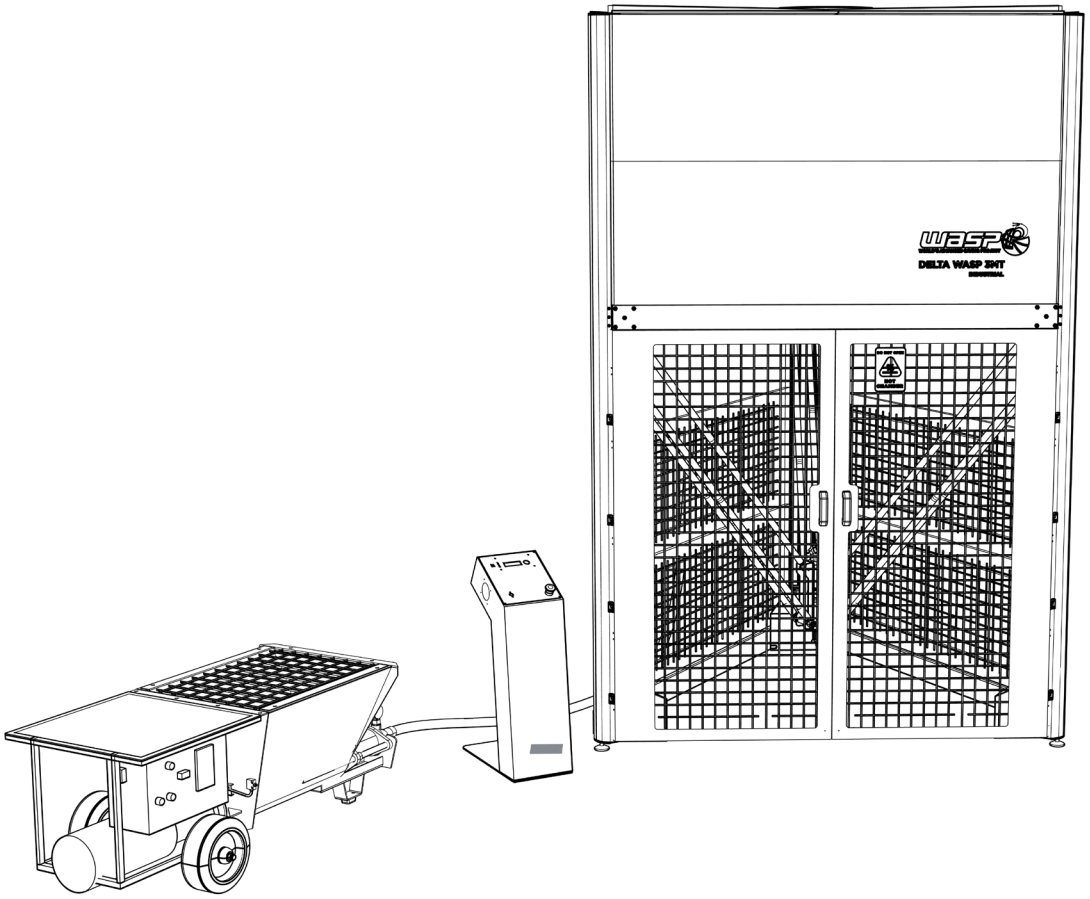
DELTA
WASP 3MT

MANUAL OF USE AND MAINTENANCE



INDUSTRIAL LINE 4.0 LDM

ORIGINAL INSTRUCTIONS

Disclaimer

IMPORTANT:

We kindly praise to read carefully and comprehend totally the content in this manual of Use and Maintanance.

The missing acknowledgment of the manual can be cause of personal injury, worst quality results or damages to the printer Delta WASP INDUSTRIAL LINE 4.0 LDM. Always make sure that the personal using the 3D printer knows and understands the content of the manual in order to the best results from DELTA Delta WASP INDUSTRIAL LINE 4.0 LDM

1	First edition	- 16/09/2019
Revision	Reason for the revision	Revision date

Sommario

0 PREMISES

0.1. Aim of the instruction manual

IIMPORTANT:
Before proceding with the installing and starting of the printer, the technician, the user, the maintainer and the safety responsible must read and understand the actual manual.

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

It contains instructions that must be acknowledged by the personal devoted to the use, maintanance 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.

It must always be available for consultation, in copy and by the recupient, 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.
It is susceptible of updates which, appropriately classified, will be transmitted to the employer in order to update the consultation copy (s).

• The recipient must ensure that the personnel authorized by him 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.

• Si declina ogni responsabilità per danni a persone o cose derivanti da uso improprio e/o da omessa o inadeguata manutenzione.

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

How the read the manual of instructions

This manual is composed by:

COVER WITH PRINTER IDENTIFICATION
By consulting the cover you trace to the printer model covered in the manual and to the printer serial number in your possession.

ANALYTICAL INDEX
By consulting the index it is possible to indentify to the chapter and to 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)

0.2. 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.

0.3. 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

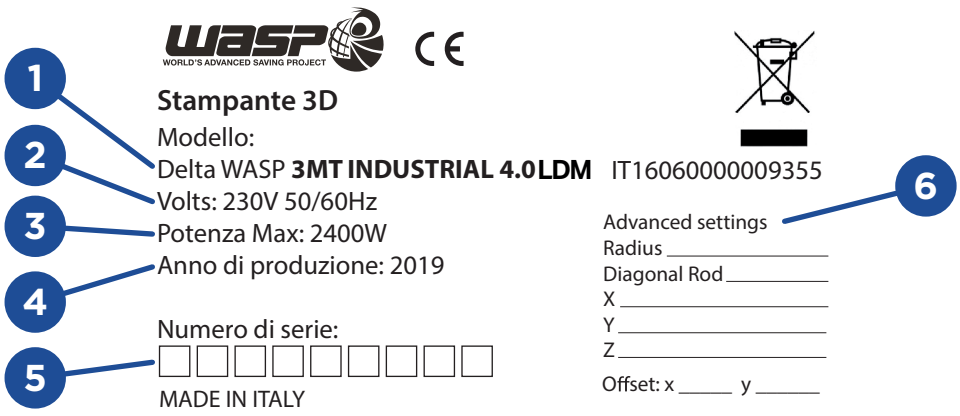
1.1. Manufacturer identification data

CSP S.r.l.
Viale Zaganelli, 26 - 48024 Massa Lombarda (RA) Italia
Tel. +39 0545 82966
info@3dwasp.com / www.3dwasp.com

1.2. Indentification 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.

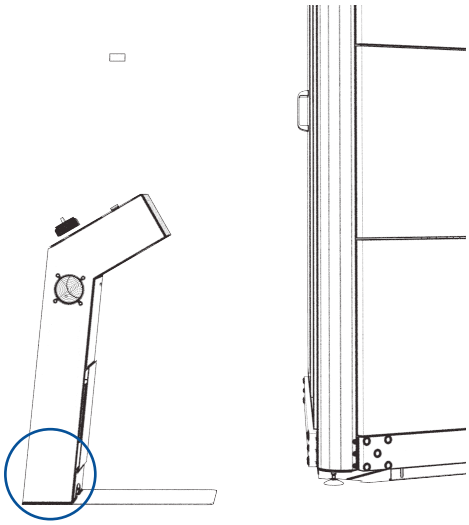
Legend:



Legend:

1. Model
2. Voltage
3. Maximum power
4. Year of production
5. Serial number
6. Advanced settings

1.2.1. Position of the label on the printer



1.3. Testing

The printer is tested directly by the Manufacturer during the phase of mounting and post mounting.

1.4. Warranty

The printers built by CSP S.r.l. are covered by a warranty for a period of 12 months for companies or VAT and 24 months for individuals.
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, CSP 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 CSP 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, possibly supplied by the manufacturer together with the machines.

NOTA:

The guarantee lapses in the following cases:

- **In case of 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;**
- **ny 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.**

ATTENTION:

The Manufacturer is not responsible in any way for improper use of the printer and the software contained in it by the customer.

Any attempt to modify or tamper with the interface, the management software, not expressly authorized by the Manufacturer in writing, will immediately void the Warranty. In no way will the Manufacturer be responsible for data loss, malfunctions and any security problems, even indirectly due to tampering and / or changes to the software or interface, not authorized by the Manufacturer

CAUTION:

Any intervention must be performed on the printer requires 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"). CSP 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 points and measures to avoid incurring any kind of accidents, which may be defined as residual risks, which are the minimum essential safety provisions to be maintained, which characteristics must have the personnel assigned to the normal assembly operations and which must be the characteristics of the maintenance personnel.
We are 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:
- Mechanics
- 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 adjustment operation must be carried out with the printer stopped and only and exclusively by the mechanical maintenance technician, qualified to operate in conditions of protection disconnected (see paragraph 1.7.1 "Identification of the operating personnel").
Maintenance work must only be performed with the printer disconnected from the mains and taking all the safety measures required by current regulations.

