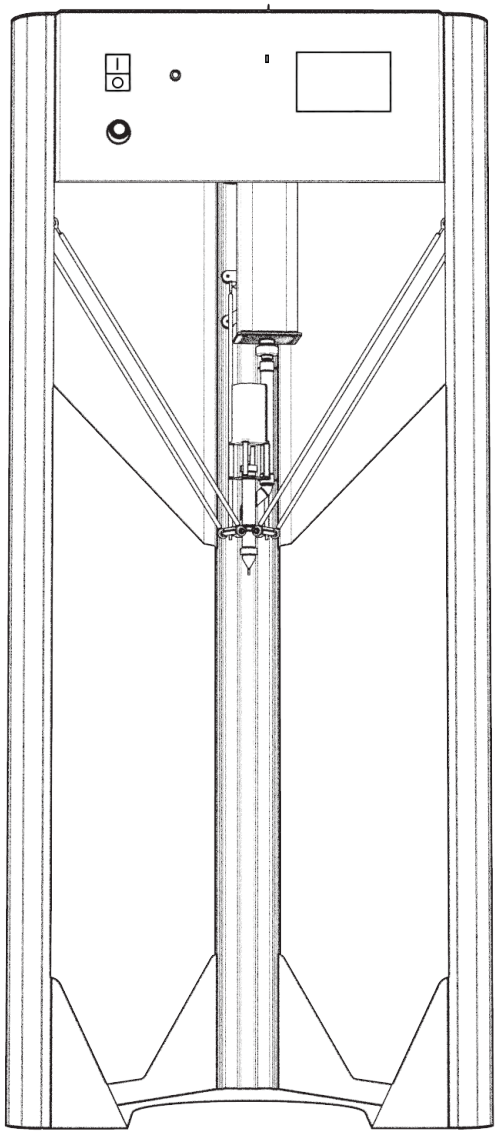
WASP
40100 LDM

USER AND MAINTENANCE MANUAL



CLAY

ORIGINAL INSTRUCTIONS

WASP

CE

Disclaimer

IMPORTANT:
Please read carefully and fully understand the contents of this Operation and Maintenance Manual.
Failure to read the manual may result in personal injury, inferior results, or damage to the Delta WASP 40100 Clay printer. Always ensure that those who use the 3D printer know and understand the contents of the manual to get maximum results from Delta WASP 40100 Clay.

4	Corrections	04/10/2024
Review	Reason for revision	Date of revision

Summary

0 INTRODUCTION

0.1. Aim of the instruction manual

IMPORTANT:
Before installing and starting the printer, the installer, user, maintainer, and safety officer must have read and understood this manual.

It should be considered an integral part of the printer, for the proper use and maintenance of which the information it contains is intended.

It contains instructions that must be known to the personnel assigned to the use, maintenance and transfer of the printer, assuming adequate experience, preparation and professional qualification as well as psychophysical aptitude.
For certain operations it may be necessary to use personnel who have obtained specific training.

It must always be available for reference, in copy and by the recipient, on the printer itself or in its immediate vicinity. In the latter case, the location of the manual should be clearly and prominently marked on the printer.

It is susceptible to updates, which, appropriately classified, will be forwarded to the employer so that he can update the consultation copy(s).

- The recipient must ensure that the personnel authorized by him to operate, use, maintain, and transport the printer have attained adequate knowledge of the instructions contained in this manual.
- The recipient must check that the maintenance operations, prescribed in the appropriate chapter, are accomplished and recorded punctually and effectively.
- No liability is accepted for damage to persons or property resulting from improper use and/or failure or inadequate maintenance.
- It is the recipient's right to request further information.

If this manual is lost or damaged, the recipient should commission one or more copies.

0.2. How to read the instruction manual

This instruction manual consists of:

COVER PAGE WITH PRINTER IDENTIFICATION.
Consulting the cover traces the printer model covered within the manual and the serial number of the printer in your possession.

ANALYTICAL INDEX
By consulting the table of contents it is possible to trace back to the chapter and paragraph on which all the notes relating to a particular topic are given.

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

0.3. Storage of the instruction manual

It is mandatory to keep this manual and all attached documents in an easily accessible place, close to the printer, and known to all users (operators and maintenance personnel).
Operators and maintenance personnel must be able to quickly find and consult the manual in any situation.
The manual is an integral part of the printer for safety purposes.

Therefore:
- It must be kept intact (in all its parts);
- Must follow the printer until it is disposed of (including when it is moved, sold, rented, leased, etc.);
- It must be kept up-to-date and report any changes made to the printer.

0.4. Updating the instruction manual

This manual must be continuously updated by attaching additional or altered parts.
The sending of any additional parts is the responsibility of the Manufacturer; it remains the responsibility of the user to replace any parts that may become altered as a result of use by making a request directly to the Manufacturer.

1 GENERAL INFORMATION

1.1. Manufacturer identification data

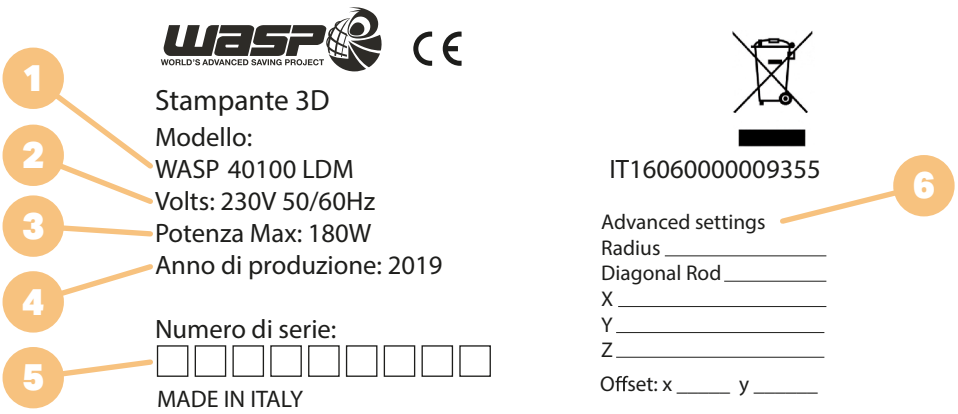
WASP S.r.l.
Via Castelletto, 104/A-B – 48024 Massa Lombarda (RA) Italia
Tel. +39 0545 87858
info@3dwasp.com / www.3dwasp.com

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 is identifiable by a Manufacturer's identification plate as required by the Machinery Directive. In case of damage, the Recipient shall commission a copy.



Legend:

1. Model
2. Volt
3. Maximum Power
4. Year of production
5. Serial Number
6. Advanced settings

1.2.1. Location of the label on the printer

IMPORTANT:
The printer identification label is located on the rear leg near the printer power outlet.

1.3. Testing

The printer is tested directly by the Manufacturer during assembly and post assembly.

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 registration number and 24 months for individuals, according to the specifications in the sales contract.
If during the period of validity, defective operation or failure of parts of the printer that fall under the cases indicated in the warranty occurs, WASP S.r.l. will, after appropriate verification, repair or replace the defective parts.
Defective parts under warranty are repaired or replaced free of charge by WASP S.r.l. .
Transportation and/or shipping costs, as well as round-trip travel expenses related to the intervention of the Manufacturer's technicians at the Customer's premises are always borne by the Customer.
Labor costs related to the intervention of the Manufacturer's technicians at the Customer's premises for the removal of defects under warranty shall be borne by the Manufacturer, except in cases where the nature of the defect is such that it can be easily removed on site by the Customer.
Excluded from the warranty are all consumable materials, if any, supplied by the Manufacturer together with the machines.
For any action of a legal nature it is necessary to contact the Court of Ravenna, Italy.

NOTE:

- **The warranty is void in the following cases:**
- **In case of delinquency or other breach of contract;**
- **Improper use of the printer;**
- **Failure to comply with maintenance standards and intervals;**
- **Tampering;**
- **If the printer is returned to the Manufacturer inside a different packaging from that provided at the time of purchase;**
- **Use of non-original spare parts, i.e., not supplied directly by the Manufacturer;**
- **Extraordinary interventions not carried out by personnel not sent by the Manufacturer;**
- **Any variation and/or non-compliance with what is indicated in the technical drawings and in this manual will result in the forfeiture of the technical and functional warranties, and release the Printer Manufacturer from all liability.**

1.5. General Safety Warnings

CAUTION:
Any work that needs to be done on the printer requires special caution on the part of the operator.

NOTE:
Interventions on the printer must be carried out scrupulously observing operational skills (see section 1.6.1 "Identification of Operational Personnel"). WASP S.r.l. disclaims any responsibility in case of non-compliance with these competencies.

The purpose of this chapter is to indicate what are the specific points and expedients to avoid incurring any kind of accident, what can be defined as residual risks, what are the indispensable minimum safety provisions to be kept in place, what characteristics must be possessed by the personnel in charge of normal assembly operations, and what must be the characteristics of the maintenance personnel.
We will not be held responsible for operations that are not indicated as being strictly the responsibility of technical service personnel or for operations carried out otherwise than as described by us in the documentation presented.

Possible interventions on the printer may be of the following nature:
- Mechanical;
- Electrical.

MECHANICAL INTERVENTIONS

Any work of a mechanical nature must be carried out in strict compliance with the guidelines required by current safety regulations. It is absolutely forbidden to carry out any kind of mechanical maintenance work on the printer during the operating cycle or otherwise with moving printer parts.
Any mechanical adjustment work must be carried out when the printer is stationary and only and exclusively by the mechanical maintenance technician, qualified to operate in conditions of disengaged protections (see section 1.6.1 "Identification of Operating Personnel").
Maintenance work must be carried out only and exclusively with the printer disconnected from the power supply and taking all safety measures required by current regulations.

ELECTRICAL INTERVENTIONS

Any work of an electrical nature must be carried out in strict compliance with the guidelines required by current safety regulations.

1.5.1. Personal protective equipment

It is mandatory to use personal protective equipment specific (PPE) to current operations made available by the company (in relation to the risk attached to the performance of certain work), even if not directly related to the use of the plant.

1.5.2. Operators to whom the manual is intended

The manual is written for:

- Printer operators (in the remainder of the manual they will be referred to briefly as “conductors”);
- Mechanical maintainers: operators trained and authorized to maintain mechanical parts, pneumatic and oil-hydraulic systems;
- Electrician Maintainers: instructed and licensed operators to maintain electrical and/or electronic parts and systems;
- Qualified technicians (employed by the Manufacturer or by the authorized service center), employed for extraordinary maintenance and for operations of a complex and/or special nature.

CAUTION:
The conductor shall not perform operations reserved for maintenance personnel or qualified technicians. The Manufacturer shall not be liable for damages resulting from failure to comply with this prohibition.

1.5.3. Risks

Crush hazard

Do not put your hands near moving parts while they are working.

CAUTION:
Moving parts. Possibility of crushing and cutting.

CAUTION:
Be careful with your head. Shock hazard.

Residual risk of electrocution

CAUTION:
Voltage is present at the top of the printer.

Maintenance / Cleaning

Maintenance/cleaning operations must be carried out by trained and authorized personnel. Operations must be performed in a safe shutdown condition by disconnecting the printer from power sources. Refer to Chapter 7

"Routine and Extraordinary Maintenance."

1.5.4. Safety stickers

The following safety stickers are attached to the printer. Before using the printer, the integrity of these stickers should be checked and the requirements given should be assimilated. Refer to section 1.7 "Glossary and pictograms." In case you do not clearly understand the meaning contact the Manufacturer.

CAUTION:
The plates and stickers applied to the printer must be mandatorily replaced before they become illegible. If one or more plates (stickers) are missing or illegible, it is the operator's obligation not to use the printer until the new plates (stickers) are applied.

