P255 printer - front isometric projection:
13. Extruder cooling fans | 14. Trapezoid bolt | 15. Heatbed
16. Cable carrier (Y axis)

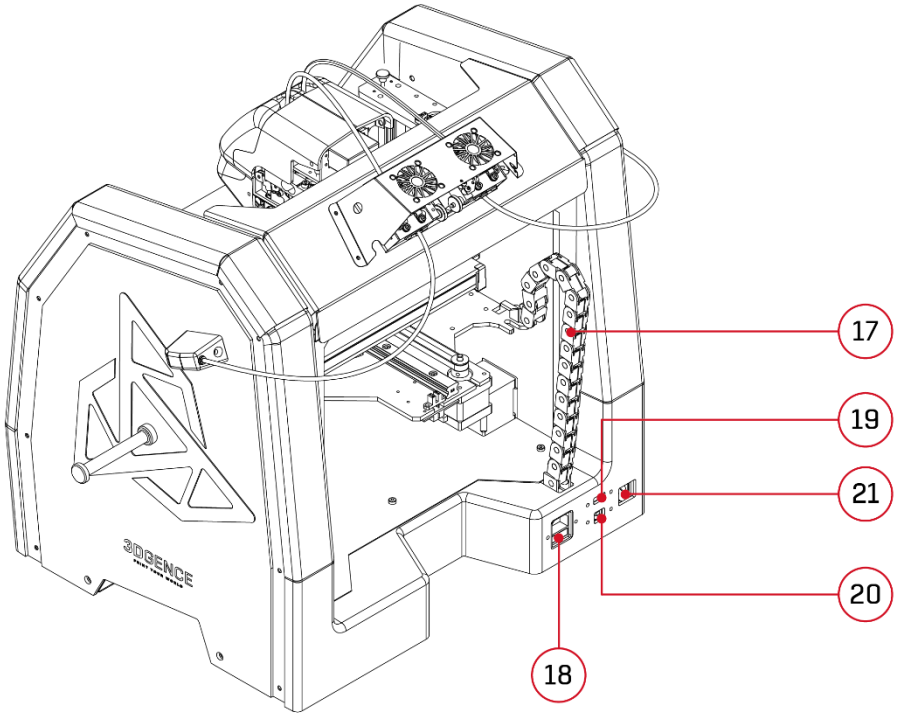


Fig. 10 3DGence DOUBLE P255 printer - rear isometric projection:
17. Cable carrier (Z axis) | 18. Mains power supply socket
19. USB port A | 20. USB port B | 21. Printer switch

1.1. Kinematic system

The printer works in the Cartesian robot's kinematics. The dual hotend module moves along X axis (to the left - to the right). The printer's heatbed moves along Y axis (forwards – backwards) and along Z axis (up – down). The designation of the printer axes is shown in fig. 11. Dimensions of available printer's working space:
X: 190 mm,
Y: 255 mm,
Z: 195 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.

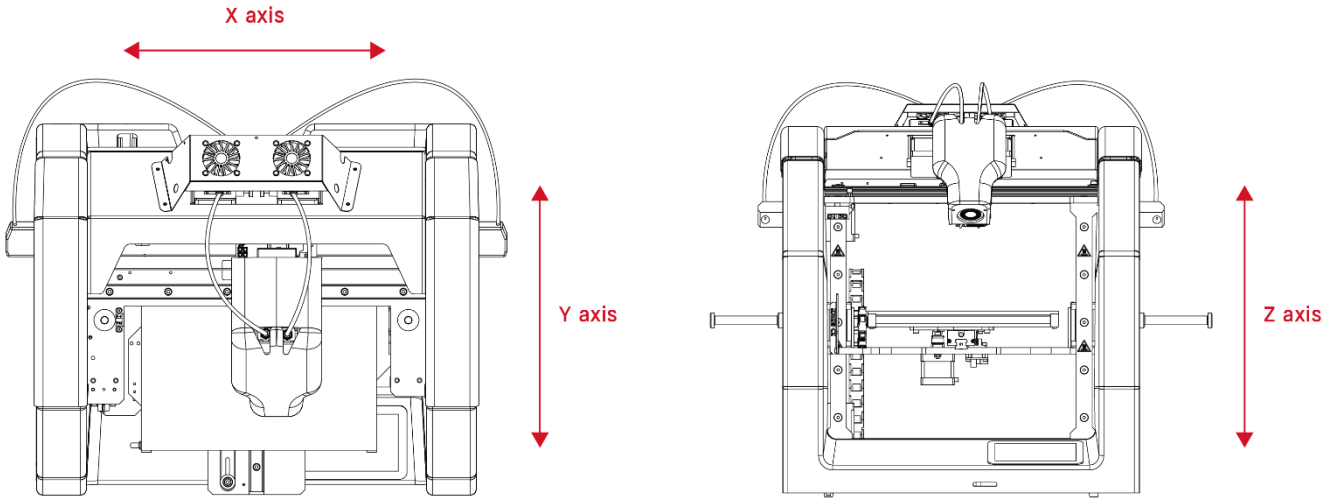


Fig. 11 Designation of 3DGence DOUBLE P255 printer axes

1.2. Heatbed

The printer's heatbed moves along Y axis and Z axis (fig. 12). The entire heatbed is marked with a lighter colour. The darker colour marks the actual printing area. The difference between the heatbed area and the actual printing area in X axis results from the use of the dual hotend system. Made of ceramic plate, the heatbed guarantees good printout adhesion even for several dozen hours of continuous operation of the printer.

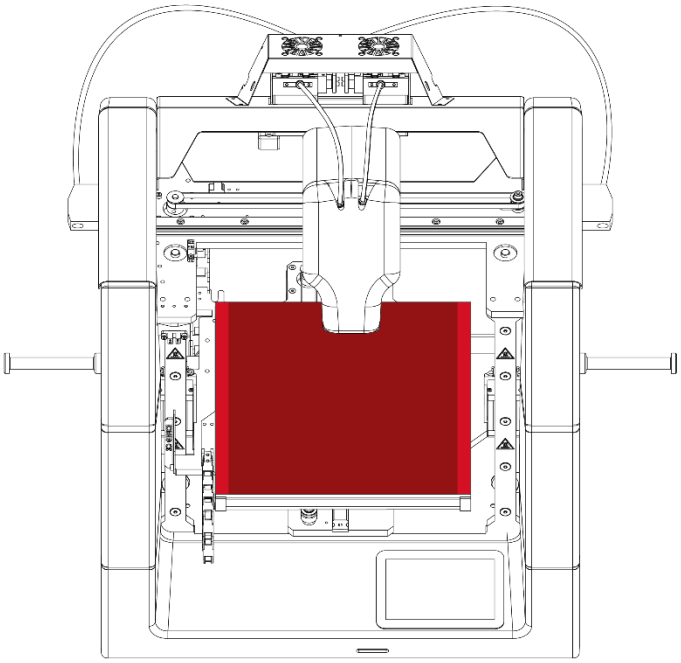


Fig. 12 Heatbed of 3DGence DOUBLE P255 printer

1.3. Extruders

3DGence DOUBLE P255 printer is equipped with two material extruding systems (Bowden type extruders) (fig. 13). They are located on the printer's top, behind the dual hotend module. Extruder T0 (Tool 0) is responsible for feeding the base material to hotend T0, while extruder T1 (Tool 1) is responsible for feeding the supporting material to hotend T1. Tool 0 extruder is located on the left side of the user facing the printer (fig. 13). More information on loading the materials and operation of extruders can be found in chapter III, point 4.

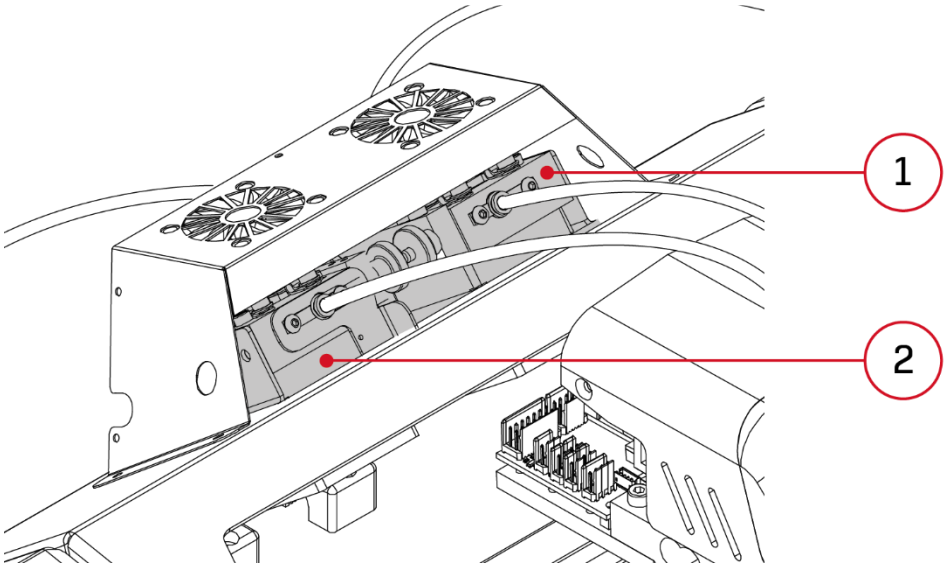


Fig. 13 Extruders of 3DGence DOUBLE P255 printer 1. Extruder T1 | 2. Extruder T0

1.4. Dual hotend module

3DGence DOUBLE P255 printer is equipped with two hotends installed in the dual hotend module (fig. 14). The module contains the hotend change system for quick assembly and disassembly of hotends having various sizes and purposes. The module contains also the printout cooling system. Detailed description of the module is included in chapter VI.

ATTENTION:
The dual hotend module contains moving, sharp and hot elements. Do not touch the module during printer operation.

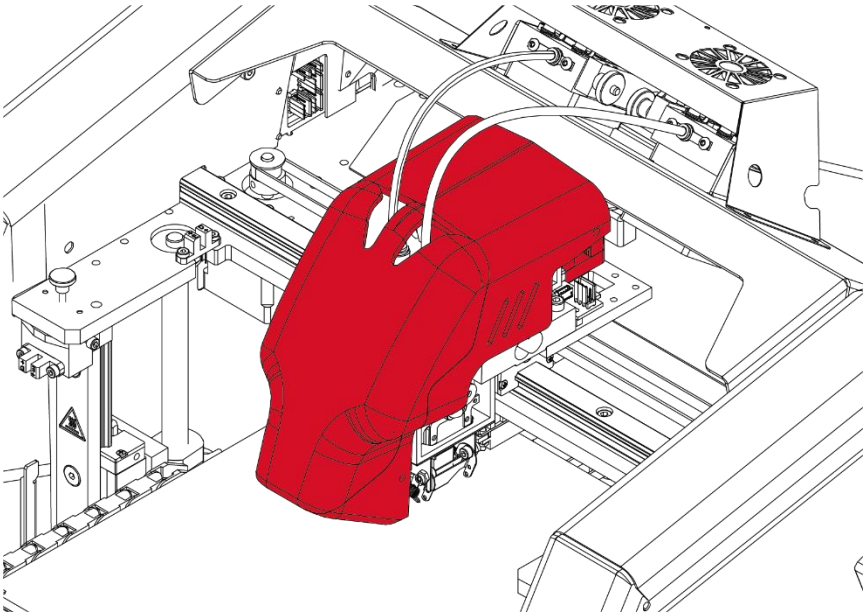


Fig. 14 Dual hotend module of 3DGence DOUBLE P255 printer

1.5. Printer's power supply management

The printer's main switch is located at the back of the printer (fig. 15). To start the printer, set the switch to the upper position (ON).

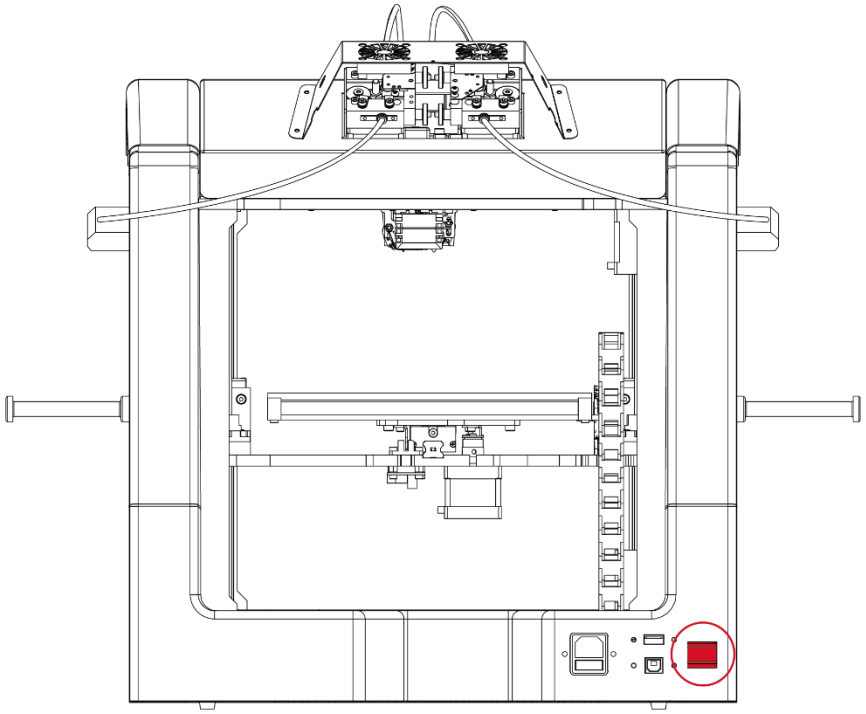


Fig. 15 . Switch of 3DGence DOUBLE P255 printer - rear view

2. SET OF PRINTER'S ACCESSORIES

3DGence DOUBLE P255 printer is delivered together with the set of consumables and the set of necessary accessories and enclosure. The box includes:

- 3DGence DOUBLE P255 printer,
- SD memory card,
- power lead,
- USB cable,
- two bowden tubes,
- two spool holders,
- Dimafix adhesive stick,
- additional accessories,
- PLA filament spool,
- BVOH filament spool.

3. USER INTERFACE

3DGence DOUBLE P255 printer is equipped with a 4.3-inch colour touch screen located on the right side of the printer's front panel (fig. 8, point 11). This is the printer's communication interface with a transparent graphic menu. The user menu structure changes depending on the printer working status.
The menu architecture diagram is shown in chapter II, point 3.3.

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. 16).

Fig. 16 Start screen

Then, the display shows the printer's main menu in idle state (fig. 17).

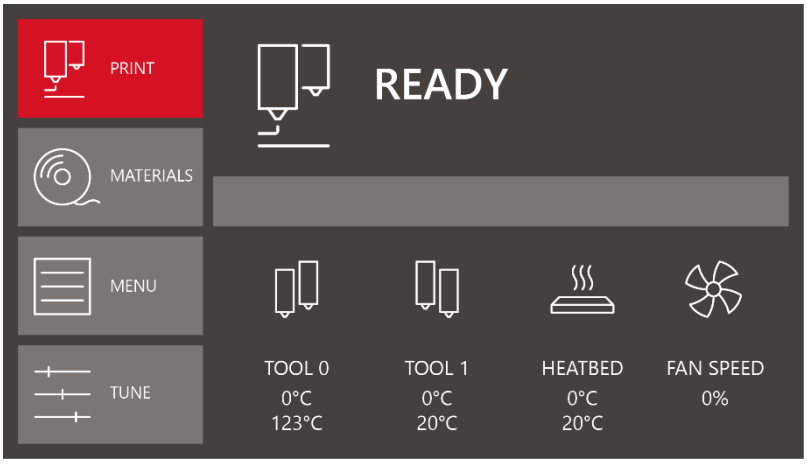


Fig. 17 The printer's main menu in idle state

In the lower part of the main panel there are fields containing information on temperatures and status of the printout cooling fans (fig. 18).

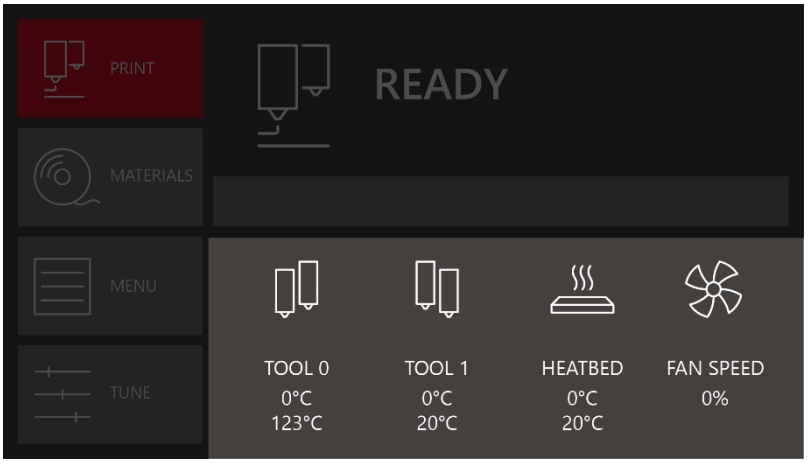


Fig. 18 Control panel for temperatures and status of cooling fans

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).
Fan speed – percentage of current power of printout cooling fans.

The left panel of the idle state menu contains four function keys (fig. 19).

