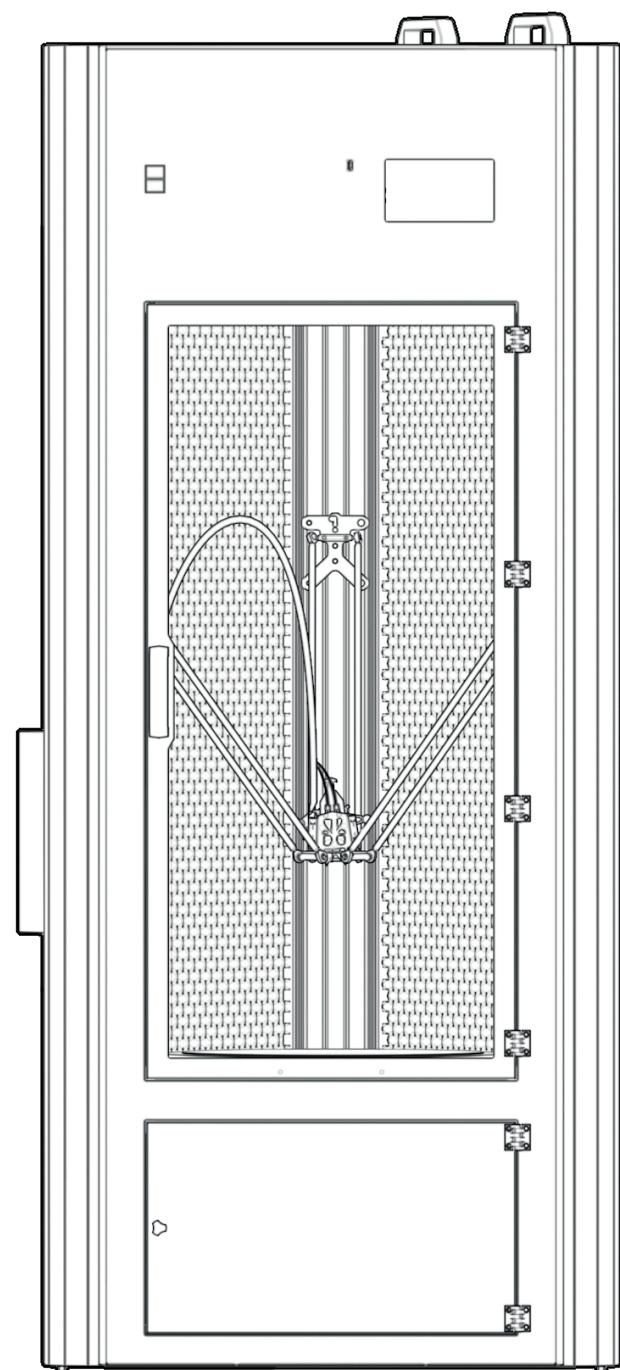


WASP 4070 ZX

MANUAL OF USE AND MAINTANANCE



ORIGINAL INSTRUCTIONS

wasp 

CE

Disclaimer



IMPORTANT:

We kindly suggest you to read carefully and comprehend in its integrity the content in this Manual of Use and Maintenance.

The missing acknowledgment of the manual can be cause of personal injury, low quality results or damages to the printer WASP 4070 ZX. Always make sure that the operators using the 3D printer knows and understands the content of the manual in order to achieve the best results from WASP 4070 ZX.

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Revision	Reason for the revision	Revision date

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0 INTRODUCTION

0.1. Aim of the instruction manual



IMPORTANT:

Before proceeding with the installing and starting of the printer, the technician, the user, the maintainer and the safety responsible must read and understand the manual.

The Manual must be considered as a fundamental part of the printer. The correct use and maintenance of the machine depends on the informations contained here.

The Manual contains instructions that must be acknowledged by the operator devoted to the use, maintenance and transport of the machine, supposing the adequate experience, preparation and professional abilitation as well as a psychophysical attitude.

For certain operations it may be necessary to ask for the intervent of personnel who have achieved a specific preparation.

The Manual must always be available for consultation, in copy and by the recipient, on the printer itself or in its immediate vicinity. In the second case the location of the manula must me indicated on the printer clearly.

The Manual is susceptible to updates which, appropriately classified, will be transmitted to the user/owner in order to update the consultation copy (s).

- The recipient must ensure that the personnel authorized by him/her to start up, use, maintain and transport the printer have obtained adequate knowledge of the instructions contained in this Manual.
- The recipient must check that the maintenance operations, prescribed in the appropriate chapter, are carried out and recorded promptly and effectively.
- We accept no responsibility for damage to persons or property resulting from improper use and / or omitted or inadequate maintenance.
- The recipient has the right to request further information.

In case of loss and/or damage of the present Manual it is responsibility of the recipient to ask for one or more copies.

0.2. How to read the manual of instructions

This manual is composed by:

COVER WITH PRINTER IDENTIFICATION

By consulting the cover you identify to the printer model covered in the manual and the printer serial number in your possession.

ANALYTICAL INDEX

By consulting the index it is possible to identify the chapter and the paragraph on which all the notes relating to a given topic are reported.

NUMERATION FIGURES

Each figure is numbered progressively, indicating with the first digit the reference chapter and with the second the progressive image (example Fig. 3.4 is the fourth figure of chapter three)

0.3. Storage of the manual of instructions

It is mandatory to keep this manual and all attached documents in an easily accessible place near the printer and known to all users (operators and maintenance personnel).

Operators and maintenance technicians must be able to quickly find and consult the manual in any situation.

The manual is an integral part of the printer for security purposes.

Therefore:

- It must be kept intact (in all its parts);
- It must follow the printer until its disposal (even in case of travel, sale, rental, rent, etc.);
- It must be kept up to date and report any changes made to the printer.

0.4. Updating the manual of instructions

This manual must be regularly updated by attaching additional or altered parts.

The sending of any additional parts is the responsibility of the Manufacturer; the user is responsible for the replacement of parts that may be altered as a result of use, making a request directly to the Manufacturer.

1 GENERAL INFORMATION

1.1. Manufacturer identification data

WASP S.r.l.

Via Castelletto, 104 - 48024 Massa Lombarda (RA) Italy

Tel. +39 0545 87858

info@3dwasp.com / www.3dwasp.com

1.2. Identification label

The printer is CE marked and complies with all relevant provisions:

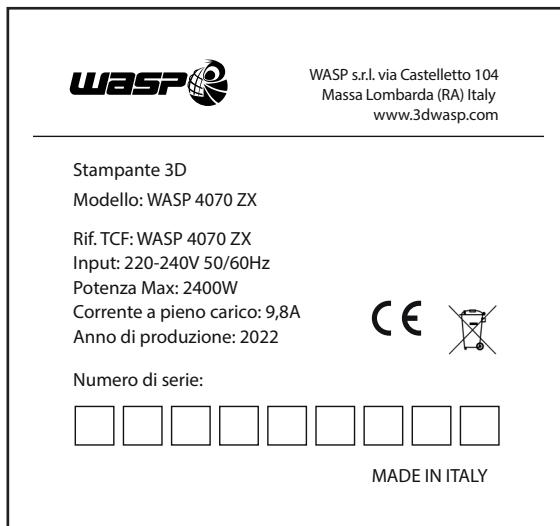
Machinery Directive 2006/42 / EC, EMC Directive 2014/30 / EU and LVD Directive 2014/35 / EU

EN 55022

EN 55024

EN 60204-1

The marking can be identified by means of an identification plate of the Manufacturer as required by the Machinery Directive. In case of damage, the Recipient must commission a copy.

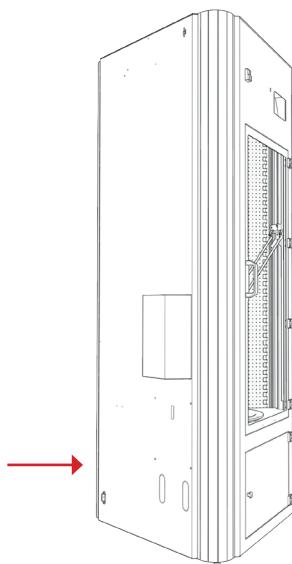


Legend:

1. Stampante 3D: 3D printer
2. Modello: Model
3. Rif. TCT: Reference
4. Input: input power
5. Potenza Max: Maximum power absorption
6. Corrente a pieno carico: full load current
7. Anno di Produzione: Year of production
8. Numero di serie: Serial number

1.2.1. Position of the label on the printer

The identification label can be found on the back profile of the printer near the supply plug.



1.3. Testing

The printer is tested directly by the Manufacturer during the phase of assembly and testing.

1.4. Warranty

The printers built by WASP S.r.l. are covered by warranty for a period of 12 months for companies or VAT and 24 months for individuals, according to the specifications set out in the sales contract.

If during the period of validity, defective operations or faults of parts of the printer that fall within the cases indicated in the warranty occur, WASP S.r.l. (after the appropriate checks) will repair or replace the defective parts.

The defective parts under warranty are repaired or replaced free of charge by WASP S.r.l..

The costs of transport and / or shipment are always charged to the Customer, as well as the return / return travel expenses related to the intervention of the Manufacturer's technicians at the Customer's premises.

The labor costs related to the intervention of the Manufacturer's technicians at the Customer's premises, for the removal of defects under warranty are the responsibility of the Manufacturer, except in cases where the nature of the defect is such that it can be easily removed on site by part of the Customer.

All consumables are excluded from the warranty.

The court of competent jurisdiction for any legal dispute is the Court of Ravenna, Italy.



NOTE:

The guarantee lapses in the following cases:

- Default or other contractual non-fulfillment;
- Improper use of the printer
- Failure to comply with the standards and maintenance intervals
- Tampering
- The printer is returned to the Manufacturer in a different packaging from the one supplied at the time of purchase;
- Use of non-original spare parts, ie not supplied directly by the Manufacturer;
- Extraordinary interventions not carried out by personnel not sent by the Manufacturer;
- Any variation and / or non-observance of what is indicated in the technical documents and in this manual entails the forfeiture of the technical and functional guarantees, and release the Manufacturer of the printer from any responsibility.

1.5. General safety warnings

**CAUTION:**

All intervention performed on the printer require particular caution on the part of the operator.

**NOTE:**

Any intervention on the printer must be carried out in strict compliance with the operational skills (see paragraph 1.7.1 "Identification of Operational Staff"). WASP S.r.l. declines any responsibility in case of non-compliance with these skills.

The purpose of this chapter is to indicate:

- which are the specific measures to avoid incurring any kind of accidents
- what may be defined as residual risks
- which are the minimum essential safety provisions to be maintained
- what characteristics must have the operators assigned to the operations on the machine
- which must be the characteristics of the maintenance operators.

WASP is not responsible for unspecified operations, as they are considered strictly pertinent to technical assistance personnel or for operations performed differently from what we described in the documentation presented.

Possible operations on the printer can include:

- Mechanical
- Electrical

**MECHANICAL NATURE INTERVENTIONS**

Any intervention of a mechanical nature must be carried out in strict compliance with the directives required by current safety regulations. It is absolutely forbidden to perform any type of mechanical maintenance intervention on the printer during the operating cycle or in any case with parts of the printer moving.

Every mechanical operation must be carried out with the printer stopped and only and exclusively by the mechanical maintenance technician, qualified to operate in conditions of safety (see paragraph 1.7.1 "Identification of the operating personnel").

Maintenance work must only be performed with the machine disconnected from the power source and taking all the safety measures required by current laws and regulations.

**ELECTRICAL NATURE INTERVENTIONS**

Every electrical adjustment operation must be carried out taking all the safety measures required by current regulations.

1.5.1. Personal protective equipment

It is mandatory to use specific personal protection devices (PPE) to the current operations made available by the company (in relation to the risk attached to the performance of certain processes), even when not directly concerning the use of the machine.

1.5.2. Operators for whom the manual is intended

The manual is written for:

- The operators involved in using the printer (in the continuation of the manual will be briefly called "users");
- Mechanical maintenance workers: trained and authorized operators for the maintenance of mechanical parts, pneumatic and oil-hydraulic systems;
- Electrician maintenance technicians: trained and authorized operators for the maintenance of electrical and / or electronic parts and systems;
- Qualified technicians (employees of the Manufacturer or authorized service center), special maintenance staff and operations of a complex and / or particular nature.



ATTENTION:

The user must not perform operations reserved for maintenance personnel or qualified technicians.

The manufacturer is not liable for damages deriving from failure to observe this prohibition. Users or qualified technicians.

1.5.3. Protection systems

The machine is provided with automatical systems of protection that reduces the risks for the user.

These systems are present as a standard in all machines and shall not, for any reason, be manipulated nor damaged. Upon seeing abnormalities in the fuctions of these systems, the user is responsible of reporting them to the Manufacturer, who'll fix it.

Anytime the fuctions of these systems are compromised the machine must not be used for no reason as it may be dangerous for the user and may lead to major damages to the machine itself.

DOOR SENSOR



ATTENTION:

Do not put any magnet or magnetic device near the frame of the door as it may compromise its right behaviour

The Door sensor activates anytime the door is open and automatically pauses any action on the machine (including heating, movements and tool-change).

OVERHEATING BLOCK

The machine is designed with a control system to prevent the overheating of its parts by blocking the heating parts as the temperatures recorded overcome the saftey threshold.

1.5.4. Residual risks

Residual risk of scalding

This risk exists during the removal phase of the filament from the extruder and during the removal of the piece from the plate.



CAUTION:

Remove the part only when both the extruder and the bed are cool.



ATTENTION:

During the operations on the machine the user must wear protective gauntlets.

Residual risk of electrocution

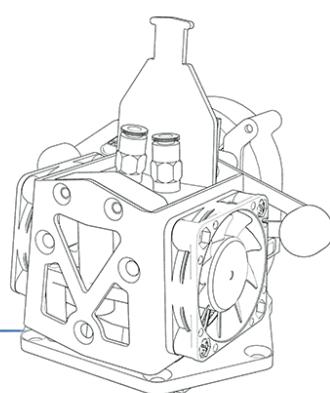
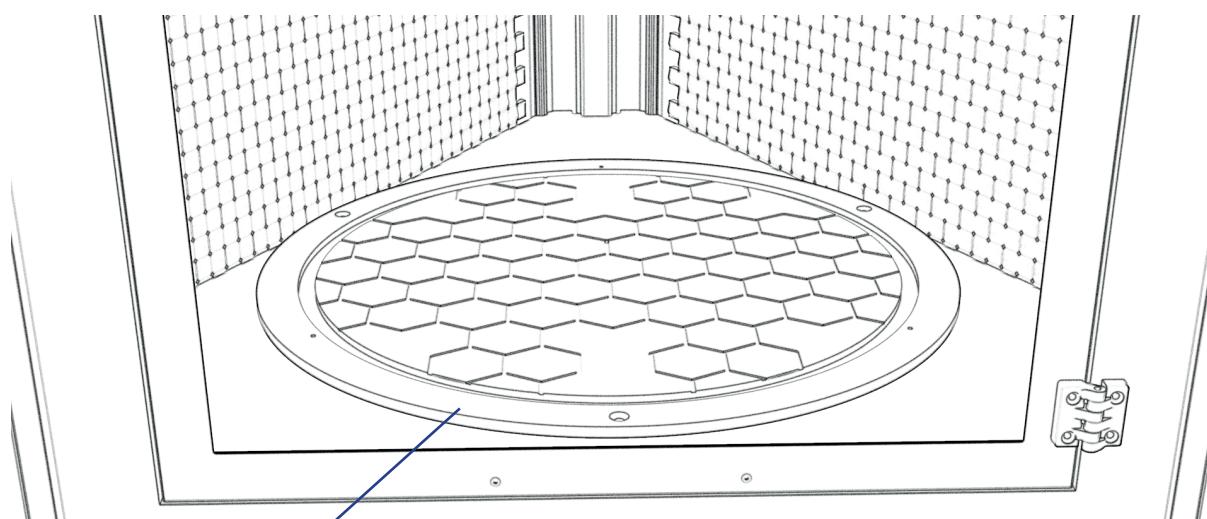


CAUTION:

It is present tension on the superior part of the printer.

Maintanance / Cleaning

Maintenance / cleaning operations must be carried out by trained and authorized personnel. Operations must be performed in a safe stop condition, disconnecting the printer from power sources. Refer to chapter 7 "Ordinary and Extraordinary Maintenance".



Legend:



Hot surfaces, pay attention not to touch when heated

1.5.5. Safety stickers

The safety stickers shown below are applied to the printer. Before using the printer, check the integrity of these adhesives and assimilate the instructions. Refer to paragraph 1.7 "Glossary and pictograms". If the meaning is not clearly understood, contact the Manufacturer.



ATTENTION:

The labels and stickers applied to the printer must be replaced before they become illegible. If one or more plates (stickers) are missing or illegible, the operator must not use the printer until the new plates (stickers) have been applied.

Legend:



Hot surfaces, pay attention not to touch when heated

1.6. Glossary and pictograms

1.6.1. Identification of operating personnel

The operator responsible for the operation or maintenance of the printer must possess the specific professional requirements for each intended operation.

The operator must be instructed and therefore be aware of the tasks entrusted to him who has responsibility for the job.

Below is a description of the professional profiles for the operators involved in the printer.

User

Qualified personnel, able to perform simple tasks, trained on using the printer.

He/she supervises the proper functioning of the same and the eventual first intervention in case an alarm condition occurs.

Mechanical maintenance technician

Qualified technician able to conduct the printer under normal conditions, to intervene on the mechanical parts to carry out all the necessary adjustments, maintenance interventions and repairs.

He/she is not enabled to work on electrical systems in the presence of voltage.

Electrical maintenance engineer

Qualified technician able to conduct the printer in normal conditions; it is in charge of all the electrical interventions of regulation, maintenance and repair. He/she is able to operate in the presence of voltage inside enclosures and junction boxes

Manufacturer Technician

Qualified technician provided by WASP S.r.l. to carry out operations of a complex nature in particular situations or in any case according to what has been agreed with the user.

1.6.2. Editorial pictograms

To ensure a deeper knowledge of the printer, the text of this manual is accompanied by indications that complete it, providing additional information, indispensable attention or particularly significant hazards to consider; in this regard, the following notation is used:

**DANGER:**

Indicates situations or operations that must be carried out, or information, to which particular attention must be paid to avoid harm to people.

**WARNING:**

Indicates situations or operations in which there is the possibility of causing damage to the printer, or to the equipment connected to it.