Fig. 1.5.4 - Safety stickers on the printer.

Legend:

1.6. Glossary and pictograms

1.6.1. Identification of operational personnel

The operator assigned to the operation or maintenance of the printer must possess the professional requirements specific to each intended operation.
The operator must be trained and thus be aware of the tasks assigned to him or her that make him or her responsible for the work.
The following is a description of job profiles for printer operators.

Operator

Qualified personnel, capable of performing simple tasks, trained in the use of the printer.
It oversees the proper operation of the printer and any initial intervention if an alarm condition occurs.

Mechanical maintenance technician

Qualified technician capable of operating the printer under normal conditions, working on mechanical parts to make all necessary adjustments, maintenance and repairs.
Not qualified to work on electrical systems where voltage is present.

Electrical maintenance technician

Qualified technician able to conduct the printer under normal conditions; is in charge of all electrical adjustment, maintenance and repair work. Is able to work in the presence of voltage inside cabinets and junction boxes.

Manufacturer's Technician

Qualified technician made available by WASP S.r.l. to perform operations of a complex nature in special situations or otherwise as agreed with the user.

1.6.2. Editorial pictograms

To ensure a more thorough knowledge of the printer, the text of this manual is supplemented with indications that complement it by providing additional news, essential cautions or particularly significant hazards to be considered; the following notation is used in this regard:

DANGER:
Indicates situations or operations that must mandatorily be performed or information to which special attention must be paid to avoid personal injury.

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

ENVIRONMENTAL NOTE:
Indicates situations or operations in which there is a possibility of harm to the environment.

NOTE:
Indicates notes, warnings, hints and other points to which you want to draw the reader's attention or complete the explanation with additional news.

Personal protective equipment (PPE)

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

PROTECTIVE GLOVES:
Indicates the need to use suitable protective gloves to perform the described operation (possibly dielectric for performing work on the electrical system).

SAFETY FOOTWEAR:
Indicates the need to use suitable safety shoes to perform the operation described.

PROTECTIVE CLOTHING:
Indicates the need to use protective clothing to perform the operation described.

PROTECTIVE HELMET:
Indicates the need to use the protective helmet to perform the operation described.

2 PRINTER DESCRIPTION

The device described in this manual is a printer intended for 3D printing using dense fluidic material. The printer consists of an extruder with a screw mounted on a delta-robot type structure and a worktable. The material is pressurized and pushed toward the extruder where it is metered in a controlled manner by a screw and poured through a nozzle that deposits very small amounts of material onto the work surface. The material is laid down by the head layer by layer according to "layers" defined by the file made using slicing software. It is therefore possible to make any shape and any type of object within the limits of this technology.

Fig. 2 - Printer

2.1. Control panel

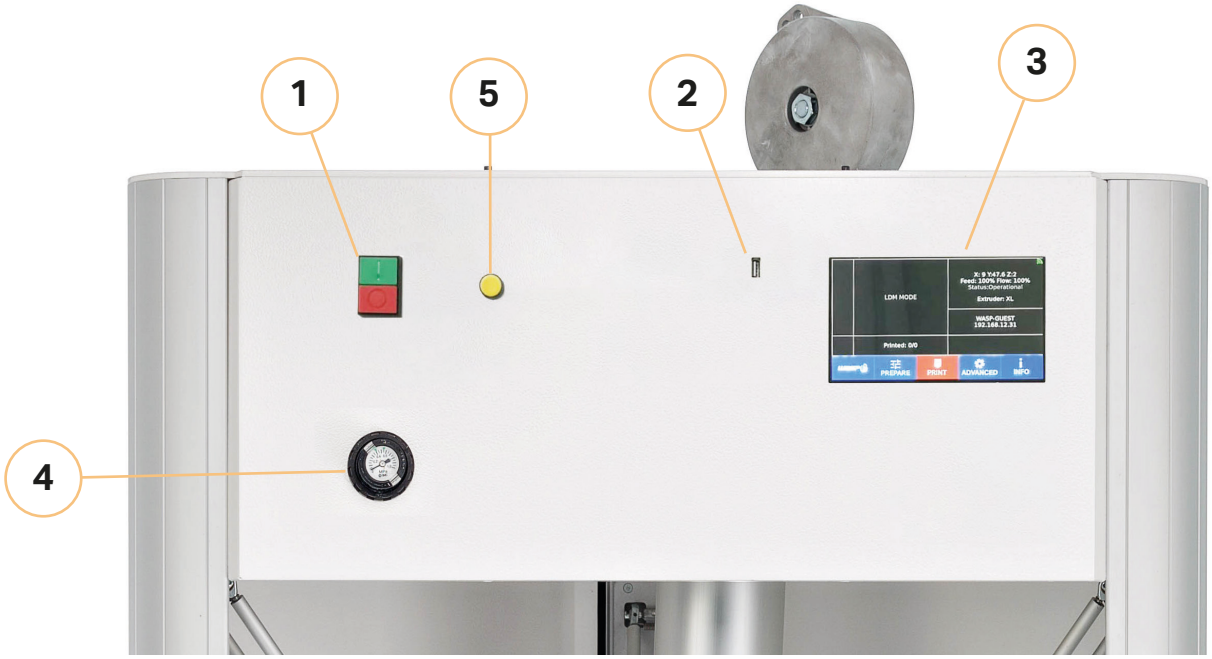


Fig. 2.1 - Control panel

Legend:

1. Power on/off button
2. USB type B port
3. Operator touchscreen display
4. Pressure regulator
5. Pause button

2.2. Work area

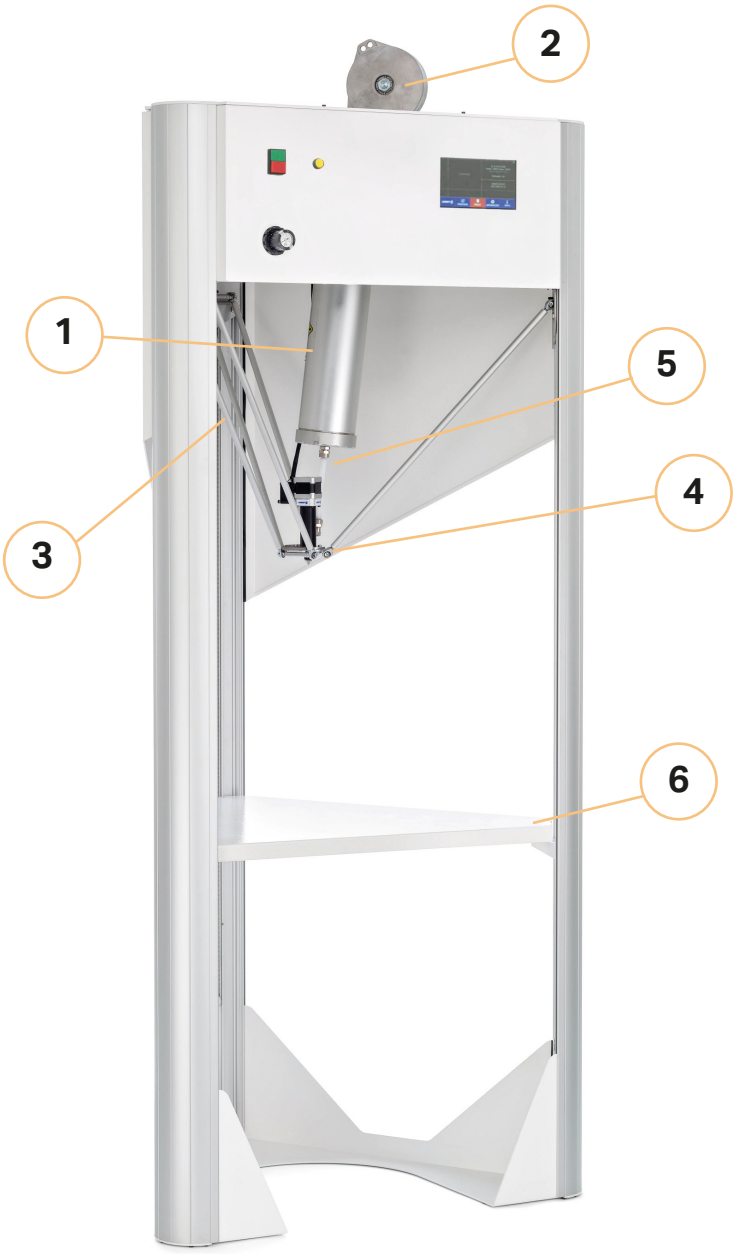


Fig. 2.2 - Working zone

Legend:

1. Tank
2. Tank support
3. Arms with double connecting rod
4. Extruder
5. Bowden tube
6. Intermediate printing table

2.3. Technical Data

All 3D printers are characterized by remarkable robustness and working precision.
Their mechanics allow for greater precision and stability while ensuring higher production speeds.
One advantage is the ability to restart part production from the point where it stops for any reason.

General features	
Length	78 cm
Width	85 cm
Height	195 cm (h 270 cm with tank support)
Approximate weight	80 kg
Noisiness	< 70 db (A)
Mechanical features	
Frame and cover	Sheet metal and aluminum
Printing plan	Painted metal
Movements	Rolling on anodized aluminum rail
Engines	Stepper Nema 23
Electrical characteristics	
Input	220/240 V - 50/60 Hz
Power consumption	200W
Usage characteristics	
Usage environment	20-30 °C
Warehouse	0-30 °C
LDM WASP extruder	nozzle diameter 1.2mm
LDM WASP extruder XL	nozzle diameter: 2mm, 4mm, 6mm, 8mm
Press information	
Technologies	LDM
Cylindrical printing area	Ø 400 x 1000 mm
Standard nozzle diameter	LDM WASP extruder / nozzle diamenter 1.2mm
Layer resolution	max 0,5mm
Axis accuracy	0,2 mm
Maximum speed	200 mm/s
Tank	5l
Materials that can be used	Porcelain, Stoneware, Earthenware, Clay, etc.
Interface and software	
Operating Systems	Windows, Mac, Linux
Slicing software	Cura, SLic3r, Simplify 3D
Software interface	Repetier Host, Pronter Face
File type	.stl, .obj, .gcode
Interface	SD Card, Touchscreen Display

2.4. Noisiness

The noise emitted by the printer alone is less than 60 dB(A).
The presence of multiple machines installed in a confined environment increases the overall noise level.

CAUTION:
It is the customer's responsibility to conduct a noise risk assessment of his or her business in accordance with the requirements of the regulations in force at the location where the printer is to be installed, and to equip operators with appropriate Personal Protective Equipment (such as hearing protection ear muffs).

2.5. Intended use of the printer

The printer is designed and built to create objects with ceramic mixtures. Materials such as porcelain, earthenware, stoneware. refractory, etc. can be used. Any use of the printer with materials other than those provided will void the Manufacturer's warranty and liability.

2.6. Improper use of the printer

The following uses of the printer are prohibited:
- Using the printer to perform operations other than those for which it was designed and built described in Section 2.6;
- Introducing body parts inside the printer while it is in motion; and
- Failure to comply with safety regulations;
- Operating the printer with procedures other than those described in this manual;
- Using components not intended at the design stage;
- Failure to adhere to established maintenance schedules;
- Performing work on the printer that involves changing components or parameters that affect the work cycle;
- Altering the calibration of the extruder;
- Using the printer outside the permissible working temperatures;
- The unauthorized use of non-original spare parts or components not approved by the Manufacturer;
- Performing any structural modification or intervention without the Manufacturer's authorization;

NOTE:
- Any of the misuse or negligence previously listed causes:
- The immediate cancellation of the warranty entered into with the Manufacturer at the time of purchase of the printer;
- The cancellation of the Manufacturer's Liabilities for damage caused to persons, property or animals.