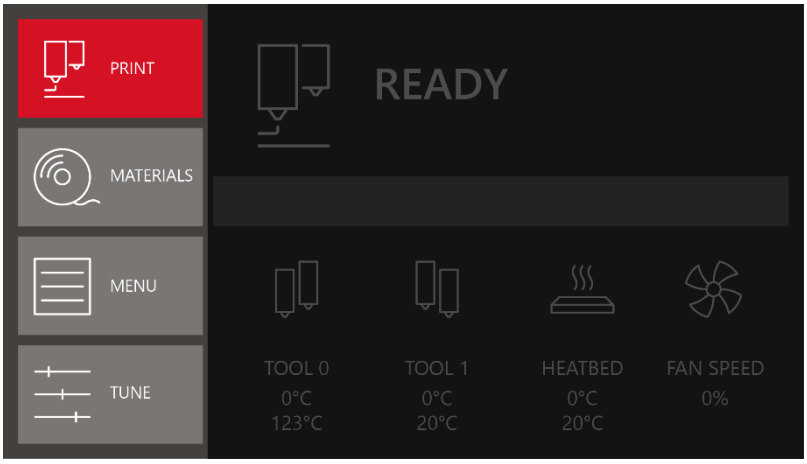


Fig. 19 The left panel of the main idle state menu

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. 20).

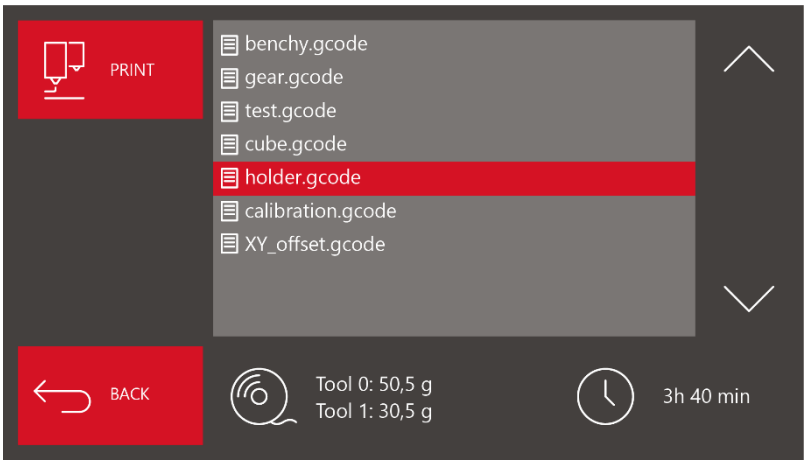


Fig. 20 SD card manager screen

To scroll the list of files, use the arrows on the right. 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 model is available – separately for model material and support material. When the *PRINT* key is pressed, the process of printing the indicated file starts.
BACK – return to main MENU.

MATERIALS – displays the screen with information and options related to loading, unloading and change of consumables (fig. 21).

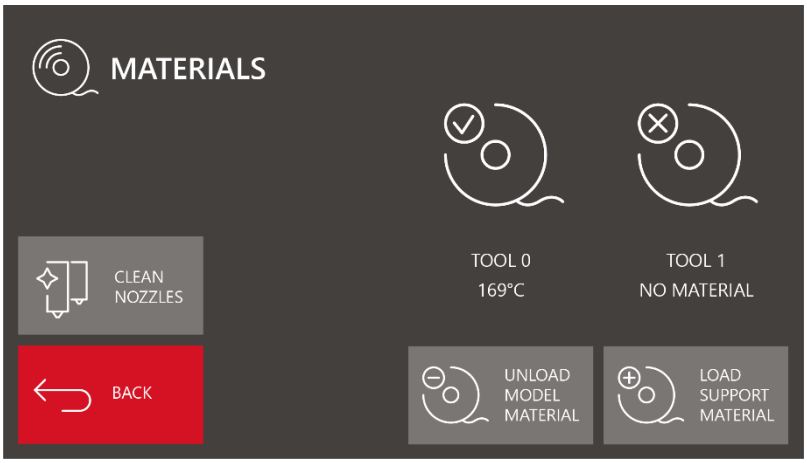


Fig. 21 MATERIALS menu screen

The information on consumables is displayed on the right side of the screen. TOOL 0 (on the left side) is the base material (MODEL MATERIAL), while TOOL 1 (on the right side) is the support material (SUPPORT MATERIAL).
In the example shown in fig. 21, the material for TOOL 0 is loaded (this is indicated by ✔ icon next to the material spool graphic symbol and the material loading temperature); UNLOAD MODEL MATERIAL option is active in this case. No material is loaded for TOOL 1 (this is indicated by ✖ icon next to the material spool graphic symbol and NO MATERIAL message) – LOAD SUPPORT MATERIAL option is active.

Load model material / load support material – choose this option to start the material loading manager (more information can be found in chapter III, point 4.1).
Unload model material / unload support material – choose this option to start the material unloading manager (more information can be found in chapter III, point 4.2).
Clean nozzles – if this option is selected, a test-extrusion of filament will be performed first by TOOL 0 and then by TOOL 1. This option is particularly useful when the user has to change the material or remove the remains of old filament or if the hotend has not been used for a long time and is slightly clogged. The automatic hotend cleaning assistant is available during printing and in the idle mode.
Back – return to main MENU.

TUNE - enables precise modifications of basic printing parameters (fig. 22).

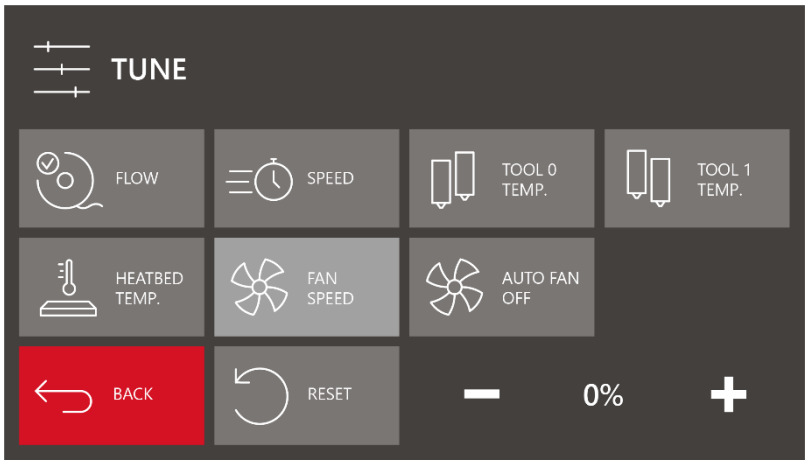


Fig. 22 TUNE menu screen

Selecting a given parameter control option activates the value selection panel in the lower right corner of the screen. The value can be modified using – / + keys. The *RESET* key restores the default value.

Flow – percentage value of amount of fed material. 100% is the default amount of extruded material. The values should not be changed by more than +/- 5%.
Speed – percentage value of printing speed. 100% is the default printing speed.
Tool 0 temp. - this key makes it possible to set any temperature for the hotend of extruder 0 within the range of 185 - 270°C.
Tool 1 temp. - this key makes it possible to set any temperature for the hotend of extruder 1 within the range of 185 - 270°C.
Heatbed temp. – this key makes it possible to set any temperature for the printer's heatbed within the range of 40-160°C.

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.

Fan speed - this screen enables smooth adjustment of current power of the printout cooling fans within the range of 1% - 100%.
Auto fan on/off – the option is active by default (on). If this option is deactivated (off), the setting of the fans will be in compliance with the power set in the printer and the commands resulting from the machine code will be ignored.
Back – return to main MENU.

MENU – activates the advanced options screen of 3DGence DOUBLE P255 printer (fig. 23).

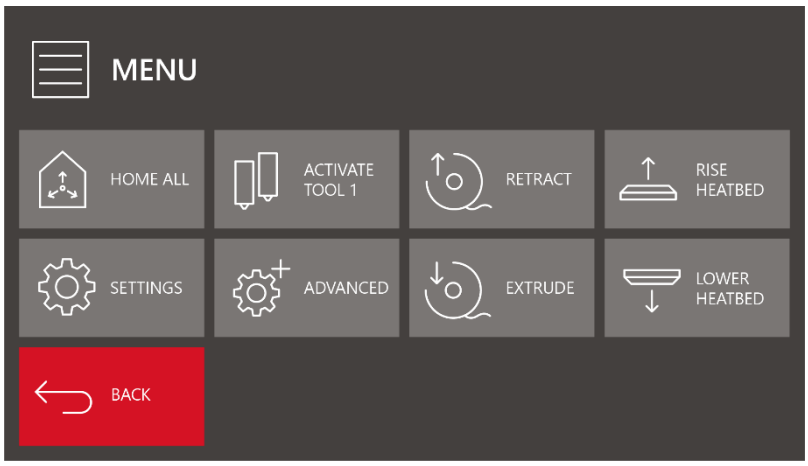


Fig. 23 Advanced options MENU screen

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

ATTENTION: do not use HOME ALL option when there is a printout or another object on the heatbed. This may cause damage to the printer!

Activate tool 0 / Activate tool 1 – choose this option to activate the hotend the number of which is on the key. Example: If this option is selected when the key displays "*ACTIVATE TOOL 0",* the TOOL 0 hotend will be set in active position and the key will display "*ACTIVATE TOOL 1".*

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

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

Rise heatbed – press and hold the key to move the heatbed smoothly up. Press the key once to move the heatbed at a short distance.activates. The upward movement is limited by the Z axis endstop. If T1 hotend is active, first the hotend will be changed to T0.

Lower heatbed – press and hold the keys to move the heatbed smoothly down. Press the key once to move the heatbed at a short distance.

ATTENTION: the heatbed downward movement by means of *LOWER HEATBED* option is unlimited! Take special care when using this option to prevent the collision of the heatbed with the printer's lower plate.

Settings – used for basic configuration of 3DGence DOUBLE P255 printer (fig. 24).

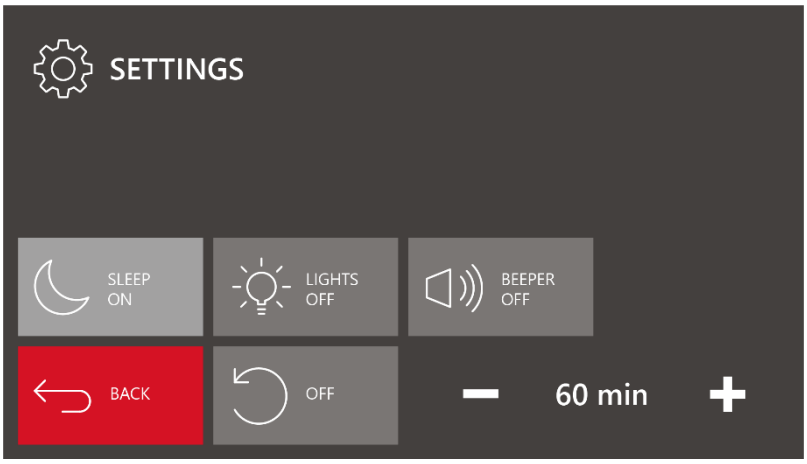


Fig. 24 SETTINGS menu screen

Sleep ON/OFF – 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 and the working lights are off.

Lights on/auto/off – settings of the lights of the printer's working field. By default, the lighting, in the form of an LED strip placed above the heatbed, is on all the time. The exception is the sleep mode described above. The LIGHTS ON/OFF option makes it possible to switch on/off the working field lights. The "*LIGHTS ON*" option activates only white light. Default colours (tab. 1) can be set using the *"LIGHTS AUTO"* option.

Beeper on/off - the printer is equipped with a beeper that informs the operator that, for example, the heatbed scanning procedure has been completed. The beeper also indicates errors that are described in detail in chapter VIII, point 3. The BEEPER ON/OFF key makes it possible to switch on/off the sound signal.

Back – return to previous menu.

Advanced – management of the advanced options as well as calibration and diagnostics of 3DGence DOUBLE P255 printer (fig. 25).

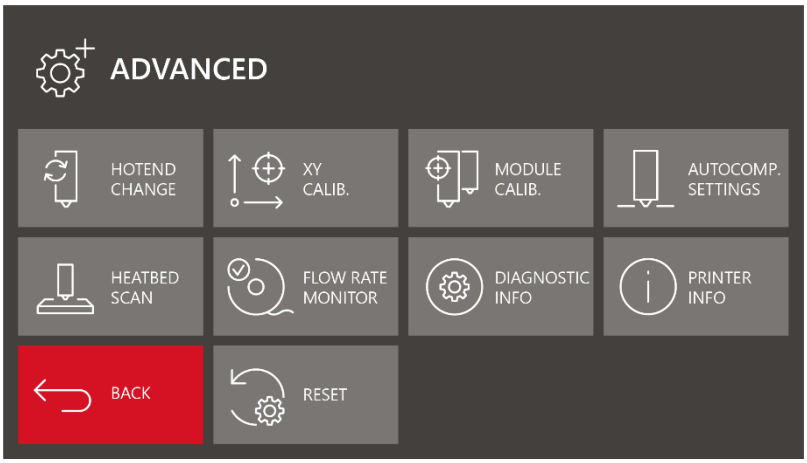


Fig. 25 ADVANCED menu screen

Hotend change - activates the hotend change manager. More information can be found in chapter VI, point 1.

Heatbed scan - this key starts the automatic heatbed calibration procedure. The procedure takes about 20 minutes. During this time, the hotend will be positioned above approximately 100 measuring points in succession. The strain gauges installed in the dual hotend module detect the heatbed surface and their readings are saved in the form of a calibration matrix in the printer memory.

Flow rate monitor - defines the sensitivity of the material flow control system. Printing will be stopped if a discrepancy between the actual amount of extruded material and the preset value is detected. The printer will display the "Material feed malfunction detected" message. This problem and its solution are described in chapter VIII, point 3. The flow rate monitor value can be set within the range from 0% (OFF) to 100%.

XY calib. - calibration of dimensional conformity along X axis and Y axis (fig. 26). The process is described in detail in chapter VIII, point 2.1.

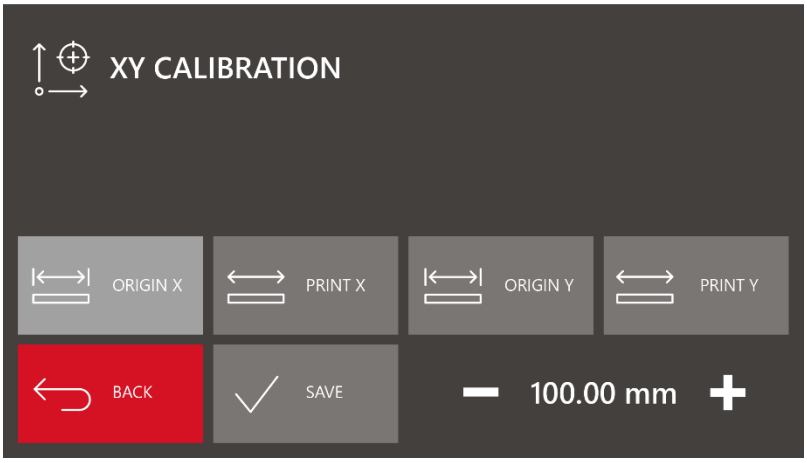


Fig. 26 XY CALIBRATION menu screen

Origin X/Y – X/Y dimension resulting from the design assumptions of the printed model.
Print X/Y – measured dimension of the printout.
Save – confirmation of changes.
Back – return to previous menu.

Module calib. - menu of calibration of dual hotend module offsets (fig. 27).

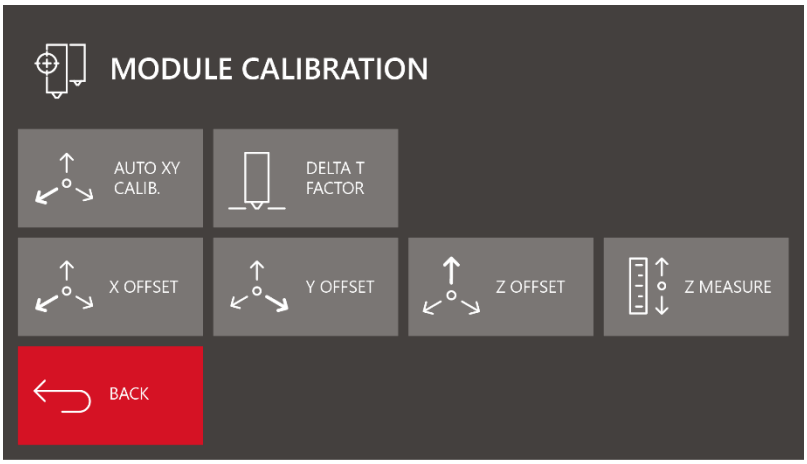


Fig. 27 MODULE CALIBRATION menu screen

Auto XY CALIB. – the option for automatic calibration of offsets between hotends in the X axis and in the Y axis. The procedure is described in chapter VIII, point 2.2.
Delta T Factor – hotend temperature correction factor. It is recommended to use it when replacing the hotend for maximum precision of temperature control by the printer. The procedure is described in chapter VI, point 1.
X/Y/Z offset – the options for adjusting the offset values of T1 hotend with regard to the global system. Correct calibration of these values is crucial for proper functioning of the dual hotend system. More information on offset calibration can be found in chapter VIII, point 2.2.
Z measure - the option used for checking and setting the correct value of Z Offset. After pressing the "*Z MEASURE*" 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 Z Offset field.
Save – confirmation of changes.
Back – return to previous menu.

Autocomp. settings - menu of printer autocompensation settings (fig. 28).

