USER'S MANUAL

Translation of the original manual

3DGence INDUSTRY F42X Series

INDUSTRY F420

INDUSTRY F421

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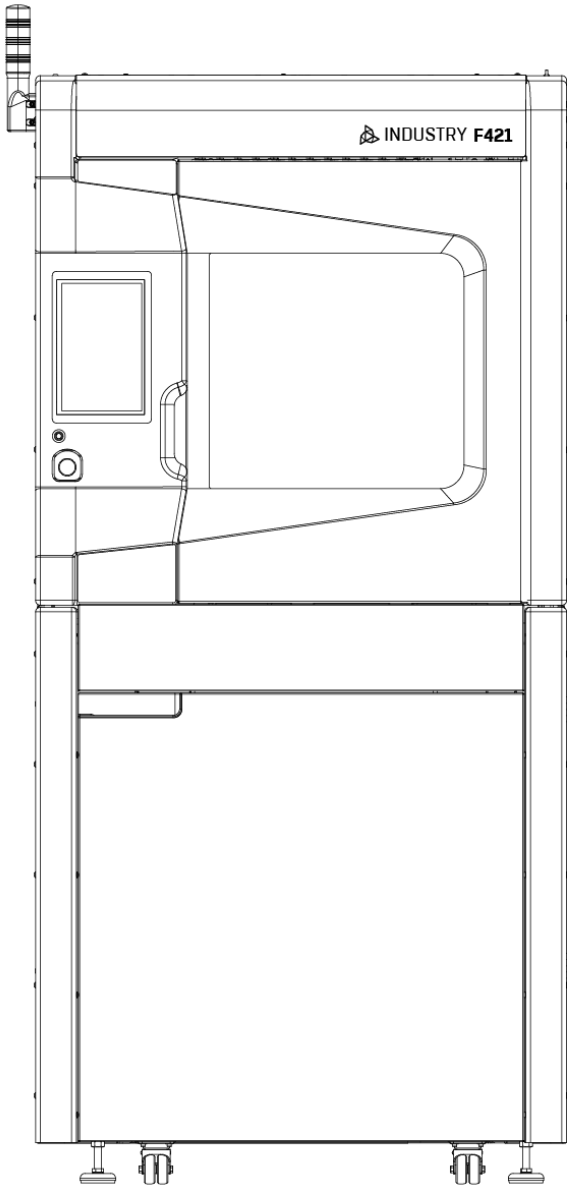

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I INTRODUCTION

1. INTRODUCTION

Thank you for choosing the 3DGence INDUSTRY F42x Series printer. This User Manual provides clear information on the industrial 3D printer to guarantee the highest quality of printing as well as long-term repeatable and safe operation of the printer.

The User Manual contains information necessary for proper and safe use of the printer. Read the entire User Manual carefully before using the printer.

The printer must not be used by persons who have not read this manual. Improper use may damage the device, cause injury or even put the operator's life at risk.

Before you start using the 3DGence INDUSTRY F42x Series printer you must read the entire User Manual and follow the guidelines contained therein as well as observe warranty terms and conditions published on the manufacturer's website www.3DGence.com.

Exercise caution when using the device due to the residual risk which could not be eliminated by the inherently safe design, safety measures and additional protective measures. Pay attention to marking and hazard warnings, i.e. stickers on the mechanical parts of the device, messages on the LCD display, light signals of the signal tower lights and audible warnings. Their meanings are described in this User Manual.

2. TECHNICAL SPECIFICATION OF THE DEVICE

The 3DGence INDUSTRY F42x Series printers are industrial devices designed for printing spatial models of thermoplastics based on three-dimensional models. The device can print durable models using the following technical materials: ABS, PC, PEEK. The system of interchangeable printing modules allows for a quick module change depending on the material required for printing. The use of an actively heated working chamber guarantees high quality and dimensional conformity of printed models. During printing the materials are stored in a stable environment thanks to the use of a heated material chamber. The air filter used in the device separates odours and ensures safe printer use. The technical specification of the device is presented in tab. 1.

Table 1 Technical specification of the 3DGence INDUSTRY F42x Series printer

DIMENSIONS AND WEIGHT	
Printer dimensions (width x depth x height)	915 x 980 x 1890 mm
Maximum printer dimensions with the top cover open, the door open, and the material chamber open (width x depth x height)	1500 x 1763 x 2230 mm (without signal tower lights) 1570 x 1763 x 2430 mm (with signal tower lights)
Printer packaging (width x depth x height)	1200 x 1000 x 2064 mm
Printer weight without packaging and accessories	~ 350 kg
Printer weight with packaging and standard accessories	~ 490 kg
Printer weight with packaging and full set of additional accessories (UPS with battery, filtration unit, signal tower lights)	~ 551 kg
ENVIRONMENT	
Operating temperature	18 – 30°C 30% to 70% relative air humidity, non-condensing
Storage temperature	-20 – 54°C 10% to 85% relative air humidity, non-condensing
Printer's sound pressure level when idle	Less than 57 dB
Printer's sound pressure level when printing	59 dB
Installation site height	It should not exceed 2000 m above sea level

POWER SUPPLY	
European connection requirements	Plug 3 ph 32 A IEC 60309 / 1 ph 20 A directly
US connection requirements	Phase-to-phase (2x120V, ϕ 180°) 20A NEMA 6l-20P plug
UK connection requirements	1ph 32A IEC 60309 plug
Power cord length	2,8 m
Voltage	230V AC (210-250V AC)
Frequency	50-60 Hz
Maximum power draw of the printer without additional accessories	20 A
Maximum power input of the printer without additional accessories	4600 W
The maximum power draw of the printer with a full set of accessories	20 A
TEMPERATURES	
Temperature of module hotends (max.)	500°C
Heatbed temperature (max.)	F420: 180°C F421:190°C
Printing chamber temperature (max.)	F420: 180°C F421:195°C
Material chamber temperature (max.)	50°C
SPEED	
Idle movement speed (max.)	1000 mm/s with an acceleration of 3000 mm/s^2
Print speed for working movements (max.)	400 mm/s
CONNECTIVITY	
Communication	Ethernet, WiFi, USB
Camera	2MP resolution camera built in working chamber, images transferred to 3DGence CLOUD every 5 seconds or on refresh request
PRINTING MODULES	
Printing modules	Two-head interchangeable modules dedicated for specific materials
Number of hotends	2
Hotend diameter	Depends on the printing module
3D PRINTING	
Technology	FFF (Fused Filament Fabrication)
Workspace (width x depth x height)	380 x 380 x 420 mm
Workspace volume	60 648 cm^3
Filament diameter	1,75 mm
Minimum diameter of filament spool core	50 mm
Maximum diameter of filament spool core	270 mm
Maximum spool thickness	90 mm
Maximum load on spool holder	2,5 kg
Model materials available	According to the used module (check 3dgence.com for list of supported materials)
Support materials available	According to the used module (check 3dgence.com for list of supported materials)
Third party materials	Supported
Printing process settings	Editable factory presets
Typical dimensional accuracy	In X, Y, Z axes: 0.125 mm or 0.0014 mm/mm, whichever is greater. Additionally, Z axis error to be assumed: - 0, +1 layer height.

SOFTWARE	
Print manager	3DGence SLICER 4.0
Systems supported by print manager	Windows, macOS
Updates to print settings	Automatic
Printer supported file formats	.3dg
Cloud system	3DGence CLOUD
DESIGN	
Design	Freestanding, fitted with castor wheels for easy handling
Frame	Steel
Door	Double-layer pane with circulation passive cooling
Drive	Stepper motors with position feedback in closed loop
Linear elements (XY and Z axes guide systems)	XY: linear guides and drive belts Z: linear guides and ball screw
Material feeding system (extruders)	2 direct drive interchangeable extruders with flow diagnostics
Electronics	• Numeric control board based on 32 bit ARM cortex architecture • User interface board based on 32 bit ARM cortex architecture • Material chamber management board based on 32-bit ARM cortex architecture
Heatbed surface	• Glass heatbed • Possible tool-free replacement of the heatbed surface, without the need to replace/disconnect the heater
Material chamber	• Closed, heated to help to keep proper material moisture content • 2 model material bays and 2 support material bays
Material loading system	Automatic material loading system located in the material chamber
Material marking system	SMM system based on NFC tags displaying the amount of material remaining on the spool
Heated material chamber	Yes
Lighting in the printing chamber	2 x LED G9 light source
Display	F421: 10,1'' IPS capacitive with a resolution of 1280 x 800 px F420: 7'' TFT capacitive with a resolution of 800 x 480 px
XY axis positioning resolution	0.008 mm
Z axis positioning resolution	0.006 mm
SAFETY	
Filters	Advanced 3 stage filtration unit as an **accessory**
Door	Electric lock, software lockable
Systems	• Overcurrent circuit breaker • Printer emergency shutdown system compliant with safety standards EN ISO 13849, EN 62061, IEC 61508, cat. 2 shutdown

	• Emergency power isolation system of the power supply unit for drives and modules • Emergency power isolation system for the logic power supply unit • Software shutdown system of the printer which can be confirmed by the user • Door open detection system • Top cover open detection system • Additional temperature sensors of high-power heat sources (chamber, table) • Heatbed surface presence detection system • Force sensor-based system to prevent collision with the heatbed or the workpiece
ADDITIONAL ACCESSORIES	
Signal tower lights	3 colour lights and audible alarm
UPS for emergency power supply	6KVA with a 72VDC battery with a capacity of 9 Ah
Active air filter of the print chamber	Advanced filtration unit (3-stage filter - preliminary/hepa/carbon)
CERTIFICATION	
Compliance with standards	Electromagnetic Compatibility (EMC) Directive 2014/30/EU. Radio Equipment (RED) Directive 2014/53/EU Machinery Directive 2006/42/EC Harmonised standards: EN 61326-1:2012 EN 61326-1:2013 EN 301 489-1 v2.2.3:2019-11 EN 301 489-3 v2.1.1.2019-03 EN 55032:2015 + AC2016 EN 300 330 v.2.1.1 EN 6024-1:2010
Marking	CE, FCC, IC

2.1. Device identification

The printer can be identified by the serial number on the rating plate on the rear side of the printer (Fig. 1). The serial number can also be checked on the device display. When sending a request via the 3DGence CLOUD platform, the 3DGence technical support department will automatically receive the serial number in the printer ticket. The serial number begins with the symbol: S/Ni and should be provided when contacting the 3DGence technical support department.

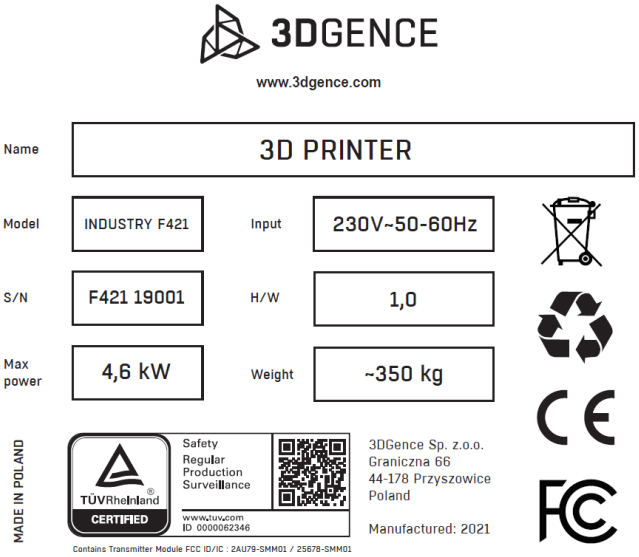


Fig. 1 Device rating plate

3. FFF TECHNOLOGY

The FFF (Fused Filament Fabrication) technology, implemented in the 3DGence INDUSTRY F42x Series printer, operates on the principle of layer-by-layer deposition of thermoplastic on the heatbed, thus bonding it with previous layers. This material is a consumable for the printer. The thermoplastic material is used in the form of a filament with a precisely defined diameter, wound on a spool (Fig. 2). The 3DGence INDUSTRY F421 printer uses only the filament with the diameter of 1.75 mm.

The 3DGence 3DGence INDUSTRY F42x Series printer can use many types of technical materials. A Certified Materials Database has been developed for 3DGence printers, accessible at www.3dgence.com. The database contains a list of all materials tested and recommended by 3DGence, for which printing settings have been prepared in the dedicated 3DGence SLICER 4.0 software. 3DGence recommends that the filaments from the Certified Material Base should be used. These materials are supported by the SMM system of the 3DGence 3DGence INDUSTRY F42x Series printer and they make it possible to achieve accurate print parameters, ensure automatic detection of the material type and, consequently, guarantee the highest print quality. More information on the SMM system can be found in section III, subsection 6.

3DGence does not limit the use of non-certified materials. However, the application of such materials prevents the use of the SMM system. 3DGence is not responsible for the quality of prints made of materials other than those listed in the Certified Material Base and for any damage caused by the use of such materials as well as it does not provide support for the quality of the prints made of filaments other than those listed in the Certified Material Base.

Fig. 2 Sample material spool with SMM tag

II INSTALLATION CONDITIONS

1. SAFETY MEASURES

The following information describes the correct operating conditions of the 3DGence INDUSTRY F42x Series printer. Failure to comply with the guidelines and warnings may significantly reduce the life of the printer, violate the warranty conditions or pose a risk to users' health.

1.1. Symbols used in this User Manual

Throughout this User Manual the following symbols are used. They identify the activities and situations that are potentially dangerous to health or may cause damage to the printer. Applicable rules must be followed and failure to follow these rules may cause damage to the printer.

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

NOTE
The situation or procedure described is potentially dangerous and may cause damage to the printer. Exercise care.

PROTECTION:
Wear protective gloves, complete with the printer, when performing the activities described.

1.2. General safety rules

The printer must not be installed:

- in open space, outdoors,
- in places that are damp or at risk of flooding,
- in the vicinity of volatile and flammable substances,
- near concentrated acids, caustic vapours or corrosive substances,
- In the environment with high particle air pollution
- in places easily accessible to children,
- where the mains supply is not fitted with a protective earth lead (PE) and a residual current circuit breaker to avoid an electric shock in the event of a device failure.

Do not:

- touch the printed model, the heatbed or the hotends during printing,
- open the working chamber door during printing,
- insert any body parts or objects into the printer working area during printing,
- touch the heated nozzle with your hands, even wearing protective gloves,
- bend over the heated printer chamber,
- touch live parts,
- touch any moving parts when the device is running, in particular: belts, linear guides, ball screw,
- operate the printer with wet hands,
- put any objects on or under the printer heatbed – both when the printer is running or at standstill,
- put containers with liquids or any other objects on the printer,
- clean the printer with running water using spray bottles or other devices,
- bypass safety systems by modifying the device (sensors, limit switches, etc.),

- leave the working printer in a room with children or animals,
- disassemble the printer or the printing module, as well as make unauthorised repairs, which may damage the printer and the printing module and void the device warranty.

Follow these guidelines:

- use only earthed power sources (to avoid an electric shock),
- ensure enough free space around the printer so that you can always open the door to its full width,
- when disconnecting the plug from the power source, pull the plug by its housing not by the cable,
- disconnect the printer from the power source before you start any repair or maintenance activities,
- make sure that the mains voltage and connection parameters comply with the device specification,
- protect the power cable and the plug against damage,
- disconnect the power plug before moving the printer,
- disconnect the power plug if the printer is not be used for a longer period of time,
- follow the maintenance recommendations,
- always wear protective gloves when operating the printer,
- provide easy access to the emergency stop switch in the event of a device failure.

1.3. Printer safety marking

3DGence makes every effort to ensure that the 3DGence printers are safe and reliable. There are a number of stickers in the printer to alert you to potential dangers.

Warning against electric voltage. This sign indicates high voltage in the printer. Care should be taken in places marked with this symbol.

Hot surface warning. The following symbol warns against a high temperature area. Always exercise extreme caution when working with heated parts and wear the protective gloves provided with the unit. Failure to comply with safety rules may cause severe burns.

Hand crush warning. This sign warns against a hand crushing risk.

Warning about moving machine parts. This sign warns against a risk of accident caused by contact with moving parts of the device.

Gloves. Wear the protective gloves provided with the unit when working in an area marked with this symbol.

1.4. Potential areas of safety hazards

Certain areas in the printer pose safety risks. Special care must be taken when using and maintaining the device.

In the event of a failure, switch off the printer using the main switch on the back of the unit (Fig. 18, point 7) or using the emergency stop switch on the front panel (Fig. 15, point 4). If anyone is injured due to the failure, provide first aid. The failure should be reported to the 3DGence technical support department. You can find all contact methods in section IX of this manual. The device should also be secured against unauthorised start-up until the failure is rectified.

- Always wear protective gloves when working inside the working chamber. There may be high temperature in the chamber.
- Do not wear loose clothing, neckties or hanging jewellery when working near moving parts.
- The drive belt, pulley, and the Z-axis heatbed stepper motor can cause serious injury. The risk of crushing by the Z-axis heatbed is minimized by locking the working chamber door when the Z axis heatbed is moving and turning off the Z-axis motor when the chamber door is open.

- In the area of the frame under the top cover of the device, there are mechanical driving elements of the X and Y axes. Special care must be taken when accessing this area.

1.5. Moving the device

To ensure user safety and to avoid accidental printer damage, the following rules must be observed when moving the printer:

The transport of the device is divided into two types: short-distance transport and long-distance transport.

For short-distance transport within a building or a complex of buildings, use the wheels that the machine is equipped with and follow the guidelines below:

• before moving the device, turn it off and disconnect all connections,
• the device should be cooled down and the consumable material and all loose elements and accessories should be removed from the printer,
• before changing the location of the device, loosen the nuts locking the stabilizing legs and screw in the stabilizing legs so that they are in the air (Fig. 3).
• Be especially careful when moving the machine over thresholds, expansion joints or drainage grates. The center of gravity is located high, so the machine may lose stability when going over such obstacles.
• It is unacceptable to transport the machine using short-haul transport devices such as an overhead crane, forklift, etc. If it is necessary to use such means, follow the guidelines for long-distance transport.

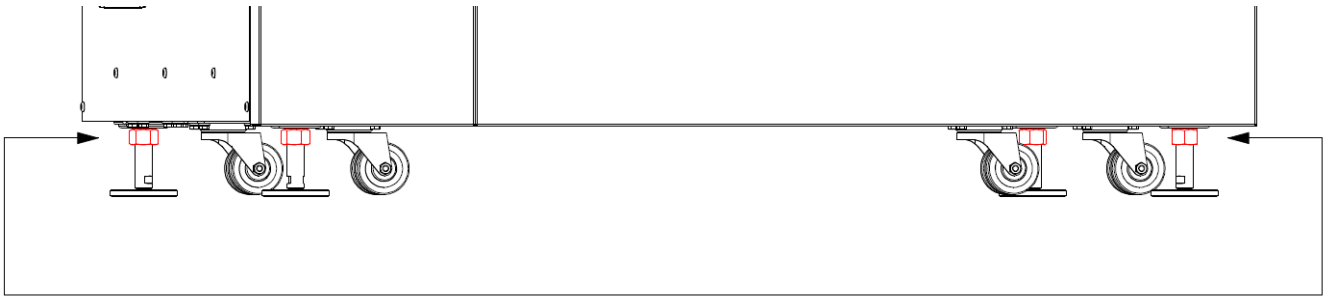


Fig. 3 Localization of levelling nuts

For long-distance transport, where transport is required between locations that prevent transport using the machine's wheels:

- Keep the transport box in which the device is delivered
- Pack the device according to guidelines for packing the device available by contacting the 3DGence support department. How to contact support is described in section IX of this manual

Transport the machine after packing the machine in accordance with the guidelines. When transporting, pay attention to a high center of gravity.

1.6. Place of device installation

Information on where to install the device:

- the device should work at a temperature of 18°C to 30°C and a relative air humidity of 30% to 70%, non-condensing,
- the device should be stored at a temperature of -20°C to 54°C and a relative air humidity of 10% to 85%, non-condensing,
- sound level of the device when idle: below 55 dB, when printing: 64 dB,
- prevent the propagation of vibrations and noise generation, the device should be placed on feet on a stable surface with a load-bearing capacity appropriate to the weight of the device, e.g. concrete floor; it is not recommended to install the device on an enclosure made of sheet metal, chipboard, wooden decking, etc.,

- the emission level of non-ionizing electromagnetic radiation generated by the device is within the limits specified by the standards for the 3DGence INDUSTRY F421 device: EN 61326-1, EN 55011, and for the built-in wireless communication device: EN 300 330, EN 55032, EN 301 489-1/-3,
- provide enough clear space around the printer based on the overall dimensions of the device (Fig. 3, 4); additionally, you ensure access to all sides of the printer to allow replacement of consumables or maintenance work as recommended by the manufacturer (Fig. 5, 6),
- the operator can stay in front or on the right side of the device, it is not recommended to stay at the back or on the left side of the device due to generated noise and/or heat,
- before starting the printer for the first time, the manufacturer recommends that the device should be left for 24 hours before connecting it to a power source in order to stabilise the temperature
- the place of installation of the device should be compliant with the the connection specification (section II, subsection 1.7),
- the printer is not designed for use in a dusty environment,
- the room where the device is installed should be provided with a ventilation system appropriate to the room size,
- always place the device on a hard and stable surface suitable for its weight (table 1),
- the printer should not be exposed to direct sunlight,
- keep the printer away from other heat sources and avoid direct long-term exposure to sunlight,
- uninterruptible power supplies (UPS) should be used in order to ensure that the printing process is not stopped in the case of a mains failure.

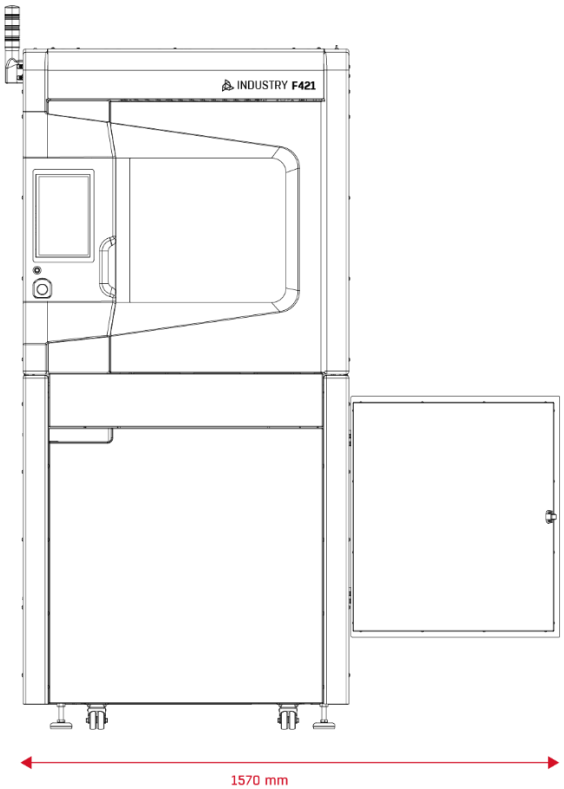


Fig. 4 Maximum printer size (width)

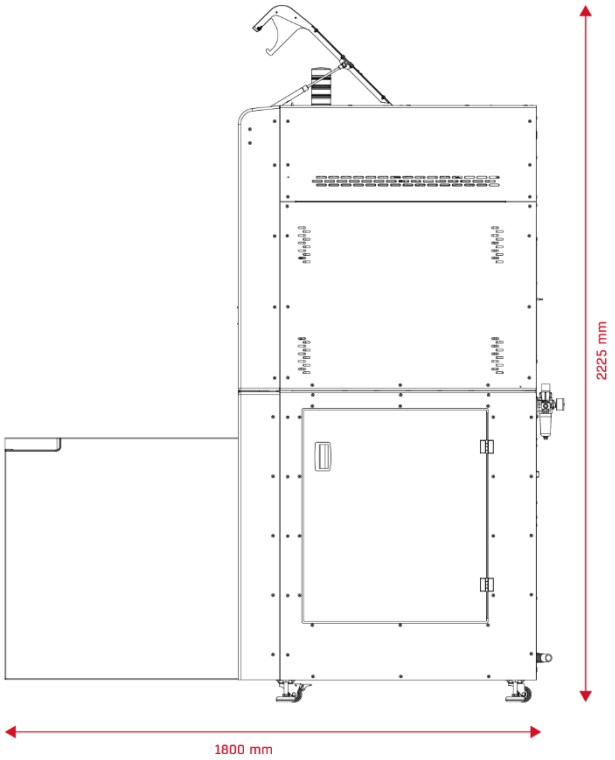


Fig. 5 Maximum printer size (depth and height)

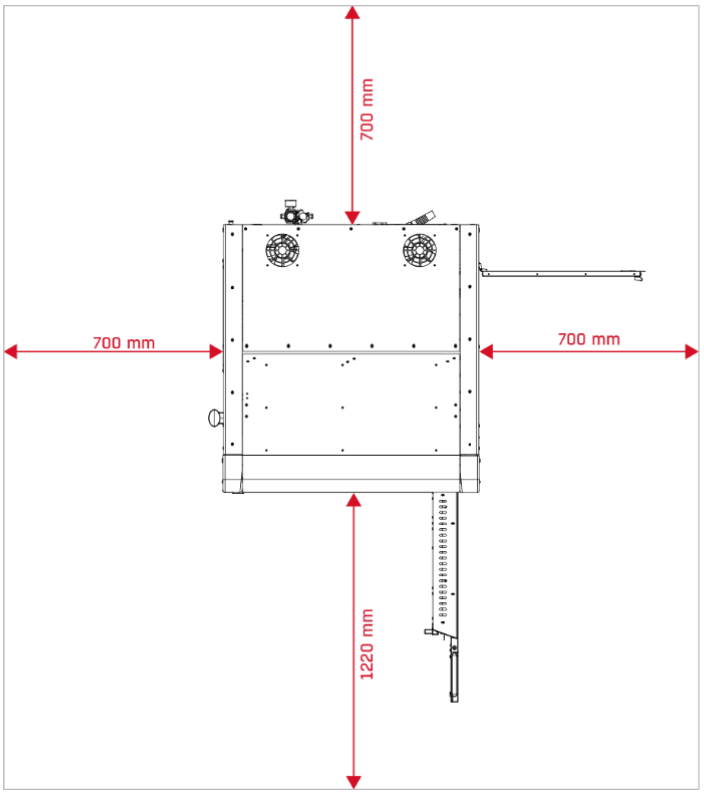


Fig. 6 Minimum clearances to be kept on all sides of the device

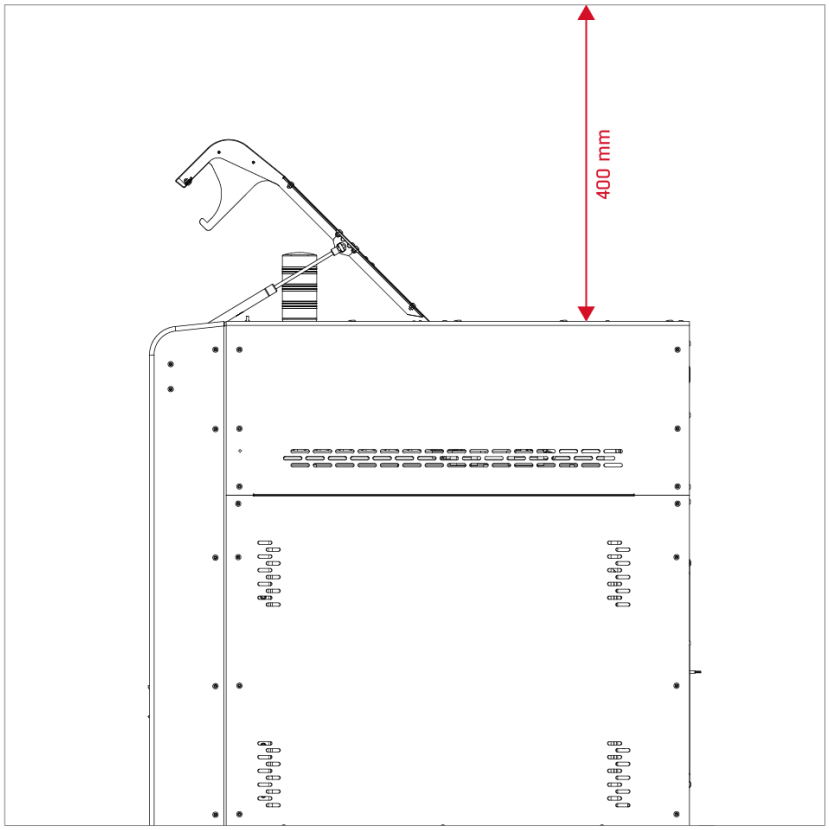


Fig. 7 Minimum clearance to be kept from the top of the device

1.7. Connection specification

The electrical characteristics of the 3DGence INDUSTRY F42x Series are presented below. The connection should be suitable for the specified values.

Voltage: 230V AC (210-250V AC).
Frequency: 50-60 Hz.
Maximum power draw of the printer with a full set of accessories: 20 A.

European connection requirements
It is recommended to connect the device to the mains directly, e.g. in a cable box or with busbars using 4 mm2 3-wire cable. If no direct connection is possible, there is a second connection option. Due to the high maximum current draw of 20 A, the device can be powered via a 3-phase socket with a maximum allowable current of 32 A according to IEC 60309 and a 5- core 4 mm2 cable. 1 of 3 phases and a neutral wire are used. If more machines are connected to the mains, in order to ensure an even load on the mains the devices should be connected to successive phases (e.g. Machine 1: L1 + N, Machine 2: L2 + N, Machine 3: L3 + N, etc..).

US connection requirements
The device is plugged into the mains phase-to-phase (2x120 V, φ 180°) via a 20-ampere NEMA 6l-20P plug via a 3-core 4 mm2 cable.
Alternatively, the device can be connected to the mains directly, e.g. in a cable box or with busbars using 4 mm2 3-wire cable.

UK connection requirements
The device is connected to the mains via a single-phase 32A IEC 60309 plug.

1.8. Power demand

The power demand depends mainly on the printing material used. For each of the materials, different temperatures are maintained in the working chamber of the device and in the material chamber. Power demand for various materials is presented in table 2.

Table 2 Characteristics of power demand for different materials

Material	Power demand when printing	Power demand when idle
PLA	0,45 kW	0,1 kW
ABS	1,35 kW	0,2 kW
ASA	1,35 kW	0,2 kW
PA	0,5 kW	0,2 kW
PC	1,8 kW	0,2 kW
ULTEM AM9085F	2,5 kW	0,2 kW
PEEK	0,7 kW	0,2 kW

2. ITEMS INCLUDED

The 3DGence INDUSTRY F42x Series printer is delivered with a set of necessary accessories. The set comprises:

- safety equipment:
  - glasses,
  - gloves,
- accessories:
  - spatula,
  - tweezers,
  - pliers,
  - USB flash drive,
  - combination wrench size 14, 15 For F420
  - combination wrench size 12, 24 for F421
  - RJ45 cable,
  - wireless communication module (WLAN),
  - Allen screwdrivers,
  - a set of bulbs,
  - a set of print cleaning tools,
  - a tool attachment for modules,
  - a set of caps for the top of the device,
- spare parts:
  - glass table,
  - adhesion promoter,
  - glass cleaning kit,
  - machine oil.

3. UNPACKING THE PRINTER

Note: the printer may be unpacked and connected to a power supply only by persons trained and authorised by 3DGence.

The device may be put into use if, after installation, it meets all the recommendations of this manual, it has no damage or defects that could compromise its safe use. The operator operating the machine must read the manual. Additionally, it is recommended that the operator should complete training conducted by the Manufacturer or an authorised Distributor.

For shipment the 3DGence INDUSTRY F421 printer is attached to a pallet and packed in a box made of OSB panels. The pallet on which the printer is placed is a 2 euro pallet with dimensions of 1,200 x 1,000 mm and 2,064 mm height.

Note: Due to the substantial weight of the device (~350 kg of the device itself), special care must be taken when unpacking.

To unpack the printer, you need the following tools:

- power Phillips screwdriver PH2 or Phillips screwdriver to unscrew OSB,
- open-ended spanner size 14 and 15 for F420 and open-ended spanner size 12 and 24 for 421 to unscrew the printer feet (included in the set of accessories)

Printer unpacking:

1. Move the printer to the installation site using a pallet truck. For information and requirements for the installation siteplease refer to point 1.6 in this Section.
2. Unscrew OSBs in the order shown in Fig. 7. Put aside the boards, the Styrofoam inserts and screws. The manufacturer recommends that you keep the packaging.
3. Slide the bag off the device.
4. Remove all loose parts from the printer, including the set of accessories.
5. Unscrew the four feet that attach the printer to the pallet.
6. Remove the mounting feet from the printer by removing the pin and pulling out the retaining clip.
7. Fasten the ramp to the pallet by sliding the two pins into the positions indicated in Fig. 8 and lock them with a retainingclip attached to the pins.
8. Loosen the four nuts locking the printer feet and screw in the feet so they are in the air.
9. Unlock the printer castors using the lock on the two front wheels.
10. Slowly slide the printer off the pallet.
11. Follow all the steps described in Section II before starting the printer.

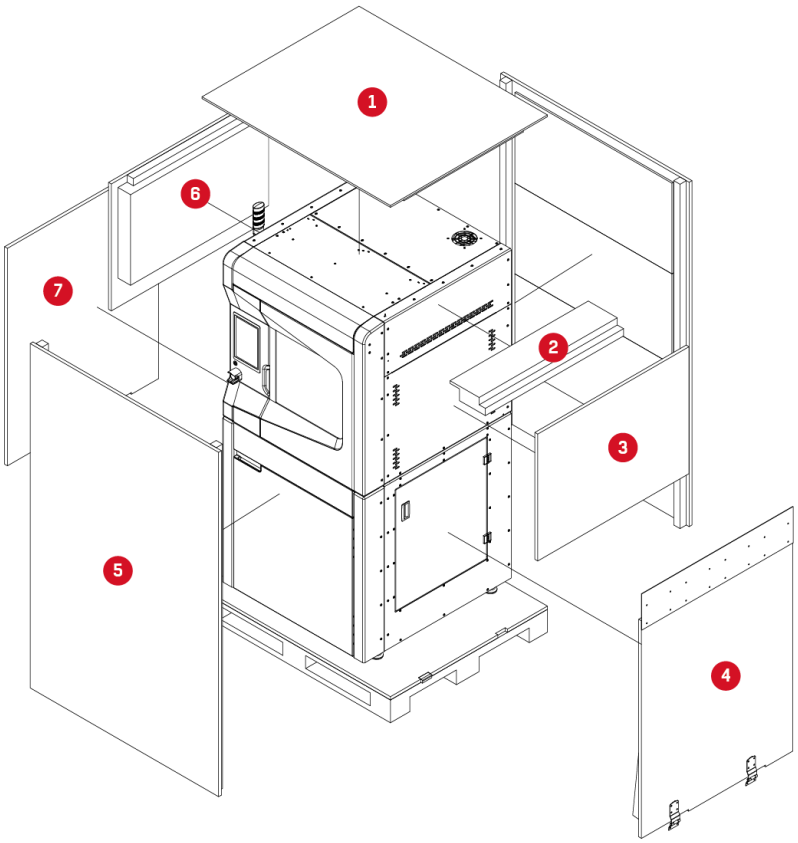


Fig. 7 Printer packaging - unpacking sequence

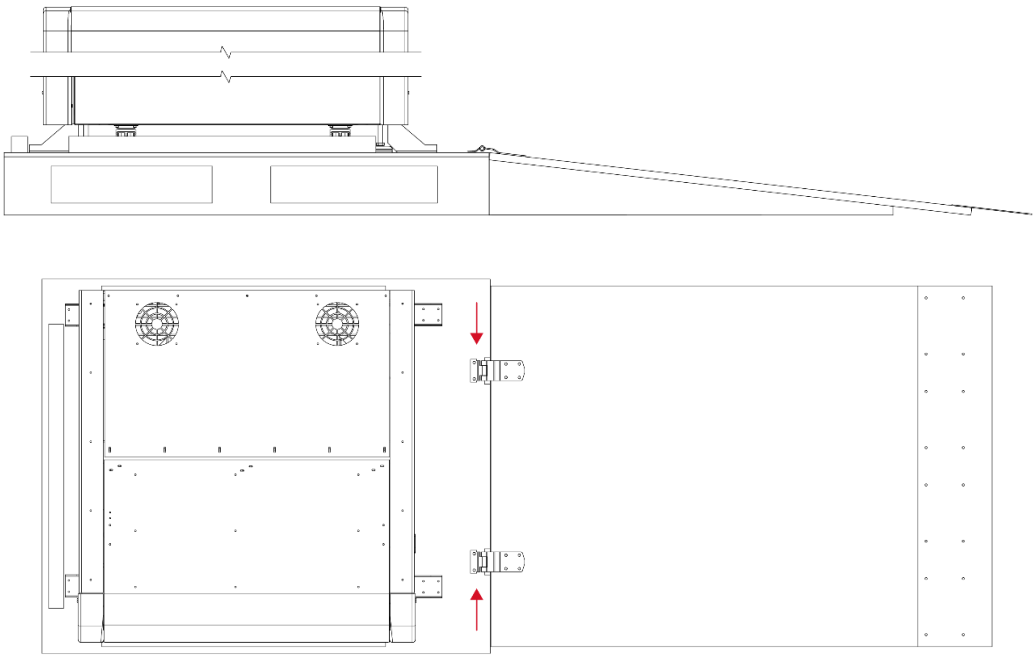


Fig. 8 Pallet ramp mounted

4. BEFORE YOU START UP THE PRINTER

Note: before you start up the printer for the first time, the Manufacturer recommends that the device should be left for 24 hours before connecting it to a power source in order to stabilise the temperature.

Note: before commissioning select an appropriate installation site and follow the instructions and requirements described in section II, subsection 1.6 and level the printer in accordance with subsection 4.1 in this section.

Before starting the printer always make sure to:

- check the cables for abrasion or other visible damage. In the event of damage to the cables, please notify 3DGence technical support department immediately. You can find all contact methods in section IX of this manual. Do not connect the printer to power supply and/or make repairs on your own;
- check that in the printer's working area there are no objects or remains of prints that could jam or damage the printer;
- check X axis and Y axis, confirm that their movements are not blocked by moving the printing module manually forward, backward, to the left and to the right;
- verify that filament is not contaminated, broken, bent or tangled on the spool.

4.1. Printer stabilisation

Note: the feet are designed to stabilise the printer after it has been moved to the desired location. Before operating the printer, level the printer and lock its feet to avoid additional vibration.

Stabilise the printer:

1. Move the printer to the desired location and make sure that the minimum space requirements are met (Fig. 5, 6).
2. Lock the printer casters with the lock on the two front casters.
3. Unscrew the feet with an open wrench size 14 (F420) or 12 (F421) so that they touch the floor. The castors should remain in light contact with the ground.
4. Lift the printer frame evenly by unscrewing the feet so that the castors can rotate freely.
5. Use the spirit level from the accessories compartment (Fig. 15, point 6) of the printer to check that the printer is level with the ground. If necessary, level the device by tightening or unscrewing the individual feet so that the air bubble of the level is in the centre.

6. Tighten the nuts to lock the feet by securing them with an open wrench size 14.

Note: before relocating the device again, observe the recommendations provided in section II, subsection 1.6.

Conditions under which the equipment meets the stability requirements during:

- use – on feet secured with a locknut,
- shipment and handling – on a pallet with the use of fasteners and a wooden crate,
- assembly/disassembly – on castor wheels from the unloading site to the designated place.

5. PRINTER START-UP

5.1. Connecting to a power source and switching on the device

After the printer is correctly positioned and leveled, connect the device to a power supply. The power cord input is located at the rear of the device (Fig. 18, point 5). The connection specification is provided in Section II, Subsection 1.7. The procedure for switching on the unit is described in Section V, point 2.1.

5.2. Connection of the air treatment and compressed air unit

The air treatment unit (ATU) is an optional accessory for the 3DGence INDUSTRY F42x Series printer. For more information, see Section III, point 12.3. Below is the procedure of connecting ATU to the device.

F420

1. Remove the two bolts from the rear case of the printer and screw the mounting plate and the air treatment unit to the printer (Fig. 10, red).
2. Plug one end of the shorter polyurethane hose included in the set into the ATU pneumatic connector, connecting it to the printer, and the other end to the printer.
3. Plug one end of the longer polyurethane hose included in the set into the compressed air inlet of the ATU, andthe other end to the compressor.