**ENVIRONMENTAL NOTE:**

Indicates situations or operations in which there is the possibility of causing damage to the environment.

**NOTE:**

Indicate the notes, warnings, suggestions and other points on which you want to draw the reader's attention or complete the explanation with further information.

Personal protective equipment (PPE)

The graphic symbols used in this manual are indicated below to indicate the need to wear certain PPE.

**PROTECTIVE GAUNTLETS:**

Indicates the need to use suitable protective gloves to perform the described operation (possibly dielectrics for carrying out work on the electrical system).

**SAFETY SHOES:**

Indicates the need to use safety shoes suitable for performing the described operation.

**PROTECTIVE WORKWEAR:**

Indicates the need to use protective clothing to perform the operation described.

**PROTECTIVE HELMET:**

Indicates the need to use a safety helmet to perform the operation described.

2 DESCRIPTION OF THE PRINTER

The device described in this manual is a 3D printer suitable for 3D printing with the use of thermoplastic filaments. The printer consists of an heated extruder mounted on a Delta-robot structure, a buildplate and a pair of spool holders.

The material is unrolled from the spool, pushed to the heated nozzle where it melts and is extruded through a nozzle that lays very small amounts of material starting from the build plate. The material is deposited by the toolhead, layer after layer. The layers are defined by the file produced with the use of a slicing software.

It's possible, in this way, to create any shape and kind of object within the limits of this technology.

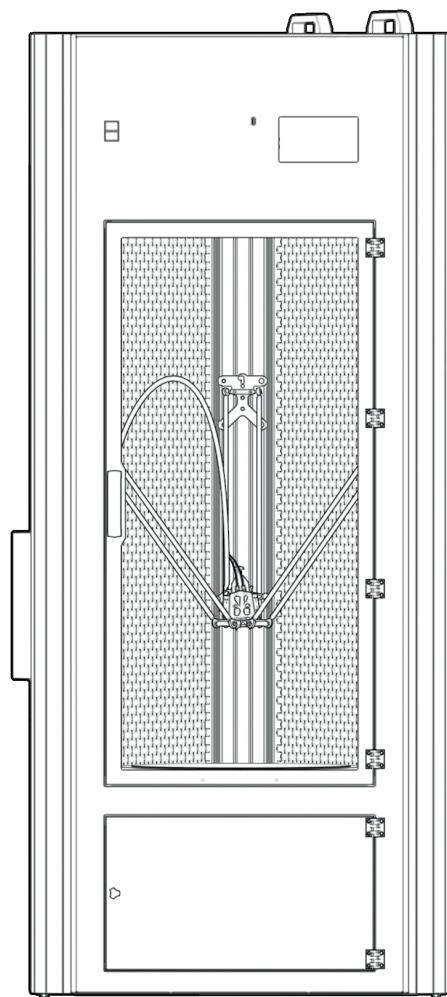


Fig. 2 - Printer

2.1. Control panel

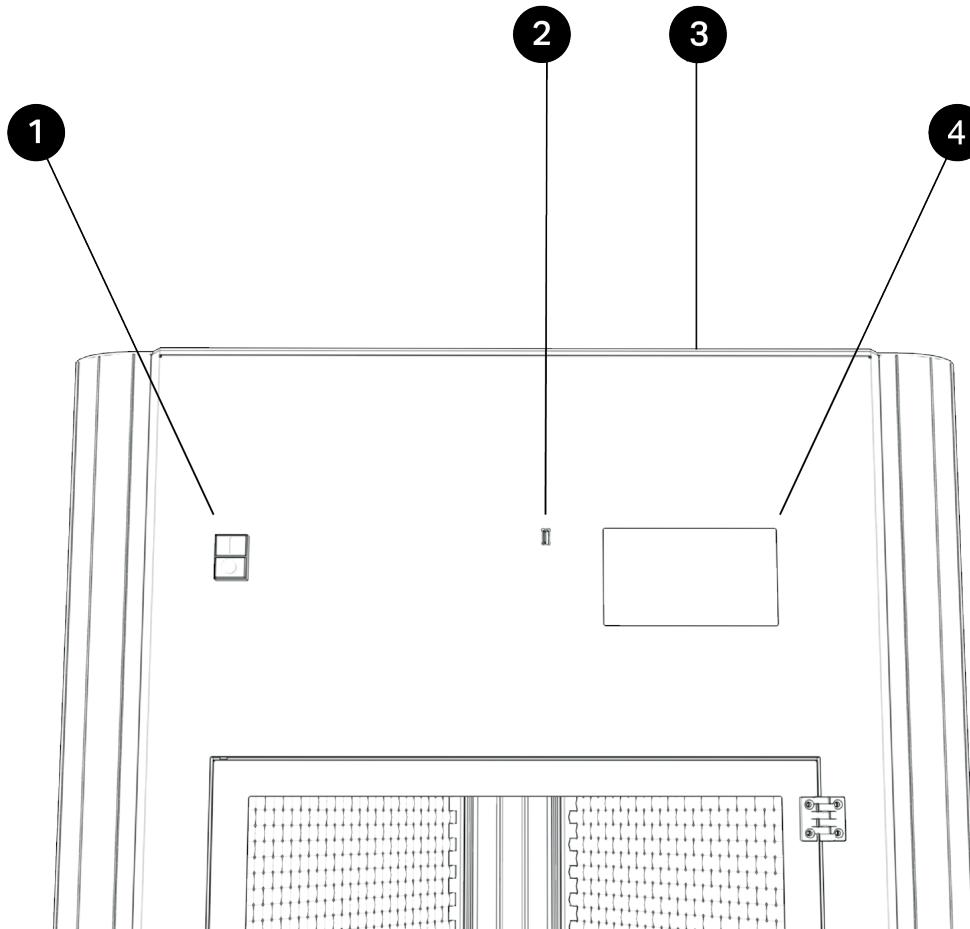


Fig. 2.1 - Control panel

Legend:

1. ON/OFF buttons: Turn ON/OFF the machine
2. USB port
3. LED stripe: the color of the light changes with the status of the printer, allowing a quick visualization:

LED color	State	Situations
Green	Operational	Machine turned on and ready to operate or print concluded
White	Printing	Machine busy in a printing process
Yellow	Paused	Machine paused or waiting for a material refill
Red	Cancelling/error	Machine cancelling an operation or sending an error message

4. TFT touch Operator display (see paragraph 5.2 "User Interface")

2.2. Work area

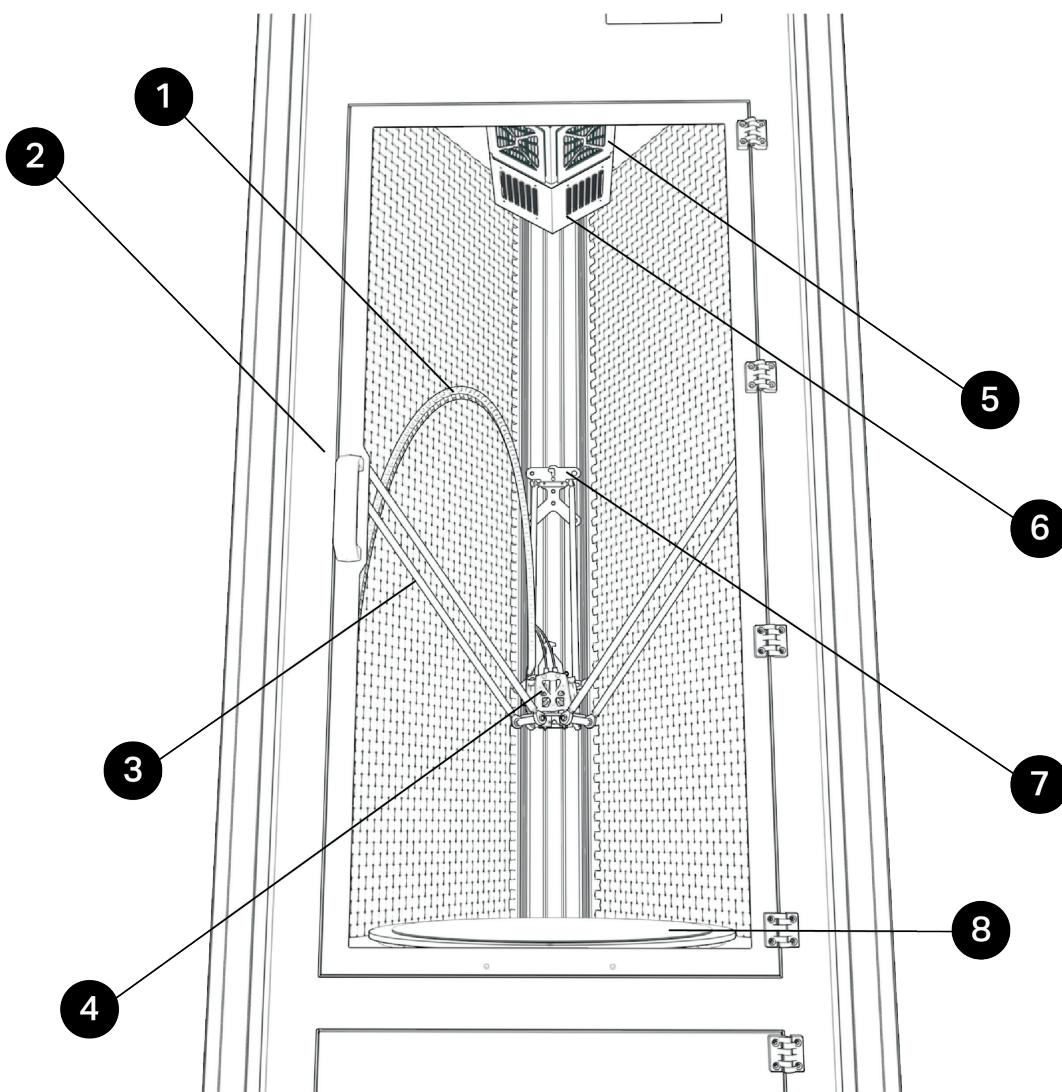


Fig. 2.2 - Work area

Legend:

1. Cable carrier
2. Door handle
3. Carbon fiber rods
4. Zen X Extruder
5. Hepa filters
6. Chamber heaters
7. Sliders
8. VACS - Vacuum Active Control System (see paragraph 8.12)

2.3. External area of the printer

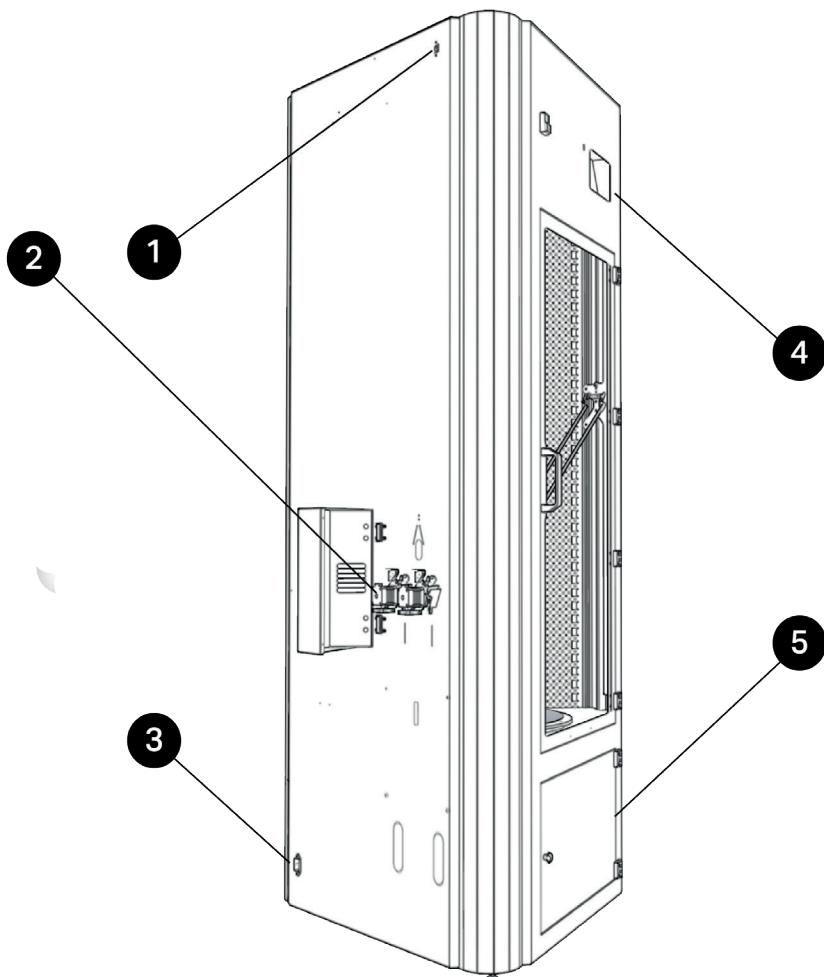


Fig. 2.3 - External area of the printer

Legend:

1. Ethernet door (for static IP cable connection)
2. Left and right filament drivers
3. Power socket
4. TFT touch Operator display
5. Material storage area

2.4. Material storage area

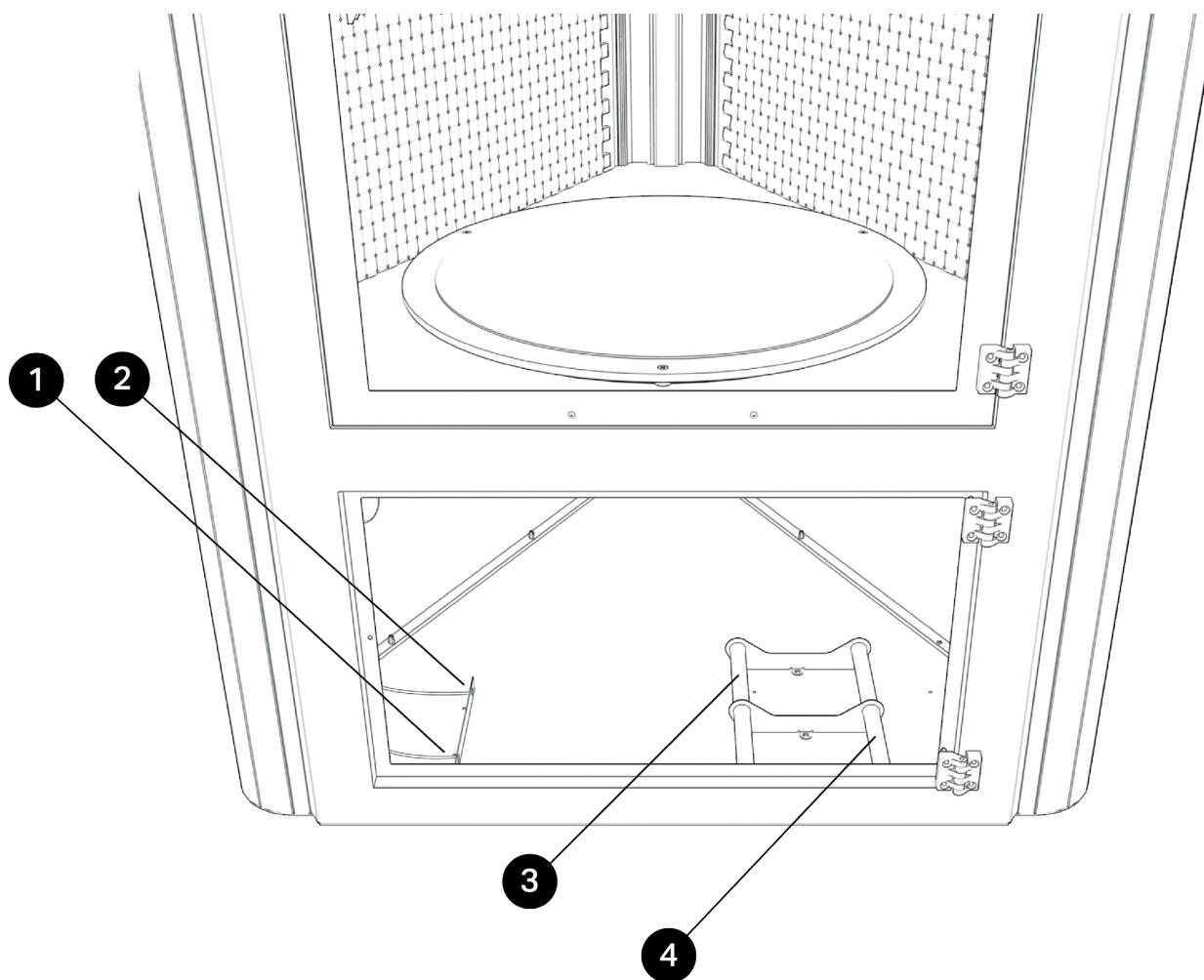


Fig. 2.4 - Material storage area

Legend:

1. Left nozzle filament inlet
2. Right nozzle filament inlet
3. Right nozzle spool holder
4. Left nozzle spool holder

2.5. VACS - Vacuum Active Control System

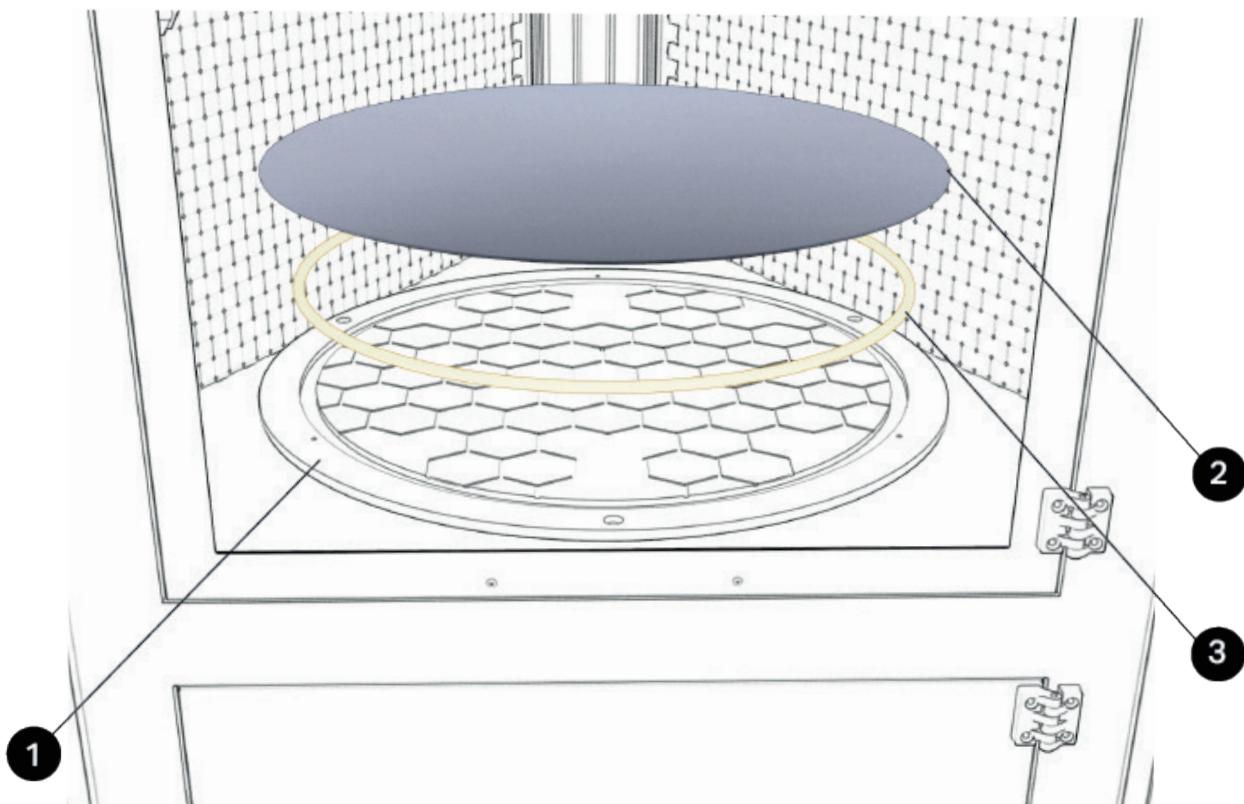


Fig. 2.5 - VACS - Vaacum active control system

Legend:

1. Aluminum vacuum bed
2. Silicon gasket
3. Removable printing plate

2.6. Technical data

General features	
Length	78 cm
Width	85,5 cm
Height	195 cm (205 cm with wheels)
Approximated weight	120 kg
Noisiness	< 70 db (A)
Mechanical features	
Frame and cover	Metal sheet and aluminium
Print bed	Vacuum bed with base in machined aluminium, multiple printing plates
Movement	Rolling on anodized aluminum slide
Motors	Stepper Nema 17
Electrical features	
Input	220/240 V - 50/60 Hz
Absorbed power	Extruder: max 120W Heated bed : max 1300 W Heated chamber: max 1500 W
Use features	
Environment of use	20-30 °C
Warehouse	0-30 °C
Nozzle	max 350 °C
Heated bed	max 120 °C
Heated chamber	max 70 °C
3D printing informations	
Technology	FFF
Cilindric build area	Ø 400 x 700 mm
Nozzle diameter	standard 0.7 mm (0.4 mm)
Layer resolution	50-350 micron
Maximum speed	200 mm/s
Filament diameter	1,75 mm
Suitable filaments	ABS, HIPS, PA CF, PMMA, PETG, PLA
Interface and software	
Operative systems	Windows, Mac, Linux
Supported slicing software	Simplify3D
File formats	.stl, .obj, .gcode
Interface	USB pendrive, TFT touch display, Wi-Fi

2.7. Noisiness

The noise emitted by the standalone printer is lower inferior than 70 dB(A).
The presence of more machines in the same area can increase the global noise.



ATTENTION:

It is the responsibility of the customer to carry out an assessment of the noise risk of his activity as prescribed by the legislation in force in the place where the printer is installed, and to equip the operators with adequate Personal Protective Equipment (such as headphones for hearing protection).

2.8. Intended use of the printer

The printer was designed and built to create thermoplastic objects by depositing a filament of molten material. It is possible to use materials such as ABS, HIPS, PA CF, PMMA, PETG, PLA.

Any use of the printer with materials other than those officially supplied will void the manufacturer's warranty and liability.

2.9. Improper use of the printer

The following printer uses are prohibited:

- Using the printer to perform operations other than those for which it was designed and constructed described in paragraph 2.6;
- Failure to comply with safety regulations;
- Operation of the printer with procedures other than those described in this manual;
- Use components not provided for in the design phase;
- Failure to comply with established maintenance schedules;
- Perform work on the printer that involves the modification of components or parameters that affect the work cycle;
- Alter the extruder calibration;
- Use of the printer outside the permitted working temperatures;
- The use without authorization of non-original spare parts or components not approved by the Manufacturer;
- The execution of any modification or structural intervention without the Manufacturer's authorization;



NOTE:

- Each of the improper uses or negligence previously listed causes:
 - the immediate cancellation of the guarantee stipulated with the Manufacturer at the time of the purchase of the printer;
 - the cancellation of the Manufacturer's Responsibility for damages caused to people, things or animals.



ATTENTION

Improper use can damage the printer which consequently can cause dangerous situations for the personnel responsible for its operation and maintenance.

3 TRANSPORT AND HANDLING

3.1. General warnings

The reading of this chapter assumes, in order to use the printer safely, the knowledge of the contents of paragraph 1.6 "General safety warnings".

Furthermore, the specific requirements for safe interaction with the printer, related to this chapter, are detailed in the following paragraphs.



ATTENTION:

The operations related to these activities must be performed by authorized and professionally qualified personnel.



ATTENTION:

During operations, the operator must wear all the necessary Personal Protective Equipment (PPE).



3.1.1. Delivery of the printer

Upon receipt, make sure that:

- The printer has not been damaged during transport;
- Any packaging has not been tampered with consequent removal of parts from the inside;
- The supply corresponds to the order specifications.



NOTE:

If the printer needs to be stored for a certain period of time before installing it, it is recommended to protect it adequately and store it in a suitable environment (with a temperature between 0 ° C and 30 ° C and relative humidity between 20 % and 60% non-condensing) and protected from atmospheric agents in order to avoid deterioration.



ATTENTION:

During storage, never stack the boxes containing the equipment.

3.2. Content

The printer is supplied with:

- Operating and maintenance manual
- USB pendrive
- Power cable
- Extruder cleaning kit
- Printing plates
- Vacuum gaskets
- Material spool
- Wheels (optionals)

3.3. Unpacking, lifting and handling of the printer



ENVIRONMENTAL NOTE:

Once the packaging has been removed from the printer it is recommended to keep it for any requests for assistance from the Manufacturer.



ATTENTION:

The weight of the printer is shown in paragraph 2.4 "Technical data". It is therefore necessary to use the lifting equipment whose expected flow is adequate for the weight to be lifted.



ATTENTION:

As long as the printer is not completely raised, it is advisable to check the correct balance of the same. During lifting, all the area around the printer is considered dangerous.



ATTENTION:

All small equipment that exceeds the weight of 25 kg must be transported with the appropriate equipment, or manually (if not exceeding 50 Kg) by two qualified operators.



ATTENTION:

The handling of the machine requires three properly qualified persons as mentioned above

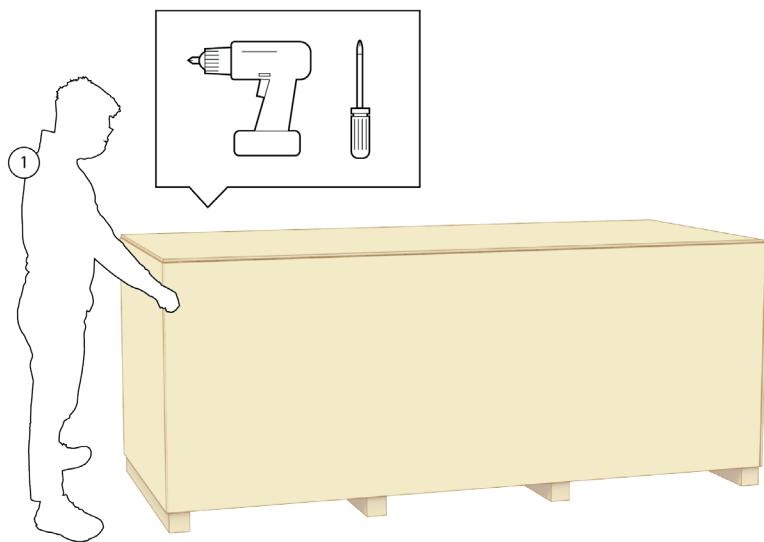


Fig. 3.2a - Opening the box

With the help of a screwdriver or a electric screwdriver remove carefully all the screws on the box. Remove the walls one by one, paying attention not to damage them. Remember that the original packaging of the machine is to be conserved for the entire life cycle of the product. When this operation is completed the machine will be laying on the base pallet only. (fig 3.2a)

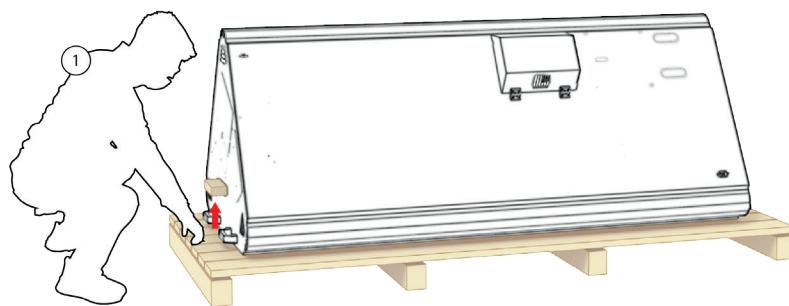


Fig. 3.2b - Removing the wooden fixture

Before handling the machine make sure to remove the wooden fixture placed close to the extremity of the machine. Don't throw this component away as it's part of the packaging and needs to be stored. DO NOT REMOVE PROTECTIVE FOAM BEFORE THE MACHINE IS STANDING (fig 3.2b)

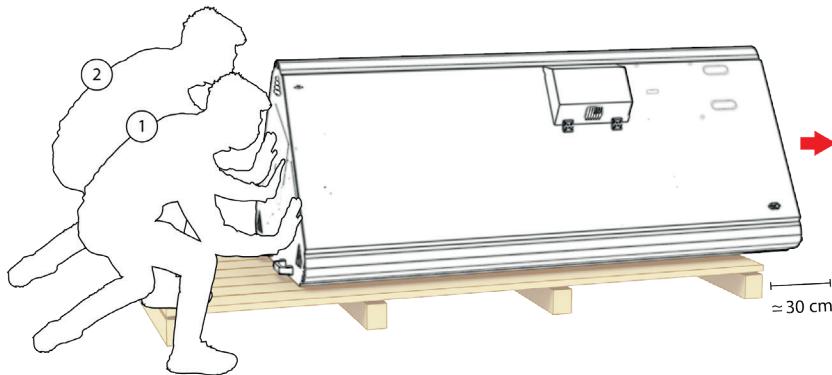


Fig. 3.2c - Sliding the machine out of the base

Now the operators 1 and 2 will push the machine from its top in horizontal direction until it overhangs about 30 cm from the pallet. (fig 3.2c)

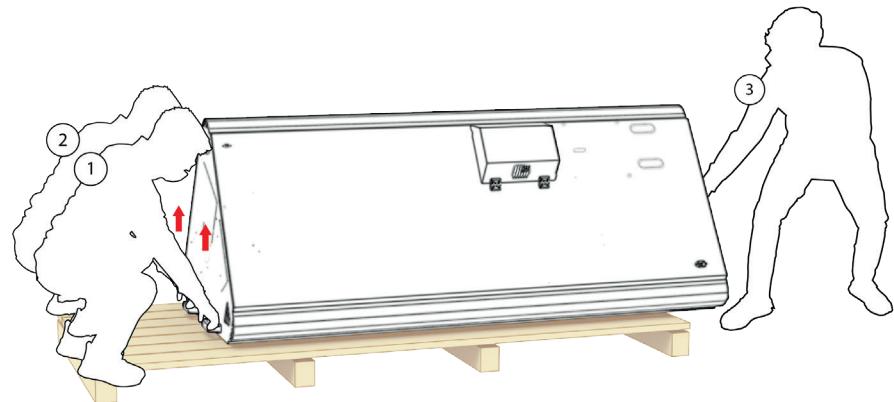


Fig. 3.2d - Holding the handles

Using the two handles positioned on the top of the machine the operators 1 and 2 will start lifting the machine. The operator 3 will guide the machine on the other side preventing it from sliding. (fig 3.2 d)

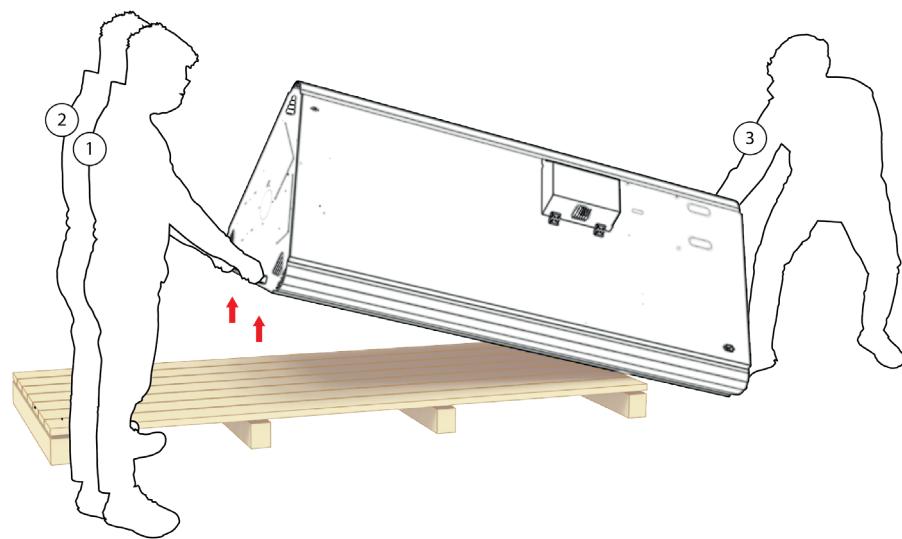


Fig. 3.2e - Lifting the machine

Using the two handles positioned on the top of the machine the operators 1 and 2 will continue lifting the machine. The operator 3 will guide the machine on the other side helping the edge to gently lay on the ground. (fig.3.2e)

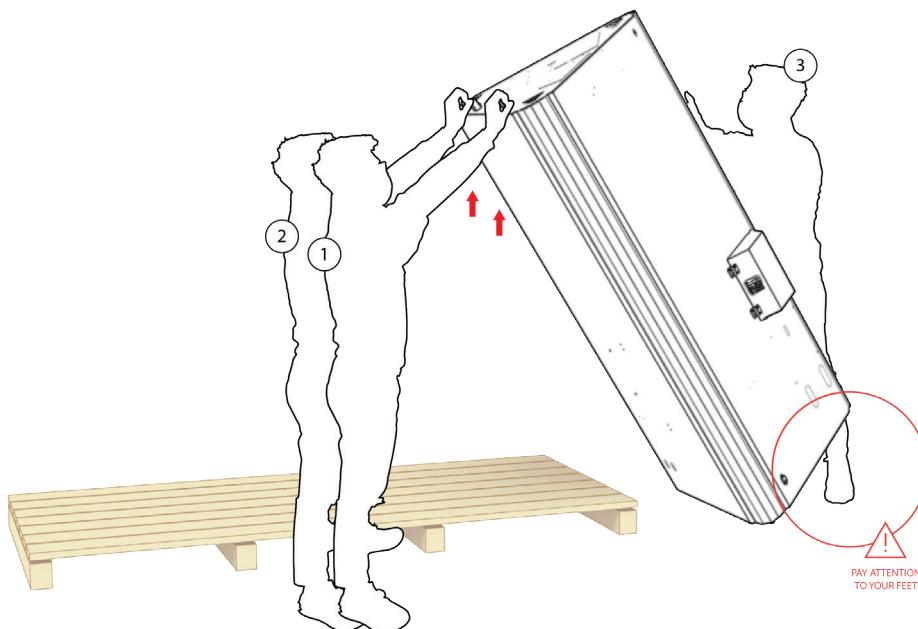


Fig. 3.2 f - Lifting the machine

Using the two handles positioned on the top of the machine the operators 1 and 2 will continue lifting the machine.

The operator 3 will guide the machine on the other side preventing the machine from falling freely. In this phase is especially important to pay attention to the feet. (fig 3.2 f)

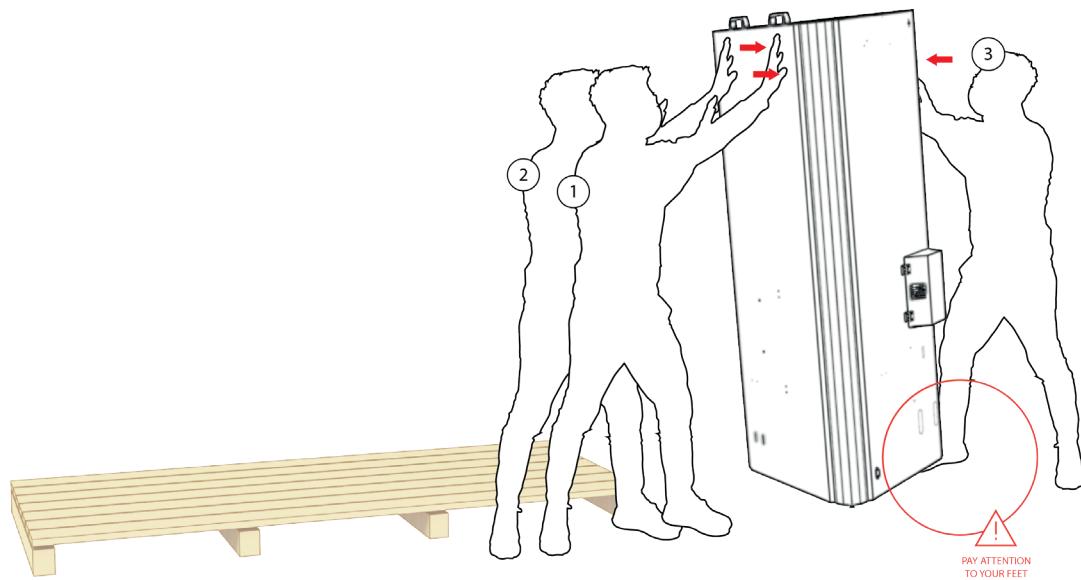


Fig. 3.2g - Laying the machine

Operators 1 and 2 will gently release the handles while operator 3 will help the machine to gently lay on the ground. In this phase is especially important paying attention to the feet. (fig 3.2g)
Now the machine is standing. Move it on the floor by pushing in 2 people.