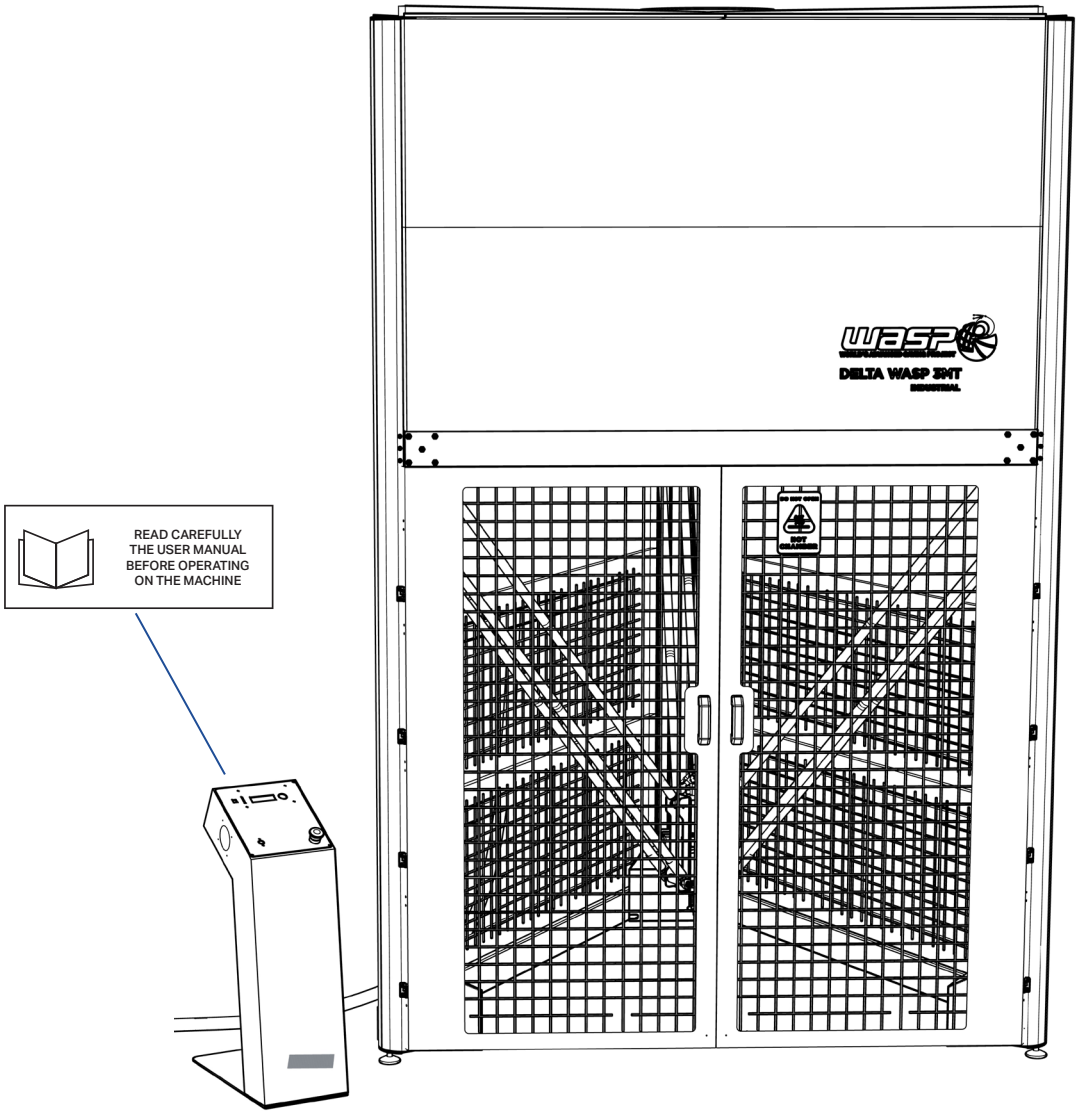
ELECTRICAL NATURE INTERVENTIONS

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 the 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 if not directly concerning the use of the plant.

1.5. General safety warnings



READ CAREFULLY
THE USER MANUAL
BEFORE OPERATING
ON THE MACHINE

Caution: warm, do not touch: risk of burns

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.

1.6. 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.
It 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.
It 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. It is able to operate in the presence of voltage inside enclosures and junction boxes

Manufacturer Technician
Qualified technician provided by CSP 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:
Indica situazioni o operazioni che devono obbligatoriamente essere eseguite o le informazioni alle quali occorre prestare particolare attenzione per evitare danni alle persone.

WARNING:
Indicates situations or operations in which there is the possibility of causing damage to the printer, 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 printed intended for fluid-dense materials.
The printer consists of an extruder with a screw mounted on a delta robot type structure.
The material is put under pressure through a continuous feeding system and pushed towards the extruder where it is dosed in a controlled way by a screw and poured through a nozzle that deposits the material on the work surface. The material is deposited by the nozzle layer upon layer according to “layers” defined by the file made by slicing software. It is therefore possible to make any shape and any type of object within the limits of this technology.