F421

1. Using 2 screw from included in ATU set, screw ATU module to 2 free threaded holes in the back of machine (Fig. 9 red).
2. Plug one end of the shorter polyurethane hose included in the set into the ATU pneumatic connector, connecting it to the printer, and the other end to the printer.
3. Plug one end of the longer polyurethane hose included in the set into the compressed air inlet of the ATU, andthe other end to the compressor.

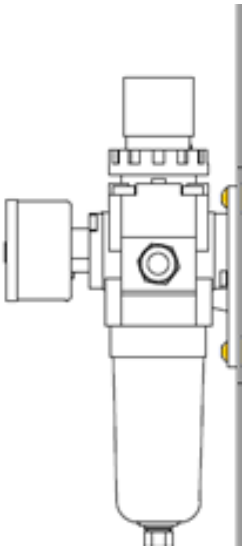


Fig. 9 Installation of ATU F421

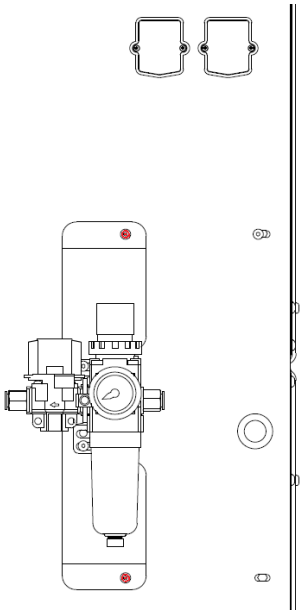


Fig. 10 Installing of ATU F420

5.3 Connecting a WLAN adapter

The accessories provided with the device include a WLAN adapter for wireless communication with the device.

1. Plug one end of the WLAN cable provided into the WLAN module (fig. 11, yellow).
2. Plug the other end of the WLAN (fig. 11, red) cable provided into the LAN/WLAN adapter socket of the printer (fig. 19, point 3).
3. Put the WLAN module on the printer. It will be fixed with a magnet (fig. 11).

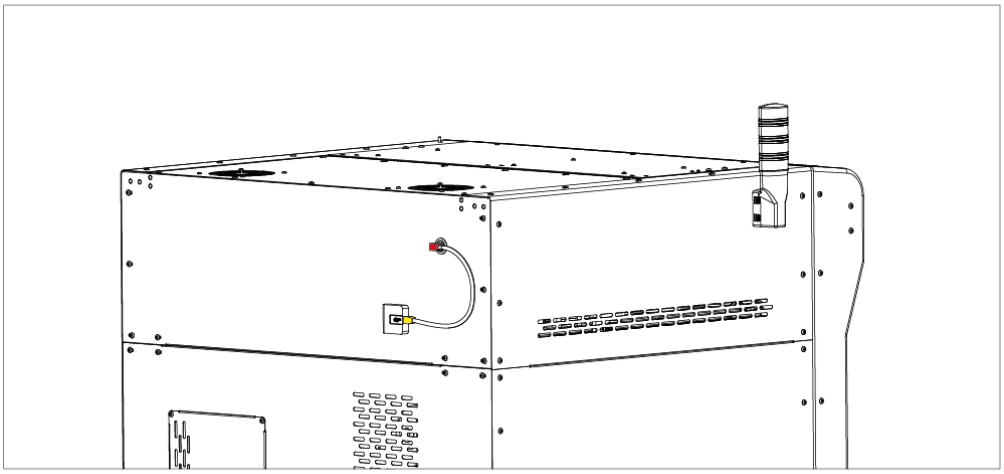


Fig. 11 WLAN module installed on the printer

5.4. Network configuration

You can select the connection type after selecting the “network” icon on the printer display in the “network type” record. Possible statuses are the following:

- disabled – network options are disabled.
- wired – connected to the LAN via a cable using an RJ45 jack.
- Wi-Fi – wireless connection using the WLAN adapter.

After connecting the WLAN adapter and selecting the Wi-Fi connection in the “network type” record, the “Wi-Fi” record below becomes active, which takes you to the list of available networks. After selecting the network, the printer attempts to connect to it and, if necessary, an on-screen keyboard is displayed to enter the password. The “connected” status at the bottom of the screen indicates that the device is connected to the network.

If you select a “wired” connection type in the “network type” record, remove the WLAN adapter from the printer and plug the LAN cable into the LAN/WLAN adapter port of the printer (Fig. 18, point 3). The “connected” status at the bottom of the screen indicates that the device is connected to the network.

5.5. Software update

Software update is described in section V, subsection 1.

5.6. Installing the printing module

The procedure for installing the printing module is described in section V, subsection 4.1.

5.7. Assembling the glass table

The procedure of assembling the glass table is described in section V, subsection 5.1.2.

5.8. Calibrating the heatbed

The heatbed calibration procedure is described in section VI, subsection 2.

5.9. Adjusting the cleaning station slats and brushes

The slats and brushes are attached to the cleaning station (Fig. 19). Before you start up the printer for the first time, make sure that each of the cleaning station slats is well adjusted to the corresponding nozzles in the printing module. Incorrectly adjusted components may impair the quality of prints, material residues left over in the working chamber or excessive wear of the station cleaning unit.

1. Open the front door of the printer by pressing the button on the display (Fig. 26, point 9).
2. Check that the printing module has been installed in the device. The procedure for installing the printing module is described in section V, subsection 4.1.
3. From the printer menu, select*:* *settings button → printer controls → manual control → default position* to position the printing module above the cleaning station.
4. Visually check if the cleaning station slats are correctly adjusted with respect to the nozzle in the printing module. When properly adjusted, the nozzle cover is gently in contact with the cleaning station's slat (Fig. 12).

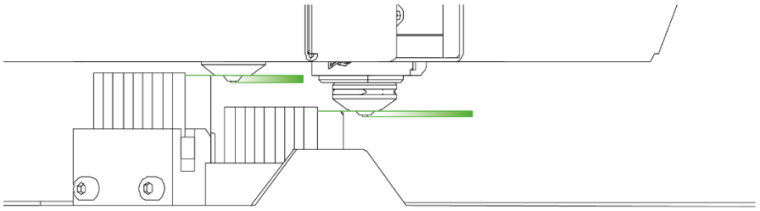


Fig. 12 Cleaning station slats properly adjusted in relation to the module nozzles

Two situations are shown below where the slat is incorrectly adjusted relative to the printing module nozzle.

1. The distance between the nozzle and the cleaning station slat is too long and the slat fails to touch the nozzle at all (Fig. 13).
2. The distance between the nozzle and the cleaning station bar is too short and the slat is in excessive contact with the nozzle cover (Fig. 14).

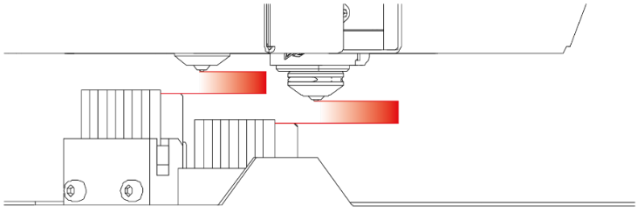


Fig. 13 Incorrectly adjusted cleaning station slats relative to the module nozzles – too long distance

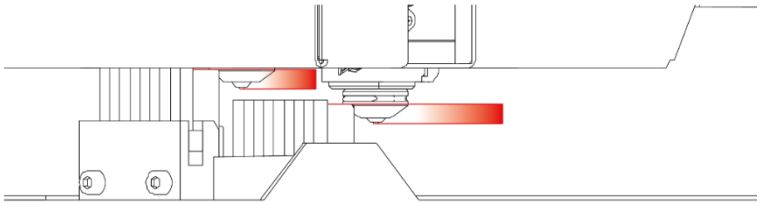


Fig. 14 Incorrectly adjusted cleaning station slats relative to the module nozzles – too short distance

In the case of an improperly adjusted slat relative to the printing module nozzle, follow the procedure below.

1. Loosen the four cleaning station adjustment screws marked in Fig. 15.
2. Gently raise or lower the cleaning station:
   - in the case shown in Fig. 12, the cleaning station should be raised,
   - in the case shown in Fig. 13, the cleaning station should be lowered,
3. Tighten the screws loosened in step one above (Fig. 15)
4. Check again that the cleaning station slats are well adjusted relative to the corresponding printing module nozzle (Fig. 12). If adjusted incorrectly, repeat the procedure.

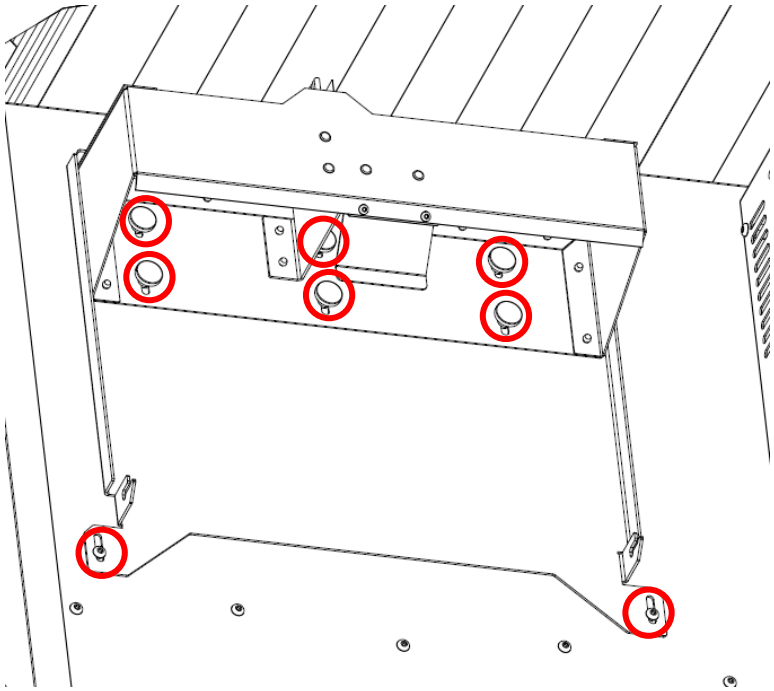


Fig. 15 Screws for adjusting the cleaning station

5.10. Calibrating the offset between the printing module hotends in the Z axis

The procedure for calibrating the offset between the printing module hotends in the Z axis is described in section VI, subsection 1.1.

5.11. Calibrating the offset between the printing module hotends in the X, Y axes

The procedure for calibrating the offset between the printing module hotends in the X, Y axes is described in section VI, subsection 1.2.

III PRINTER DESIGN

1. OVERVIEW

The following figures (15 to 18) as well as the descriptions of major printer's components make it easy to understand the operation of 3DGence INDUSTRY F42x Series and the remaining instructions of this manual.

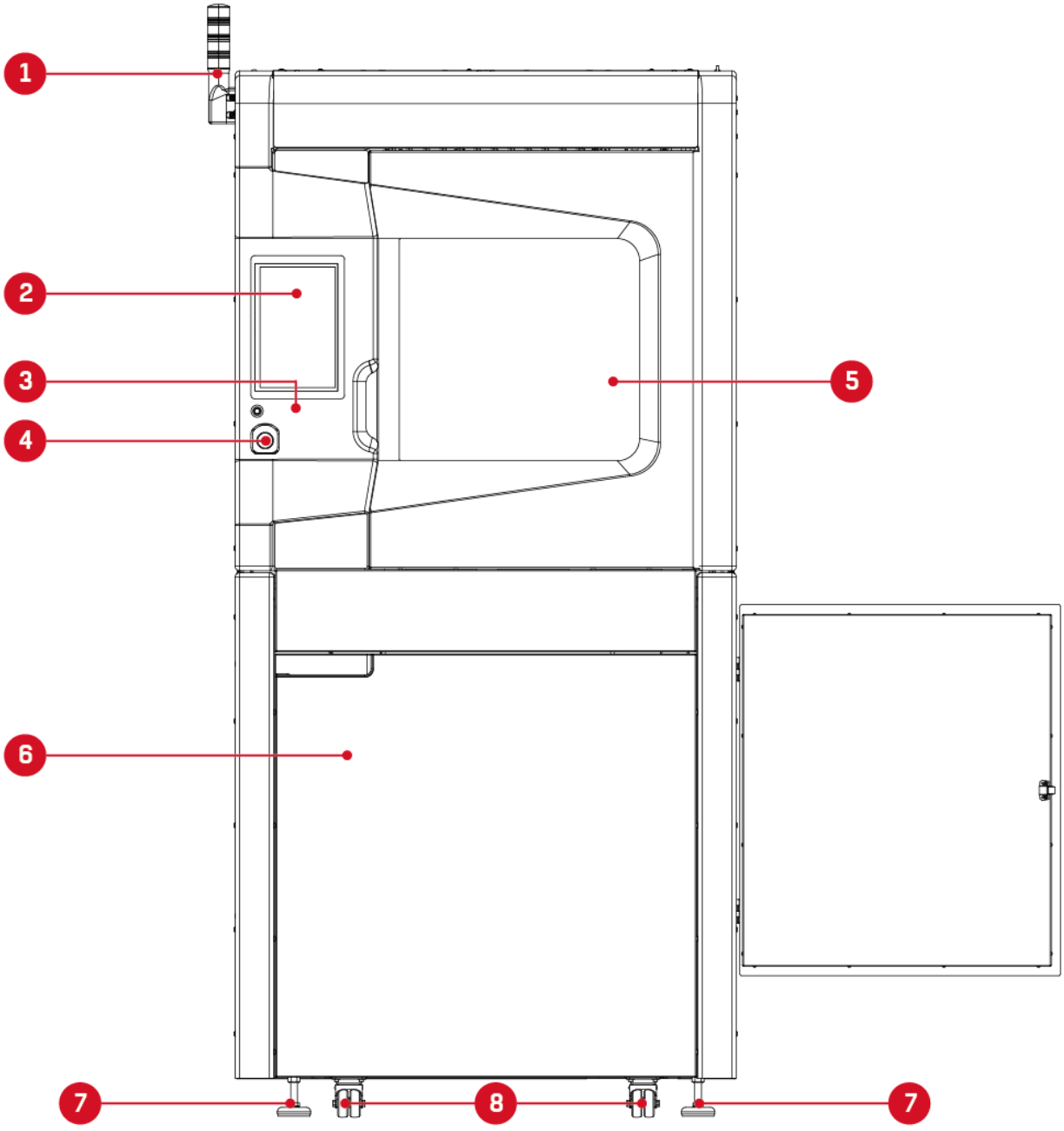


Fig. 16 3DGence INDUSTRY F42x Series – front view:
1. Signal tower lights (optional) | 2. Display | 3. Power button
4. Emergency stop switch | 5. Working chamber door
6. Accessories compartment door | 7. Stabilizer feet | 8. Castor wheels

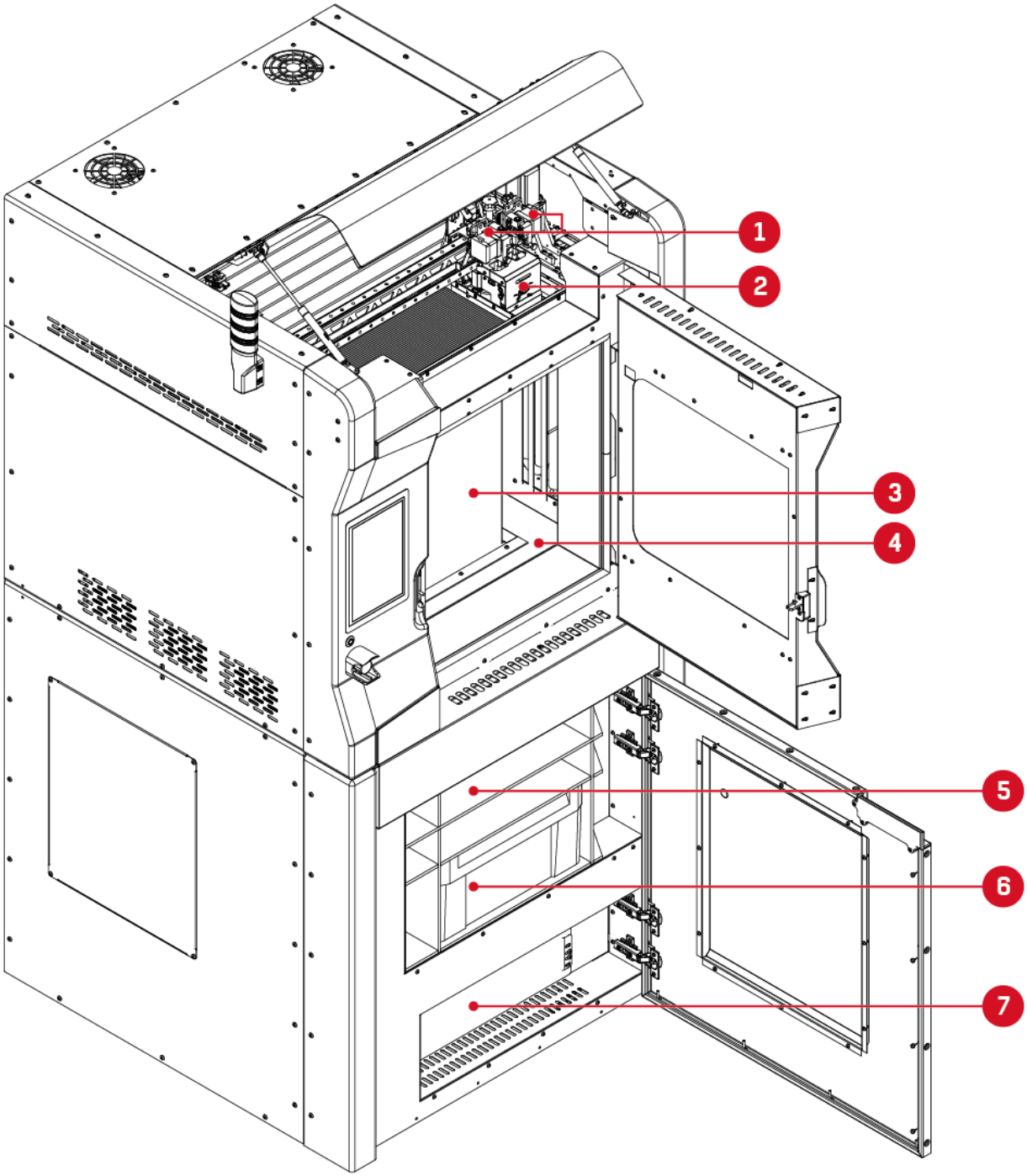


Fig. 17 3DGence INDUSTRY F42x Series – isometric projection, open working chamber door and top cover:
1. Extruders | 2. printing module | 3. Z axis column
4. Working chamber | 12. USB port | 13. Storage space | 14. Space for UPS

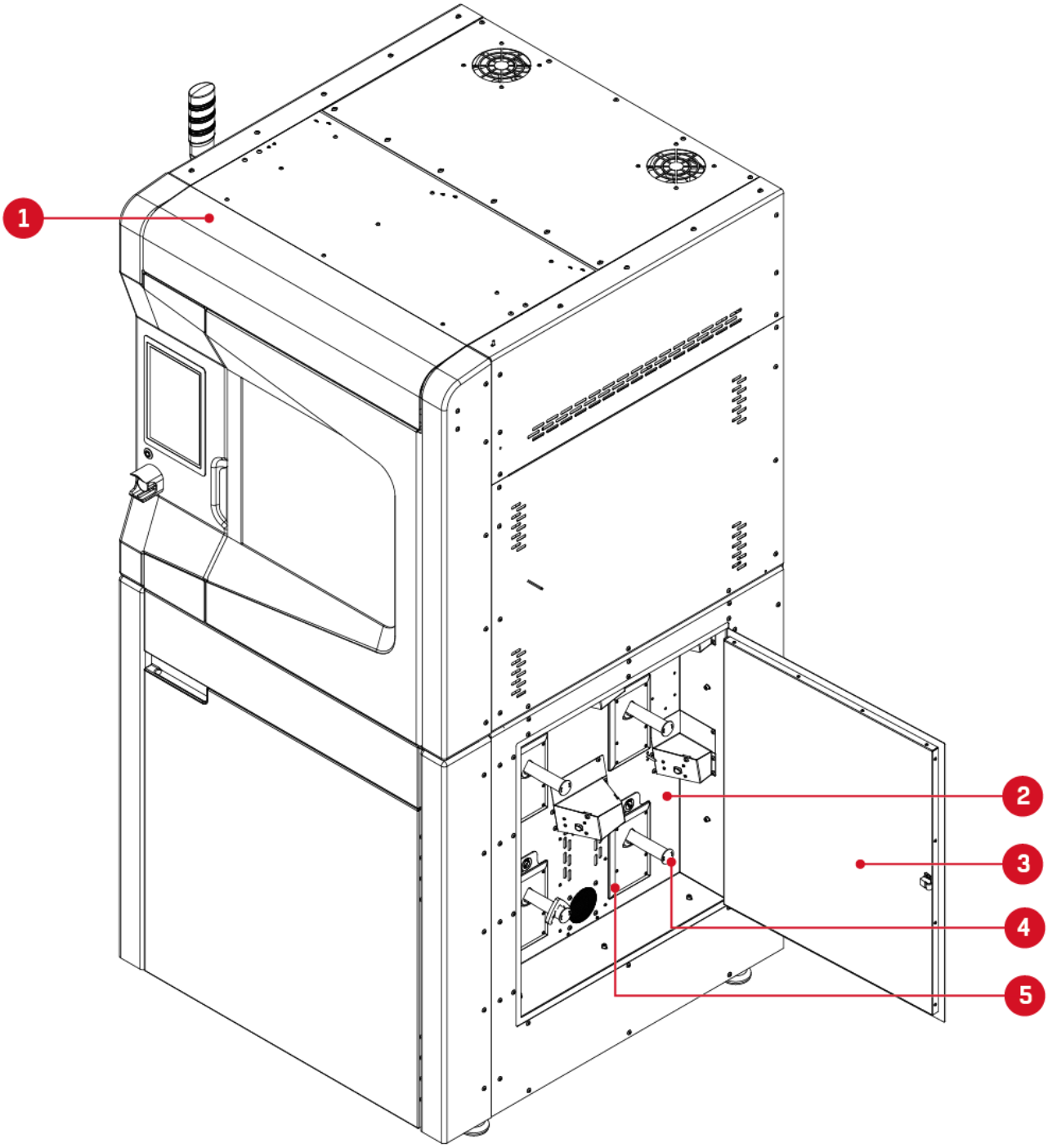


Fig. 18 3DGence INDUSTRY F42x Series – isometric projection:
1. Top cover | 2. Material chamber | 3. Material chamber door | 4. Material bay | 5. SMM reader

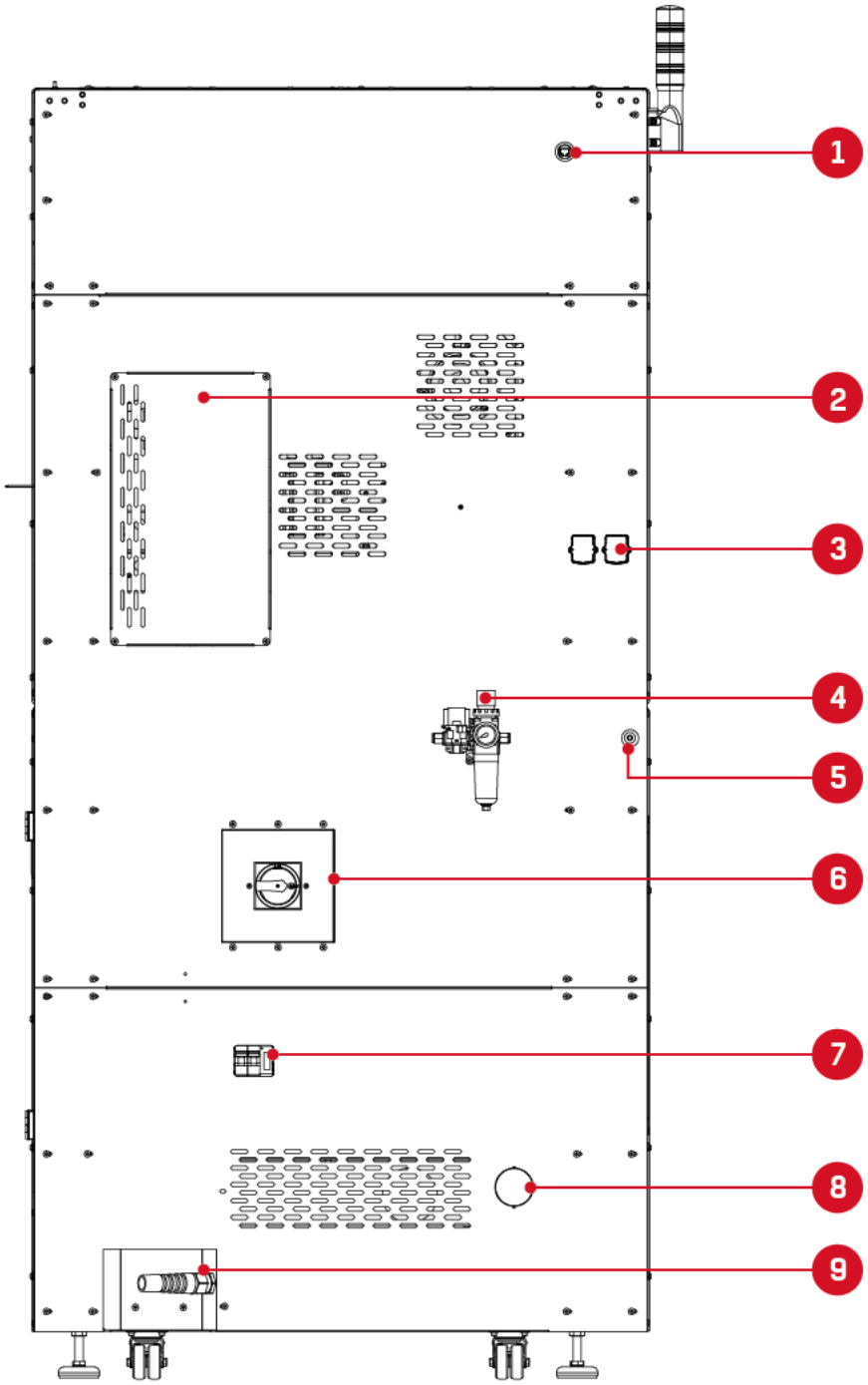


Fig. 19 3DGence INDUSTRY F42x Series – rear view:
1. LAN / WLAN adapter port
2. Access panel for the module cooling blower and replacement of the blower filter (not available for the F420 model) | 3. Access opening for the material feed system | 4. Air treatment and compressed air unit | 5. Compressed air supply plug | 6. Main Switch 7. Overcurrent protection | 8. Clean air outlet from the filtration system | 9. Power cable inlet

2. KINEMATIC SYSTEM

The printer is a Cartesian (gantry) robot. The printing module moves on the X axis (left – right) and on the Y axis (front – back). The printer heatbed moves along the Z axis (up – down).
Dimensions of the available printer's workspace:
X axis: 380 mm,
Y axis: 380 mm,
Z axis: 420 mm.
The printed piece must not exceed these 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 to be printed. For some profiles, the actual maximum size of the printed model may be limited by the width of the base structure (so-called raft).

3. USER INTERFACE PANEL

3.1. Display

A colour touchscreen display is located on the left side of the front panel of the device (Fig. 16, point 2). This is the printer's communication interface with a transparent graphic menu. It allows the user to control the printer and displays the operating status of the device.

3.2. Power button

The power button is located on the left side of the front panel of the device under the display (Fig. 16, point 3). It is used to switch the printer on and off. This button turns off the power supply only to the machine's main controller. To power down the printer completely, move the main switch and the overcurrent protection to the "off" position. After the printer is turned off with the power button, the material bay controller and the power meter module are still active and the material chamber temperature is still maintained. An uninterruptible power supply module (UPS) is also active and the battery is charging or the battery charge level is maintained.

4. WORKING CHAMBER

4.1. Working chamber door

The working chamber door allows access to: Z axis column, heated print bed, slats and brushes of the cleaning station, cleaning station container, camera and lighting. The door is locked with an electric lock. During printing the door is locked and cannot be opened. Once the print is complete, when the temperature of the device is safe, the printer software will unlockthe door. Please note that an attempt unauthorised open the door or upper cover. It will start the safety procedure, cut off the power supply to the drives and stop the printing process. In such a case, the manufacturer cannot guarantee that the printing process can continue process a significant loss of print quality or machine failure. The door is fitted with a gasket that ensures tightness of the working chamber.

4.2. Heated print bed

The heated print bed of the device moves in the Z axis. Its design allows the use of different work surfaces. The heated print bed is fitted with a vacuum system which enables the use of pads from various materials during printing and a sensor detecting the presence of a glass work surface.

4.3. Slats and brushes of the cleaning station

The slats and brushes for cleaning the nozzles of the print module are located on the left wall of the working chamber (Fig. 20). One of the brushes is designed for cleaning the model material head nozzle and the other for cleaning the support material head nozzle. Their task is to clean the heads from the remains of extruded materials.

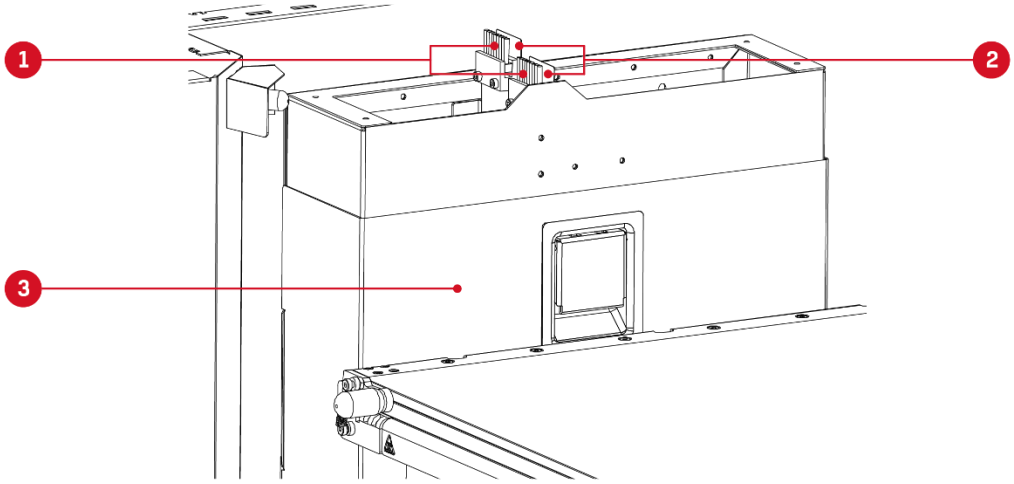


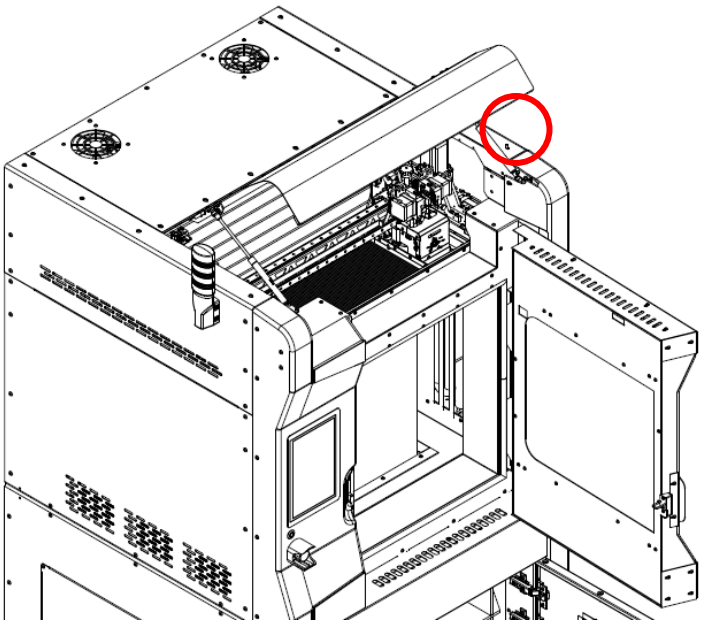
Fig. 20 1. Cleaning station brushes | 2. Cleaning station slats | 3. Cleaning station container

4.4. Cleaning station container

The container of the cleaning station as well as the slats and brushes for cleaning the print module are placed on the left wall of the device working chamber (Fig. 20). The container is designed to collect residual materials and must be emptied regularly after each print in accordance with the procedure described in Section VIII, point 1.3.

Fig. 21 Camera location

4.5. Camera



The camera is located in the upper right corner of the printer door frame (Fig. 21). You can use 3DGence CLOUD software to remotely monitor the progress of the printing process. The camera automatically transmits the image at a fixed interval, every 5 seconds, or upon user’s request to refresh the view.

4.6. Light source

The printer is equipped with two halogen lamps illuminating the inside of the device's working chamber. By default, the lighting in the device is on. The printer is equipped with a system that automatically turns off the chamber lighting in the event of a long period of no action on the display. You can disable and re-enable them from the menu.

5. MATERIAL CHAMBER

3DGence INDUSTRY F42x Series printer is equipped with a heated material chamber. The material chamber is designed to keep an elevated temperature of the consumables environment. This prevents moisture, which has an adverse effect on the parameters and dimensions of the filament. The enclosed housing also protects materials from direct exposure to sunlight, protects against dirt and accidental damage. Inside the material chamber there are two material bays for model materials (material bay 1 and material bay 2) and two containers for support materials (material bay 3 and material bay 4). In addition to the spool holders, there is a heater in the chamber that controls the temperature inside the material chamber and SMM readers (Fig. 22).

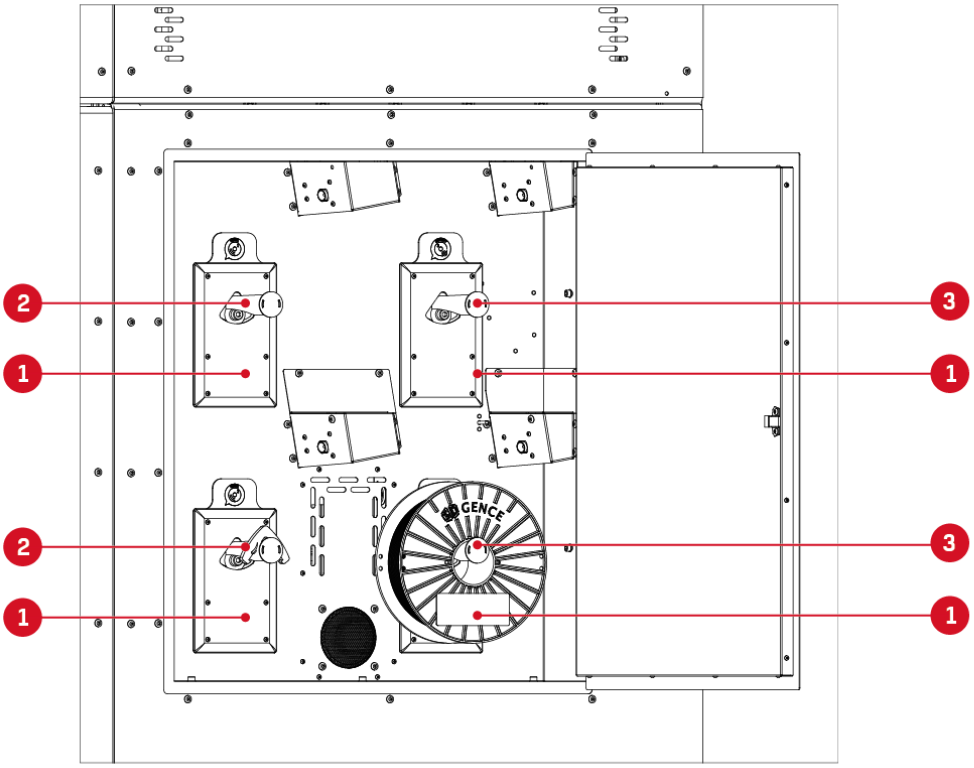


Fig. 22 Interior of the material chamber:
1. SMM reader | 2. Material bay for model materials | 3. Material bay for support materials

5.1. Temperature control in the material chamber

After loading 3DGence-certified materials with an SMM tag, the temperature in the material chamber is read from the tag and automatically set to a correct value. When loading materials without an SMM tag, the temperature in the material chamber is set to a default value set by the manufacturer. The temperature in the material chamber can be changed manually from the printer menu. The manufacturer recommends the use filaments from the 3DGence Certified Material Database marked with a SMM tag where the temperature selection process takes place automatically. When no material is loaded, the heating in the material chamber is switched off. Some materials may require drying before use. Information on selected materials is available at: www.3dgence.com/support.

6. SMART MATERIAL MANAGER SYSTEM

Smart Material Manager is a system developed by 3DGence in order to facilitate the 3D printer operation by using the system of SMM (Smart Material Manager) tags on dedicated printing materials, the subsystem measuring material consumption and appropriate software functions.

Among other things, the system makes it possible to:

- automatic read the material net weight, type and manufacturer, printer operating parameters for the material,
- monitor the amount of material remaining on the spool,
- communicating possible problems to the user, e.g. using inappropriate material for a .3dg file,
- control the quality of material flow during operation,
- detect that the material has finished.

The SMM consists of six key components:

- SMM tag reader, located in the material chamber at each material bay;
- SMM tag including material data, located on a spool of material from the Certified Material Database;
- Measuring system that continuously controls the amount of material fed;
- Material depletion sensor;
- Automatic material loading system.

7. PRINT MODULE

The print module is a replaceable component of the 3DGence INDUSTRY F42x Series printer. Its key elements are shown below (Fig. 23, 24). The module is equipped with two printheads, which consist of a heating block and an exchangeable printing tip. The T0 hotend is stationary, while the T1 hotend moves along a vertical plane. The built-in servo motor drives the T1 head and thegear handles its linear motion. In addition, a strain gauge system is integrated into the module, which measures the pressure force of a given head on the printing surface. Two print cooling systems are built into the module. One system consists of heat-resistant fans that recirculate hot air from the working chamber, which is then directed to the print. This system is provided with M280 and M360 modules. A second cooling system draws cold air from outside the chamber and moves it toward the print nozzle outlet. This system is available in the M500 print module. The print module is also equipped with a cold zone cooling system for the heads and a sensitive mechanical and electronic system of the module together with the extruders. The air is supplied from outside the chamber by means of a blower and a piping system, and the flow rate is controlled depending on the machine operating mode. This solution ensures the reliability of the printheads, since the material plasticisation zone is very short, which prevents the material from blocking in the head. In addition, the print module and extruders are maintained within a safe temperature range. Each printing tip is fitted with casings, which are additional heat insulators and prevent the material from sticking to the head. The module is also equipped with EEPROM memory. The offset calibration values for this module are saved in the memory. Assuming that module replacement takes place in the printer itself, the module replacement does not involve printer recalibration and the printer can be restarted immediately after a module change.

The print module contains moving, sharp and hot components. Do not touch the module during printer operation! The module may be removed only after the printer has cooled down completely.