CAUTION:
Improper use may damage the printer, which consequently may result in dangerous situations for the personnel involved in its operation and maintenance.

3 TRANSPORTATION AND HANDLING

3.1. General Warnings

Reading this chapter assumes, for the purpose of safe use of the printer, knowledge of the contents of Section 1.6 “General Safety Warnings.”
In addition, specific requirements for safely interacting with the printer, related to this chapter, are detailed in the following sections.

CAUTION:
The operations involved in these activities must be carried out by authorized and professionally qualified personnel.

CAUTION:
The operator must wear all necessary Personal Protective Equipment (PPE) during operations.

3.1.1. Printer delivery

Normally the printer is shipped in one block.
The printer is carefully checked before delivery to the shipper.
Upon receipt make sure that:

- The printer has not been damaged in transit;
- Any packaging has not been tampered with resulting in the removal of parts from the interior;
- The delivery matches the order specifications.

NOTE:
In case it is necessary to store the printer for a certain period of time before installing it, it is recommended to protect it properly and store it in a suitable environment (with temperature between 5°C and 40°C and relative humidity between 20% and 60% non-condensing) and protected from the weather in order to avoid deterioration.

CAUTION:
When storing, never stack crates containing equipment on top of each other.

3.2. Unpacking

ENVIRONMENTAL NOTE:
Once the packaging is unpacked at the printer, it is recommended that it be kept for possible service requests to the Manufacturer.

Delivery of the printer will take place inside a horizontally oriented wooden crate.
After removing the printer from the crate, the printer must be tipped upright.

NOTE:
Three operators are required to perform this procedure as two will be responsible for tipping it and the other will hold it steady on one side.

3.3. Content

The printer is shipped with:
- user manual
- SD card
- power cord with shucko plug
- marine multilayer printing plate
- ceramic slurry
- LDM extruder

3.4. Lifting and handling the printer

CAUTION:
The weight of the printer is given in Section 2.3 "Technical Data." Therefore, it is necessary to use the lifting equipment whose intended capacity is appropriate for the weight to be lifted.

CAUTION:
As long as the printer is not fully raised, it is a good idea to check that it is properly balanced. During lifting, the entire area surrounding the printer should be considered hazardous.

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

4 INSTALLATION

4.1. General Warnings

Reading this chapter assumes, for the purpose of safe use of the printer, knowledge of the contents of Section 1.6 “General Safety Warnings.”
In addition, specific requirements for safely interacting with the printer, related to this chapter, are detailed in the following sections.

CAUTION:

- **The operations involved in these activities must be carried out by authorized and professionally qualified personnel.**
- **A thermal-magnetic protection device must be inserted upstream of the system.**

CAUTION:
The operator must wear all necessary Personal Protective Equipment (PPE) during operations.

4.1.1. Placement

The installation of the printer must be in a suitable place, i.e., such that normal operation of the printer, routine and extraordinary maintenance can be carried out.
The installation site must be free of contaminants of any kind, dust, fumes, mists, etc.
Therefore, the necessary operating space must be provided by referring to the dimensions (expressed in mm) given in Section 2.3 “Technical Data.”
The room must also be:

- Equipped with the appropriate power supply line;
- Installed in environments with lighting equivalent to that provided for industrial environments; as indicated by the regulations in force in the country of destination, regarding safety in working environments. The lighting must not cause visual disturbing effects on the transparent part of the door. The lighting must ensure perfect reading of the information given by the display.

The printer must be placed on a stable, horizontal plane having a load bearing capacity adequate for the weight to be supported. Any unevenness must be within the standards of building construction.
The printer should be placed in an environment with foundations that prevent the transmission of environmental vibrations.
Once the printer is placed, lock the front wheels with the brakes.

CAUTION:
Do not place the printer near sources of heat, water or other free liquids.
Do not install the printer without proper safeguards.

NOTE:
Good installation not only gives more rigidity to the printer but also prevents vibration and noise.

4.2. Electrical connection

CAUTION:

- **The operations involved in these activities must be carried out by authorized and professionally qualified personnel.**
- **It is the user's responsibility to protect the cable mechanically against any crushing or sources of wear and tear depending on the type of laying carried out.**
- **The printer must be powered from a 10A outlet protected by a circuit breaker set at 30 mA.**

NOTE:
All data regarding the electrical characteristics of the printer can be found in the manual, see section 2.3 "Technical Data."

Before plugging the printer's power cord into the electrical outlet, check that the system's power draws and voltages are suitable.

5 PREPARING TO USE THE PRINTER

5.1. General Warnings

Reading this chapter assumes, for the purpose of safe use of the printer, knowledge of the contents of Section 1.6 “General Safety Warnings.”
In addition, specific requirements for safely interacting with the printer, related to this chapter, are detailed in the following sections.

CAUTION:

- **The operations involved in these activities must be carried out by authorized and professionally qualified personnel.**
- **Read the instructions carefully before use.**

CAUTION:
The operator must wear all necessary Personal Protective Equipment (PPE) during operations.

5.2. Operator interface (Pre-print)

5.2.1. “Home” screen

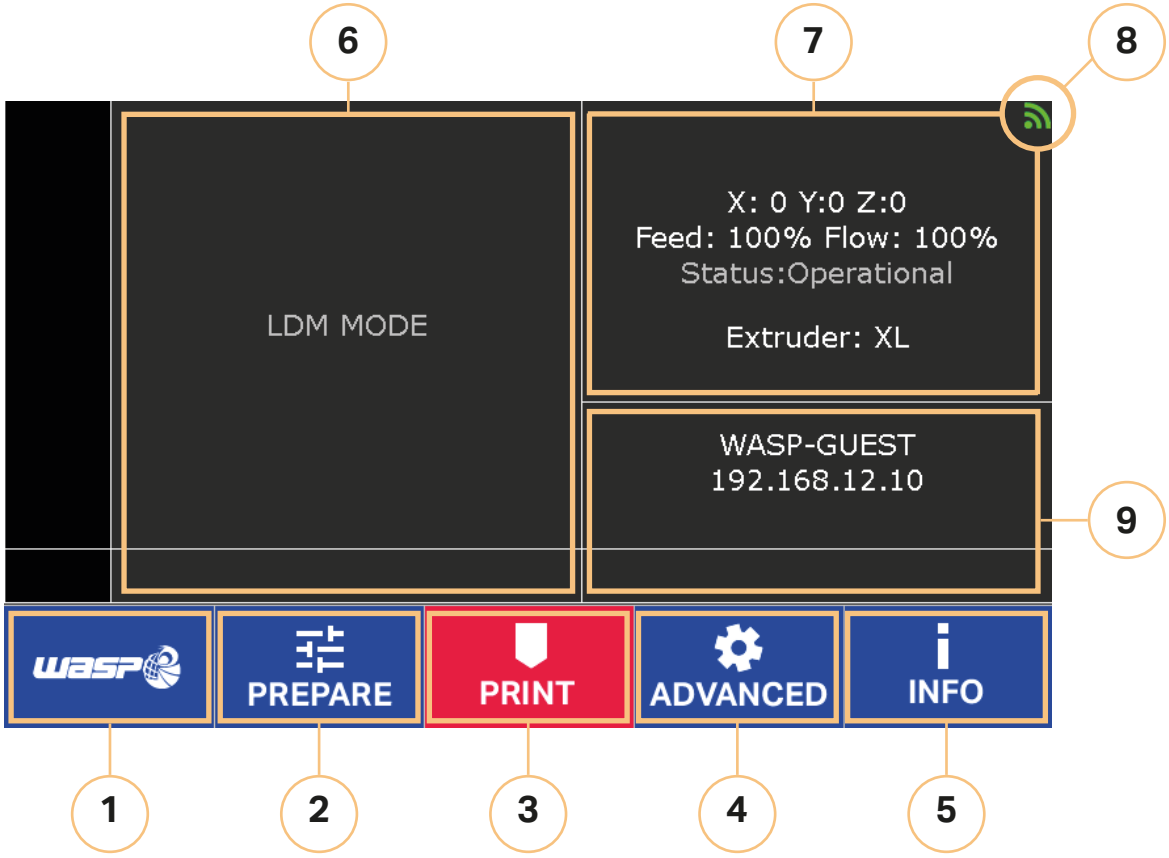


Fig. 5.2.1 (A) - “Home” screen

The main board appears when the printer is turned on and printing starts. It is intended to be the main tool for monitoring and controlling the printer. The toolbar provides access to the PREPARATION, PRINT, ADVANCED and INFO menus.
Legend:

1. “WASP” key (allows you to display the HOME screen of the printer).
2. “Prepare” key (allows displaying the printer preparation screen).
3. “Print” key (allows you to display the printer preparation screen).
4. “Advanced” key (allows you to change printer parameters usually NOT related to printing).
5. “Info” key (allows you to view printer information).
6. “LDM MODE” screen (allows to display the type of technology used by the printer).
7. “Status” (allows you to view the printer status and the type of extruder mounted).
8. “Network Connection” icon (informs the operator of the printer’s connection status to the Internet).
9. “IP Address” (provides the operator with the IP address of the printer to connect to it via browser).

5.2.2. “Prepare” screen

Fig. 5.2.2 (A) - “Prepare” screen

1. “Free Zeta System” key (allows access to the Free Zeta System).
2. “Set Z MAX” key (allows you to change the maximum height of the extruder).
3. “Manual Control” key (allows you to operate the printer manually).
4. “Manual Levelling” key (allows you to manually level on the printer).
5. “Disable Motors” button (allows you to disable the printer’s motors).
6. “Clean Extruder” button (starts the extruder cleaning procedure).

1. "Free Zeta System"

"Free Z system" is the system to resume a print based on a known height.

- Measure the z value of the last printed layer, then:
- MENU/PREP/MOVE AXIS/10,1,0.1/AXIS Z
- Approach until you touch the last printed layer and mark down the z value
- Then:
- MENU/FREE Z SYSTEM
- Enter the value of z
- Select the gcode
- Wait for the file to load

The operation depending on the height of the part can take up to several minutes
The printer will begin to make some calculations until it has reached the percentage of work done up to the Z value it has been instructed, after which it will resume printing from where it stopped.