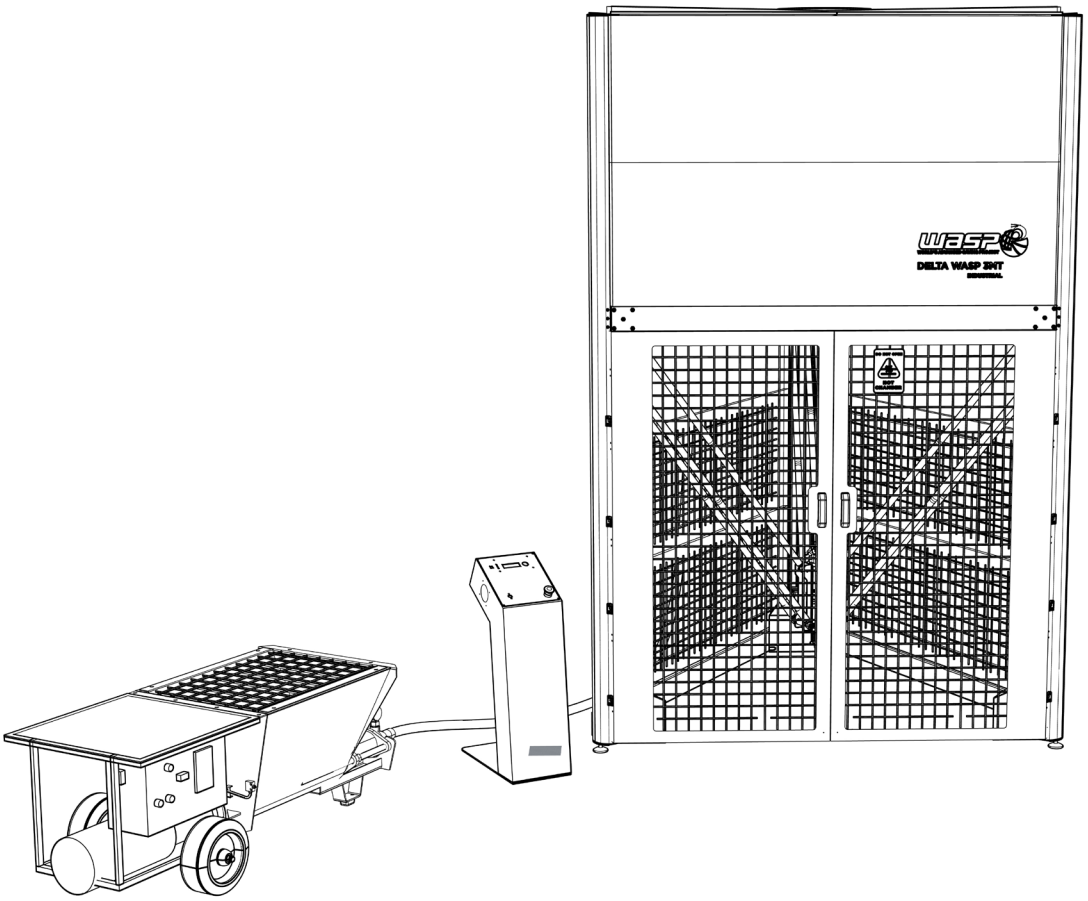


Fig. 2 - Printer

2.1. Control panel

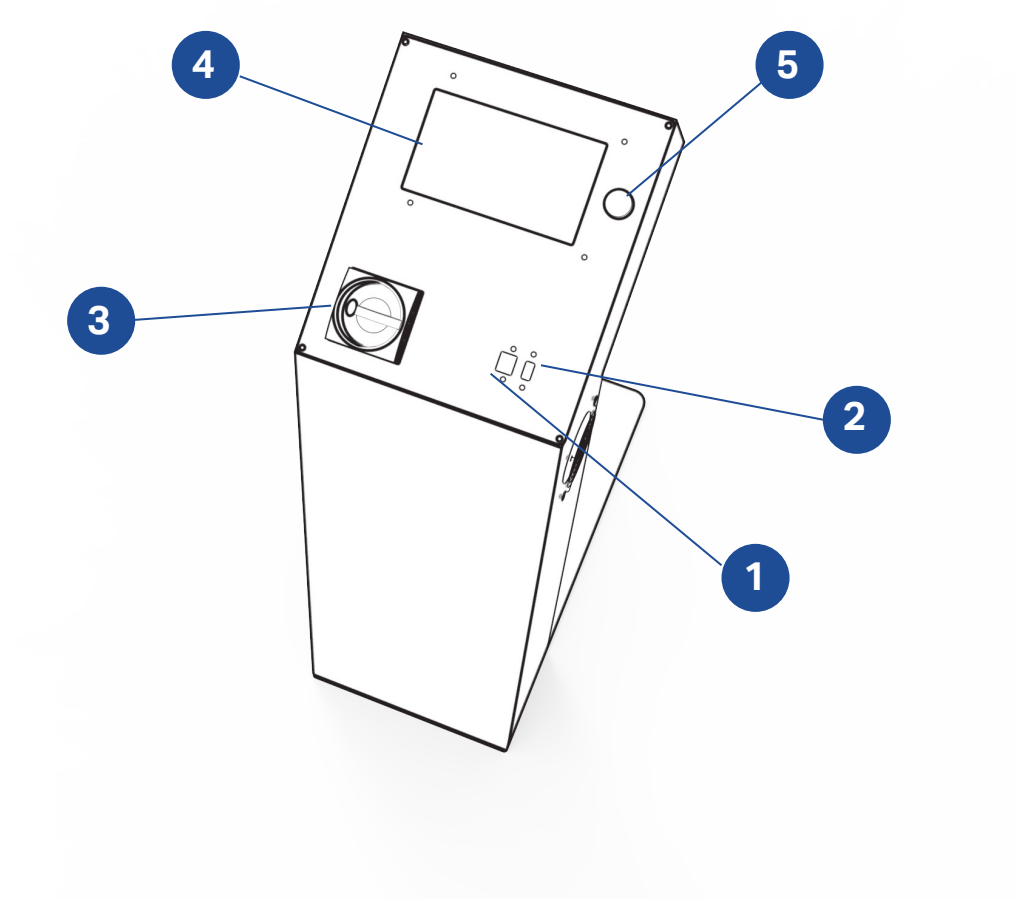


Fig. 2.1 - Control panel

Legend:

1.ETHERNET CABLE

2. USB door

3. ON/OFF

4. Operator display

5. Display control handle (Rotates left and right and is clickable)

2.2. Work area

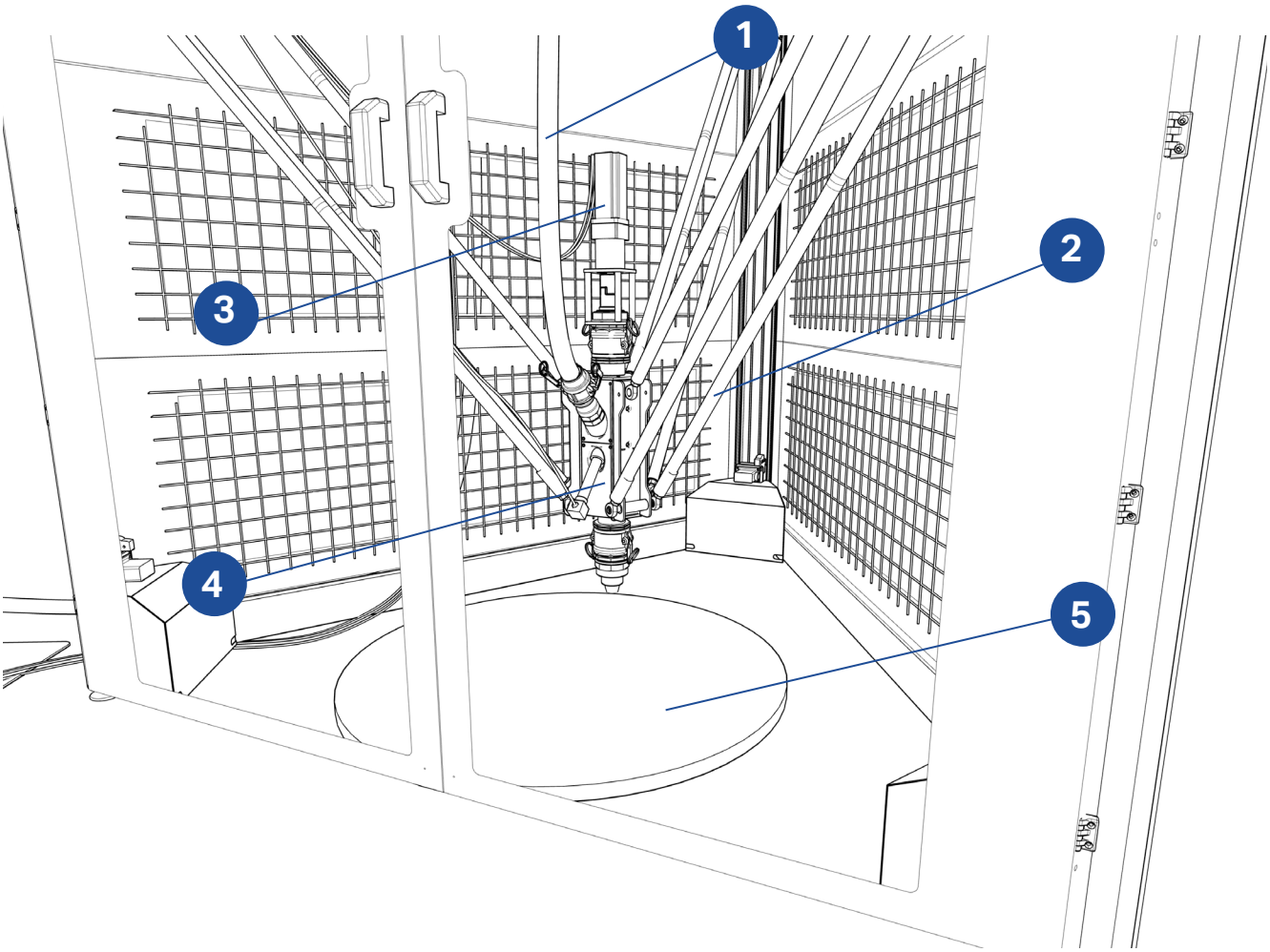


Fig. 2.3 - Work area

Legenda:

1. Feeding tube
2. Handling arms
3. Motor brushless extruder
4. Extruder
5. printing plan

2.3. WASP Concrete extruder description

The WASP Concrete Extruder is an extruder developed specifically for the Delta WASP 3MT 4.0 3D printer. It is capable to extrude fluid-dense materials such as concrete mortars, clay and other raw earth-based mixtures.
The WASP Concrete Extruder is connected through a tube to a fluid-dense material pump. The feeding of the material is controller with an adjustable pressure sensor that is screwed near the inlet of the extruder.
The material is then conveyed by a screw that is powered by a motor that controls the extrusion flow.
The material is then printed in position after being pushed through a nozzle that defines the width of the extruded path.