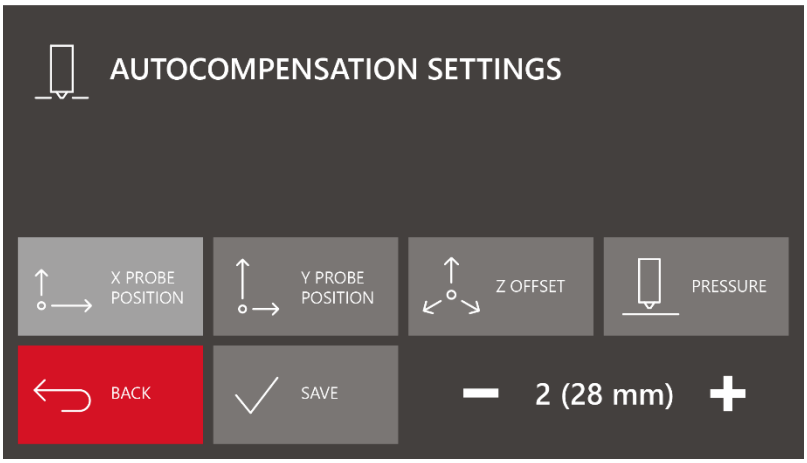


Fig. 28 AUTOCOMPENSATION SETTINGS menu screen

X probe position – 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.
Y *probe position* – 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.

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: 0.2mm
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 50 to 250. 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.
Save – confirmation of changes.
Back – return to previous menu.

Diagnostic info - activates the screen with the information on the condition of the hardware installed in the printer (fig. 29).

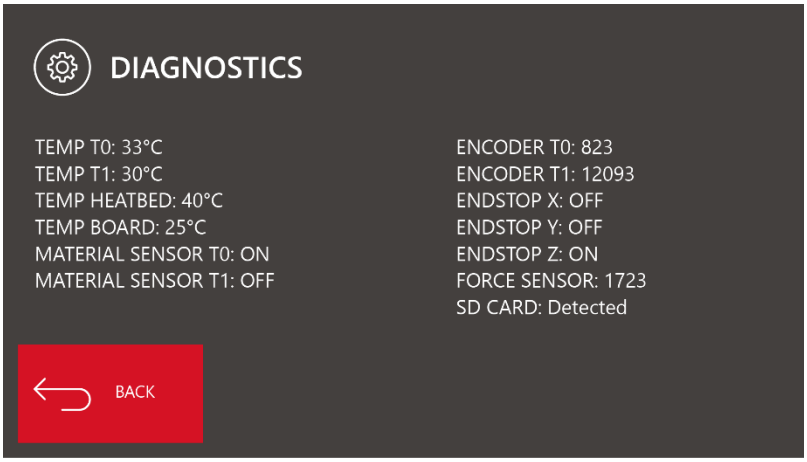


Fig. 29 . DIAGNOSTIC INFO menu screen

Temp. T0: current temperature of T0 hotend.
Temp. T1: current temperature of T1 hotend.
Temp. heatbed: current temperature of heatbed.
Temp. board: current temperature of electronic system.
Material sensor T0: status of T0 filament sensor (ON/OFF).
Material sensor T1: status of T1 filament sensor (ON/OFF).
Encoder T0: absolute position of T0 encoder.
Encoder T1: absolute position of T1 encoder.
Endstop X: status of X endstop.
Endstop Y: status of Y endstop.
Endstop Z: status of Z endstop.
Force sensor: readout of the dual hotend module's strain gauge.
Sd card: presence of SD card.

Printer info - displays the information on the printer (fig. 30).

Fig. 30 PRINTER INFO menu screen

Machine type: printer model.
Serial number: printer serial number.
Firmware: firmware version.
Build date: firmware release date.
Total printed material: total length of printed filament.
Total printed time: total printing time.

3.2. Menu during operation

The menu of 3DGence DOUBLE P255 printer changes during printing process. Some menu options available in the idle state are not available during printing. The menu structure in the working mode is shown below.
The main menu of the working printer is shown in fig. 31.

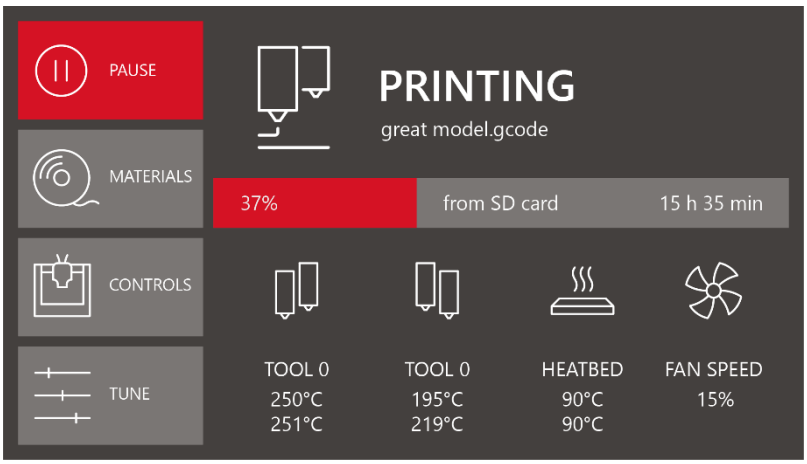


Fig. 31 The printer's main menu in the working mode

The lower part 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 left column contains the following menus:

PAUSE - the command that suspends the printing process. When the *„PAUSE"* command is used, the printer will move the hotend to the home position of X axis and Y axis. The temperatures of both hotends will be changed, i.e. reduced to 100°C. 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.

CONTROLS - activates the menu for manual control of the 3DGence DOUBLE P255 printer's functions (fig. 32). During operation, the "*RISE HEATBED*" and "*LOWER HEATBED*" commands can be often used in order to adjust the height of the first printout layer. The functions can be used when printing and during a pause in printing.

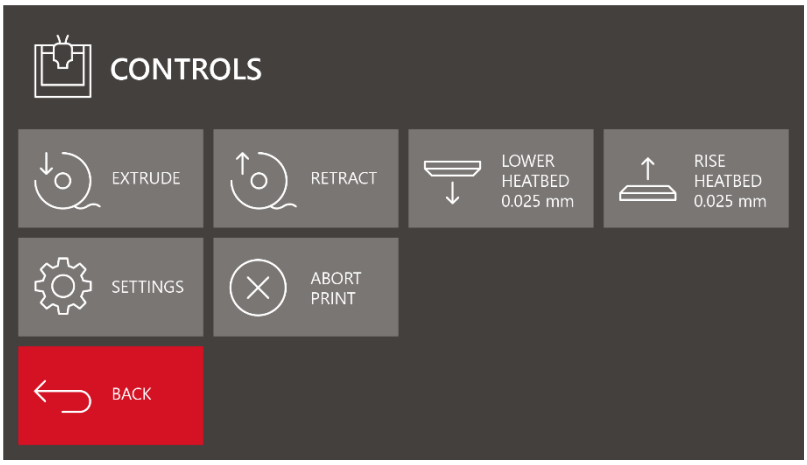


Fig. 32 Controls menu in the printer's working mode

Extrude/retract - activates the material extruding/withdrawal movement. This option applies only to the hotend in active position and can be activated only after the hotend has reached the minimum operating temperature (similarly as in the idle mode).

Lower heatbed 0.025/rise heatbed 0.025 - press the key once to move the printer's heatbed down (increase the distance from the hotend by 0.025 mm) or up (decrease the distance from the hotend by 0.025 mm). The key is useful when adjusting the adhesion of the first printout layer. The printer's operation is not affected by keeping the key pressed.

Settings - used for configuration of 3DGence DOUBLE P255 printer. The working mode menu corresponds to the idle mode menu (fig. 24).

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. Printing will be stopped after a few seconds (after the last commands in the printer's buffer have been executed).

ATTENTION: when "*ABORT PRINT*" command is selected, the following message will be displayed "*Are you sure you want to continue?*". If "*YES*" key is pressed, the interrupted printing process can not be resumed.

Back – return to main menu.

MATERIALS – displays the screen with information and options related to loading, unloading and change of consumables (fig. 21). The *MATERIALS* menu in the working mode is similar to that in the idle mode. The only difference is that the UNLOAD MODEL/SUPPORT MATERIAL key is replaced by the CHANGE MODEL/SUPPORT MATERIAL key.

TUNE - enables precise modifications of basic printing parameters. The *TUNE* menu in the working mode is the same as the *TUNE* menu in the idle mode (fig. 22).

Flow – percentage value of amount of fed material. 100% is the default amount of extruded material. The values should not be changed by more than +/- 5%.
Speed – percentage value of printing speed. 100% is the default printing speed.
Tool 0 temp. - this key makes it possible to set any temperature for the hotend of extruder 0 within the range of 185 - 270^{o}C. In the case of inactivity longer than 3 minutes, the heating will be automatically turned off.
Tool 1 temp. - this key makes it possible to set any temperature for the hotend of extruder 1 within the range of 185 - 270^{o}C. In the case of inactivity longer than 3 minutes, the heating will be automatically turned off.
Heatbed temp. – this key makes it possible to set any temperature for the printer's heatbed within the range of 40-160°C.

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.

Fan speed - this screen enables smooth adjustment of current power of the printout cooling fans within the range of 1% - 100%.
Auto fan on/off – the option is active by default (on). If this option is deactivated (off), the setting of the fans will be in compliance with the power set in the printer and the commands resulting from the machine code will be ignored.
Back – return to main MENU.

3.3. 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 following menus are shown below:

- main menu in the idle mode (fig. 33),
- advanced options menu (fig. 34),
- main menu in the working mode (fig. 35).

MAIN MENU (IDLE)

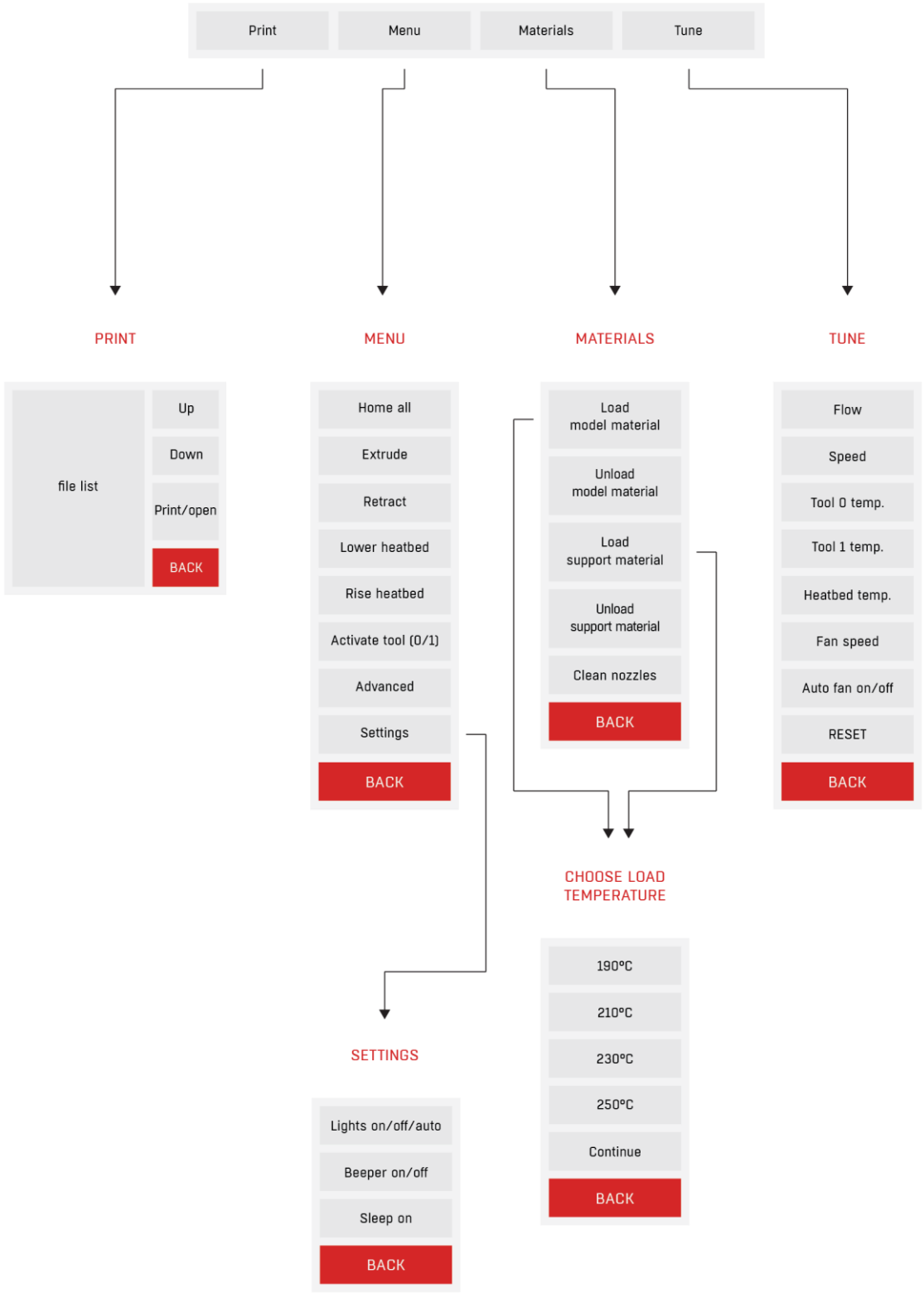


Fig. 33 Main menu structure in the idle mode

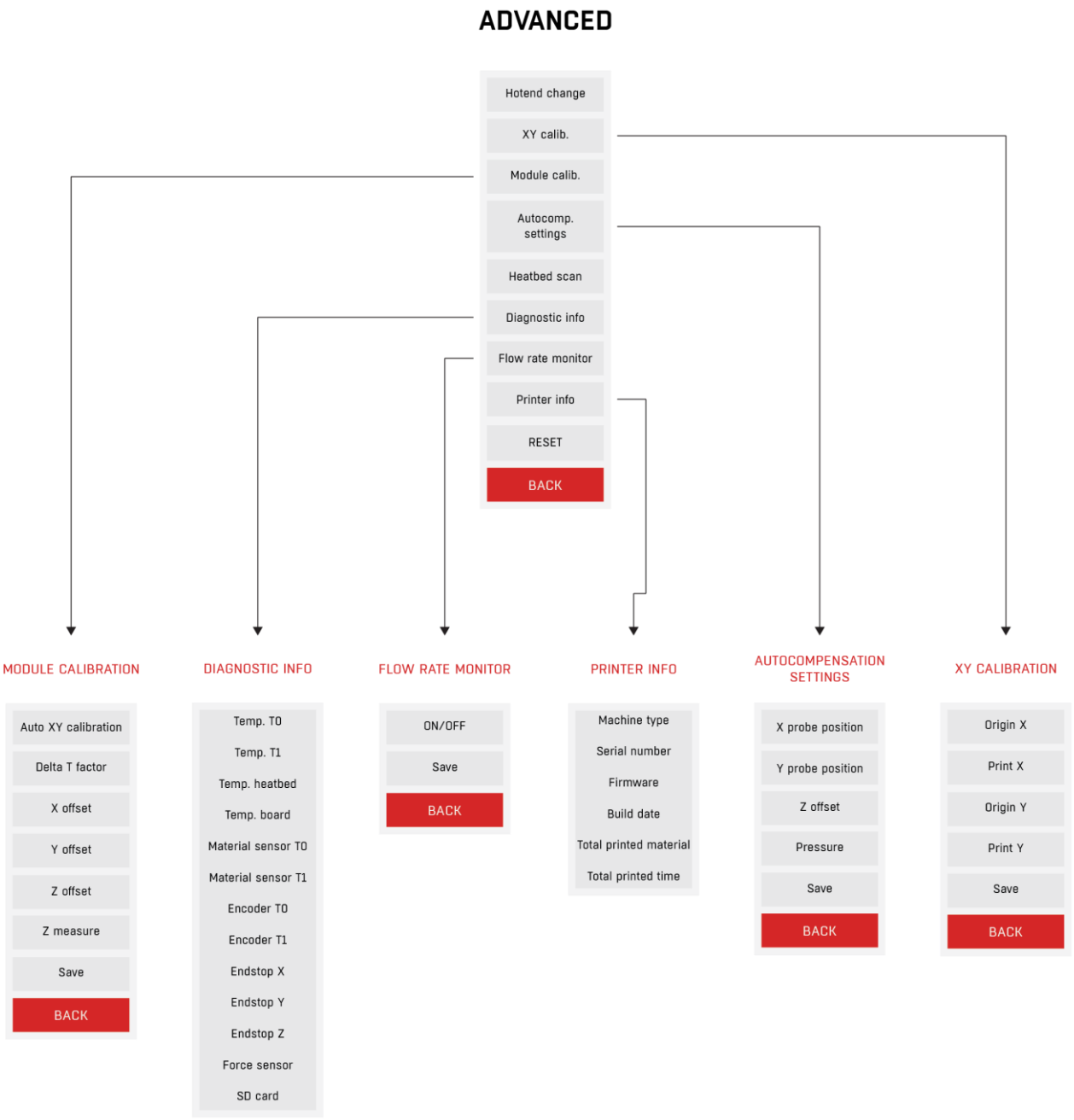


Fig. 34 *Advanced menu structure*

MAIN MENU (ACTIVE)

