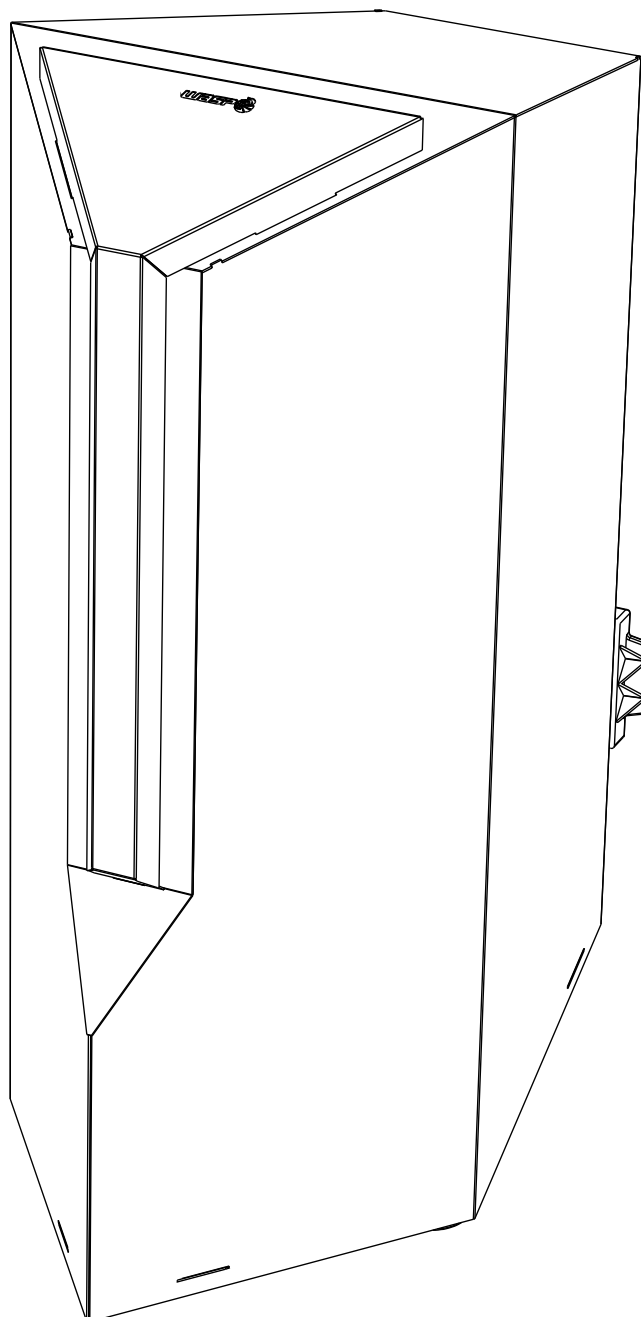


CEREBRO

MANUAL OF USE AND MAINTENANCE



ORIGINAL INSTRUCTIONS



Disclaimer



IMPORTANT:

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

The missing acknowledgment of the manual can be cause of personal injury, worst quality results or damages to Cerebro and WASP products. Always make sure that the operators using the 3D product knows and understands the content of the manual in order to achieve the best results from POWER WASP 45 HDP.

1	First edition	22/01/2025
Revision	Reason for the revision	Revision date

No part of this publication may be reproduced, stored in a filing system or transmitted to third parties in any form or by any means, without the Manufacturer having issued a prior written authorization. The Manufacturer reserves the right to make changes to its products at any time and without notice in order to constantly increase the quality, therefore this publication may also be subject to future modifications and updates.

Summary

0	Introduction	6
0.1.	Aim of the instruction manual	6
0.2.	How to read the manual of instructions	7
0.3.	Storage of the manual of instructions	7
0.4.	Updating the manual of instructions	7
1	General information	8
1.1.	Manufacturer identification data	8
1.2.	Identification label	8
1.3.1.	Position of the label on the product	9
1.4.	Testing	9
1.5.	Warranty	9
1.6.	General safety warnings	10
1.6.1.	Personal protective equipment	10
1.6.2.	Operators for whom the manual is intended	11
1.6.3.	Residual risks	11
1.6.4.	Safety stickers	11
1.7.	Glossary and pictograms	12
1.7.1.	Identification of Operational Staff	12
1.7.2.	Editorial pictograms	13
2	Description of the product	14
2.1.	Cerebro workflow overview	15
2.2.	Connections	16
2.3.	Led strip	17
2.4.	Technical data	18
2.5.	Noisiness	18
2.6.	Intended use of the product	18
2.7.	Improper use of the product	19
3	Extruder description	20
3.1.	Extruder's tools requirement	20
3.1.1.	Air compressor	21
3.1.2.	Dehumidifier Tank	21
3.1.3.	V.A.C.S. (Vacuum Active Control System)	22
3.1.4.	Continuous Feeding System	23
3.1.5.	Concrete HD Continuous Feeding System	24
3.2.	WASP HDP Extruder	25
3.2.1.	WASP HDP Extruder general safety warnings	25
3.2.2.	Personal protective equipment	25
3.2.3.	WASP HDP Extruder description	27
3.2.4.	WASP HDP Extruder Cerebro connection	28
3.2.5.	WASP HDP Extruder assembly and use	29
3.2.6.	WASP HDP temperature controls	33
3.2.7.	WASP HDP Extruder cleaning	33
3.2.8.	WASP HDP Extruder maintenance	34
3.2.9.	WASP HDP Extruder loading/unloading the material	34
3.2.10.	WASP HDP Extruder Extraordinary maintenance	35
3.3.	WASP HDP XL Extruder	36
3.3.1.	WASP HDP XL Extruder general safety warnings	36
3.3.2.	Personal protective equipment	36
3.3.3.	WASP HDP XL Extruder description	38
3.3.4.	WASP HDP XL Extruder Cerebro Connection	39
3.3.5.	WASP HDP XL temperature controls	40
3.3.6.	WASP HDP XL Extruder cleaning	41
3.3.7.	WASP HDP XL Extruder maintenance	41
3.3.8.	WASP HDP XL Extruder loading/unloading the material	43
3.3.9.	WASP HDP XL Extruder purging	43

3.3.10. Extraordinary maintenance.....	44
3.4. LDM WASP Extruder 3.0.....	45
3.4.1. LDM WASP 3.0 Extruder general safety warnings.....	45
3.4.2. Personal protective equipment.....	45
3.4.3. LDM WASP Extruder 3.0 description.....	47
3.4.4. LDM WASP Extruder 3.0 material.....	47
3.4.5. LDM WASP Extruder 3.0 Cerebro Connection.....	48
3.4.6. LDM WASP Extruder 3.0 assembly and use.....	49
3.4.7. LDM WASP Extruder 3.0 cleaning.....	50
3.4.8. LDM WASP Extruder 3.0 maintenance.....	50
3.4.9. LDM WASP Extruder 3.0 material tank.....	51
3.4.10. LDM WASP Extruder 3.0 loading/unloading the material.....	53
3.4.11. LDM WASP Extruder 3.0 extraordinary maintenance.....	53
3.5. LDM WASP XL Extruder 3.0.....	54
3.5.1. LDM WASP XL 3.0 Extruder general safety warnings.....	54
3.5.2. Personal protective equipment.....	55
3.5.3. LDM WASP XL Extruder 3.0 description.....	56
3.5.4. LDM WASP XL Extruder 3.0 Cerebro Connection.....	57
3.5.5. LDM WASP XL Extruder 3.0 assembly and use.....	58
3.5.6. LDM WASP XL Extruder 3.0 cleaning.....	60
3.5.7. LDM WASP Extruder 3.0 material.....	60
3.5.8. LDM WASP XL Extruder 3.0 maintenance.....	61
3.5.9. LDM WASP XL Extruder 3.0 material tank.....	62
3.5.10. LDM WASP XL Extruder 3.0 loading material.....	64
3.5.11. LDM WASP XL Extruder 3.0 extraordinary maintenance.....	64
3.6. LDM WASP XXL Extruder 3.0.....	65
3.6.1. LDM WASP XXL 3.0 Extruder general safety warnings.....	65
3.6.2. Personal protective equipment.....	65
3.6.3. LDM WASP XXL Extruder 3.0 description.....	67
3.6.4. LDM WASP XXL Extruder 3.0 Cerebro Connection.....	68
3.6.5. LDM WASP XXL Extruder 3.0 assembly and use.....	69
3.6.6. LDM WASP XXL Extruder 3.0 cleaning and maintenance.....	72
3.6.7. LDM WASP XXL Extruder 3.0 material.....	72
3.6.8. LDM WASP XXL Extruder 3.0 maintenance.....	73
3.6.9. LDM WASP XXL Extruder 3.0 loading material.....	73
3.6.10. LDM WASP XXL Extruder 3.0 extraordinary maintenance.....	74
4 Transport and handling.....	75
4.1. General warnings.....	75
4.2. Delivery of the product.....	75
4.3. Content.....	76
4.4. Unpacking, lifting and handling of the product.....	76
5 Installation.....	77
5.1. General warnings.....	77
5.1.1. Placement.....	77
5.2. Electrical connection.....	78
5.3. Pneumatic connection.....	78
6 App MyCerebro.....	79
6.1. First use.....	79
6.1.1. Download and installation.....	79
6.1.2. Connection to Cerebro.....	79
6.1.3. Network settings.....	79
6.1.4. Mode selection menu.....	80
6.2. Robot modules description.....	81
6.3. Manual mode.....	81
6.4. GPIO Module.....	82
6.4.1. Signals.....	82
6.5. User interface HDP.....	83
6.5.1. HDP main board.....	83
6.5.2. HDP advanced setting.....	84
6.5.3. HDP options.....	85
6.6. User interface HDP XL.....	86
6.6.1. HDP XL main board.....	86
6.6.2. HDP XL advanced setting.....	87
6.6.3. HDP XL options.....	88
6.7. User interface LDM.....	89
6.7.1. LDM main board.....	89
6.7.2. LDM advanced setting.....	90
6.7.3. LDM options.....	91

7 Ordinary and extraordinary maintenance.....	92
7.1. General warnings.....	92
7.2. Ordinary maintenance.....	92
7.3. Extraordinary maintenance	93
8 Additional Instructions.....	94
8.1. General warnings.....	94
8.2. Disposal and dismantling.....	94
8.3. Instructions for emergency situations	95

0 INTRODUCTION

0.1. Aim of the instruction manual

**IMPORTANT:**

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

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

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

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

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

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

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

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

0.2. How to read the manual of instructions

This manual is composed by:

COVER WITH PRODUCT IDENTIFICATION

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

ANALYTICAL INDEX

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

NUMERATION FIGURES

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

0.3. Storage of the manual of instructions

It is mandatory to keep this manual and all attached documents in an easily accessible place near the product 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 product for security purposes.