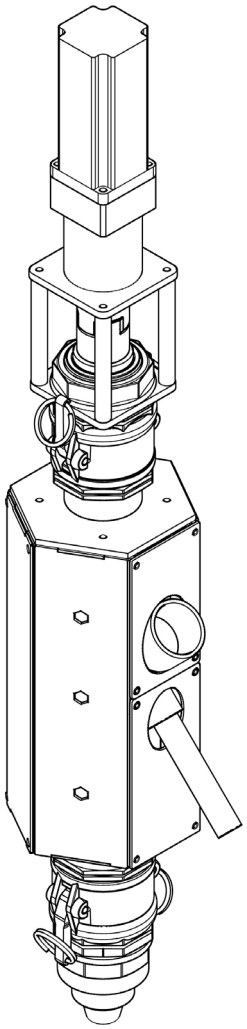


Fig. 2.4 - Extruder

2.3.1. Cleaning and maintenance

The entire extrusion system has been designed for fast disassembly to promote great speed during the cleaning phase. In fact, a thorough cleaning of all parts is required every time a print is finished or the extrusion is interrupted for a period longer than the setting time of the material.
----- Ordinary cleaning is described in the *first use - cleaning chapter*. -----
The maintenance of the extrusion system includes:
accurate cleaning of all parts of the extruder to avoid the accumulation of residues inside the joints and moving parts
• greasing and periodic cleaning of the thread where the pressure sensor is screwed
• greasing and periodic cleaning of all camlock couplings
• greasing and periodic cleaning of the elastic joint between the motor and the screw conveyor

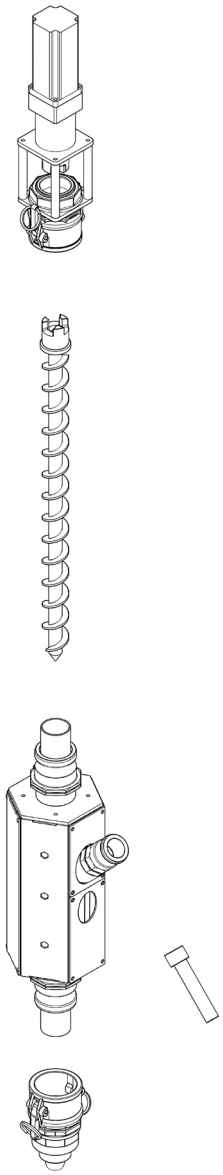


Fig. 2.5 - Extruder

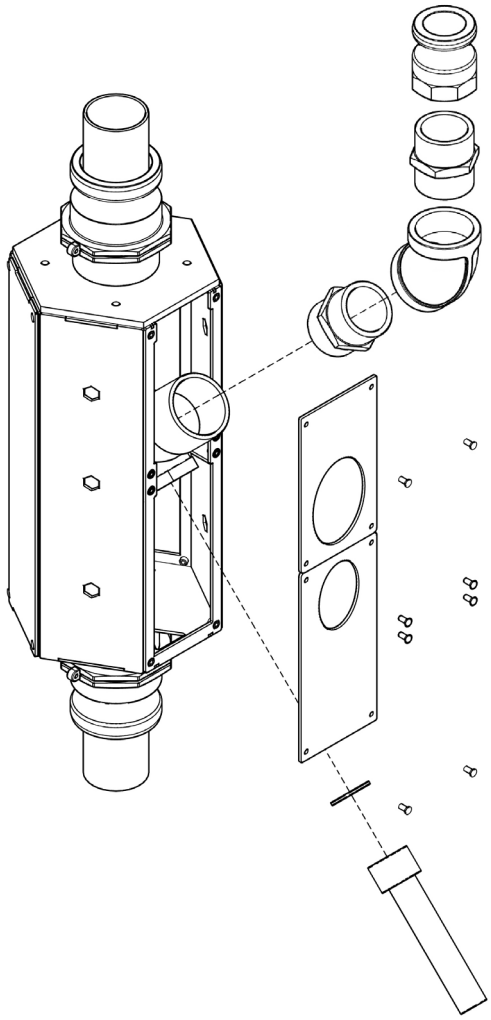


Fig. 2.6 - Extruder

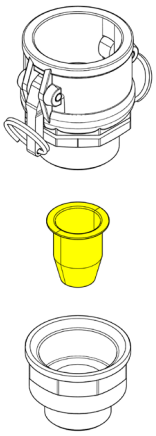


Fig. 2.7 - Nozzle

2.4. External printer area

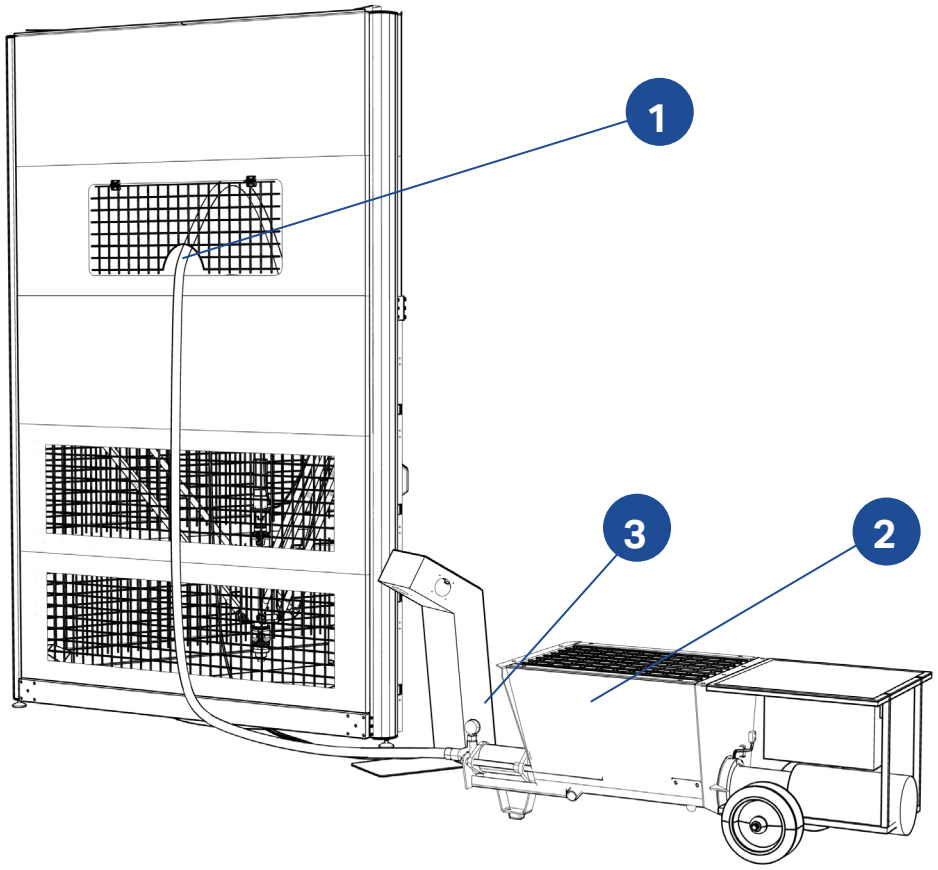


Fig. 2.8 - External printer area

Legend:

1. Feeding tube
2. Mixer pump
3. Label CE

2.5. Feeding system description

The WASP continuous feeding system is a loading system developed in collaboration with MIXER Technology able to work with fluid-dense materials such as concrete mortars, clay and raw earth based materials.
The continuous loading system is connected to the WASP Concrete Extruder through a camlock coupling located at the end of the feeding hose. The material supply to the extruder is controlled by an adjustable pressure sensor positioned near the material inlet.
The material is then transported by a screw driven by a motor that controls the extrusion flow.
The previously prepared material is inserted into the continuous loading system which regulates the flow through a pressure sensor.

Pressure reading adjustment
The mortar pump is equipped with a control panel, inside there is an inverter that regulates the feeding of the pump based on the outlet pressure.
Depending on the density of the material to be printed, the maximum set pressure must be adjusted.
To change this value it's necessary to follow this procedure:

- Set the pump into automatic mode
- Adjust the potentiometer from 0 to 6 based on the density obtained. (pressure switch reads from 0 bar to 6 bar)

2.5.1. Cleaning and maintenance

Instructions are given in the mortar pump manual.

It is mandatory to clean the output connection of the stator every time it is used.

2.5.2. Installation

Instructions are given in the mortar pump manual.

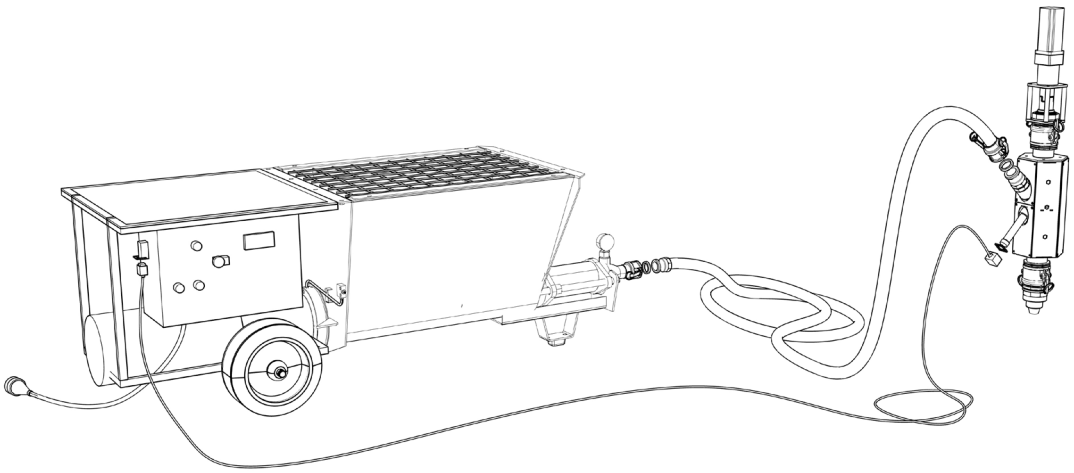


Fig. 2.9 -Feeding system

Technical data

All WASP 3D printers are characterized by considerable strength and working precision.
Their mechanics allows for greater precision and stability, guaranteeing greater production speeds.
A further advantage is the possibility of restarting the production of the piece from the point where it should be interrupted for any reason.