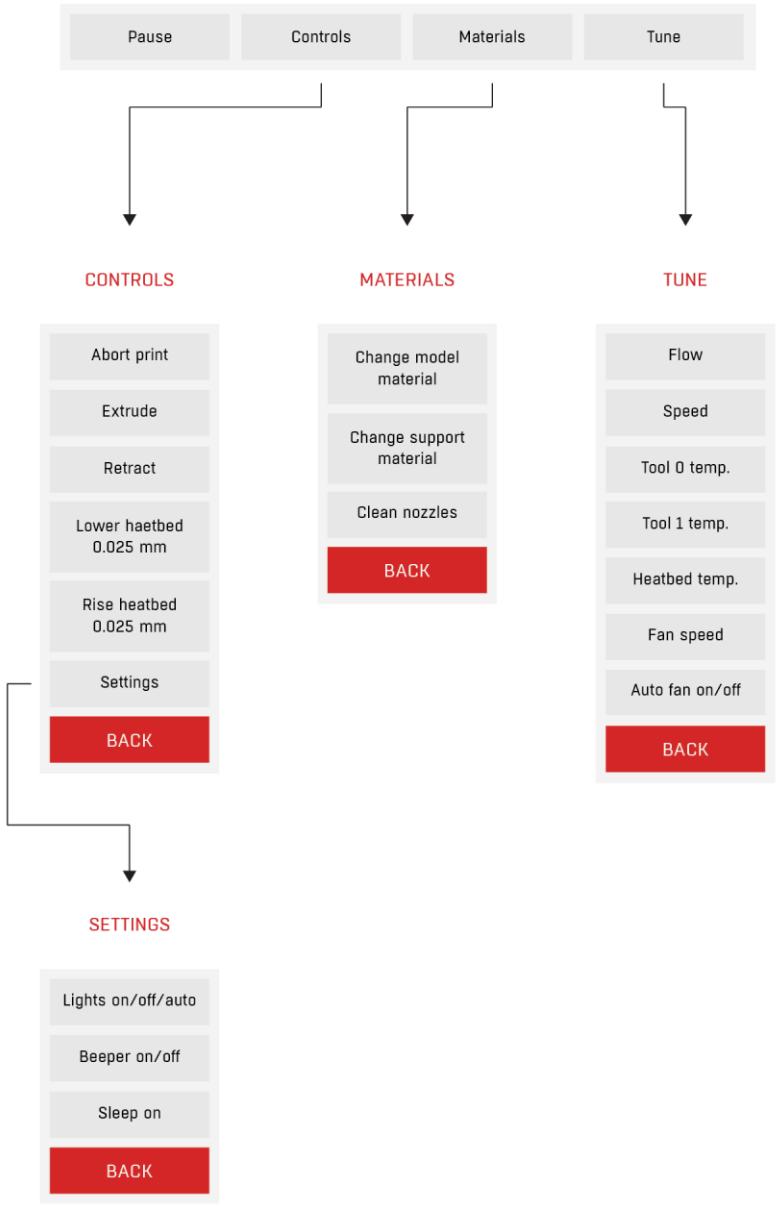


Fig. 35 Main menu structure in the working mode

III PREPARATION FOR WORK

1. FIRMWARE UPDATE

No additional drivers are required to be installed for 3DGence DOUBLE P255 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. Updating the firmware

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 port B on the printer (fig. 10).
3. Connect USB cable to USB port on the computer.
4. Switch the printer on.
5. Wait for the new hardware installer to finish working if it was automatically started.
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 Security -> 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. Disconnect USB cable from the printer and restart the printer.

2. UNPACKING AND STARTING THE PRINTER

The detailed instructions for unpacking and starting the printer for the first time can be found on "Quickstart" card attached to the printer.
ATTENTION: The printer may be connected only to a supply network that meets the requirements described in chapter I, point 4.3.1.

2.1. Unpacking the printer

3DGence DOUBLE P255 printer is protected for storage and transport with profiled EPS shapes placed inside the cardboard box with the printer. A box with accessories (chapter II, point 2) is located at the top EPS protective shape.

Unpacking the printer:

1. Cut the adhesive tape on the cardboard box.
2. Take out the top EPS protective shape with the accessories.
3. Take the box with accessories out of the EPS protective shape.
4. Take the printer out of the cardboard box.
5. Take the printer out of the protective film.

2.2. Starting the printer

1. To start the printer for the first time (after taking it out of the cardboard box) follow the instructions on "Quickstart" card placed in the packaging.
2. Make certain that all the packing elements have been removed.
3. Place the printer on an even and stable surface and connect it to a power source using a power lead. The power supply socket is located at the back of the printer (fig. 36).

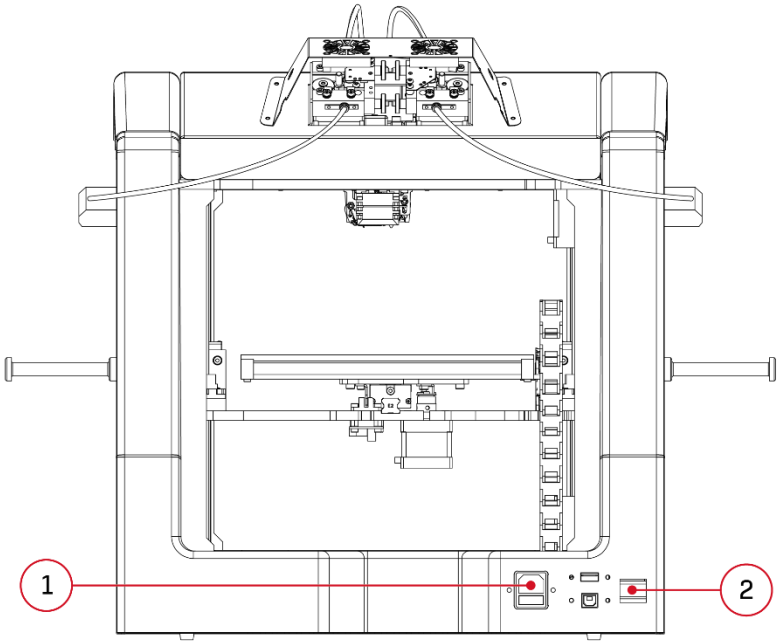


Fig. 36 Rear view of the printer: 1. Power supply socket | 2. Printer switch

4. To switch the printer on, press ON/OFF button on the right side of the rear panel (fig. 36). 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 DOUBLE P255 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 4.2.

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 DOUBLE P255 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 Z axis breaker (fig. 6) is not damaged, broken or bent and that it is aligned with the Z axis endstop notch. To do this, use the "*Rise heatbed*" option in the menu and move the heatbed slowly up.
2. If there is a filament in the hotend, unload it (chapter III, point 4.1), and then cool both hotends down to a temperature below 50°C (*TUNE → Tool 0 temp. / Tool 1 temp. → RESET*).
3. Gently remove all dirt and material residues from the nozzle of T0 hotend using tweezers and from the heatbed using a spatula (this does not apply to the first start-up).
4. From the printer's *MENU*, choose the *HOME ALL option.*

ATTENTION： observe carefully the movement of all axes. When the Z axis breaker (fig. 37, violet colour) reaches the level of the Z axis endstop (fig. 37, green colour) and stops, check the distance between T0 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 between the heatbed and T0 nozzle tip is outside the range of 0.8 - 1.5 mm, adjust it manually:

a) Move the heatbed maximally backward along Y axis.
b) Loosen the clamp bolt (fig. 37, blue colour) locking the slide (fig. 37, yellow colour).
c) Adjust the distance by means of the thumbscrew (fig. 37, red colour). Tighten the thumbscrew to lower the slide and increase the distance between the nozzle and the heatbed. Unscrew the thumbscrew to rise the slide and bring the nozzle closer to the heatbed (fig. 37 red-yellow arrow).
d) Tighten the thumbscrew and check the position of the nozzle above the heatbed using a feeler gauge, after selecting the "*HOME ALL" command.*

ATTENTION: During manual calibration of the heatbed, exercise particular care to prevent the heatbed from hitting the hotend nozzle. Otherwise, the ceramic heatbed or hotend may get damaged. The guarantee provided by 3DGence does not cover such damage.

5. In the printer's menu, choose Menu → Advanced → Heatbed Scan. At this point, the process of heatbed scanning starts.
6. Wait until the scanning is completed – it will take about 20 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.

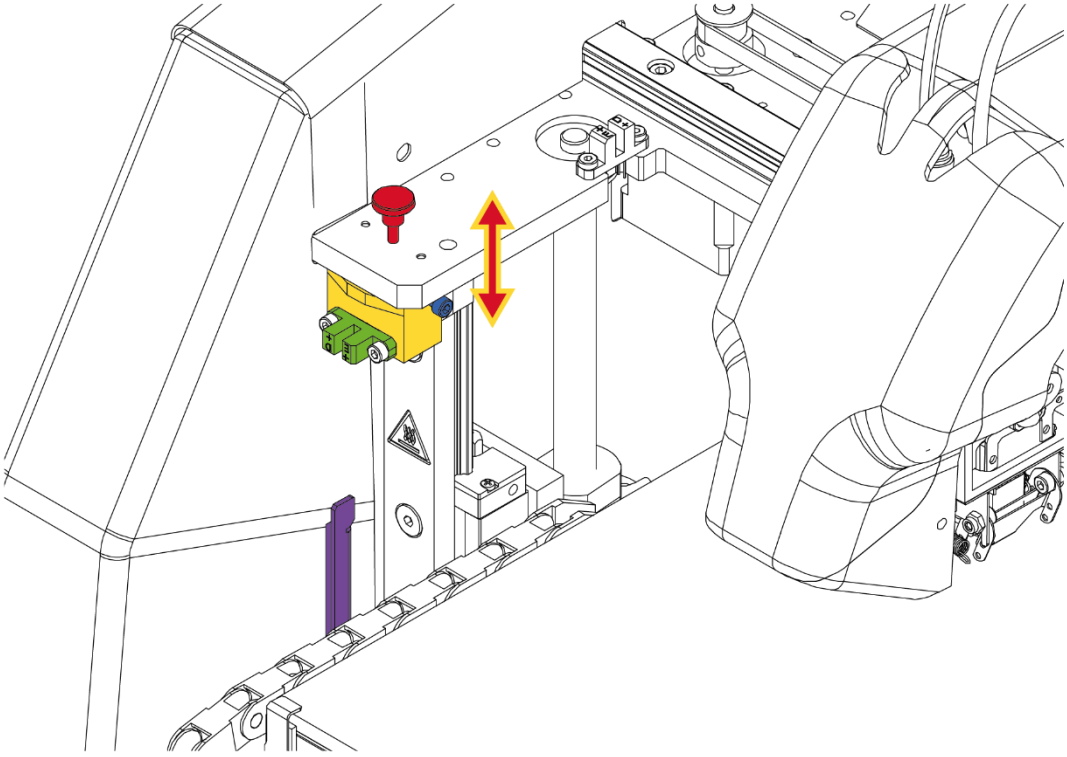


Fig. 37 Manual adjustment of the distance between the heatbed and T0 nozzle tip

4. ACTIVITIES CONNECTED WITH PRINTING MATERIAL

3DGence DOUBLE P255 printer is equipped with the diagnostic system of the extrusion system. The diagnostic system significantly facilitates printing with a variety of materials. The system consists of a filament sensor (fig. 38), bowden tube and extruders whose correct operation is monitored by encoders.

Among other things, the system makes it possible to:

- choose the temperature of heating elements in a semi-automatic manner, depending on type of material;
- inform the user about problems and errors;
- detect that the material has finished;
- monitor the filament flow.

The system designated as "Flow rate monitor" is automatic and invisible for the user. However, the system makes it possible to determine the threshold value of the flow difference. The material flow difference is understood as the difference between the amount of material required by the control code and the amount of material detected by magnetic encoders measuring actual filament movement. The activation threshold expressed as a percentage determines the specific value of the material flow difference. If this value is exceeded, the printer will stop working. At this time, the user can solve the problem connected with filament extrusion by unloading and reloading the material. The threshold value of "Flow rate monitor" function set to 100% corresponds to the total conformity of extrusion parameters. 1% corresponds to the maximum error required to ensure continuity of printing process (however, it does not guarantee positive effects). If the value is set to 0%, the system is deactivated.
The default threshold setting of 70% ensures quality control of the extrusion process at the manufacturer's specification level. When using materials that may cause the interference of readouts (for example, highly flexible materials, materials from other manufacturers or materials with large diameter variations), it may be necessary to reduce the default threshold value or even set the value to 0% in order to deactivate the system.

To change the error notification threshold:
1. Go to MENU → Advanced → Flow rate monitor (fig. 25).
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, printing process will be stopped. The printer will display the "Material feed malfunction detected" message. This problem and its solution are described in chapter VIII, point 3. The flow rate monitor value can be set within the range from 0% (OFF) to 100%.

4.1. Material loading

1. Confirm that the filament holders and the Bowden tubes are correctly installed in the printer. The installation of these elements is described in more detail in "Quickstart" card attached to the printer.
2. Make sure that there is no material installed on the filament spool holder (fig. 38) you want to install the new material on. Also, make sure that there is no filament in the bowden tubes and in the extruder (this does not apply to the first material loading). If the material is loaded, first use the *"Unload model material / Unload support material"* option (material unloading) - the procedure is described below.
3. If there are no fragments of material on the holder and in the bowden tubes, the material loading procedure can be continued. From the "*MATERIALS"* level, choose the "*LOAD MODEL MATERIAL"* option located under TOOL 0 extruder or "*LOAD SUPPORT MATERIAL"* option located under TOOL 1 extruder. The filament loading assistant will start in order to display the sequence of commands and guide the user through the next steps of the process.
4. The first step of the assistant operation is to choose the right material loading temperature. To facilitate the process, the suggested plasticization temperatures for individual thermoplastic materials are shown on the screen (tab. 4).

Tab. 4 Suggested loading temperatures for specific materials

LOW TEMPERATURE	PLA, BVOH, FLEX	PP, NYLON, PET	ABS, HIPS
190°C	210°C	230°C	250°C

The temperature can be also set manually using -/+ keys in the lower right corner of the screen. Confirm the selected loading temperature with "*CONTINUE"* key.

5. Cut the filament end at the angle of 45° and place the filament spool on the holder (fig. 38, point 1).
6. Slide the filament end into the input opening of the filament sensor (fig. 38, point 2).

7. The extruder motor will start after activation of the sensor. Push the filament so that its tip passes through the entire length of the bowden tube (fig. 38, point 3) up to the extruder (fig. 38, point 4). If the material has been inserted correctly, it will be intercepted by the extruder. The material will be drawn by the extruder and resistance will be felt when attempting to withdraw the material.
8. When the nominal material extrusion temperature is reached, the process will start automatically. The extruder will push the material through the short bowden tube (fig. 38, point 5) to the hotend heated up to the material plasticization temperature.
9. Observe the nozzle tip carefully. The printer will perform a test-extrusion of a short section of the filament.
10. Confirm successful loading of material with "*CONTINUE*" key and remove the remaining extruded material from the heatbed.

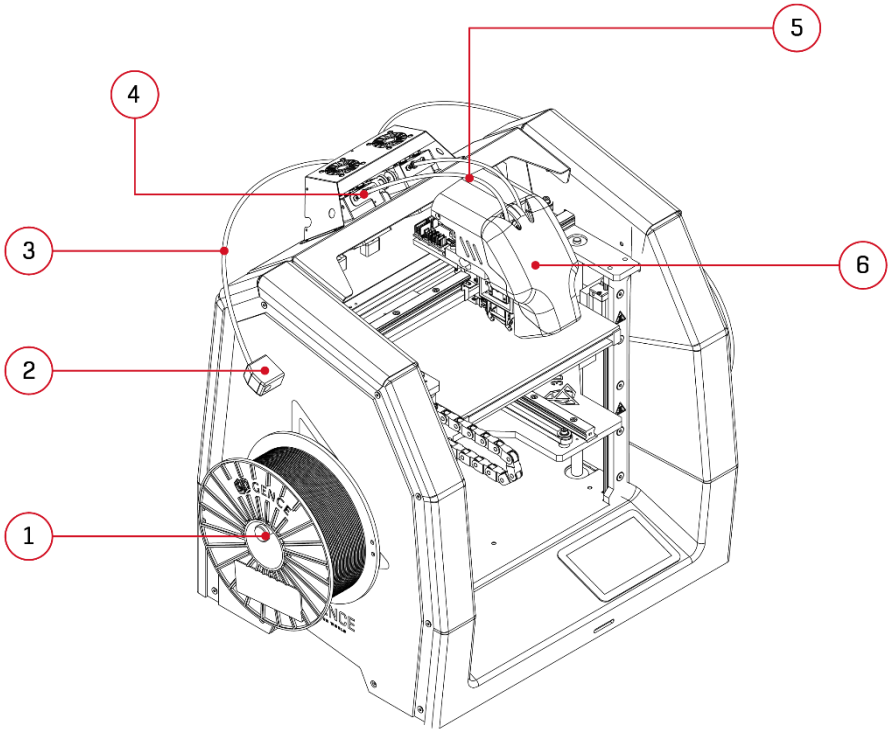


Fig. 38 The most important components of the extrusion system:
1. Spool holder | 2. Filament sensor | 3. Bowden tube
4. Extruder | 5. Short bowden tube | 6. Dual hotend module

4.2. Material unloading

1. From the "*MATERIALS*" level, choose the "*UNLOAD MODEL MATERIAL*" option located under TOOL 0 extruder or "*UNLOAD SUPPORT MATERIAL*" option located under TOOL 1 extruder. The filament unloading 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 of the filament sensor and remove the spool from the holder. Remember to keep the filament in a dry place protected against direct sunlight.
3. 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. Slide the remaining filament out of the bowden tube and confirm that the assistant has finished its operation. To facilitate the removal of, for example, remains of material extended at their ends, the extruder motor will run until the material is completely removed from the bowden tube.

4.3. Failure to load/unload material

There are two bowden tubes for each extruder in the printer:

- long bowden tube - connects the filament sensor with the extruder,
- short bowden tube - connects the extruder with the hotend.

Case 1: the material does not exist in the printer's memory (MATERIALS), 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 MODEL MATERIAL/LOAD SUPPORT MATERIAL* option is available, even though the material is already installed. When you try to load the material automatically, the printer will display a message informing that the material must be unloaded manually. In such a case, unload the filament manually and load it again.