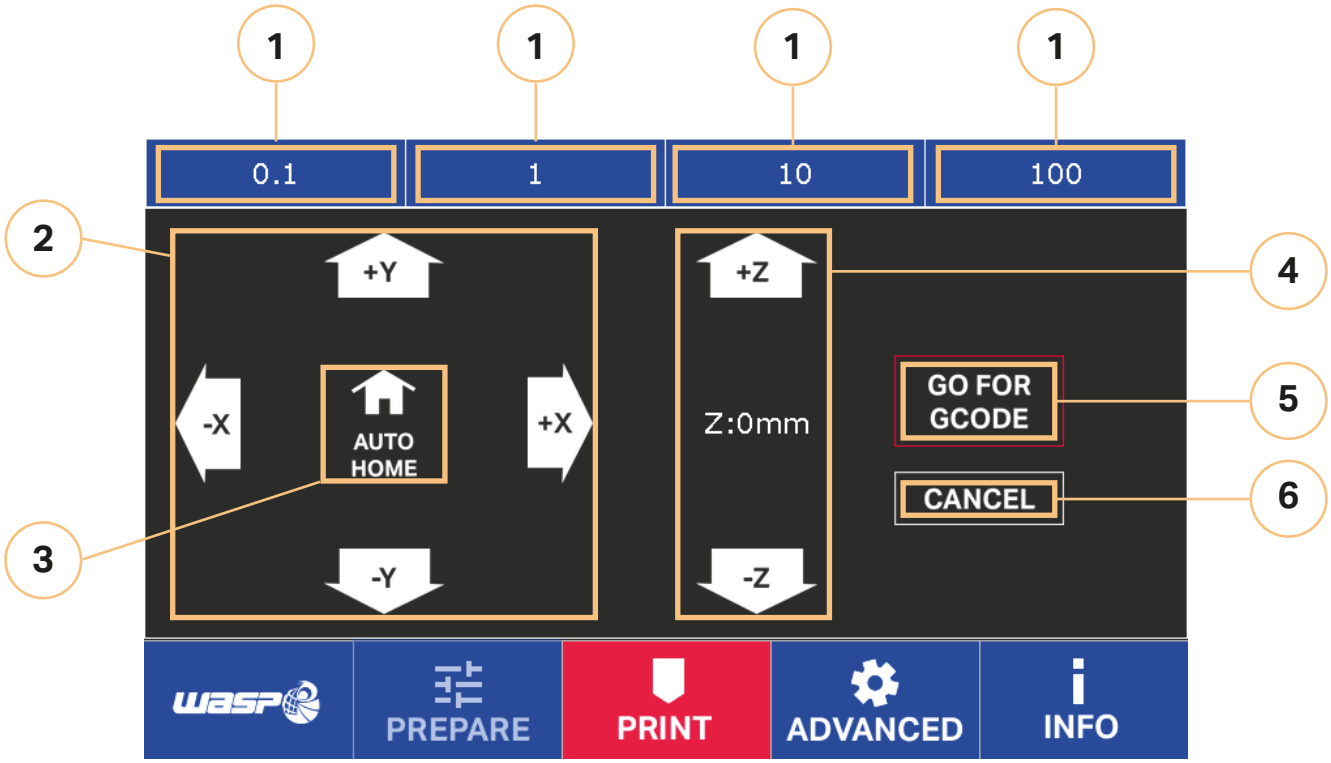


Fig. 5.2.2 (B) - "Free Zeta System" Screen

1. "0.1 / 1 / 10 / 100" keys (allow you to change the range of motion the machine performs each time a button is pressed: 0.1mm / 1mm / 10mm / 100mm).
2. "Directional +/- XY" keys (allow to change the position of the extruder in the XY plane without changing its height).
3. "Auto Home" key (allows you to return the extruder to the HOME position).
4. "Directional +/- Z" keys (allow you to change the height of the extruder from the printing plane).
5. "GO FOR GCODE" key (allows you to select the GCODE to be printed).
6. "CANCEL" key (disables the "Free Zeta System" command).

2. “Set Z MAX”

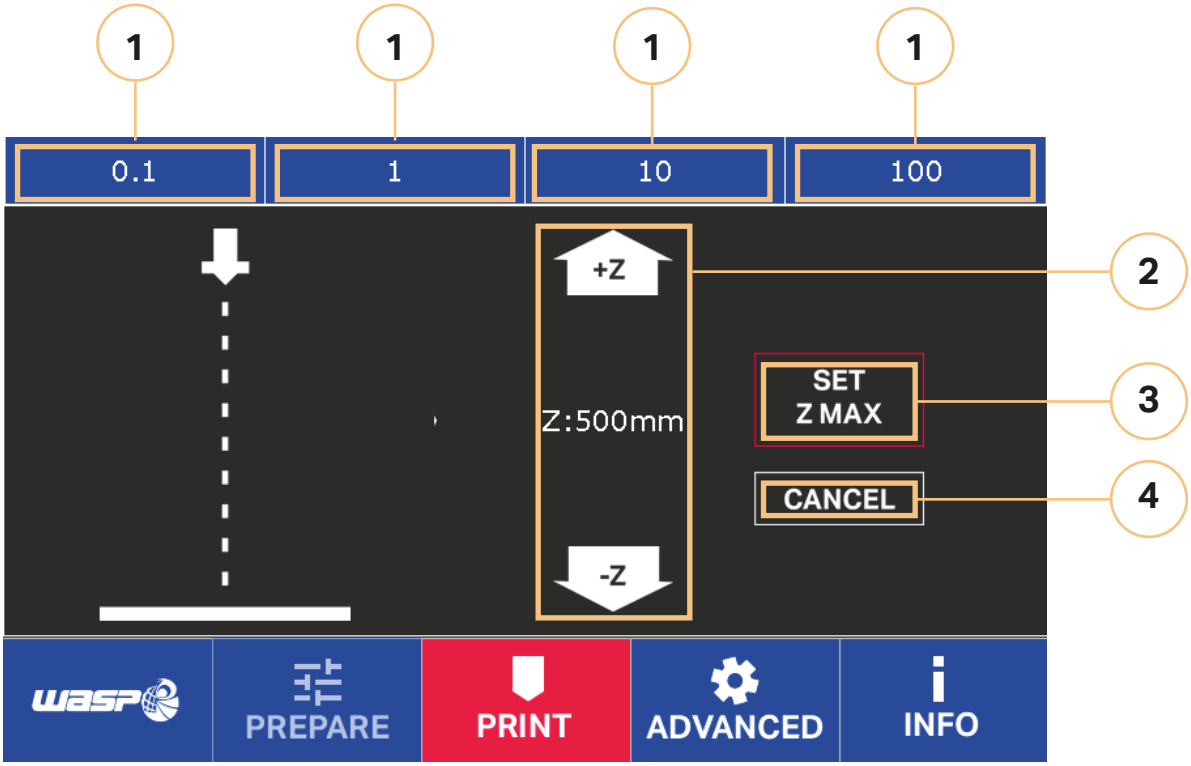


Fig. 5.2.2 (C) - “Set Z MAX” screen.

1. “0.1 / 1 / 10 / 100” keys (allow you to change the range of motion the machine performs each time a button is pressed: 0.1mm / 1mm / 10mm / 100mm).
2. “Directional +/- Z” keys (allow you to change the height of the extruder from the print bed).
3. “SET Z MAX” key (allows you to set the maximum height of the extruder).
4. “CANCEL” key (disables the “Set Z MAX” command).

3. “Manual Control”

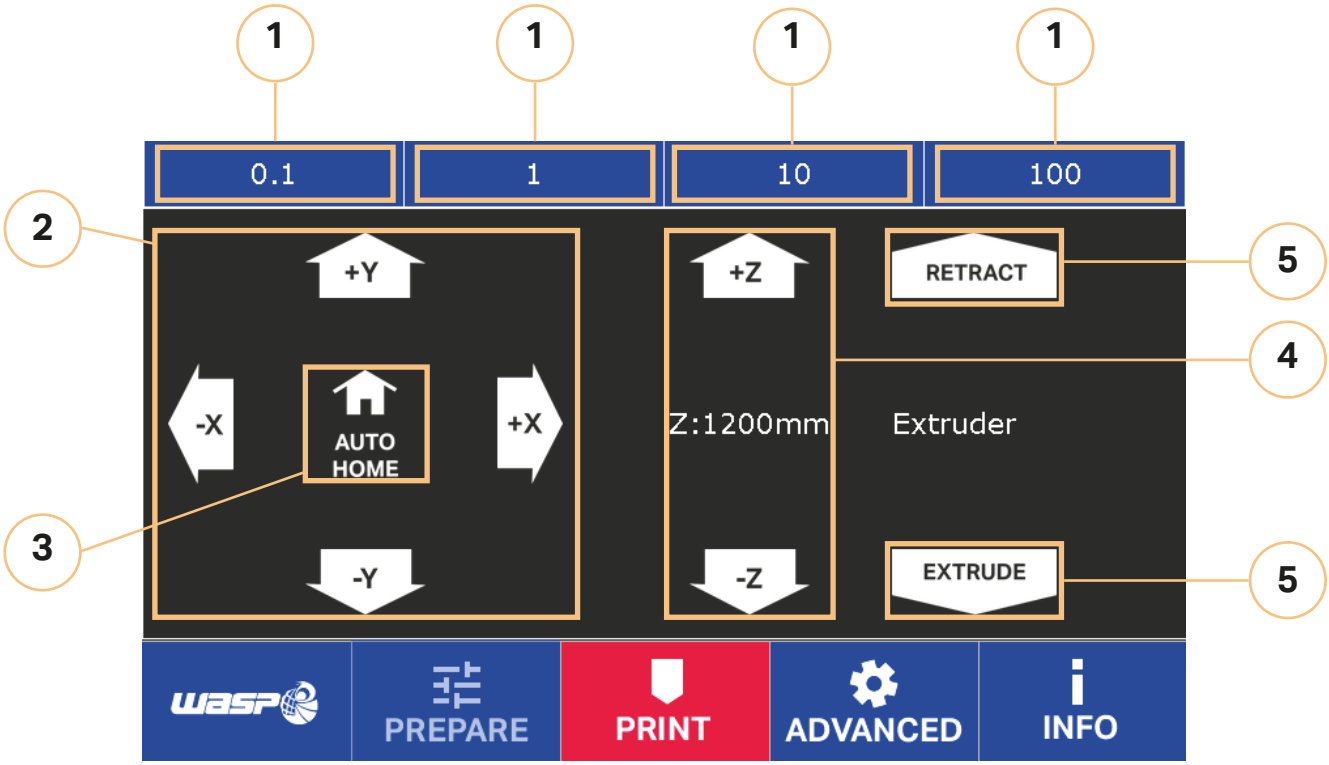


Fig. 5.2.2 (D) - “Manual Control” screen

1. “0.1 / 1 / 10 / 100” keys (allow you to change the amount of material extruded each time the “EXTRUDE” key is pressed or to change the range of motion performed when changing the extruder position settings: 0.1mm / 1mm / 10mm / 100mm).
2. “Directional +/- XY” keys (allow you to change the position of the extruder in the XY plane without changing its height).
3. “Auto Home” key (allows you to return the extruder to the HOME position).
4. “Directional +/- Z” keys (allow you to change the height of the extruder from the printing plane).
5. “RETRACT / EXTRUDE” keys (allows you to extrude a specific amount of material to fill the extruder and prevent it from printing “empty”).

4. “Manual Levelling“

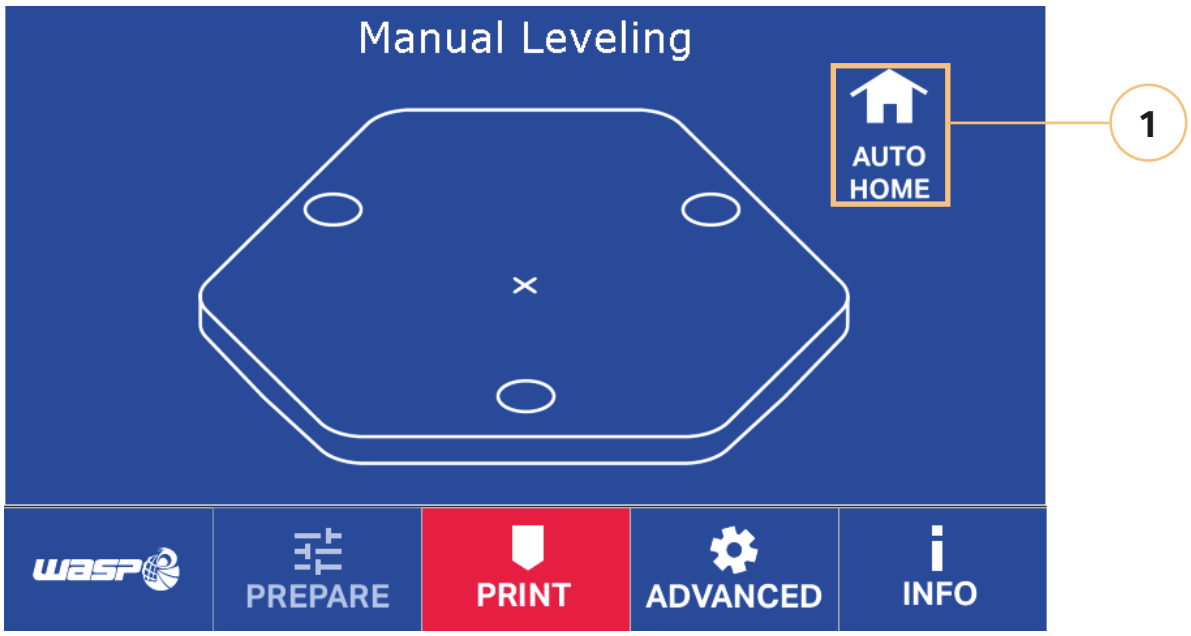


Fig. 5.2.2 (E) - “Manual Levelling” screen

Allows you to manually level the machine, or reset the position of the extruder by the “AUTO HOME” key (Key: 1)