General characteristics	
Length	215 cm
Width	235 cm
Height	305 cm
Approximate weight	250 kg
Noise	< 70 db (A)

Mechanical characteristics	
Frame and cover	Sheet metal and aluminum
Print plan	Rectified aluminum
Movements	Rotolamento su guida di alluminio anodizzato
Motosi	Stepper Nema 34 + brushless

Electrical characteristics	
Input	220/240 V - 50/60 Hz
Absorbed power	Estrusore Concrete: 400 W max Drivers: small 200 w

characteristics of use	
Environment of use	20-30 °C
Storage	0-30 °C
Nozzle	/
Heated floor	/

IInformation on the printer	
Technologies	LDM
Cylindrical printing area	Ø1000 x h 1000 mm (h max 1000 mm)
Nozzle diameter	Concrete 1-3cm
Layer resolution	1mm
Speed max	200 mm/s
Diameter aggregates	Ø 0-2 mm
	/
	/

Interface and software	
Operating systems	Windows, Mac, Linux
Software slicing	Simplify3D, Cura, Slic3r
Software interface	Repetier Host, Pronter Face
File type	.stl, .obj, .gcode
Interface	Pendrive USB, TFT touch display, Wi-Fi

2.6. Noisiness

The noise emitted by the printer only is inferior than 60 dB(A).

The presence of more machines in the same area increases

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).

2.7. Intended use of the printer

The device described in this manual is a 3d printed intended for fluid-dense materials.
The printer consists of an extruder with a screw mounted on a delta robot type structure.

2.8. 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. Printer delivery

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 5 ° C and 40 ° 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. Unpackaging

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.

The printer will be delivered in a horizontally oriented wooden box.
After removing the printer from the case, you must place the printer upright.

NOTE:
To perform this procedure it is required the presence of three operators because two will take care of overturning it and the other will keep it steady on one side..

3.3. Content

The printer is supplied with:

- "Getting started" guide

3.4. Lifting and handling of the printer

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 50Kg) by two qualified operators.

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.
Once the printer is positioned, lock the front wheels with the brakes.

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..

AATTENTION:
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 suitable.

4.3. WASP Concrete Extruder

- Remove any other extruders from the Delta WASP 3MT 4.0 3D printer.
- Position the extruder vertically on the printing surface and screw the plates positioned on the three arms of the printer to the appropriate threaded inserts on the extruder using a number 6 hex wrench. It is necessary to orient the extruder maintaining the entrance of the material and the pressure sensor towards the front of the printer.
- Connect the two cables from the extruder motor to the corresponding cables present in the printer.
- Connect the pressure sensor cable and secure it by screwing the appropriate screw with a flat screwdriver.
- Connect the material loading tube with the camlock coupling.

4.4. Pump connection

Refer to the instruction manual of the pump.

5 PREPARING TO USE THE PRINTER

5.1. 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).

5.2. User interface

5.2.1. Main board

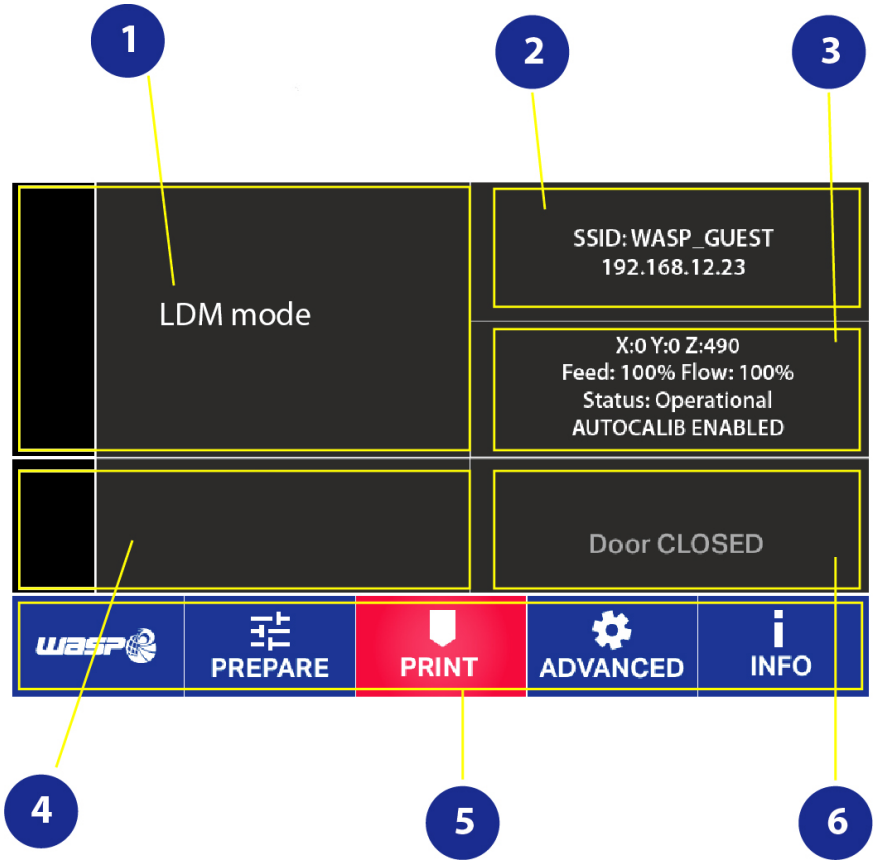


Fig. 5.2.1 - Main board

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

Legenda:

1. LDM mode
2. Info wifi
3. Info: positions, feed, flow, state
4.
5. Toolbar
6. door open/closed

5.2.2. Menù print

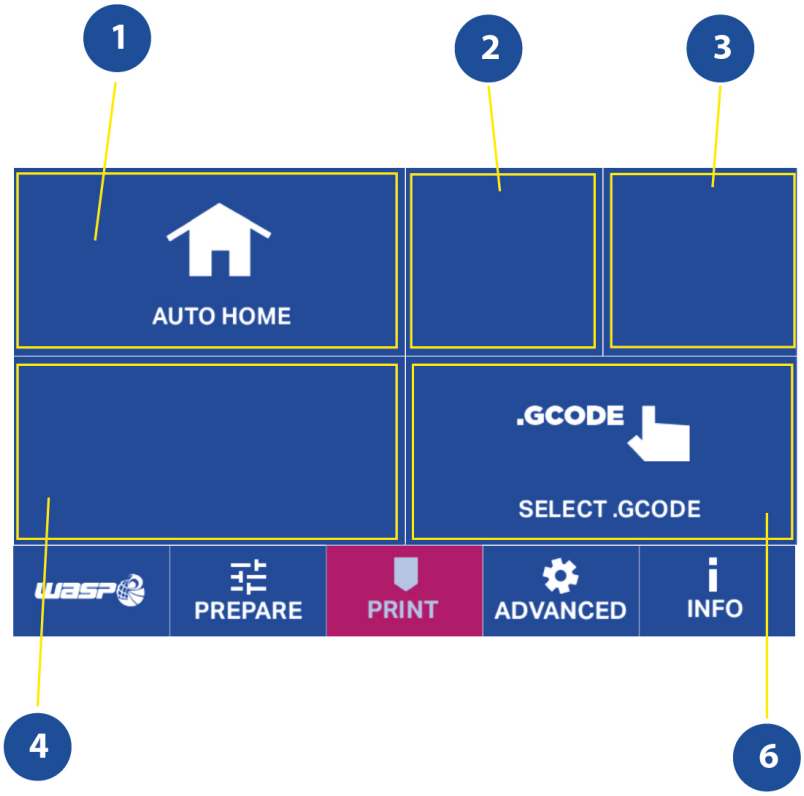


Fig. 5.2.2 - Menu print

The PRINT menu contains the commands useful in order to prepare and launch the print, proceeding in reading order

Legenda:

1. Auto home: resets the printer to the axis reset position
6. Gcode: gives access to the gcode menu for printing (par 8.5)

5.2.3. Menu PREPARA

Fig. 5.2.3 - Menu PREPARE

It is accessed from the respective button on the toolbar and contains several useful commands that are not frequently used.