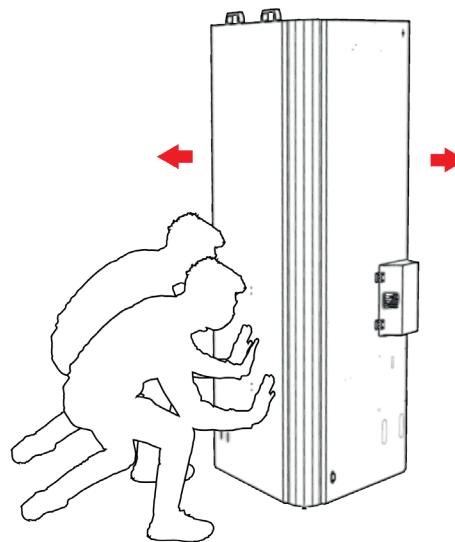


Fig. 3.2h - Positioning the machine

If the machine must be moved in more complex ways carry out these operations with maximum care and attention. Do not ever for any reason move the machine without the following recommendations (fig 3.2h)

Optional wheels

The assembly of the wheels is optional and must be carried out before the lifting of the machine.

First unscrew the rubber pads assembled by default on the machines.

Assemble the wheels on the bottom of the machine during the phase showed in fig 3.2b using the screws included

Notice that one of the wheels is provided without brake, this has to be placed on the top edge of the machine as its laying on the pallet as displayed in fig. 3.2i



ATTENTION:

If the optional wheels are assembled, before any handling of the machine make sure to lock the brakes on the wheel where present

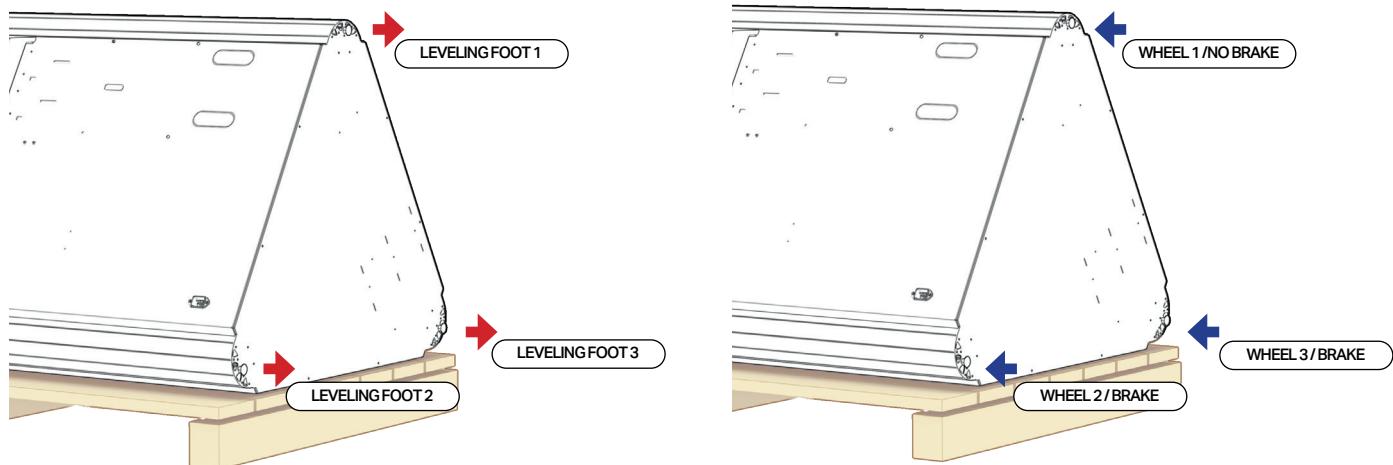


Fig. 3.2i -Removing the rubber pads and assembling the optional wheels

4 INSTALLATION

4.1. General warnings

The reading of this chapter assumes, in order to use the printer safely, the knowledge of the contents of paragraph 1.6 "General safety warnings".

Furthermore, the specific requirements for safe interaction with the printer, related to this chapter, are detailed in the following paragraphs.



ATTENTION:

The operations related to these activities must be performed by authorized and professionally qualified personnel.



ATTENTION:

During operations, the operator must wear all the necessary Personal Protective Equipment (PPE).



ATTENTION:

A thermal magnetic protection device must be inserted upstream of the system.

4.1.1. Placement

The printer must be installed in a suitable place, ie such as to allow normal operations of the printer, ordinary and extraordinary maintenance.

The installation site must not contain any kind of contaminants, dust, fumes, mists, etc.

It is therefore necessary to prepare the necessary operating space by referring to the dimensions (expressed in mm) given in paragraph 2.4 "Technical data".

The room must also be:

Equipped with the appropriate power supply line;

Installed in environments with brightness equivalent to that expected for industrial environments; as indicated by the regulations in force in the country of destination, with regard to safety in the workplace. Lighting must not cause visual disturbance on the transparent part of the door. The lighting must guarantee a perfect reading of the information given by the display.

The printer must be positioned on a stable and horizontal plane having a capacity suitable for the weight to be supported. Any unevenness must be included in the construction regulations.

The printer must be placed in an environment with foundations that prevent the transmission of environmental vibrations.



ATTENTION:

Do not place the printer near sources of heat, water or other free liquids.

Do not install the printer without the appropriate protections.



NOTE:

A good installation as well as giving greater rigidity to the printer, avoids vibrations and noises.

4.2. Electrical connection

**ATTENTION:**

The operations related to these activities must be performed by authorized and professionally qualified personnel.

**ATTENTION:**

It is up to the user to protect the cable mechanically against any crushing or sources of wear according to the type of installation made.

**ATTENTION:**

The printer must be powered by a 10A socket protected by a magnetothermic set at 30 mA.

**NOTE:**

All the data concerning the electrical characteristics of the printer can be found in the manual, see paragraph 2.4 "Technical data".

Before connecting the printer's power cord to the electrical outlet, check that the system's power consumption and voltages are suit

5 PREPARING TO USE THE PRINTER

5.1. General warnings

The reading of this chapter assumes, that in order to use the printer safely, the knowledge of the contents of paragraph 1.6 "General safety warnings".

Furthermore, the specific requirements for safe interaction with the printer, related to this chapter, are detailed in the following paragraphs.



ATTENTION:

The operations related to these activities must be performed by authorized and professionally qualified personnel.



ATTENTION:

During operations, the operator must wear all the necessary Personal Protective Equipment (PPE).



5.2. User interface

5.2.1. Main board

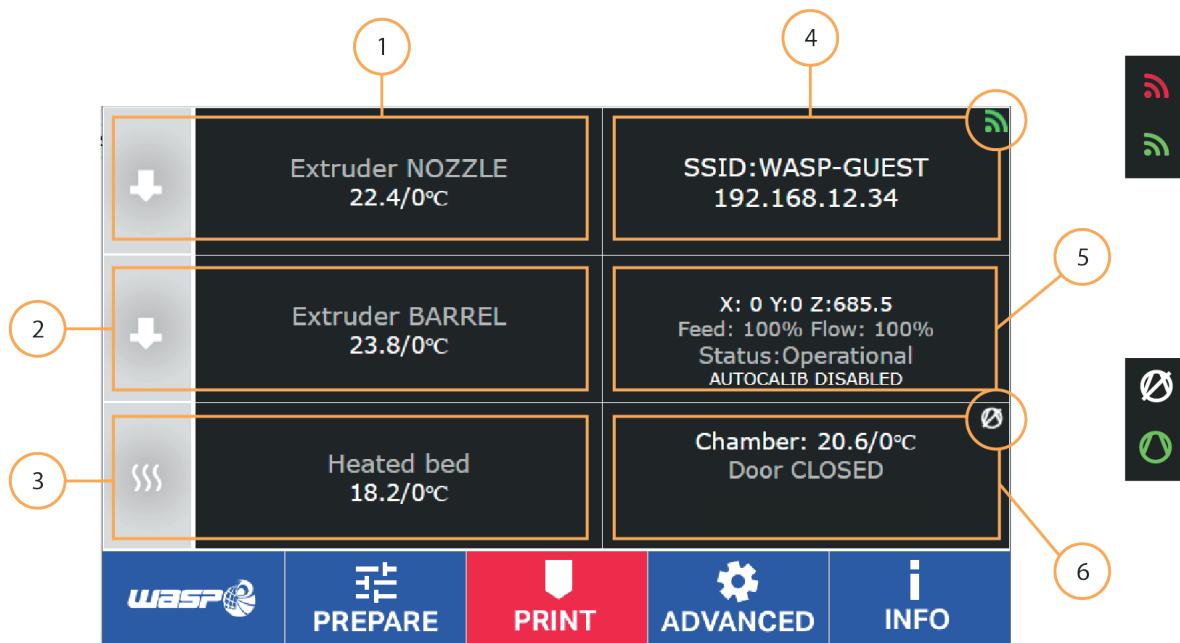


Fig. 5.2.1 - Main board

The main board appears when turning on the printer and when launching the print. It is intended to be the principal tool for the monitoring and control of the printer. The toolbar allows to access the menus PREPARE, PRINT, ADVANCED and INFO.

Legend:

1. Left extruder temperature (click to set new target temperature)
2. Right extruder temperature click to set new target temperature)
3. Heated bed temperature (click to set new target temperature)
4. WiFi connection (when connected shows network and IP for the machine)
When connected the WIFI icon is green, when disconnected the icon is red.
5. State of the machine (see paragraph 2.1 "Control of the printer"), Autocalibration ENABLED/DISABLED
6. Heated chamber (click to set new target temperature) - Door OPEN/CLOSED

5.2.2. PRINT MENU

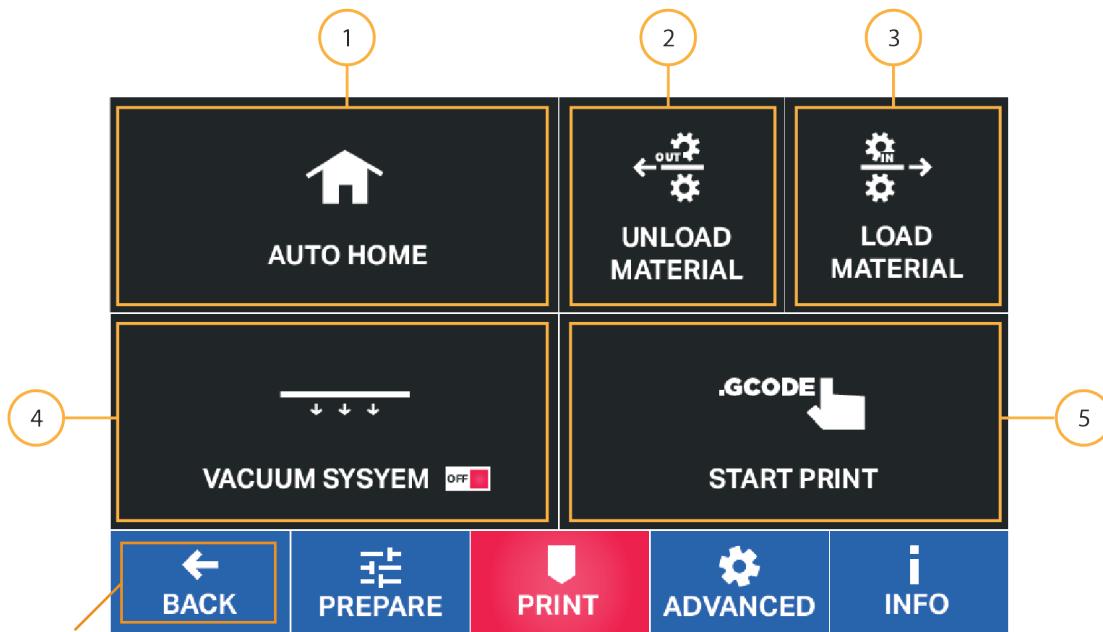


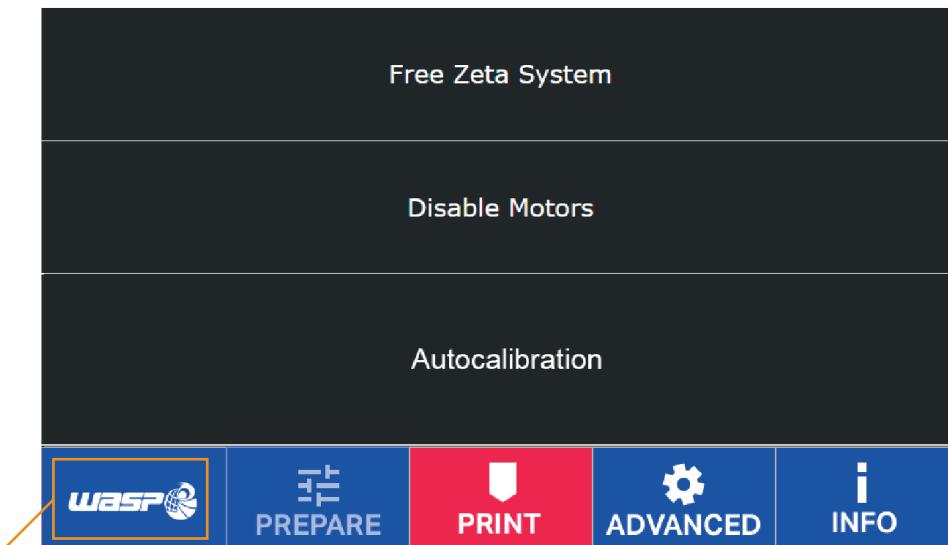
Fig. 5.2.2 - Menu print

PRINT menu contains commands that guide you to the launch of the print.

Legend:

1. Auto home: moves the machine in position of zeroing of the axes
2. Unload material: removes material from the selected extruder
(see par. 6.5 "Loading/unloading the filament")
3. Load material: loads material inside the selected extruder
(see par. 6.5 "Loading/unloading the filament")
4. Vacuum: Enables or disables VACS(Vacuum Active Control System)
The switch shows current state ON or OFF.
Learn more in paragraph 8.12 "VACS (Vacuum Active Control System)"
5. Gcode: access to gcodes list to proceed with the printing
(see par. 5.2.6 "GCODE")

5.2.3. PREPARE menu



[BACK TO MAIN BOARD](#)

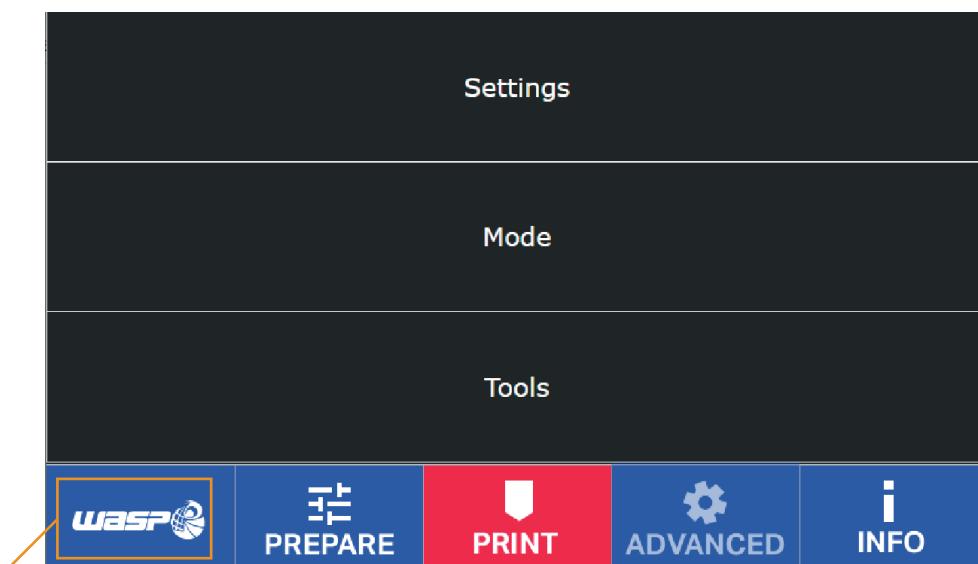
Fig. 5.2.3 - Menu PREPARE

Access it by clicking the PREPARE button in the toolbar.

Legend:

- **Free Zeta system:** enters in Free Zeta System
Learn more in paragraph 8.6 "Free Zeta System"
- **Disable motors:** disables all stepper motors on the machine
- **Autocalibration:** Perform autocalibration procedure (see par. 8.2 "Autocalibration")

5.2.4. ADVANCED menu



BACK TO MAIN BOARD

Fig. 5.2.4 - Menu ADVANCED

Access it by clicking the ADVANCED button in the toolbar. It contains advanced tools and settings to be used extraordinarily with the instructions of the Manufacturer.