5.2.3. “Print” screen

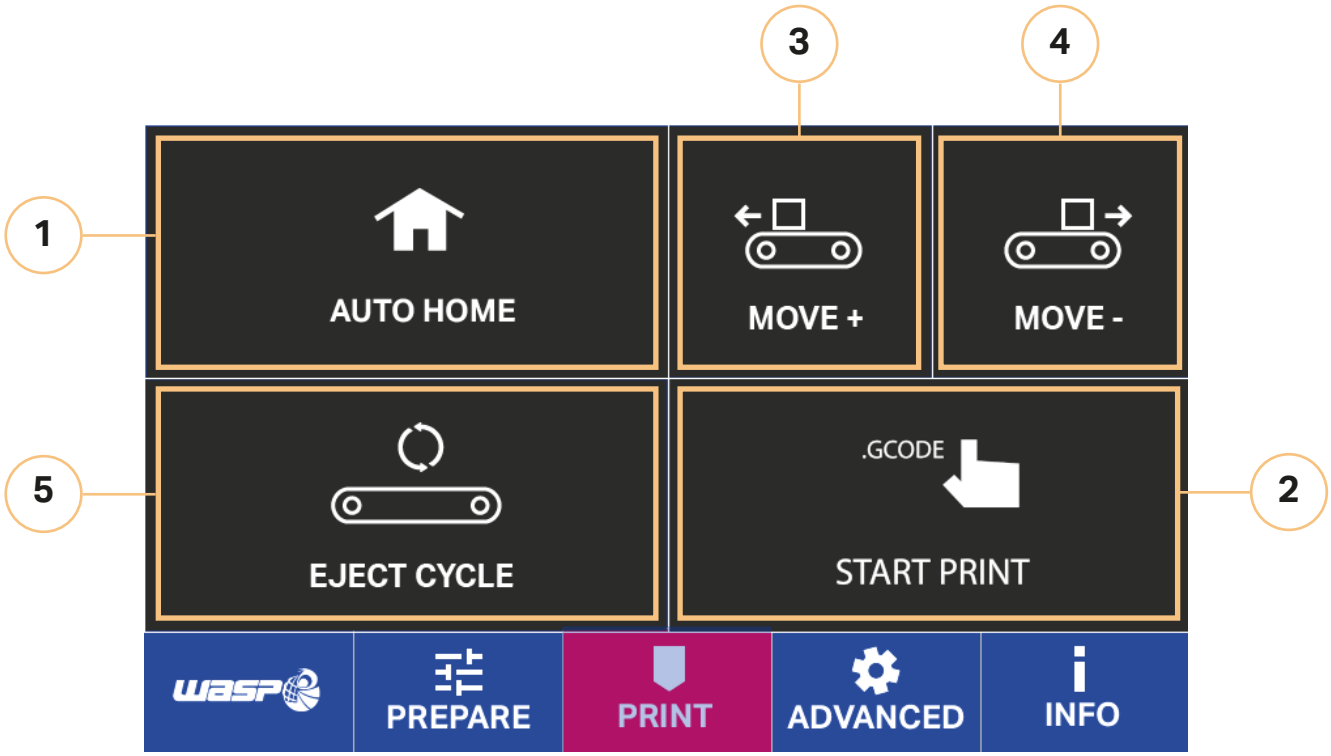


Fig. 5.2.3 (A) - “Print” screen

1. “Auto Home” key (allows the extruder to return to the HOME position).
2. “Start Print” key (allows to select the .gcode to be printed; in case there is conveyor belt connected to the printer, the printer will ask the operator how many copies to print).
3. “Move +” key (in case the printer is equipped with the conveyor belt, this key allows to advance the belt by a given distance “X” to allow the machine to print the next piece).
4. “Move -” key (in case the printer is equipped with the conveyor belt, this key allows the belt to move backward by a given distance “X” to allow the machine to print the piece).
5. “Eject Cycle” key (in case the printer is equipped with the conveyor belt, this key allows you to initialize the cycle to eject the printed piece from the printer).

2. .GCODE selection screen (“Start Print”)

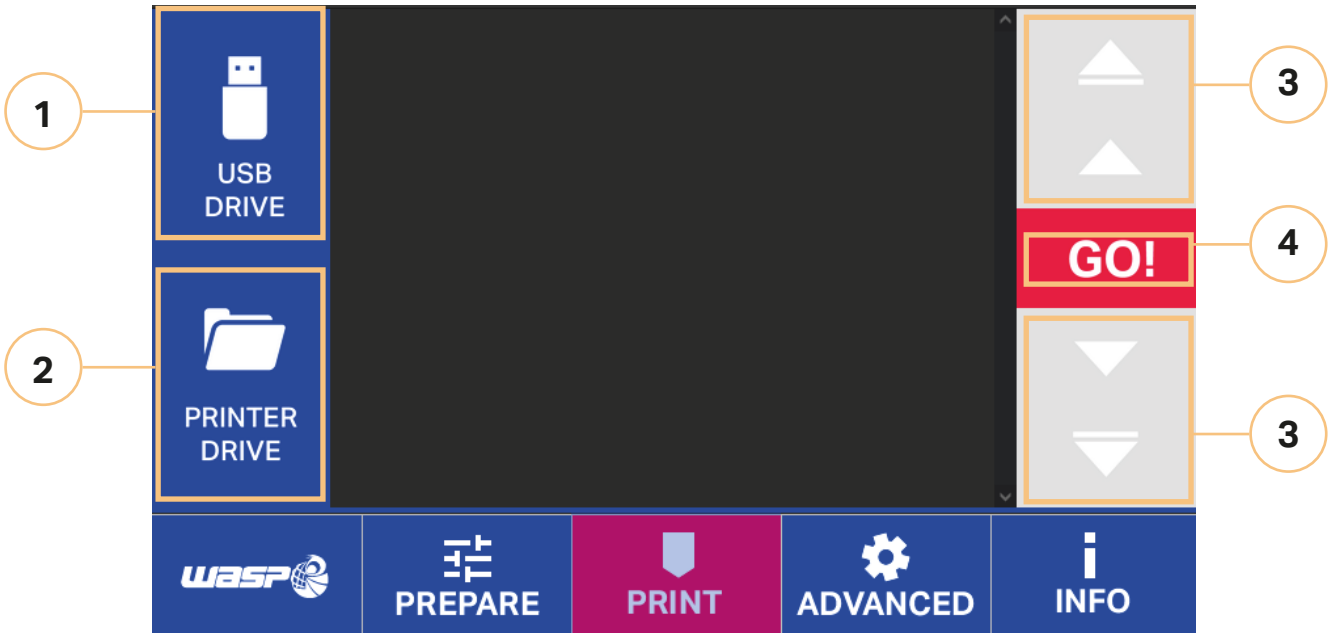


Fig. 5.2.3 (B) - “Start Print” screen

1. “USB Drive” button, allows access to .GCODE files from the USB flash drive whenever it is inserted
2. “Printer Drive” button, allows access to .GCODE files from the printer’s internal memory
3. Navigation keys, allows you to navigate through the .GCODE files
4. “GO!” key, allows you to start printing

5.2.4. “Advanced” screen

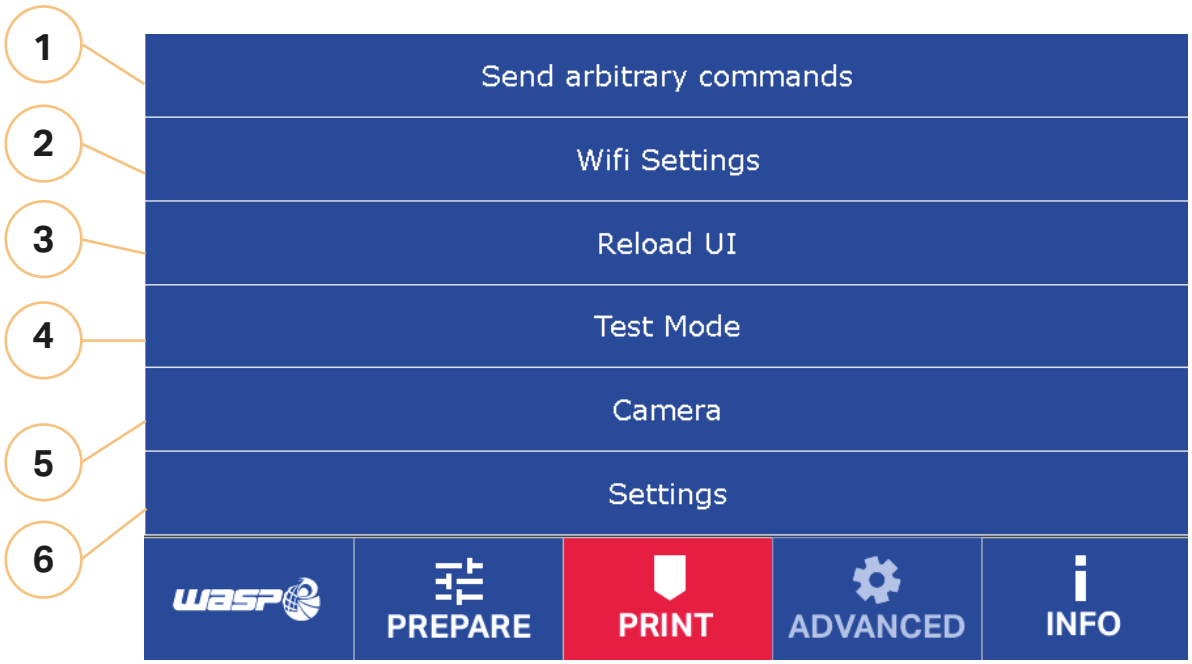


Fig. 5.2.4 (A) - “Advanced” screen

1. “Send Arbitrary Commands” button (allows you to launch commands to the printer).
2. “Wifi Settings” button (allows you to connect the printer to the Wifi network).
3. “Reload UI” button (allows you to reload the printer’s basic interface).
4. “Test Mode” button (allows you to initialize the Test mode).
5. “Camera” button (allows you to start the printer’s internal camera).
6. “Settings” button (allows access to other printer settings).