Legend:

- Free Zeta system: as in Free Zeta System
- Set Z max: allows to set a height value of the machine
- Manual extrusion: as in Manual Extrusion
- Manual leveling: manual leveling environment
- Disable motors: disable motors stepper

5.2.4. Menù ADVANCED

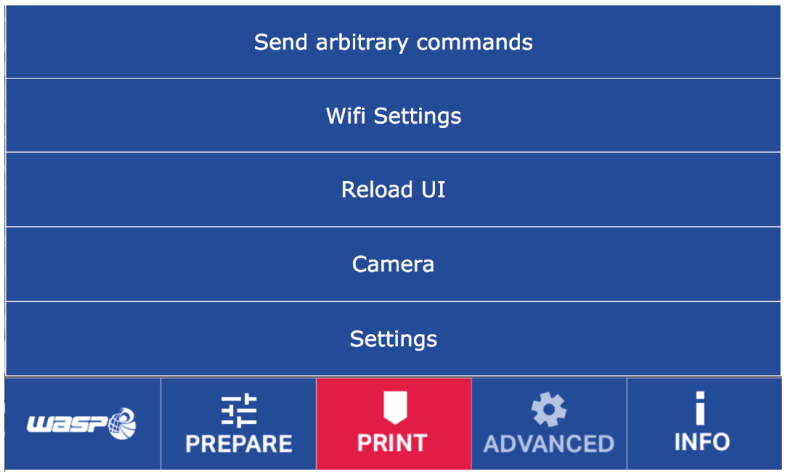


Fig. 5.2.4 - Menu ADVANCED

It has several useful commands for extraordinary use.

Legend:

- Send arbitrary command: contains a keyboard that allows you to directly launch commands to the card
- Wifi settings: is used to connect the machine to a WiFi network(par 8.14)
- Reload UI: reload the machine's graphic interface
- Camera: shows what the camera sees
- Settings: allows to set different advanced parameters

5.2.5. WIFI settings

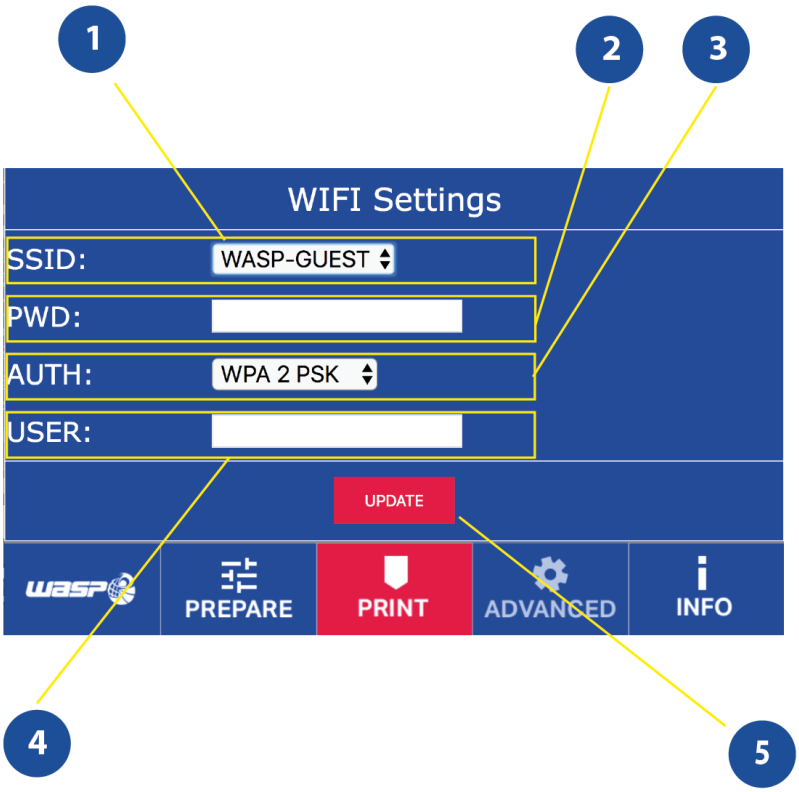


Fig. 5.2.5 - WIFI settings

Through WIFI settings, present in the ADVANCED menu it is possible to connect the printer on the network (par 8.14)

Legend:

1. SSID: It is used to select the desired network to connect
2. PWD: Allows you to enter the network password (if present)
3. AUTH: Specifies the type of network to which you are connected
4. USER: Enter (if present) the user name to connect
5. Clicking UPDATE restarts the machine with the new settings.

5.2.6. GCODE

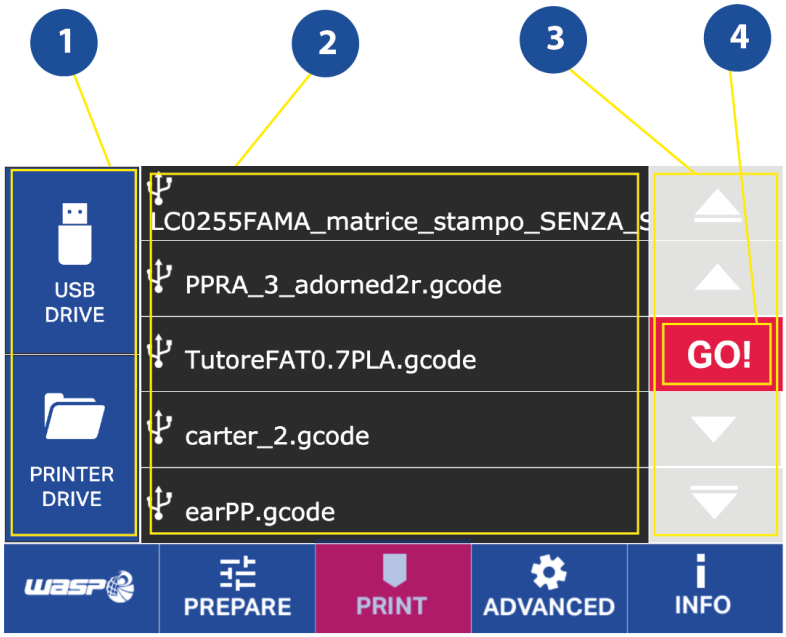


Fig. 5.2.6 - GCODE

From the "PRINT> GCODE" menu it is possible to choose the code to be launched and save it from the USB flash drive to the internal memory (par 8.5)

Legend:

1. USB Memory Choice / Printer Memory
2. List gcode, those on the USB memory have the icon on the side
3. Arrows for navigation
4. GO: launch the selected print

5.2.7. Menù INFO

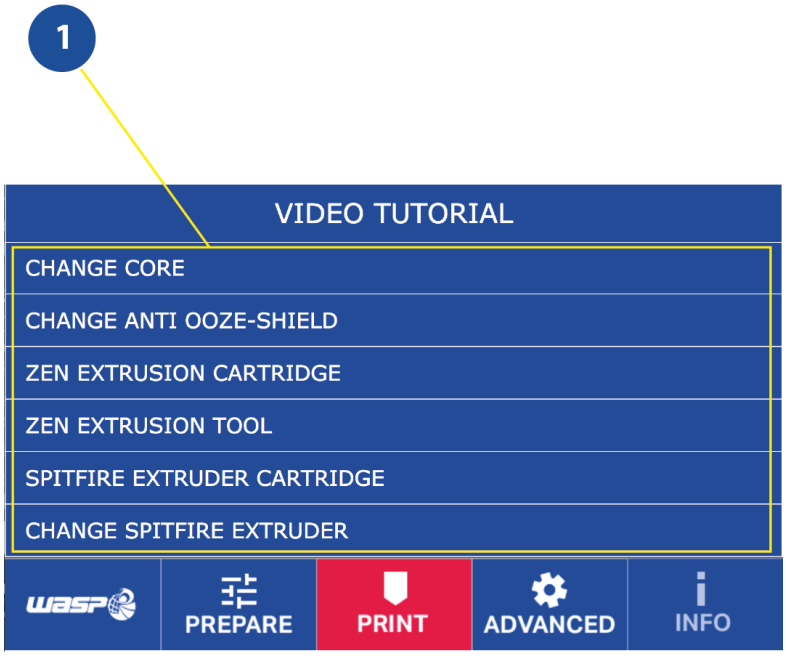


Fig. 5.2.7 - menu INFO

In the INFO menu there is a series of explanatory videos collected with a didactic title. It is possible to view them directly on the machine display. Exiting the menu the video will pause. Clicking the INFO button inside a specific page dedicated to that area (when present)

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

- **NOTE:**
- **Inside the SD card supplied with the printer are provided:**
- **• Free software for creating models to print**
- **• Standard software configurations to be imported into the computer**
- **• Sample file in “.gcode” format to be printed in 3D.**

6.2. Gcode creation

Make sure that the 3D model has the following features:
- no open edges
- correct positioning on the printing surface
- export in .stl format

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 the slicing is a code file containing the coordinates of the movements, and the commands that the printer will execute. Open the slicing software (eg Simplify3D) and load the .fff profile contained in the USB flash drive ("configurations" folder) already inserted in the printer. Load the .stl file and set the printing parameters.
Save the .gcode inside the USB and insert it in the printer.