Legend:

- **SETTINGS:** Delta Settings, Continuous print, Extruder settings, Motion settings, Temperature settings, Bed touch, Filament sensor, Out of Plate Blocking, Access information, WIFI settings
- **MODE:** Send arbitrary commands, Reload UI, Test Mode, Camera
- **TOOLS:** Set Z Max, Manual Control, Manual Levelling

5.2.5. WIFI settings

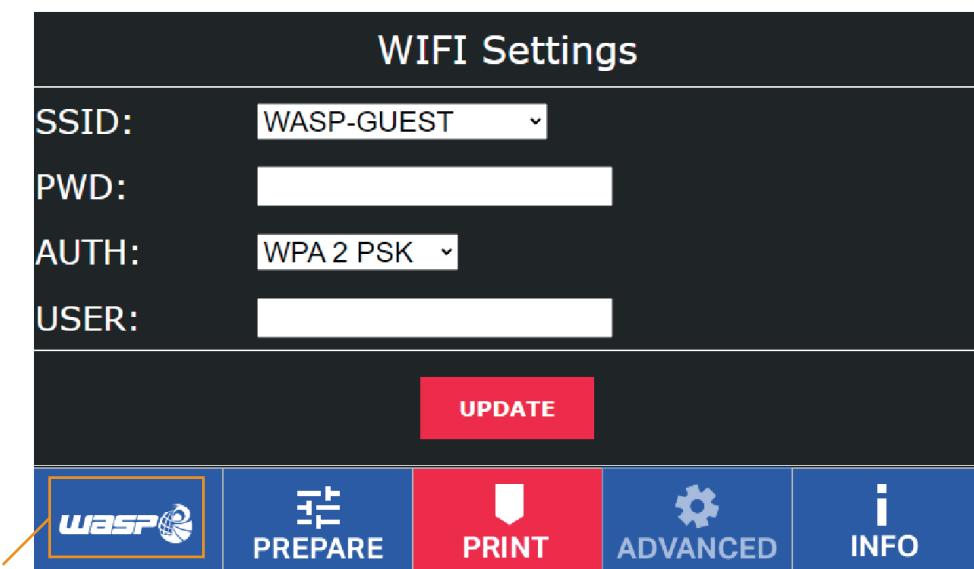


Fig. 5.2.5 - WIFI settings

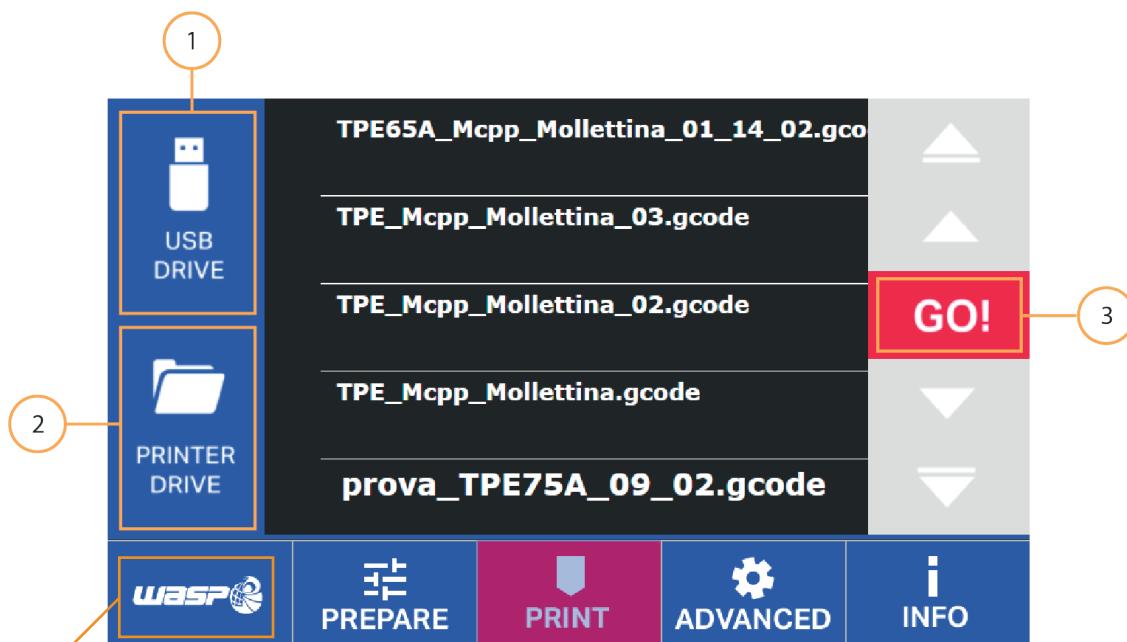
Access WIFI settings with ADVANCED>SETTINGS>WIFI settings
 With this window is possible to connect the machine to wifi network
 Learn more in paragraph 8.9 "Network and printing server"

Legend:

1. SSID: to chose the desired network between all visible ones (Static IP option available with cable)
2. PWD: Allows to insert a password, if present
3. AUTH: makes you specify what kind of connection you're working with
4. USER: Allows to insert user (if present)

Clicking UPDATE the machine restarts with new settings

5.2.6. GCODE



[BACK TO MAIN BOARD](#)

Fig. 5.2.6 - GCODE

From PRINT menu, by choosing GCODE you can launch gcodes and moving them from the USB to the printer. The gcodes are loaded in the machine as explained in detail in paragraph 8.7 "Loading .gcode"

Legend:

1. Chose to navigate USB Drive
2. Chose to navigate Printer Drive
3. GO: launches selected print

5.2.7. PRINTING board

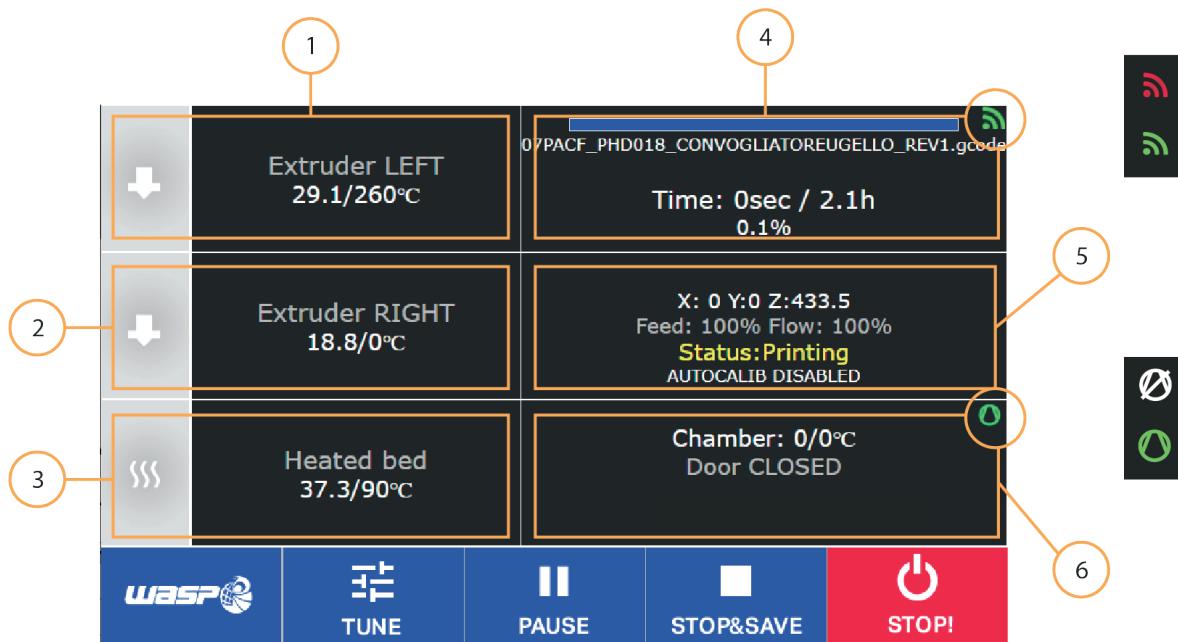


Fig. 5.2.7 - Printing board

During the print the board will be very similar to the Main board.
The toolbar changes introducing commands for printing: TUNE, PAUSE, STOP&SAVE, STOP.

Legend:

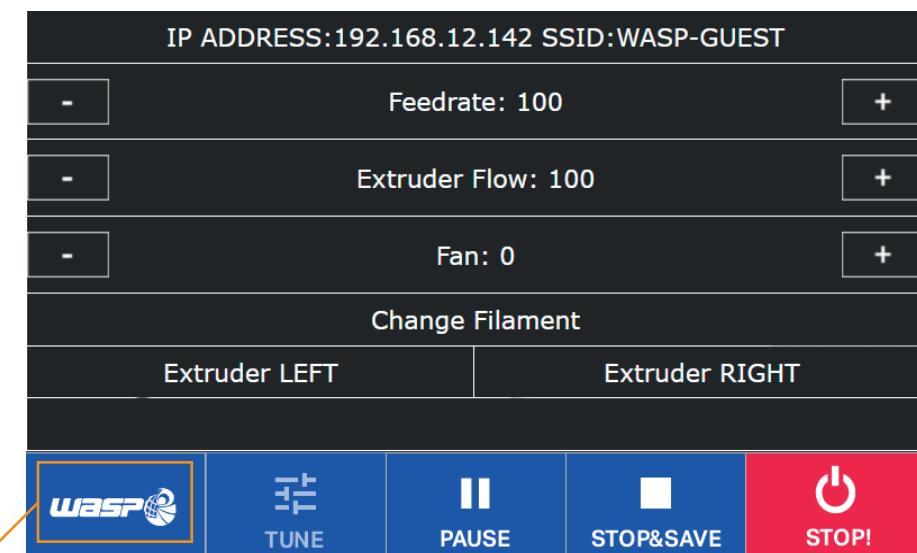
1. Left extruder temperature (click to set new target temperature)
2. Right extruder temperature click to set new target temperature)
3. Heated bed temperature (click to set new target temperature)
4. Name of the gcode printed, time count and estimated print time left, percentage of layers processed.
When the machine is connected the WIFI icon is green, when disconnected the icon is red.
5. State of the machine: OPERATIONAL/PRINTING/PAUSE/CANCELLING, Autocalibration ENABLED/DISABLED
6. Heated chamber (click to set new target temperature) - Door OPEN/CLOSED
When VACS is active VACUUM icon is green, when disabled the icon is white.

PAUSE: Pause the print with the possibility to resume it afterwards.

STOP&SAVE: Stop the print with the possibility to resume it afterwards with Resurrection System.

STOP: Abort the print without the possibility to resume it. Temperatures won't cool down after stopping.

5.2.8. TUNE menu



[BACK TO PRINTING BOARD](#)

Fig. 5.2.8 - TUNE menu

During the print its possible to access TUNE menu from the toolbar.
All the values changed using the tune menu won't affect the .gcode file used for the print.
The values will be stored in the machine until next reboot.

Legend:

1. IP ADDRESS and network
2. Feedrate: defines the speed of the process (standard is 100%, to tune it use + and - button and wait 3 seconds)
3. Flow: defines the amount of the flow (standard is 100%, to tune use + and - button and wait 3 seconds)
4. Fan: allows to set an user defined value for the fan (standard is 0 and max is 255, to tune use + and - button and wait 3 seconds) NOTE: this value doesn't take into account the value for the fan set on the gcode.
5. Change filament: pause the print and starts the procedure for loading a new spool on active extruder
6. Extruder LEFT/RIGHT: allows manually changing active extruder to the selected one.

5.2.9. Digit window



Fig. 5.2.9 - Digit window

The digit window is used when is necessary to define a numeric value.
Use the button to digit the desired value and confirm with the green button SET.
Use the CANC button to erase a digit.
Use BACK to exit the digit window.

5.3. First start

After having correctly connected the printer to the socket it is necessary to perform some operations in order to allow the printer to work.

Belt-stop clamps

Inside the printer there are three belts necessary for moving the extruder during printing.

To avoid movements of the extruder during transport, clamps are applied on the straps, this have to be removed before starting the print.

6 FIRST USE OF THE PRINTER

6.1. General warnings

The reading of this chapter assumes, in order to use the printer safely, the knowledge of the contents of paragraph 1.6 "General safety warnings".

Furthermore, the specific requirements for safe interaction with the printer, related to this chapter, are detailed in the following paragraphs.



ATTENTION:

The operations related to these activities must be performed by authorized and professionally qualified personnel.



ATTENTION:

Pay particular attention during the various stages of the procedures, it is essential to wear gloves because there is a risk of burns.



ATTENTION:

During operations, the operator must wear all the necessary Personal Protective Equipment (PPE).



NOTE:

- Visit the website www.3dwasp.com/en/download/ for the updated printing profiles, user manuals and useful resources for the use of the machine.

6.2. Preparing the 3D file

Make sure that the 3D model follows these guidelines:

- Watertight (manifold geometry and absence of defects)
- Correctly scaled
- Exported in .stl format (binary is generally to prefer)

6.3. Slicing software

The slicing software divides the 3D model into many sections, giving the user the ability to set temperature and print parameters, determining the quality of the printed product and the speed of the process.

The result of slicing is a text file in .gcode format containing all the coordinates of the movements, and the commands that the printer will execute.

Open the slicing software (eg Simplify3D) and load the .fff profile.

Load the .stl model and set the print parameters.

Save the .gcode inside the USB and insert it in the printer or use instead the wifi network.

6.4. Autocalibration

First of all remove the safety clips from the belts. To enable automatic calibration, when the machine is off, manually move the extruder and bring it into contact with the aluminum plate, at which point the printer can be switched on. If the automatic calibration sensor is detected successfully, the message "AUTOCALIBRATION ENABLED" will appear on the display, this will enable the command in the PREPARE menu.

Before starting the automatic calibration, it is recommended to set the desired bed temperature according to the material and wait a few minutes for the temperature to be evenly distributed.

Make sure that the printing plate is clean and the aluminum of the bed is clearly visible. there are no obstacles to contact with the extruder (anything other than aluminum or covering it needs to be removed/cleaned).

Also make sure that there are no printing residues on the extruder nozzle, it is advisable to clean the hot nozzle with a cloth or paper.

At this point it is possible to start the automatic calibration from "PREPARE> AUTOCALIBRATION", a warning message will appear on the display, which will make sure to clean the bed and the extruder, it will start the procedure that will last a few minutes.

Learn more on the Autocalibration procedure on paragraph 8.2 "Autocalibration".

6.5. Loading/unloading of the filament

To load the filament, proceed as follows:

1. Use the command PRINT>LOAD MATERIAL and follow the procedure in the display
2. Choose the extruder you want to load (LEFT for Left Extruder or RIGHT for Right Extruder)
3. Wait for the extruders to reach temperature.
4. Take the spool to be loaded into the printer by first removing it from its packaging.
5. Break off the first two centimeters of wire and straighten the first section so as to facilitate loading later.
6. Place the spool on the appropriate reel support
7. Insert the filament inside the inlet and slide it until it reaches the thread take-up hole.
8. Confirm on the display and wait for the extrusion process to finish

If another filament is already loaded in the extruder remove it following this procedure:

1. Use the command PRINT>UNLOAD MATERIAL and follow the procedure in the display
2. Choose the extruder you want to unload (LEFT for Left Extruder or RIGHT for Right Extruder)
3. Wait for the extruders to reach temperature.
4. Wait for the printer to unload the filament
5. Remove the spool from the spool holder on the material storage area.

6.6. Placing the printing plate on the vacuum bed

Before positioning the print plate, the compatibility with the print material must be checked.
It is possible to consult the documentation on www.3dwasp.com/en/support/

With the machine switched on, check the cleanliness of the aluminum vacuum bed.
The possible presence of debris can compromise the system's ability to reach the vacuum.

Place the silicone gasket in its slot.

With the door closed, activate the vacuum with the PRINT> VACUUM command.
Once clicked, the command will show the switch to ON and the pump will start working.

Open the door and place the build plate on the gasket centered
Aid the positioning by applying light even pressure on the plate.
Verify that the operation was successful by testing the adhesion of the plate.

Learn more on the Placing of the printing plate on paragraph 8.12 "VACS (Vacuum Active Control System)".

6.7. Selecting gcode

Select the printing file from: PRINT>GCODE .
Choose USB DRIVE to navigate the file in the external drive or PRINTER DRIVE to navigate the files saved in the internal storage of the printer.
Printing will start as soon as the printing bed and the extruder reach the pre-set temperatures.
After launching the print the USB drive can be removed as the .gcode is copied in the internal drive.

6.8. Function during the print

During the print, other functions such as tune, pause, change filament, stop and save and stop are available.
Check the paragraphs 5.2.7 "PRINTING board" and 5.2.8 "TUNE menu" to learn more.

6.9. Removal of the printing plate

When the printing plate has cooled down (below 50°C) deactivate the vacuum system with the PREPARE> VACUUM command.
Once clicked, the command will show the switch to OFF and the pump will stop working.
Wait 1-2 minutes to ensure a gradual release of the print plate.

6.10. Detaching of the printed parts

Hold the printing plate and detach the print by practicing a slight bending on the plate or with the help of a spatula just if necessary.

For information and support please visit F.A.Q. section on our website: www.3dwasp.com

7 ORDINARY AND EXTRAORDINARY MAINTAINANCE

7.1. General warnings

The reading of this chapter assumes, in order to use the printer safely, the knowledge of the contents of paragraph 1.6 "General safety warnings".

Furthermore, the specific requirements for safe interaction with the printer, related to this chapter, are detailed in the following paragraphs.



ATTENTION:

The operations related to these activities must be performed by authorized and professionally qualified personnel.



ATTENTION:

Pay particular attention during the various stages of the procedures, it is essential to wear gauntlets because there is a risk of burns.



ATTENTION:

During operations, the operator must wear all the necessary Personal Protective Equipment (PPE).



7.2. Ordinary maintenance

Periodic maintenance and correct use are essential to ensure the functionality, safe operation and durability of the printer. The maintenance interventions and the required interventions are carried out by the mechanical maintenance technician who must operate in compliance with the safety instructions contained in this manual.



ATTENTION:

The maintenance operations must be carried out by disconnecting the printer from the power source by unplugging the power plug.



NOTE:

In case of replacement of components during maintenance, they must be replaced with identical and original components.

Part	Kind of intervention	Period	Procedure
Belts	Tension control	160 h	Par. 7.2.1
Arms ball joint	Lubrication	160 h	Par. 7.2.2
Fans	Check if working	160 h	Par. 7.2.3
Sliders	Check plays	160 h	Par 7.2.4
Ooze shield protection	Replacement	If damaged	Par 7.2.5
Nozzle	Cleaning and replacement	If clogged	Par 7.2.6
HEPA filter	Replacement	320 h	Par 7.2.7

7.2.1. Belts

Tension monitoring

Turn off the machine and open the door.

Manually check that the tension between all the belts results uniform.

If it is possible to perceive an important difference in tension on one of the belts, contact the Manufacturer addressing support@3dwasp.com

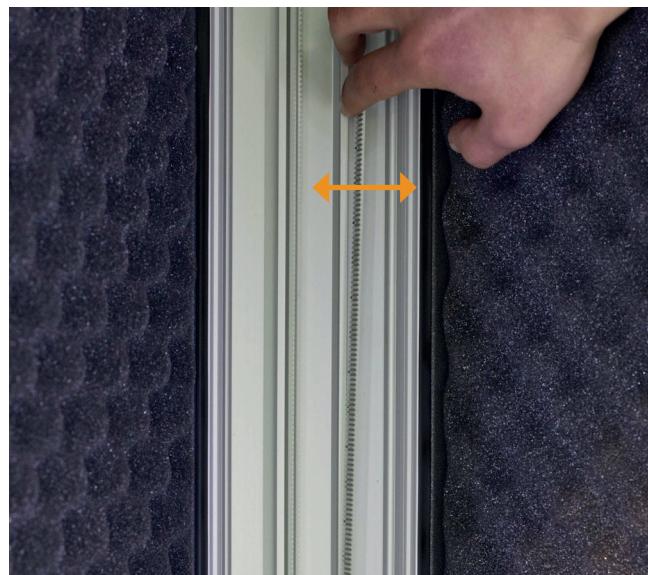


Fig. 7.2.1- Monitoring the tension of the belts

7.2.2. Ball joints

Lubrication

Turn off the machine and open the door.

Check the mobility / stiffness of the arm joints.