2. “WiFi Settings“

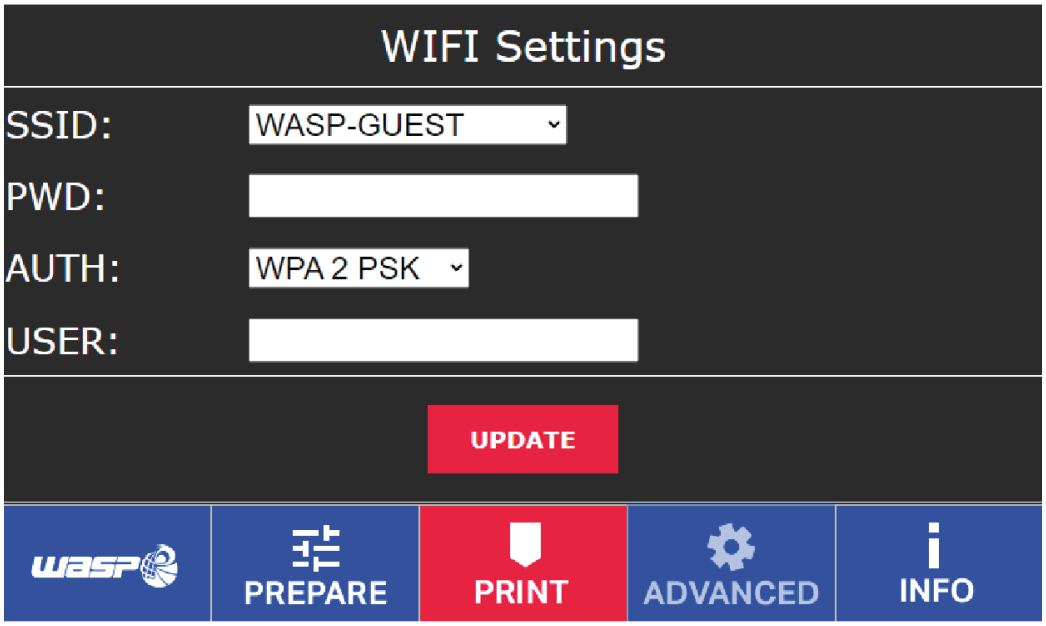


Fig. 5.2.4 (B) - “WiFi Settings” screen

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 aption 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 use (if present)

Clicking UPDATE the machine restarts with new settings

5. “Settings“

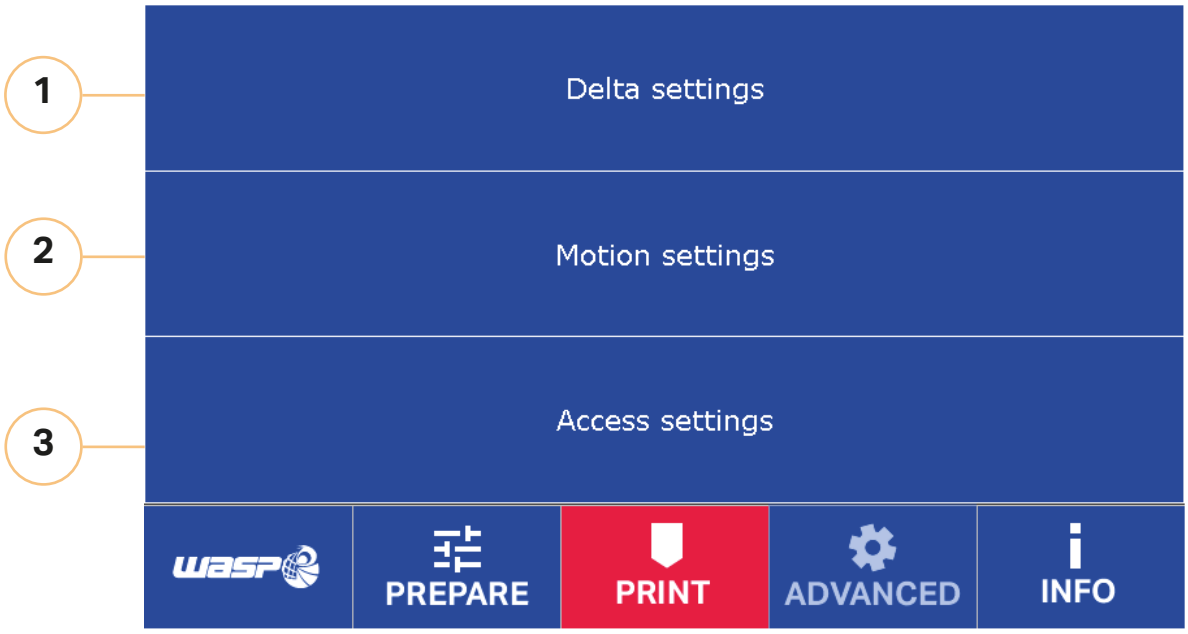


Fig. 5.2.4 (C) - “Settings” screen

1. “Delta Settings” key (allows you to change the settings of the “Delta” system).
2. “Motion Settings” key (allows you to change the printer’s motion values).
3. “Access Settings” key (can NOT be changed).

Fig. 5.2.4 (D) - "Delta Settings" screen

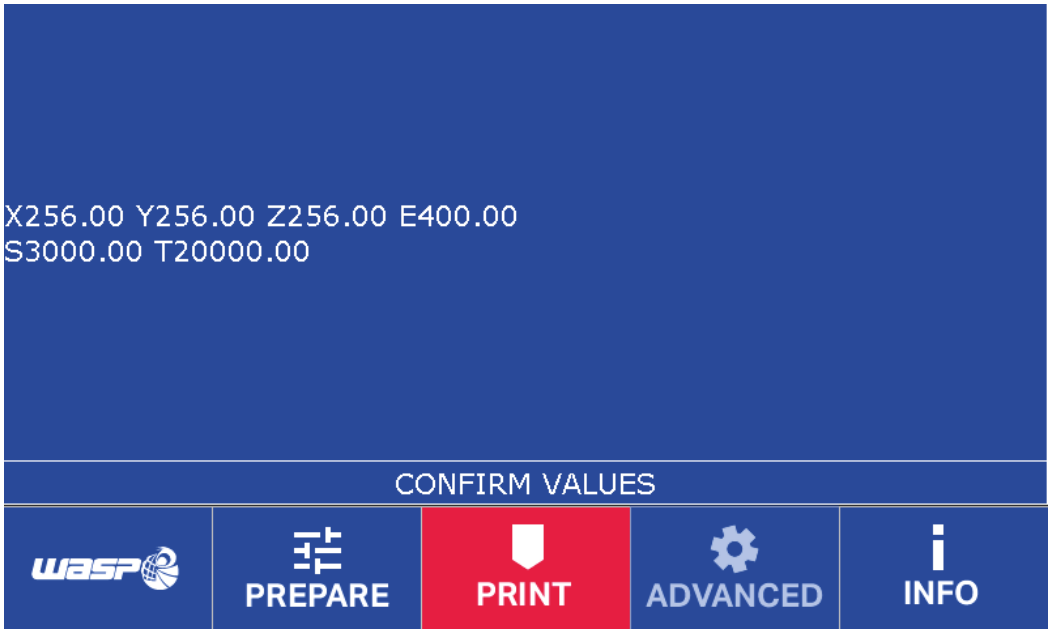


Fig. 5.2.4(E) - "Motion Settings" screen

5.3. Operator interface (In print)

5.3.1. “Home” screen

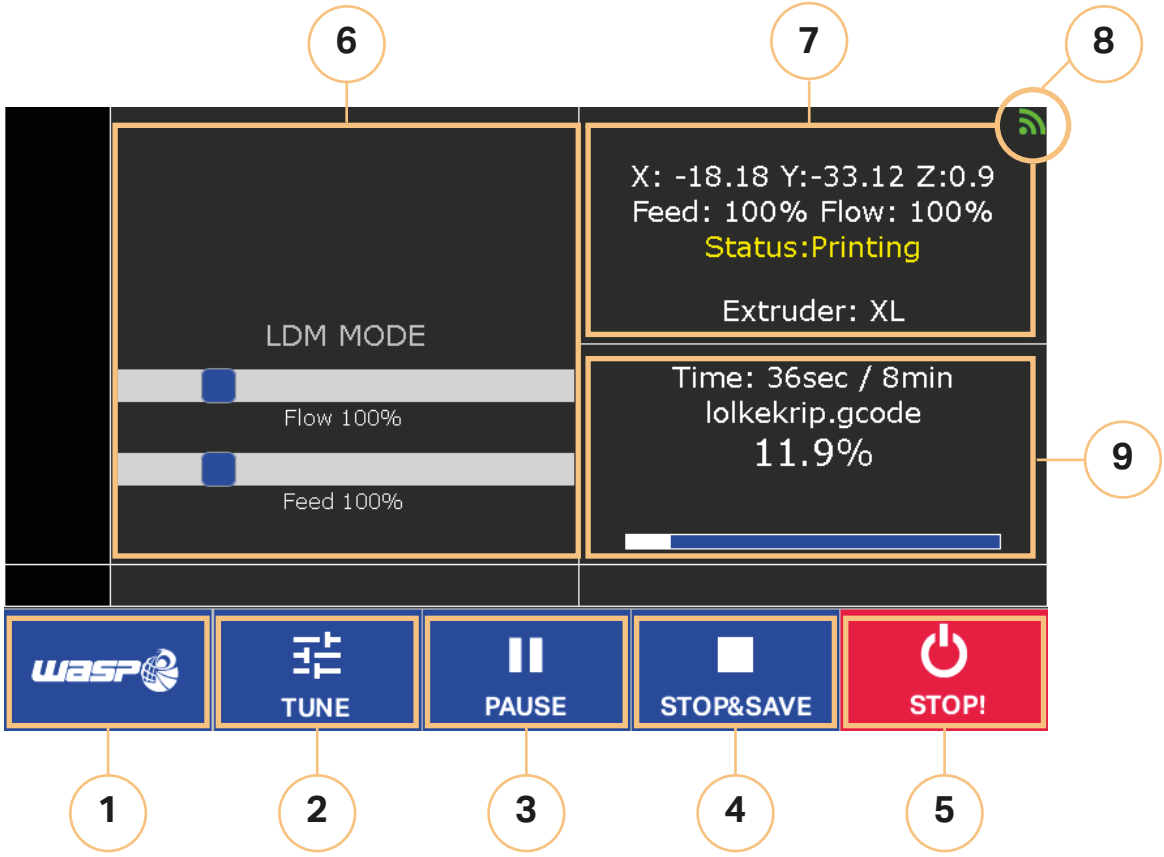


Fig. 5.3.1 (A) - “Home” screen

1. “Home” key (allows you to display the HOME screen of the printer).
2. “Tune” key (allows you to display the print adjustment screen).
3. “Pause” key (allows you to pause printing).
4. “Stop&Save” key (allows you to stop printing and be able to restart it later).
5. “Stop!” key (allows you to stop printing permanently, without being able to restart it).
6. “LDM MODE” screen (allows you to adjust the flow and overall speed of the printer while printing).
7. “Status” (allows you to view the status of the printer and the type of extruder mounted).
8. “Network Connection” icon (informs the operator of the printer’s connection status to the Internet).
9. “Time” screen (allows to display the name of the printed .gcode and the elapsed/remaining time being printed