Therefore:

- It must be kept intact (in all its parts);
- It must follow the product 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 product.

0.4. Updating the manual of instructions

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

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

1 GENERAL INFORMATION

1.1. Manufacturer identification data

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

1.2. Identification label

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

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

EN 55022

EN 55024

EN 60204-1

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

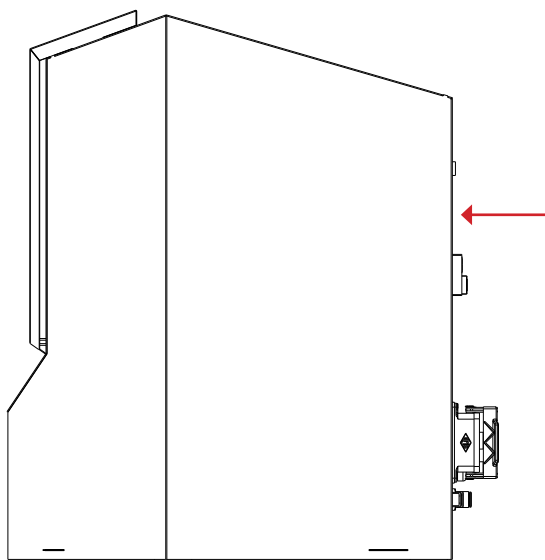


Legend:

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

1.3.1. Position of the label on the product

The identification label can be found on the back profile of the product.



1.4. Testing

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

1.5. Warranty

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

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

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

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

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

All consumables are excluded from the warranty.

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



NOTE:

The guarantee lapses in the following cases:

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

1.6. General safety warnings



CAUTION:

All intervention performed on the product require particular caution on the part of the operator. Under no circumstances should an operator be present inside the machine during the printing process



NOTE:

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

The purpose of this chapter is to indicate:

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

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

Possible operations on the product can include:

- Mechanical
- Electrical



MECHANICAL NATURE INTERVENTIONS

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

Every mechanical operation must be carried out with the product stopped and only and exclusively by the mechanical maintenance technician, qualified to operate in conditions of safety (see paragraph 1.6.1 "Identification of the operating personnel").

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



ELECTRICAL NATURE INTERVENTIONS

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

Every electrical operation must be carried out with the product stopped and only and exclusively by the electrical maintenance technician, qualified to operate in conditions of safety (see paragraph 1.6.1 "Identification of the operating personnel").

1.6.1. Personal protective equipment

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

1.6.2. Operators for whom the manual is intended

The manual is written for:

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



ATTENTION:

The user must not perform operations reserved for maintenance personnel or qualified technicians. The manufacturer is not liable for damages deriving from failure to observe this prohibition. Users or qualified technicians.

1.6.3. Residual risks

Residual risk of scalding

This risk exists if the chosen tool has a set temperature.



CAUTION:

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



ATTENTION:

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

Residual risk of electrocution



CAUTION:

It is present tension on the control unit.

Maintenance / Cleaning

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

1.6.4. Safety stickers

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



ATTENTION:

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

1.7. Glossary and pictograms

1.7.1. Identification of Operational Staff

The operator responsible for the operation or maintenance of the product 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 product.

User

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

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

Mechanical maintenance technician

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

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

Electrical maintenance engineer

Qualified technician able to conduct the product in normal conditions; it is in charge of all the electrical interventions of regulation, maintenance and repair.

He/she is able to operate in the presence of voltage inside enclosures and junction boxes

Manufacturer Technician

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

1.7.2. Editorial pictograms

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



DANGER:

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



WARNING:

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



ENVIRONMENTAL NOTE:

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



NOTE:

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

Personal protective equipment (PPE)

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



PROTECTIVE GAUNTLETS:

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



SAFETY SHOES:

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



PROTECTIVE WORKWEAR:

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



PROTECTIVE HELMET:

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

2 DESCRIPTION OF THE PRODUCT

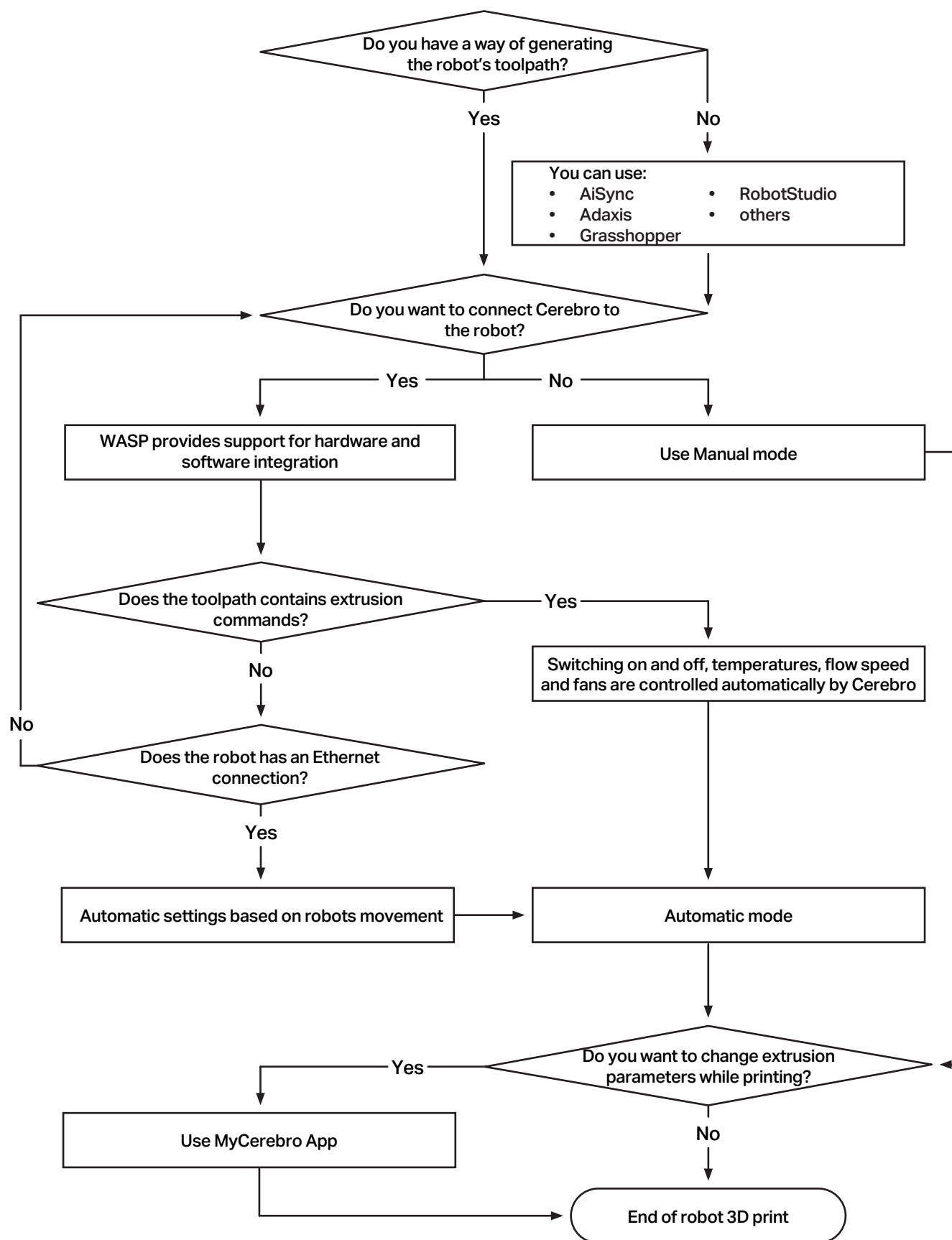
CEREBRO is an integration system between robots and extruders, designed to integrate any robotic arm to all of WASP extruders and printing tools, including both LDM and FGF technologies.

This technology will give you the possibility to print any kind of material, from technical and recycled thermoplastic pellets to clay and concrete, and even biomaterials such as mycelium.