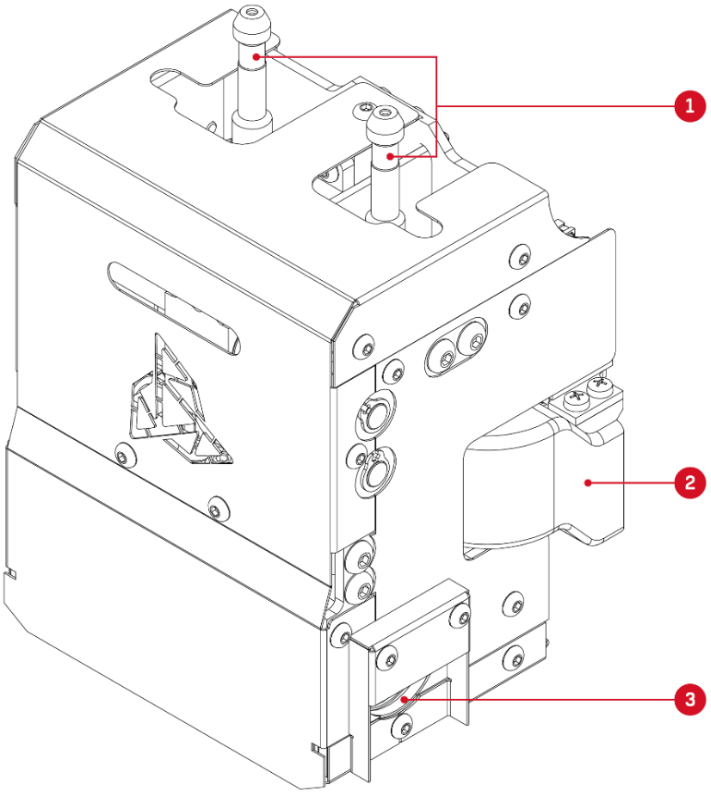


Fig. 23 M280 and M360 print modules - isometric projection
1. Head guide sleeves | 2. Air inlet of the module cooling system | 3. Print cooling fan

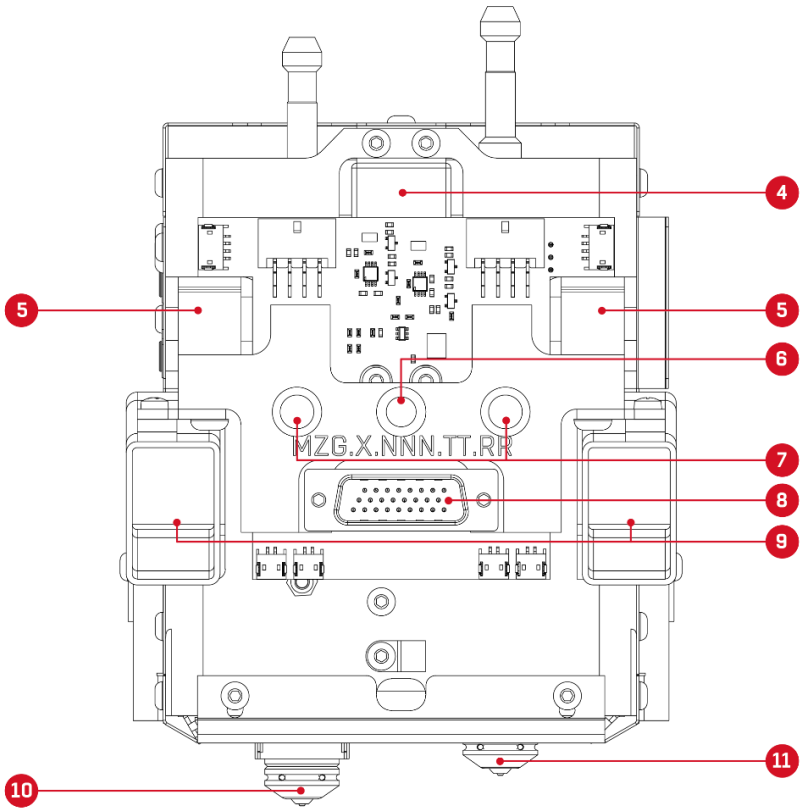


Fig. 24 M280 and M360 print modules - rear view
4. Servomechanism | 5. Strain gauge | 6. Ball pin | 7. Positioning pins | 8. Cable connector
9. Air inlet of module cooling system | 10. Active T0 hotend | 11. Disabled T1 hotend

8. EXTRUDER MODULES

The 3DGence INDUSTRY F42x Series printer is equipped with two direct type material extruding systems - hereinafter referred to as extruders (Fig. 25). The extruders are located in the working chamber, above the print module and connected with the material chamber by means of the feeding system. Extruder T0 is responsible for feeding the base material to hotend T0, while extruder T1 is responsible for feeding the supporting material to hotend T1. When you face the printer, the T0 extruder is on the left and the extruder T1 is on the right.

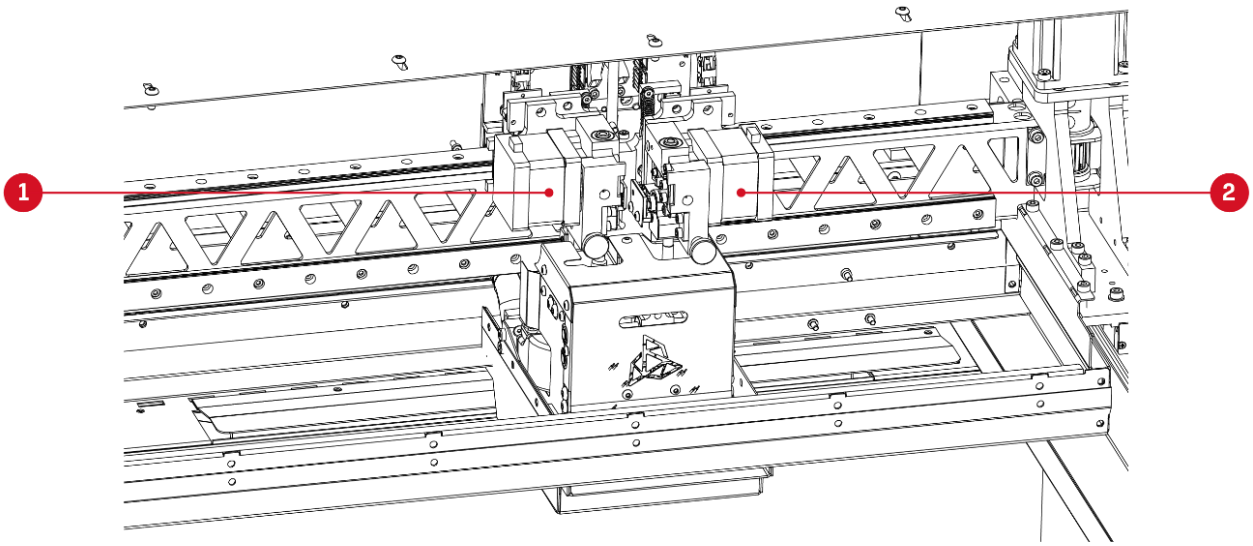


Fig. 25 Arrangement of extruders: 1. Extruder T0 | 2. Extruder T1

9. MATERIAL LOADING SUPPORT MODULES

There are four modules in the printer for material loading support (MLS) in the material chamber. Each of them is located at the appropriate material bay under the housing. The MLS is designed to automatically feed material to the extruder and the hotend at a certain speed through the feed system. Each MLS is equipped with a material sensor that detects material presence in the feed system and potential errors.

10. TOP COVER

The top cover allows access to the X-axis and Y-axis frame, extruders and print module. During printing, the top cover and the working chamber door are locked. Opening the top cover allows the operator to access the mechanical system of the XY door driver for maintenance or service works. The top cover can be opened by opening the chamber front door.

11. ACCESSORY CHAMBER

11.1. Accessories chamber door

The accessories chamber door is located on the front panel below the working chamber door. In the accessories compartment there is a USB port, which can be used for connecting an external USB flash drive, from which you can print models, space for a UPS module and space for additional accessories.

11.2. USB port

In the accessory compartment on the top left there is a USB port (*Fig*. 25).

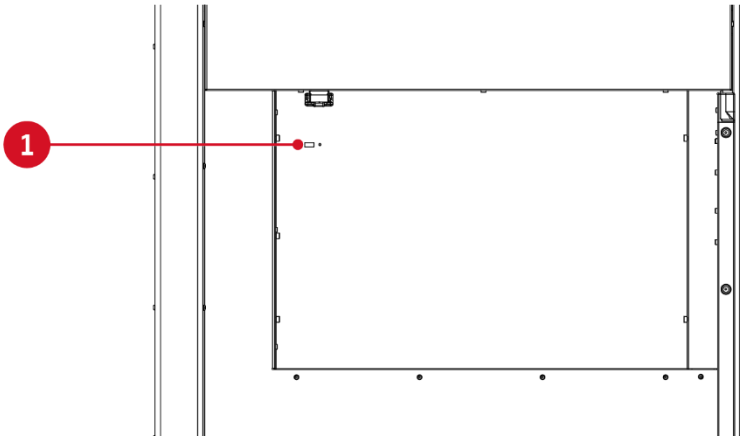


Fig. 25 Location of the USB port in the accessories compartment

12. REAR PANEL

12.1. LAN

The LAN socket allows to connect the device to the network infrastructure via a cable with a standard RJ45 jack. This network can be connected to the Internet, in which case you can use the 3DGence CLOUD system and automatic printer software updating. The network may also not be connected to the Internet, in which case you will be able to use local file transferred to your devices via 3DGence SLICER 4.0.

Due to the PoE (Power over Ethernet) technology used the socket can also be used to connect a WLAN adapter. When using the adapter provided by the manufacturer, no additional power supply is required. The device you receive from is the manufacturer is pre-configured, and an appropriate WiFi network and security features can be selected from the operator panel. It is acceptable to use LAN/WLAN adapters from external providers, but then you will need to configure the device outside of the printer software and the PoE function will not be active.

We recommend using up to 10 meters long cables with the RJ45 Cat 5 jack.

12.2. Overcurrent protection

The printer's overcurrent protection (AC circuit breaker) is located on the rear enclosure of the device (Fig. 18, point 6). It protection the printer against short-circuits and low-voltage overloads of alternating and direct current. When the AC circuit breaker is moved up, it is turned to the "ON" position and power is supplied to the printer. When high current surges occur, the AC circuit breaker trips to protect the printer's electrical and electronic components. When the AC circuit breaker trips, its handle moves down to the "OFF" position. Before restarting, make sure that all failures are rectified and the device can be started safely. To reconnect power supply, set the AC circuit breaker to the "ON" position by sliding it upwards.

12.3. Air connection

The 3DGence INDUSTRY F42x Series printer is equipped with a vacuum system allowing the use of interchangeable build plates. For the system to work properly, the device must be supplied with compressed air with appropriate parameters. As an additionalaccessory to the 3DGence INDUSTRY F421 printer, an air treatment unit is available, consisting of a reducer, a filter and a driertank, as the incoming air must be dried, filtered and oil-free (Fig. 26). Remember to drain water from the drier tank regularly.

Printer input pressure: maximum 6 bar.
Compressed air line diameter: 8 mm.

Compressed air system capacity: minimum 50 l/min.

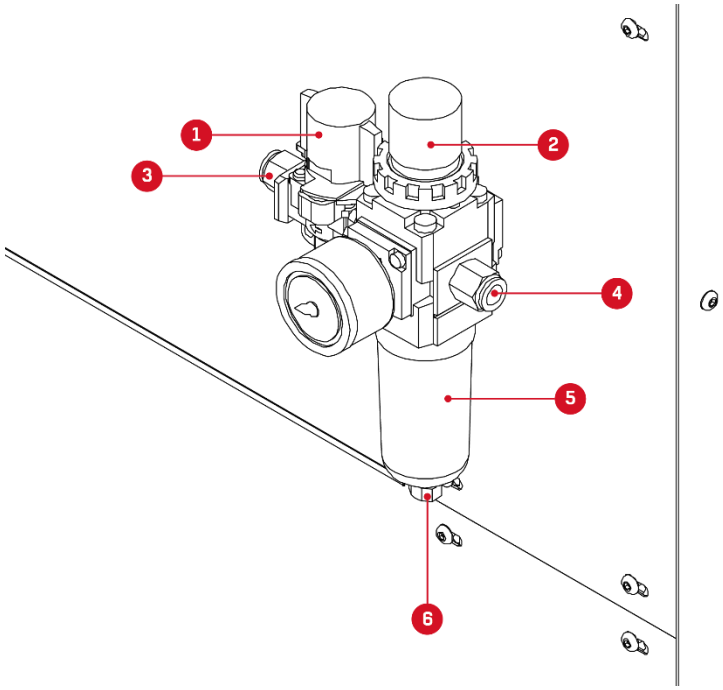


Fig. 26 Air treatment unit:
1. Cut-off valve | 2. Pressure regulator | 3. Compressed air inlet
4. Connection to the printer | 5. Filter with drier | 6. Drier drain valve

12.4. Main switch

The printer main switch is located on the rear of the device and supplies power to all systems inside the device (Fig. 19). The switch is equipped with 4 current circuits. When the printer is equipped with an uninterruptible power supply (UPS) module, power is cut off both upstream and downstream the module. This prevents the device from being powered by the UPS battery when it is necessary to switch it off completely. It is recommended to use the main switch to turn off the device after safe shutdown procedure from the operator panel (power button on the front panel of the device). The current processes will be completed, and the device will finish operation after the print module and the work chamber have cooled down, otherwise permanent damage to key components may occur.

12.5. Power cable inlet

The power cord inlet is located on the left bottom of the housing rear panel (Fig. 19). It is equipped with a cable glandto prevent the power cable from breaking. Use a power cord that meet the specifications and check the condition of the power cord. Do not use the device with a damaged power cord or cable gland.

13. ADDITIONAL ACCESSORIES

13.1. The signal tower lights with audible warning

The tower is a warning device intended to generate visual or visual and audible warnings. A clear light or audible warning alerts persons in the vicinity to the mode the machine is currently in. This element is optional and intended primarily for industrial sector customers. An audible warning signals the occurrence of a serious disturbance in the operation of the device, requiring operator's action. The operating status symbols are presented in table 3.

Table 3 Symbols of the device operation status

Colour	Meaning
Continuous green	All systems are operational.
Continuous orange	A fault or warning not affecting the continuity of the device operation process.
Continuous red	A major fault or error preventing the work process from continuing. An operator's action is required.
Intermittent orange	The device is busy, the production or preparation process is in progress.

13.2. UPS

An *uninterruptible power supply* (UPS) is a system whose function is to maintain the continuity of power supply to the device in the event of a mains failure or incorrect parameters of the mains supply. This module is an optional accessory, however, it is recommended for the following three important reasons.

- The printing process can continue in the event of a mains failure with no interruption. The printing process will be successfully completed when a mains failure does not exceed the critical time during which the batteries are discharged. This time depends on the initial level of battery charge and inversely proportional to the energy consumption of the process (depending on the type of consumable used and process parameters – see table 3).
- When a critical battery discharge level is reached, a safe shutdown procedure will occur automatically. Ongoing processes will be terminated and the device will stop working after cooling the printing module and the working chamber, as otherwise permanent damage to key components may occur.
- Stabilising power supply parameters. The module used is an online type system, which means that it completely separates the system connected at the output from the input power supply. It operates on the principle of double conversion, the alternating mains current is converted into direct current in the rectifier circuit, and then alternating current is output from the inverter system. Such a system ensures output stable voltage, almost completely immune to disturbances and input voltage decays. This eliminates the risk of impairing operating parameters or damaging the device as a result of mains disturbances.

The module is located at the bottom of the device and can be accessed through the front door of the accessories compartment. It consists of an online main power supply unit and a removable battery module.

13.3. Advanced filtration unit

When printing using styrene-based polymers such as ABS, ASA or HIPS, styrene vapours are released. For health and safety reasons of people in the immediate vicinity of an operating device, the manufacturer has equipped the printer with an optional industrial-grade filtration system. The filter unit contains an H13 class HEPA filter and activated carbon. This combination ensures very good adsorption of volatile organic compounds (VOC) and styrene. The filtration of suspended PM10 and PM2.5 is close to 100%.

IV USER INTERFACE

The 3DGence INDUSTRY F42x Series printer is equipped with a colour touch screen located on the left side of the device front panel (Fig. 16, point 2). This is the printer's communication interface with a transparent graphic menu.

For the INDUSTRY F421 model, it is a 10.1' IPS screen with a resolution of 1280x800px with an interface in portrait orientation.

For the INDUSTRY F420 model it is a 7' TFT screen with a resolution of 800x460px with an interface in landscape orientation.

The structure of the user menu and the graphical representation of the functions is the same for both models of the device, the interfaces of the F420 / F421 devices differ in the screen orientation (Horizontal for F420 and Vertical for F421). The description below uses the F421 interface in portrait orientation as an example.

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. 27).

Fig. 27 Start screen

Then, the display shows the printer's main idle state menu (Fig. 28).

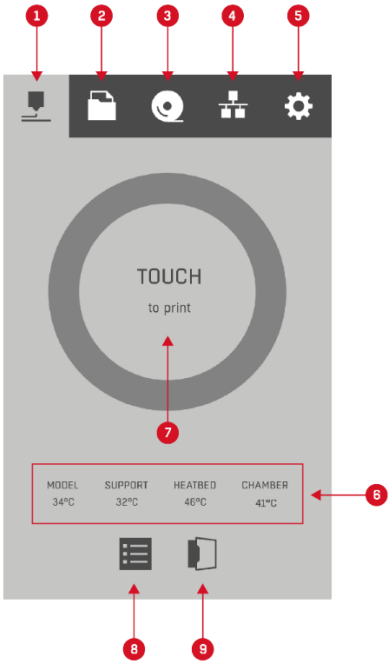


Fig. 28 Printer's main menu in idle state
1. Main screen | 2. Files button | 3. Materials button | 4. Network settings button | 5. Settings button
6. Temperatures: model hotend, support hotend, working table, printing chamber
7. Multifunction button | 8. Notification button | 9. Button for opening the working chamber door

1. **Main screen button** – after switching to other tabs, select this button to return to the main screen of the device (Fig. 28).
2. **Files button** – press to go to the screen with the list of files to be printed.
3. **Materials button** – press to the screen for the printing module, printing materials, the heatbed and the temperature in the material chamber.
4. **Network settings button** – go to the screen for network functionalities.
5. **Settings button** – access the settings screen.
6. **Temperatures** – shows current temperatures of the model hotend, the support hotend, the working table and the printing chamber. Select a temperature to the temperature settings screen.
7. **Multifunction button** – access the list of queued files (same as the "files" button). While the device is in operation, the multifunction button displays the status and progress of the heating, printing and cooling stages.
8. **Notification button** – access the notifications screen.
9. **Door opening button** – open the printer's working chamber door. During the printing process, the door is locked and cannot be opened (the button is greyed out). After printing is finished and the device temperature is safe, the printer software will allow you to open the door.

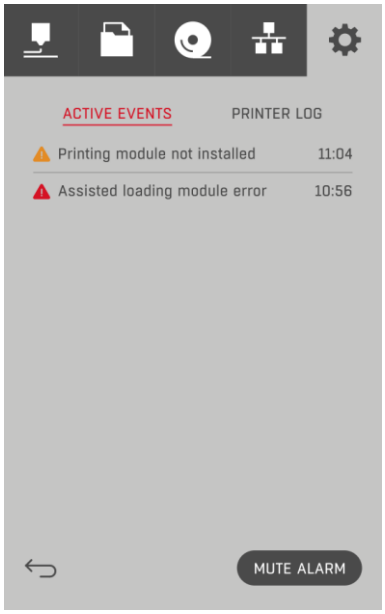


Fig. 29 Notifications screen – active events

Active events – this tab displays all active events, such as information or warnings, along with the time of occurrence. If any of the events changes its status to inactive, it is moved to the "printer log" tab.

Mute alarm – use it to confirm an event and disable the alarm if signal tower lights are installed in the printer.

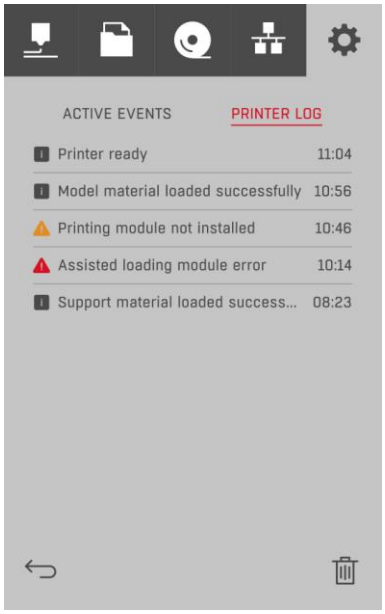


Fig. 30 Notification screen – printer log

Printer log – this tab displays all events that are no longer active. This allows the user to see all the information, warnings, and errors see by the printer. The recycle bin icon can be used to delete all events saved in this place.

1.1. Files screen

When the "files" button or the multifunction button is used, the user is transferred to the list of queued print files. On this screen, there are three tabs on the top bar from which you can select a file for printing. The current user location is marked in red on the top bar (Fig. 31).

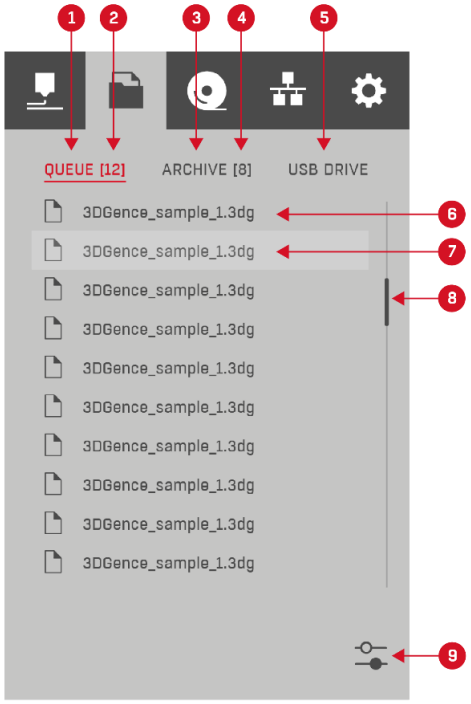


Fig. 31 Queue screen:
1. Queue | 2. Number of queued files | 3. Archive | 4. Number of files in the archive | 5. USB flash drive | 6. File name
7. Selected file | 8. Scrolled list | 9. File sorting

Queue – editable from the 3DGence SLICER 4.0 software and the 3DGence CLOUD platform. The most recent print that appears in the queue is moved to the end of the list. After the printing process is completed (not interrupted), the file is automatically moved to the top of the archive list. After selecting a file in this tab, the user is transferred to the screen with information about the model (Fig. 31). Additionally, the number of currently queued files is shown in square brackets.

Archive – here you can access files that have been printed or transferred by the user. When you select a file in this tab, you are transferred to the screen with information about the model (Fig. 32). Additionally, the number of currently queued files is shown in square brackets.

USB drive – here you can access files stored on a USB flash drive that has been connected by the user to the printer. When you select a file in the “USB drive” tab, you are transferred to the screen with information about the model (Fig. 34).

For the procedure of starting a print from 3DGence SLICER 4.0 and 3DGence CLOUD and from a USB flash drive please see section V, subsection 6.

All files visible – this option allows you to sort files visible on a tab. If no sorting is selected, the message “all file visible” is displayed. When the sort icon is selected, you are transferred to the screen where available filters can be selected (Fig. 35).

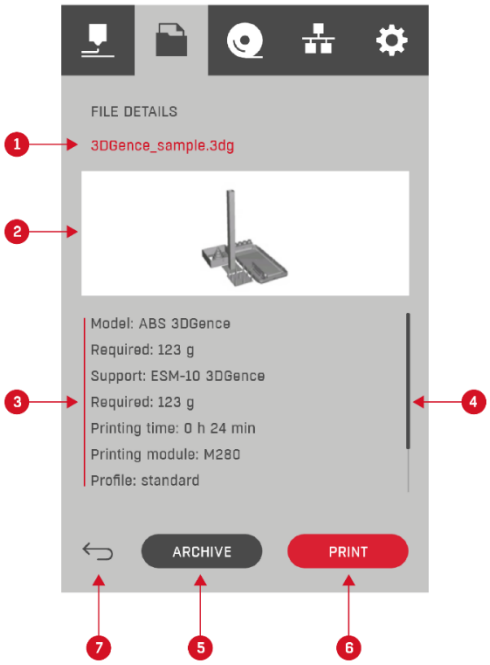


Fig. 32 Model information screen from the queue level:
1. File name | 2. Model preview | 3. File information | 4. Scrolled list
5. Transfer file to archive button | 6. Start printing button | 7. Back button

Model preview – the preview will be enlarged when you select the model preview.

Archive button – moves a file to the “archive” tab.

Print button – starts printing the file shown on the screen.

Back button – use this button to returns to a previous screen.

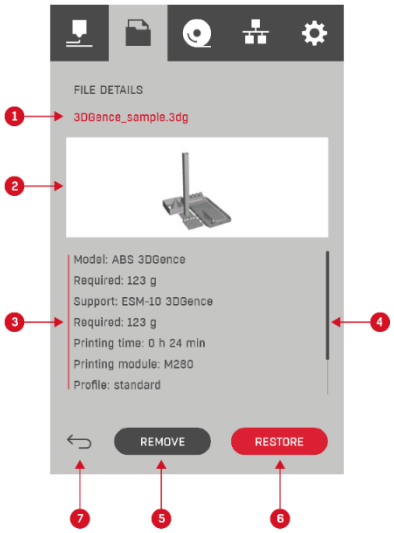


Fig. 33 Screen with model information from the archive level
1. File name | 2. Model preview | 3. File information | 4. Scrolled list
5. Delete print *button | 6. Restore* print *to queue button | 7. Back button*

Model preview – the preview will be enlarged when you select the model preview.

Remove button – removes the selected file.

Restore button – restores a file to the “queue” tab.

Back button – use this button to returns to a previous screen.

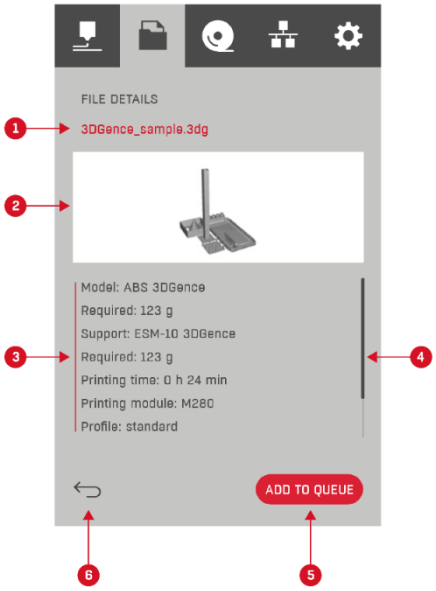


Fig. 34 Model information screen from USB flash drive
1. File name | 2. Model preview | 3. File information | 4. Scrolled list
5. Add print *to queue button | 6. Back button*

Model preview – the preview will be enlarged when you select the model preview.

Add to queue button – moves a file to the “queue” tab.

Back button – use this button to returns to a previous screen.

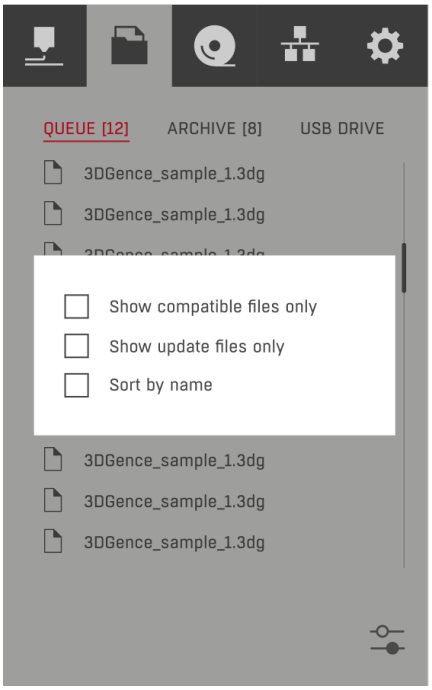


Fig. 35 File filter scree

Show compatible files only – check this option to show files that are compatible with the printing module installed in the printer. This means that only files prepared in the 3DGence SLICER 4.0 software for the printing module installed in the printer will be visible.

Show update files only – select this option to show the files used to update the software.

Sort by name – select this option to sorts files by name.

1.2. Materials screen

Use the "materials" button to access the screen where the hotend icons in the printing module and the icons for material bays are shown (Fig. 36).

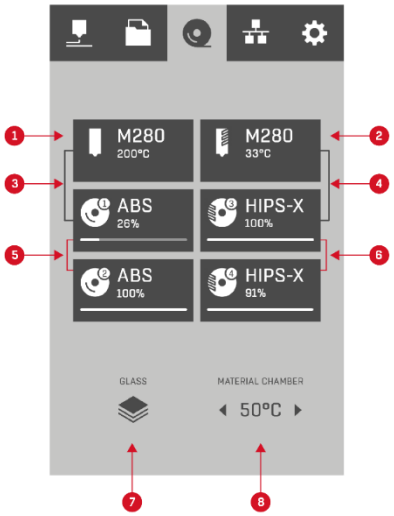


Fig. 36 Materials screen
1. Model hotend icon in the printing module | 2. Support hotend icon in the printing module
3. Symbol showing that model material is loaded into the model hotend
4. Symbol showing that model material is loaded into the support hotend | 5. Model material bay icon
6. Support material bay icon | 7. Heatbed icon | 8. Manual temperature setting in the material chamber

1. Icon of the model hotend in the printing module. The screen shows the name of the installed module and the current temperature of the model hotend. Use this icon to go the printing module screen (Fig. 37).
2. Support hotend icon in the printing module. The screen shows the name of the installed module and the current temperature of the support hotend. Use this icon to go the printing module screen (Fig. 37).
3. Symbol showing that model material is loaded into the model hotend.
4. Symbol showing that model material is loaded into the support hotend.
5. Model material bay icon (model material bay 1). When SMM tagged material is loaded in the printer, its name and the percentage of material remaining on the spool are displayed on this screen. Use this icon to go the model material bay screen (Fig. 39).
6. Support material bay icon (support material bay 2). When SMM tagged material is loaded in the printer, its name and the percentage of material remaining on the spool are displayed on this screen. Use this icon to go the model material bay screen (the screen is similar to the model material bay screen).
7. The heatbed type installed in the device is shown above the icon. If the heatbed is removed from the printer, no text will be displayed above the icon.
8. Here you can manually set the material chamber temperature. For more information on the material chamber temperature please see section III, subsection 5.1.

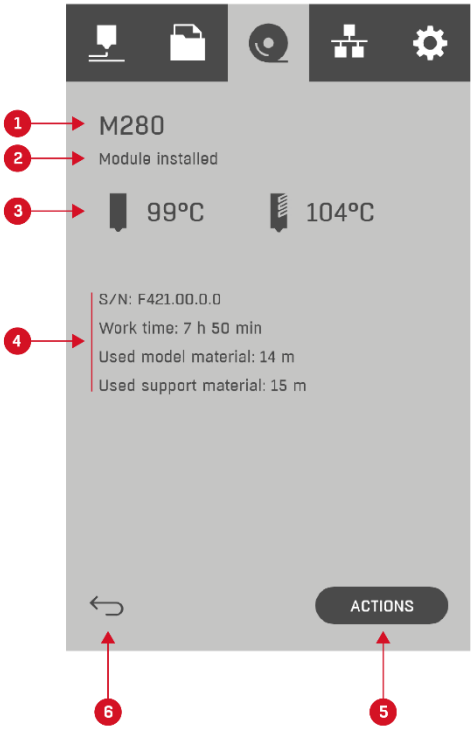


Fig. 37 printing module screen
1. Name of installed printing module | 2. printing module status
3. Icons of printing module hotends with current temperatures | 4. printing module Information
5. Button for transferring to screen with printing module related actions | 6. Return to previous screen

Hotend icons in printing module – the icon on the left is for the T0 model hotend, while the icon on the right is for the T1 support hotend. If a printing module is installed in the device, current temperatures of both hotends are displayed next to the icons.

Printing module information – visible if a printing module is installed in the device:

- "S/N" – printing module serial number,
- "Work time" – printing module working time,
- "Used model material" – amount of model material used by the printing module,
- "Used support material" – amount of support material used by the printing module.

Actions – select this button access the screen with printing module related actions (Fig. 38).

Fig. 38 Screen with printing module related actions

Remove printing module / **Install printing module** – when a printing module is installed in the printer, the *"Remove printing module"* option is displayed, which starts the printing module removal assistant. When no printing module is installed in the printer, the "*Install printing module"* option is displayed, which starts the printing module installation assistant.

Clean model tool – select this option to start the procedure of unblocking the model hotend (T0). It is recommended to use this option when the extruder is unable to force material through the print hotend.

Clean support tool – select this option to start the procedure of unblocking the support hotend (T1). It is recommended to use this option when the extruder is unable to force material through the print hotend.

Run Z calibration – this option is used to test and set the correct offset value in the Z axis. When you select this option, the printer will check the T0 hotend position using strain gauges. Next, in the same place, the printer will make the same measurement for the T1 hotend position. The difference resulting from the measurement will be recorded in the Z Offset field. The procedure is described in section VI, subsection 1.1.

Run XY calibration – the option for automatic calibration of offsets between hotends in the X axis and in the Y axis. The procedure is described in section VIII, subsection 1.2.

Manual calibration – use this option to go to the manual calibration of the printing module (Fig. 47). These options are intended for advanced users only.

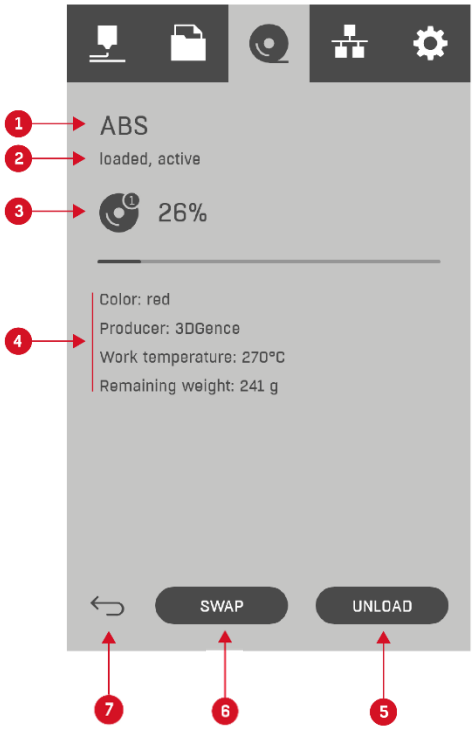


Fig. 39 Model material bay screen (model material bay 1)
1. Loaded material name | 2. Material status | 3. Icon showing the relevant material bay and the percentage of material remaining on the spool | 4. Loaded material information
5. Material unload or load button| 6. Return to previous screen

Loaded material information – visible if material has been loaded in the device using an SMM tag:

- "colour" – the colour of the loaded material,
- "producer" – the producer of the loaded material,
- "work temperature" – the extrusion temperature of the loaded material,
- "remaining weight" – the remaining amount of material on the spool.

Unload / load – when material is loaded in the printer, the "*unload"* option is visible, which starts the assistant for unloading the material from the appropriate bay (section V, subsection 3.2). If no material is loaded, the *"load"* option is visible, which starts the material loading assistant for the appropriate bay (section V, subsection 3.1).

Swap – In case when there are two materials of the same type loaded in the printer (using the SMM system) or two materials of the same type (as CUSTOM, without the SMM system), the option allows changing the active bay used by the printer.

1.3. Network settings screen

Select the “network settings” button to access the network functionalities screen (Fig. 40).

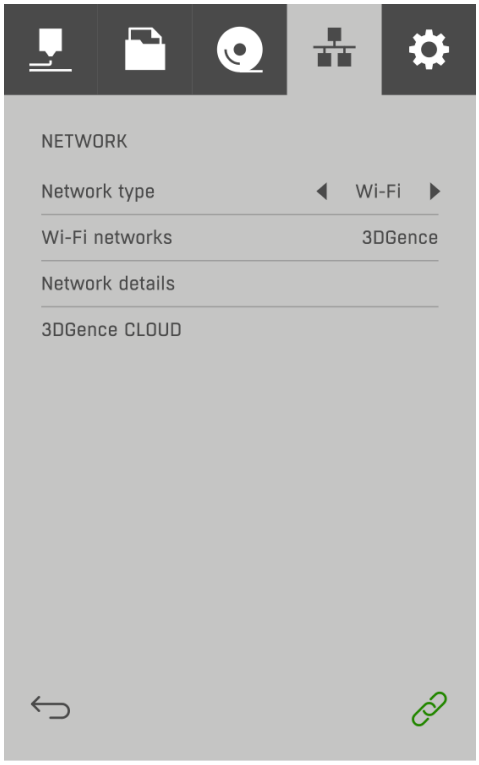


Fig. 40 Network settings screen

Network type – use the arrows to select the printer connection type. The possible statuses are:

- “Disabled” – network options are disabled,
- “Wired” – LAN is connected via a cable with an RJ45 plug,
- “Wi-Fi” – wireless connection using a WLAN adapter.

Wi-Fi network – used to access the list of available networks (Fig. 41).

Network details – access the network connection details screen (Fig. 42).

3DGence Cloud – go to the screen for the 3DGence CLOUD connection (Fig. 43).

Connection status – shows the connection status.

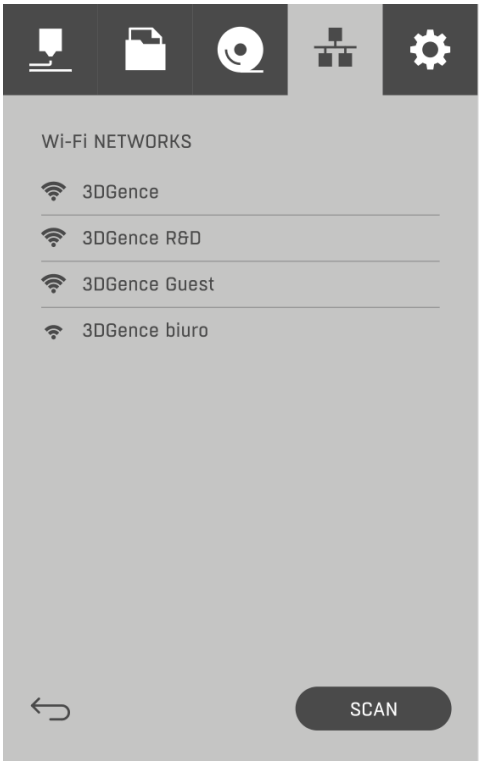


Fig. 41 Screen with available WiFi networks

Scan – select this button to search for available networks.

Select it to enable connection to one of the available Wi-Fi networks. The printer then tries to connect to the network and an on-screen keyboard will appear to enter a password, if necessary. Connection to the network is indicated by the “connected” status at the bottom of the screen (Fig. 40).

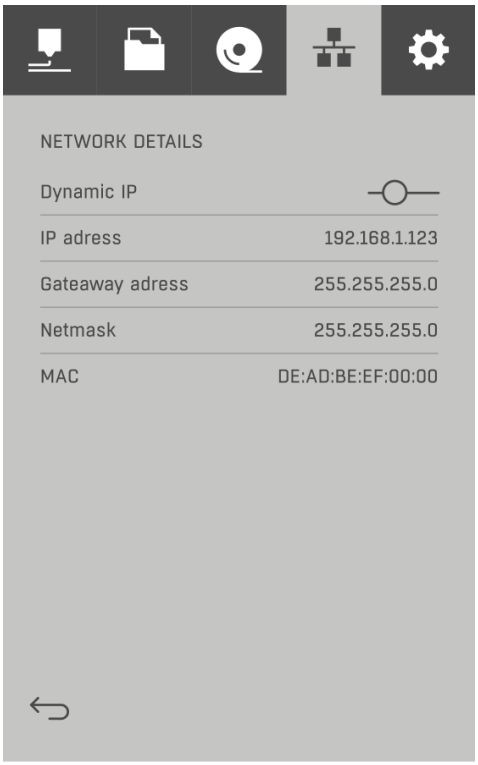


Fig. 42 Network details screen

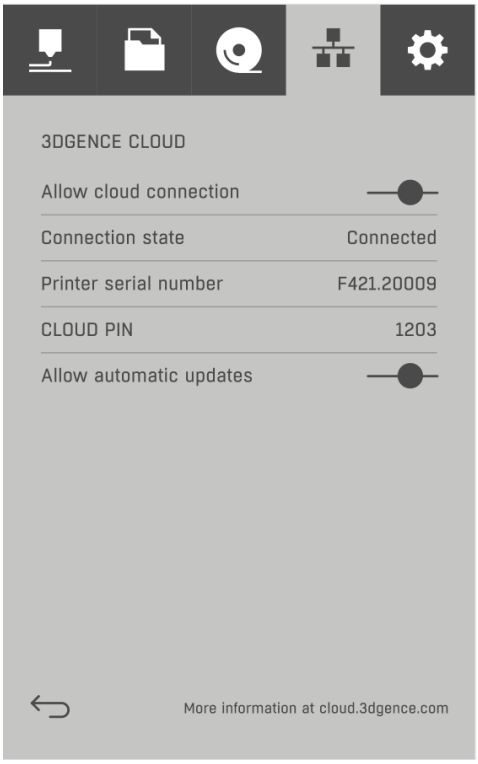


Fig. 43 3DGence Cloud Screen

Allow cloud connection – the default "on" setting allows the printer to connect to the 3DGence CLOUD platform. This option can be disabled by moving the slider to the "off" position.

Connection state – status showing if the printer is connected to the 3DGence CLOUD platform.

Printer serial number – the serial number of the printer that should be entered when adding the device on the 3DGence CLOUD web platform.

Cloud PIN – a code that must be entered when adding a device on the 3DGence CLOUD web platform.