6.4. Printing bed

The Delta WASP Industrial 4.0 3D printer is designed to print on the ground or on a mobile support, the printed part is easily removable by frontal translation through a passage positioned at ground level (to open the passage: lift and remove the bottom front beam positioned under the doors).

To provide better adhesion on the first layers, it's possible to use different types of printing beds.
An update of the "Z max" value is necessary every time the printing bed height is changed.

6.5. Loading the material

WASP provides guidelines for a generic concrete mixture (% in weight): 10% water; 36% binder; 54% inert; 0,5%

additives.

The percentages might change but the extruded material must be dense enough to sustain itself while being printed.
NB if the percentage of the binder is lowered too much, the material risks disgregating during transport and blocking the pump.
NB the inert diameter recommended by WASP ranges from 0 to 1mm, the extrusion system supports up to 2mm, the pumping system supports up to 6mm, the extruder is not guaranteed if a grain size larger than 2mm is used.

1 evenly mix the grout (water-binder)
2 mix the desired mortar evenly
3 insert the grout into the material transport hose (pump side, using a funnel)
4 insert of mortar inside the hopper (min 20 litres)
5 extrude until the entire grout is removed (this material must be disposed of)

6.6. First print layer

It's suggested to set the extrusion flow percentage to 150% while printing the first layer to increase the adhesion to the printing bed.

6.7. Lineup First use

1. bring the mortar pump into position in order to have control over the two control panels and the pressure gauge
2. Install the WASP Concrete Extruder on the Delta WASP Industrial 4.0 3D printer and mount the desired nozzle (fig 6.7.a), (fig 6.7.b), (fig 6.7.k), (fig 6.7.l) and (fig 6.7.m)
3. fit the Teflon circular diaphragm (thickness 1mm) to the inner end of the pressure switch thread. (fig 6.7.c)
4. assemble pressure sensor (fig 6.7.d) and (fig 6.7.e)
5. Connect the pressure sensor cable on the mortar pump and the extruder, checking that the seal on the pressure sensor is present, (fig 6.7.f) and (fig 6.7.r)
6. insert the screw, checking that the seal on the coupling is present, (fig 6.7.g)
7. fit the motor to the WASP Concrete Extruder, checking that the cables are connected (fig 6.7.h) and (fig 6.7.i)
8. Grease all the camlock couplings on the extruder and on the mortar pump
9. install the squirt shield cover (fig 6.7.j)
10. install (45 degree) junction (fig 6.7.n)
11. Plug the pump supply hose to the extruder, checking that the seals are present (fig 6.7.o), (fig 6.7.p), (fig 6.7.q), (fig 6.7.s) and (fig 6.7.t)
12. prepare the dough in sufficient volume to fill at least the continuous transport system (approximately 20 litres)
13. mount the pressure reading system and check its correct operation by testing the reading
14. lubricate the material transport system with a grout and make sure the pressure sensor is working correctly. (see chapter 7.3)
15. Activate the mortar pump in automatic mode
16. Extrude the material with "menu > extruder material"
17. Send the 3d printer to home position with "menu > prepare > auto home"
18. Measure the maximum height with "menu > prepare > Z max"
19. Perform manual levelling by screwing or unscrewing the 3 adjustment screws of the feet of the printer until reaching the necessary flatness
20. Select the printing .gcode file with "menu > sd card > file.gcode"

Fig. 6.7.a

Fig. 6.7.b

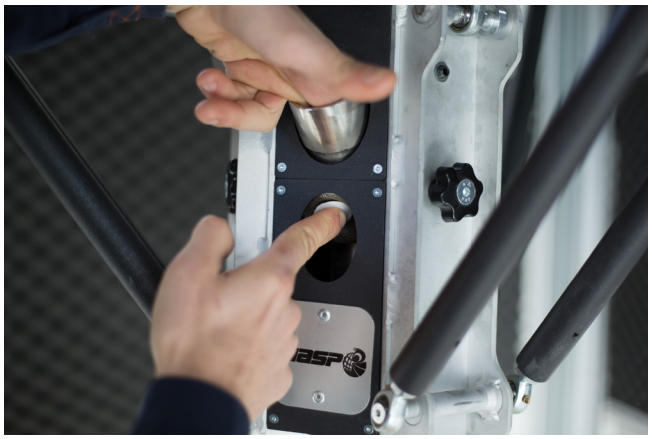


Fig. 6.7.c

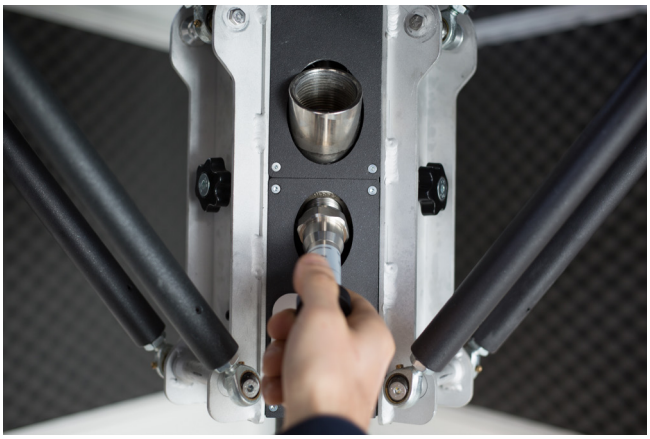


Fig. 6.7.d

Fig. 6.7 - First use

Fig. 6.7.e

Fig. 6.7.f

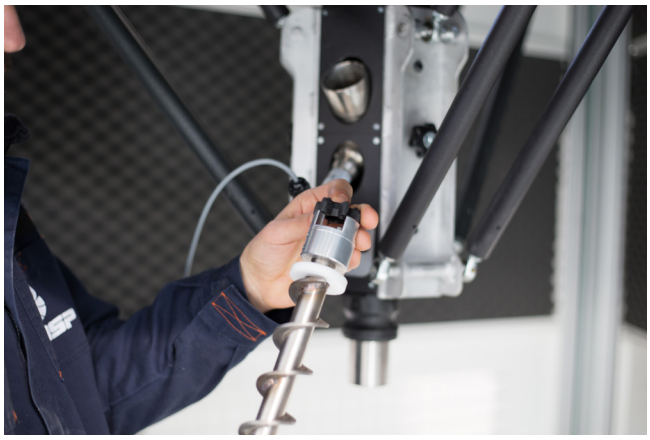


Fig. 6.7.g

Fig. 6.7.h

Fig. 6.7 - First use

Fig. 6.7.i

Fig. 6.7.j

Fig. 6.7.k

Fig. 6.7.l

Fig. 6.7 - First use

Fig. 6.7.m

Fig. 6.7.n

Fig. 6.7.o

Fig. 6.7.p

Fig. 6.7 - First use

Fig. 6.7.q

Fig. 6.7.r

Fig. 6.7.s

Fig. 6.7.t

Fig. 6.7 - First use

6.8. End of the print

1. Remove the printed part from the 3d printer
2. insert water in the mortar pump and extrude until the material exiting the extruder is clear
3. unplug the feeding hose from the extruder (fig 6.8.a)
4. clean the mortar pump (follow the instruction in the mortar pump manual)
5. clean the extruder.
6. disconnect the cables coming from the extruder motor and the pressure sensor (fig 6.8.a)
7. remove the nozzle (fig 6.8.b)
8. remove the squirt shield (fig 6.8.a)
9. unmount the extruder motor component opening the relative camlock coupling
10. unscrew the pressure sensor (fig 6.8.c)
11. remove the (45 degree) junction (fig 6.8.d)
12. remove the screw (fig 6.8.e) (fig 6.8.f)
13. clean all the part and reassemble the extruder (fig 6.8.g) (fig 6.8.h)