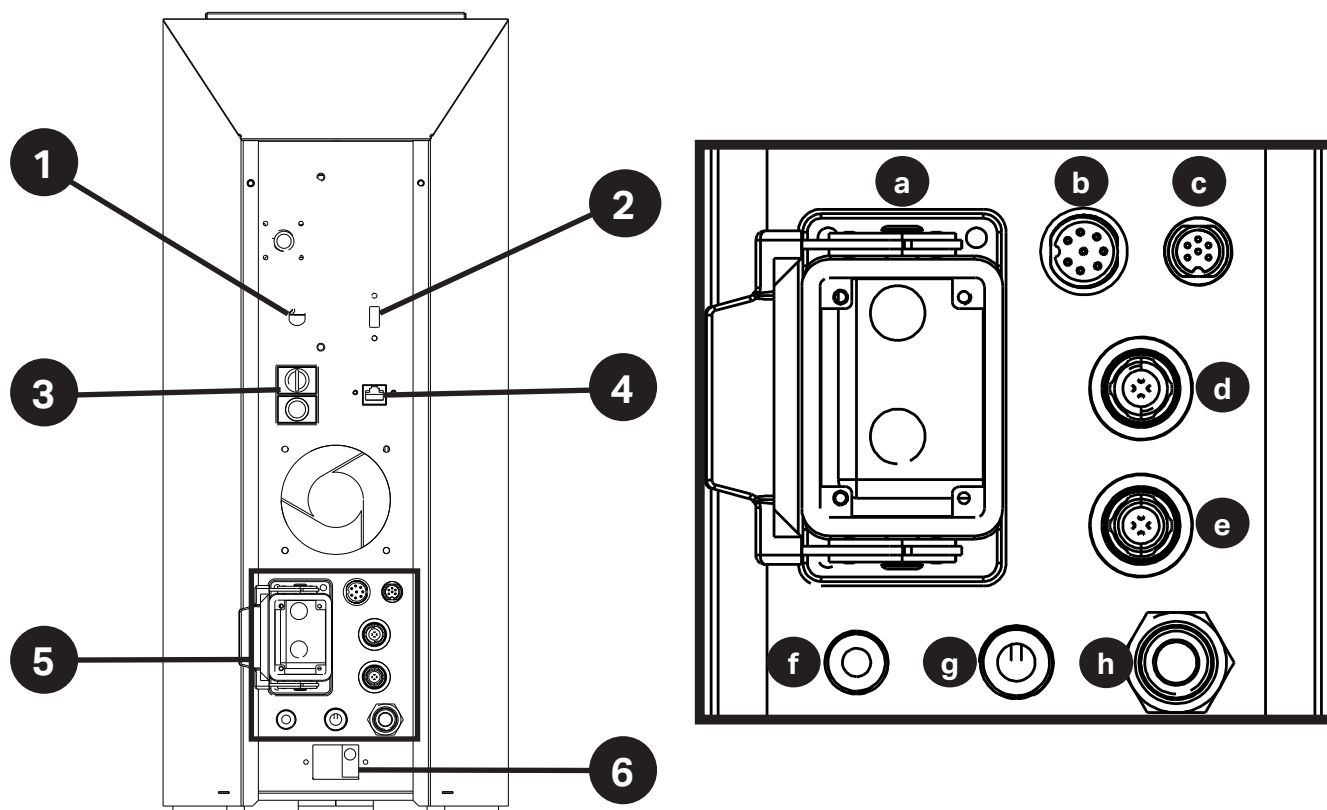
CEREBRO contains all the necessary hardware for controlling WASP extruders and tools, allowing the possibility of later connecting additional extruders. Various strategies are available for connecting to the robot, both analogue and digital, including TCP-IP protocols via ethernet or Wi-Fi, serial port through USB and Bluetooth connection to the dedicated app, which enables monitoring and control of the printing process through an integrated camera.



2.1. Cerebro workflow overview



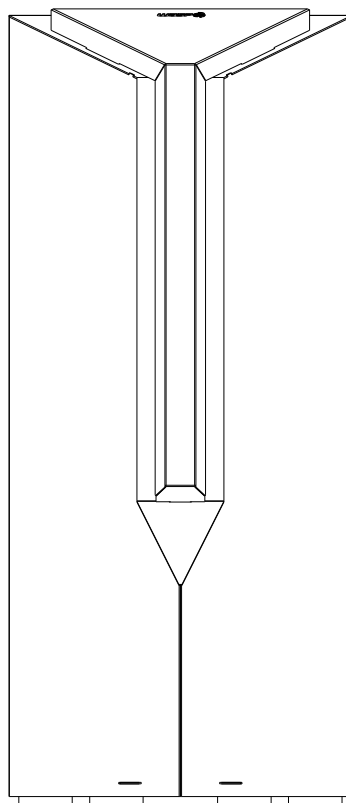
2.2. Connections



Legend:

1. Wi-Fi button
2. USB port
3. On/Off switch
4. Ethernet cable
5. Connections:
 - a. ILME 6 pins
 - b. GX 16-8
 - c. GX 12-6
 - d. GX 20-8
 - e. GX 20-12
 - f. V.A.C.S. air outlet 6mm
 - g. Compressed air inlet 8mm
 - h. Material charging outlet 10mm
6. 220V power outlet

2.3. Led strip



Legend:

1. Doors
2. Control panel
3. LED stripe: the colour of the light changes with the status of the product, allowing a quick visualization:

LED colour	State	Situations
White 	Operational	Machine turned on and ready to operate or print concluded
Red 	Cancelling/error	Machine cancelling an operation or sending an error message

2.4. Technical data

General features	
Length	25 cm
Width	50 cm
Height	58 cm
Approximated weight	17 kg

Electrical features	
Input	220/240 V - 50/60 Hz (110V on request)
Power consumption	From 200W to 3000W (depending on used tools)

Compressed air requirements (only for FGF tools)	
Input	>8 bars Minimum compressor volume 100 l 8 mm inlet hose

Use features	
Environment of use	15-30 °C
Warehouse	0-30 °C

Interface and software	
Operative systems	Android
Interface	US, Ethernet, Wi-Fi, Bluetooth
Remote control	MyCerebro

2.5. Noisiness

The noise depends on the used tools and materials.



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 product is installed, and to equip the operators with adequate Personal Protective Equipment (such as headphones for hearing protection).

2.6. Intended use of the product

The product was designed and built to integrate WASP extruder and printing tools with any robot. The supported technology include both LDM (Liquid Deposition Modelling) and FGF (Fused Granular Fabrication) depending on the installed tools. Any use of the product with materials other than those officially supplied for that tool will void the manufacturer's warranty and liability.

2.7. Improper use of the product

The following product uses are prohibited:

- Using the product to perform operations other than those for which it was designed and constructed described in this manual;
- Failure to comply with safety regulations;
- Operation of the product 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 product that involves the modification of components or parameters that affect the work cycle;
- Use of the product 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 product;
- the cancellation of the Manufacturer's Responsibility for damages caused to people, things or animals.



ATTENTION

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

3 EXTRUDER DESCRIPTION

Cerebro is designed to work with WASP extruders, the compatible ones are the following:

FGF Extuders				
Name	Nozzle diameter	Max pellet size	Dimensions	Weight
HDP	1 mm	Ø 3 mm	30x11x8 cm	1.9 kg
HDP XL	3 mm standard (2 mm and 5 mm available)	Ø 6 mm	71x22x18 cm	18 kg
LDM Extuders				
Name	Nozzle diameter	Max particle size	Dimensions	Weight
LDM 3.0	From 1.26 mm to 3 mm	Ø 0.3 mm	20x10x7 cm	0.8 kg
LDM XL 3.0	4, 6, 8 mm	Ø 0.5 mm	30x12x7 cm	1.5 kg
LDM XXL 3.0	17mm (other diameters on request)	up to Ø 3 mm	82x14x18 cm	10 kg

3.1. Extruder's tools requirement

Some extruder necessitates external components in order to work.

	HDP	HDP XL	LDM 3.0	LDM XL 3.0	LDM XXL 3.0
Air compressor Par. 3.1.1	Needed	Needed	Needed	Needed (with tank)	
Dehumidifier Tank Par. 3.1.3	Recommended	Recommended			
V.A.C.S. (vacuum active control system) Par. 3.1.2	Recommended	Recommended			
Continuous Feeding System Par. 3.1.4				Recommended	
Continuous Feeding System Concrete HD Par. 3.1.4					Needed



ATTENTION:

The data and specifications provided in this table are subject to change over time. Please refer to the most recent documentation or contact us for the latest information.

3.1.1. Air compressor

The air compressor is needed for the loading of the material with different extruders. Is recommended at least a 8 bar, 105L/min air compressor.

Attach the compressor with a 8mm pipe to the manometer and to the 8mm air inlet of Cerebro (as indicated in the par.2.1 - "Connections")

3.1.2. Dehumidifier Tank

The dehumidifier tank is used to dry, store and load material's pellet into a HDP extruder.

Use a 10mm pipe to connect the 10mm air outlet of Cerebro with the material feeding hose (as indicated in the par.2.1 - "Connections")

First use procedure:

1. Open the dehumidifier's lid and verify that it is empty
2. Check that the feeding hose is correctly attached to the machine (fig. 3.1.2 a)
3. Attach the 10mm tube from the air outlet of Cerebro (as shown in par. 2.1 - "Connections") to the feeding hose air inlet
4. Fill the dehumidifier with the material's pellets (fig. 3.1.2 b)
5. Set the dehumidifier according to the material as instructed in its manual
6. Close the dehumidifier's lid
7. Load the material as described in the used extruder's description

To remove the material from the dehumidifier place a container underneath it and open the discharging lid. Once the tank is empty close the discharging lid.



fig 3.1.2 a



fig 3.1.2 b

3.1.3. V.A.C.S. (Vacuum Active Control System)

The VACS (Vacuum active control system) is a system that guarantees a removable printing base.

The characteristics of this system are:

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

To prepare the system for printing follow the steps:

1. Make sure that the V.A.C.S. is correctly connected to the 6mm air outlet of Cerebro (as indicated in the par.2.1 - "Connections")
2. With the machine turned on, check the cleanliness of the vacuum bed
The possible presence of debris can compromise the system's ability to reach the vacuum.
3. Place the silicone gasket in its slot (fig 3.1.3 a)
4. Place the removable printing surface on the top of the vacuum bed making sure that the gasket is touching the printing surface for the whole length (fig 3.1.3 b)
5. Activate the vacuum pump from the app (see par. 6.5.2 - "HDP Advanced settings" or par. 6.6.2 - "HDP XL Advanced settings").