Allow automatic updates – the default "on" setting enables automatic updates of the printer software. This option can be disabled by moving the slider to the "off" position. The manufacturer recommends enabling automatic software updates.

Allow 3DGence to download diag. data – setting it to "on" allows the 3DGence technical team to remotely download the diagnostic log saved in the device memory. This log contains important information, crucial in the diagnosis of faults and incorrect operation of the device. This log will be downloaded when:

- The user agreed to it (setting the slider in the ON position),

- The printer is running and connected to the Internet,

- The user contacted the technical department for help.

3DGence does not download sensitive data, i.e. executive files (.3dg), device usage statistics etc.

1.4. Settings screen

The “settings” button takes you to the screen showing six options (Fig. 44), which are described in the following sections.

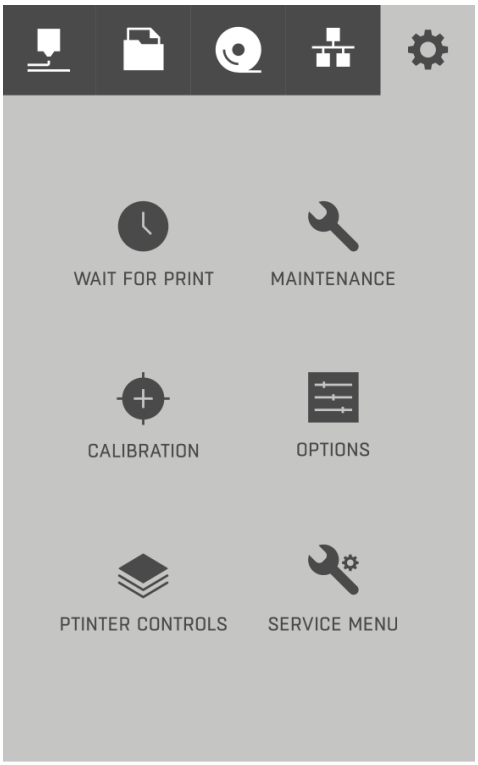


Fig. 44 Settings screen

1.4.1. Wait for print

When you select the “wait for print” option, the printer‘s door will be locked and you must confirm on the display that all activities related to the preparation of the print have been completed. After that, the machine will start pre-warming and the printer will automatically start the first job (printing) that will be sent to the machine and match what is installed in the printer. To be able to start printing he sent file must be compatible with the module installed in the device, the type of the heatbed and the type of loaded materials. The “wait for print“ mode prevents performing any operations on the printer.

1.4.2. Calibration

This option contains the settings and parameters of the printer calibration process (Fig. 45).

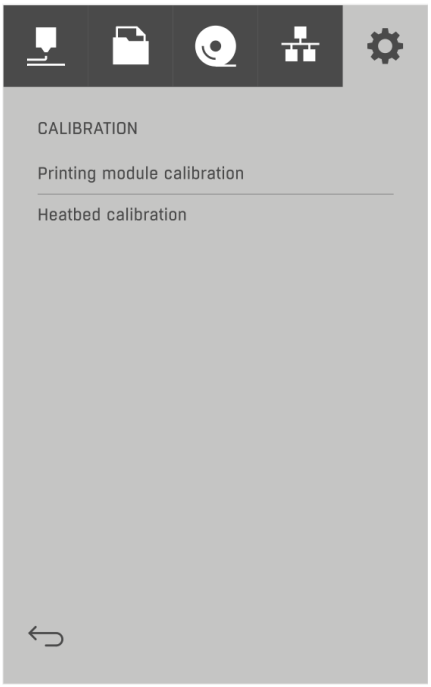


Fig. 45 Calibration screen

Printing module calibration – use is to access the screen for the calibration of offsets of the printing module (Fig. 46).

Heatbed calibration – access the heatbed calibration screen (Fig. 48).

Fig. 46 Screen for printing module calibration

Run Z calibration – this option is used to test and set the correct offset value in the Z axis. When you select this option, the printer will check the T0 hotend position using strain gauges. Next, in the same place, the printer will make the same

measurement for the T1 hotend position. The difference resulting from the measurement will be recorded in the Z Offset field. The procedure is described in section VI, subsection 1.1.

Run XY calibration – the option for automatic calibration of offsets between hotends in the X axis and in the Y axis. The procedure is described in section VI, subsection 1.2.

Manual calibration – use this option to go to the manual calibration of the printing module (Fig. 47). These options are intended for advanced users only.

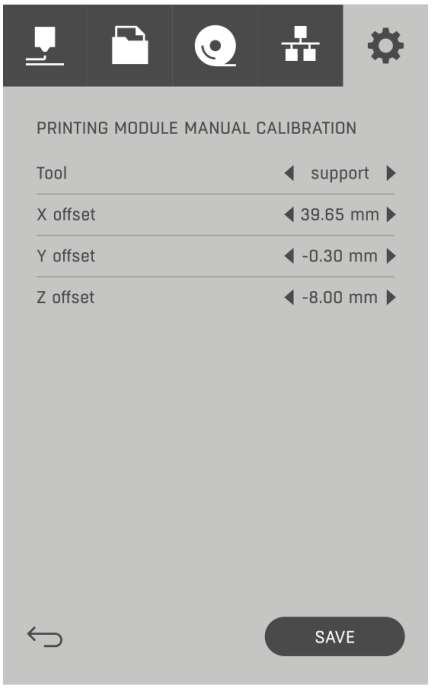


Fig. 47 Screen for printing module manual calibration

Tool – the hotend selected in the button will be set in the active position. After selecting the "support" option, the T1 hotend will move to the active position. When you select the "model" option, the T0 hotend will move to the active position.

X offset – the option for adjusting the value of the T1 hotend offset relative to the global system on the X axis. Correct calibration of these values is crucial for the proper operation of the printing module.

Y offset – the option for adjusting the value of the T1 hotend offset relative to the global system on the Y axis. Correct calibration of these values is crucial for the proper operation of the printing module.

Z offset – the option for adjusting the value of the T1 hotend offset relative to the global system on the Z axis. Correct calibration of these values is crucial for the proper operation of the printing module.

After you change the settings, remember to save them using the **"save"** button**.**

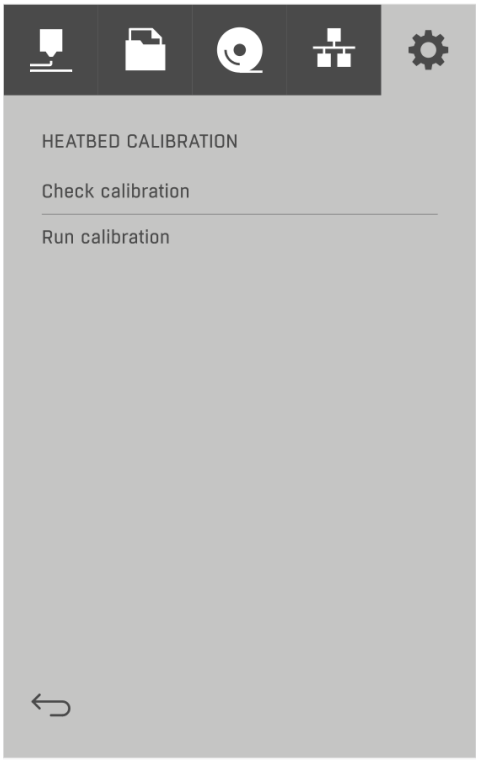


Fig. 48 Heatbed calibration screen

Check calibration – starts the procedure for checking if the heatbed is properly calibrated.

Run calibration – runs the heatbed calibration procedure.

1.4.3. Printer controls

Use the “printer controls“ option to access the screen for manual control of printer functions (Fig. 49).

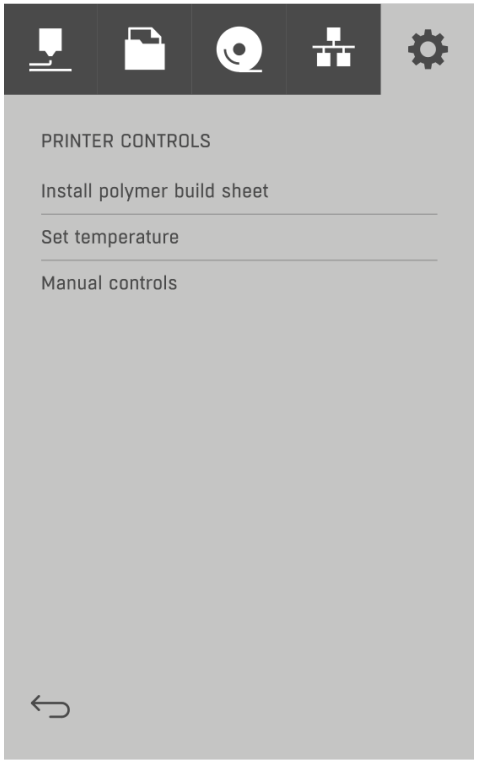


Fig. 49 Screen for manual control of printer functions

Install polymer build sheet – launches an assistant to help install the polymer build sheet on the workbench.

Set temperature – access the temperature setting screen for the T0 hotend, T1 hotend, the hotend and the printer chamber (Fig. 50).

Manual controls – use it access the screen for printer manual control (Fig. 51).

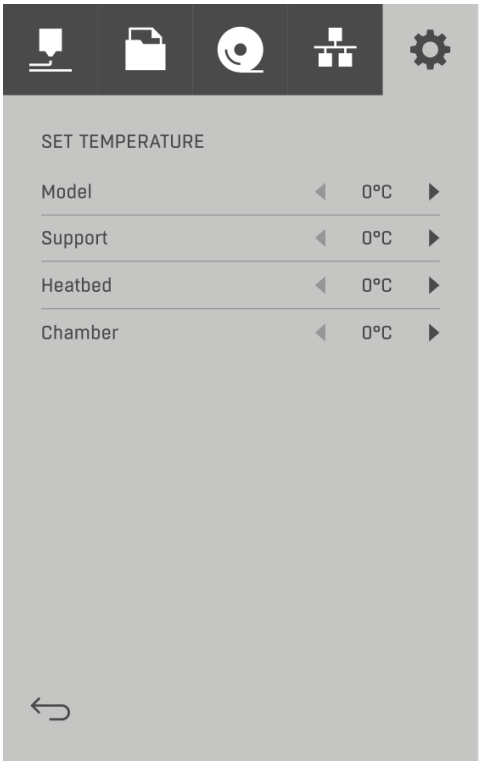


Fig. 50 Set temperature screen

Model – set temperature for the T0 model hotend.

Support – set temperature for the support hotend T1.

Heatbed – set temperature for the heatbed.

Chamber – set temperature in the working chamber of the device.

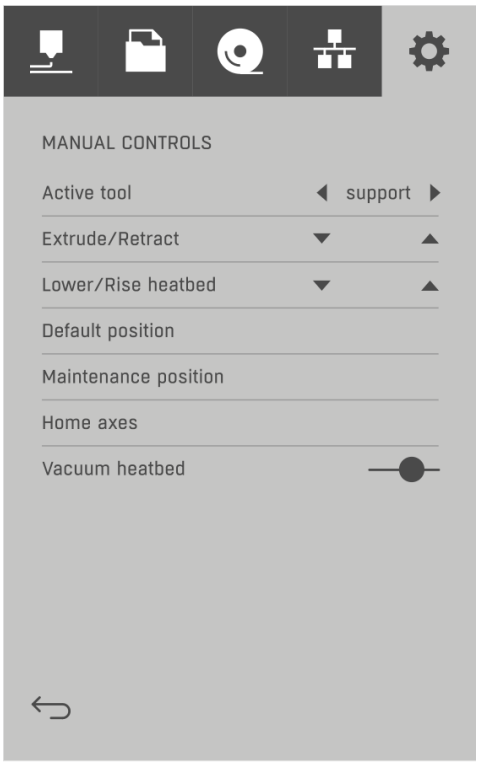


Fig. 51 Manual control screen

Active tool – select this option to change the hotend whose name can be found on the active position button. When “support” is selected, the T1 hotend will be set in the active position. When “model” is selected, the T1 hotend will be set in the active position.

Extrude – use the down arrow to start the material extrusion movement. This option applies only to the hotend in the active position and can be enabled only after the hotend has reached the minimum operating temperature.

Retract – use the up arrow to start the backward material movement. This option applies only to the hotend in the active position and can be enabled only after the hotend has reached the minimum operating temperature.

Lower heatbed – hold down the “down” arrow to move down the heatbed smoothly, and single click to move the table by a low value.

Rise heatbed – hold down the “up” arrow button to move up the heatbed smoothly, and single click to move the table by a low value.

Set temperature – can be used to access the screen for setting temperatures for the T0 hotend, the T1 hotend, the heatbed and printer work chamber.

Default position – this option is used to set the heatbed in the low position and the print module above the cleaning station. This option is useful for checking the correct adjustment of the cleaning station slats relative to the corresponding nozzles in the print module.

Maintenance position – this option is used to set the heatbed in the low position and the print module in the position of X = 180, Y = 80.

Vacuum heatbed– this option allows to move the slider to the right and turn on the vacuum table, after moving the slider to the left the vacuum table is turned off.

1.4.4. Maintenance

The “maintenance” option is used to access the screen shown in Fig. 52.

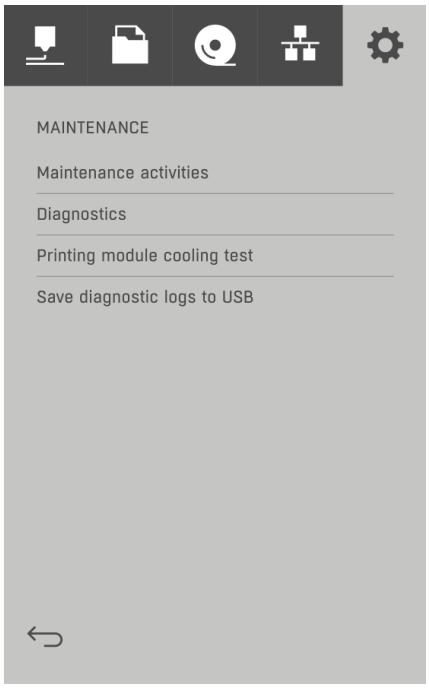


Fig. 52 Maintenance screen

Maintenance activities – use it to access the screen for printer and printing module maintenance activities (Fig. 52).

Diagnostics – access the device diagnostics screen (Fig. 54).

Printing module cooling test – this option will check if the printing module fans are operational.

Save diagnostic logs to USB – this option can be used to save the device diagnostic log to a USB flash drive.

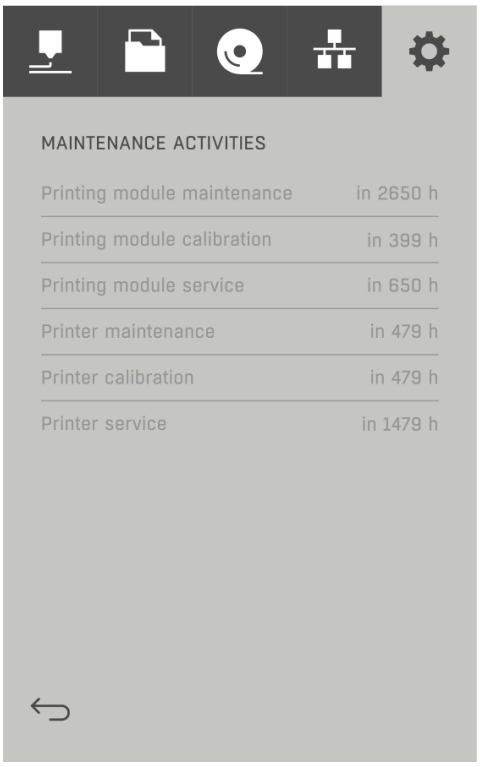


Fig. 53 Maintenance activities screen

Printing module maintenance – the time displayed next to this option shows the time until the next maintenance will be required to replace the print tips in the printing module. When you select this option, a screen appears with to do items and prompting you to reset the operation status counter.

Printing module calibration – the time shown next to this option is the time until the printing module calibration is necessary. When you select this option, a screen appears with to do items and prompting you to reset the operation status counter.

Printing module service – the time shown next to this option is the time until the printing module service is necessary. When you select the option, a screen appears informing about the need to contact the 3DGence support department to service the printing module. You can find all contact methods in section IX of this manual. After the service, the counter will be reset by a 3DGence service technician.

Printer maintenance – the time shown next to this option is the time until the maintenance of the device is required. When you select this option, a screen appears with to do items and prompting you to reset the operation status counter.

Printer calibration – the time shown next to this option is the time until the printer calibration is necessary. When you select this option, a screen appears with to do items and prompting you to reset the operation status counter.

Printer service – the time shown next to this option is the time until the printer service is necessary. When you select the option, a screen appears informing about the need to contact the 3DGence support department to service the printer. You can find all contact methods in section IX of this manual. After the service, the counter will be reset by a 3DGence service technician.

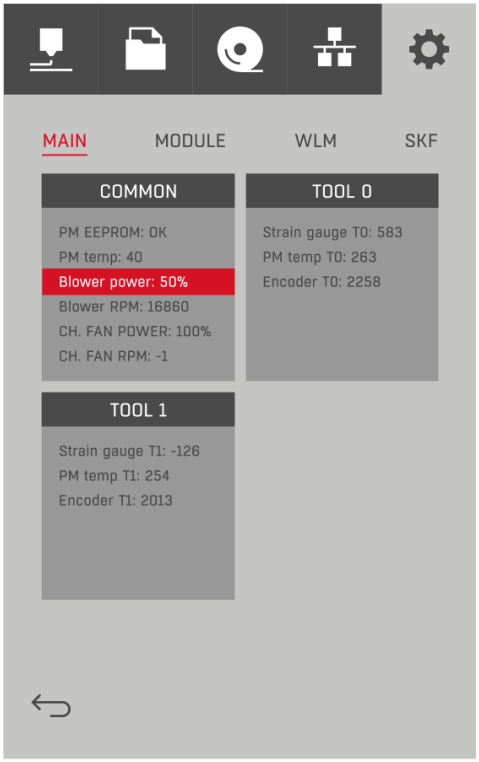


Fig. 54 Device diagnostics screen

In the case of problems with the device, the diagnostics screen will be helpful when contacting the 3DGence technical support department. You can find all contact methods in section IX of this manual. The orange colour on the diagnostics screen is a warning but does not require an immediate response of the printer operator. The red colour on the diagnostics screen indicates an error and requires an immediate response of the printer operator.

The first **“main“** tab is for general device diagnostics.

The second **“module“** tab concerns the diagnostics of the printing module.

The third **“WLM“** tab concerns diagnostics of the assisted material loading modules.

The fourth **“SKF“** tab concerns diagnostics of the filament chamber controller.

1.4.5. Options

The options screen is intended for the basic printer configuration (Fig. 55).

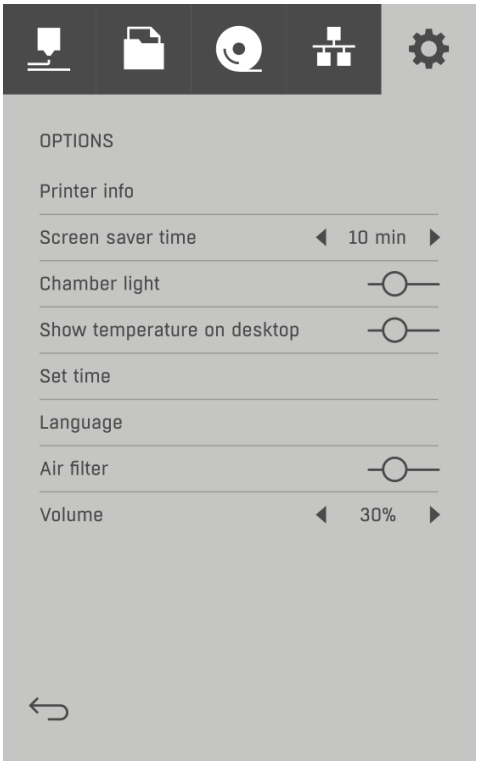


Fig. 55 Options screen

Printer info – use this option to go to the device information screen (Fig. 56).

Screen saver time – this option is used for setting the time after which the screen saver is activated (Fig. 57).

Chamber light – use this option to set the lighting of the printer‘s working chamber. By default, the lighting is on. The “off” option turns off the working field lighting. The “on“ option turns on the lighting.

Show temp. on desktop – this option is used to set temperatures being displayed on the main screen. By default, the temperature display is turned off. Use the “on“ option to turn on the display of temperatures on the printer‘s main screen.

Set time – this option can be used to access the date and time settings screen (Fig. 58).

Language – use this option to access the screen for selecting the printer’s language (Fig. 61).

Air filter – this option is used to enable or disable the air filter.

Volume – this option is used to adjust the volume.

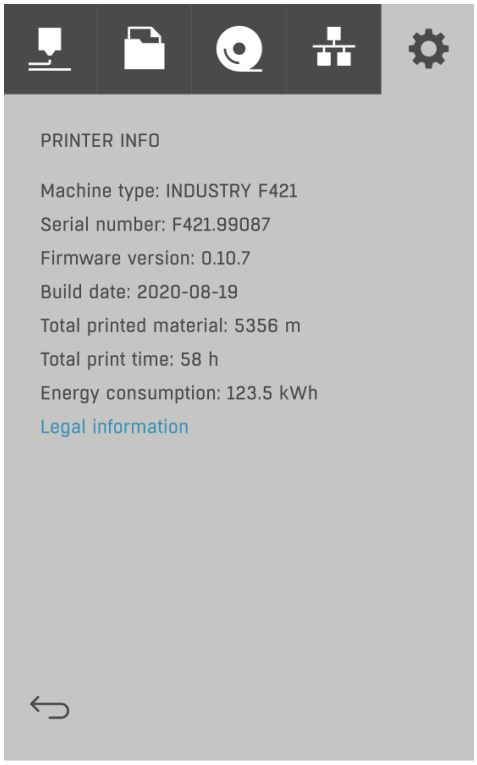


Fig. 56 Printer info screen

Machine type – printer model.

Serial number – the printer serial number.

Firmware version – printer firmware version.

Build date – software release date.

Total printed material – the total amount of material printed by the printer.

Total print time – total printer working time.

Energy consumption – the energy consumption of the printer.

Legal information – licenses.

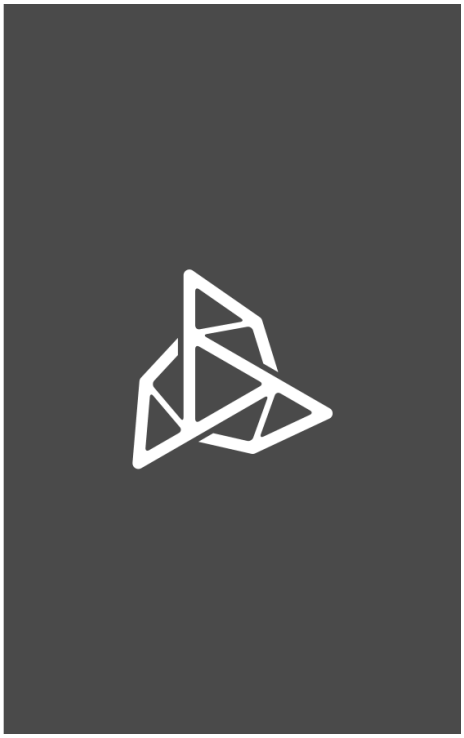


Fig. 57 Screen saver / screen in sleep mode

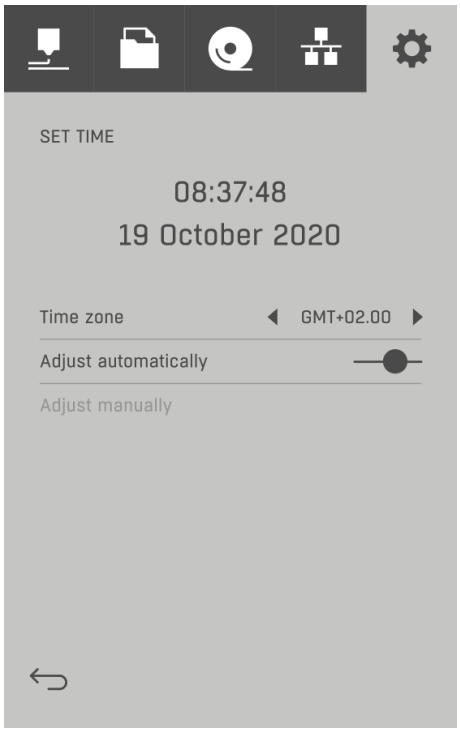


Fig. 58 Set time screen

The current time and date are shown at the top of the screen (Fig. 58).

Time zone – enables manual time zone setting.

Adjust automatically – the default “on“ setting enables the date and time to be set automatically. All that is required is that the printer is connected to the network. This option can be turned off by moving the slider to the “off“ position, when the “adjust manually“ option becomes active.

Adjust manually – enables manual time setting (Fig. 59), manual date setting (Fig. 60).

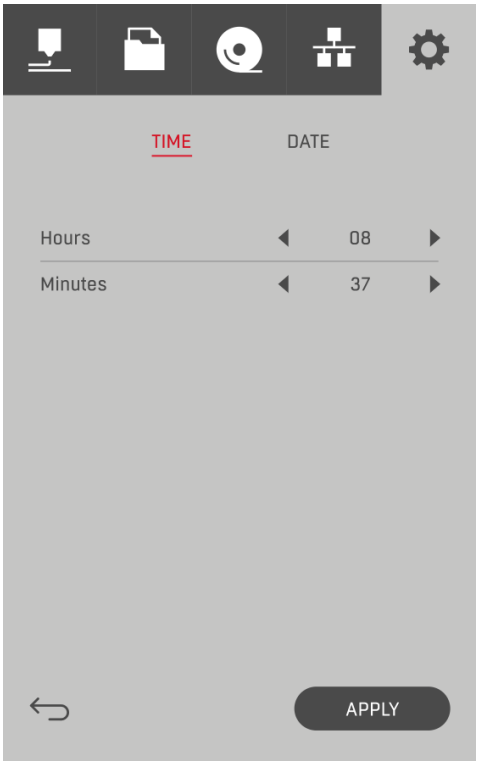


Fig. 59 Adjust time manually screen

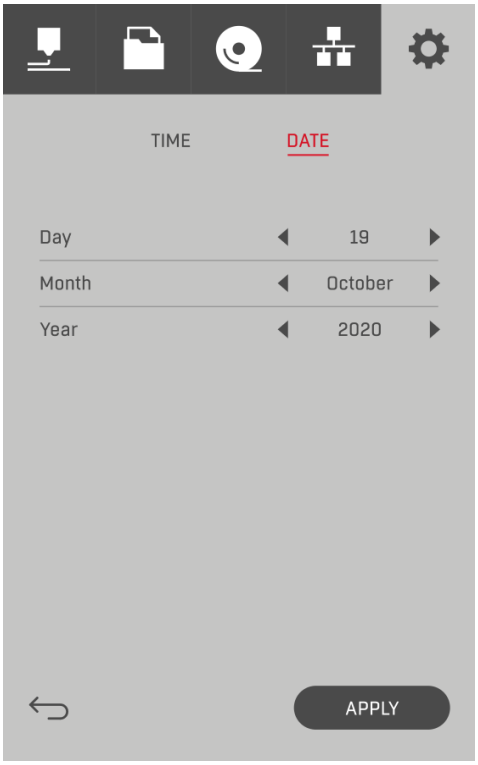


Fig. 60 Adjust date manually screen

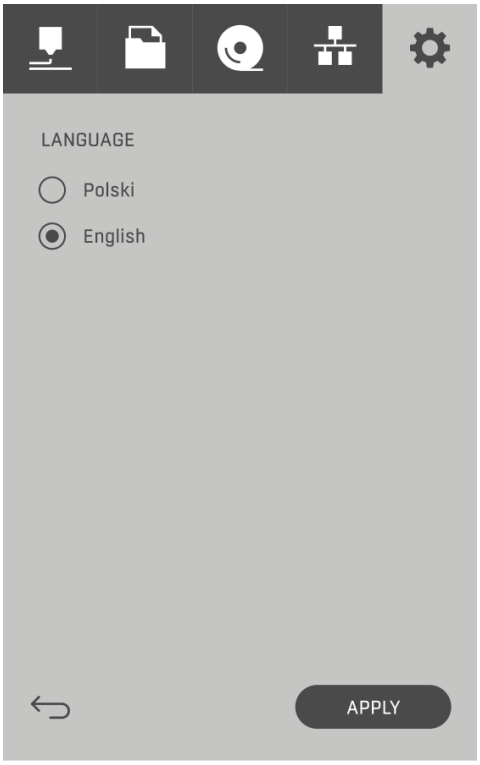


Fig. 61 Select printer language screen

1.4.6. Service menu

The service menu is accessible to a 3DGence service technician.

2. MENU DURING OPERATION

During the printing process, some menu options are greyed out to indicate they are unavailable and cannot be selected. The main screen of the printing device is shown in Fig. 62. The progress of the printing process is shown on the multifunction button. During the device operation, it is impossible to open the working door from the printer display, which is why the door opening button is greyed out. After the printing process is completed, the screen shown in Fig. 62 is visible as well as the cooling process. After completing the printing process, the printer door is unlocked, you can open it and remove the model from the heatbed.

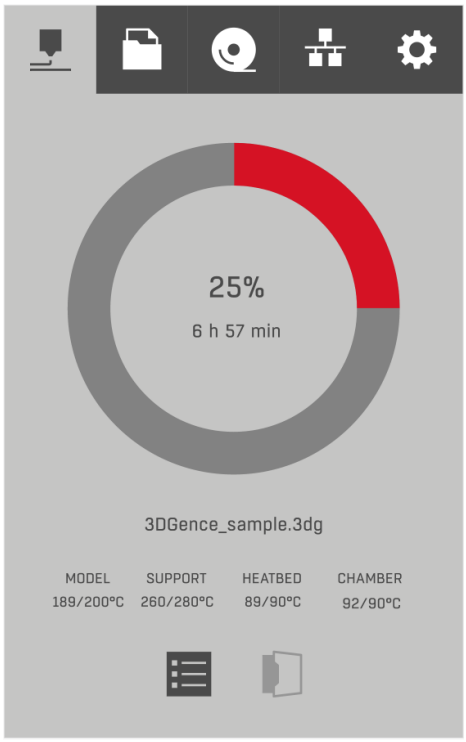


Fig. 62 Printer's main screen in working mode

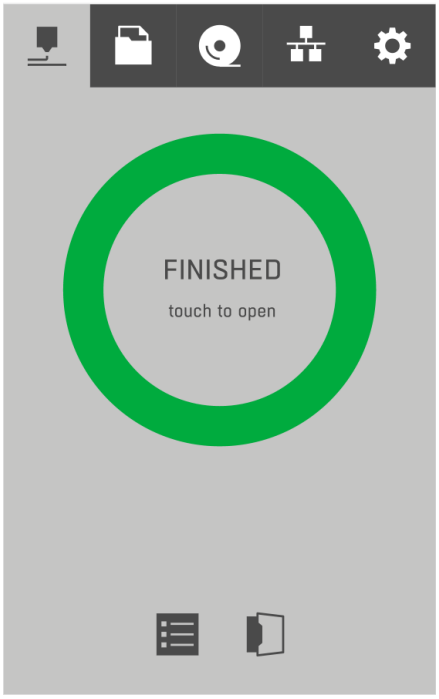


Fig. 63 The screen after the printing process and the cooling process are finished

When the multifunction button is selected while printing, basic information about the printed model and a possibility to stop or interrupt the printing process is displayed (Fig. 64).

Fig. 64 Model information screen while printing

Abort – allows you to cancel and finish the ongoing printing process. When you select this option printing will be stopped after the last commands in the printer buffer are executed. The “Abort” command is irreversible and the process cannot be resumed once stopped.

Pause – allows you to stop the printing process in progress. To resume a stopped print, select the "resume" option” (Fig. 65).

Fig. 65 Screen with model information after selecting pause

3. STATUSES IN THE PRINTER MENU

Various colours may appear on the sidebar of the menu as well as in individual screens indicating a change in the device status (Fig. 66). Additionally, on the notification button on the main screen, dots in three different colours (grey, orange, red) are displayed, which also provide information about the device status change (Fig. 66). The different colours that may appear in the printer menu have the following meanings.

- Dark grey – indicates that the option is active and can be selected. If a grey dot is displayed on the notification button (Fig. 66), it means that there is new information there, which is neither a warning nor an error. The grey dot on the notification screen may indicate that material has been loaded correctly or the start or end of the printing process.
- Light grey (greyed out icon) – means that at this moment the option is unavailable and cannot be selected. In addition, on the materials screen, if a material is not loaded, the icon for that material will also be greyed out, but you can select it to load the material.
- Orange – means a warning, but does not require an immediate reaction of the printer operator, e.g. the printer or the printing module maintenance is required, the material has been loaded without an SMM tag, the printer has been disconnected from the network, etc. The user will receive more information when the option that is highlighted in this colour is selected.
- Red – indicates an error that requires immediate reaction of the printer operator, e.g. there is a communication error in the printing module or the SMM reader cannot read SMM tag data. The user will receive more information when the option that is highlighted in this colour is selected.

If both a warning and an error appear on one screen, the sidebar menu will be highlighted with the higher level colour, i.e. red in this case.

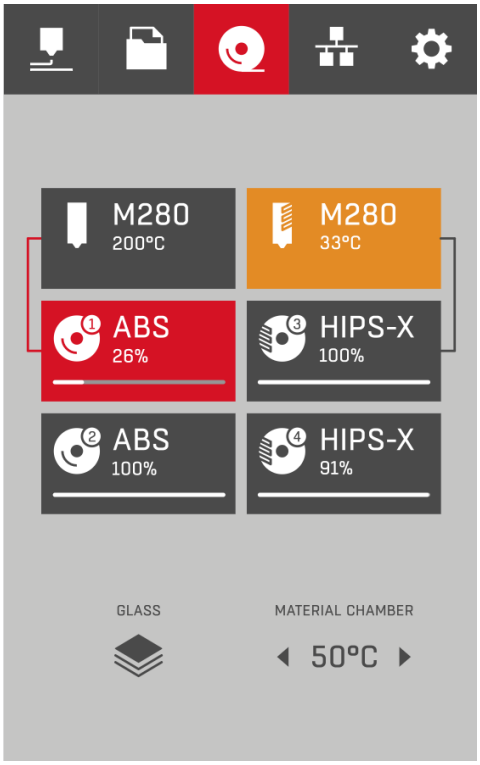


Fig. 66 Screen with sample status highlighting

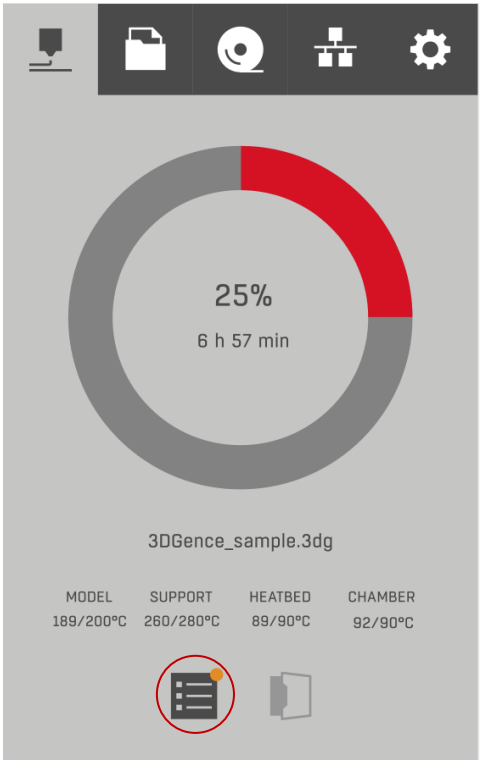


Fig. 67 New information in notification screen (grey dot)

V PRINTER OPERATION

1. FIRMWARE UPDATE

Due to the constant development, the printer firmware is updated periodically. It is important to ensure that the firmware is always updated to the latest available version. To enable automatic printer firmware updates set the "on" option in the printer menu:  *network settings → 3DGence Cloud → allow automatic updates*. If the automatic update option is enabled, the new firmware will be downloaded and automatically updated when the device is restarted. The printer must be connected to the network.

If the "off" option is set to "*allow automatic updates", automatic* firmware update will be disabled.

2. PRINTER POWER ON AND SHUT DOWN

2.1. How to power on the printer

1. Set the overcurrent protection located on the back of the device to the upper ON position (Fig. 19).
2. Set the main switch located on the back of the device to the ON position (Fig. 19).
3. If an uninterruptible power supply (UPS) is installed in the printer, turn it on by pressing the ON button for a few seconds until you hear a beep.
4. Press the power button on the left side of the front panel (Fig. 16).
5. The printer will boot up and the touch screen will turn on. During start-up, the printer starts preparing for operation, the startup screen appears, and then the main screen of the device.

2.2. How to shut down the printer

3. Make sure the printer is not printing.
4. Press the power button on the left side of the front panel (Fig. 16).
5. Confirm the onscreen message that you want to shut down the printer. If the message is not acknowledged, the printer will return to the main menu and will not be shut down.
6. After you acknowledge the message, wait until the device cools down and reaches a safe temperature. After the printer cools down to a safe temperature, it shuts down automatically.

Note: After you select the power button, do not disconnect the power supply until the printer has cooled down and shut down.

Note: The described procedure only turns off the power to the electronics. To completely isolate the printer from the power supply, set the main switch (Fig. 19) and the overcurrent protection (Fig. 19) to the OFF position.

3. MATERIALS AND MATERIAL HANDLING

The 3DGence INDUSTRY F42x Series printer is equipped with a semi-automatic filament feed system (MPF) and the Smart Material Manager (SMM). The manufacturer recommends the use of materials NFC tagged by the manufacturer (Fig. 2). This will enable you to use the full functionality of the printer. The SMM makes it possible to:

- automatic read the material net weight, type and manufacturer, printer operating parameters for the material,
- monitor the amount of material remaining on the spool,
- communicate possible problems to the user, e.g. the use of material that is inappropriate for a .3dg file,
- control the quality of material flow during operation,
- detect the end of the material.

Inside the material chamber there are two material bays for model materials (material bay 1 and material bay 2) and two containers for support materials (material bay 3 and material bay 4).

3.1. Material loading

NOTE:

- Material bay 1 and material bay 2 for model material can be loaded with two the same materials (the same type and manufacturer). Otherwise, an error will appear on the printer screen stating that the materials do not match, and the loading process cannot be completed. The material will then be unloaded from the filament feed module.
- Material bay 3 and material bay 4 for support material can be loaded with two the same materials (the same type and manufacturer). Otherwise, an error will appear on the printer screen stating that the materials do not match, and the loading process cannot be completed. The material will then be unloaded from the filament feed module.

1. Turn on the printer.
2. Make sure that the material bay in the material chamber where you want to load the new material is empty. Also, make sure that there is no material in the material feeding system and, in the extruder, (this does not apply to the first material loading). If material is loaded, the procedure for unloading the material described in point 3.2 of this section should be completed first.
3. Start the material loading assistant by selecting material icon → material bay icon to be loaded material to → “load”
4. button. Follow the messages displayed on the printer screen.
5. The corresponding hotend will be set to the active position, the printer will read the axis reference positions and the print module will be set up in the cleaning station.
6. Place the material in the appropriate material bay in the material chamber. Cut the end of the material at an angle of 45° and straighten the end. Slide and gently push the end of the material into the input opening of the filament feed mechanism (Fig. 68).
7. The sensor in the filament load assist module reads the presence of material and the printer starts the preloading procedure beyond the filament loading assist module.
8. The printer will automatically read data from the NFC tag placed by the manufacturer on the material spool. If a spool of material with no NFC tag is loaded, a screen with the choice of material type will appear (using this option will prevent the use of the NFC system functionality).
9. Then the loading of the material into the extruder will continue and at the same time the heating of the corresponding hotend will start.
10. When the hotend reaches the nominal extrusion temperature for the material, the material will be automatically fed to the hotend.
11. After the material is extruded from the hotend, the heating will be switched off and a message will appear confirming that the material has been properly loaded.

When loading material into a second material bay (inactive) for the same type of material, the procedure is reduced and does not require hotend heating. In this case, material will be pre-loaded into the filament load assist module and stopped. When material runs out in the active material bay, the pre-loaded material will be loaded into the hotend to continue printing.