Apply machine tool lubricant and gently move them manually. Wipe off excess oil

This will preserve the optimal functioning of the mechanics.

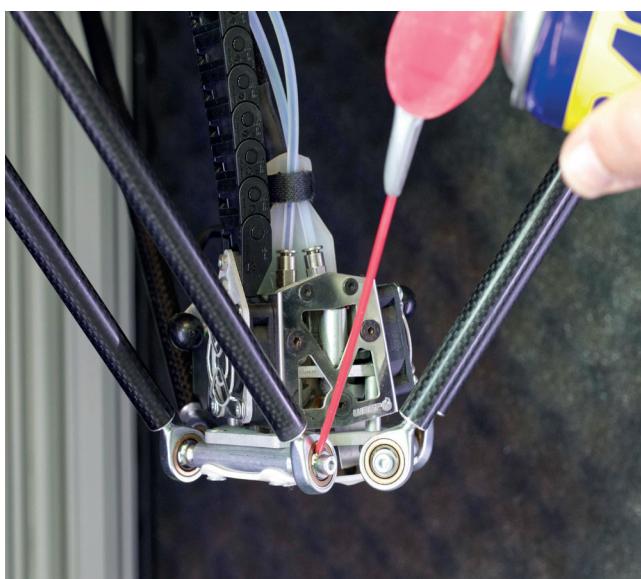


fig 7.2.6 a



fig 7.2.6 b

Fig. 7.3.1- Ball joints lubrication

7.2.3. Fans

Check if working

Turn on the printer.

Check the fans:

- on the side of the extruder,
- below each filament driver
- on the top of the machine.
- on the heaters

All the fans should work at minimum speed when the machine is turned on.

If one or more of the fans are not working contact the Manufacturer addressing support@3dwasp.com

7.2.4. Sliders

Check plays

Check that the arm sliders do not have any play between them and the sliding aisle, if it is present, contact the manufacturer

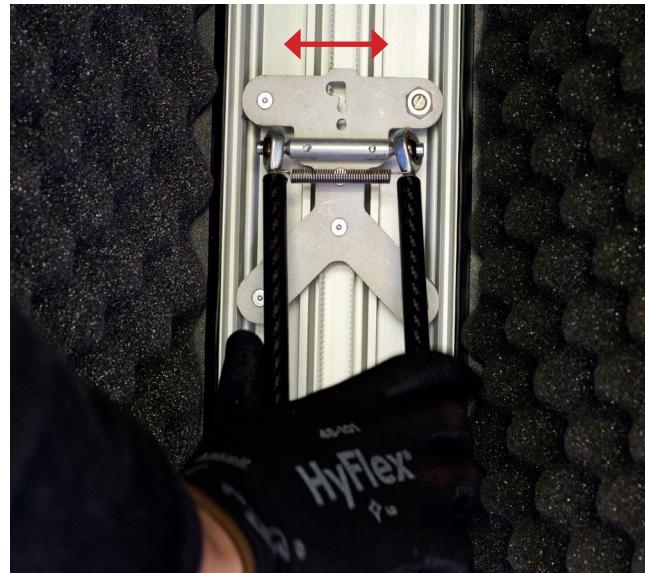


Fig. 7.2.4 - Check plays on the sliders

7.2.5. Ooze shield

To replace the Ooze shield, deform it by allowing it to be removed by the six screws underneath the extruder. To assemble the new protection, widen it by hooking the holes provided on the six screws under the extruder. The protection can be cleaned to continue using it or be replaced with a new one in the event of breakage.

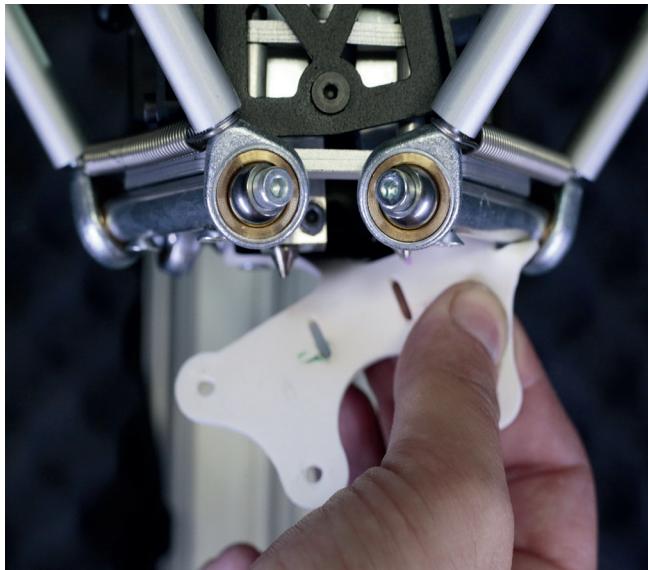


fig 7.2.6 a

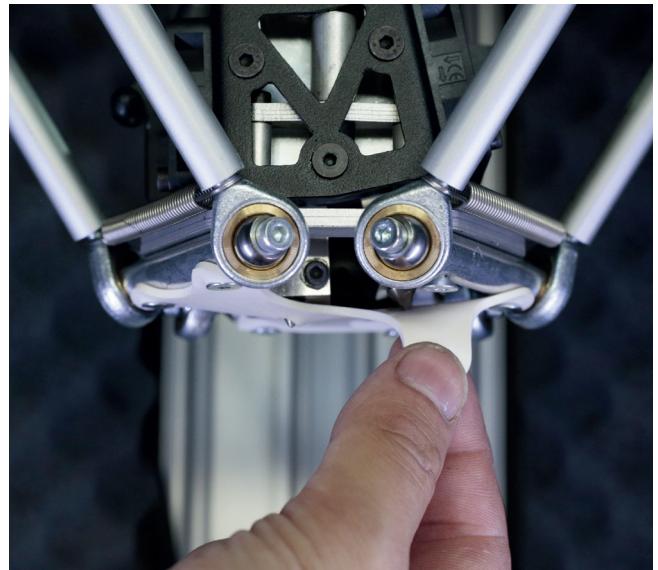


fig 7.2.6 b

Fig. 7.3.1- Removal of Ooze shield

7.2.6. Nozzle

Cleaning the nozzle

In the event that the extruder is clogged, it is possible to clean it using the appropriate cleaning kit.

- Heat up the nozzle to be cleaned at the melting temperature of the last material printed
- use the needle provided in the kit to penetrate the nozzle and move the needle
- Check again the extrusion

To clean the extruder consult the material present on the website www.3dwasp.com.

For additional information or if you think your extruder is compromised contact support@3dwasp.com

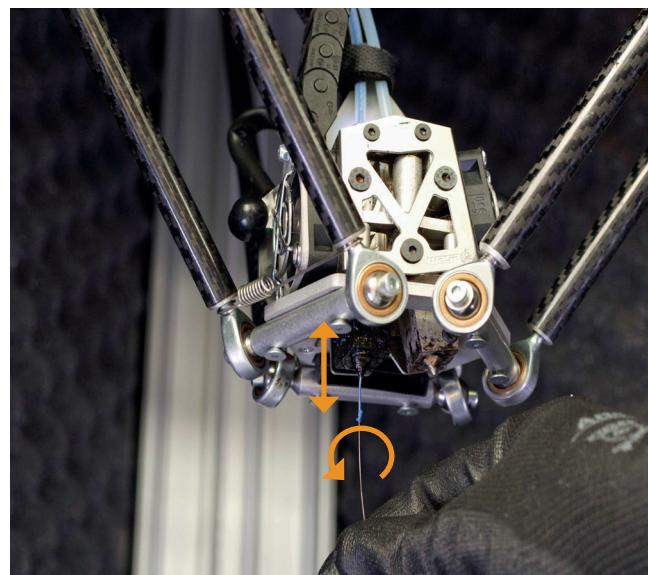


Fig. 7.2.6 - Cleaning the nozzle

Changing the nozzle

Changing nozzle is only recommended when:

- The print looks inconsistent due to a clogging
- Necessity of changing nozzle's diameter
- Necessity of using a nozzle in different

1. Turn on the printer
2. For removing the nozzle bring the chosen extruder at the previously used temperature, then wait few seconds.
3. Perform the removal of the filament as described in paragraph 5.3 "First Start"
4. Remove the Ooze shied protection as described in paragraph 7.2.5 "Replacing Ooze shield protection"
5. Unscrew and remove the nozzle using the provided wrench, pay attention to hot surfaces.
6. Tighten back the new nozzle fixing it in its position.
7. Place back the Ooze shied protection as described in paragraph 7.2.5 "Replacing Ooze shield protection"
8. Perform the loading of the filament as described in paragraph 5.3 "First Start"

After a nozzle replacement is recommended to carry the Autocalibration (see paragraph 8.2 Autocalibration).



fig 7.2.6 a



fig 7.2.6 b

Fig. 7.2.6 - Changing the nozzle

7.2.7. HEPA filters



ENVIRONMENTAL NOTE:

Once an HEPA filter has been replaced, it must be disposed of in accordance with the directives in force in your country and region.

The replacement of the HEPA filter is carried out with the machine turned off.

1. Open the printer door
2. Unscrew the knob securing the protective plate of the first HEPA filter
3. Remove the HEPA filter protection plate by gently pulling towards the door
4. Use the retaining clip to remove the HEPA filter.



fig 7.2.8 a



fig 7.2.8 b



fig 7.2.8 c



fig 7.2.8 d



fig 7.2.8 e



fig 7.2.8 f

Fig. 7.2.9- Replacement of HEPA filters

7.3. Extraordinary maintenance

**ATTENTION:**

Extraordinary maintenance operations must be carried out by the Manufacturer's Technicians or by maintenance personnel who have been instructed and authorized by the Manufacturer.

Any of these operations not carried out by a manufacturer's technician can cause irreversible damage to the machine or its parts and therefore renders the warranty null and void.

Extraordinary maintenance interventions are those that are carried out:

- On the occasion of exceptional events, such as revisions;
- Stopping due to breakage of mechanical or fluid parts;

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7.3.1. Removing core from Zen X Extruder

1. With machine turned on use "Autohome" command from menu PRINT>AUTOHOME
2. Perform the removal of the filament as described in paragraph 5.3 "First start"
3. Turn off the machine
4. Remove the velcro band
5. Remove the PTFE pipes by pushing down the crowns and pulling up the pipes
6. Unplug the connector
7. Remove the OOZE SHIELD as described in paragraph 7.2.6 "Replacing Ooze shield protection"
8. Unscrew and remove the two central-external fixing screws when holding with strength the extruder block itself
9. Remove the extruder block from the extruder carter

After a core replacement is recommended to perform the Autocalibration (see paragraph 8.2 Autocalibration).



fig 7.3.1 c



fig 7.3.1 d



fig 7.3.1 a



fig 7.3.1 b

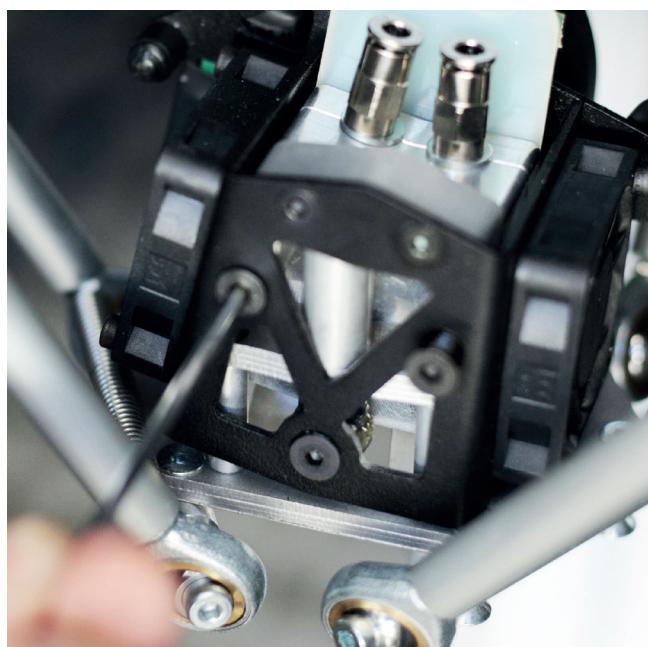


fig 7.3.1 c

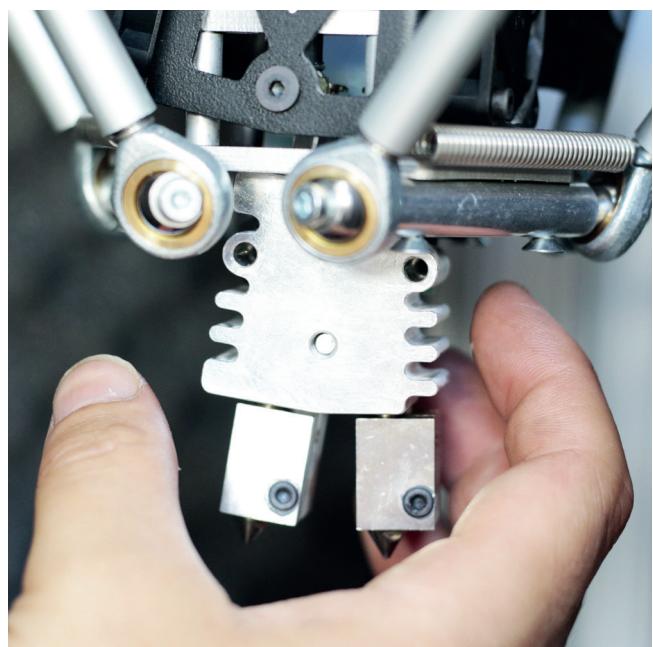


fig 7.3.1 d

Fig. 7.3.1 - Removing the Core from ZEN X Extruder

7.3.2. Manual leveling


ATTENTION:

The manual leveling procedure will erase the values saved during the last autocalibration procedure. These values will be permanently deleted.

Manual leveling is a command that allows you to adjust the inclination of the aluminum bed in order to match the printer's reference. A bad leveling can be the cause of a non-homogenous sticking to the bed on the first layer.

The command is found in ADVANCED>TOOLS>MANUAL LEVELING

Based on the three-point principle, the machine moves the tool to the vertices of an equilateral triangle proportional to the aluminum bed.(fig 7.3.2 a)

At each point, by rotating a screw, the distance between the tool and the bed is adjusted. (fig 7.3.2 b-c-d-e)

Use a piece of paper(80-90 gr) as thickness between the bed and the nozzle.

Once completed, verify that the height in the center of the bed is similar to the other points. (fig 7.3.2 f)
If it's not, contact the Manufacturer for support.

After manual leveling is recommended to carry the autocalibration procedure(see paragraph 8.2 Autocalibration).

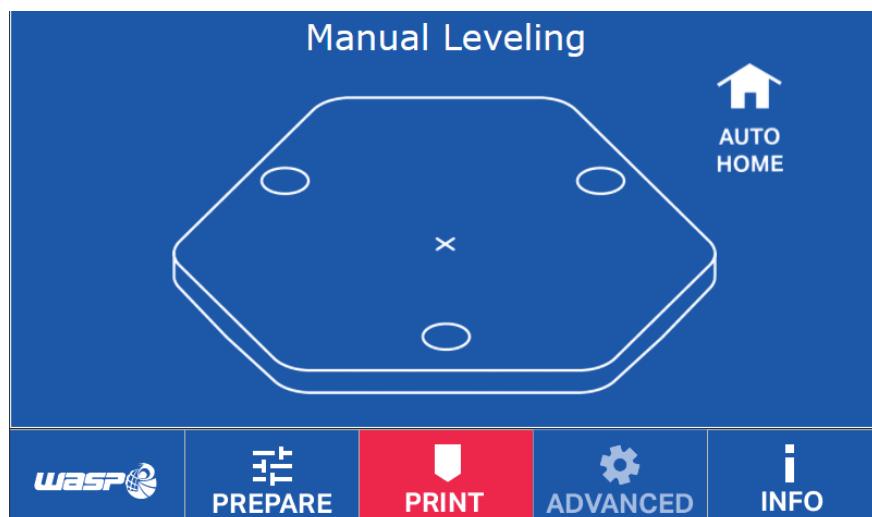


fig 7.3.2 a

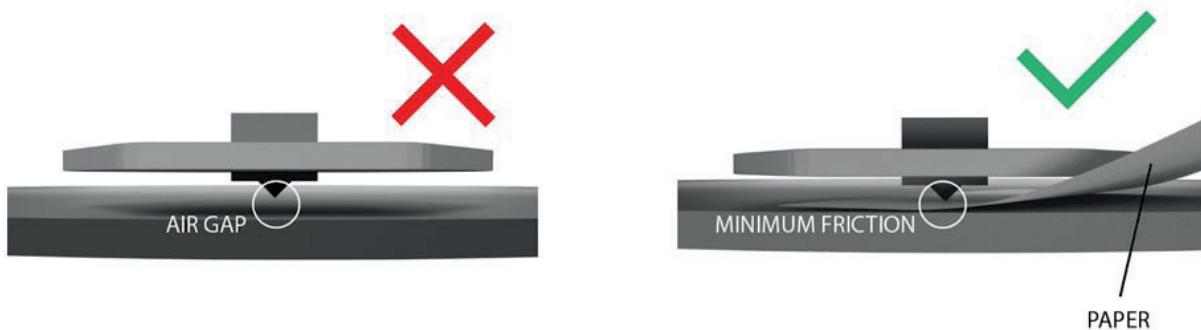
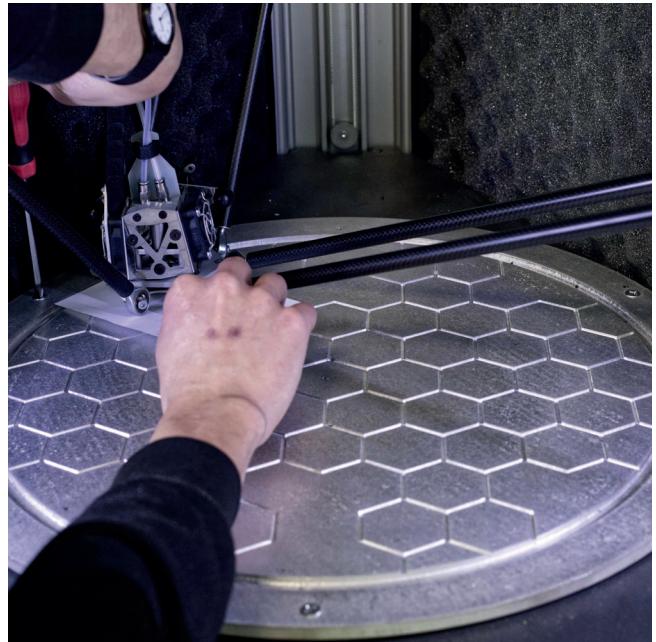
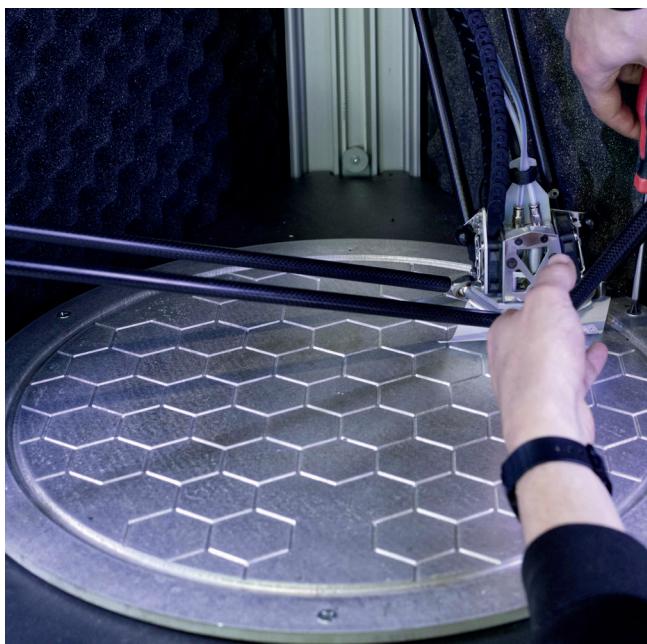


fig 7.3.2 b

Fig. 7.3.2 - Manual Leveling

**fig 7.3.2 c****fig 7.3.2 d****fig 7.3.2 e****fig 7.3.2 f****Fig. 7.3.2 - Manual Leveling**

8 USE OF THE PRINTER

**ATTENTION:**

The operations related to these activities must be performed by authorized and professionally qualified personnel.