Manual unloading of filament:

1. Make certain that the heatbed is empty.
2. Activate the appropriate hotend from which you want to unload the filament: *MENU → Activate Tool 0/Acticate Tool1.*
3. Heat the hotend up to the nominal temperature (for example, 210°C for PLA): *TUNE → Tool 0/Tool 1* and using +/- key set the temperature.
4. Pressing the *EXTRUDE* key in the *MENU* in order to extrude a piece of material.
5. Pressing the *RETRACT* key in the *MENU* in order to guide the filament end to the extruder.
6. Pull the material gently at the input opening (fig. 7, point 2, 3) and remove the material from the long bowden tube.
7. After manual unloading, load the material again using the *LOAD MODEL MATERIAL/LOAD SUPPORT MATERIAL* option.

Case 2: failure to load material.
The printer will automatically withdraw the material. Slide the material out of the filament sensor (fig. 7, point 2, 3) and cut the material end at the angle of 45° and repeat the material loading procedure using the *LOAD MODEL MATERIAL/LOAD SUPPORT MATERIAL* option.

Case 3: failure to load the material due to blockage of the filament in the short bowden tube.
If the printer can not withdraw the filament automatically, for example, due to blockage of the filament in the short bowden tube, and the filament has exceeded the encoder threshold, unload the material manually.

Manual unloading of filament in this case:

1. If the material is in the hotend, heat the hotend up to the plasticization temperature of the given material and wait for the hotend to reach the preset temperature: *TUNE → Tool 0/Tool 1* and using +/- key set the temperature.
2. To loosen the extruder clamp:
   a) loosen the knurled nuts (fig. 39, red colour),
   b) pull the extruder clamp (fig. 39, green colour).
3. Pull the material lightly at the filament sensor opening (fig. 7, point 2, 3) and slide the material out of the long bowden tube.
4. Tighten the knurled nuts (fig. 39, red colour).
5. Cut the filament end at the angle of 45° and repeat the filament loading procedure using the *LOAD MODEL MATERIAL/ LOAD SUPPORT MATERIAL* option.

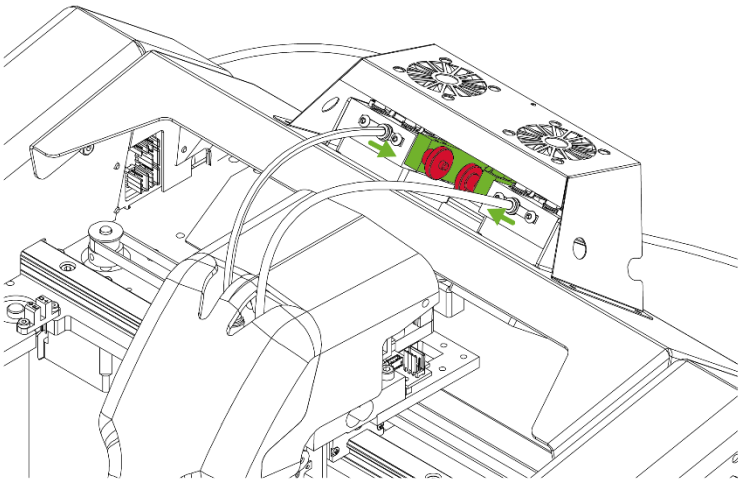


Fig. 39 Loosening the extruder clamp

If the material is blocked so strongly that it is impossible to unload it manually and slide it out of the extruder and the filament sensor, the short bowden tube can be dismounted in order to remove the blockage.
To do this:

1. If the material is in the hotend, heat the hotend up to the plasticization temperature of the given material and wait for the hotend to reach the preset temperature: *TUNE → Tool 0/Tool 1* and using +/- key set the temperature.
2. To loosen the extruder clamp:
   c) loosen the knurled nuts (fig. 39, red colour),
   d) pull the extruder clamp (fig. 39, green colour).
3. Cut the end of the filament at the filament sensor (fig. 7, point 2, 3).
4. Dismount the short bowden tube:
   a) slide out the C-shaped pipe connector lock in the hotend (fig, 51, step 1),
   b) press the pipe connector lock (fig, 51, step 2) and simultaneously, slide the short bowden tube out of the pipe connector opening (fig, 51, step 3).
5. Remove the remaining material in the hotend and in the bowden tubes.
6. Mount the short bowden tube material. Remember to insert it as far as possible (about 2 cm) and put a C-shaped block. Properly installed short bowden tube will be visible in the hole in the hotend guiding sleeve (fig. 40).
7. Tighten the knurled nuts (fig. 39, red colour).
8. Load the material using the *LOAD MODEL MATERIAL/LOAD SUPPORT MATERIAL* option.

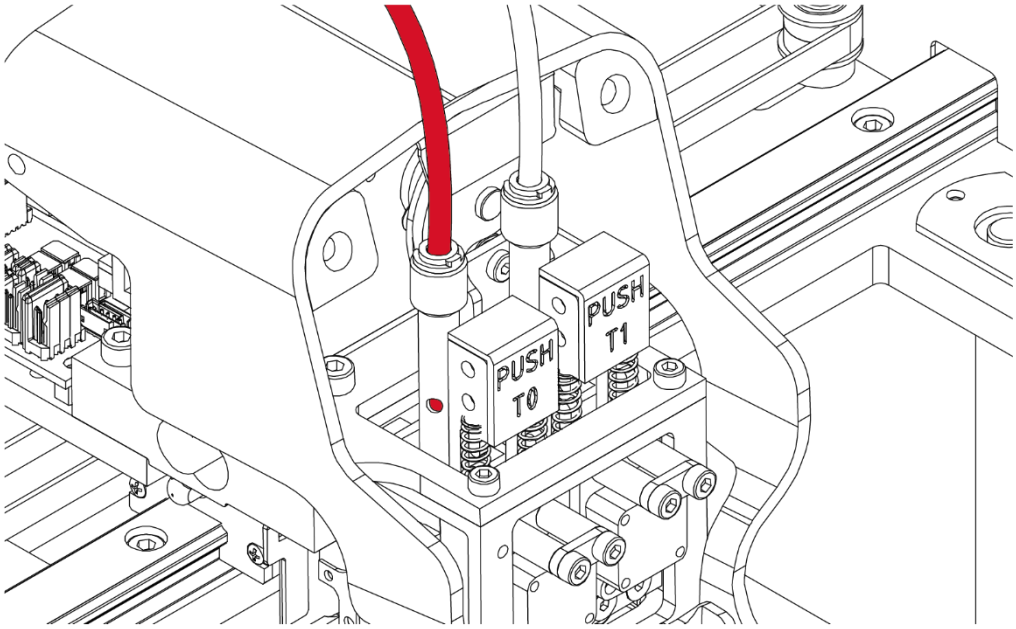


Fig. 40 Properly installation of the short bowden tube

ATTENTION: If the material is fed correctly by the extruder, the bowden tubes have been cleared, but it is not possible to extrude the material through the hotend, it is recommended to replace the hotend with a new one (chapter VI, point 1).

4.4. Change of material during printing process

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). After unloading the previous material, the printer will store the loading temperature for the new material.

1. Press the *MATERIALS* key on the touch screen.
2. Choose the *CHANGE MODEL MATERIAL* option for Tool 0 hotend or CHANGE SUPPORT MATERIAL option for Tool 1 hotend.
3. Confirm the start of the material change manager operation by clicking on *CONTINUE*.
4. The printer will start heating the hotend to the nominal extrusion temperature. A test section of the filament will be extruded and then, the material will be withdrawn from the extruder.
5. Slide the end of the material out of the bowden tube manually and remove the spool from the holder.
6. Cut the new filament end at the angle of 45° and place the spool with material on the holder.
7. Slide the filament end into the input opening of the filament sensor.

8. The extruder motor will start after activation of the filament sensor. Push the filament so that its tip passes through the entire length of the bowden tube up to the extruder.
9. When the nominal material extrusion temperature is reached, the process will start automatically.
10. Observe the nozzle tip carefully. The printer will perform a test-extrusion of a short section of the filament.
11. Confirm successful loading of material with "*CONTINUE*" key and remove the remaining extruded material from the heatbed.
12. The printer will restart the printing process automatically.

4.5. Depletion of material during printing

The printer's system monitors the condition of the filament sensor on an ongoing basis. If the material is depleted on one of the spools (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 bowden tube and the message *"Materiał T0/T1 depleted*" will be displayed. At this point, the user can load a new material or return to *MATERIALS* menu. In order to load a new filament, choose the "*CONTINUE*" option. The printer will start the material loading manager (chapter III, point 4.1).

IV FIRST PRINTOUT

1. STARTING A READY CODE FROM SD CARD

The 3DGence DOUBLE P255 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 file tab (the tab is available after creating an account and registering the device).

Before making the first printout confirm that:

- an appropriate place for the printer operation is provided,
- the printer is properly connected to the power supply,
- all axes of the printer move freely,
- the heatbed is properly calibrated,
- SD memory card is properly installed in the printer,
- filaments are properly loaded,
- all readouts from the printer's sensors are correct.

ATTENTION: Failure to meet the above conditions and the conditions mentioned before in manual before making the first printout may cause damage to the printer or injury to the operator. Always follow the safety instructions, even if you are an experienced operator.

ATTENTION: Insert SD card into SD card slot with SD card's pins upwards!

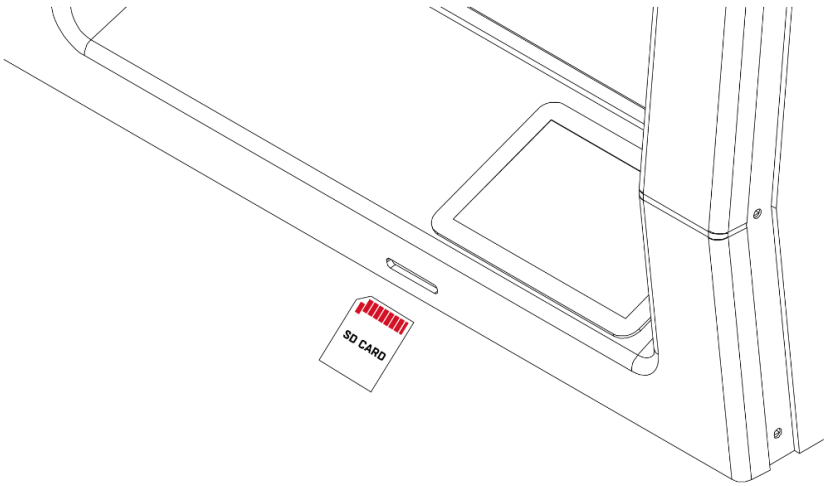


Fig. 41 Proper position of SD card in SD card slot

In order to start printing:
1. Start the printer if it was switched off.
2. Insert the SD card into the SD card slot (fig. 41).
3. Select the *PRINT* option from the main menu.
4. Select the file to be printed from the file manager (fig. 20). 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 hotends and heatbed. Do not remove the printout before the cooling process is completed. Otherwise, the printed model may get deformed or the heatbed may get damaged.
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 42, 43, 44.

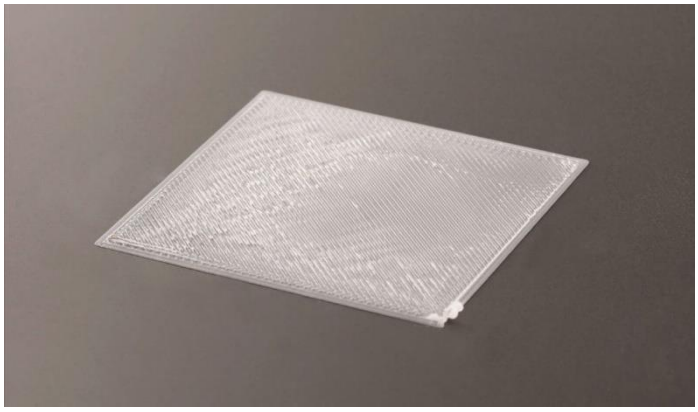


Fig. 42 Example of a too high position of the heatbed

Too high position of the heatbed

The distance between the heatbed and the nozzle is too small. 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 *Controls* option on the display and lower the heatbed by clicking *Lower heatbed* (one click moves the heatbed by 0.025mm along Z axis).

Fig. 43 Example of correct heatbed position

The heatbed in proper position

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

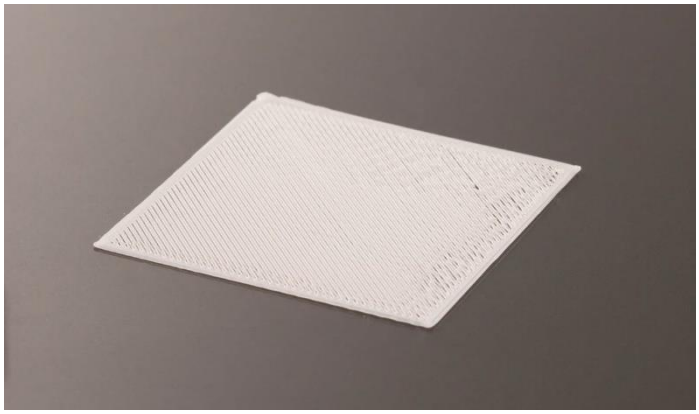


Fig. 44 Example of a too low position of the heatbed

Too low position of the heatbed

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 *Controls* option on the display and rise the heatbed by clicking *Rise heatbed* (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 bar 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 left) 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. 45). 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 removing the printout from the heatbed, it is recommended that the heatbed should be heated and cooled 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.

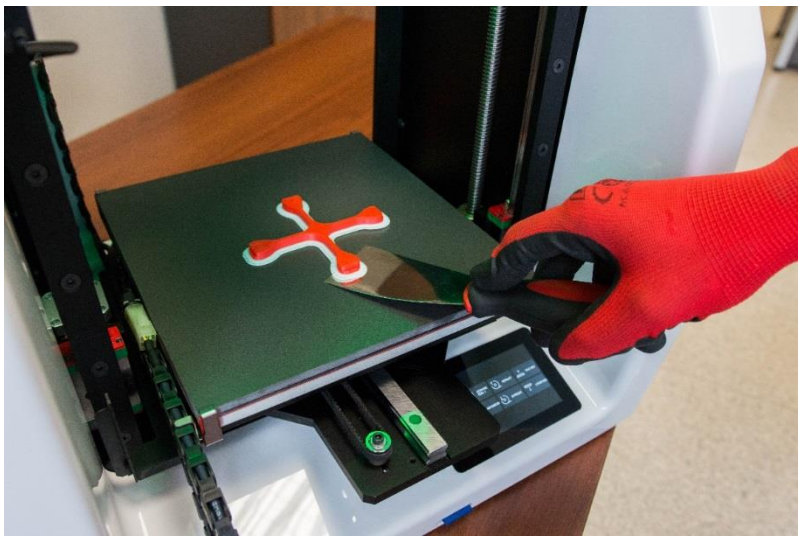


Fig. 45 The correct procedure for removing the model from the printer

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. CLEANING

4.1 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. In the *TUNE* menu, set the heating temperature for the given hotend using +/- keys. Choose *Tool 0 temp.* option for T0 hotend and *Tool 1 temp.* option for T1 hotend.
2. Ensure good access to the hotend using the *RISE HEATBED* or *LOWER HEATBED* option in the *MENU*. Press and hold the keys to move the heatbed smoothly up or down. Press the key once to move the heatbed at a short distance.
3. Using a non-flammable material or tweezers, gently remove the remaining molten/burnt material.
4. After cleaning the hotend, switch the heating off *(TUNE → Tool 0 temp. / Tool 1 temp. → RESET).*

3DGence DOUBLE P255 printer can also clean the hotends automatically by extruding a section of material. This function is particularly useful when the user has to change the material or remove the remains of old filament or if the hotend has not been used for a long time and is slightly clogged. The automatic hotend cleaning assistant is available during printing and in the idle mode.

Hotend cleaning assistant:

1. Choose *MATERIALS* and then *CLEAN NOZZLES in the main menu.*
2. Specify the hotend to be cleaned – *MODEL MATERIAL* for T0, *SUPPORT MATERIAL* for T1 *or BOTH TOOLS* for both hotends. Confirm the choice with *CONTINUE key.*
3. The process will start automatically.
4. After completed process, remove the rest of the filament extruded from the hotend.

4.2. 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 (*MENU → RISE HEATBED / LOWER HEATBED*).
2. Switch off all heating elements of the printer and wait until they are cooled down completely.
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.

5. SLEEP MODE

3DGence DOUBLE P255 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. 46):
- switches off all heaters,
- switches off the working field backlight,
- reduces the energy consumption of the display and limits its wear.

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 → SETTINGS → SLEEP ON*.
2. Using the keys +/- set a new time (maximum 120 minutes).
3. The sleep mode can be switched off completely using Off key.

Fig. 46 Sleep mode screen

6. SWITCHING THE PRINTER OFF

To switch the printer off, press ON/OFF button located at the back of the printer (fig. 15).

After switching the printer off, it is advisable to protect the filaments against moisture, dust and other contaminations. Additionally, if the printer will not be used for a long time, it is recommended that the guides and trapezoid bolt should be protected against dust and other contaminations.
After switching the printer off:
- do not leave the printer in a damp room,
- do not leave the printer in a dusty room,
- do not put the printer on high racks/shelves,
- do not place the printer in the cardboard box/bag/cabinet until the heaters are completely cooled down,
- keep the printer out of the reach of children,
- protect the filament and the printer against contamination,
- disconnect the power leads from the printer before storage.