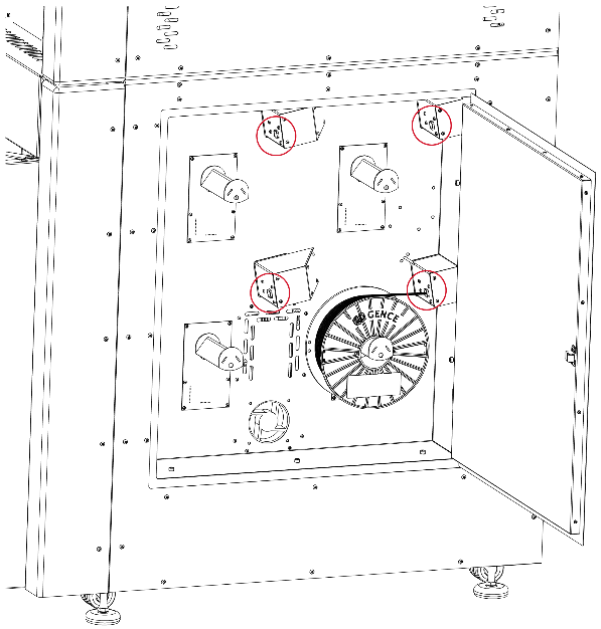


Fig. 68 Location of the entrance holes for the filament feed module

3.2. Material unloading

Material can be unloaded either when it is active (loaded into the hotend) or when it is inactive, i.e. pre-loaded beyond the filament loading assist module.

1. Turn on the printer.
2. Start the material unloading assistant by selecting material icon → material bay to be unloaded material to → “unload” button. Follow the messages displayed on the printer screen.
3. The corresponding hotend will be set to the active position, the printer will read the axis reference positions and the print module will be set up in the cleaning station.
4. A message will appear on the printer screen indicating that the unloading will start when the hotend is heated up.
5. When the correct temperature is reached, the material unloading process will start automatically. Initially, the material will be extruded to facilitate its subsequent withdrawal from the hotend.
6. After material unloading, the heating will be switched off and a message will be displayed confirming the correct unloading.
7. Remove the material from the appropriate bay in the material chamber. Remember to store material in a dry place, protected against direct sunlight.

For unloading inactive material, initially loaded beyond the filament feed module, -the procedure is reduced and does not require hotend heating. In this case, the printer will only withdraw the material beyond the MLS and the user will have to remove it from the corresponding bay in the material chamber.

3.3. Change of material from the active bay to inactive bay / activating inactive material

When material loaded into one bay is active (reaching the hotend), while being inactive in the other bay (loaded into the MLS,ready for replacement), select the “swap” option to activate the material unloading assistant from the active material bay andload material from the inactive material bay into the hotend.

1. Turn on the printer.
2. Start the assistant for changing the active material bay to inactive by selecting material icons → material icons you want

to change → “swap” button. Follow the messages displayed on the printer screen.

3. The corresponding hotend will be set to the active position, the printer will read the axis reference positions and the print module will be set up in the cleaning station.

4. PRINT MODULE

4.1. Print module installation

Note: The print module must be mounted and removed when the printer is switched off.

The protective gloves included in the set are required to perform the activities described.

When the module is installed in the printer, go to the instructions for removing the print module described in this section in point 4.2.

The X axis moves the module trolley from the left to the right, while the Y axis moves the module trolley from the front to theback.

1. Turn on the printer.
2. In the printer menu, run the module installation assistant by selecting: *materials button → model or support hotend icon → actions → install printing module.*
3. Open the printer‘s front door by pressing the button on the device display. The printer will shut down.
4. Open the top cover of the printer.
5. Prepare a new module and remove the black plug marked “please remove“ that protects the module slot.
6. If necessary, position the module carriage in a position that allows easy access so that you can install the module.
7. Insert the module at an angle into the module working space (Fig. 70). Straighten the module so that the ball pin (Fig. 69, yellow) enters its slot in the mounting plate (Fig. 69, yellow). Gently press the module against the mounting plate so that the two positioning pins (Fig. 69, orange) and the signal socket (Fig. 69, blue) are inserted into the mounting plate. Be careful not to scratch the front housing of the module during installation.
8. Tighten the knob above the module (Fig. 71, yellow). The knob should be tightened as far as it will go to compensate for any play.
9. Press and hold the T0 extruder locking mechanism (Fig. 71, blue), then lower and release the T0 extruder (Fig. 71, grey). Check that the extruder is locked on the hotend sleeve (Fig. 71, orange) by pushing lightly it upwards. When the extruder is locked properly, it will stay in the lower position (Fig. 72, grey).
10. Press and hold the T0 extruder locking mechanism (Fig. 69, blue), then lower and release the T0 extruder (Fig. 72, grey). Check that the extruder is locked on the hotend sleeve (Fig. 71, orange) by pushing lightly it upwards. When the extruder is locked properly, it will stay in the lower position (Fig. 72, grey).
11. Close the top printer cover.
12. Open the front printer door.
13. Turn on the printer.

Caution: Each time after you install the printing module, calibrate the offset between the hotends in the printing module on the Z axis, and then on the X, Y axes, according to the instructions provided in section VI, subsection 1.

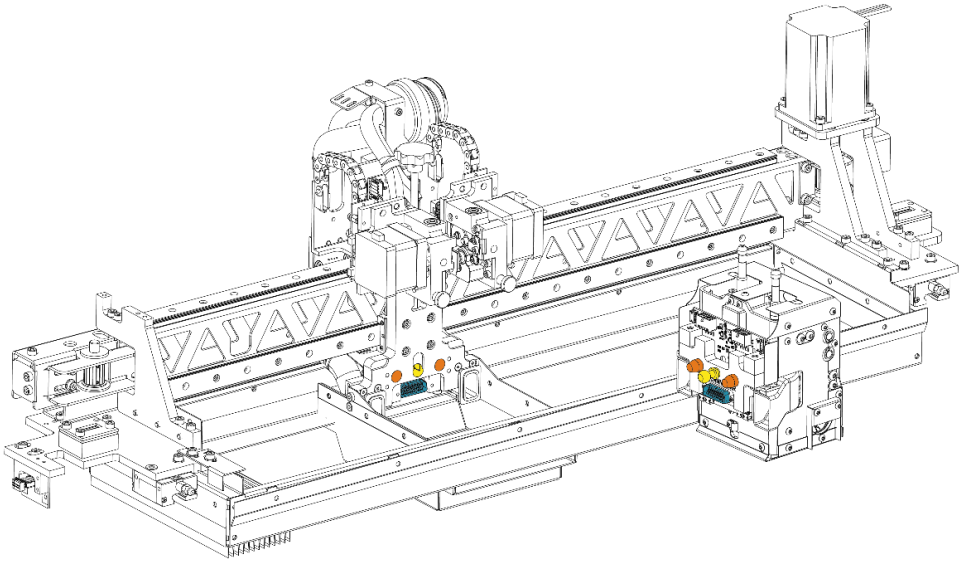


Fig. 69 Printing module installation

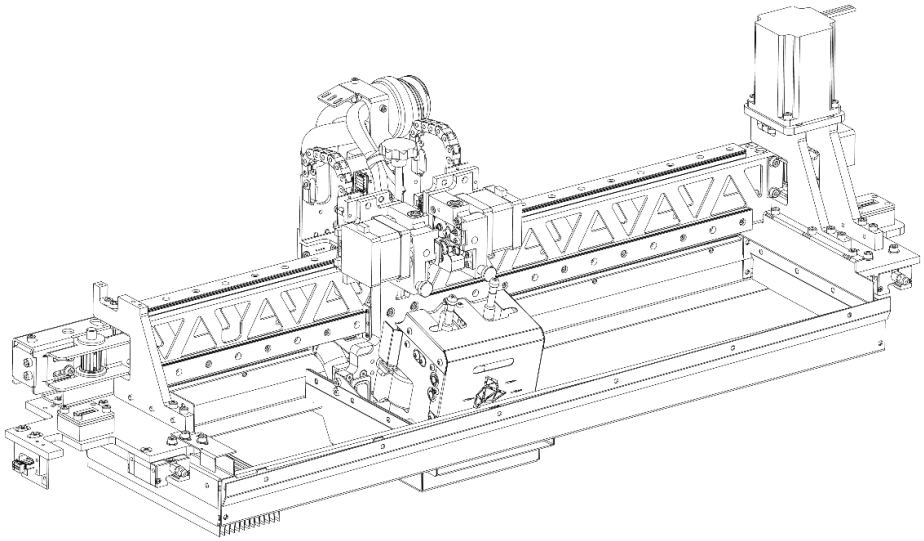


Fig. 70 Printing module installation

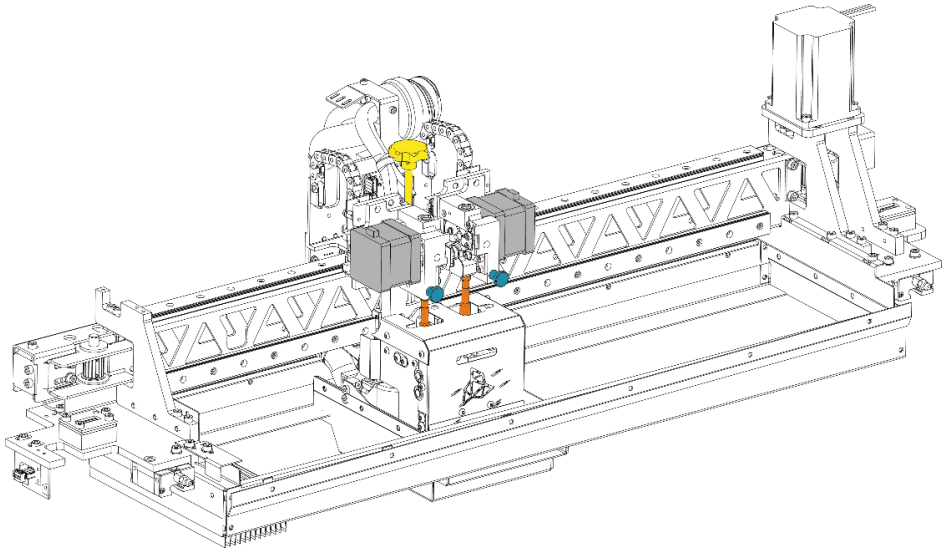


Fig. 71 Printing module installation

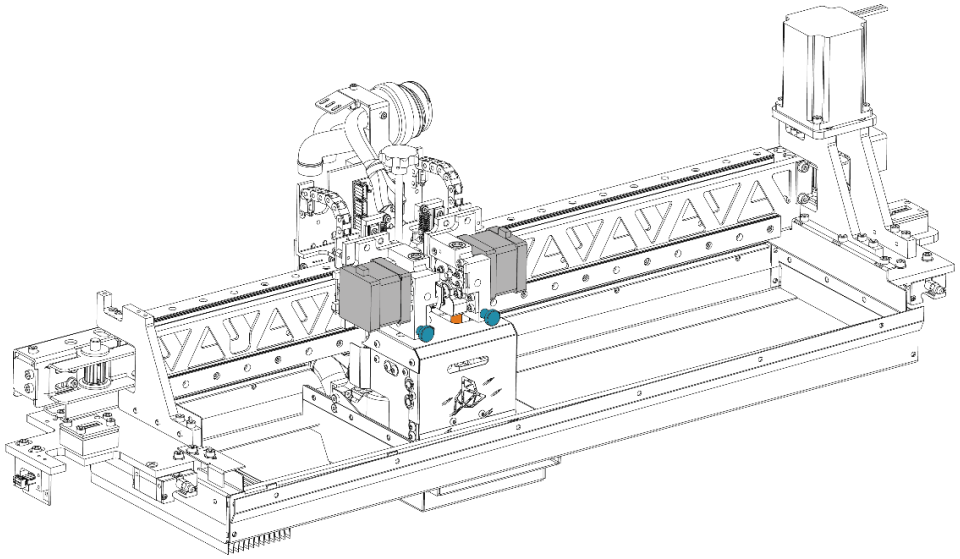


Fig. 72 Printing module installation

4.2. Printing module removal

Note: The printing module should be installed and removed when the printer is shut down.

When performing the activities described wear protective gloves, delivered with the printer.

1. Turn on the printer.
2. In the printer menu, run the module removal assistant by selecting: *materials* *icon* → *model and support hotend icons* → *actions* → *remove printing module.*
3. If any material is loaded, the printer will first unload it. Follow the instructions on the printer screen.
4. Then, the device cools down to a safe temperature and the module carriage will be set in the appropriate position.
5. Use the button on the display to open the printer's front door. The printer will shut down.
6. Open the top cover of the printer.
7. Unlock the T0 extruder from the hotend sleeve by pressing the T0 extruder locking mechanism (Fig. 70, blue). The unlocked extruder will be set to a higher position (Fig. 71, grey).
8. Unlock the T1 extruder from the hotend sleeve by pressing the T1 extruder locking mechanism (Fig. 70, blue). The unlocked extruder will be set to a higher position (Fig. 71, grey).
9. Unscrew the knob above the module until it is possible to pull the module socket out of the mounting plate (Fig. 71, yellow).
10. Slide the dual hotend module out of the mounting socket. When removing the module, gently lift the extruders upwards if necessary.
11. Install the new module according to the instructions described in subsection 4.1 of this section.

5. BUILD PLATE

5.1. Mounting the print surface

5.1.1. How to select the build plate

The 3DGence INDUSTRY F42x Series printer heatbed allows the use of various types of build plates. The user has the option to print on a glass or magnetic build plate another option is to use polymer sheet (requires compressed air). The choice of the build plate is mainly determined by the material. When printing on a glass build plate, an adhesion glue should be used. Information on the types of build plates for different material profiles is available in the 3DGence SLICER 4.0 software and on the 3DGence technical support web page.

5.1.2. Installing a glass build plate

When performing the activities described wear protective gloves, delivered with the printer.

When installing the glass build plate, be careful not to damage the heatbed white gasket.

1. Turn on the printer.
2. Lower the heatbed to the bottom position by selecting: *settings button → printer controls → manual controls → maintenance position.*
3. Check that the temperatures of the hotends, heatbed and the working chamber are below 30°C. If not, turn the heating off before continuing using the option: *settings → printer controls → manual controls → set temperature.* Wait until the temperature is safe.
4. Open the working chamber door with the button on the main screen in the bottom right corner.
5. Open the two side locks (Fig. 73, grey) using the handles (Fig. 73, black).
6. Check that the glass build plate is clean. If dirty, follow the instructions in section VIII, subsection 1.2.
7. Place the glass on the heatbed (Fig. 74, blue). A printer sensor read if the glass is in place.
8. Check that the glass is evenly placed on the heatbed.
9. Using the handles (Fig. 75, black), close the side locks (Fig. 75, grey).
10. Close the working chamber door.

Note: Before you start printing, check if the selected materials requires the use of an appropriate adhesion promoter Print recommendations for individual materials are available at: www.3dgence.com/support.

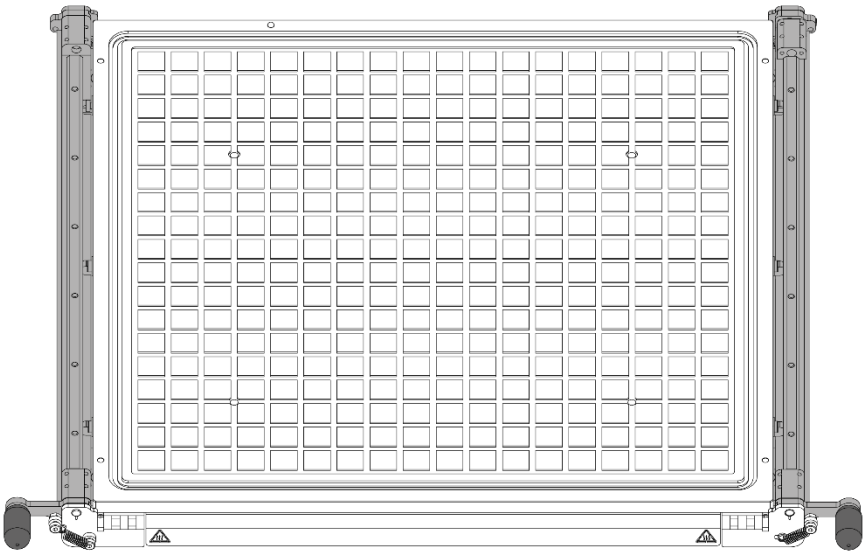


Fig. 73 Build plate installation – open clamps with handles

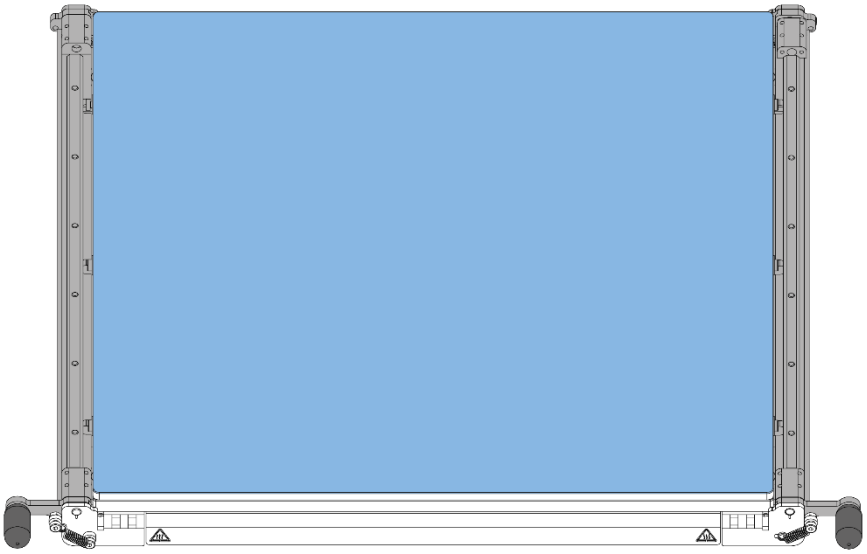


Fig. 74 Build plate installation – place glass build plate

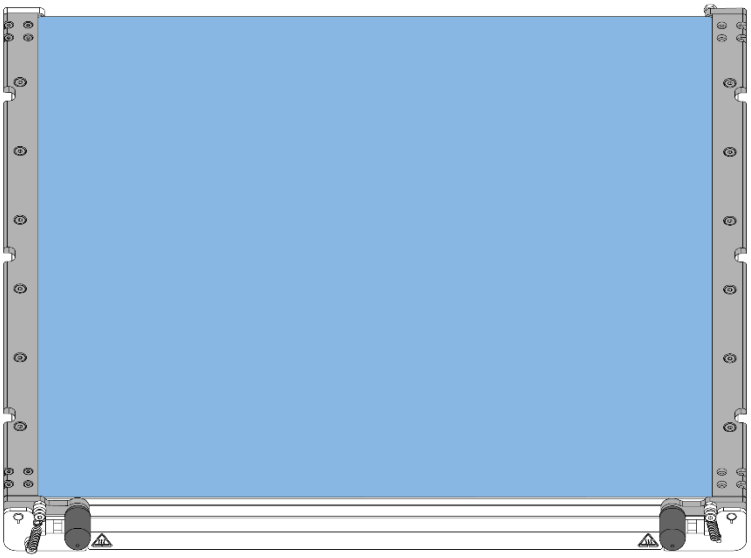


Fig. 75 Build plate installation – close clamps with handles

5.1.3. Installation of the polymer pad

The protective gloves included in the set are required to perform the activities described.

When installing a pad, care must be taken not to damage the gasket in the heated print bed.

1. Turn on the printer.
2. In the printer menu, start the assembly printing surface assistant by selecting setting icon → manual control → "install polymer build sheet" button.
3. The print module and the Z axis column will be set in the correct position to allow the procedure to run smoothly.
4. If the temperature in the working chamber is too high, the corresponding message will be displayed. Wait until the temperature is safe to continue.
5. If the work chamber door is closed, an appropriate message will appear indicating that it must be opened.
6. Tilt the two side locks (Fig. 73, grey) using the handles (Fig. 73, black).
7. When a glass pane is installed in the printer, a message will appear that it must be removed.
8. Remove any soiling or residual material from the vacuum plate, then wash the gasket with isopropyl alcohol and soft cloth. Any soiling can result in difficulties in keeping the pad on the bed.
9. Place the pad on the vacuum table. Please note that the type of washer should be selected conforming with the type of material and the material profile selected.
10. After accessing the next step on the display, the printer will check if the vacuum is maintained and the pad is properly sucked in place. If this is not the case, a message appears to press the pad with as large area as possible with your hand tothe vacuum table.
11. After the pad has been properly sucked, degrease the surface of the pad with isopropyl alcohol.
12. After the procedure is complete, close the work chamber door to complete the procedure of mounting the pad.

Note: Do not close the side locks after the pad is installed.

6. ACTIVITIES CONNECTED WITH PRINTING

6.1. Start printing from a flash drive

The 3DGence INDUSTRY F42x Series printer accessory kit comes with a flash drive that allows you to save your ready to print models.The procedure of starting the printing process from a flash drive is easy and quick.

1. Prepare the model for printing in 3DGence SLICER 4.0 software. The software user manual is available at: www.3dgence.com/support.
2. Save the print to a USB flash drive. Wait for the message in 3DGence SLICER 4.0 informing that the file has been saved.
3. Turn on the printer.
4. Insert the USB flash drive into the USB port located in the accessories compartment.
5. Install a build plate that corresponds to the one selected in 3DGence SLICER 4.0.
6. From the main menu, select the *"files"* button or press the centre of the circle in the centre of the display. Both options will move you to the print queue.
7. Select the *"USB DRIVE"* tab.

8. Click the file name to select the model you want to print.
9. You will be transferred to the model preview screen. Select *"add to queue"* to transfer the print to the *"queue"* tab. After the file is moved to the *"queue"* tab, the file is saved in the device memory and the USB flash drive can be removed from the printer.
10. Select the *"queue"* tab by clicking the file name to select the model you want to print.
11. You will be transferred to the model preview screen. Select *"print"* to start printing.
12. The device will automatically start the warm-up procedure and the working chamber door will be locked.
13. After the temperatures set in the prepared .3dg file is reached and the heating process completed, the printing process will start automatically.
14. When the printing process is completed, the printer will start the process of cooling down the working chamber, the hotends and the heatbed. Please wait until this process is completed.
15. After the cooling process is completed, the working chamber door is unlocked and you can remove the print. The print should be removed using a spatula, by gently prising its base.

Note: The print should be removed after the device cools down to avoid deformation of the printed model and damage to the glass build plate.

6.2. Send a print to a printer over the network

6.2.1. From 3DGence SLICER 4.0 via the local network

The necessary condition is that the printer and the computer are connected to the same IP domain. No Internet access is required to send a print file to a printer from 3DGence SLICER 4.0 via the local network.

1. Turn on the printer.
2. Prepare the model for printing in 3DGence SLICER 4.0 software. The software user manual is available at: www.3dgence.com/support.
3. In 3DGence SLICER 4.0 select the "online printers" button in the lower left corner of the software screen.
4. Select the *"LAN"* option in the *"online printers"* window from 3DGENCE SLICER 4.0.
5. Add a printer in 3DGence SLICER 4.0 by selecting the device from the list of available printers or by entering its IP address.
6. In 3DGence SLICER 4.0, on the left side select the printer to which you want to send the print. The printer status must be "*online"*.
7. In 3DGence SLICER 4.0 select the *"add to queue"* option to add the print prepared in the software to the queue or the *"add from device"* option to add to the queue the print that is saved on a drive.
8. Go to the printer.
9. Install a build plate that corresponds to the one selected in 3DGence SLICER 4.0.
10. From the main menu, select the *"files"*  button or press the centre of the circle in the centre of the display. Both options will move you to the print queue.
11. Click the file name to select the model you want to print.
12. You will be transferred to the model overview screen. Select *"print"* to start printing.
13. The device will automatically start the warm-up procedure and the working chamber door will be locked.
14. After the temperatures set in the prepared .3dg file is reached and the heating process completed, the printing process will start automatically.
15. When the printing process is completed, the printer will start the process of cooling down the working chamber, the hotends and the heatbed. Please wait until this process is completed.
16. After the cooling process is completed, the working chamber door is unlocked and you can remove the print. The print should be removed using a spatula, by gently prising its base.

Note: The print should be removed after the device cools down to avoid deformation of the printed model and damage to the glass build plate.

6.2.2. From 3DGence SLICER 4.0 via the local network

To send a print to a printer from 3DGence SLICER 4.0 via the CLOUD system does not require the printer and the computer to be in the same IP domain. A high level of security is ensured because the file is sent in fragments and the files are not stored anywhere after they have been sent via the CLOUD system.

1. Turn on the printer.
2. Prepare the model for printing in 3DGence SLICER 4.0 software. The software user manual is available at: www.3dgence.com/support.
3. In 3DGence SLICER 4.0 select the "*online printers*" button in the lower left corner of the software screen.
4. From the 3DGence SLICER 4.0 select the *"3DGence CLOUD"* option in the *"online printers"* window.

5. Log in to your 3DGence CLOUD account in 3DGence SLICER 4.0.
6. In 3DGence SLICER 4.0, on the left side select the printer to which you want to send the print. The printer must be *"online"*. If you have not added a printer, use the *"go to cloud"* button to access the 3DGence CLOUD online platform, where you can add your device.
7. In 3DGence SLICER 4.0 select the *"add to queue"* option to add your print prepared in the software to the queue or the *"add from device"* option to add to the queue a print saved on a disk.
8. Go to the printer.
9. Install a build plate that corresponds to the one selected in 3DGence SLICER 4.0.
10. From the main menu, select the  *"files"* button or press the centre of the circle in the centre of the display. Both options will move you to the print queue.
11. Click the file name to select the model you want to print.
12. You will be transferred to the model preview screen, where you can select *"print"* to start printing.
13. The device will automatically start the warm-up procedure and the working chamber door will be locked.
14. After the temperatures set in the prepared .3dg file is reached and the heating process completed, the printing process will start automatically.
15. When the printing process is completed, the printer will start the process of cooling down the working chamber, the hotends and the heatbed. Please wait until this process is completed.
16. After the cooling process is completed, the working chamber door is unlocked and you can remove the print. The print should be removed using a spatula, by gently prising its base.

Note: The print should be removed after the device cools down to avoid deformation of the printed model and damage to the glass build plate.

6.2.3. From the 3DGence CLOUD web platform

1. Turn on the printer.
2. Prepare the model for printing in 3DGence SLICER 4.0 software. The software user manual is available at: www.3dgence.com/support.
3. Save the print to your computer.
4. Go to www.cloud.3dgence.com and log in to your account.
5. Select the printer to which you want to add the print.
6. Add the print to the queue with the *"add* print*"* button.
7. Go to the printer.
8. Install a build plate that corresponds to the one selected in 3DGence SLICER 4.0.
9. From the main menu, select the *"files"*  button or press the centre of the circle in the centre of the display. Both options will move you to the print queue.
10. Click the file name to select the model you want to print.
11. You will be transferred to the model preview screen. Select *"print"* to start printing.

12. The device will automatically start the warm-up procedure and the working chamber door will be locked.
13. After the temperatures set in the prepared .3dg file is reached and the heating process completed, the printing process will start automatically.
14. When the printing process is completed, the printer will start the process of cooling down the working chamber, the hotends and the heatbed. Please wait until this process is completed.
15. After the cooling process is completed, the working chamber door is unlocked and you can remove the print. The print should be removed using a spatula, by gently prising its base.

Note: The print should be removed after the device cools down to avoid deformation of the printed model and damage to the glass build plate.

6.3. Removing prints

Immediately after the printing process is completed, the cooling sequence will start automatically. A pie chart on the display shows the progress of the cooling process. Once the printer has reached a safe temperature, the display will return to the main screen and the door of the working chamber can be opened.

Always use gloves provided when performing any model removing operations.

Remove the print from the heatbed using a spatula delivered together with the printer by prising it gently from different sides. Do not use sharp corners of the spatula, use only its flat edge. Do not remove the print by force as it may cause damage to the heatbed. In there are any problems when separating the print from the heatbed, it is recommended that the heatbed should be heated and cooled down again. This process may be repeated and it is recommended for prints with a large base surface. Use the spatula to prise the print.

NOTE: Do not touch the heatbed surface with bare hands. Otherwise, the heatbed surface will be soiled causing difficulties due to adhesion of next prints to the heatbed surface. Use clean protective gloves.

VI CALIBRATION

1. PRINTING MODULE CALIBRATION

Note: Each time after you install the printing module, calibrate the offset between the hotends in the printing module on the Z axis, and then on the X, Y axes.

1.1. Calibrate the offset between hotends in the printing module on the Z axis

The Z offset between the T0 hotend and the T1 hotend is a key parameter for high print quality. The correctly calibrated Z offset value allows you to obtain high quality surfaces between the raft and the base material as well as between the support and the base material.
The 3DGence INDUSTRY F42x Series printer enables automatic offset measurement in the Z axis. The measurement is carried out with the use of a strain gauge and consists in determining the difference between the height of the T0 and T1 hotends.
Since it is necessary to carry out the measurement when the hotends are heated to the material processing temperature, to measure on the Z axis, the glass build plate of the heatbed must be installed in accordance with the procedure described in section V, subsection 5.1.2.
To perform the measurement, select settings button → calibration → printing module → calibration → run Z calibration.

1.2. Kalibracja offsetu pomiędzy głowicami w module drukującym w osi X, Y

To verify the offset in both axes, print the calibration model stored in the printer's memory (the procedure is described below).

The model consists of two parts – part X and part Y (Fig. 74). Part X is used to set offsets between the hotends on the X axis. Part Y is used to set offsets between the hotends on the Y axis. Each part consists of two material layers – the bottom layer printed from support material (Fig. 74, white) and the upper layer printed from model material (Fig. 74, red).

The centre line of the X and Y parts is point 0. The lines of both X and Y parts to the right from point 0 increase with the plus sign every 0.05 mm, and the lines to the left from 0.00 point decrease with the minus sign every 0.05 mm. The printed "+" symbols next to X and Y symbols are helpful in determining the sign with which the read point must be entered into the printer.

With the correctly calibrated offsets on the centre line at point zero, the model material matches the support material both on the X axis and on the Y axis. If materials overlap on a different line than the middle one, the calibration must be repeated.

Calibration procedure for offsets in the X, Y axes:

1. Turn on the printer.
2. Install the printing module in the printer according to the procedure described in section V, subsection 4.1.
3. Load the model material and the support material according to the procedure described in section V, subsection 3.1. Load a pair of materials in two different colours, which work together and are designed for use with the printing module installed in the printer.
4. Check that the glass build plate is installed in the printer. If no the plate is in place, clean it following the procedure in section VIII, subsection 5.1.2.
5. Check that the build plate is clean. If the plate is dirty, clean it following the procedure in section VIII, subsection 1.1.
6. Check that the hotend tips are clean. If they are dirty, clean them following the procedure in section VIII, subsection 1.2.
7. Print the calibration model stored in the printer memory by selecting Menu *settings button* →  *calibration* → *printing module calibration* → *run XY calibration* from the printer menu.
8. After printing the calibration model, the door of the working chamber is opened automatically.

9. Use display arrow buttons to select the line number that best matches the model material with the support material in part X.
10. Use display arrow buttons to select the line number that best matches the model material with the support material in part Y.
11. Select the *"apply"* button on the display to save the values and complete the calibration procedure.
12. Remove the model from the printer.
13. Reprint the model stored in the printer memory by selecting: *settings button* → *calibration* → *printing module calibration* → *run XY calibration* from the printer menu and assess the calibration level of the offsets:
    - when the model material on the centre line matches the support material both in the X part and in the Y part, the XY offsets of the printing module are calibrated correctly,
    - when the model material on the centre line does not match the support material in the X part or in the Y part, the XY offsets of the printing module are not calibrated correctly, Recalibrate the offsets according to steps 5 to 10.

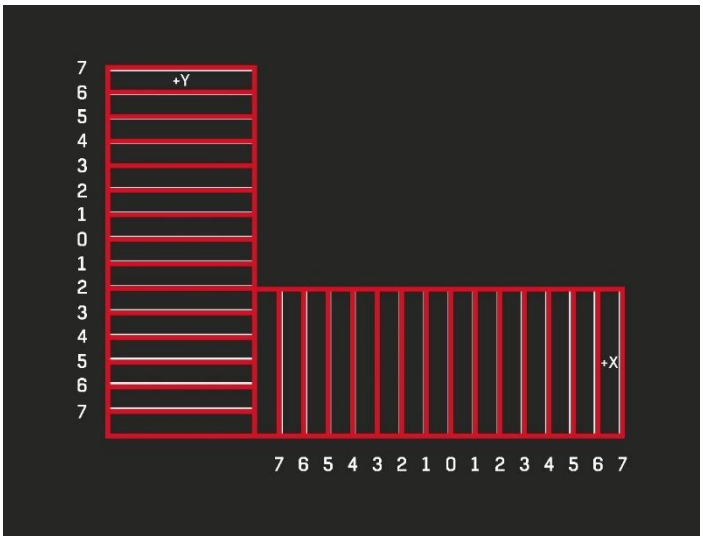


Fig. 76 Offset calibration model for X and Y axes

2. HEATBED CALIBRATION

D Wear protective gloves, complete with the printer, when performing the activities described.

The following describes the procedure to follow to calibrate the printer heatbed correctly. The build plate must be recalibrated when problems with the adhesion of the first print layer can be noticed.

1. Turn on the printer.
2. When material is loaded, unload it following the procedure in section V, subsection 3.2.
3. Check that the glass build plate is installed in the printer. If no plate is in place, install it following the procedure in section V, subsection 5.1.2.
4. Check that the heatbed is clean. If the heatbed is dirty, clean it following the procedure in section VIII, subsection 1.1.
5. Check that the hotend tips are clean. If they are dirty, clean them following the procedure in section VIII, subsection 1.2.
6. Tilt the container handle of the cleaning station and gently tilt the container towards the work chamber.

7. Lift the container slightly vertically and then slide it out of the two mounting hooks on the printer
8. Remove the cleaning station container from the machine working chamber.
9. Raise the heatbed to the top position by selecting: *settings button* →  *printer controls* → manual controls → raise *heatbed.* Hold down the "raise heatbed" button to move the table up.
10. Wear protective gloves.
11. Open the working chamber door with the button on the main screen in the bottom right corner. When you open the working chamber door, be sure not to open the top cover of the printer, if not necessary.
12. Lower the heatbed by loosening the four adjustment knobs underneath the printed bed (Fig. 77, red). To do this, turn each knob several times ccw.
13. Close the working chamber door.
14. Start the heatbed calibration procedure by selecting from the printer menu: *settings*  *button* → *calibration* → *heatbed calibration.*
15. The heatbed will be placed in the correct position.
16. The heatbed will be heated to a temperature that enables the calibration procedure to be carried out.
17. When the heatbed is heated, the printer will first prepare for the measurement. A check will be carried out whether the adjustment knobs under the heatbed are loosened sufficiently to allow calibration to be carried out.
    - If the adjustment knobs are loosened insufficiently, a message will be displayed indicating that the adjustment knobs need to be loosened in each corner under the heatbed. In this case, select "end" on the display and repeat the procedure as set out in steps 8 to 11.
    - If the adjustment knobs are loosened sufficiently, the printer can start the calibration procedure.
18. Open the working chamber door as prompted by the message on the display.
19. The printing module is positioned above the first corner of the heatbed (first measuring point) where the first measurement will be made.
20. The a screen will be displayed on the printer display with a bar that will change colour when you tighten the knob. Red, orange or green are the colours that may be displayed. Tighten the adjustment knob at the first measuring point until the bar turns green. As soon as it turns green, release the knob and check if the bar is still green on the display.
    - If the bar is not green, repeat the procedure described in step 17.
    - If the bar is green, select the highlighted "next" button on the display.
21. The printing module will then move to the next measuring point where the procedure described in step 17 must be repeated. At each of the four measurement points, the printing module will be set twice, so the measurement will be made 12 times.
22. After the calibration procedure is completed close the working chamber door as prompted by the message on the display.
23. An appropriate message on the screen will be displayed to confirm that the calibration process is complete.

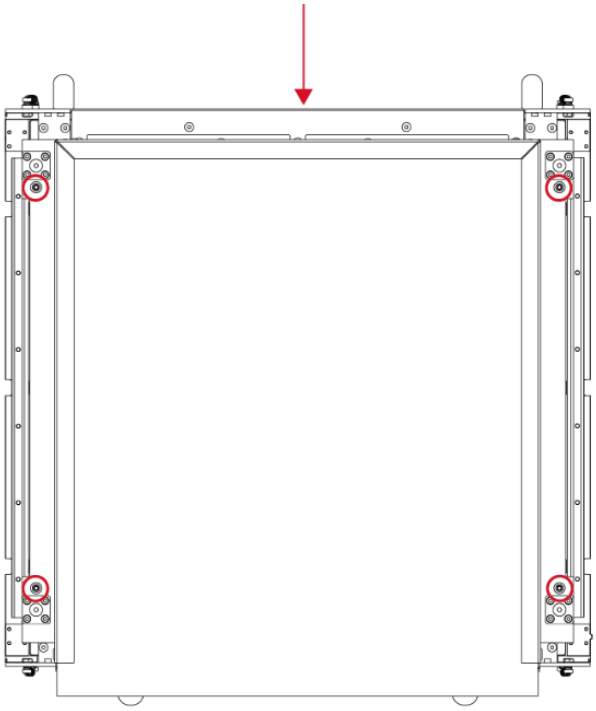


Fig. 77 Adjustment knobs located under the heatbed (the red arrow marks the front of the printer)

VII SOFTWARE

1. 3DGENCE SLICER 4.0

1.1. Introduction

The dedicated 3DGence SLICER 4.0 software has been prepared for 3DGence printers. The software is designed for preparing machine codes from files describing spatial geometry. It also contains ready-made print settings for dedicated materials. Each of the profiles available in 3DGence SLICER 4.0 has been developed by a team of specialists and then tested for over 1,000 hours of printing many complex test models. That is why we recommend using the default profiles for your first experience with 3D printing.

The option for changing the print settings is available for advanced users. This option is designed to modify the existing profiles to adjust the quality/parameters of prints using materials other than those certified by the manufacturer. Due to the character of parameter modifications, the manufacturer does not guarantee the quality and repeatability of prints prepared in this way.

Please note that the customer is responsible for using materials and print settings which are not supplied by the manufacturer. This means that the manufacturer does not provide support services for the use of advanced profiles.

3DGence SLICER 4.0 uses a modified CuraEngine slicing engine while maintaining the parameter names, so even experienced users can benefit from the extensive documentation of the Cura software community. The names and functions are the same as in the Cura software.

1.2. Quality guarantee

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

1.3. 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, macOS 10.10 or higher,
- screen resolution: 1920×1080 pixels,
- 4 GB of RAM,
- Intel Core i3 dual core processor or higher.
- recommended graphics card supporting OpenGL 4.2 or higher.

The software can be run on hardware that does not meet these requirements, however, the comfort of work and the speed of model processing may deteriorate. The manufacturer does not provide support for hardware that does not meet the system requirements, especially older versions of operating systems.

2. 3DGENCE CLOUD

3DGence CLOUD is software designed to remotely operate sets of printers that are part of equipment resources. The software was developed to meet industry 4.0 requirements for 3DGence devices and supports remote communication with the 3DGence INDUSTRY F42x Series printer. The communication in the system is encrypted. User .stl files are divided into many components and encrypted as .3dg files. 3DGence does not have access to files sent to the system by Customers. 3DGence CLOUD allows full control of the 3D printing process, including starting and queuing print jobs, collecting statistics and accessing maintenance service functions. It is a solution that improves workflow and enables remote control of printing.

Main system functionalities:

- remote support of 3D printers,
- queuing prints,
- monitoring of printed models, using a camera located in the printer,
- problem reporting – technical service support,
- management of the printer fleet: adding and removing machines in the system, granting access to machines to users with specified permissions,
- granting different permissions to individual users,
- accessing files made available by the manufacturer,
- collecting statistics.

A Customer account in the 3DGence CLOUD system is created by 3DGence engineers during the installation of 3DGence INDUSTRY F42x Series device, after reading the terms of use of the platform and its acceptance. The only requirement for using the system is access to the Internet, and consenting to the processing of personal data.

VIII MAINTENANCE ACTIVITIES

In order to ensure a high level of safety, the manufacturer recommends the use of spare parts compliant with the factory numbers. In case such parts are not available, you are recommended to contact 3DGence Technical Support. You can find all contact methods in section IX of this manual.