**ATTENTION:**

Pay particular attention during the various stages of the procedures, it is essential to wear gauntlets because there is a risk of burns.

**ATTENTION:**

During operations, the operator must wear all the necessary Personal Protective Equipment (PPE).

**NOTE:**

The procedures of use of the printer described in this section are presented in alphabetical order.

If you need a guided printing procedure, see section 6 "First use of the printer"

8.1. Adhesion to the bed

The adhesion to the plate takes place during the deposition of the first layer and is essential for the success of the printing.

Before reading this paragraph make sure to read and understand the paragraph 8.12 "VACS - Vacuum Active Control System".

The fundamental points of a good adhesion are:

- Good calibration of the printing bed
- Right printing plate or glue (based on the material to be printed)
- Adequate speed, flow and nozzle temperature in the first layer
- Adequate printing floor temperature (basing on the material to be printed)

It is recommended to monitor the adhesion between first layer and bed during the first minutes of each print.

In order to control the sticking on the first layer some print settings can also be used:

- Raft: creates an interface structure before printing the actual part, improving a lot the adhesion and resolving minor calibration imperfections.
- Brim: creates additional external perimeters on the base of the object increasing the sticking surface and stabilizing the extrusion before the print.
- First layer height: the height of the first layer can be increased to resolve minor calibration issues

If the extrusion of the material on the first layer is particularly scarce or even absent, check that:

- The extruder is not clogged, with the procedure displayed in paragraph 8.8 Manual Control
- The extruder is not printing too close to the bed (preventing extrusion during the print)
- The extruder temperature is actually the one needed for the material in use

8.2. Autocalibration

The self-calibration procedure allows the printer to calibrate itself automatically thanks to a system based on the electrical contact between each nozzle and aluminum vacuum plate.

to ensure the electrical contact of the parts, it is important to make sure that there is no material that prevents the two parts from touching.

For this reason it is important to make sure that

- each nozzle is perfectly clean from plastic and dirt
- the print bed is well cleaned of plastic and dirt

Avoid using abrasive materials and cleaning solvents.

8.2.1. Enable Autocalibration procedure

The autocalibration needs a specific procedure to be enabled:

1. Clean the nozzles and bed as described previously
2. Remove the removable printing plate from the aluminum vacuum plate
2. Heat up the nozzles to the temperature of 220°C
3. Use the command PREPARE>DISABLE STEPPERS
4. Lay down gently the nozzle on the bed so that they touch
5. Use the command PREPARE>AUTOCALIBRATION
6. Notice AUTOCALIBRATION ENABLED message on the main window

8.2.2. Launch Autocalibration

After the procedure for enabling the Autocalibration (paragraph 8.2.1) the actual Autocalibration command can be started using the command PREPARE>AUTOCALIBRATION.

The printer will start to heat up nozzles and bed.

The autocalibration will start automatically and takes few minutes.

After a correct Autocalibration the printer will have saved various values useful for its best functioning. These values can be lost in case of

- manual leveling
- manual changes in advanced settings
- firmware update (without storing the values)

8.2.3. When is Autocalibration necessary?

The auto calibration is saved in the machine and with the exception of the above cases there is no need to repeat the operation every time the machine is turned on.

Instead, it is recommended to repeat the operation whenever:

- The machine results badly calibrated from the first layer (see paragraph 8.1 Adhesion to the bed)
- A nozzle is replaced
- An extruder is replaced
- A procedure of manual levelling is carried out

8.3. Continuous printing

Continuous printing is an option to print in sequence with the two nozzles.

It's possible to activate it using ADVANCED>SETTINGS>CONTINUOUS PRINTING.

The printing starts with the left extruder and as soon as the end-filament sensor of the first nozzle realizes that it is without material, it switches the second nozzle which continues processing, conserving temperatures and settings.

Requirements to be taken into consideration:

- The nozzles must both be well calibrated
- Neither nozzle must be clogged
- The material must be correctly loaded on both nozzles
- The filament feed sensor must not be disabled in the advanced settings

The Continuous printing system will automatically disable after each print.

8.4. Deleting .gcode from the machine

To delete gcode from the machine memory enter into the gcode' list from the PRINT menu.

Click and hold the gcode you want to delete for at least three seconds, then select OK in the warning message that appears.

The printer server also makes it possible to manage, upload, download and erase gcode, see paragraph 8.9 "Network and printer server".

8.5. Dual extruder calibration

The Zen X extruder is composed of two extrusion modules to allow multi-color and multi-material prints. It could happen that the two extruders are not calibrated to each other.

In the case of the Zen X extruder, calibration requires, in addition to the normal calibration (plane leveling and height modification), an offset setting procedure between the two tilting nozzles.

Acess the command for Zen X extruder calibration from ADVANCED>TOOLS>DUAL EXTRUDER CALIBRATION

The calibration of the Zen X extruder is based on the principle of the nonius, used in the common caliber. It consists of two overlapping grids with slightly different sized cells, where each line corresponds to a tenth of a millimeter (0.1mm).

The position of the second extruder (T1) with respect to the first (T0) will depend on the coordinate that precisely overlaps the other.

Suppose we have already printed the calibration file and the grids perfectly match the coordinate $x = 4$, $y = 3$, so we will have to add 0.4mm to x and 0.3 to y .

The calibration values found must be added to those already existing (or subtracted in the case of negative values) in Advanced> Movement> Extr Settings

Relaunching the file after setting the new calibration values, we will realize that the corresponding coordinate will be $x = 0$, $y = 0$

Then proceed with an Autocalibration procedure (par 8.2 "Autocalibration").

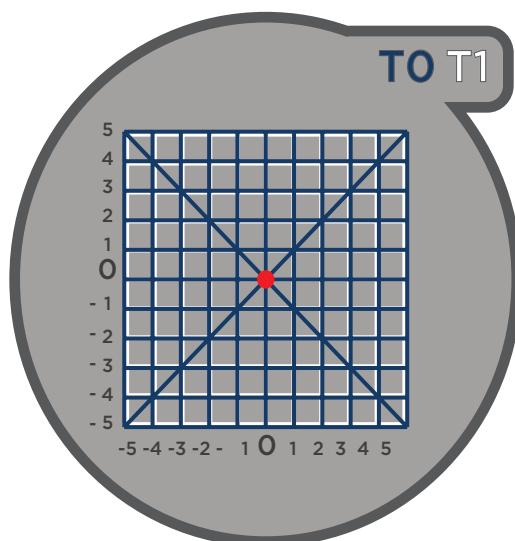


Fig. 8.5a- Explaining of calibration grid

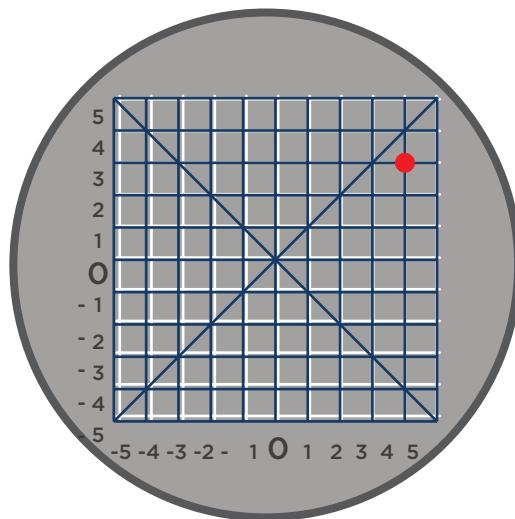


Fig. 8.5b- Example of non correct calibration grid

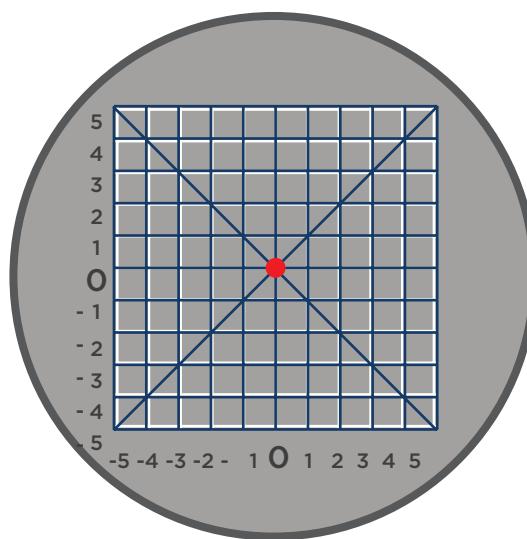


Fig. 8.5c- Example of correct calibration grid

8.6. Free zeta system

The Free Zeta system is a useful command to resume interrupted prints that for any reason it was not possible to recover with the Resurrection system.

It is based on the principle of restarting to print a chosen gcode from a certain height onwards, so that the first layer of the new print adheres to the last printed layer.

Some scenarios where it can be useful are:

- The Resurrection automatic save was not successful
- The machine ran out of material but for any reason continued to print
- The nozzle stopped during printing but the machine has continued to print

The cases in which it is not possible to recover the print are when:

- The printed part detached the printing floor
- The printed part broke during the press
- The deformation of the piece is such that it is not possible to recover the print

To run the Free Zeta system correctly.

1. Activate the VACS paying attention not to move the printing plate.
2. Bring the machine floor into temperature
3. Select the "Free Zeta system" command from the PREPARE menu (fig. 8.4)
4. Go down with the navigator on the interface until the nozzle is extremely close to the last layer of the printed object (fig. 8.7b)
5. Click the GO FOR GCODE button
6. Select the gcode to be recovered and launch the print.

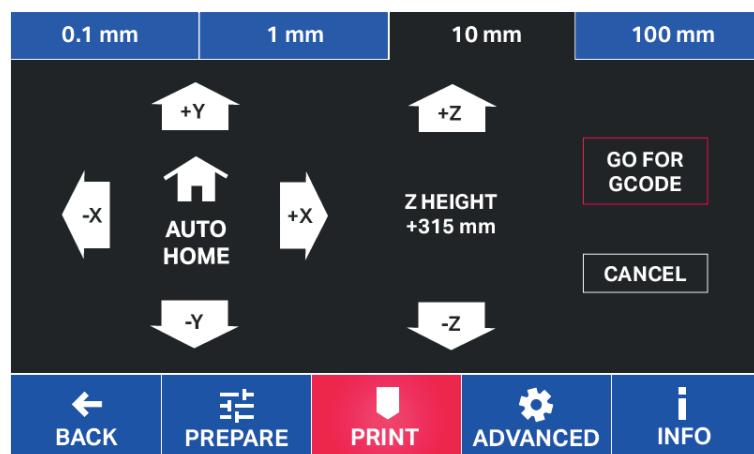


Fig. 8.6 - Free Zeta System

8.7. Loading .gcode

The gcode can be loaded in two ways:

- Using a USB pendrive
- Using the Wi-fi module

8.7.1. Loading with pendrive USB

7. Correctly save the file in .gcode format on the USB pendrive.
8. Safely remove the pendrive from the computer and insert it into the machine front USB port.
9. Use PRINT>START PRINT
10. Search for your file's name and select it for printing.
11. Once the printing has started, the file is saved inside the machine's memory and the USB pendrive can be removed.

8.7.2. Loading with Wi-fi

- Access the printer server from your browser.
- Enter the "Control" page and click on "Upload gcode"
- Choose the gcode in your device.
- Wait for the .gcode to load.
- After being loaded the file is selectable for printing.

If the internal memory of the printer is full it will not be possible to add other gcode and you will need to delete files to free up space. See paragraph 8.4 "Deleting gcode from the machine"



Fig. 8.7a - Loading gcode from USB pendrive

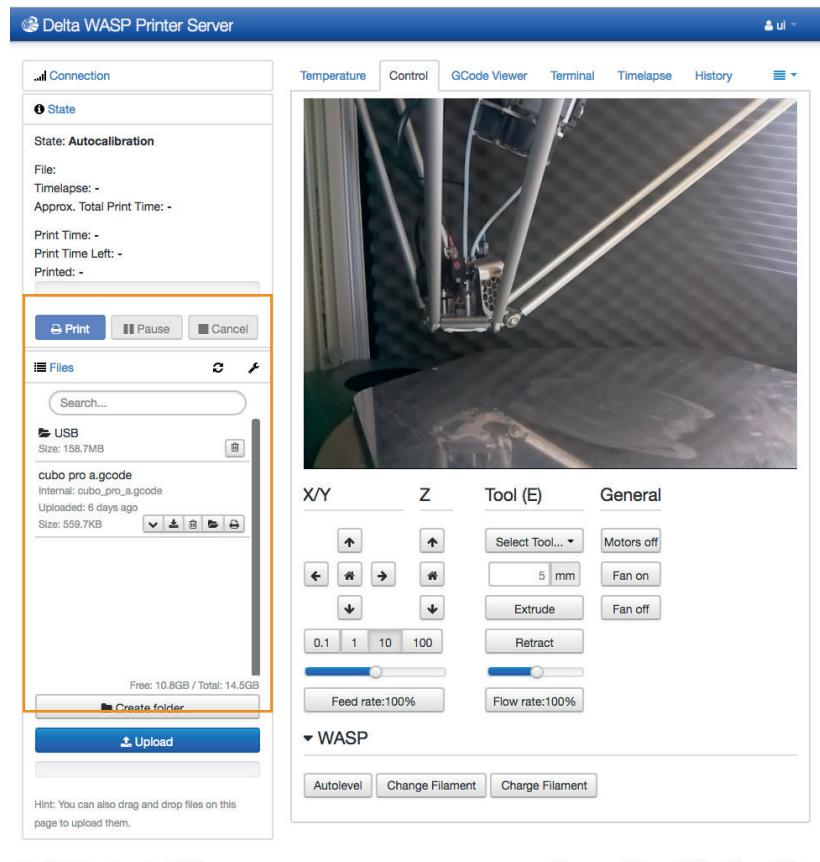


Fig. 8.7b- Loading the gcode on printer server

8.8. Manual control

Manual control is a tool accessible when the machine is turned on and operational.
With this tool it's possible to control manually all the motors in the machine: X(left column),Y(right column),Z(back column) and E(filament threader).

MOVING X, Y or Z axis

The procedure for moving X,Y or Z axis is:

1. Use the command PRINT>AUTOHOME
2. Access ADVANCED>TOOL>MANUAL CONTROL
3. Select from the bar on the top the desired scale in mm
4. Choose +X, -X, +Y, -Y, +Z or -Z to command the machine the movement in the specified direction

Remember that whenever the machine touches an endstop the operation will be aborted.

EXTRUDING or RETRACTING (E axis)

The procedure for moving X,Y or Z axis is:

1. Assign the extruder to move a target temperature depending on the material loaded
2. Use the command PRINT>AUTOHOME
3. Access ADVANCED>TOOL>MANUAL CONTROL
4. Select from the bar on the top the desired scale in mm
5. Choose EXTRUDE(+E) to extrude material and RETRACT(-E) to retract material

The speed of movement for the Manual Control command is fixed.