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

If the plate is not solidly anchored to the vacuum bed, it means that the operation was not successful, generally this means there's a leak of air.

In this case repeat the procedure verifying:

- The cleanliness of the vacuum bed
- The integrity of the gasket, replacing it if necessary
- The flatness and integrity of the removable printing plate, replacing it if necessary



fig 3.1.3 a



fig 3.1.3 b

3.1.4. Continuous Feeding System

The CFS is the world's first continuous supply system for dense fluid materials for additive manufacturing that replaces the limited capacity tank with a virtually infinite power system.

The CFS can be fed continuously without ever interrupting the printing process. The material, after being mixed and brought to the correct consistency for printing, can then be introduced before the start of the system from the large side door and subsequently from the circular inlet hole during the printing phase.

However, it no longer matters that the material is compacted and degassed before being introduced, since the continuous movement of the mixer can easily remove all the air bubbles. An outcome that is difficult to achieve with standard tanks.

You can learn more about the Continuous Feeding System in its manual downloadable on the WASP website:

<https://www.3dwasp.com/en/download/download-info/manual-wasp-continuous-feeding-system/>

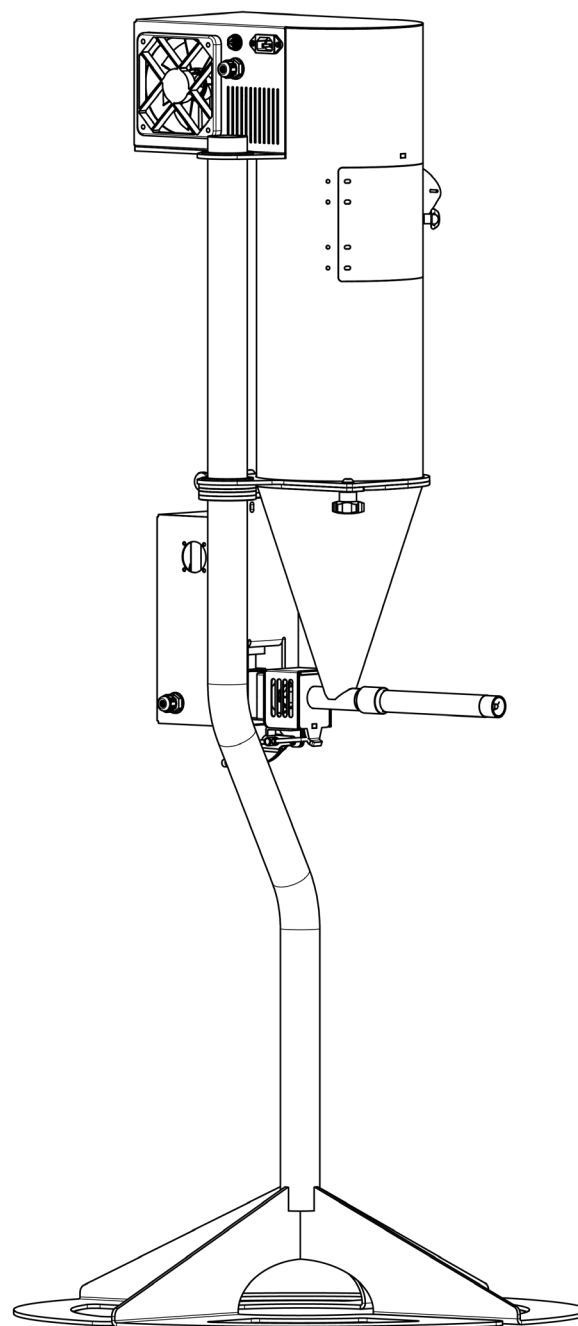


Fig. 3.1.4 - Continuous Feeding System

3.1.5. Concrete HD Continuous Feeding System

The Concrete HD Continuous Feeding System (or Concrete HD CFS for short) is the new WASP solution for concrete printing.

The Concrete HD CFS can be fed continuously without ever interrupting the printing process. The material, after being mixed and brought to the correct consistency for printing, can then be introduced while printing directly in the hopper. The material flows inside a cavity pump that pushes it up to the end of the tube where it is connected to our WASP XXL 3.0 LDM Extruder using a DN25 mortar coupling.

The Concrete HD CFS can handle various materials such as 3D printing ready-mixes, dry mortars, fibre filled mixtures and concrete with particle sizes up to 3mm and promises delivery rates up to 3L/minute. All the components are very easy to disassemble without tools to ensure fast cleaning.

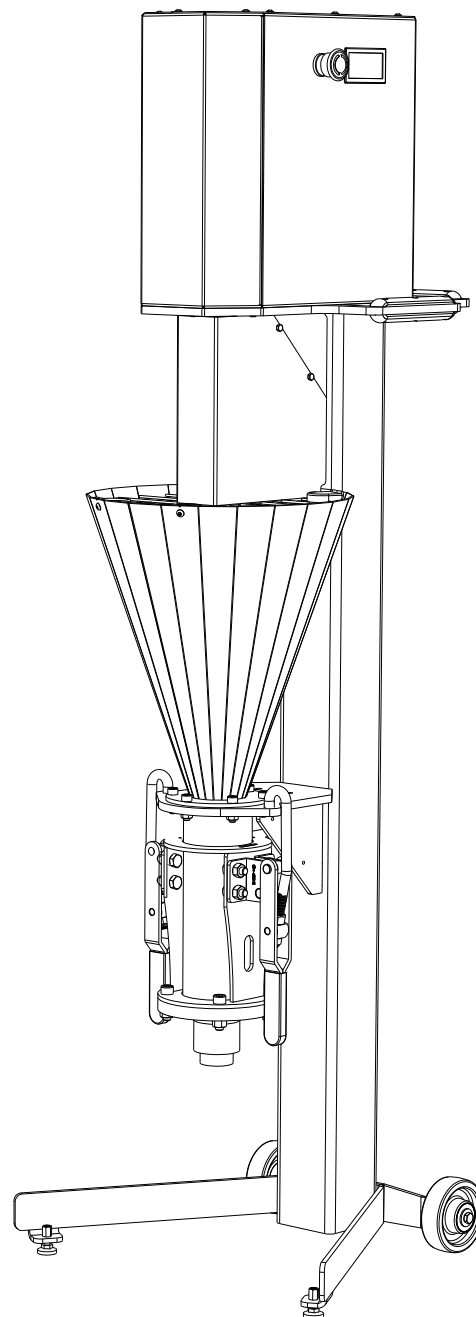


Fig. 3.1.5 - Concrete HD Continuous Feeding System

3.2. WASP HDP Extruder

3.2.1. WASP HDP Extruder general safety warnings

**CAUTION:**

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

**NOTE:**

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

The purpose of this chapter is to indicate:

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

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

Possible operations on the product can include:

- Mechanical
- Electrical

**MECHANICAL NATURE INTERVENTIONS**

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

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

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

**ELECTRICAL NATURE INTERVENTIONS**

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

3.2.2. Personal protective equipment

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

Residual risk of scalding

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

**CAUTION:**

Remove the part only when the extruder is cool.

**ATTENTION:**

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

Maintenance / Cleaning

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

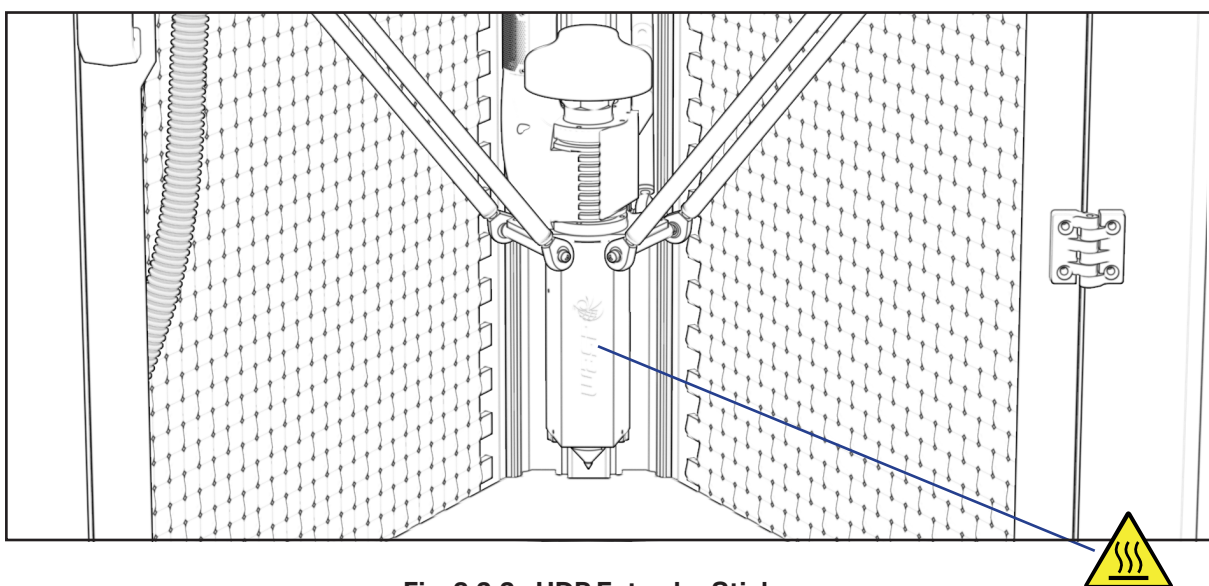


Fig. 3.2.2 - HDP Extruder Stickers

Legend:

Hot surfaces, pay attention not to touch when heated

3.2.3. WASP HDP Extruder description

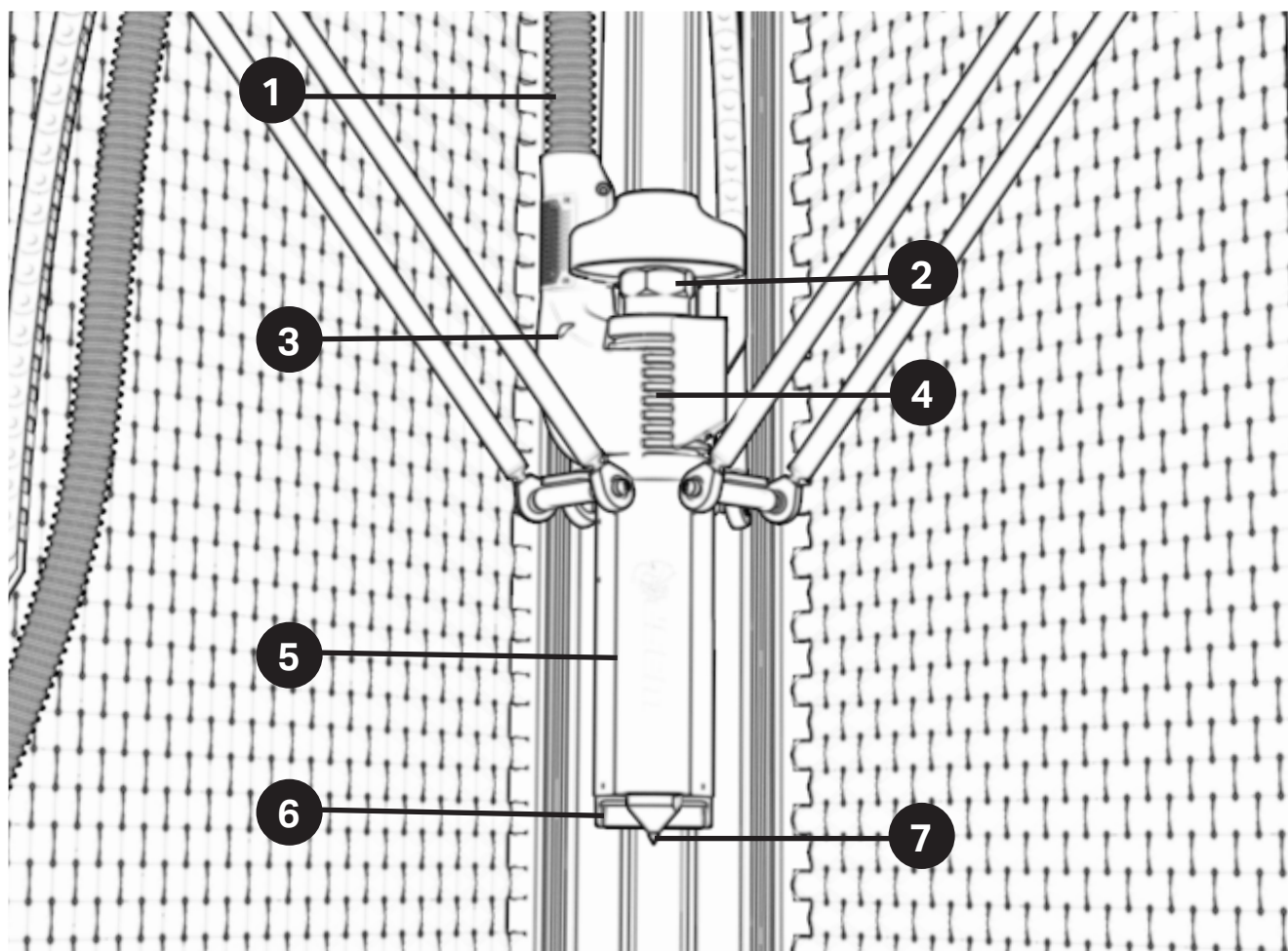


Fig. 3.2.3 - WASP HDP extruder description

Legend:

1. Pellet hose
2. Extruder screw
3. Pellet hopper
4. Heat sink
5. Barrel
6. Cooling fan
7. Nozzle

3.2.4. WASP HDP Extruder Cerebro connection

Connections needed:

- GX 20-12 (e)
- GX 20-8 (d)

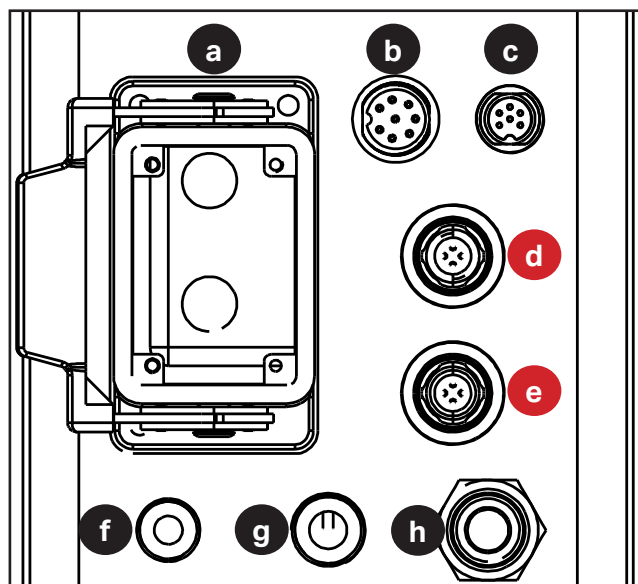


Fig. 3.2.4 - WASP HDP Extruder Cerebro connections

To connect the extruder to Cerebro attach the corresponding cables from the extruder to the corresponding outlet as shown in the figure



ATTENTION:

Make sure that the cables do not interfere with the movement during the printing process.

3.2.5. WASP HDP Extruder assembly and use

Changing the nozzle

Changing nozzle is only recommended when:

- The print looks inconsistent due to a clogging
- The nozzle is damaged or consumed

1. Turn on the product
2. From the app set nozzle and barrel to the last temperatures used and wait until they're reached (see par. 6.5.1 - "HDP main board")
3. Remove the Silicone Ooze shield protection
4. Unscrew and remove the nozzle using the provided tool, pay attention to the hot surfaces.
5. Clean the extruder with the provided tools
6. Tighten back the new nozzle fixing it in its position.
7. Fix the Silicone Ooze shield protection
8. Extrude material with the App

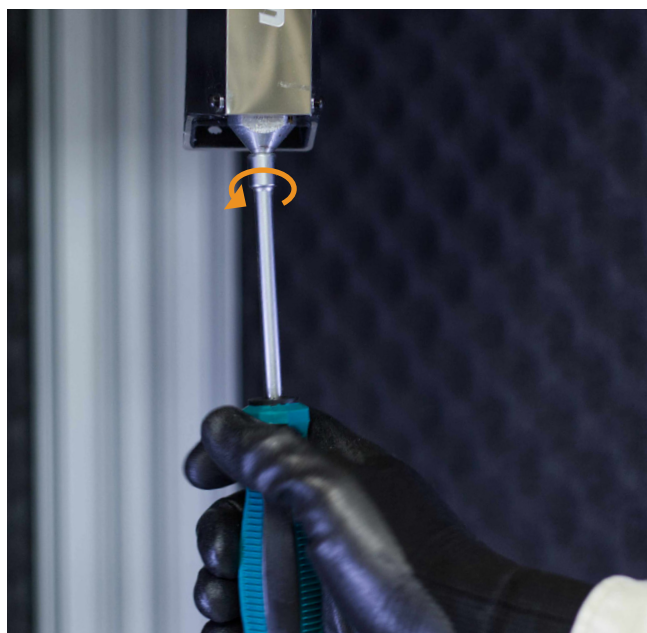


fig 3.2.5a

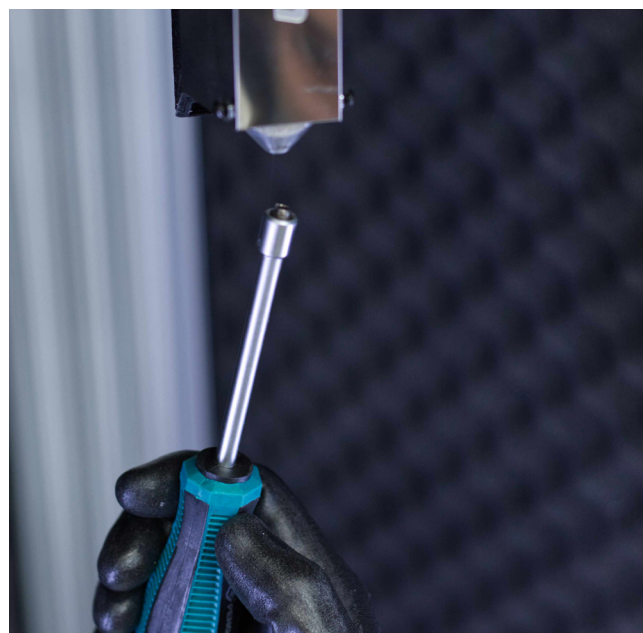


fig 3.2.5 b

After a nozzle replacement is recommended to set the distance from the extruder and the printing bed.

Changing the screw

The procedure of cleaning the screw may be necessary when the extruder is clogged and regular maintenance procedures are not effective. Before cleaning the screw try the procedure for cleaning and changing the nozzle.

The screw cleaning procedure is an extraordinary maintenance operation, therefore it is advisable to understand what is the cause of the problem that requires its use.