1. AFTER PRINTING COMPLETION

1.1. Check the hotend tips for soiling

Each time when printing is completed, it is recommended to visually check hotend tips for soiling. Dirty hotend tips can impair the quality of printed models. That is why it is recommended to clean the hotend tips from molten/burnt material that may be on the outside of the nozzle or the nozzle cover.

How to clean hotend tips:

1. Power on the printer according to the procedure described in section V, subsection 2.1.
2. Move the heatbed to a position allowing easy access to hotends by selecting: *settings* → *printer*  *controls* → manual controls → *maintenance position.*
3. Heat up the T0 hotend by selecting:  *settings* → *printer controls* → *set temperature* → *model* and set the appropriate temperature:
   - for the M280 module up to 265°C,
   - for the M360 module up to 320°C,
   - for the M500 module up to 400°C,
4. Heat up the T1 hotend by selecting:  *settings* → *printer controls* → *set temperature* → *model* and set the appropriate temperature:
   - for the M280 module up to 220°C,
   - for the M360 module up to 265°C,
   - for the M500 module up to 265°C,
5. Set the T0 hotend in the active position by selecting:  settings → *printer controls* → manual controls → *active tool* → *model.*
6. Wear protective gloves.
7. Open the working chamber door with the button on the main screen in the bottom right corner.
8. Gently remove any molten/burnt material from the T0 nozzle with non-combustible material or tweezers.
9. Set the T1 hotend in the active position by selecting:  settings → *printer controls* → manual controls → *active tool* → *support.*
10. Gently remove any molten/burnt material from the T1 nozzle with non-combustible material or tweezers.
11. After cleaning the heads, switch off the heating by selecting:  settings → *printer controls* → *set temperature.*

1.2. Clean the glass build plate and apply an adhesive layer

A dirty or greasy glass build plate can make printing difficult or completely impossible. It is recommended to clean the heatbed each time after printing is finished or before it is started. Clean the printer heatbed by following the instructions below.

The procedure for cleaning the heatbed:

1. Power on the printer according to the procedure described in section V, subsection 2.1.
2. Move the heatbed to a position where it can be cleaned by selecting:  *settings* → *printer controls* → *manual controls* → *maintenance position.* 

3. Turn off all heating elements by selecting: *settings → printer controls → set temperature.* Wait to allow to cool down completely to ambient temperature.
4. Open the working chamber door with the button on the main screen in the bottom right corner.
5. Shut down the device according to the procedure described in section V, subsection 2.2.
6. Wear protective gloves.
7. Clean the heatbed surface of any plastic residue with a spatula.
8. Clean the heatbed with a damp cloth and then wipe dry with a paper towel.
9. Degrease the heatbed with a cloth soaked in ethyl alcohol or isopropyl alcohol and wait for the alcohol to evaporate.
10. Apply adhesion promoter onto the build plate according to the printing requirements of the individual materials as described on the 3DGence technical support page: www.3dgence.com/support.

If the build plate is very dirty, it can be removed from the device and cleaned thoroughly outside the device. After cleaning and drying the glass build plate, install it in the device according to the procedure described in section V, subsection 5.1.2.

1.3. Clean the cleaning station container

The cleaning station container collects the residue material that has been extruded by the hotends during printing. This processallows you to clean the hotend before changing it in order to maintain high quality prints. It is recommended to empty the cleaning station container each time a print is completed. The cleaning station container should be cleaned by following the instructions below.

Procedure for cleaning the cleaning station container:

1. Switch on the printer in accordance with the procedure described in Section V, point 2.1.
2. Set the heatbed to the lower position for easy removal of the cleaning station container using the option: *settings →maintenance → maintenance position.*
3. Switch off all printer heating elements using the option: *settings → manual control → set temperature*. Allow to coolcompletely and reach a safe temperature.
4. Open the work chamber door with the button on the main screen in the lower right-hand corner.
5. Wear protective gloves.
6. Tilt the container holder of the cleaning station and gently tilt the container towards the work chamber (Fig. 78 yellow).
7. Lift the container slightly vertically and then slide it out of the two mounting hooks in the printer (Fig. 79, red).
8. Remove the cleaning station container from the working chamber of the device.
9. Remove the contents of the container.
10. Mount the cleaning station container in accordance with the procedure described in Section II, point 5.9.

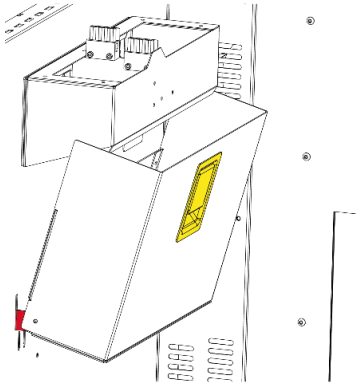


Fig. 78 Removing the cleaning station container – step 1

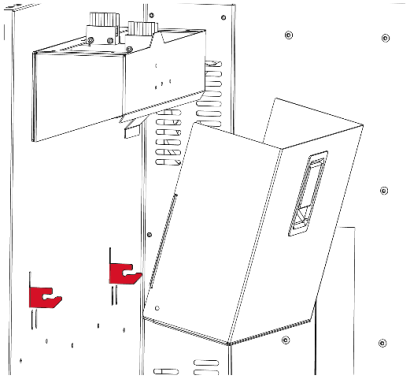


Fig. 79 Removing the cleaning station container – step 2

2. WEEKLY

2.1. Cleaning the working chamber

A dirty working chamber can make printing difficult or completely impossible. It is recommended to clean the working chamber at least once a week. Clean the working chamber by following the instructions below.

The procedure for cleaning the working chamber:

1. Switch on the printer in accordance with the procedure described in Section V, point 2.1.
2. Set the heatbed in a position that makes it easy to clean the working chamber using the options: *settings* → *maintenance* → *maintenance position.*
3. Switch off all printer heating elements: *settings* → *manual control* → *set temperature*. Allow to cool completely and reachthe ambient temperature.
4. Open the work chamber door with the button on the main screen in the lower right-hand corner.
5. Switch off the printer in accordance with the procedure described in Section V, point 2.2.
6. Wear protective gloves.
7. Use a vacuum cleaner to thoroughly remove the residue material accumulated in the working chamber.

3. MONTHLY OR EVERY 500 HOURS OF PRINTER OPERATION

3.1. Lubricating the X axis

Before you start to lubricate, please obtain:

- dispenser with the needle provided with the printer (Fig. 80),
- machine oil LAN 46 or oil with the same characteristics.

Fig. 80 Machine oil dispenser

Procedure for lubricating the X axis:

1. If the print module is not installed in the printer, install it according to the procedure described in Section V, point 4.1.
2. Switch on the printer in accordance with the procedure described in Section V, point 2.1.
3. Open the work chamber door with the button on the main screen in the lower right-hand corner.
4. Open the printer top cover (Fig. 16).
5. Switch off the printer in accordance with the procedure described in Section V, point 2.2.
6. Wear protective gloves.
7. Make sure you have good access to the lubricated area by manually moving the print module fully to the right. Take care not to damage delicate parts (air supply lines, hoses, etc.).
8. Prepare the dispenser with the needle and machine oil in place.
9. Squeeze the dispenser for a few seconds to apply oil into the hole in the front carriage and the hole in the top carriage. The oil application points are marked red in Fig. 81.

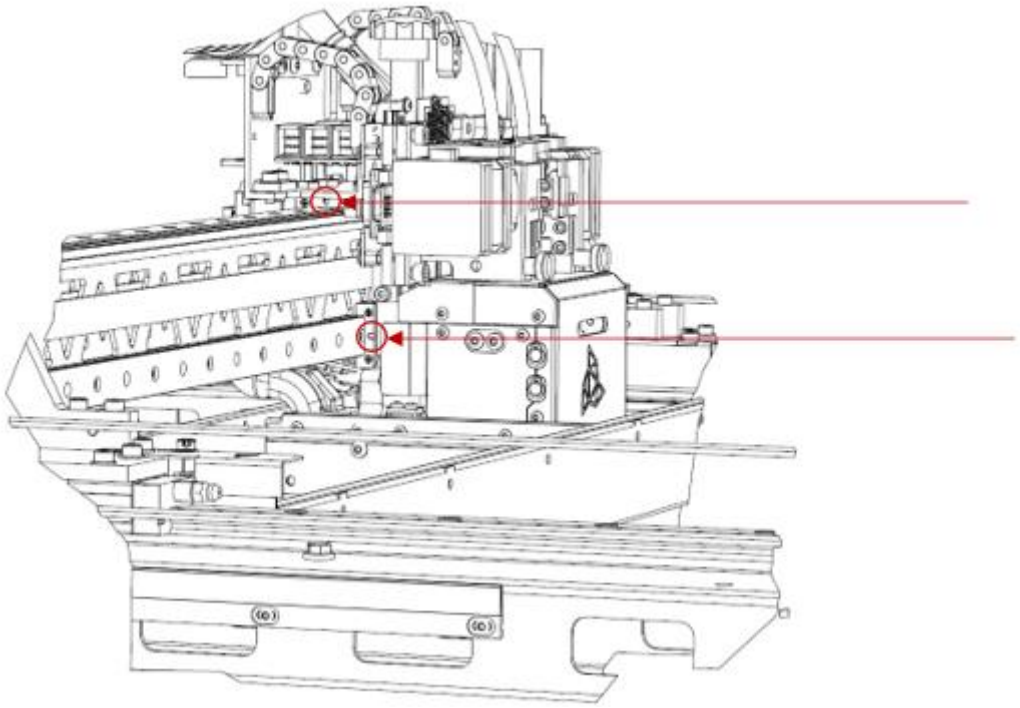


Fig. 81 Lubrication holes on the left side of the print module

10. Make sure you have good access to the lubricated area by moving the print module fully to the left. Take care not to damage delicate parts (air supply lines, hoses, etc.).
11. Squeeze the dispenser for a few seconds to apply oil into the hole in the front carriage and the hole in the top carriage. The oil application points are marked red in Fig. 82.

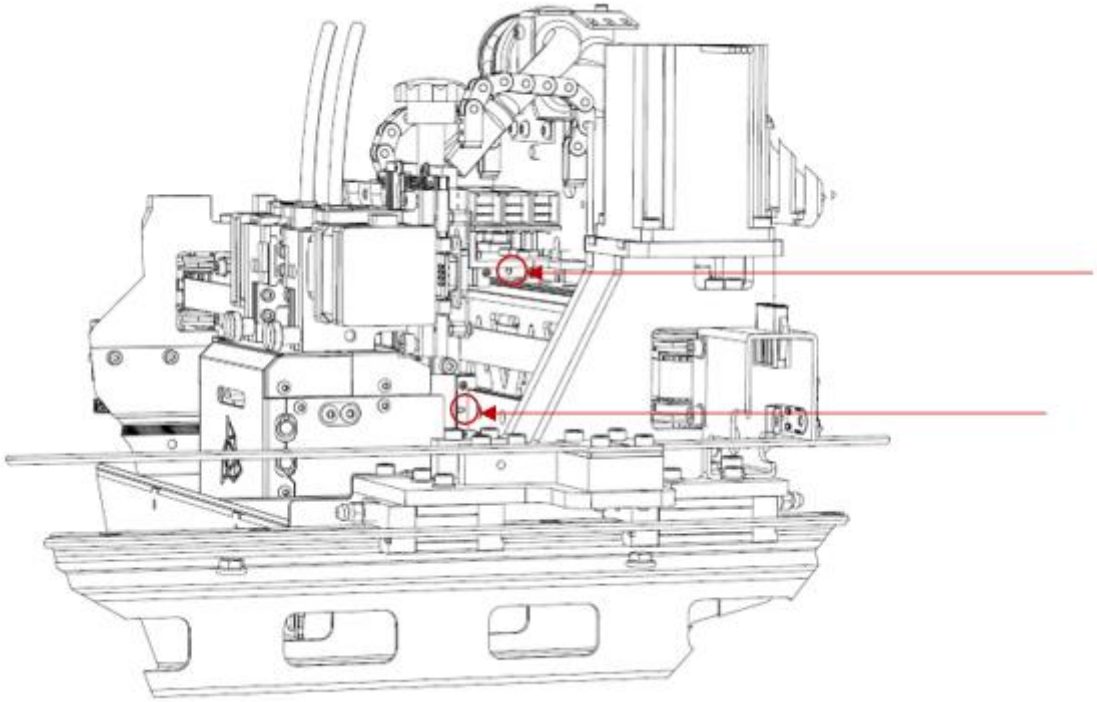


Fig. 82 Lubrication holes on the right side of the print module

12. Close the top cover of the printer.
13. Open the front door of the printer.
14. Switch off the printer in accordance with the procedure described in Section V, point 2.1.

3.2. Cleaning the extruders

1. Switch on the printer in accordance with the procedure described in Section V, point 2.1.

2. When materials are loaded in the printer, they should be unloaded in accordance with the procedure described in Section V, point 3.2.

3. Move the heatbed to a position where the procedure can be carried out by selecting: ⚙ *settings* → *printer controls* → *manual controls* → *maintenance position.*

4. Set the T1 hotend in the active position by selecting: ⚙ settings → *printer controls* → manual controls → *active tool* → *support.*

5. Wear protective gloves.

6. Open the working chamber door with the button on the main screen in the bottom right corner.

7. Open the top printer cover to allow free access to extruders.

8. Shut down the device according to the procedure described in section V, subsection 2.2.

9. Remove the C-shaped lock (Fig. 83, green, step 1) from the connector.

10. Press the connector lock (Fig. 83, red, step 2) and simultaneously remove the material feeding system from the connector by pulling it up (Fig. 83, yellow, step 3). Similarly, remove the material feeding system from the other extruder.

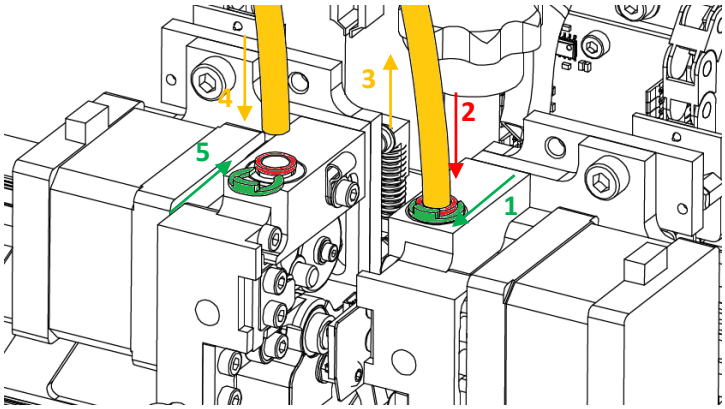


Fig. 83 Removing and installing the material feeding system

11. Unlock the T0 extruder and the T1 extruder (Fig. 84, grey) from the hotend sleeve (Fig. 84, 85, orange) by pressing in the T0 extruder locking mechanism (Fig. 84, blue). The unlocked extruder will be set to a higher position (Fig. 84, grey).

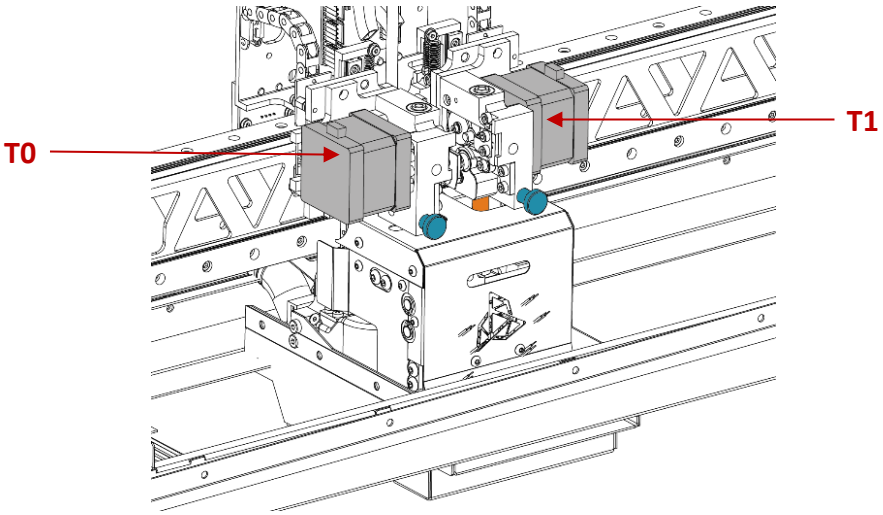


Fig. 84 Unlocking extruders – step 1

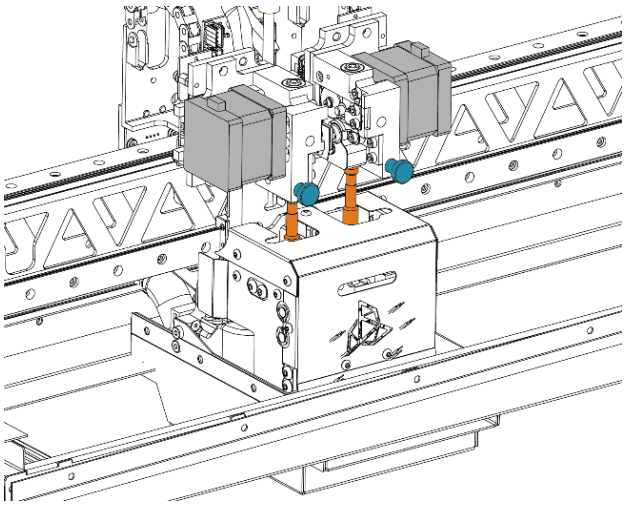


Fig. 85 Unlocking extruders – step 2

12. Unscrew two screws securing the T0 extruder to the extruder seat, located above and under the extruder (Fig. 86) and remove the extruder from the printer. Put the screws aside. Repeat the same procedure for the T1 extruder.

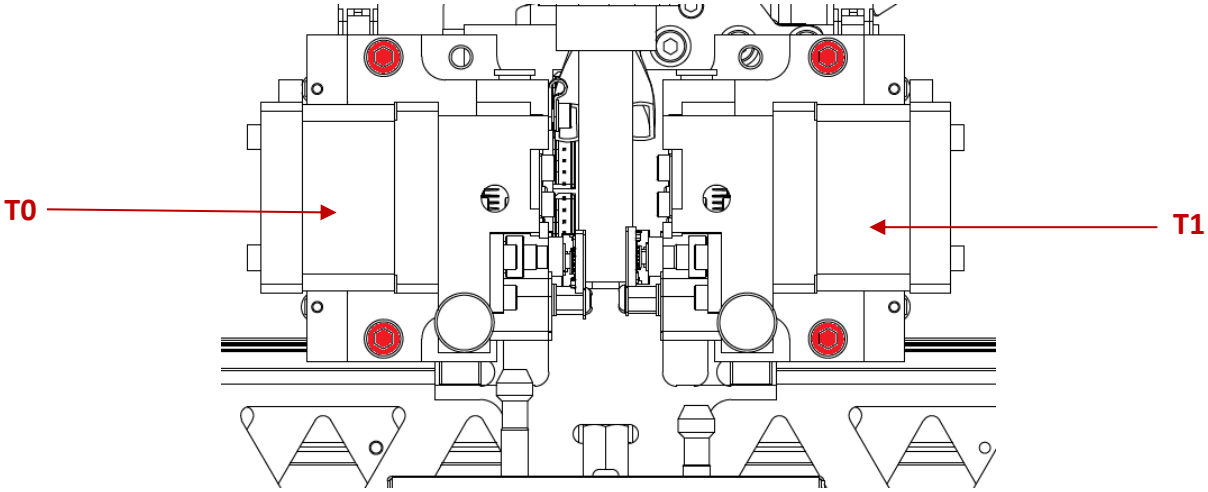


Fig. 86 Removing extruders

13. Clean the extruder from residual material with compressed air. Compressed air should be dry to prevent corrosion of extruder elements. Direct compressed air mainly to the places indicated in Fig. 87. When cleaning, be careful not to damage the D-sub socket and the encoder board. After cleaning, check that the encoder plug on the extruder is not loosened and is firmly connected.

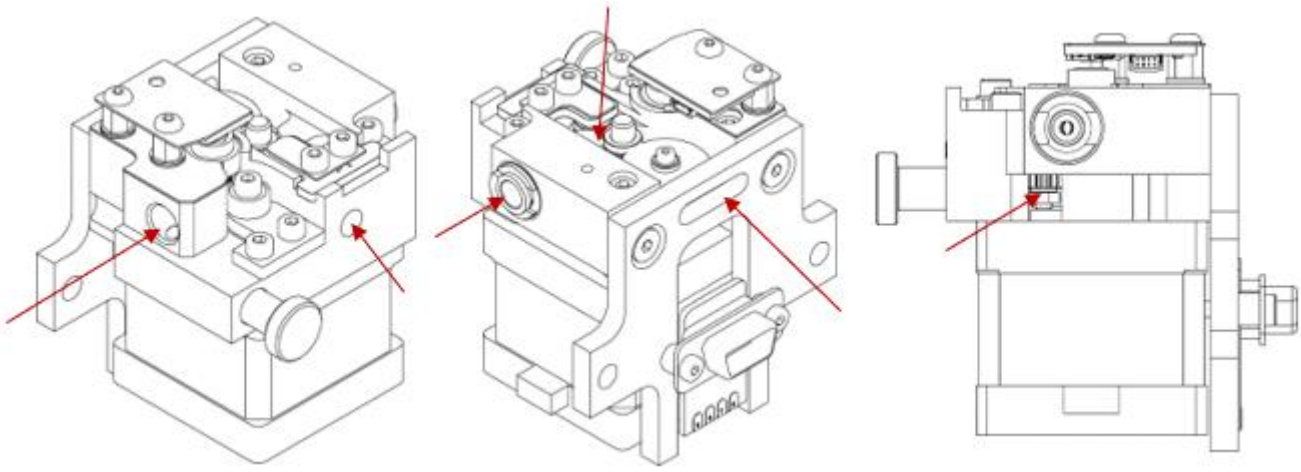


Fig. 87 Places where the extruder should be cleaned with compressed air

14. Install the T1 extruder in the printer by inserting the plug into the D-sub socket (Fig. 88, yellow).

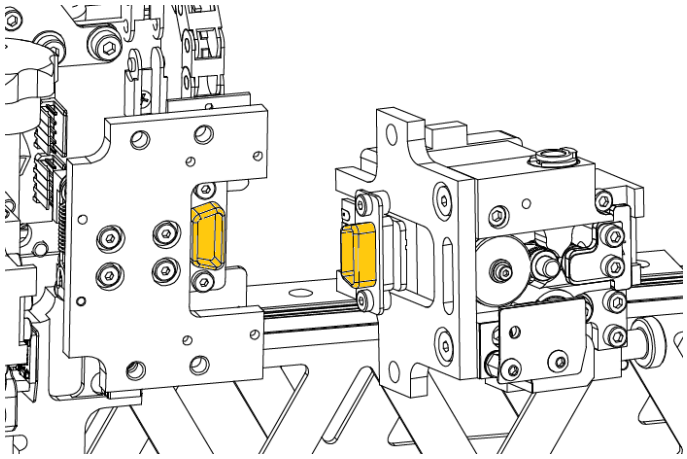


Fig. 88 Installing the extruder

15. Tighten the previously unscrewed two T1 extruder fixing screws securing the extruder to the extruder seat, located above and under the extruder (Fig. 86).
16. Install the T0 extruder in the printer by inserting the plug into the D-sub socket.
17. Unscrew two extruder fixing screws securing the T0 extruder to the extruder seat, located above and under the extruder (Fig. 86).
18. Slide the T0 material feeding system back into the connector opening until resistance is felt – about 2 cm (Fig. 83, step 4, yellow), and then, slide the C-shaped lock in (Fig. 83, step 5, green).
19. Press and hold the T0 extruder locking mechanism (Fig. 85, blue), then lower and release the T0 extruder (Fig. 85, grey). Check that the extruder is locked on the hotend sleeve by pushing lightly it upwards. When the extruder is locked properly, it will stay in the lower position (Fig. 84). Repeat the procedure for the T1 extruder.
20. Close the top printer cover.
21. Open the front printer door.
22. Turn on the device according to the procedure described in section V, subsection 2.2.
23. After you complete cleaning, load materials according to the procedure described in section V, subsection 3.1.

3.3. Calibrate the offset between hotends in the printing module on the Z axis

The procedure for calibrating the offset between the printing module hotends in the Z axis is described in section VI, subsection 1.1.

3.5. Calibrate the offset between the printing module hotends on the X, Y axes

The procedure for calibrating the offset between the printing module hotends on the X, Y axes is described in section VI, subsection 1.2.

4. TWICE MONTHLY OR EVERY 1,000 HOURS OF PRINTER OPERATION

4.1. Replace the hotend tip and cover

If the print time after which you need to replace the hotend tip is reached or you notice signs of tip wear, please contact 3DGence Technical Support to purchase new tips, covers and locking pins. You can find all contact methods in section IX of this manual.

How to replace the hotend tip:

1. Turn on the printer according to the procedure described in section V, subsection 2.2.
2. Make sure that the printing module to replace the print tips in is correctly installed in the printer. If not, install the module in accordance with the procedure described in section VI, subsection 4.1.
3. Make sure that the materials are unloaded from the printing module. If not, unload them in accordance with the procedure described in section VI, subsection 3.1.
4. Move the heatbed to the maintenance position by selecting: *settings* → *printer controls* → *manual controls* → *maintenance position.*
5. Turn off the heating of the working chamber and the heatbed by selecting: settings → *printer controls* → set temperature. Wait to allow to cool down completely to ambient temperature.
6. Set the hotend to replace the tip into the active position by selecting: settings → *printer controls* → manual controls → *active tool.* When replacing the tip in the model hotend (T0), select “model”. When replacing the tip in the support hotend (T1), select “support”.
7. Heat the hotend to replace the tip into the maximum temperature by selecting: *settings* → *printer controls* → *set temperature.*
8. When the hotend has heated, open the front door of the printer by pressing the button on the display.
9. Wear protective gloves.
10. Remove the metal cotter pin securing the hotend tip cover with tweezers or combination pliers (Fig. 89).

Fig. 89 Removing the cotter pin

11. Remove the cover from the hotend tip by prising it with a flat tool such as a tweezers tip (Fig. 90).

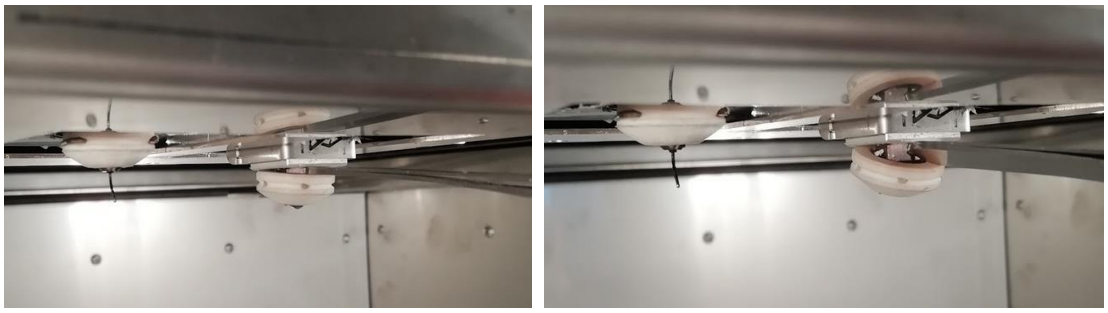


Fig. 90 Removing the cover

12. Unscrew the hotend tip with the spanner provided with the printing module (Fig. 91).

Fig. 91 Unscrewing the hotend tip

13. Gently remove the hotend tip from the hotend with pliers (Fig. 92). Take care not to break the tube in the hotend and that the hotend tip does not fall on the heatbed.

Fig. 92 Removing the hotend tip

14. Prepare a new hotend tip and insert it evenly into the hotend with pliers. Tighten the hotend tip with a flat wrench hand tight.
15. Wait a few minutes until the hotend tip reaches the temperature of the hotend.
16. Tighten the hotend tip with a flat wrench.
17. Place the new cover in the cover installation tool provided with the unit by pressing it down.
18. Replace the cover fixed in the tool onto the hotend tip (Fig. 93).

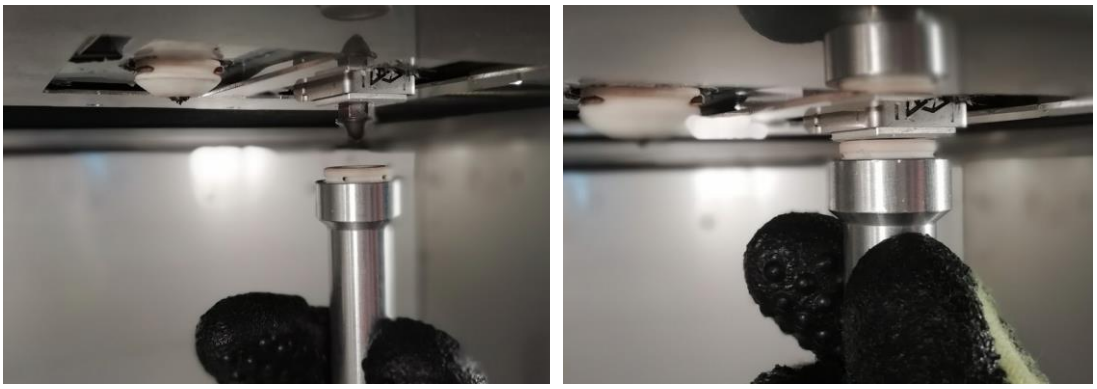


Fig. 93 Installing the cover

19. Use tweezers or pliers to insert the metal cotter pin. The cover must be positioned so that the pin is inserted into the holes in the cover and into the wrench hole (Fig. 94).

Fig. 94 Installing the metal cotter pin

20. Turn on the heating of the hotends by selecting: ⚙ *settings* → *printer controls* → *manual controls* → *set temperature.*
21. Open the front printer door.

4.2. Clean the fans in the printing module

1. Remove the printing module from the printer according to the procedure described in section V, subsection 4.2.
2. Visually check if the fans in the printing module are not dirty.
3. If dirty, remove them gently with tweezers.
4. Install the printing module in the printer according to the procedure described in section V, subsection 4.1.

5. QUARTERLY OR EVERY 1,500 HOURS OF PRINTER OPERATION

5.1. Lubricating the Y axis

1. Before you start to lubricate, please make sure you have the following items:
   - grease gun with rubber hose (fig. 95),
   - SKF Bearing Grease LGEP 2 or other grease of similar characteristics (fig. 96),
   - 4-jaw grease gun tip M10 x 1.0 (fig. 97).

Fig. 95 Grease gun with rubber hose

Fig. 96 SKF Bearing Grease LGEP 2

Fig. 97 4-jaw M10 x 1.0 lubricator tip

2. Turn off the printer using the power button, then the main switch. If possible, disconnect the device from the power source.

3. Remove the right upper cover by unscrewing the 11 fixing screws marked in Fig. 98. Depending of version of printer red or blue circles.

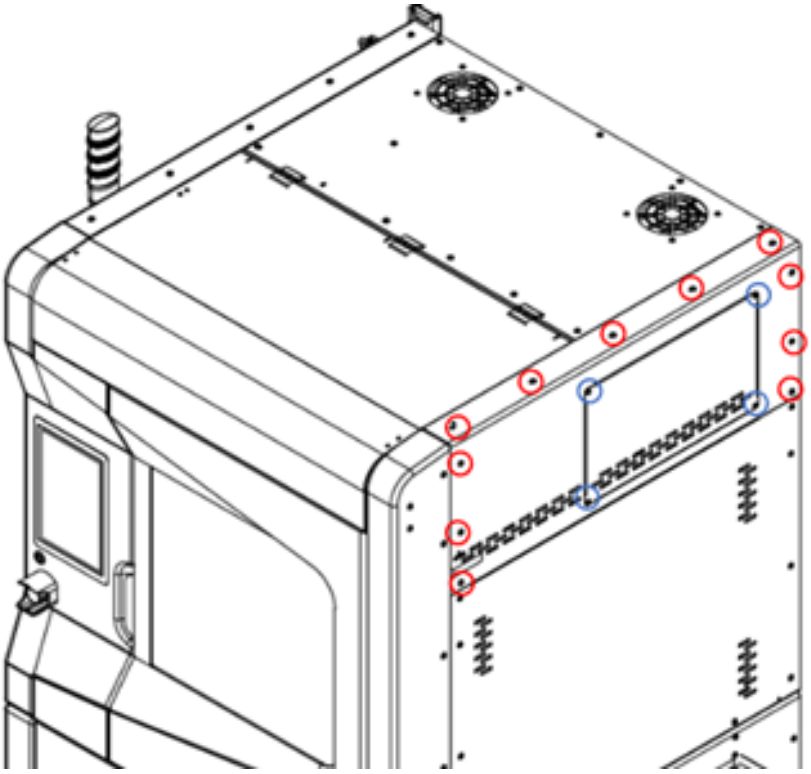


Fig. 98 Top right cover of the printer

4. Fill the grease gun with the appropriate grease according to the manufacturer's instructions.

5. Manually move the X-axis gate to the position allowing access to the grease nipples from both sides by grasping the aluminium tongue or the motor.

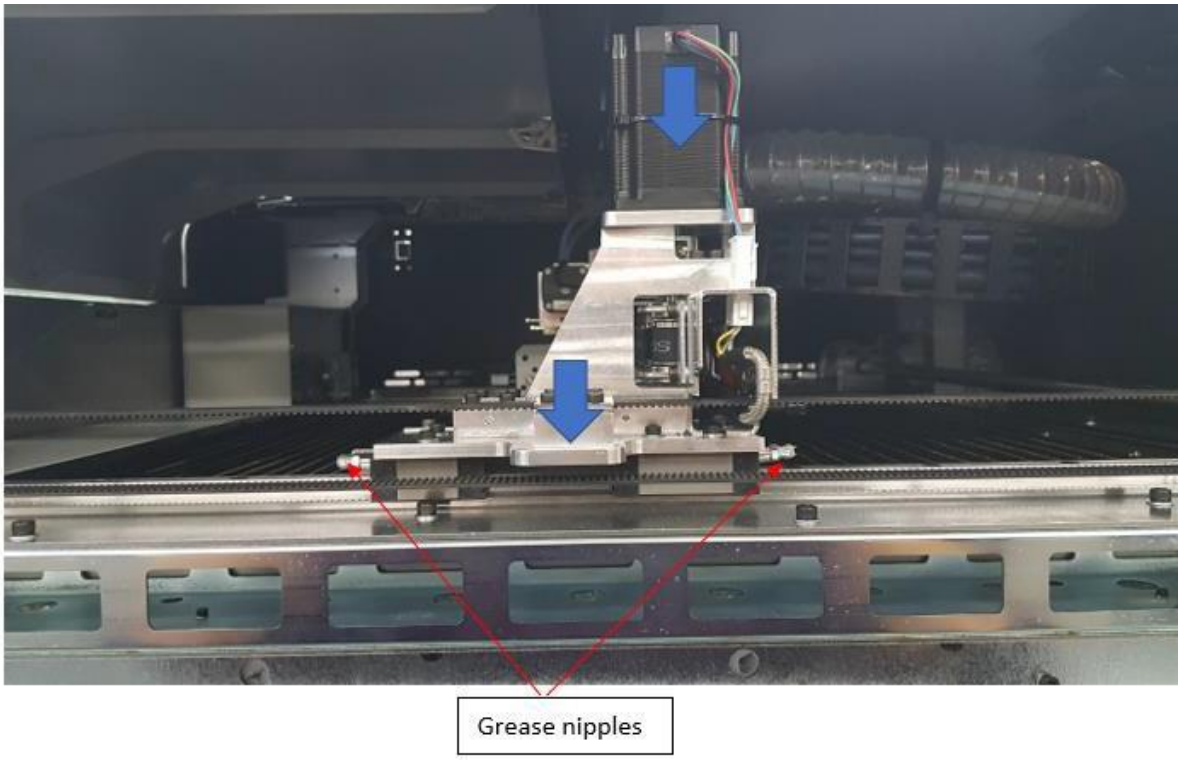


Fig. 99 Location of grease nipples on the right side of the printer

6. Press down on the grease gun tip lever (Fig. 100), then put the tip on the grease nipple and release the lever until the tip gripsthe nipple. To release the tip press the lever again and pull the tip off the grease nipple.

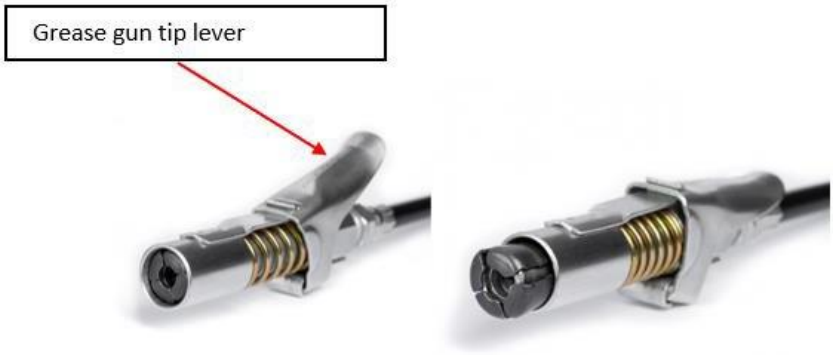


Fig. 100 Lubricator tip lever

7. Press a small amount of grease into the grease nipple on the left and then the right side as in Fig. 101 and Fig. 102.

8. Push grease out by smoothly pressing the grease gun lever once.

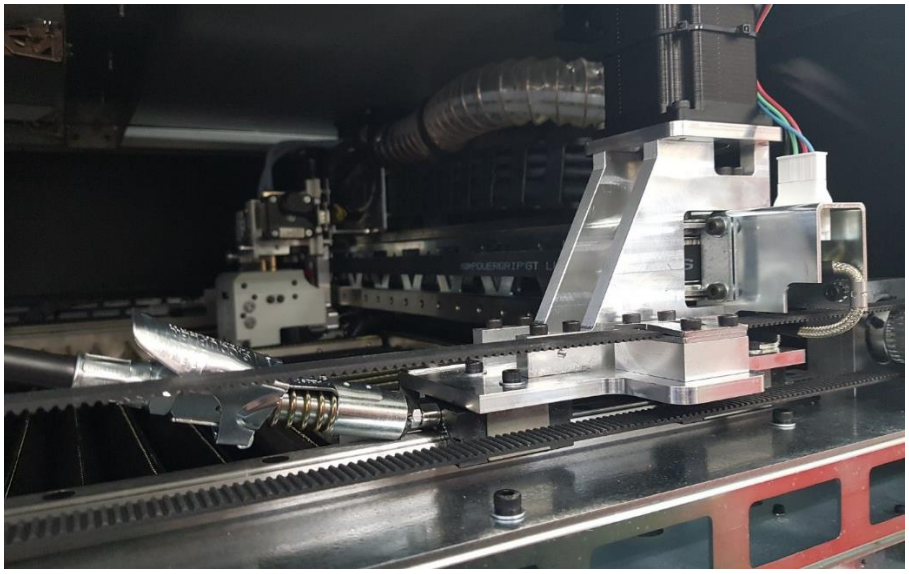


Fig. 101 Lubricate the grease nipples on the right side of the printer

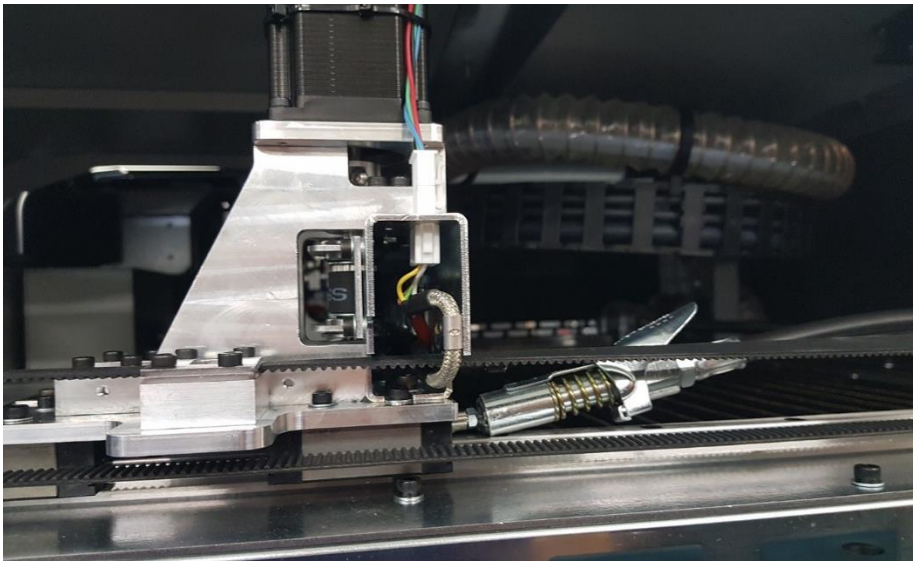


Fig. 102 Lubricate the grease nipples on the right side of the printer

9. Wipe up excess grease with a clean cloth or paper towel.

10. Replace the upper right cover of the printer by tightening the 11 screws.

11. If the printer does not have a stack light, go to step 13.

If it does have a stack light, disconnect it by following these steps:

- turn on the printer using the power button,

- open the front door of the printer using the door button in the printer menu,

- open the top cover of the printer and then turn off the printer using the power button in the printer menu,

disconnect the plug of the stack light (Fig. 103). After you open the top cover, the plug for the stack light can be found at the top left of the front of the printer.