For materials with low Melting Flow Index or highly compressible the Manual Control extrusion could be too fast. In that case choose a lower scale value (for example 1mm instead of 10 mm)

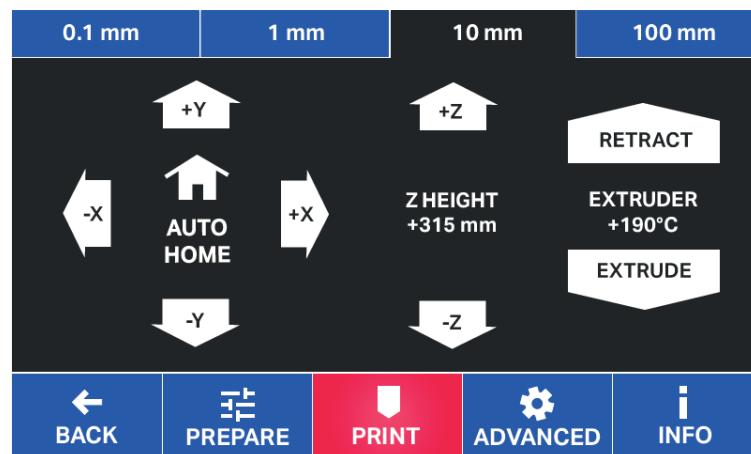


fig. 8.6- "Manual control" command inside Prepare menu

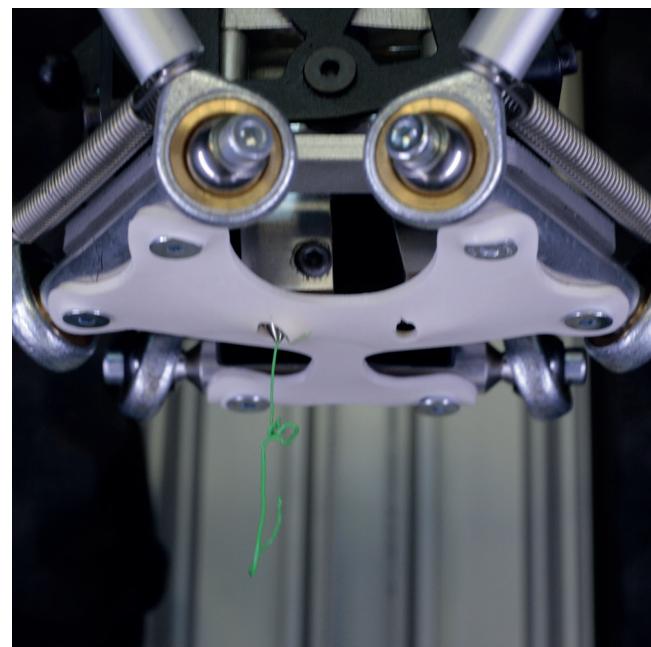


fig. 8.6- Manual extrusion of the filament

8.9. Network and printing server

8.9.1. Wi-fi connection

The wi-fi network for the connection of the machine must be:

- safe
- stable
- managed by those who manage the machines
- does not overcharge
- correctly connected to the internet
- possibly dedicated to computer-printer communication

To correctly connect the machine to a wifi network:

1. Make sure the wifi network is switched on and visible
2. Turn on the machine
3. Enter the advanced> wifi settings menu
4. Fill in the format choosing among the visible networks that request, enter password (if any) and username (if necessary)
5. The machine will reboot and if the information is correct it will be connected to the chosen wifi
6. In the machine's main screen will appear an information about the wifi connection (including the IP address of the machine to connect with the computer)

When the wifi settings are set the machine will try to automatically reconnect to the saved wifi network as it is turned on.

8.9.2. Wired connection (Static IP)

To use a wired network instead of wifi, there must be a DHCP server on the network that can automatically configure the printer.

In case a manual configuration is required (FIXED IP) it will be possible to do it through the WIFI configuration by selecting "NOWIFI / STATIC IP"

When the wifi settings are set the machine will try to automatically reconnect to the saved wifi network as it is turned on.

8.9.3. Printer server

Once the machines is connected to the network can be controlled through a computer's browser connected to the same wifi network as the printer.

To access the printer server:

1. Make sure that both the computer and the printer are connected to the same network
2. Enter the IP address that appears on the machine into the browser's URL * (eg <http://192.128.12.114>)
3. The browser will enter the printing server for monitoring and controlling the machine "
4. To access all the functions log in on "Octoprint" with the generic username "user" and password "password"

* Changing browsers can change the use's possibilities and the view's correctness.

In the absence of a fixed and stable network it is also possible to set up a wifi hotspot from a smartphone or tablet, proceeding in the same way as described above.

With the same IP address you can also connect from smartphone, tablet or any device with the use of a browser and the possibility to connect to the wifi.

All protocols work independently on Windows operating system, OSX, Linux.

8.9.4. Printer server features

The printer server features several functions for the control and monitoring of the machine:

- Gcode manager (upload, download and erase)
- Print job history
- Camera for remote monitoring of the print on the first layers
- Monitoring of the printer in Operational state
- Monitoring of the printing process in Printing state
- Gcode viewer (with real time advancement)
- Terminal (for monitoring and arbitrary commands)
- Control of the temperatures: Nozzles, Heated bed, heated chamber

Even if the print server architecture contains functions other than those mentioned above, they may not be stable or compatible with the machine.

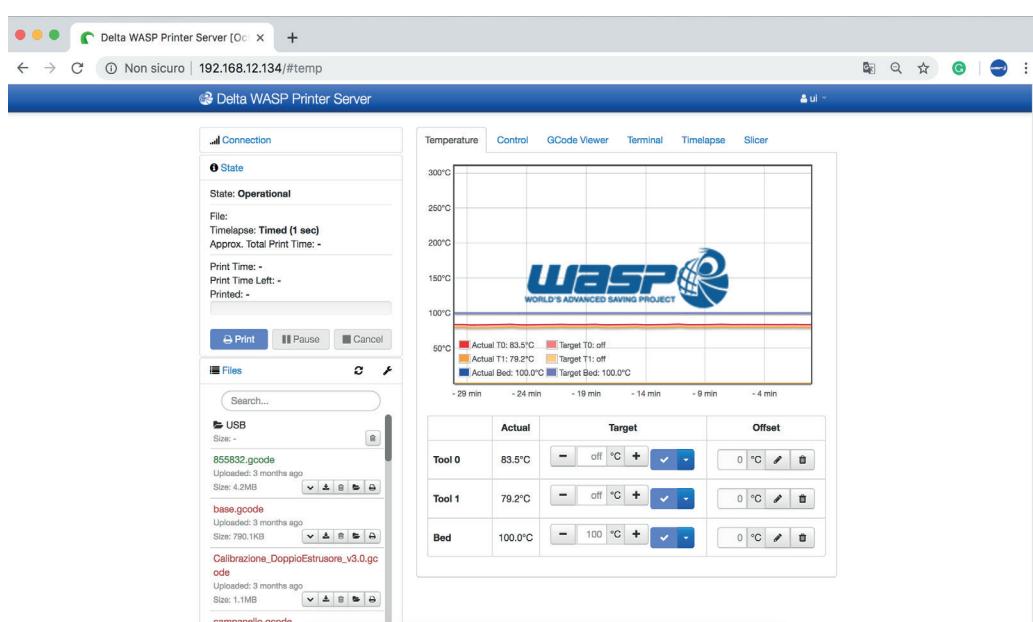


Fig. 8.9c- Printer server home

8.10. Resurrection system

The Resurrection system is a command for the automatic recovery of the print jobs interrupted by a sudden switch-off during processing.

The system is designed in particular for:

- Blackouts and sudden power failures during printing
- Accidental removal of the power cord during printing

The Resurrection system banner(fig 8.10) appears anytime a print has been interrupted for any reason and we access the PRINT>START PRINT menu.

When the command STOP&SAVE is used to interrupt a print the process can be resumed\using the Resurrection System banner.

Make sure to reactivate the VACS before restarting your printer as the shutdown may have released the printing plate.

In addition, it should be considered that in the time span between turning off the machine and launching the "Resurrection" command, the printed piece is cooled and this in some cases may cause problems in recovering the print.

8.11. Set Z max

The height (often called Z max) of the printer is the value that defines the distance between the nozzle and the print bed when it is in its zero position (home).

The height is part of the calibration values of the machine and the right value is essential for good operation.

This value is automatically saved by the machine during autocalibration.

After the AUTOHOME command it is possible in the main board to see among the values shown the Z max saved in the machine (indicated as Z).

The command for manually setting a Z Max value can be found inside ADVANCED>TOOLS> Set Z max.(fig 8.11 a)

1. With a scale value of 100, click on the -Z arrow making the nozzle descend to about 20 cm above the printing surface.
2. Select the scale value at 10 mm
3. With scale value 10, click on the -Z arrow making the nozzle descend to about 2 cm above the printing surface.
4. Select the scale value at 1 mm
5. With scale value 1, click on the -Z arrow making the nozzle go down to about 2 mm above the printing surface.
6. Select the scale value at 0.1 mm
7. With a scale value of 0.1, click on the -Z arrow making the nozzle go down until a slight friction is felt by placing a sheet of paper between it and the top.(fig 8.11 b)
8. Click on the SET Z MAX button to save the new value or CANCEL to cancel the operation

It is necessary when it is not possible to perform an Autocalibration and in one of the following cases:

- Nozzle replacement
- Extruder's replacement

NOTE:

If the height set is lower than this measure, the tool will work higher than necessary, in that way the material will not attach properly to the floor.

If the height set is higher than required, the tool will work

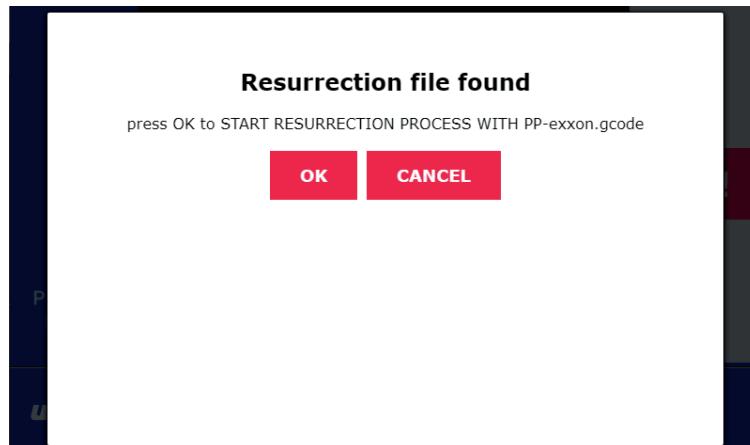


Fig. 8.10 -Resurrection system banner

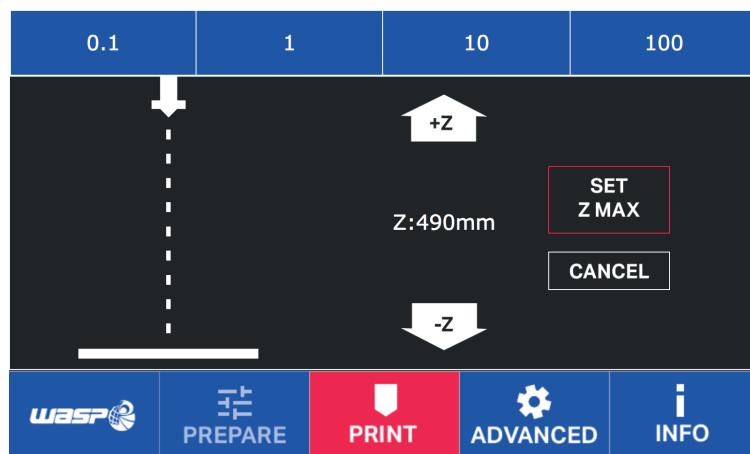


Fig. 8.11a -SET Z MAX window

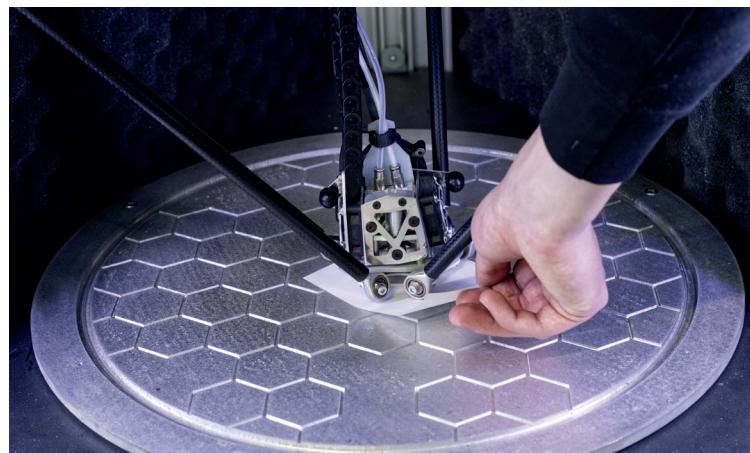


Fig. 8.11b - SET Z MAX procedure

8.12. VACS (Vacuum Active Control System)

**WARNING:**

The procedure for positioning and removing the removable printing plates must always be carried out when the read temperature of the plate is equal to or lower than 50 °C.

Forcing the detachment of the removable printing plate at higher temperatures may cause more or less severe deformation of the plate itself.

The VACS (Vacuum active control system) is the system that the machine uses to guarantee a removable printing base.

The characteristics of this system are:

- Ability to remove the plate after printing to facilitate the detachment of the part
- Ability to easily replace a compromised print plate
- Ability to use plates in different materials for better chemical compatibility

Before moving further with the use of the system make sure to understand the

1. With the machine turned on, check the cleanliness of the aluminum vacuum bed. (fig 8.12a)
The possible presence of debris can compromise the system's ability to reach the vacuum.
2. Place the silicone gasket in its slot (fig 8.12b)
3. With the door closed, activate the vacuum with the PRINT> VACUUM command.
The switch should change from OFF to ON.
4. Once clicked, the command will show the switch to ON and the pump will start working.
5. Open the door and place the removable printing plate on the gasket centered
6. Help the positioning by applying light even pressure on the plate. (fig 8.12c)

Verify that the operation was successful by testing the adhesion of the plate.

If the plate is not solidly anchored to the aluminum vacuum bed, it means that the operation was not successful.

In this case repeat the procedure from point verifying:

- Cleaning the aluminum vacuum bed, cleaning it if necessary
- Integrity of the gasket, replacing it if necessary
- Flatness and integrity of the removable printing plate, replacing it if necessary.

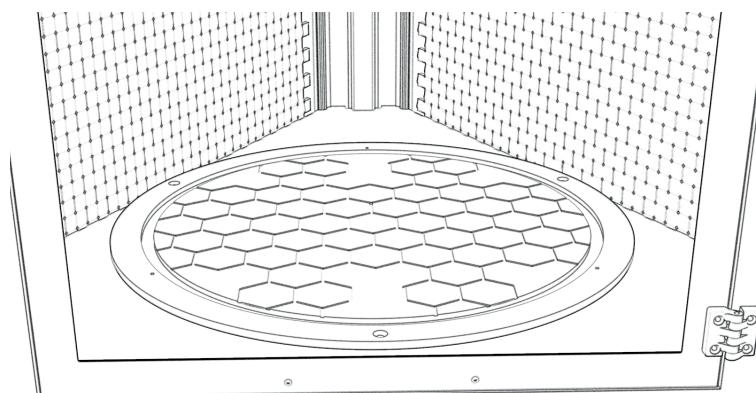


Fig. 8.12a - Clean the aluminum vacuum bed

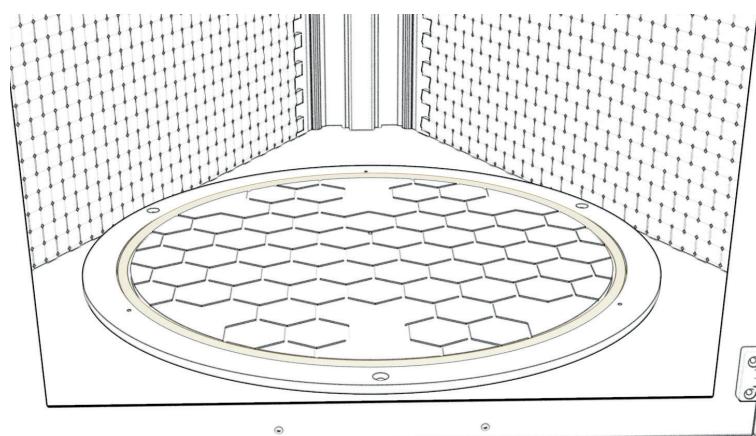


Fig. 8.12b - Placing the silicone gasket

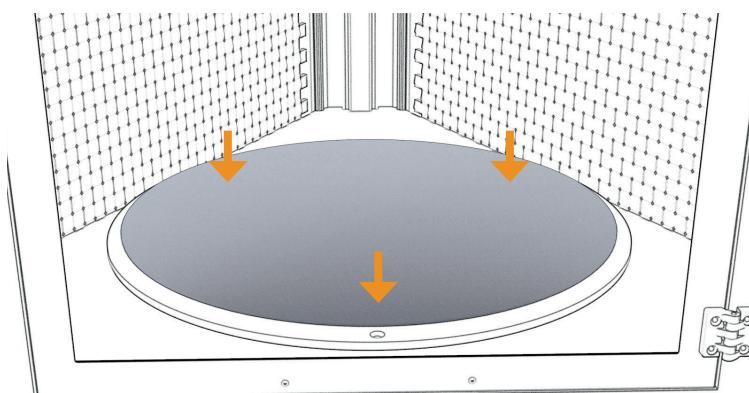


Fig. 8.12c - Position the removable printing plate

9 ADDITIONAL INSTRUCTIONS

9.1. General warnings

The reading of this chapter assumes, in order to use the printer safely, the knowledge of the contents of paragraph 1.6 "General safety warnings".

Furthermore, the specific requirements for safe interaction with the printer, related to this chapter, are detailed in the following paragraphs.



ATTENTION:

The operations related to these activities must be performed by authorized and professionally qualified personnel.



ATTENTION:

During operations, the operator must wear all the necessary Personal Protective Equipment (PPE).



9.2. Disposal and dismantling

In the event that the printer should be taken out of service for a prolonged period while waiting for the dismantling, it is advisable to indicate its presence, preventing unauthorized access to the printer. Before starting the dismantling operations, it is necessary to create around the printer a sufficiently large and orderly space in order to allow all the necessary movements without risk created by the surrounding environment.



ATTENTION:

Observe the requirements imposed by the laws in force and by the authorities in charge of the country in which the demolition takes place.

If the mechanical parts have to be dismantled, keep in mind that they consist of different types of material. The user is therefore obliged to consider disassembling the printer in its parts in order to facilitate a differentiated disposal aimed at recycling the various materials and products, in full compliance with all the regulations in force on the spot.

**NOTE:**

The dismantling of the printer must be performed by a qualified mechanical maintenance technician.

**ATTENTION:**

Before carrying out any type of disassembly on the printer, make sure that the power supply is disconnected.

**ATTENTION:**

Danger crushing hands, falling materials, cuts and abrasions. Obligation to use clothing appropriate to the operation to be performed.

**NOTE:**

It is absolutely necessary to apply the regulations in force in the country of destination, concerning the disposal of waste, so it is forbidden to disperse in the environment any type of processing residue, oils, etc .. subdividing the dismantled parts by type for a correct separate collection of materials.

**NOTE:**

Within the European Community, electrical equipment must be disposed of as prescribed by the European Community Directive 2012/19 / EU on waste electrical and electronic equipment (WEEE).

**ATTENTION:**

The user is obliged to dispose of the equipment in the consortia and collection centers for the treatment and recovery of "WEEE".

9.3. Instructions for emergency situations

**ATTENTION:**

In the event of a fire, the operator must immediately give the alarm and move away from the area to allow the intervention of trained personnel equipped with suitable protective and operational means.

Electrical parts

In case of fire of electrical parts, intervene with CO₂ extinguishers to limit and limit the damages

In general

Use ABC + Nitrogen powder extinguishers to quickly extinguish fires delimited to parts or areas without electrical parts.

NOTES



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