Fig. 6.8.a

Fig. 6.8.b

Fig. 6.8.c

Fig. 6.8.d

Fig. 6.8 - End of the print

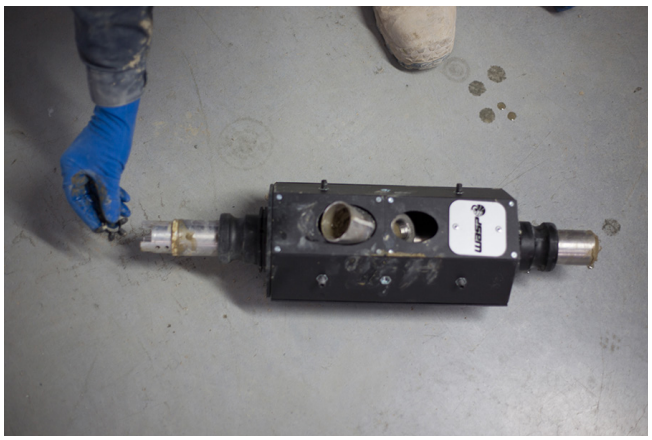


Fig. 6.8.e

Fig. 6.8.f

Fig. 6.8.g

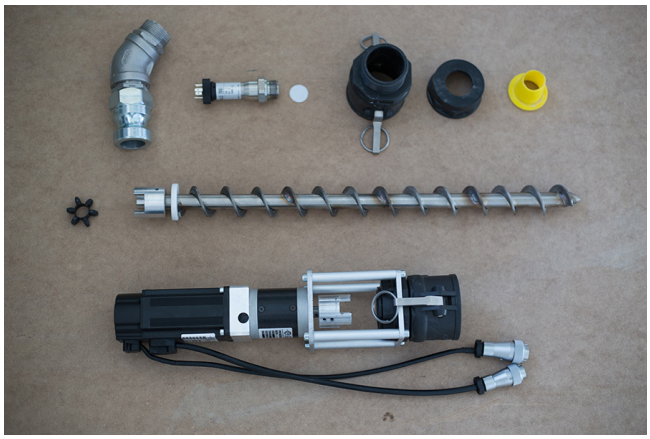


Fig. 6.8.h

Fig. 6.8 - End of the print

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

7 MAINTENANCE

7.1. General warnings

The reading of this chapter assumes, for a safe use of the printer, the knowledge of what contained in chapter1.6 “General safety warnings”.
Moreover, the specific prescriptions for interacting in a safe way with the printer, relative to this chapter, are detailed in the next 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).

7.2. Ordinary maintenance

Periodic maintenance and correct use are essential factors to ensure the functionality, safe operation and life of the printer. The maintenance operations and the interventions prescribed are the responsibility of the mechanical maintenance technician who must operate in compliance with the safety prescriptions contained in this manual.

ATTENTION:

Maintenance operations must be performed by disconnecting the printer from the power supply by disconnecting the power plug.

NOTE:

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

Parte coinvolta	Tipo di intervento	Periodicità	Procedura
Fan filter	Verification and / or Replacement	160 hours	Par. 7.2.1
Belt	Tension control	160 hours	/
Joints arms	Lubrication	160 hours	Par. 7.2.2
arms and sliders	Game Control	160 hours	Par. 7.2.5

7.2.1. Fun filter

Filter verification and replacement

To perform the verification, proceed as described below:

1. Remove the filter
2. If these are gray, replace or clean them.

7.2.2. Joints arms

Lubrication

Check the movement / rigidity of the joints of the arms, if these are rigid, apply grease with a brush.

7.2.3. Arms and sliders

Plays control

check that the joints of the arms do not have any play between them and the sliding lane, if present, contact the manufacturer

7.2.4. Extruder

The entire extrusion system has been designed for fast disassembly to promote great speed during the cleaning phase. In fact, a thorough cleaning of all parts is required every time a print is finished or the extrusion is interrupted for a period longer than the setting time of the material.

----- Ordinary cleaning is described in the *first use - cleaning chapter*. -----

The maintenance of the extrusion system includes:

accurate cleaning of all parts of the extruder to avoid the accumulation of residues inside the joints and moving parts

- greasing and periodic cleaning of the thread where the pressure sensor is screwed
- greasing and periodic cleaning of all camlock couplings
- greasing and periodic cleaning of the elastic joint between the motor and the screw conveyor

7.2.5. Feeding system

Instructions are given in the mortar pump manual.

7.3. Extraordinary maintenance

ATTENTION

Extraordinary maintenance operations must be carried out by Technicians of the Manufacturer or by maintenance staff instructed and authorized by the Manufacturer.

Any of these operations not carried out by a technician of the Manufacturer may cause irreversible damage to the machine or its parts and therefore void the Warranty.

Extraordinary maintenance interventions are those that are carried out:

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

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

8 USE OF THE PRINTER

8.1. General warnings

Reading this chapter assumes, for the sake of safe use of the printer, knowledge of the contents of paragraph 1.6 “General safety warnings”.
Furthermore, the specific provisions for safely interacting with the printer, relating to this chapter, are detailed in the following paragraphs.

ATTENTION:

The operations concerning these activities must be carried out by authorized and professionally qualified personnel.

8.2. Load the gcode

In the WASP 4.0 line the gcode can be loaded in two ways:

- Using a USB flash drive
- Using the Wi-Fi network

8.2.1. USB pendrive charging:

1. Correctly save the file in .gcode format on the pendrive.
2. Safely remove the pendrive from the computer and insert it into the front USB port of the machine
3. Select in the machine display “gcode” in the “PRINT” menu
4. Search for your file name and select it for printing
5. Once printing has begun, the file is saved in the machine memory and the pendrive can be removed

8.2.2. Wi-Fi upload:

1. Access the printer control from your browser (typing in the URL of your browser the IP address shown on the machine, see chapter 8.14)
2. Enter the “Control” page and click on “Upload gcode”
3. Wait for the .gcode to load
4. At the end the file can be selected for printing

If the internal printer memory is full, it will not be possible to add other gcode. And you will need to delete files to free up space.

8.3. Delete gcode from the machine

To delete gcode from the machine memory, enter the gcode list from the “PRINT” menu.

Keep pushing the gcode to be deleted for at least two seconds, select OK in the alert message that appears.

8.4. Change height

The height of the printer is the distance (in mm) set between the tip of the nozzle and the printing surface.
It is a fundamental requirement for calibration.

It is necessary in the case of:

- Extruder change
- Change printing plan

PLEASE NOTE:
If the set height is lower than this measurement, the tool will work higher than necessary (preventing the material from sticking properly to the surface).
If the set height is higher than necessary, the nozzle will be lower than the printing surface (with consequent damage to the surface and the tool).

8.5. Print removal

- To perform a good removal of the piece from the printing plate is required:
- That the printer is stopped: turned on or off is not important
- What can help in removing the piece is:
- remove the extruder before removing the piece

8.6. Wifi and remote control

To be used in its full potential, the printer needs to be connected to a wi-fi network. It is important that the network in questiones:

- safety
- stable
- managed by those who manage the machines
- not overloaded
- 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 on and visible
2. Turn on the machine
3. Enter the advanced menu> wifi settings
4. Complete the format by choosing the one required from the visible networks, enter the password (if present) and username (if necessary)
5. The machine will restart and if the information is correct it will be connected to the selected wifi
6. In the main screen of the machine will appear the information on the wifi connection (including the IP address of the machine to connect with the computer)

The machines connected to the network have the possibility of being controlled through the browser of a computer connected to the same wifi network as the printer.
To enter the "Octoprint" control environment:

7. Make sure both the computer and the printer are connected to the same wifi network
8. Enter in the browser URL * the IP address that appears on the machine (eg http://192.168.12.177)
9. The browser will enter the “Octoprint” platform for machine monitoring and control “
10. To access all the functions, log in with your account on “Octoprint” with username “wasp” and password “paspadmin”.

To enter the machine control interface:

1. Make sure both the computer and the printer are connected to the same wifi network
2. Enter in the browser URL * the IP address that appears on the machine by adding “/ wasp” (eg http://192.168.12.177/wasp)
3. The browser will enter a page similar to the printer interface, where you can work with the same commands.

Changing browsers can change the possibilities of use and the correctness of the views.

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

With the same IP address you can also connect from your smartphone

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

NOTE:

It is absolutely necessary to apply the regulations in force in the country of destination, regarding waste disposal, therefore it is forbidden to disperse any type of processing residue, oils, etc. in the environment.

Divide the dismantled parts by type for a correct differentiated collection of materials.

NOTE:

Within the European Community, electrical equipment must be disposed of in accordance with the provisions of the European Community Directive 2012/19 / EU on waste electrical and electronic equipment (WEEE).

ATTENTION:

The user has the obligation to dispose of the equipment at consortia and collection centers for the treatment and recovery of "WEEE".

9.1. 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 fire extinguishers to limit and limit damage.

In general

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

NOTE

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