5.3.2. "Tune" screen

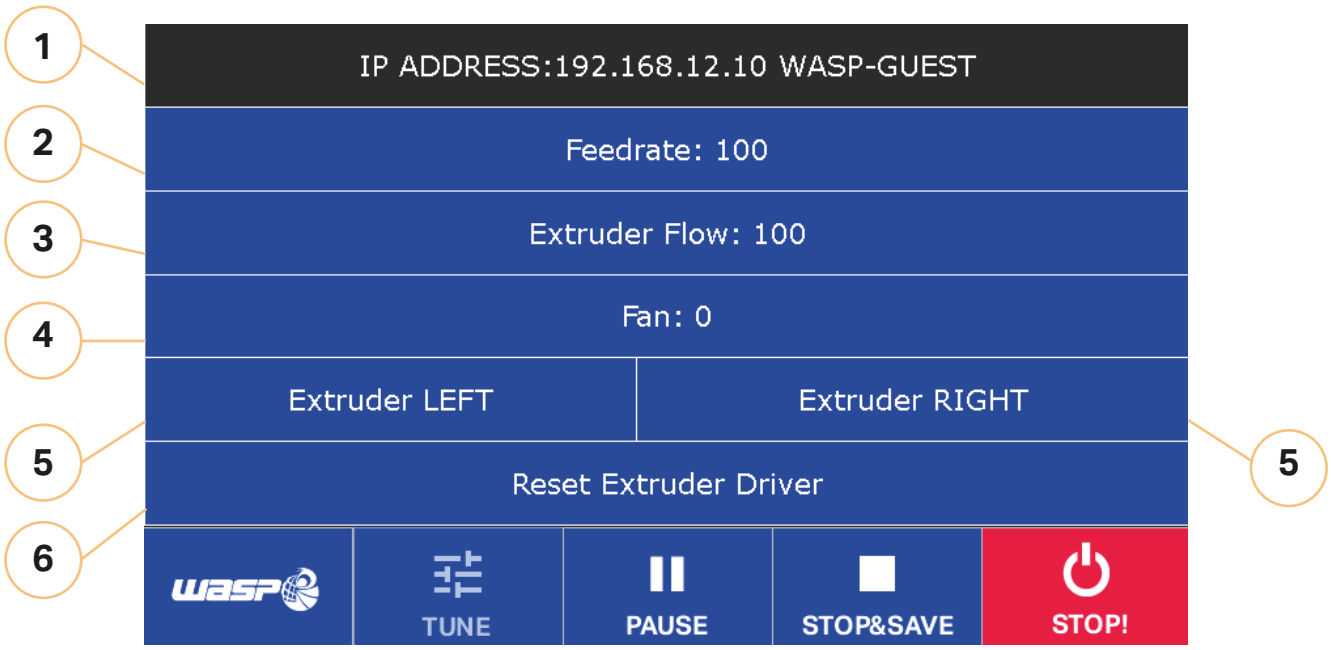


Fig. 5.3.2 (A) - "Tune" screen

1. Displays IP of the printer and network to which it is connected.
2. Lets you view view the feedrate of the printer.
3. Lets you view the print flow rate.
4. Displays the speed of the cooling fans.
5. "Extruder Left" / "Extruder Right" keys allow to display active extruders.
6. "Reset Extruder Driver" key allows to reset the extruder driver.

5.4. First startup

After the printer has been properly connected to the power outlet, some steps must be taken to enable the printer to function.

Belt clips

Inside the printer are three straps required for handling the extruder during printing.
To prevent movement of the extruder during transport, clips are attached to the straps, which must be removed before starting the printer.

CAUTION:
Pay special attention to the head during the various stages of the procedures.

To make the first printout, proceed as described below:

1. Check that the power connector is properly inserted
2. Place the tank stand at the 2 holes above the printer top
3. Tighten the 2 screws to secure the tank stand
4. Turn on the printer using the on/of button on the rear guide of the printer
5. Using the knob, select menu>prep>load material
6. Wait for the extruder to position at half height
7. Do not stick fingers inside the extruder
8. Make sure there are no obstructions inside the extruder
9. Check that the fan to the left of the LDM struder motor is running
10. Take the tank loaded with material and insert it into the holder
11. Connect the nylon air hose into the appropriate connector
12. Check for bottlenecks in the tubing
13. Periodically check the tubes for wear at the connection points
14. Bring the tank under pressure by turning the pressure regulator located on the left side of the printer
15. Extrude material then menu>extrude material (check)
16. Send to Home then menu>prepare>auto home
17. Measure the distance by height modification, then: menu/prep/edit height (recommended 0.5 mm distance between nozzle and plate.)
18. Perform manual leveling by screwing or unscrewing the 3 adjusting screws until the required flatness is achieved.
19. Send gcode to print then menu>sd card>file.gcode

6 FIRST USE OF THE PRINTER

6.1. General Warnings

Reading this chapter assumes, for the purpose of safe use of the printer, knowledge of the contents of Section 1.6 “General Safety Warnings.”
In addition, specific requirements for safely interacting with the printer, related to this chapter, are detailed in the following sections.

CAUTION:

- **The operations involved in these activities must be carried out by authorized and professionally qualified personnel.**
- **Do not introduce or place hands or other body parts near the handling parts**

CAUTION:

Pay special attention during the various stages of the procedures

CAUTION:
The operator must wear all necessary Personal Protective Equipment (PPE) during operations.

NOTE:

- **Inside the SD card supplied with the printer are:**
- **Free software for making the templates to be printed**
  Standard software configurations to import into the computer
- **Sample files in “.gcode” format to be able to 3D print.**

6.2. Printing bed

- **The sampant is designed to be able to print directly on the ground, allowing the printer to be moved to proceed with subsequent prints.**
- **A second mode is printing on an intermediate plane. The intermediate plane rests on top of three brackets about halfway up the machine. By reducing the value of "Z" it will be possible to start printing.**
- Different types of planes can be used to improve the adhesion of the first layers.
  Normally, the company provides wooden discs made of marine plywood. Depending on its purposes, other types of planes can be used by going to vary the value of "Zmax" according to its thickness.

6.3. First printing layer

NOTE:
To facilitate adhesion of the first printing layer, keep the nozzle at a distance from the contact surface of about 2 mm.

CAUTION:
Moving parts. Possibility of crushing and cutting.

With LDM WASP extruder keep a distance of 1mm from the printing surface
With LDM WASP extruder XL based on nozzle diameter set a distance between nozzle and contact surface corresponding to half the nozzle diameter.

6.4. Loading the material

NOTE:
WASP provides a slurry to be mixed with water. The amount of water depends on the type of extruder, nozzle and external conditions. Usually the following recipe can be followed: porcelain 95%, water 5%. With the equipment provided, it is possible to use most of the slurries involved in the traditional ceramic world.

1. Roll out the dough on a clean surface.
2. Add water (5% water 95% dough) and knead until fully absorbed. If the material is too thin, add more water.
3. Divide the dough into balls to be loaded inside the aluminum tank.
4. Bring the tank to the locking plate and release it.
5. Then unscrew the knobs on the aluminum tank cover (fig.1), and then slide off the base with the 4 bars (the side without the valve) (fig.2).
6. Bring the white nylon plunger towards the bottom to load the material.
7. Insert and compress the various portions of material into the tank (fig.3).
8. Slide the base on and screw the knobs on the lid (fig.4).
9. Hook the tank onto the support hook and pull the tank away from the plate.

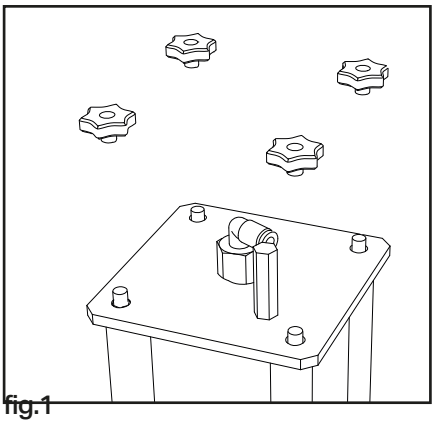


fig.1

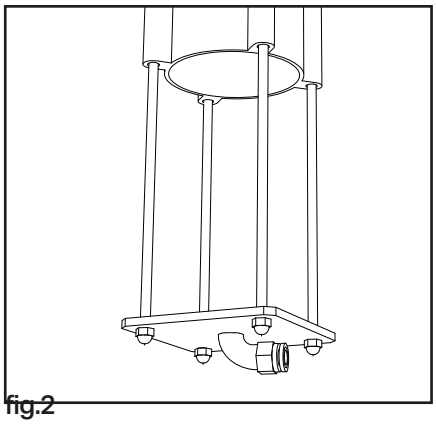


fig.2

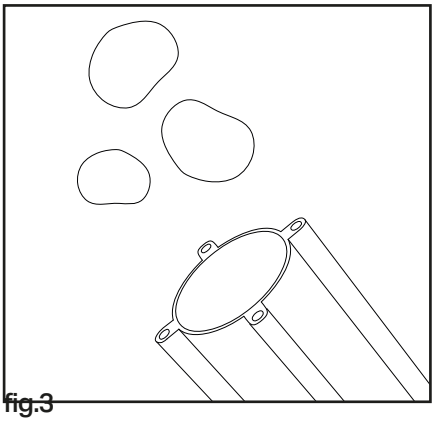


fig.3

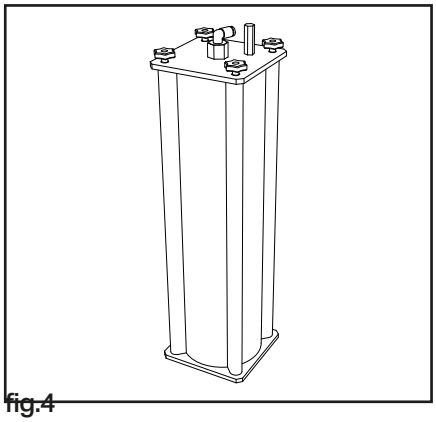


fig.4

NOTE:
- **Make sure, before pressurizing, that the 2 tank caps are screwed on completely until the tank thread is fully covered.**
- **Make sure the nylon tube connecting the 'extruder to the tank and the nylon air tube are properly inserted.**
- **Do not exceed 8 bar pressure.**
- **Do not point the pressurized and uncapped tank toward people.**

CAUTION:
The operator must wear all necessary Personal Protective Equipment (PPE) during operations.

To make the printout, proceed as described below:

1. Turn on the compressor to 8 bar.
2. Turn the pressure gauge clockwise up to about 5 bar (the pressure required for extrusion varies depending on the composition of the dough).
3. Extrude the material then menu>extrude material.
4. Start printing then select gcode: menu>sd card menu>file.gcode

At this point the printing will start automatically and all that remains is to wait for the process to finish.
At the end of printing, the extruder will return to the starting position.

CAUTION:
Remove the workpiece only when the movement axes are stationary.

NOTE:
In the event that it is necessary to interrupt the printer during the printing phase there are two courses of action:

- **Power on/off button: pressing this button, located on the back of the printer, in this way brings the printer to a safe stop state.**
- **Access door: opening the access door stops the printing phase by putting the extruder and consequently the printing on standby.**
- **Pause option, then: menu>pause ideal for material change or nozzle cleaning.**

6.5. Resurrection

Resurrection mode (viewable only with an SD card inserted in the printer) saves the print coordinates of where the printer should have stopped in the event of a power failure.
A backup file is created in the hardware memory.
To perform this function, select the “Resurrection” item from the main menu and wait for the printer to restart.

CAUTION:
If the nozzle remains in contact with the workpiece, directly select the “resurrection” item from the menu without sending the axes to “home”.

6.6. Network and printing server

6.6.1. 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.

6.6.2. 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.

6.6.3. 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 following:

username: user	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.

6.6.4. 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.