Some examples of situations that may require screw cleaning are:

- debris or foreign matter in the pellet loaded inside the extruder
- material not compatible with the extruder (for example with aggregates that prevent extrusion)
- incorrect process settings and temperatures
- extruder failure

To carry out the procedure, carefully follow the instructions below:

1. Turn off the machine
2. Unscrew the three screws on the pellet hopper (fig 3.2.5 c) with a 2.5 mm Allen key
3. Remove the pellet loading element gently, using a container to collect the falling material (fig 3.2.5 d)
4. Remove the residual material in the extruder manually or with the help of a vacuum cleaner
5. Unscrew the two screws securing the upper gear guard with a 2.5 mm Allen key (fig 3.2.5 e)
6. Remove the top gear guard (fig 3.2.5 f)
7. Turn on the machine and set the extruder temperature to the printing temperature for the material loaded inside (for both nozzle and barrel) from the app (see par. 6.5.1 - "HDP main board")
8. With a 30 wrench remove the screw by unscrewing it clockwise (fig 3.2.5 g)
9. Proceed manually until the screw is completely unscrewed (fig 3.2.5 h)
10. Once free from the thread, carefully lift the entire screw assembly
This operation is not possible without heating the extruder.
Pay attention to the hot and liquid material on the screw during extraction.
Also make sure that the bearing on the screw is removed together with the assembly (fig 3.2.5 i, fig 3.2.5 l)
11. With the help of pliers remove the material from the screw before it solidifies completely.
12. Once cleaned, put the screw back in place and push down until it is back in place, making sure that the bearing on the screw is properly seated (fig 3.2.5 m)
13. Repeat all the previous operations for fixing in reverse order.



ATTENTION:

Pay particular attention during the various stages of the procedures, it is essential to wear safety gauntlets to avoid the risk of burns.

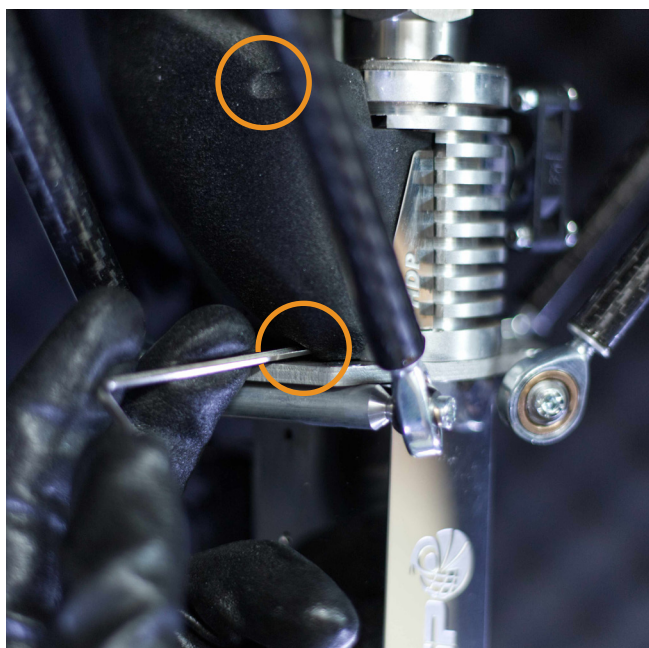


fig 3.2.5 d



fig 3.2.5 e

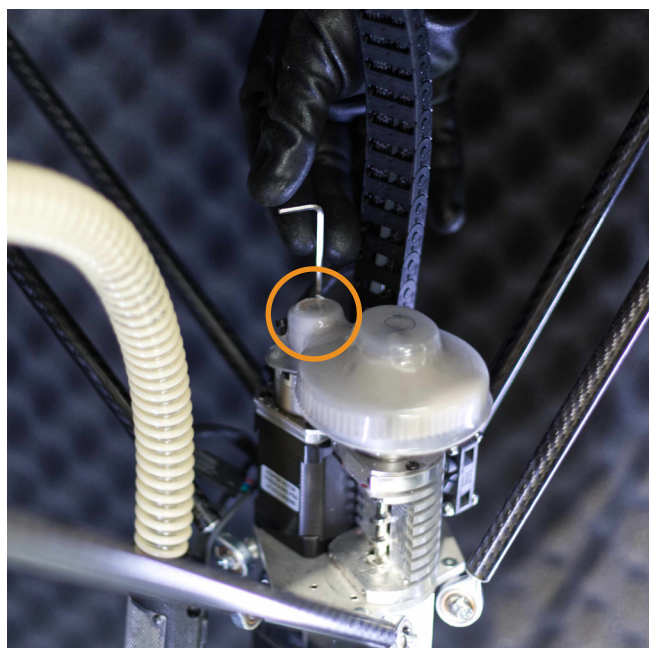


fig 3.2.5 f

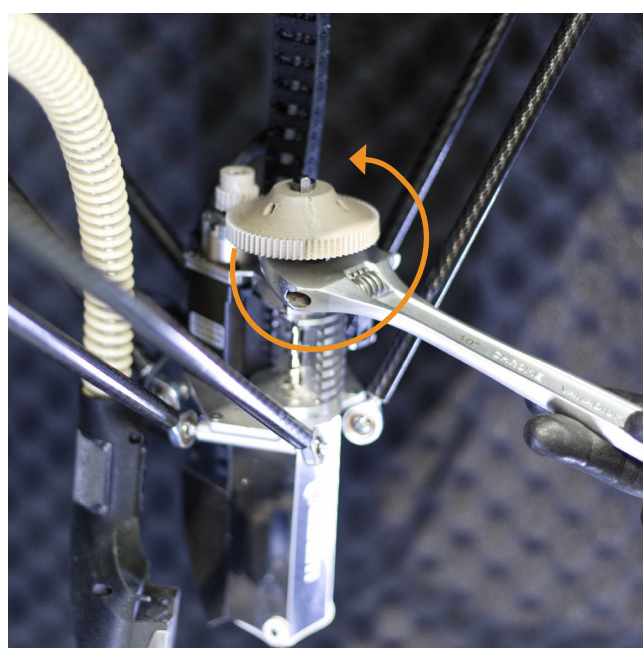


fig 3.2.5 g



fig 3.2.5 h



fig 3.2.5 i

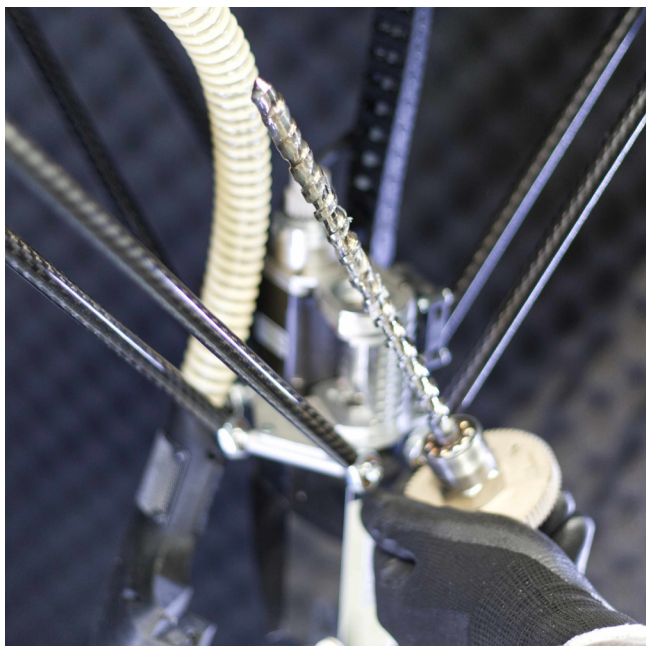


fig 7.3.1 l

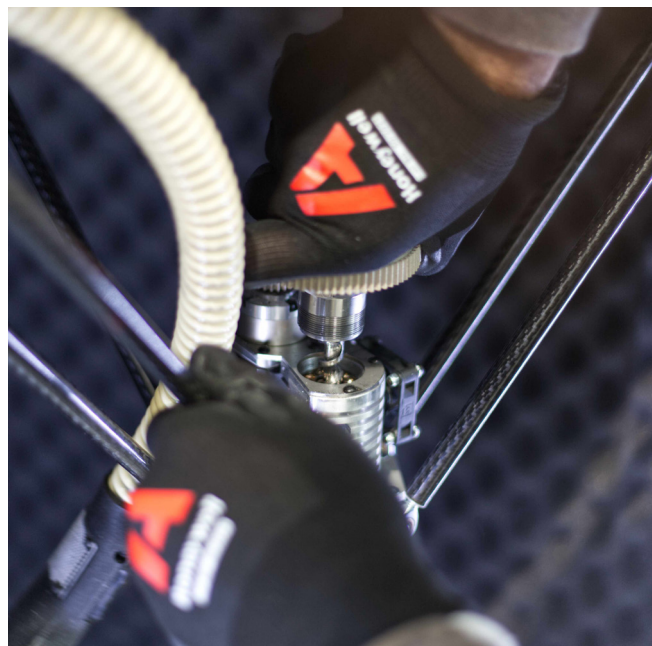


fig 7.3.1 m

3.2.6. WASP HDP temperature controls


ATTENTION:

Pay particular attention during the various stages of the procedures, it is essential to wear safety gauntlets to avoid the risk of burns.


NOTE:

The extruder allows to manage two distinct temperatures for preheating and for the nozzle.

Material manufacturers can provide useful information on the ideal temperature ranges to maintain for each material.

The machine allows several temperature controls and it's very important to manage them correctly in order to get a good quality output.

Control	Description	Max value
Nozzle	Temperature of the nozzle, controls the melting of the pellets and the consistency of the material extruded	280 °C
Barrel	Preheat zone before the nozzle, it starts softening the pellets before the complete melting	Always equal or lower than the nozzle

The temperatures can be managed with the interface on the app, see par. 6.6.1 - "HDP Main Board"

3.2.7. WASP HDP Extruder cleaning

Cleaning the extruder is especially important when:

- switch from one material to another
- load a new extruder with material
- check if the nozzle is clogged or not
- check if the machine is able to extrude a given material

Before extruding, it is necessary to set the correct nozzle and barrel temperatures according to the material in use.