ATTENTION: under no circumstances should you switch 3DGence DOUBLE P255 printer off by pulling the power lead out of the socket. This may cause damage to the printer.

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 using the problem notification form at www.3dgence.com/support and attach a photo and description of the defect and, if possible, .gcode and .stl files (the notification form is available after creating an account and registering the device). 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

The dual hotend module is a permanent element of 3DGence DOUBLE P255 printer. T0 hotend, which is responsible for plasticizing the base material, is located on the left side of the user facing the printer (in fig. 47, the hotend is in the inactive position, marked in red). On the right side, there is T1 hotend responsible for plasticizing the support material (in fig. 47, the hotend is in the active position, marked in blue). Other key elements of the dual hotend module are shown below (fig. 48, 49).

To get access to the module, dismount the front casing mounted on magnets. As standard, the module is equipped with two replaceable 3DGence hotends with the nozzle diameter of 0.4 mm. The complete system, thanks to its driving servo-mechanism, is able to automatically switch the printer to printing with one of the two materials in a short time. The servo-mechanism drive rises and lowers the hotends using a special cam. The hotends are connected to the extrusion system by means of the guiding sleeves. Stoppers prevent the material from flowing out of the inactive hotend. Additionally, the module has a printout cooling system and integrated strain gauge system responsible for autocalibration and autocompensation measurements. The module is also equipped with the PUSH system - the quick hotend change system. More information on the hotend change can be found in chapter VI, point 1.

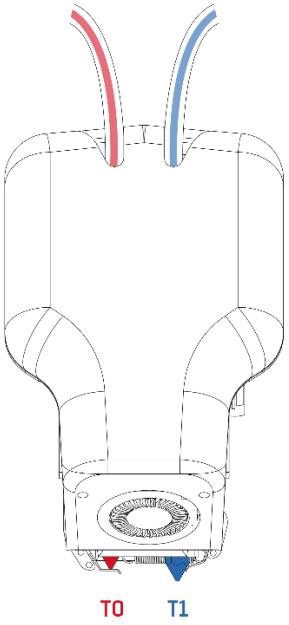


Fig. 47 Dual hotend module - front view

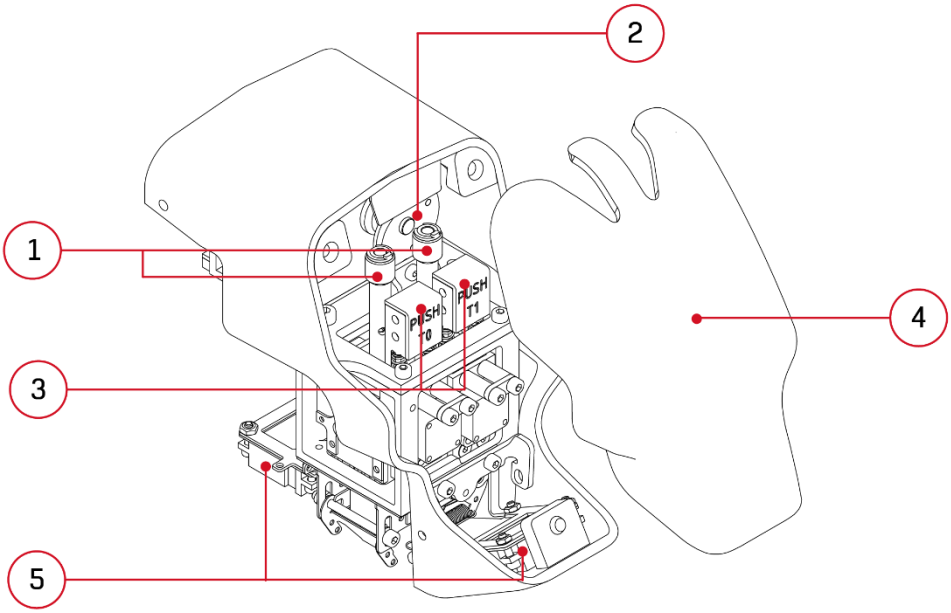


Fig. 48 Dual hotend module: 1. Guiding sleeves | 2. Mechanism cam
3. PUSH keys | 4. Front casing (attachable part) | 5. Printout cooling fans

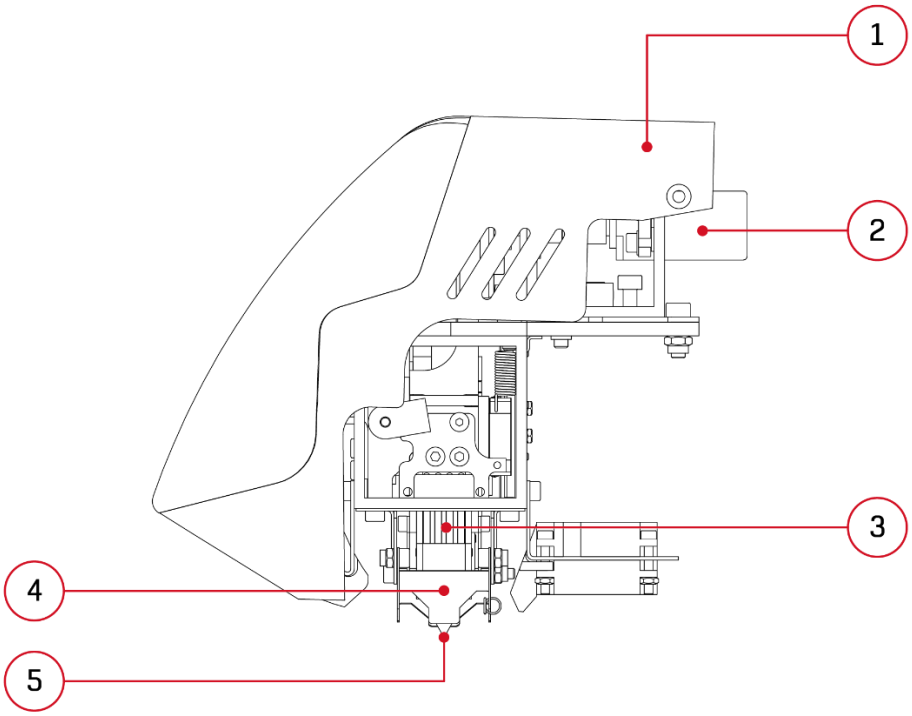


Fig. 49 Dual hotend module: 1. Casing (permanent part) | 2. Servomechanism
3. Hotend contact plate | 4. Mechanical hotend stopper | 5. Hotend nozzle

1. HOTEND CHANGE

3DGence DOUBLE P255 printer is equipped with the quick hotend change system (PUSH SYSTEM). The hotends are shown in fig. 50. A different hotend should be used for each material when making multiple-material printouts.

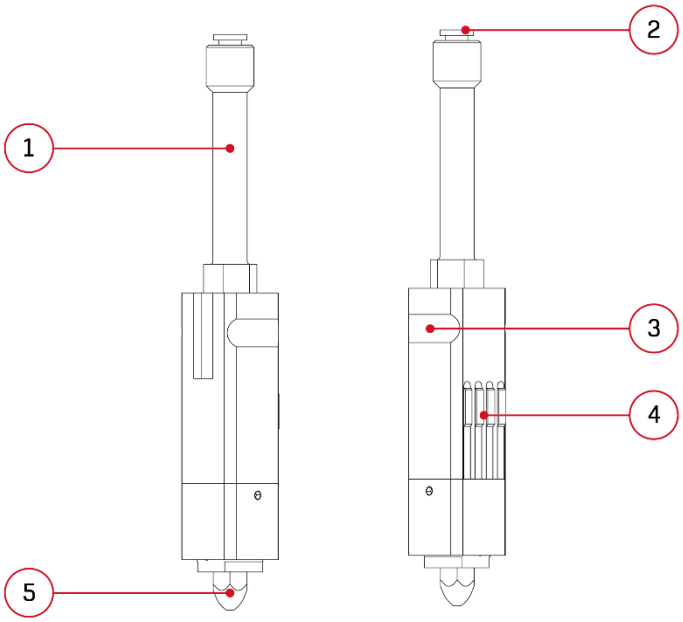


Fig. 50 Hotend of 3DGence DOUBLE P255 printer:
1. Guiding sleeve | 2. Connector | 3. Groove | 4. Contacts | 5. 0.4 nozzle

ATTENTION: the front casing of the dual hotend module may be dismounted only if the printer is disconnected from the power supply! Otherwise, bodily injuries may be suffered!

To change the hotend, follow the instructions below.

1. In the *ADVANCED* menu, choose the *HOTEND CHANGE* option and choose the hotend you want to change. You can choose T0 hotend (Model Material), T1 hotend (Support Material) or both hotends (Both Tools):
   a) if the given hotend still contains filament, the filament unloading manager will be first started (see chapter III, point 4.2),
   b) prepare a new hotend and enter the value of the Delta T temperature correction factor which is engraved on the hotend (if there is no engraved factor, enter the default value = 1)
   c) wait until the hotend temperature drops below 50°C,
   d) switch the printer off and disconnect the power lead.
2. Put protective gloves on.
3. Remove the front casing of the module (fig. 51) by pulling it towards you.
4. Disconnect the bowden tube from the hotend (fig. 52):
   a) slide the C-shaped lock out (fig. 52, step 1),
   b) press the connector lock (fig. 52, step 2) and simultaneously slide out the bowden tube (fig. 52, step 3).
5. With one hand, gently bend the stopper to the left (in the case of T0 hotend) or to the right (in the case of T1 hotend) – in fig. 53, marked in green. At the same time, press fully and hold the PUSH key (fig. 53, red colour) and push the hotend up while holding it from the bottom with your hand (fig. 53, yellow colour). **Make sure that the hotend does not fall on the ceramic heatbed under its own weight.**
6. Take the previously prepared new hotend:

Gently bend the stopper and simultaneously press fully and hold the PUSH key. Insert the hotend into the clamping ring until resistance is felt and release the PUSH key and the stopper. When inserting the hotend, make sure it is set correctly – the contacts should be directed outwards and the horizontal groove should be directed towards the user (fig. 54). Next, slide the bowden tube into the hotend as shown in fig. 52. Properly installed short bowden tube will be visible in the hole in the hotend guiding sleeve (fig. 40).

ATTENTION: Be especially careful when inserting the hotend. To avoid bending the contacts, the hotend must be kept in vertical position. If the contacts are damaged or the hotend is incorrectly installed, the "DEF" error (no signal from the temperature sensors) will be displayed in the temperature indication field after switching the printer on.

7. The hotend change procedure has been completed. Now you can switch on the power supply, start the printer and go to the material loading manager (chapter III, point 4.1)

ATTENTION: after each hotend change, perform the calibration of offsets along X,Y and Z axes again (chapter VIII, point 2.2). First perform the calibration of offset along Z axis and then along X and Y axes.

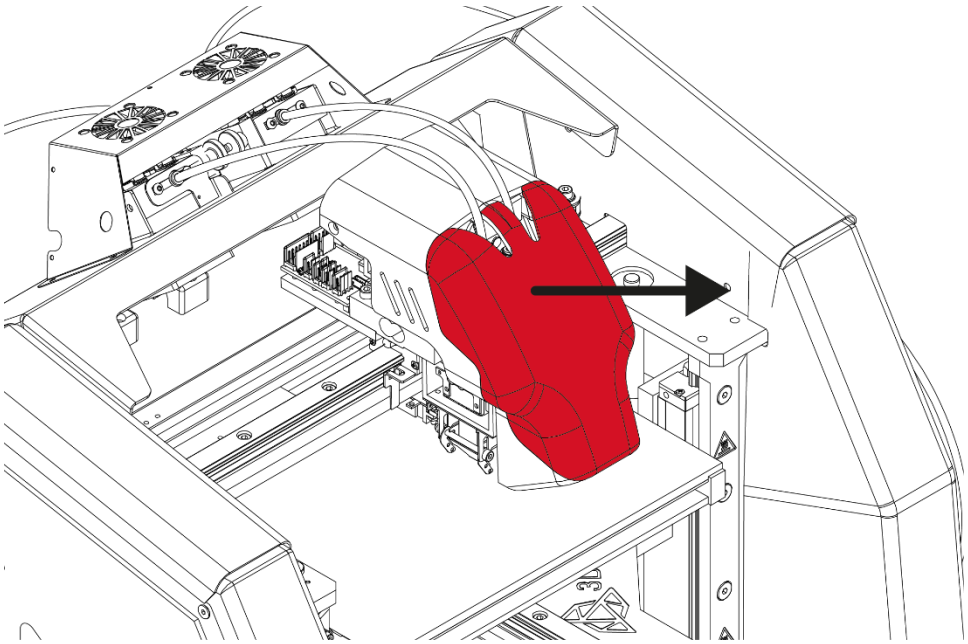


Fig. 51 Removing the module casing

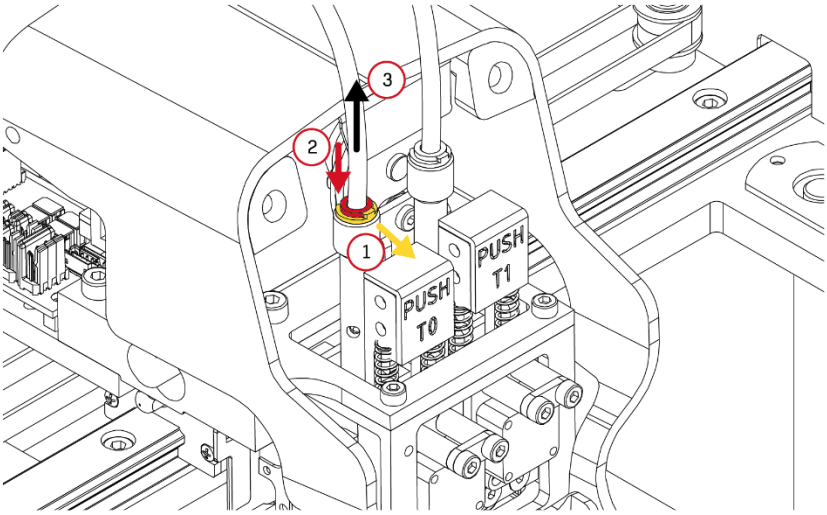


Fig. 52 Sliding the bowden tube out

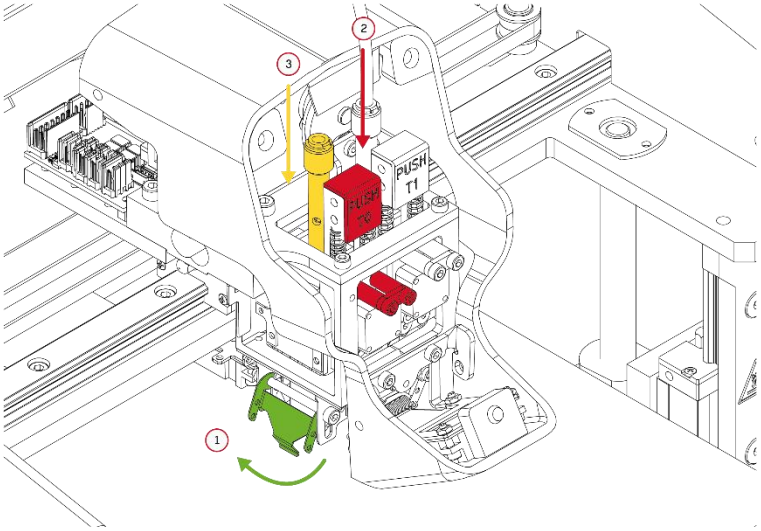


Fig. 53 Sliding the hotend out

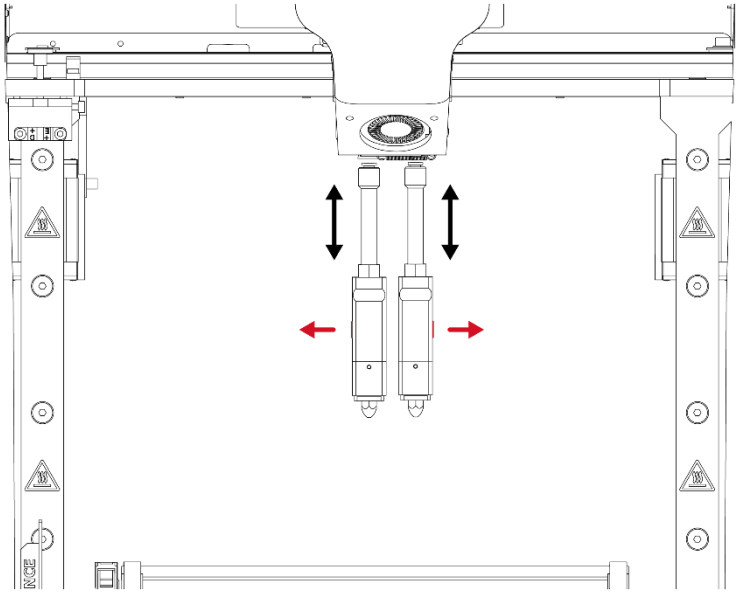


Fig. 54 Proper hotend position (contacts directed outwards)

VII COMPLEMENTARY INFORMATION

1. AUTOCOMPENSATION AND AUTOCALIBRATION

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 DOUBLE P255 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 100 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. 55).