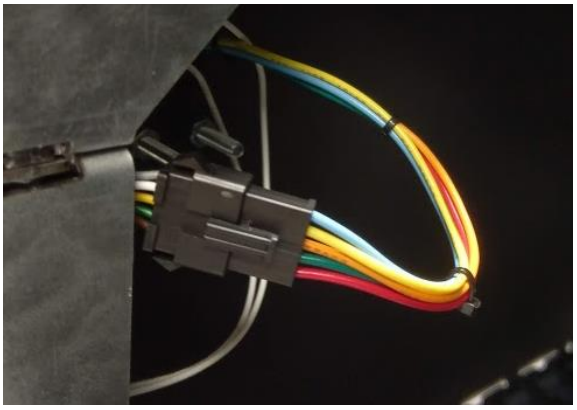


Fig. 103 Stack light plug

12. Remove the left top cover from the left side of the printer by unscrewing the 11 fixing screws. . Depending of version of printer red or blue circles.

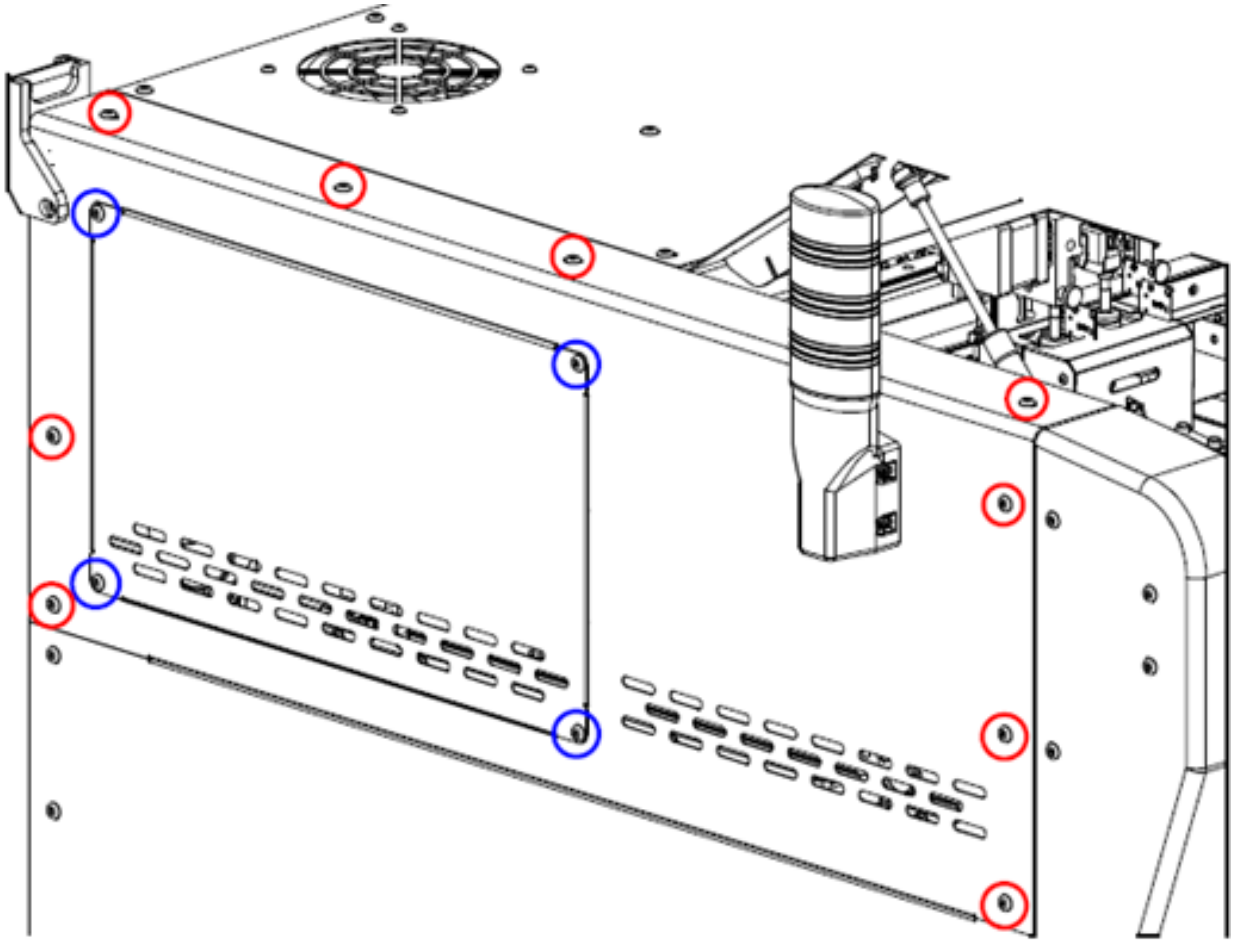


Fig. 104 Top left cover of the printer

13. Locate the grease nipples as shown in Fig. 105.

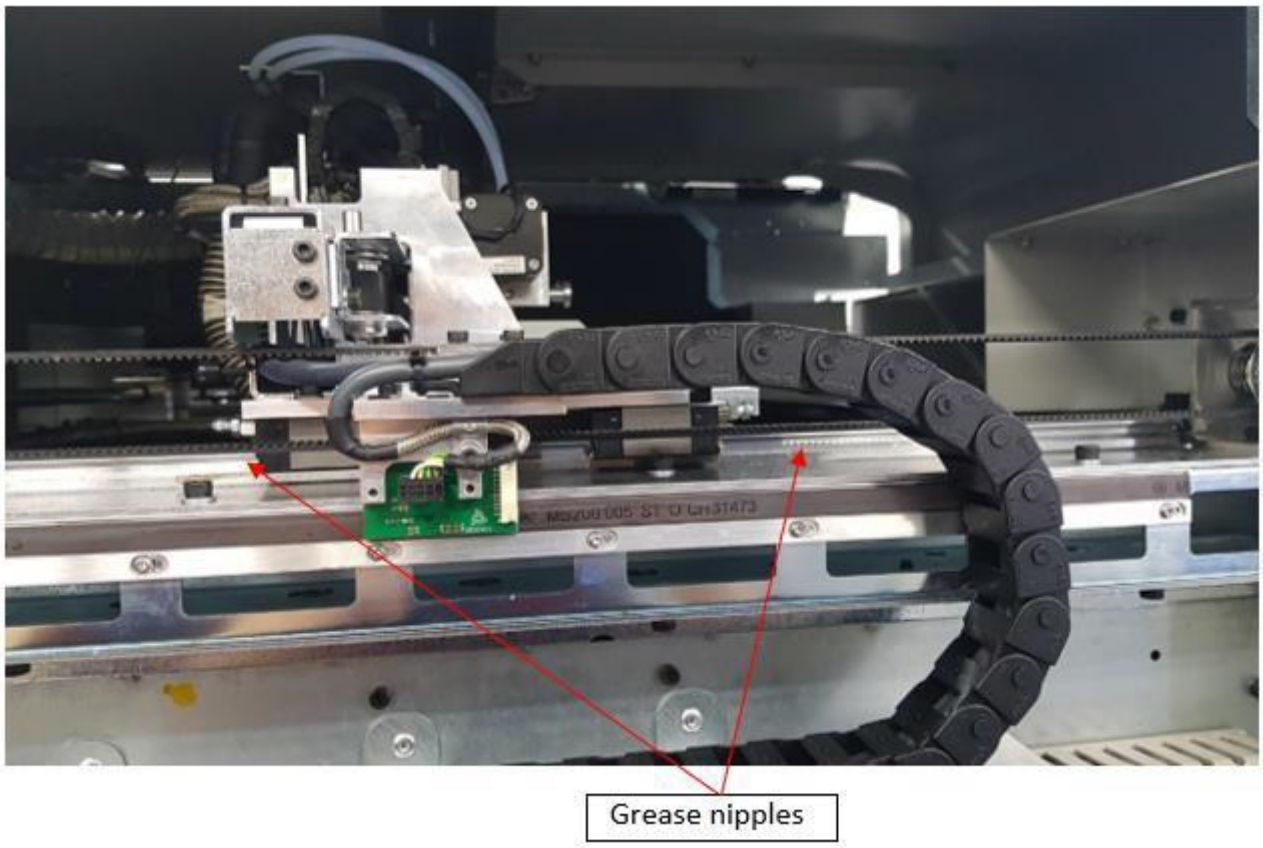


Fig. 105 Location of grease nipples on the left side of the printer

14. Press a small amount of grease into the grease nipple on the left and then the right side as in Fig. 106 and Fig. 107.
15. Push grease out by smoothly pressing the grease gun lever once.
16. Wipe up excess grease with a clean cloth or paper towel.

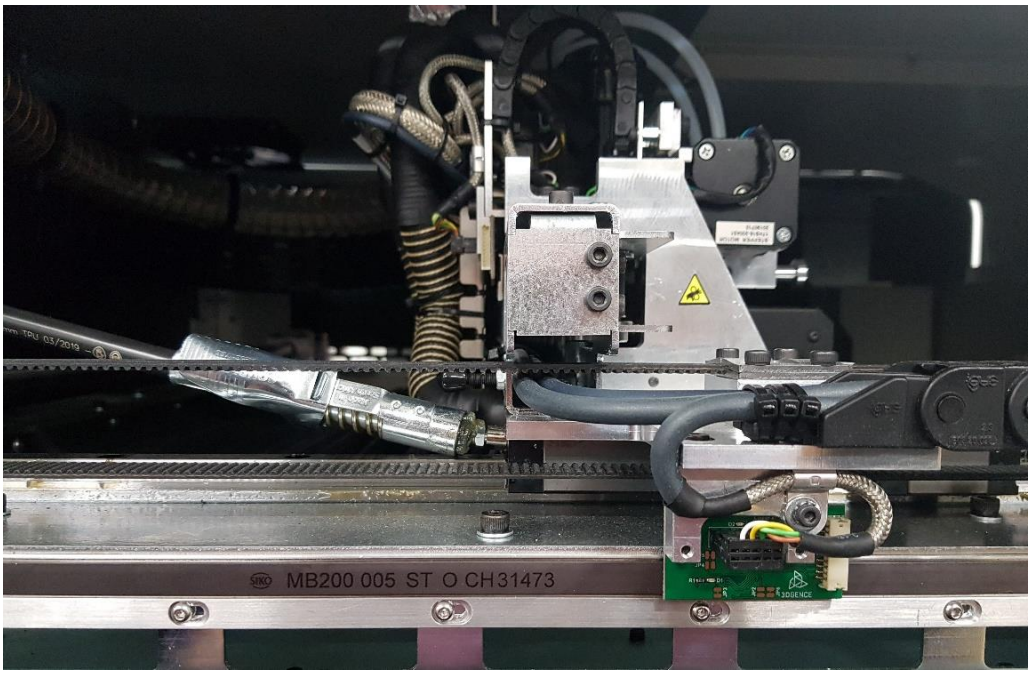


Fig. 106 Lubricate the grease nipples on *the left side of the printer*

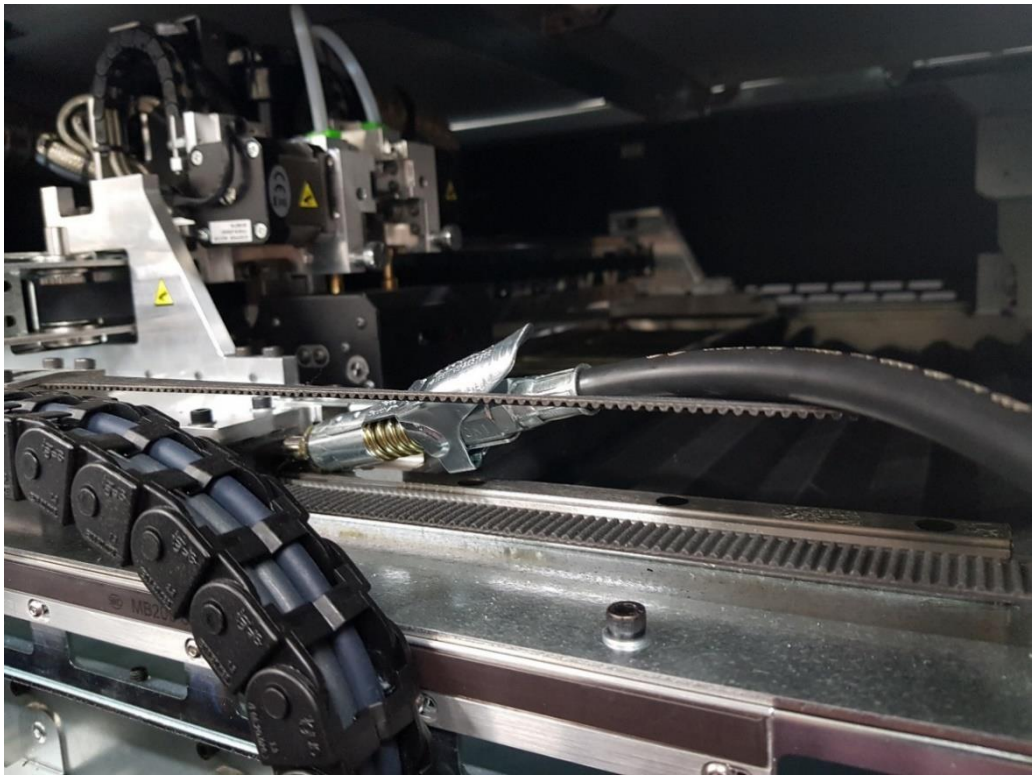


Fig. 107 Lubricate the grease nipples on *the left side of the printer*

17. Reassemble the stack light as described in step 12.
18. Replace the left top cover by tightening the 11 screws.
19. Close the top cover and close the printer's front door.
20. Start the printer.

5.2 Clean the extruder gear rack and lubricate the extruder needle bearing

1. Turn the printer on according to the procedure described in Chapter V, Section 2. 1.
2. If materials are loaded in the printer, unload them according to the procedure described in Chapter V, Section 3. 2.
3. Set the table in a position to perform the procedure: settings → printer controls → manual controls → maintenance position.
4. Set the T1 extruder to the active position using the following options: settings → printer controls → manual controls →active tool → support.
5. Wear protective gloves.
6. Open the work chamber door using the button located on the main screen in the lower right corner.
7. Open the top cover of the printer, allowing free access to the extruders.
8. Switch off the device according to the procedure described in chapter V, point 2. 2.
9. Remove the C-shaped locking pin (fig. 83, green, step 1) from the connector.
10. Press the coupling locking mechanism (fig. 83, red, step 2) and at the same time remove the feed system from the coupling by pulling it upwards (fig. 83, yellow, step 3). Similarly, remove the material feed system from the second extruder.
11. Unlock the extruder T0 and the extruder T1 (fig. 84, grey color) from the head sleeve (fig. 84, 85, orange color) by pressing the locking mechanism of the extruder T0 (fig. 84, blue color) and pulling the extruder up. The unlocked extruder will be moved to a higher position (fig. 85, grey).

12. Clean the extruder of residual material with compressed air. The compressed air should be dried to prevent corrosion of extruder components. Direct the compressed air primarily at the locations marked in Figure 87. When cleaning, be careful not to damage the D-sub socket and the encoder board. After cleaning, check that the encoder plug located on the extruder has not come loose and is properly plugged in.

13. After cleaning the extruder with compressed air, lubricate the extruder gear. For lubrication, you should get lithium-molybdenum grease, e. g. Valvoline Multipurpose Moly 2 or another grease with similar characteristics (fig. 95), and a toothpick. Apply a small amount of lithium molybdenum grease equivalent by volume to the head of the pin on a toothpick and spread it over the gearwheel, applying it through the hole marked in the diagram (Figure 108).

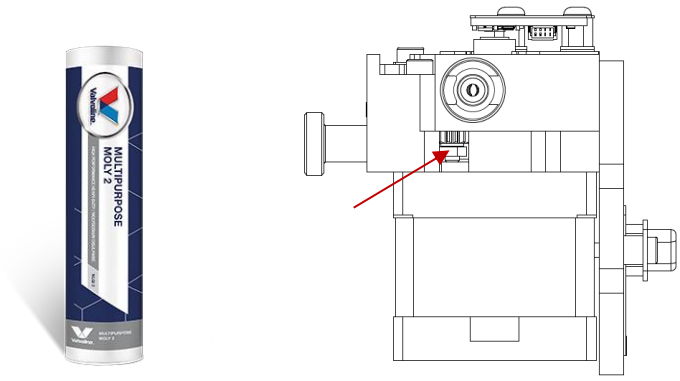


Fig. 108 Lithium molybdenum grease and where to apply it

14. After completing the above steps, reinstall extruders T0 and T1 to the printer.

5.3. Check the condition of the hotend cleaning unit

Quarterly or after exceeding 1,500 hours of printer operation, it is necessary to visually check the condition of the slats and brushes of the cleaning station, which are located on the left wall of the working chamber (Fig. 19).

If the slats or brushes of the cleaning station are damaged / worn out, contact the technical support to purchase a new hotend cleaning unit for T0 or T1 hotends.

The procedure for replacing the hotend cleaning unit is described in subsection 7.1 of this section.

5.4. Calibrate the heatbed

The heatbed calibration procedure is described in section VI, subsection 2.

6. ONCE IN SIX MONTHS OR EVERY 3,000 HOURS OF PRINTER OPERATION

6.1. Lubricate the Z axis

1. Before you start to lubricate, please make sure you have the following items:
   - grease gun with rubber hose (fig. 95),
   - SKF Bearing Grease LGEP 2 or other grease of similar characteristics (fig. 96),
   - 4-jaw grease gun tip M10 x 1.0 (fig. 97).

2. Fill the grease gun with the appropriate grease according to the manufacturer's instructions.

3. Turn on the printer, lower the table all the way down using Settings -> Manual control -> Maintenance position, wait untilthe Z axis column is set to the lower base position.

4. Turn off the printer using the power button, then the main switch. If possible, disconnect the device from the powersource.

5. Remove the lower left cover by unscrewing the 16 fixing screws (Fig. 109).

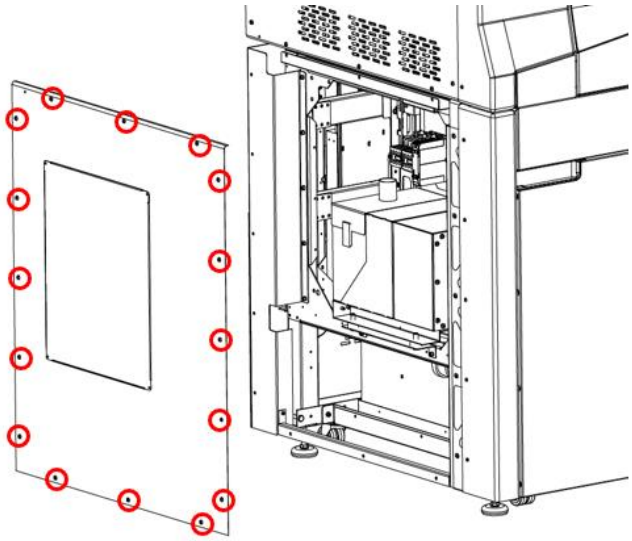


Fig. 109 Lower left cover of the printer

6. Locate the grease nipples as shown in Fig. 110
   - facing the front of the printer, the grease nipple in the lower left carriage of the linear guide,
   - facing the front of the printer, the grease nipple in the upper left carriage of the linear guide,
   The location of these grease nipples is shown in Fig. 110

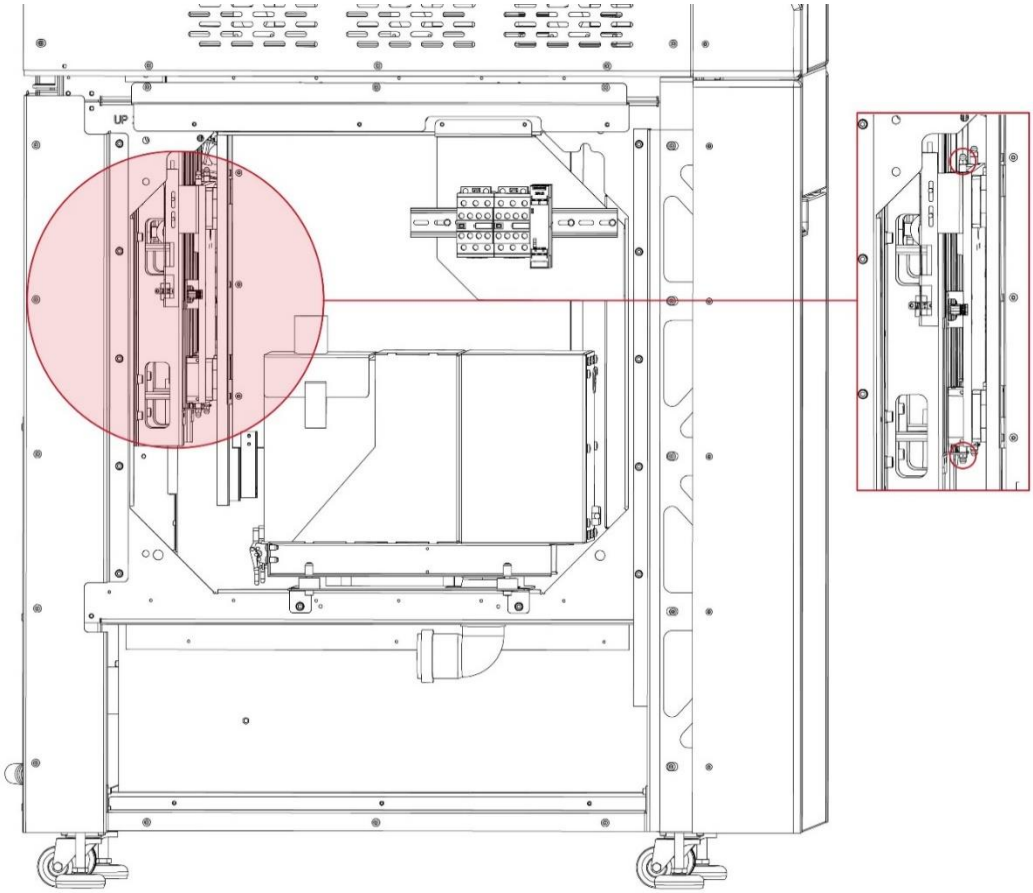


Fig. 110 Location of grease nipples - side view.

7. Press down on the grease gun tip lever (Fig. 100), then put the tip on the grease nipple and release the lever until the tip grips the nipple. To release the tip press the lever again and pull the tip off the grease nipple.
8. Press a small amount of grease into the grease nipples. Push grease in by smoothly pressing the grease gun lever once.
9. Wipe up excess grease with a clean cloth or paper towel.
10. Replace the upper right cover of the printer by tightening the 16 screws.
11. If the printer is equipped with an air preparation unit (APU), first disconnect the compressed air conduit and then unscrew the 2 screws to remove the APU with the mounting plate.
12. Remove the rear centre cover by unscrewing the 20 fixing screws (fig. 111). Disconnect the earth point plug that connects the cover to the printer housing.

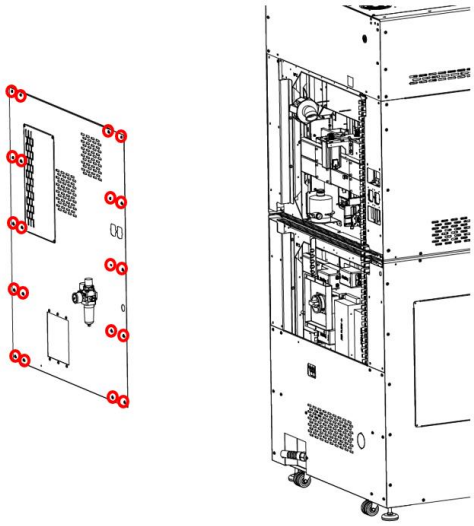


Fig. 111 Rear printer cover

13. Locate the upper right grease nipple (viewed from the front of the printer) as shown in Fig. 112

- facing the front of the printer, the grease nipple in the lower right carriage of the linear guide,
- facing the front of the printer, the grease nipple in the upper right carriage of the linear guide,

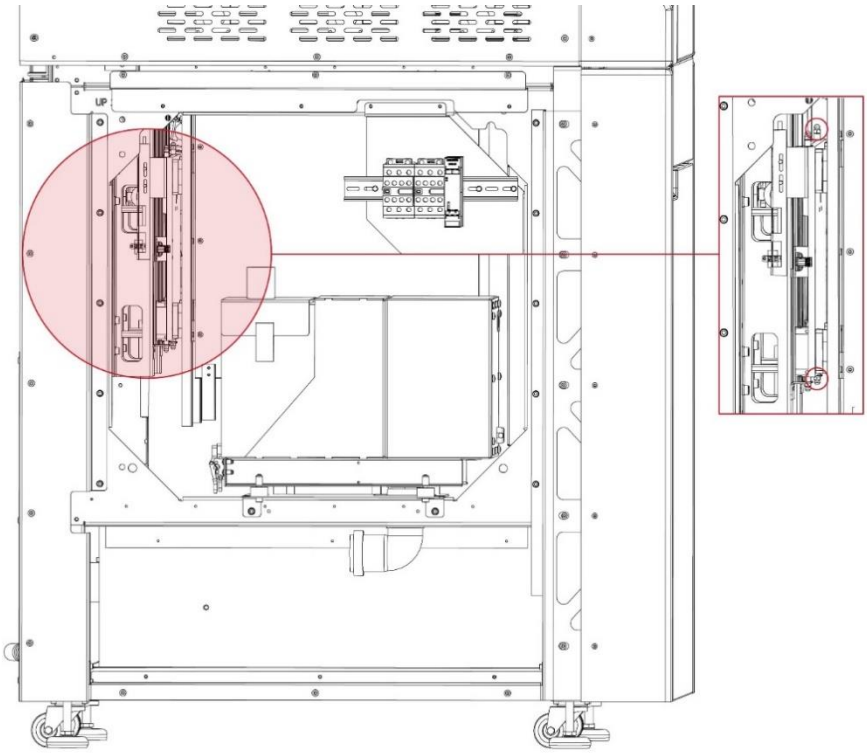


Fig. 112 Location of grease nipples - side view

14. Locate the upper right grease nipple (viewed from the front of the printer) as shown in Fig. 113. The location of this grease nipple is also marked in Fig. 113.

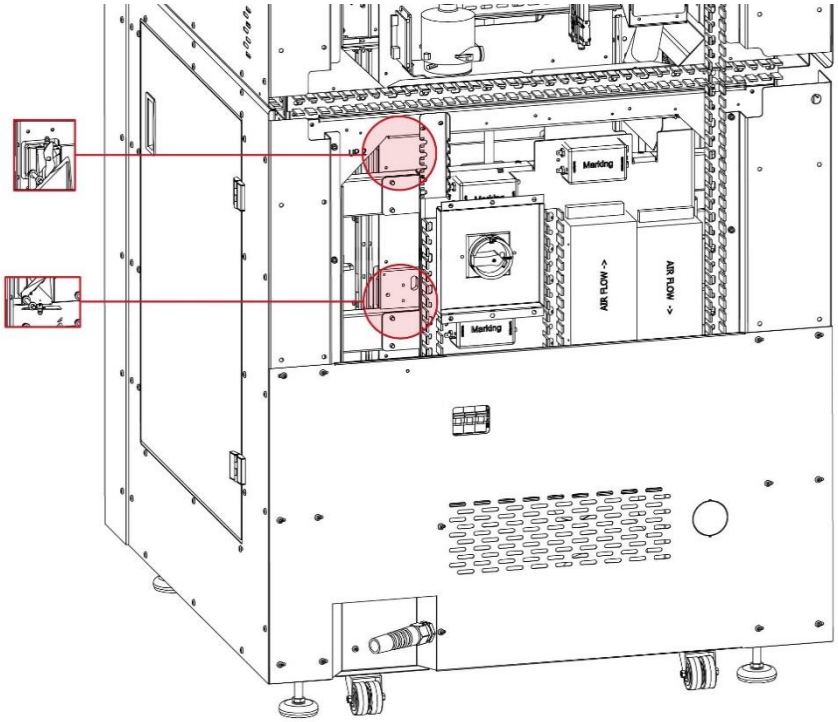


Fig. 113 Location of the grease nipple

15. Put the grease gun tip on the grease nipple according to the instruction in step 7. Press a small amount of grease into thegrease nipple. Push grease in by smoothly pressing the grease gun lever once.
16. Wipe up excess grease with a clean cloth or paper towel.
17. Replace the rear printer cover by tightening the 20 screws.
18. Connect the printer to a power source. Turn the main switch to the ON position, then turn on the printer using the power button. Observe the printer during the first printing job. If you notice any malfunction of the printer (e.g. noisy operation), please contact 3DGence technical support immediately.

6.2. Adjusting timing belts tension

Before adjusting the ribbed belt tension, make sure you have the following items available:

- hex key size 2.5,
- hex key size 3,
- hex key size 5,
- ring spanner size 13,
- meter for measuring belt tension using the oscillation frequency with a measuring range of 50-150 Hz,
- pliers/side cutters,
- fixing clips 3 x 100 mm.

Ribbed belt tensioning procedure

1. If the print module is not installed in the printer, install it according to the procedure described in Section V, point 4.1.
2. Switch on the printer in accordance with the procedure described in Section V, point 2.1.
3. Open the work chamber door.
4. Open the printer top cover.
5. Switch off the printer in accordance with the procedure described in Section V, point 2.2.
6. Wear protective gloves.
7. Remove the top right inspection opening cover.
8. Remove the top left inspection opening cover.
9. Adjusting X axis belt tension:

a) Move the X axis through the space under the top cover to the front of the printer by gripping the gate profile.

b) Move the module carriage to the position described in Fig. 114. Fig. 115 shows the module carriage surface to be used for positioning the carriage on the machine.

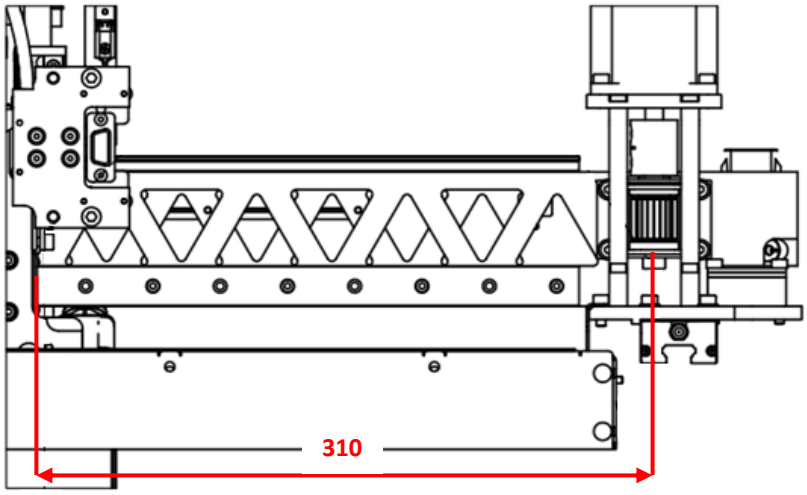


Fig. 114 Module carriage position ready for tensioning

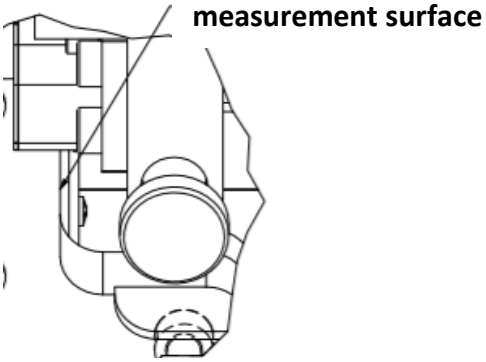


Fig. 115 Detail showing base surface for measuring position

c) Loosen the 4 screws securing the tensioner (Fig. 116, kolor czerwony).

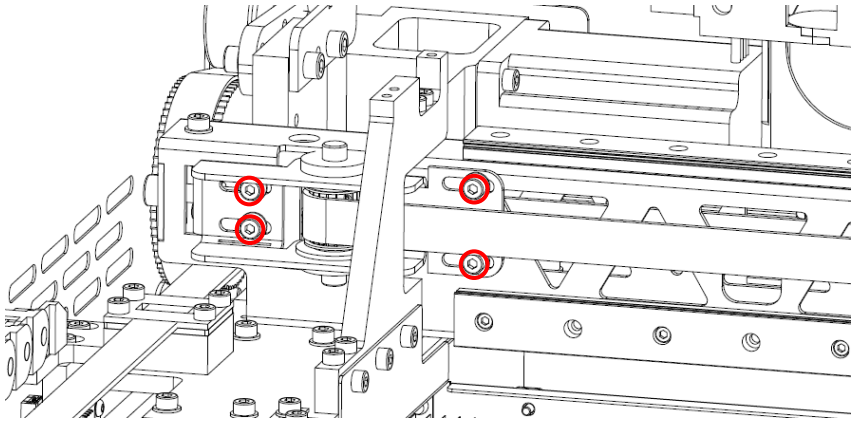


Fig. 116 Tensioner X securing screws

d) Move the X axis to the rear of the machine so that you can see the tensioning screw in the left inspection opening.

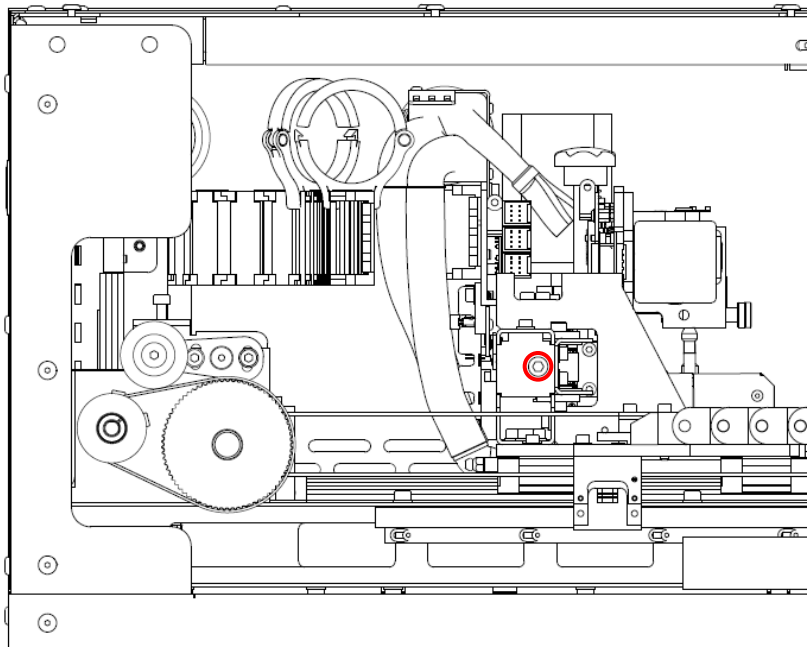


Fig. 117 Tensioner X adjustment screw

e) Adjust the belt tension by tightening (to increase belt tension) or loosening (to decrease belt tension) the tensioner adjusting screw (Fig. 117). Use a size 5 HEX screwdriver for the adjustment. The adjustment values are shown in Table 4. They vary depending on whether you adjust a new or used drive belt. Belt tension should be measured with a belt tension meter using the oscillation frequency. The measurement should be made in the middle of the belt section to the right of the module carriage in the position shown in Fig. 114.

Tab. 4 Belt adjustment values

New belt		**Old belt**	
Minimum	Maximum	Minimum	Maximum
92,6 Hz	97,1 Hz	77,5 Hz	82,8 Hz
138 N	152 N	97,0 N	110 N

f) When you have finished tensioning the belt, tighten the previously loosened screws securing the X tensioner (Fig. 116).

10. Adjusting the Y belts tension.

a) Move the X axis gate to the position shown in Fig. 118.

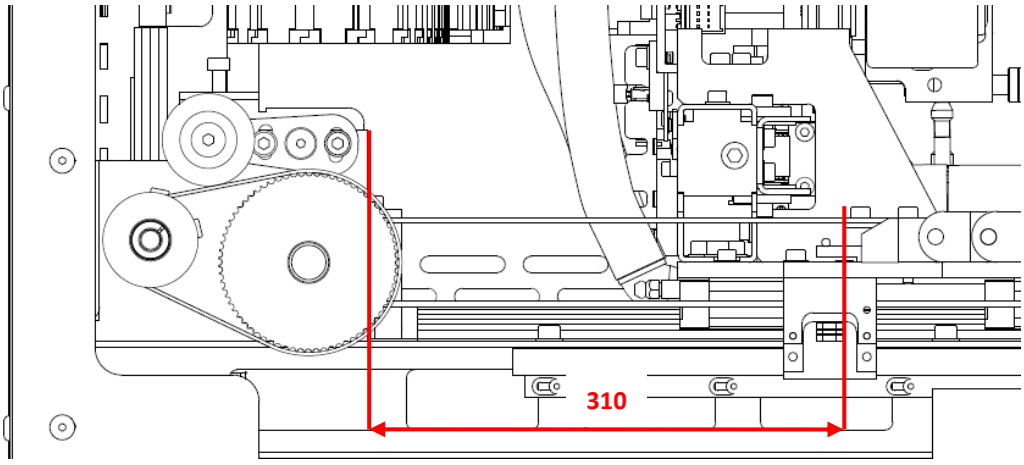


Fig. 118 Gate position for measuring belt tension

b) Before measuring, remove the 3 fixing clips at the wrapped end of both belts. The operation must be carried out carefully so as not to damage the belt.

c) Adjust the belt tension by tightening (to increase belt tension) or loosening (to decrease belt tension) the tensioner adjusting screw. The adjusting nuts are located just below the cover under the top cover as shown in Fig. 119 and 120. The adjustment values are shown in Table 5. They vary depending on whether you adjust a new or used drive belt. Belt tension should be measured with a belt tension meter using the oscillation frequency. The measurement should be made in the middle of the top belt visible in the inspection openings. The gate position during measurement must be set according to the guidelines in Fig. 118.

Note: please note that the belt tension between the left and right belts must not differ by more than 2 Hz.