Thorough cleaning

To clean the screw of any debris or remnants of previous material, it is also possible to remove the nozzle as indicated in par. 3.2.5- "WASP HDP Extruder assembly and use" maintenance and then launch the command without it.

Remember to reassemble the nozzle after the operation.

3.2.8. WASP HDP Extruder maintenance

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



ATTENTION:

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



NOTE:

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

Part	Kind of intervention	Period
Extruder fans	Check if works	160 hours
Nozzle	Cleaning or replacing	When needed

3.2.9. WASP HDP Extruder loading/unloading the material

Loading material is a basic procedure required for printing.

The machine is compatible with pellets with a dimensions under 3x3 mm.

Consider that also the density, texture and integrity of the pellets may affect the compatibility with the technology.

Loading the material:

1. Check the connections with the material tank
2. Move the extruder where you intend to extrude the material
3. Select the manual mode from the app (as described in par. 6.3 - "Manual mode")
4. Select "Extrude" from the app
5. Extrude until the flow of material is consistent
6. Stop the extrusion from the app



ATTENTION:

Make sure that the extruder and the tank are at an appropriate distance for the feeding hose to not be stretched during the robot movements

3.2.10. WASP HDP Extruder Extraordinary maintenance



ATTENTION:

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

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

Extraordinary maintenance interventions are those that are carried out:

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

For additional information, support and FAQs on our website: www.3dwasp.com/support



ATTENTION:

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



ATTENTION:

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



ATTENTION:

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



ATTENTION:

Please consult the most recent version of the manual available on our website for detailed and updated instructions on using the tool.

3.3. WASP HDP XL Extruder

3.3.1. WASP HDP XL Extruder general safety warnings

**CAUTION:**

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

**NOTE:**

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

The purpose of this chapter is to indicate:

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

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

Possible operations on the product can include:

- Mechanical
- Electrical

**MECHANICAL NATURE INTERVENTIONS**

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

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

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

**ELECTRICAL NATURE INTERVENTIONS**

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

3.3.2. Personal protective equipment

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

Residual risk of scalding

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



CAUTION:

Remove the part only when the extruder is cool

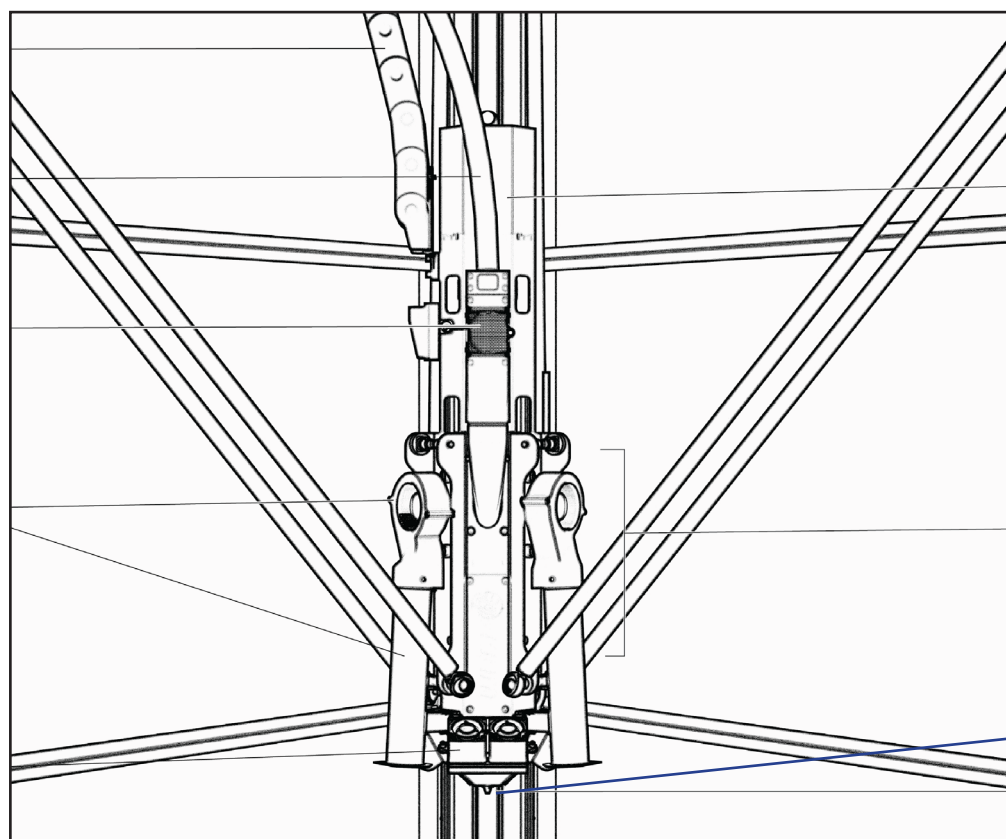


ATTENTION:

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

Maintenance / Cleaning

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



Legend:



Hot surfaces, pay attention not to touch when heated

3.3.3. WASP HDP XL Extruder description

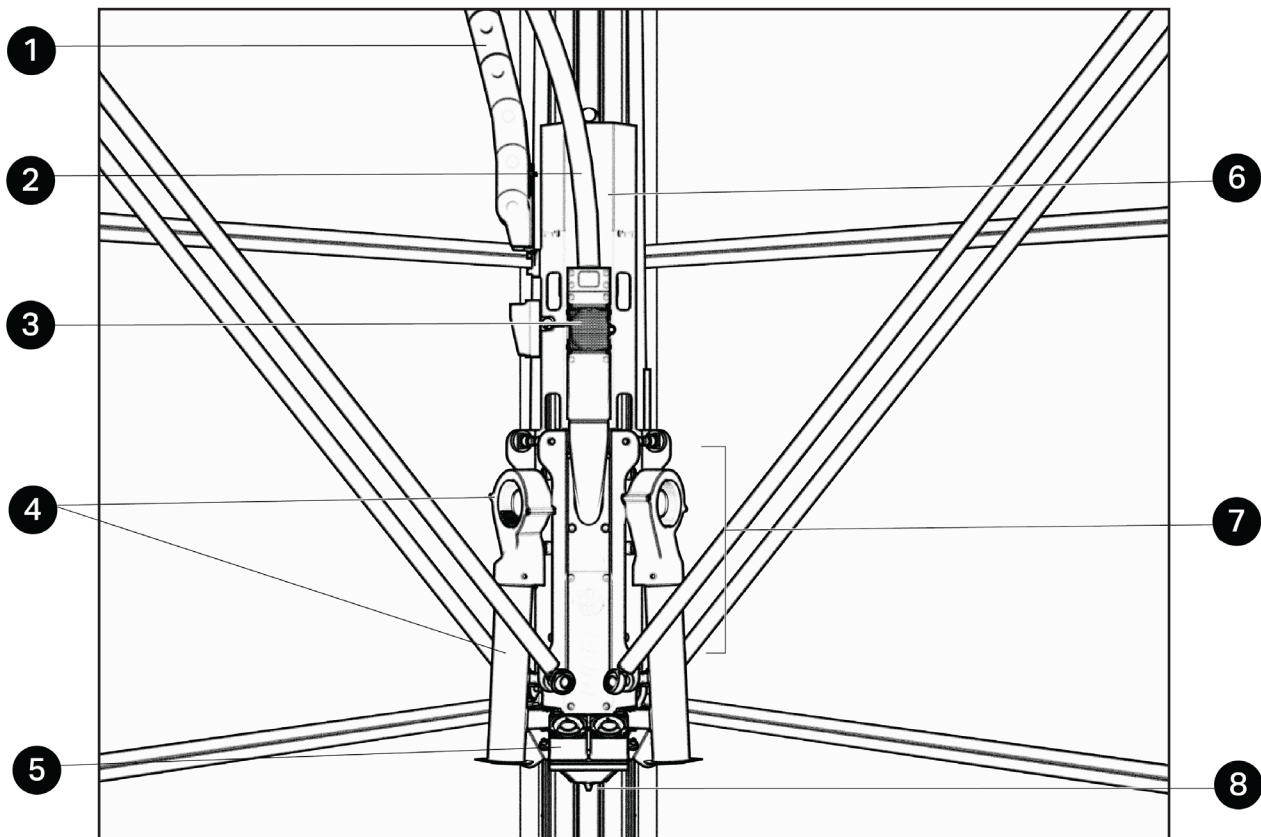


Fig. 3.3.3 - WASP HDP XL Extruder description

Leg

1. Cable carrier
2. Pellet hose
3. Material sensor
4. Firecap module (see par. 3.3.5 - "WASP HDP XL temperature controls")
5. Cooling fan
6. Extruder motor
7. Barrel zone (see par. 3.3.5 - "WASP HDP XL temperature controls")
8. Nozzle zone (see par. 3.3.5 - "WASP HDP XL temperature controls")

3.3.4. WASP HDP XL Extruder Cerebro Connection

Connections needed:

- GX 20-12 (e)
- GX 20-8 (d)
- ILME 6P

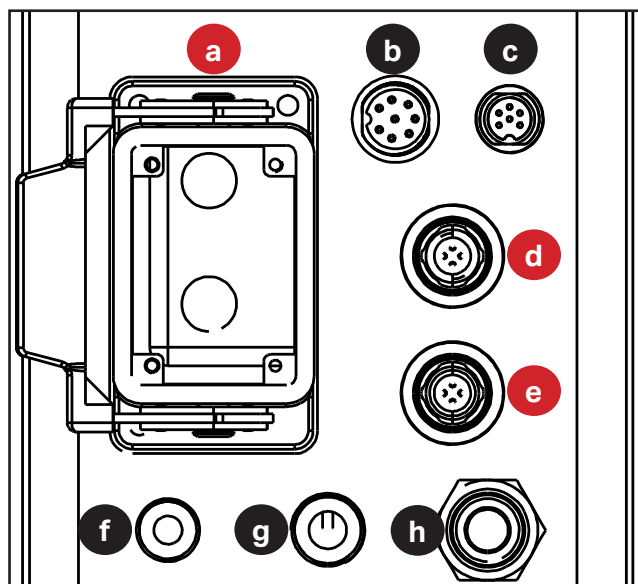


Fig. 3.3.4 - WASP HDP XL Extruder Cerebro connections

To connect the extruder to Cerebro attach the corresponding cables from the extruder to the corresponding outlet as shown in the figure



ATTENTION:

Make sure that the cables do not interfere with the movement during the printing process.