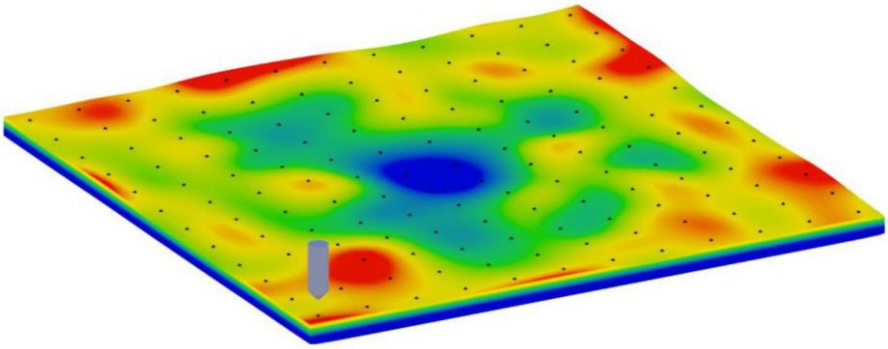


Fig. 55 The map of the heatbed curvature resulting from autocalibration

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.

It is possible to set the autocompensation measuring point (fig. 56).
By default, the autocompensation point is set at the centre of the heatbed. To modify the autocompensation point, go to *MENU → ADVANCED → AUTOCOMP. SETTINGS* and choose *X PROBE POSITION.* Set the measuring point from 1 to 10, choose *Y PROBE POSITION (set 1 - 10)* and confirm with *CONTINUE* key.

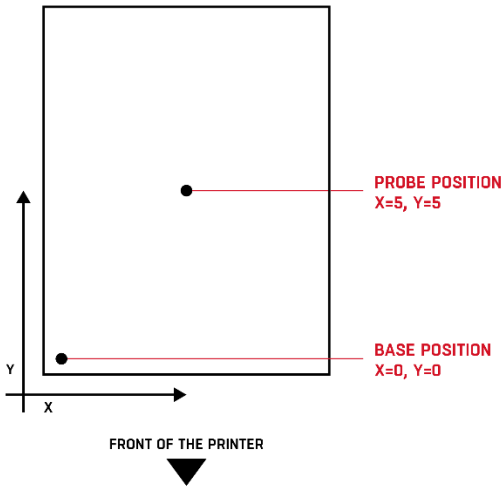


Fig. 56 Example of autocompensation measuring point

VIII SERVICE ACTIVITIES

1. INDICATIONS FOR HEATBED CALIBRATION

The calibration process of the heatbed (heatbed scan) 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. The heatbed calibration process is described in chapter III, point 3.1.

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),
- too thinly applied layer, eventually, skipping, clicking of the extruder motor, accumulation of excess material between the hotend passages,
- the heatbed surface has been unintentionally lifted,
- large force has been applied, for example, when removing the printout, and there is a reasonable suspicion that it 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.

1.1. Heatbed change

3DGence DOUBLE P255 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. The ceramic heatbed of 3DGence DOUBLE P255 printer can be quickly changed as described below.
To prevent damage to the ceramic heatbed, do not remove printouts from the heatbed too quickly, before the heatbed has cooled down. If the adhesive agents not recommended by 3DGence are used, the ceramic heatbed may crack or even a piece of the ceramic surface may be torn away.

Change of ceramic surface of the heatbed:
1. Switch the printer on and make certain that the heatbed temperature is lower than 30°C.
2. Lower the heatbed (*MENU → LOWER HEATBED*) so that you get free access to the heatbed from the top.

ATTENTION: the heatbed downward movement by means of *LOWER HEATBED* option is unlimited! Take special care when using this option to prevent the collision of the heatbed with the printer's lower plate.

3. Switch the printer off and disconnect the power lead.
4. Remove four metal clips fastening the ceramic surface by sliding them off (fig. 57, yellow colour, point 1). If it is difficult to remove the clips, use pliers.
5. Gently raise the ceramic surface upright (fig. 57, red colour, point 2).
6. Gently install a new, clean ceramic surface and fix it with clips.
7. Clean the ceramic surface (chapter IV, point 4.2).
8. Calibrate the heatbed: *Menu → Advanced → Heatbed scan.*

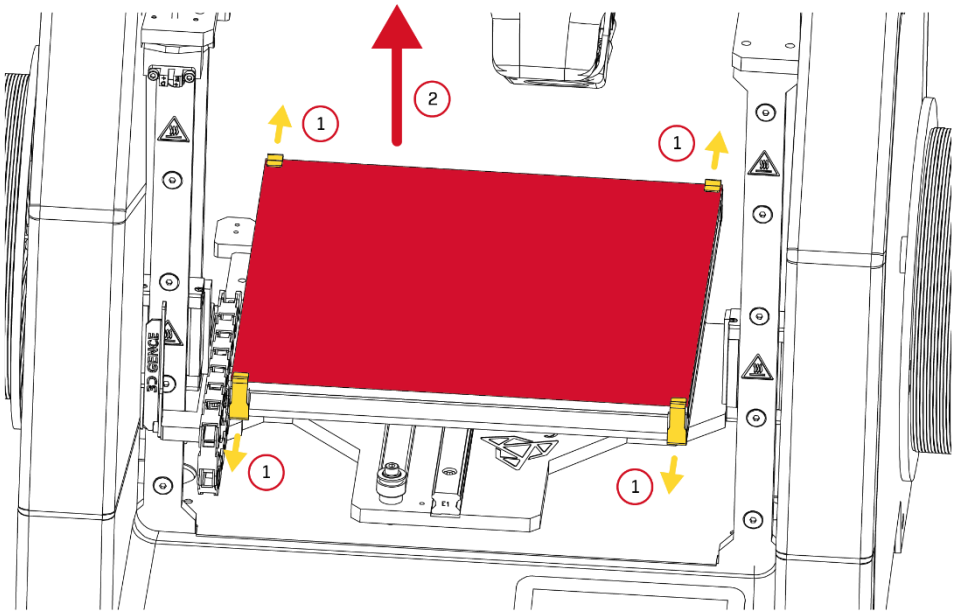


Fig. 57 Heatbed: 1. Clips | 2. Ceramic heatbed surface

2. DUAL HOTEND MODULE CALIBRATION

2.1. Precise axes calibration

3DGence DOUBLE P255 printer, like all 3DGence printers, is equipped with a unique system for precise dimensional correction of the printed model. The printer is factory calibrated for Verbatim PLA 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 DOUBLE P255 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 (fig. 58). *Dimmension_Calibration.stl* model is available at www.3dgence/support in the Your file tab (the tab is available after creating an account and registering the device). The model should be prepared for printing in 3DGence Slicer software for selected materials. The printout will take about 45 minutes.

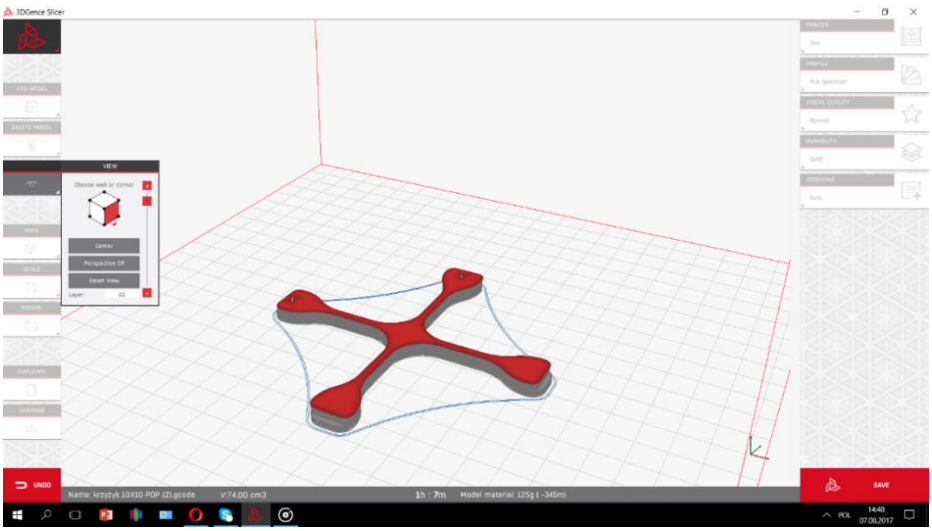


Fig. 58 Visualization of Dimmension_Calibration.stl model

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 in the middle of the model height above the step, both points at the height of the same layer (fig. 59),
- 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. 60).

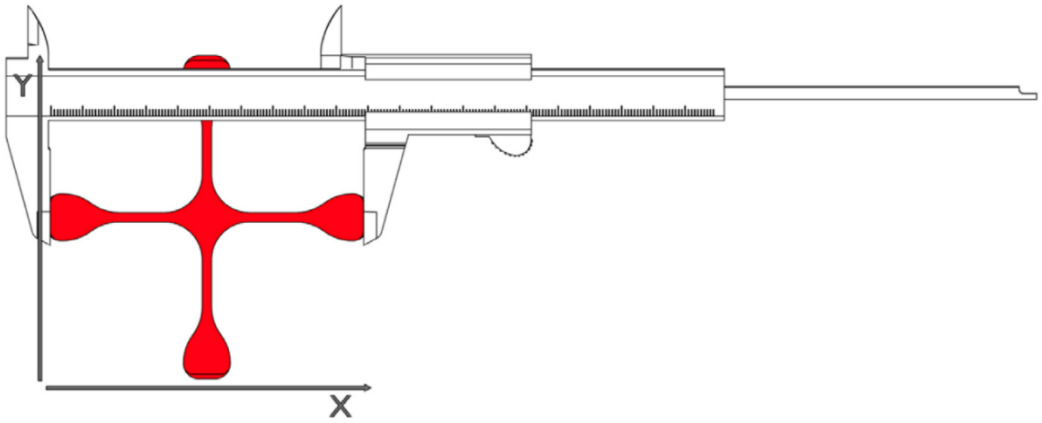


Fig. 59 Measurement visualization

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. 60 Table of measurements for X axis and Y axis

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

1. Go to *MENU → ADVANCED → XY CALIB. (fig. 25)*.
2. Choose *ORIGIN X* and use *–/+* keys to enter the value of the dimension given to the model in X axis. In the case of *Dimmension_Calibration.stl* file downloaded from the website, this value is 100,00 mm.
3. Choose *PRINT X* and use *–/+* keys to enter the value measured on the cross in X axis.
4. Choose *ORIGIN Y* and use *–/+* keys to enter the value of the dimension given to the model in Y axis. In the case of *Dimmension_Calibration.stl* file downloaded from the website, this value is 100,00 mm.
5. Choose *PRINT Y* and use *–/+* keys to enter the value measured on the cross in Y axis.
6. Confirm the changes with the *Save* key.

Additionally, in order to verify correct axis calibration, you can print the *Dimmension_Calibration.stl* model downloaded from the website once again and measure it.

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

2.2. Calibration of offsets along X, Y and Z axes

Due to design characteristics of the dual hotend 3D printer, there are differences in the position of the hotends along X, Y and Z axes.
X/Y/Z Offset is the name of the parameter describing the position difference of T1 extruder nozzle with respect to T0 extruder nozzle along X/Y/Z axes. Fig. 61 shows the visualization of the offsets along X axis and Z axis. This difference can be compensated by the printer settings, using the touch panel.

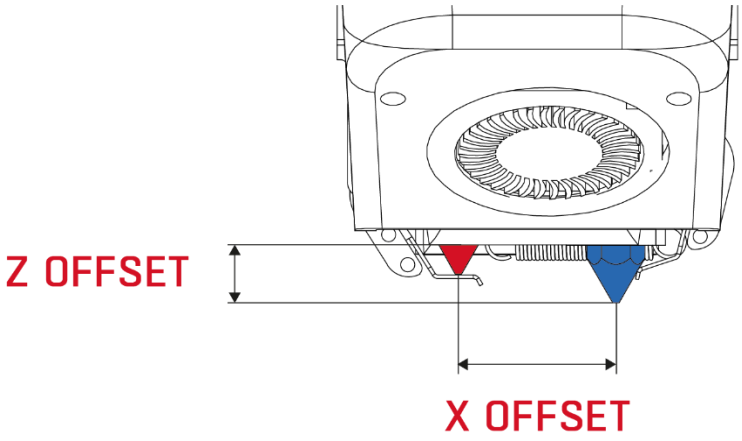


Fig. 61 Visualization of the nozzle position difference (offsets)

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:
To calibrate the nozzle position difference along Z axis, use the *Z MEASURE* option available in *MENU → ADVANCED → MODULE CALIB.* The printer makes the tensometric measurement of the distance of both hotends (T0 and T1) from the heatbed and recalculates these distances to the position difference of the T1 extruder nozzle with respect to the T0 extruder nozzle.

The Z offset value can be also modified manually: *MENU → ADVANCED → MODULE CALIB. → Z OFFSET* and use the +/- keys to enter a value.

Calibration of XY offsets:
In order to verify the offset along the X, Y axes, the calibration model should be printed in the printer memory (procedure described below). The model is prepared for PLA and BVOH materials. The printout takes about 10 minutes.
The model consists of two parts - part X (fig. 62) and part Y (fig. 63). 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. 62, white) and the upper layer printed from model material (fig. 62, 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. 62, 63). 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. 62, 63). 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.

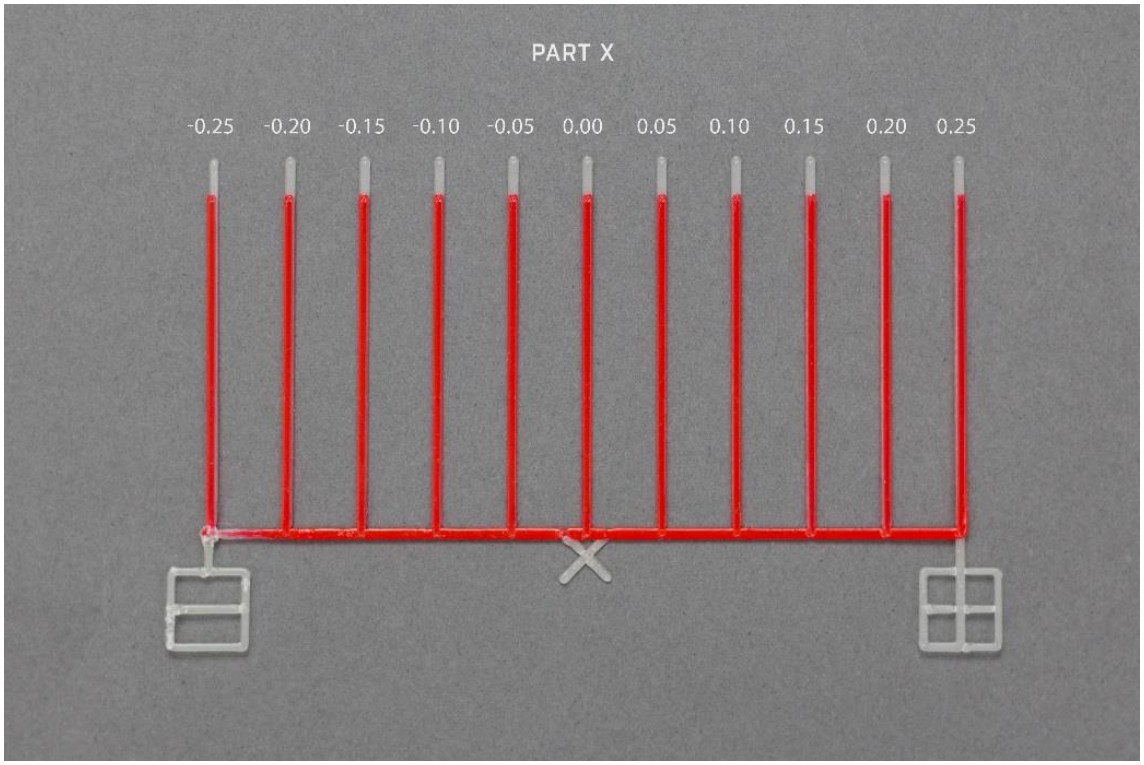


Fig. 62 Calibration model of offset along X axis

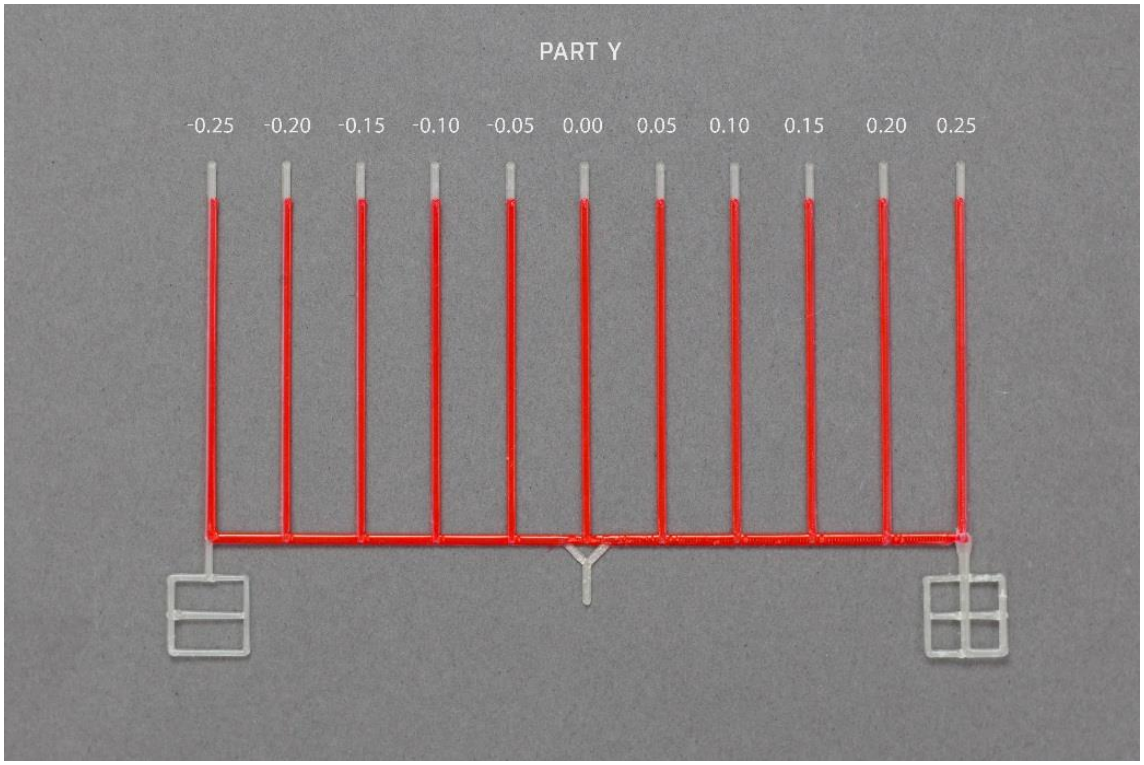


Fig. 63 Calibration model of offset along Y axis

Figure 63 presents two calibration models – 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. 64).
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. 64, bottom model).