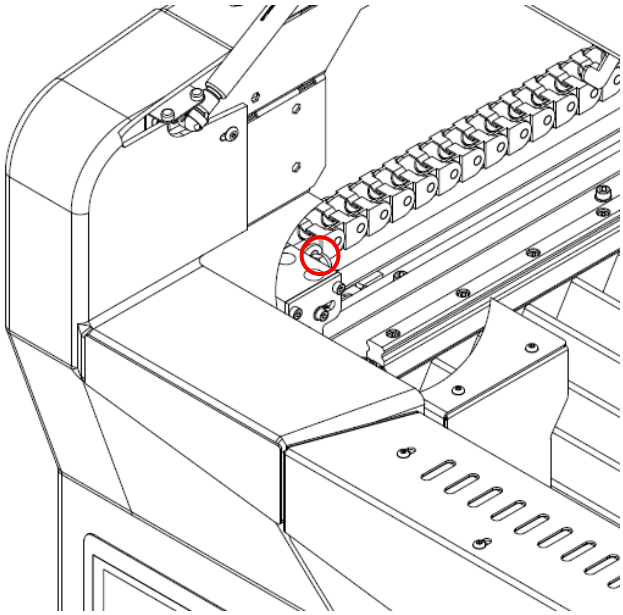


Fig. 119 Adjustment screw for the left Y-axis belt

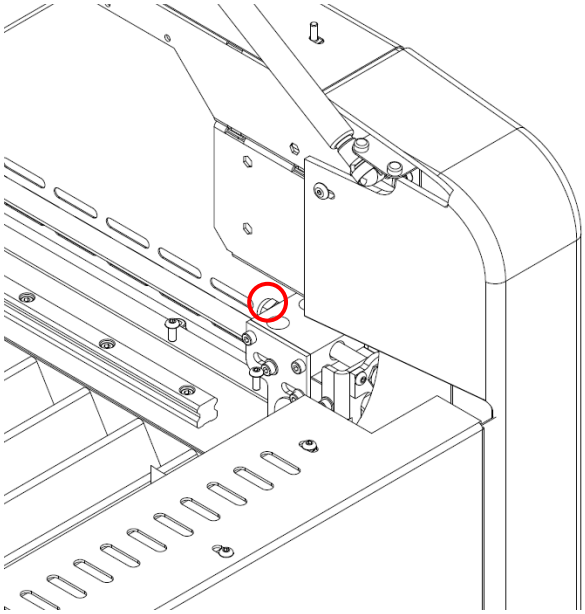


Fig. 120 Adjustment screw for the right Y-axis belt

Tab. 5 Belt adjustment values

New belt		Old belt	
Minimum	Maximum	Minimum	Maximum
80,9 Hz	84,8 Hz	67,7 Hz	72,3 Hz
105 N	116 N	73,9 N	84,5 N

11. In place of the removed fixing clips, tighten 3 pcs of 3 x 100 fixing clips, restoring the previous belt arrangement.
12. Screw back the previously unscrewed inspection opening covers.
1. Switch on the printer in accordance with the procedure described in Section V, point 2.1.
13. Start the procedure for calibrating the offset between the hotends in the Z axis. To carry out the measurement select:

   settings button → calibration → printing module calibration → run Z calibration.

6.3. Module cooling filter replacement

Procedure for replacing the module cooling filter:

1. Switch off the printer in accordance with the procedure described in Section V, point 2.2.
2. Disconnect the power supply with the main switch.
3. Disable the overcurrent protection.
4. Make sure you have good access to the back of the unit.
5. For model F421: Loosen the 4 screws securing the rear cover of the printer and put it aside (Fig. 121a).

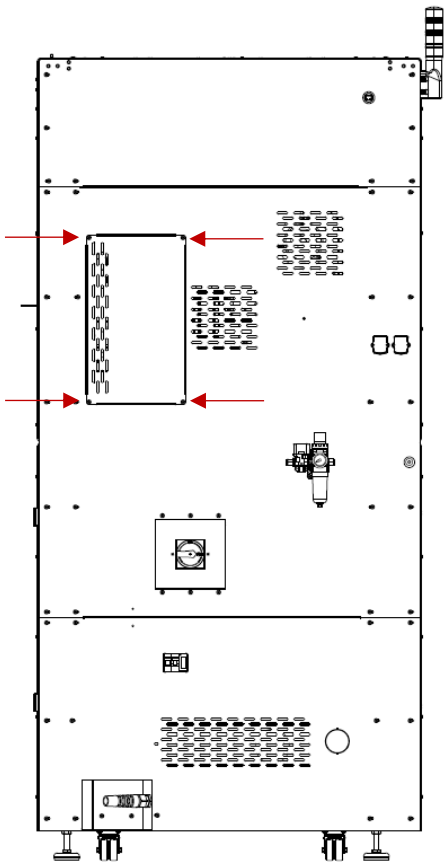


Fig. 121a Marking of the 4 screws of the rear inspection cover to be unscrewed

6. For model F420: Remove the rear center cover by unscrewing the 20 retaining screws (Fig. 121b). Disconnect the ground point plug connecting the cover to the printer housing.

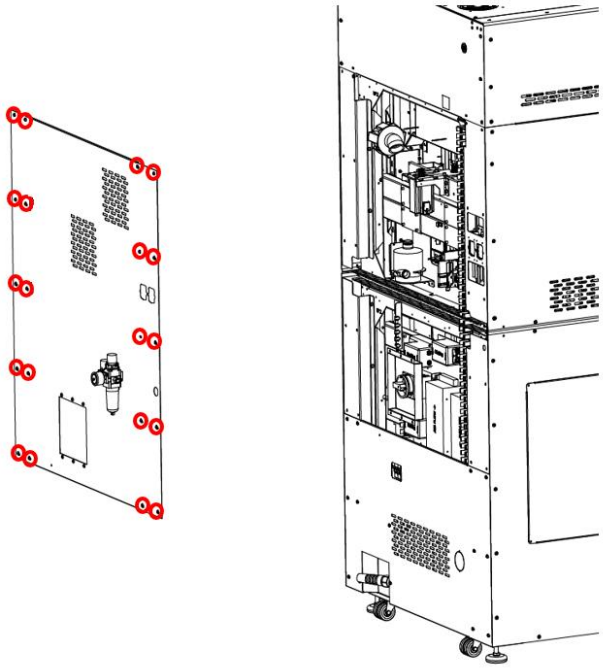


Fig. 121b Rear cover of the printer

7. Remove the unscrewed rear center cover or inspection cover and set it aside.
8. The module cooling filter is located at the top left underneath the unscrewed rear case.
9. Unscrew the metal bracket that fixes the supply hose and remove the filter hose (Fig. 122).

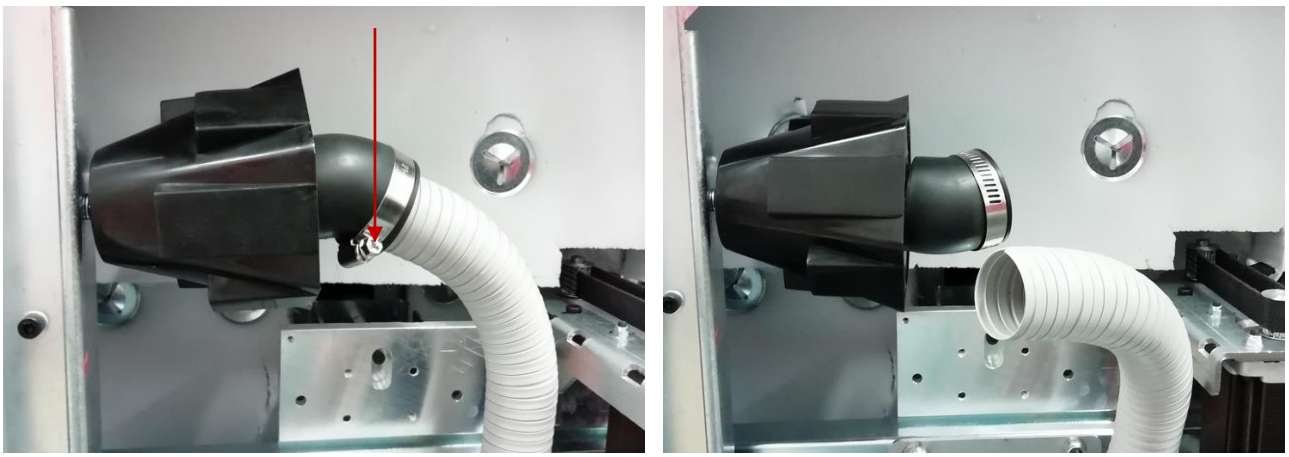


Fig. 122 Unscrewing the metal clamp fixing the supply hose

10. Unscrew the filter housing with the filter element clockwise (Fig. 123).

Fig. 123 Unscrewing and removing the filter element from the housing

11. Replace the removed filter with a new one.
12. Insert the supply line into the filter opening and tighten the metal clamp.
13. Replace the unscrewed rear center cover or inspection cover and tighten it with the 4 previously unscrewed screws.

6.4 Checking the curtains

Once every six months or after exceeding 3000 hours of printing, check the condition of the machine curtains. If the curtains are damaged or worn, please contact 3DGence Technical Support to buy new curtains and receive assistance. Contact methods are described in Section IX of this manual.

6.5 Print module service

Once every six months or after exceeding 3,000 hours of operation, it is recommended to carry out a service control of the printing module. After the counter reaches the required time to carry out servicing, the user will be informed about it on the printer display. Please contact technical support for assistance. Possible ways of contact are described in chapter IX of this manual.

6.6 Printer service

Once every six months or after exceeding 3,000 hours of operation, it is recommended to carry out a service control of the printer. After the counter reaches the required time to carry out servicing, the user will be informed about it on the printer display. Please contact technical support for assistance. Possible ways of contact are described in chapter IX of this manual.

16 WHEN REQUIRED

7.1 Replacing the hotend cleaning unit

Note: The printhead cleaning unit has sharp edges.

If the slats or brushes of the cleaning station are damaged / worn out, contact the Technical Support Department to purchase a new hotend cleaning unit for the T0 or T1 hotend.

Procedure for replacing the hotend cleaning unit:

The procedure is described for replacing the T0 hotend cleaning unit. The procedure for replacing the T1 hotend cleaning unit is similar to this procedure. The T1 hotend cleaning unit is located on the right side of the cleaning station.

1. Switch off the printer in accordance with the procedure described in Section V, point 2.2.
2. Wear protective gloves.

3. Loosen the two screws securing the T0 hotend cleaning unit on the left side of the cleaning station (Fig. 124). Put the loose screws aside.

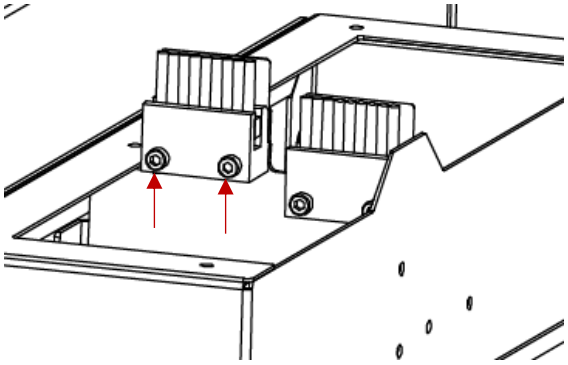


Fig. 124 Fastening screws of the T0 hotend cleaning unit

4. Remove the T0 hotend cleaning unit from the printer.
5. Install a new hotend cleaning unit in place of the dismantled T0 hotend cleaning unit. Screw it with two previouslyunscrewed screws.
6. Make sure that the cleaning station slats are well adjusted to the corresponding nozzles in the print module.

7.2 Replacing bulbs

The printer is fitted with two halogen filaments that illuminate the inside of the working chamber of the device. One of the bulbs is located in the upper left corner in front of the working chamber of the device - on the side of the drop container (Fig. 125). The other bulb is located in the upper right-hand corner in front of the working chamber (Fig. 126). Lack of lighting in the printer reduces the operator safety and makes it impossible to view the print in the 3DGence CLOUD system. The procedure for replacing the bulb on the right and left sides of the working chamber is the same. If a bulb is blown, follow the instructions below.

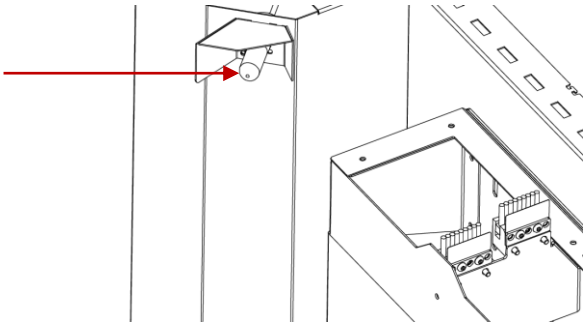


Fig. 125 The bulb located in the upper left corner in front of the device working chamber - on the side of the drop container

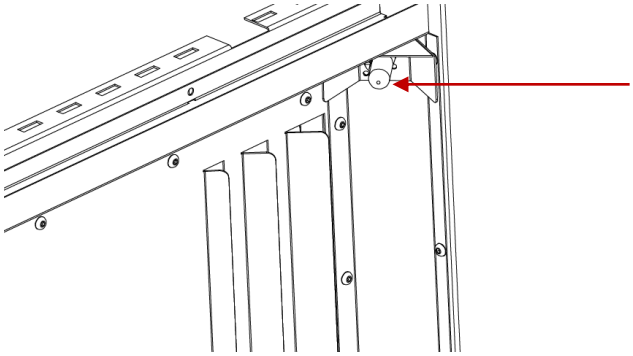


Fig. 126 The bulb located in the upper right-hand corner in front of the working chamber

Bulb replacement procedure:

1. Switch on the printer in accordance with the procedure described in Section V, point 2.2.
2. Set the heatbed to a position where you can conveniently change the light bulb using the options: *settings* → *manualcontrol* → *lower/rise heatbed.*
3. Switch off all printer heating elements using the option: *settings*→ *manual control* → *set temperature*. Allow to coolcompletely and reach the ambient temperature.
4. Open the work chamber door with the button on the main screen in the lower right-hand corner.
5. Switch off the printer in accordance with the procedure described in Section V, point 2.2.
6. Wear protective gloves.
7. Gently pull out the blown halogen filament from the holder in the printer.
8. Replace the removed halogen filament by inserting a new filament into the holder in the printer, making sure not to touch the glass bulb of the filament with your bare hands.

7.3 Removal of residual material from the feed system

The material remaining in the feed system can be removed manually. Two sections of the feed system can be distinguished inthe printer:

- downstream the MLS to the manifold,
- downstream the manifold to the extruder.

Downstream the MLS to the manifold

To remove the remaining material from the feed system between the MLS and the manifold, follow the instructions below.

The access opening of the material feed system on the left side is intended for model materials that are loaded into the material bays 1 and 2. The access opening of the material feed system on the right side is intended for support materials that are loaded into the material bays 3 and 4.

Procedure for removing residual material from the feed system for support material:

1. Switch on the printer in accordance with the procedure described in Section V, point 2.1.
2. Unload the materials from the print module in accordance with the procedure described in Section V, point 3.2.
3. Switch off the printer in accordance with the procedure described in Section V, point 2.2.
4. Unscrew the two screws fixing the glass pane of the access opening on the right-hand side (Fig. 127).

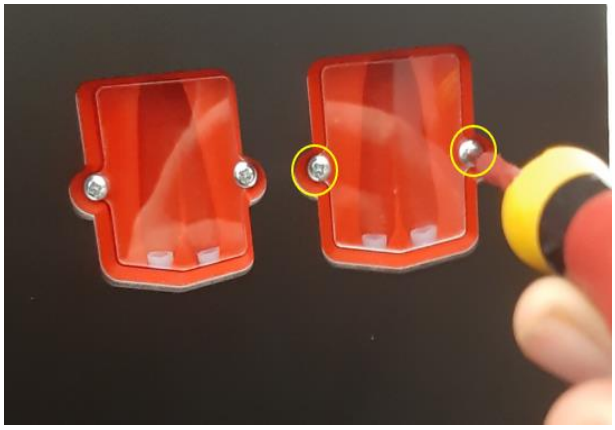


Fig. 127 Unscrewing the fixing screws of the glass pane of the access opening

5. Prepare about 150 cm of material (e.g. ABS). Straighten the tip of material and insert it into the outlet opening of the filament feed mechanism number 3 (support material bay 3).
6. Push the material through the entire length of the feed system at the MLS - manifold section. This way, the material thatremained in the feed system will be removed.

7. Pull the material out of the feed system.
8. Insert the pulled material it into the inlet opening of the filament feed mechanism number 4 (support material bay 4).
9. Push the material through the entire length of the feed system at the MLS - manifold section. This way, the material thatremained in the feed system will be removed.
10. Pull the material out of the feed system.
11. Screw the glass pane of the access opening with two screws.

The procedure for removing residual material from the feed system for model material is similar. In this case, unscrew the glass pane of the access opening located on the left-hand side.

Downstream the manifold to the extruder

To remove the remaining material from the feed system between the manifold and the extruder, follow the instructions below.

The access opening of the material feed system on the left side is intended for model materials that are loaded into the material bays 1 and 2. The access opening of the material feed system on the right side is intended for support materials that are loaded into the material bays 3 and 4.

Procedure for removing residual material from the feed system for support material:

1. Switch on the printer in accordance with the procedure described in Section V, point 2.1.
2. Unload the materials from the print module in accordance with the procedure described in Section V, point 3.2.
3. Open the work chamber door with the button on the main screen in the lower right-hand corner.
4. Open the top cover of the printer to allow free access to the extruders.
5. Switch off the printer in accordance with the procedure described in Section V, point 2.2.
6. Wear protective gloves.
7. Remove the C-shaped lock from the connector. in extruder T1.
8. Press the connector lock and at the same time remove the material feed system from the connectorby pulling it upwards in the T1 extruder.
9. Unscrew the two screws fixing the glass pane of the access opening on the right-hand side (Fig. 127).
10. Prepare about 200 cm of material (e.g. ABS). Straighten the end of material and slide it into one feed system from the manifold.
11. Push the material through the entire length of the feed system at the manifold - extruder section. This way, the materialthat remained in the feed system will be removed.
12. Pull the material out of the feed system.
13. Slide the extracted material into the other feed system from the manifold side.
14. Push the material through the entire length of the feed system at the manifold - extruder section. This way, the materialthat remained in the feed system will be removed.
15. Pull the material out of the feed system.
16. In the T1 extruder, insert the material feed system back into the connector hole until it stops - about 2 cm and then insert the C-shaped lock.
17. In the T1 extruder press and hold the T0 extruder locking mechanism.

18. Close the top cover of the printer.

19. Open the front door of the printer.

20. Screw the glass pane of the access opening with two screws.

The procedure for removing residual material from the feed system for model materials is analogous. In this case, unscrew the inspection glass on the left side and remove the feed system from the extruder T0.

7.4 LAS 42 filter replacement (optional accessory)

Notice: The pre-filter can be replaced up to 2 times. Then the filter cassette must be replaced.

1. Turn off the printer using the power button, then the main switch. If possible, disconnect the device from the power source.
2. For INDUSTRY F421: Remove the revision on the left side of the printer by unscrewing the screws holding it in place (Fig. 128a)

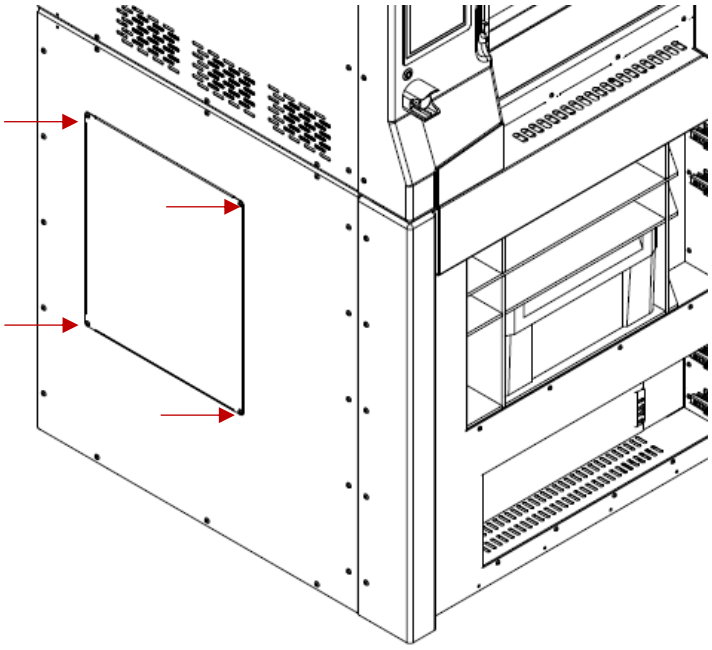


Fig. 128a Lower left printer cover (INDUSTRY F421)

3. For INDUSTRY F420: Remove the bottom cover on the left side of the printer by unscrewing the screws holding it in place (Figure 128b).

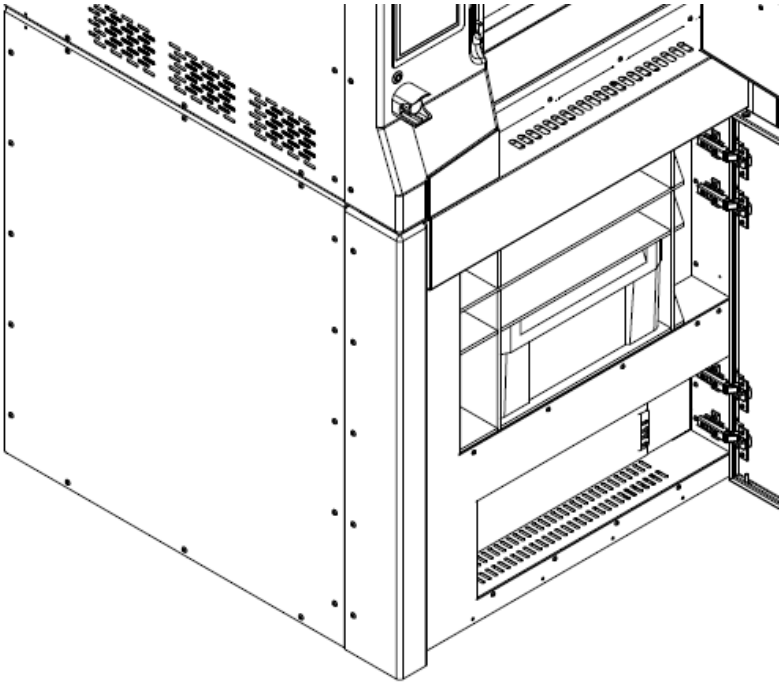


Fig. 128b Lower left printer cover (INDUSTRY F420)

4. Open the two clasps securing the top filter cover (Fig.129).

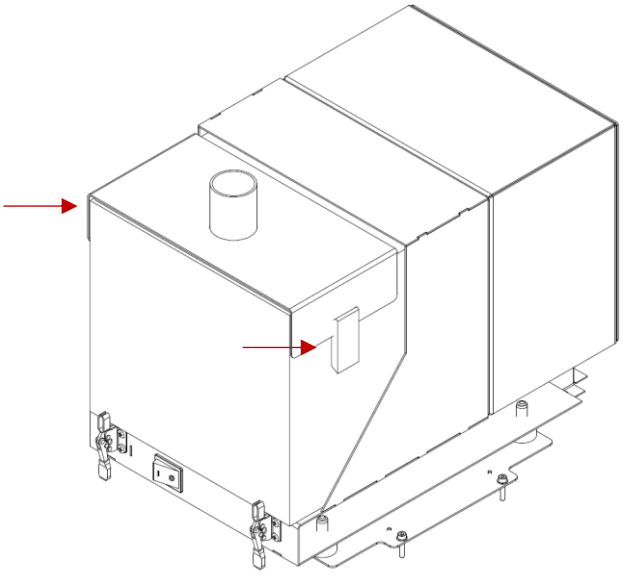


Fig. 129 Clasps securing the filter cover

5. Remove the top filter cover and put it aside (Fig. 130).

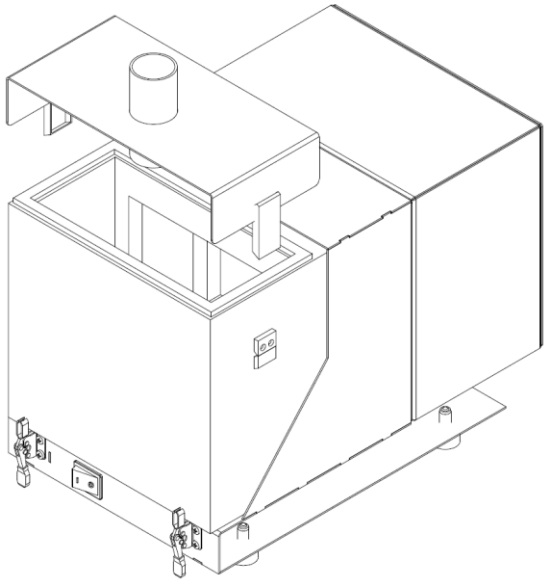


Fig. 130 Prefilter

6. To prevent dirt from escaping from the filter being replaced, peel off the white protective sticker on the new pre-filter and use it to cover the inlet of the replaced filter (Fig. 131).

Fig. 131 Protective sticker

7. Pull out the pre-filter and insert a new one in its place.
8. Replace the top cover and close the clasps securing the filter cover (Fig.130).
9. Replace the side cover by tightening the 16 fixing screws.
10. Connect the printer to a power source. Turn the main switch to the ON position, then turn on the printer using the powerbutton.
11. The old filter cassette should be disposed of in accordance with the applicable waste recycling regulations.

7.5 Filter cartridge replacement

Notice: If the pre-filter has been changed twice, the entire filter cassette must be replaced the next time.When you purchase a new filter cassette, it comes with a new pre-filter already fitted inside.

1. Turn off the printer using the power button, then the main switch. If possible, disconnect the device from the power source.
2. For INDUSTRY F421: Remove the bottom cover on the left side of the printer by unscrewing the screws holding it in place (Figure 128a).

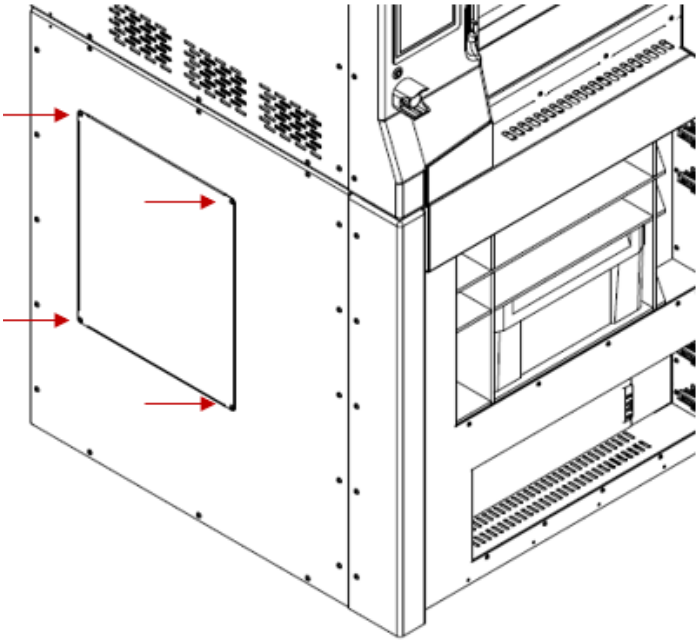


Fig. 128a Lower left printer cover (INDUSTRY F421)

3. For INDUSTRY F420: Remove the bottom cover on the left side of the printer by unscrewing the screws holding it in place (Figure 128b).

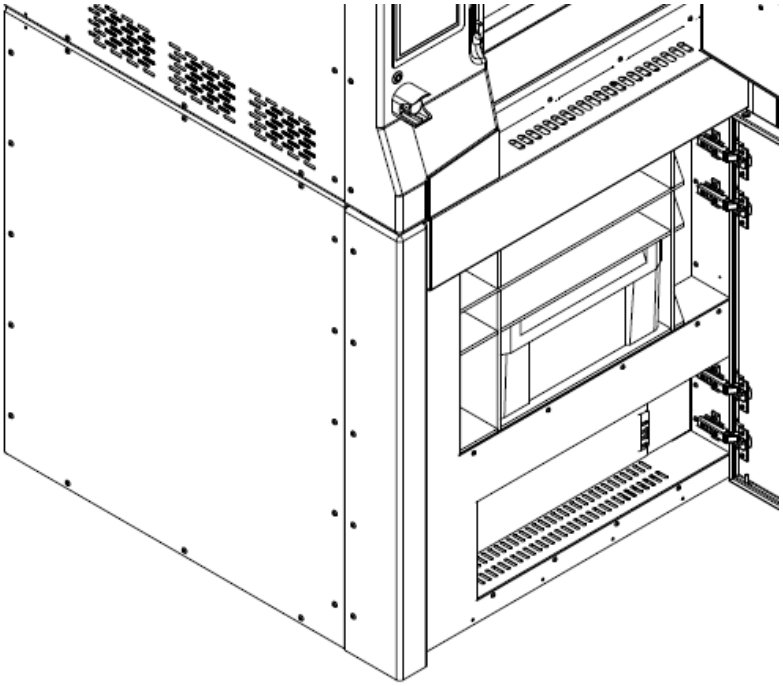


Fig. 128b Lower left printer cover (INDUSTRY F420)

4. Open the two clasps securing the top filter cover (Fig. 133).

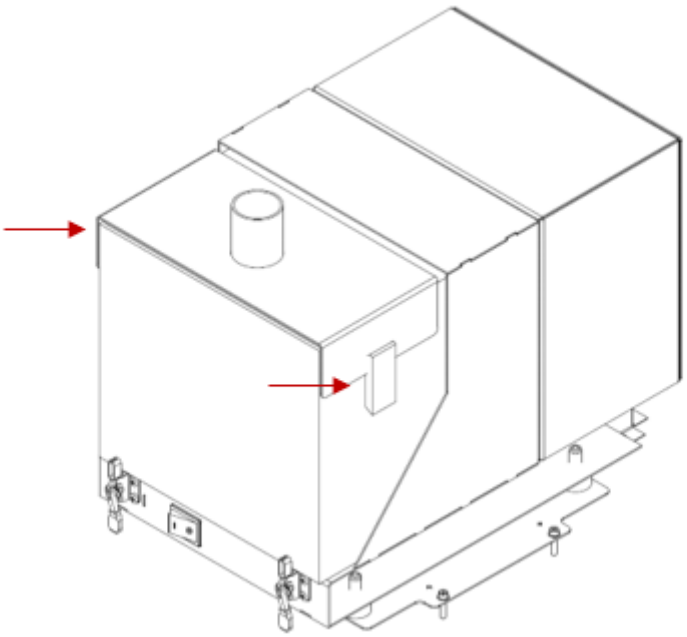


Fig. 133 Clasps securing the filter cover

5. Remove the top filter cover and put it aside (Fig. 134).

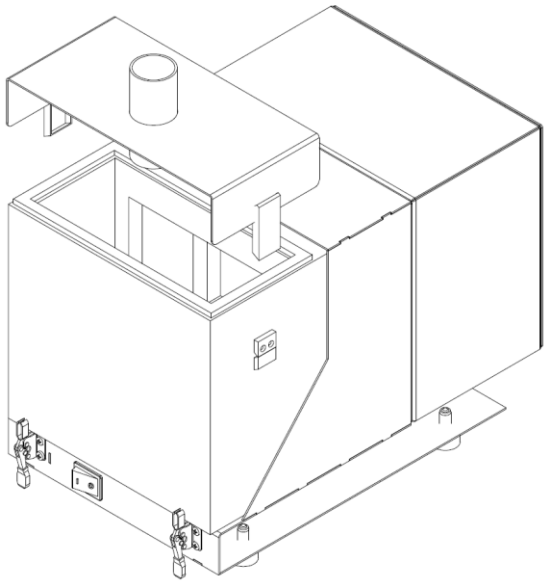


Fig. 134 Prefilter

6. Open the two clasps securing the cassette to the filter base (Fig. 135).

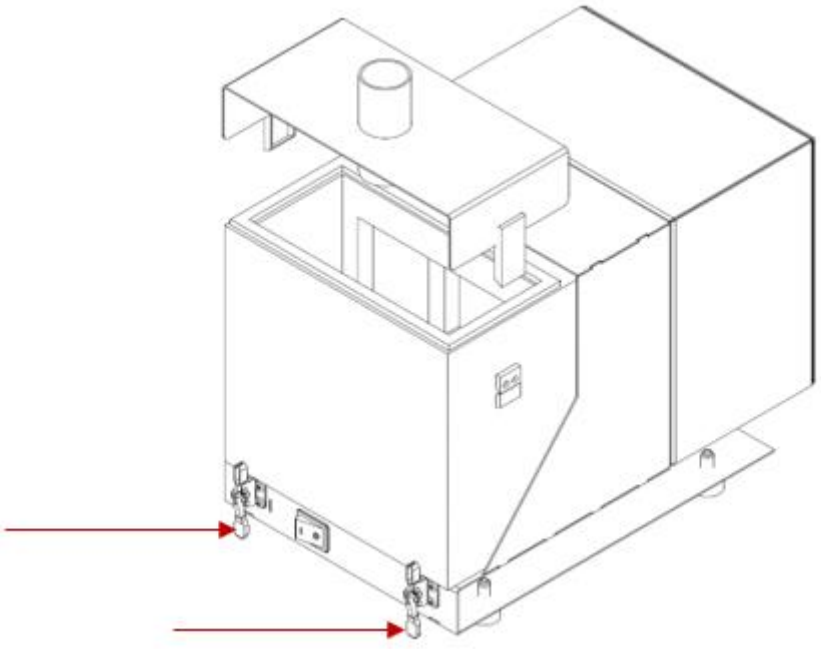


Fig. 135 Clasps fixing the cassette

7. Replace the top cover and close the clasps securing the filter cover (Fig. 136).

Fig. 136 Filter cassette

8. Close the clasps securing the cassette to the filter base (Fig. 137).

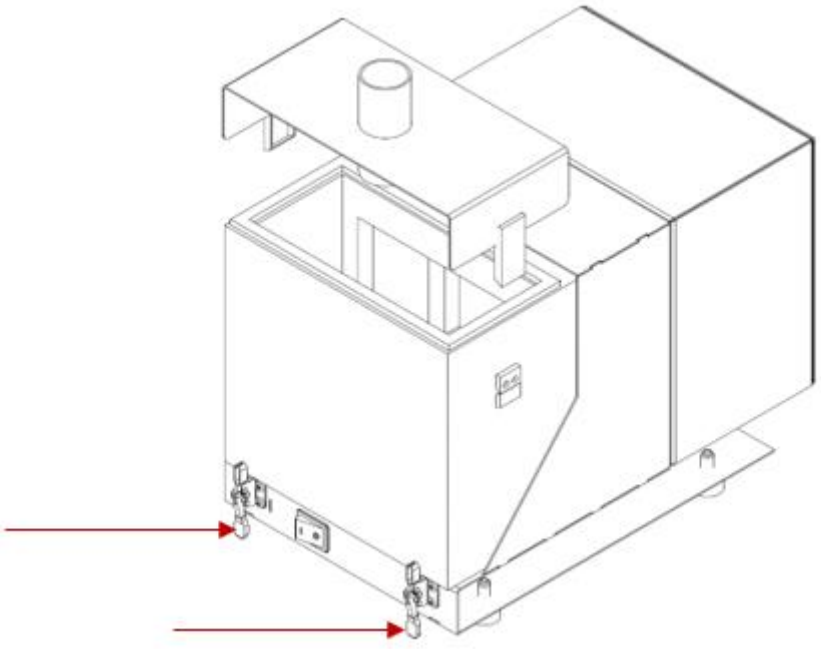


Fig. 137 Clasps fixing the cassette

9. Replace the top cover and close the clasps securing the filter cover (Fig.138).

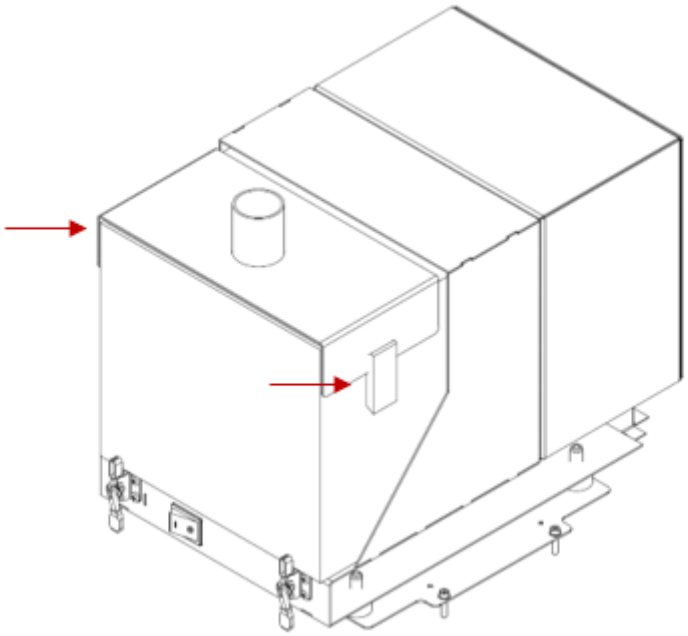


Fig. 138 Replacing the filter cover

10. Replace the bottom left cover by tightening the 16 fixing screws.
11. Connect the printer to a power source. Turn the main switch to the ON position, then turn on the printer using the powerbutton.
12. The old filter cassette should be disposed of in accordance with the applicable waste recycling regulations.

IX TECHNICAL SUPPORT

If you have a problem with your device or software that is not covered in the manual, please contact 3DGence Technical Support Department.
When contacting the technical support team, in addition to a detailed description of the problem, provide the serial number of the device (Section I, point 2.1).

Contact methods:

- contact form at www.3dgence.com/support,
- e-mail: support@3dgence.com,
- phone: +48 /32 438 98 64,
- contact form on the 3DGence CLOUD platform (www.cloud.3dgence.com).

X GLOSSARY

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

Adhesion – in the context of 3D printing, adhesion of print to the printer's heatbed. Insufficient print adhesion may cause partial or complete separation of the print from the heatbed during printing. Grease and dirt on the heatbed have detrimental impact on adhesion.

Bridge – a part of the model printed in the air, suspended between two parts of the print. 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 print element should be supported with support structures.

Brim – one of the methods for improving adhesion of prints to the heatbed. It consists in enlarging the adhesion surface of the print to the heatbed by generating additional external outlines of the model proper at the level of the first print layer. The more brim lines are added, the larger the adhesion surface will be. Usually, from 5 to 20 additional brim lines are applied. The brim should be used when separating the print from the build plate poses problems.

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

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

Model slicing (slicing) – the process aimed at generating paths and instructions for the printer (machine code) from a three-dimensional model. From the slicer, 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 print adhesion to the heatbed (e.g. raft or brim) can be selected. 3DGence INDUSTRY F421 printer uses the 3DGence SLICER 4.0 software in which settings for various modules and resolutions are defined. The final slicer's product is the machine code representing a given 3D model in the form of a G code, which is interpreted by the printer's electronic system.

Nozzle – the hotend's element in direct contact with the print. The nozzle heated up to the temperature proper for the particular material melts the material and forms a thread of plastic with the diameter equal to the nominal diameter of the nozzle. The nozzle output diameter determines the available resolutions, speed and printing accuracy.

Extruder – a component of a FFF 3D printer. Its task is to feed the filament at a precisely defined speed and, consequently, amount. 3DGence INDUSTRY F421 printer is equipped with the Direct type extruder. This means that the extruder motors are located directly above the printing module and feed material to the hotends through the sleeves.

Endstop (limit switch) – optoelectronic switch that restricts the 3D printer movements to the allowable limits. 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 may cause false activation.

Filament – popular name of the material used for printing in FFF technology. Filament is a wire made of a thermoplastic (PLA, ABS, HIPS, PC, Nylon and others) within a specified tolerance. Filament is wound on a spool. The following are important parameters for selecting a filament: 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 it should be stored in a dark, dry place with a moisture absorber.
NOTE: The use of materials other than those from the 3DGence Certified Material Base prevents the use of the SMM system.

Firmware – internal software of the 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 printer performance.

Missing steps – under 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 us assume that the print is a cube and the printer has lost steps in the middle of the printing process. The printed object would look as if cut into haves 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. It is characterised 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 (PA)– group of polyamides developed by DuPont. Currently, it is also used for manufacturing durable filaments for 3D printing. The main advantages of such prints are: high mechanical and chemical resistance, the possibility of processing and dyeing with fabric dyes. The prints 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. 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 4.0.

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 4.0 software recogniSes 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 4.0 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 print adhesion to the 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 print to the heatbed and also prevents the effects of thermal shrinkage (plastic-plastic connection). Another advantage of the raft is that it levels small irregularities of the heatbed surface. Raft also makes it easier to print models that do not have a flat surface that would serve as the base. Brim, described earlier, and raft should not be used simultaneously.

Stepper motor – electric motor that can rotate at precisely defined step angles. This is possible thanks to the arrangement of pairs of electromagnets A and B around a gear-shaped iron rotor connected to the motor shaft. Due to the fact that they ensure very precise position control, the stepper motors are the main drive of 3DGence INDUSTRY F421 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 print 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 print. 3DGence SLICER 4.0 generates supports automatically. The support generated by 3DGence SLICER 4.0 has two parts – loosely laid material and the so-called dense support layers that directly support the model.

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

Knurl – part of extruder driven directly by stepper motor. It enables precise filament dosing 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 print, most frequently corners, to detach from the heatbed. Warping is prevented by heated heatbed and working chamber of the printer.

.3dg – detailed instructions for the machine, including which way, how fast and on which axis to 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.

Manufacturer's name and full address

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