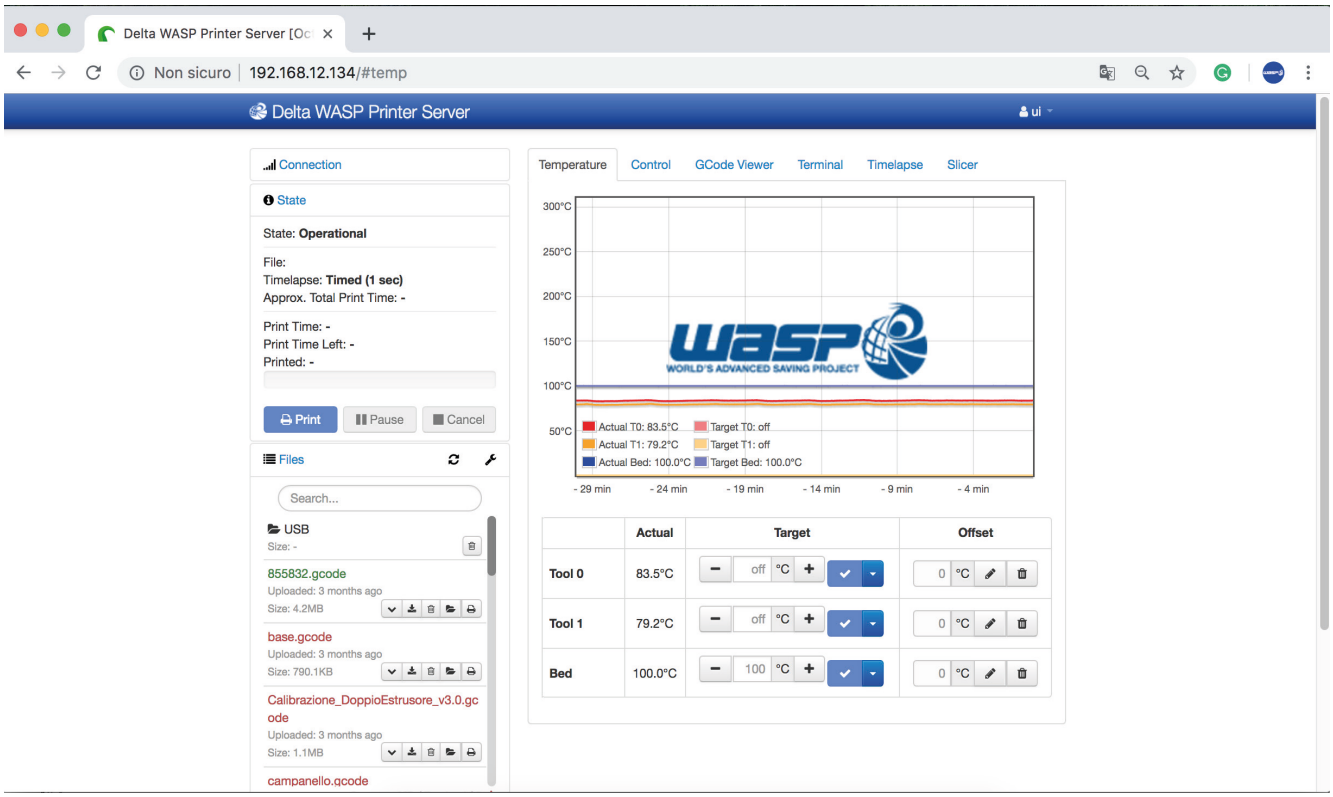


Fig. 8.7.4 - Printer server home

7 ROUTINE AND EXTRAORDINARY MAINTENANCE

7.1. General Warnings

Reading this chapter assumes, for the purpose of safe use of the printer, knowledge of the contents of Section 1.6 “General Safety Warnings.”
In addition, specific requirements for safely interacting with the printer, related to this chapter, are detailed in the following sections.

WARNING:

- **Operations involving these activities must be performed by authorized and professionally qualified personnel.**
- **Before any work near and/or inside the work area, stop the movement of the arms by pressing the pause button on the right side of the front panel.**
- **Do not replace parts unless they are original parts supplied by the parent company.**

CAUTION:
The operator must wear all necessary Personal Protective Equipment (PPE) during operations.

- Before working on the printer, make sure that the printer is in a safe condition;
- At the end of a maintenance operation, remove all tools and rags used and remove any accumulation of material;
- Always take great care not to damage the nozzle, to the connecting tubes;
- Do not wear rings, watches, chains, bracelets, etc. during maintenance operations;
- Periodically lubricate the movement joints with grease;
- The only element of the printer that needs maintenance at the end of each printing process is the table top and the extruder, which can be cleaned with soap and water being careful not to ruin/scratch the surface;
- Don’t clean surfaces with alcohol.

7.2. Ordinary maintenance

Periodic maintenance and proper use are indispensable factors in ensuring the functionality, safe operation, and longevity of the printer. Prescribed maintenance and operations are the responsibility of the mechanical maintainer, who must work in compliance with the safety requirements in this manual.

TANK CLEANING

1. Bring the pressure inside the tank to zero by unscrewing the pressure regulator counterclockwise (fig.1).
2. Open the tank cap "B" by first unscrewing the knobs on cap A and then pulling off cap B with the 4 bars (fig.2).
3. Place the tank downward.
4. With your clenched fist (or with the help of e.g. a broomstick handle) push the nylon plunger outward. (fig.3).
5. Clean the plunger with running water and reload into the reservoir.
6. To remove residual material that has dried up inside the 12mm-diameter Teflon tube, gently tap the tube itself to allow the material to detach or push the material out with a plunger.
7. Periodically put grease on the threads of the plugs and reservoir

CAUTION:
Always keep tank caps clean in order to avoid improper closures

EXTRUDER CLEANING

At the end of printing, plug the nozzle with electrical tape to keep air from passing through during non-use.

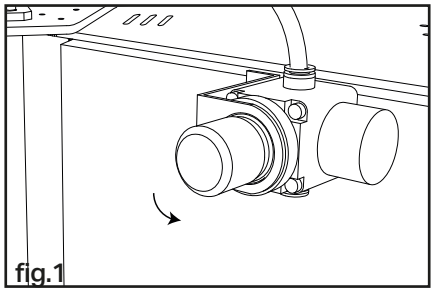


fig.1

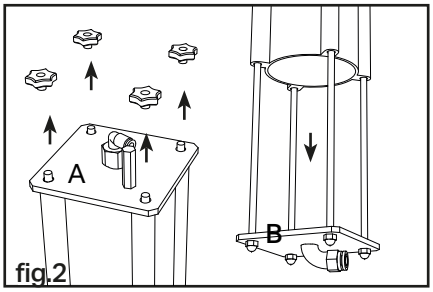


fig.2

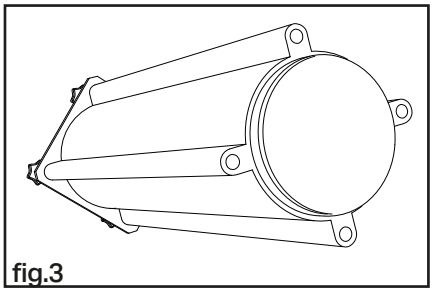
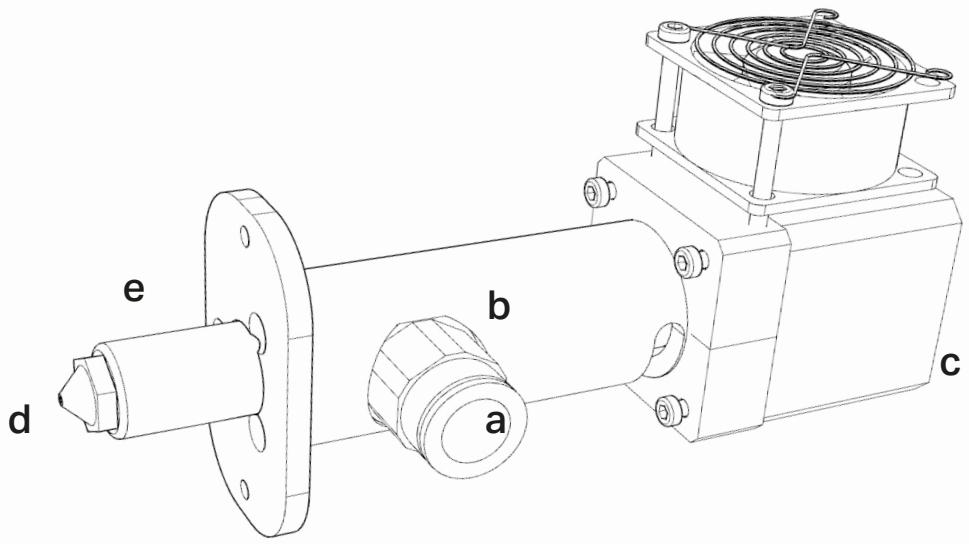


fig.3

After approximately one week of non-use, a complete cleaning of the extruder will be necessary, then follow the following procedure:

- remove the LDM extruder from the printer
- unscrew the quick coupling “A” with 19 mm wrench and clean it under running water
- unscrew the extruder body “B” from the motor “C”
- unscrew the nozzle “D” and clean it under running water
- to remove the plate “E” unscrew the 3 M3 screws (not necessary)
- reassemble the various parts following the following exploded view



7.2.1. Arm joints

Lubrication
Check the movement/stiffness of the arm joints; if they are stiff, apply grease by brush.

7.2.2. Fillets

Periodically check the threads of the black knobs and threaded rods for wear or dents

7.2.3. Motor Fan

Check the proper operation of the fan present on the LDM extruder motor.

7.2.4. Arm trolleys

Play control
Check the arm carriages for play between them and the sliding lane, if there is play, contact the Manufacturer

7.3. Extraordinary maintenance

CAUTION:
Extraordinary maintenance operations must be carried out by Manufacturer's Technicians or by maintenance technicians instructed and authorized by the Manufacturer.
Any of these operations not carried out by a Manufacturer's technician may cause irreversible damage to the machine or its parts and therefore void the Warranty.

Extraordinary maintenance operations are defined as
Those that are carried out:

- During exceptional events, such as overhauls;
- Shutdown due to breakdown of mechanical or fluidic parts;

For info and assistance visit the F.A.Q. section on our website: www.3dwasp.com

8 ADDITIONAL INSTRUCTIONS

8.1. General Warnings

Reading this chapter assumes, for the purpose of safe use of the printer, knowledge of the contents of Section 1.6 “General Safety Warnings.”
In addition, specific requirements for safely interacting with the printer, related to this chapter, are detailed in the following sections.

CAUTION:
The operations involved in these activities must be carried out by authorized and professionally qualified personnel.

CAUTION:
The operator must wear all necessary Personal Protective Equipment (PPE) during operations.

8.2. Decommissioning and dismantling

In the event that, the printer, should be taken out of service for a prolonged period pending dismantling, it is advisable to signal its presence, preventing unauthorized persons from accessing the printer. Before starting dismantling operations, it is necessary to create a sufficiently large and orderly space around the printer so as to allow all necessary movements without risks created by the surroundings.

CAUTION:
Observe the requirements imposed by applicable laws and regulatory agencies related to the country in which demolition takes place.

Should the mechanical parts need to be dismantled, it should be borne in mind that they consist of different types of materials. The user is therefore obliged to consider disassembling the printer into its parts in order to encourage differentiated disposal aimed at recycling the various materials and products, in full compliance with all local regulations.

NOTE:
Dismantling of the printer must be performed by a qualified mechanical maintainer.

CAUTION:

- **Before performing any kind of disassembly work on the printer, make sure that the power supply is disconnected.**
- **Danger of crushing hands, falling materials, cuts and abrasions. Obligation to use clothing appropriate to the operation to be performed.**
- **The user is obliged to dispose of the equipment at consortia and collection centers for the treatment and recovery of "WEEE".**

NOTE:
It is absolutely necessary to apply the regulations in force in the country of destination, regarding waste disposal, so it is forbidden to disperse any kind of processing residue, oils, etc. into the environment.
Sort dismantled parts by type for proper collection of materials.

NOTE:
Within the European Community, equipment of an electrical nature must be disposed of in accordance with the requirements of EU Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE).

8.3. Instructions for emergency situations

WARNING:
In case of fire, the operator must immediately raise the alarm and move away from the area to allow trained personnel with the appropriate protective and operational means to intervene.

Electrical parts

In case of fire of electrical parts, take action with CO2 fire extinguishers to limit and circumscribe the damage.

In general

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

9 SUPPORT

Need more help? Want to take a look at our products? Feel free to look at our support wab page at this link: https://www.3dwasp.com/en/support

Use the QR code below to keep the site running on your mobile device:

NOTES

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