First of all, on the out of calibrated model find the line on which the model material (fig. 64, red) is best covered with support material (fig. 64, white). On the top model (fig. 64), 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).

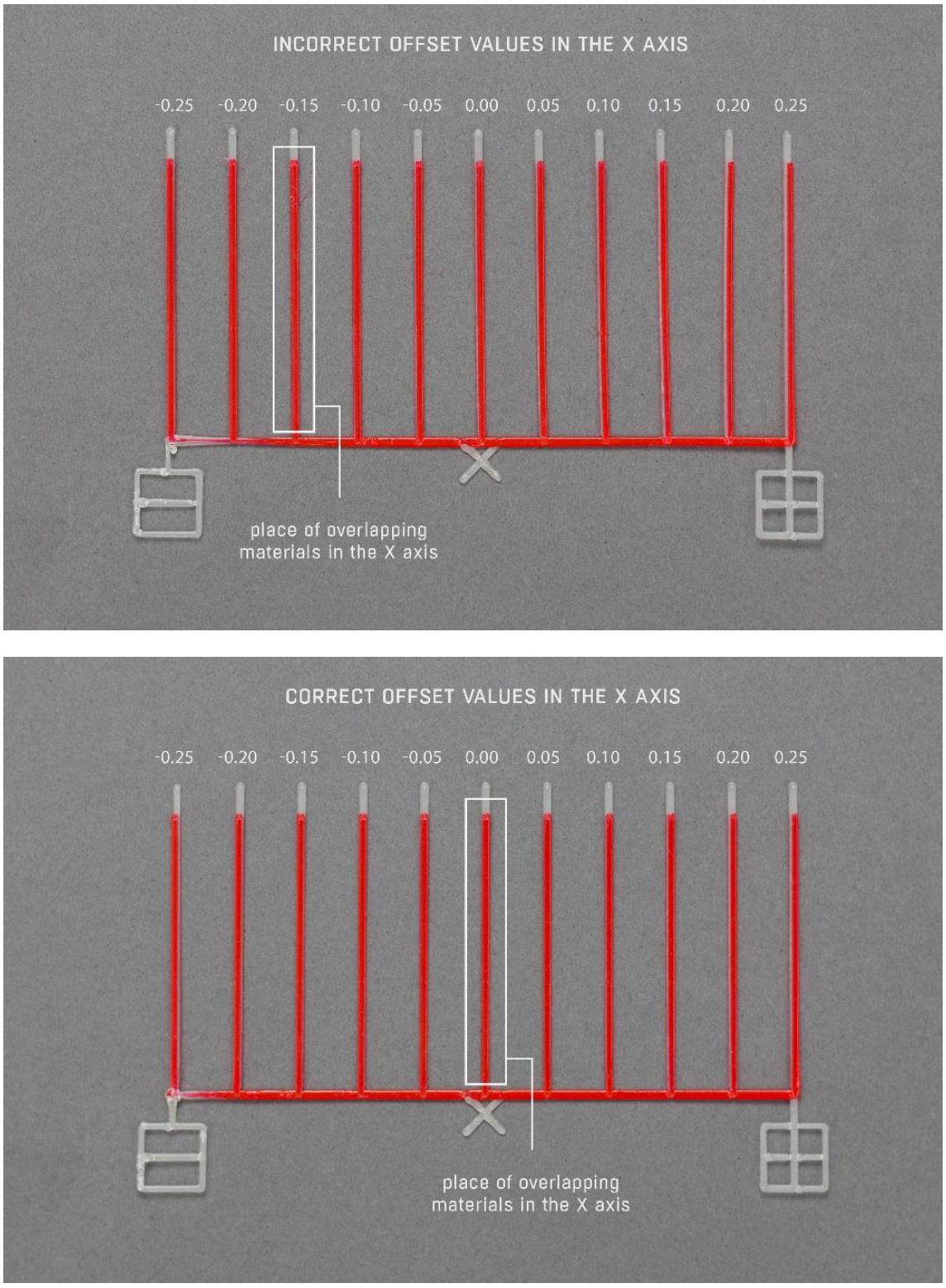


Fig. 64 Comparison of correctly calibrated offset values with incorrectly calibrated ones

Calibration of XY offsets:

1. Load the model filament (PLA) and support filament (BVOH) by selecting from the printer menu: *MATERIALS → LOAD MODEL MATERIAL / LOAD SUPPORT MATERIAL* and follow the instructions on the display.
2. Print the calibration model in the printer memory by selecting from the printer menu: *MENU → ADVANCED → MODULE CALIB. → AUTO XY CALIB.*
3. After printing the model, select the line on the display on which the model material with the support material in part X is best covered (fig. 65).

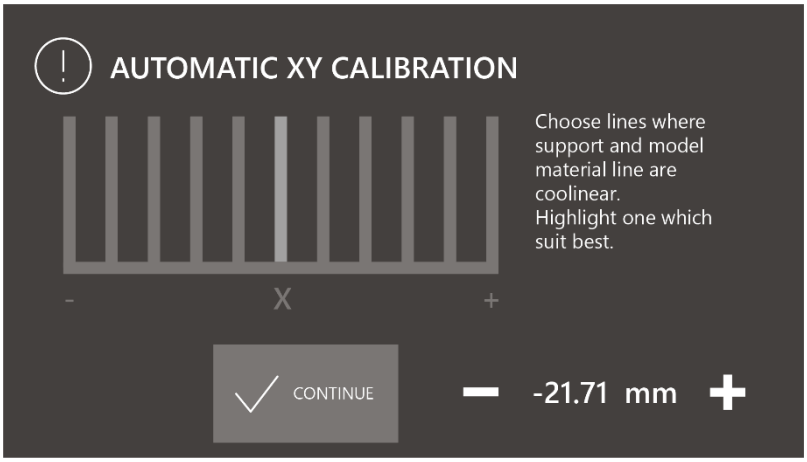


Fig. 65 Automatic offset calibration screen in the X axis

4. Select the *CONTINUE* button.
5. Select the line on the display on which the model material with the support material in part Y is best covered (fig. 66).

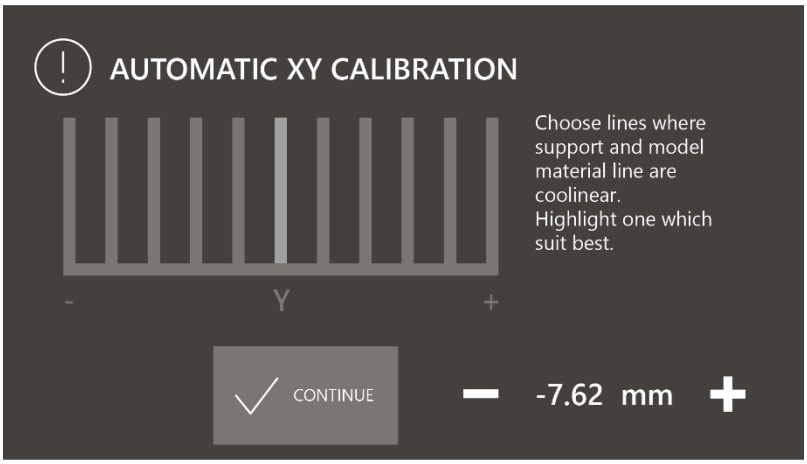


Fig. 66 Automatic offset calibration screen in the Y axis

6. Select the *CONTINUE* button.
7. Confirm with the *SAVE* key.
8. Print the calibration model in the printer memory again by selecting from the printer menu: *MENU → ADVANCED → MODULE CALIB. → AUTO XY CALIB.* 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 2 - 7.

3. 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:

- hotends have been installed correctly,
- the printing module has not been mechanically damaged,
- after Z axis referencing (*Rise Heatbed* option in *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. the systems feeding the material to the hotend.

INFORMATION: the correct force readout value should be within the range of -15500 – 15500 units. The value can be read by choosing the *Diagnostic info* option in *Advanced* 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 (*Rise Heatbed* option in *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 *Diagnostic info* option in *Advanced* menu). If the value does not change considerably after application of the force, contact the technical assistance department.

ATTENTION: the hotends 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/def/Temperature Sensor Fail – 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:

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

If the hotends have 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 (*Rise Heatbed* option in *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,
- hotends have been installed correctly,
- the printing module has not been mechanically damaged,
- after Z axis referencing (*Rise Heatbed* in *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. the bowden tubes.

Material T0/T1 feed malfunction detected – the extrusion quality indicator value has exceeded the threshold value

1. If this error occurs, unload and load again the material using the *Change model material / Change support material* option in the printer menu and then resume printing using the *Resume* option.
2. If the *Change material* procedure is not completed successfully, you should follow the description in chapter III, point 4.3.

If the problem persists and points 1 and 2 do not help, 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 bowden tube is not mechanically damaged.

If this error occurs repeatedly, replace the hotend with a new one and 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.

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.

Temperature sensor fail - error in readout of heatbed temperature
If this error occurs, contact the technical assistance department.

IX ENCLOSURE ASSEMBLY

WARNING: Printer has to be placed on a firm, level surface at least 630×630 mm big.

1. If the materials are loaded – turn the printer on and unload them by choosing: *MATERIALS → UNLOAD MODEL MATERIAL/UNLOAD SUPPORT MATERIAL* and follow the steps on the screen.
   WARNING: in case of problems with material unloading, refer to user's manual (chapter III, point 4.3).

2. Turn the printer off.

3. Pull out the bowden tubes from both extruders (fig. 67). To do that:
   - remove the collet clip (fig. 67, step 1),
   - push and hold the protective ring down (fig. 67, step 2), at the same time pull out the bowden tube (fig. 67, step 3).

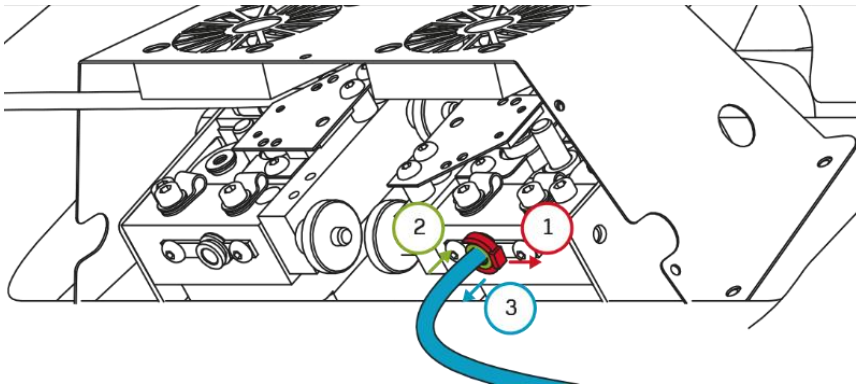


Fig. 67 Pulling out the bowden tubes from both extruders

4. Mount the rear enclosure part (fig. 68). Align the curvature of the enclosure, so that it interlocks with the back of the printer (fig. 68).

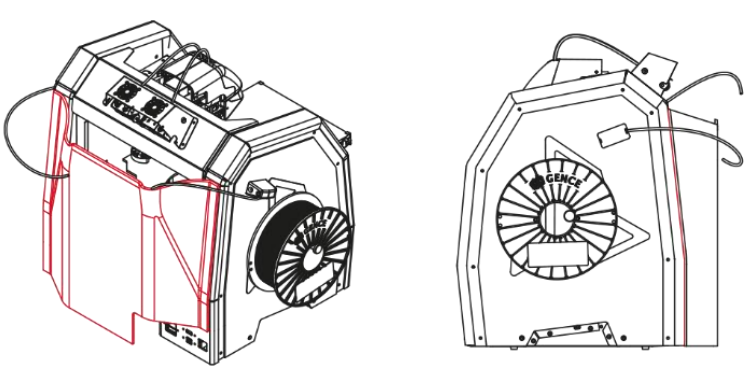


Fig. 68 Mounting the rear enclosure part

5. Mount the clips on the rear enclosure part. The side of the magnetic clips should fit into the recess on the printer (fig. 69).

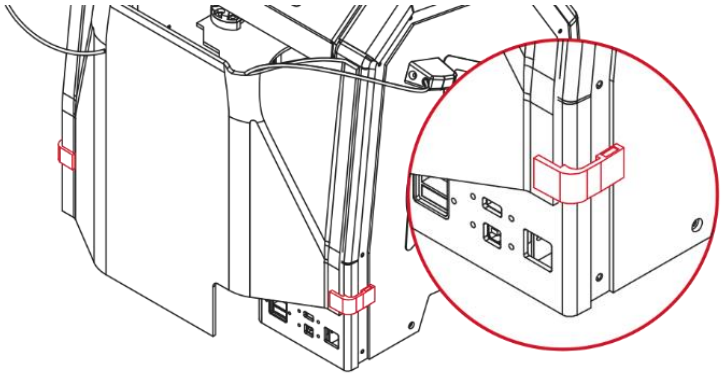


Fig. 69 Mounting the clips on the rear enclosure part

6. Mount the top enclosure part, so that extruders are placed in the cutout of the part (fig. 70). Top enclosure part should lay on the rear enclousure part. Magnets will hold the element in place.

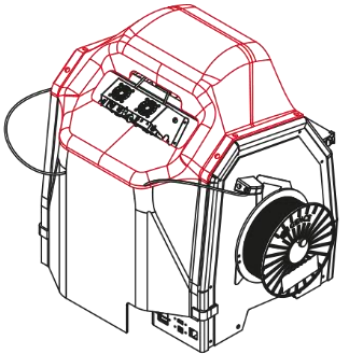


Fig. 70 Mounting the top enclosure part

7. Plug in the bowden tubes to the T0 and T1 extruders (fig. 71). To do that:
   - plug in bowden tube into the nipple (fig. 71, step 1). Make sure that bodwen tube is pushed to the end (about 2 cm, until resistance is felt),
   - put the collect clip on (fig. 71, step 2).

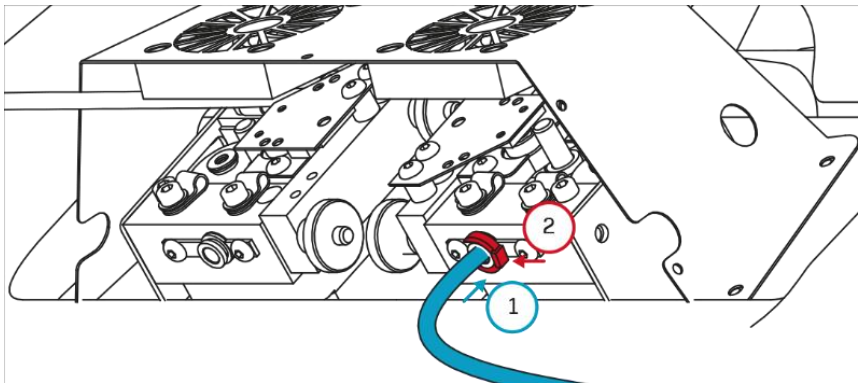


Fig. 71 Plugging in the bowden tubes to the T0 and T1 extruders

WARNING: mounting the front enclosure part in the next step of this manual will prevent access to the control panel. If you are planning to print, first:

- turn the printer on,
- load the materials by choosing: *MATERIALS → LOAD MODEL MATERIAL/LOAD SUPPORT MATERIAL* and follow the steps on the screen,
- start printing by choosing the file from the list and pressing PRINT.

8. Mount the front enclosure part. Front part should overlap the top enclosure part (fig. 72). Magnets will hold the enclosure assembly together.

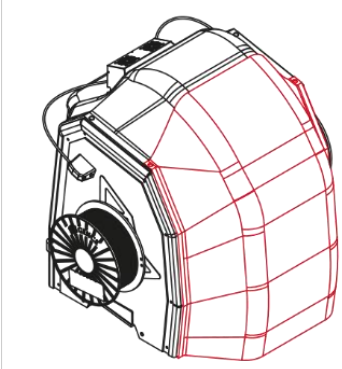


Fig. 72 Mounting the front enclosure part

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.

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 DOUBLE P255 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 DOUBLE P255 printer uses the 3DGence Slicer software in which settings for various nozzles 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 DOUBLE P255 printer is equipped with two nozzles with the diameter of 0.4 mm. 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 DOUBLE P255 printer is equipped with the Bowden type extruder. This means that the extruder motors are located outside the moving parts of the printer and the filament is pushed to the hotends through Teflon tubes. The use of the Bowden type extruders lightens the printer structure and has beneficial impact on printing quality.

Endstop (limit switch) – optoelectronic switch that restricts the 3D printer movements to the allowable limits. 3DGence DOUBLE P255 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.

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.

Stepper motor – brushless 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 DOUBLE P255 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.

Drive gear – 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 the printer's heated heatbed or, additionally, a dedicated casing.

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