3.3.5. WASP HDP XL temperature controls



ATTENTION:

Pay particular attention during the various stages of the procedures, it is essential to wear safety gauntlets to avoid the risk of burns.



NOTE:

The extruder allows to manage two distinct temperatures for preheating and for the nozzle.

Material manufacturers can provide useful information on the ideal temperature ranges to maintain for each material.

The machine allows several temperature controls and it's very important to manage them correctly in order to get a good quality output.

Control	Description	Max value
Nozzle	Temperature of the nozzle, controls the melting of the pellets and the consistency of the material extruded	350 °C
Barrel	Preheat zone before the nozzle, it starts softening the pellets before the complete melting	Always equal or lower than the nozzle
Firecap	Blows hot air distributed on the top of the print, maintaining a high temperature on the last layer product and slowing down the cooling process. This can prevent delamination, reduce the warping and ensure optimal layer bonding.	150 °C

The temperatures can be managed with the interface on the app, see par. 6.6.1 - "HDP XL Main Board"

3.3.6. WASP HDP XL Extruder cleaning

Cleaning the extruder is especially important when:

- switch from one material to another
- load a new extruder with material
- check if the nozzle is clogged or not
- check if the machine is able to extrude a given material

1. Turn on the product
2. From the app set nozzle and barrel to the last temperatures used and wait until they're reached (see par. 6.6.1 - "HDP XL main board")
3. Extrude material with the App

Thorough cleaning

To clean the screw of any debris or remnants of previous material, it is also possible to remove the nozzle as indicated in par. 3.3.7- "WASP HDP Extruder maintenance" maintenance and then launch the command without it.

Remember to reassemble the nozzle after the operation.

3.3.7. WASP HDP XL Extruder maintenance

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



ATTENTION:

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



NOTE:

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

Part	Kind of intervention	Period
Pellet filter	Clean or replace	40 hours
Extruder fans	Check if works	160 hours
Nozzle	Cleaning or replacing	When needed

Nozzle



ATTENTION:

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

Changing the nozzle is necessary when:

- the nozzle is clogged
- another dimension of the nozzle is needed

To change the nozzle follow the procedure below:

1. Preheat the Nozzle to 200°C.
2. Using a 12 mm Hex wrench unscrew delicately the nozzle (fig. 3.3.7 d).
Make sure the nozzle housing is not rotating with the nozzle. A 26 mm wrench can be used to hold it in place
3. Remove it helping yourself with some pliers (fig 3.3.7 e).
4. Pay maximum attention to the molten plastic that can cause burns.

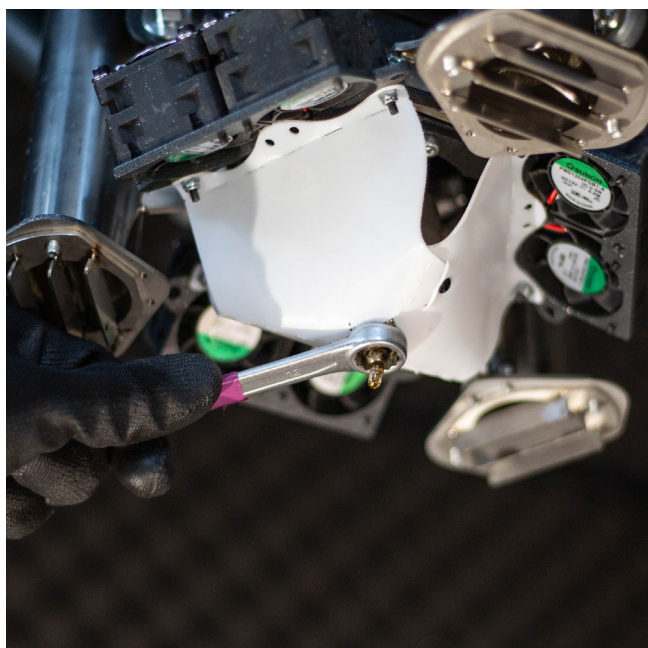


fig 3.3.7 d



fig 3.3.7 e

3.3.8. WASP HDP XL Extruder loading/unloading the material

Loading material is a basic procedure required for printing.

The machine is compatible with pellets with a dimensions under 6x6 mm.

Consider that also the density, texture and integrity of the pellets may affect the compatibility with the technology.

Loading the material:

1. Check the connections with the material tank (if purchased from WASP refer to par 3.1.2 - "Dehumidifier tank") and Cerebro's 10mm air outlet
2. Move the extruder where you intend to extrude the material
3. Select the manual mode from the app (as described in par. 6.1.4 "Mode selection menu")
4. Set the correct temperature for the material in use
5. Select "Extrude" from the app (as described in par. 6.6.3 "HDP XL Options")
6. Extrude until the flow of material is consistent
7. Stop the extrusion from the app



ATTENTION:

Position the extruder in a place suitable for the material extrusion

3.3.9. WASP HDP XL Extruder purging

The extruder cleaning procedure may be necessary if the material outlet flow is compromised.

Check that the flow inconsistency is not related to operating temperatures or speeds before proceeding with this operation.

To purge the extruder:

1. Set a temperature compatible with the material inside the extruder.
2. Unscrew the nozzle with a 12 mm wrench.
3. Remove the nozzle with the help of some pliers.
4. Follow the procedures in for loading material as described in par. 3.3.8 "WASP HDP XL Extruder loading/unloading the material"
5. Reassemble the nozzle

3.3.10. Extraordinary maintenance

**ATTENTION:**

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

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

Extraordinary maintenance interventions are those that are carried out:

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

For additional information, support and FAQs on our website: www.3dwasp.com/support

**ATTENTION:**

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

**ATTENTION:**

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

**ATTENTION:**

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

**ATTENTION:**

Please consult the most recent version of the manual available on our website for detailed and updated instructions on using the tool.

3.4. LDM WASP Extruder 3.0

3.4.1. LDM WASP 3.0 Extruder general safety warnings

**CAUTION:**

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

**NOTE:**

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

The purpose of this chapter is to indicate:

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

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

Possible operations on the product can include:

- Mechanical
- Electrical

**MECHANICAL NATURE INTERVENTIONS**

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

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

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

**ELECTRICAL NATURE INTERVENTIONS**

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

3.4.2. Personal protective equipment

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

**ATTENTION:**

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

Maintenance / Cleaning

Maintenance / cleaning operations must be carried out by trained and authorized personnel. Operations must be performed in a safe stop condition, disconnecting the product from power sources. Refer to chapter 9 "Ordinary and Extraordinary Maintenance".

3.4.3. LDM WASP Extruder 3.0 description

The WASP LDM Extruder 3.0 is capable to extrude clay or earth-based materials.

The material is stored in the aluminium tank and pushed with a system of compressed air through the feeding hose to the extruder.

The WASP LDM Extruder 3.0 controls the flow of the material with a screw that also allows to have retractions during the printing process.

The material is then printed in position after being pushed through a nozzle that defines the width of the extruded path.

The extruder supports nozzle of the diameters of 1.5mm, 2mm and 3mm.

3.4.4. LDM WASP Extruder 3.0 material

Loading material is a basic procedure required for printing.

The machine is compatible with material such as earthenware, stoneware and porcelain which has the aggregates diameter up to 0.5mm.

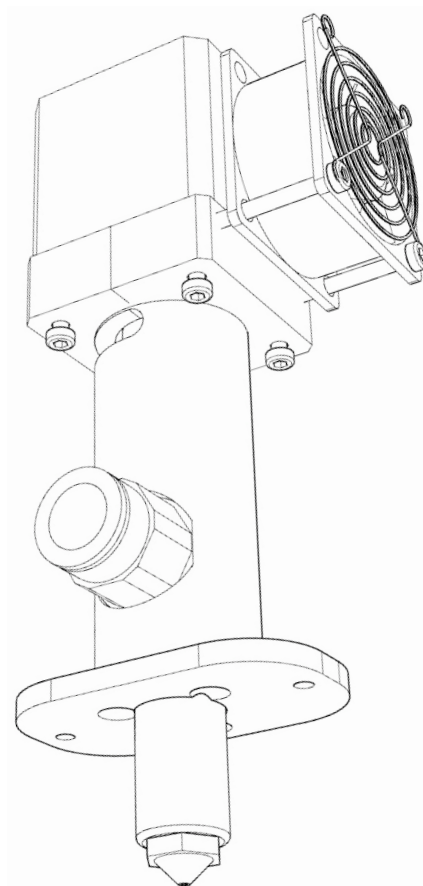


Fig. 2.2.3 - WASP LDM Extruder XL 3.0

3.4.5. LDM WASP Extruder 3.0 Cerebro Connection

Connections needed:

- GX 20-12 (e)

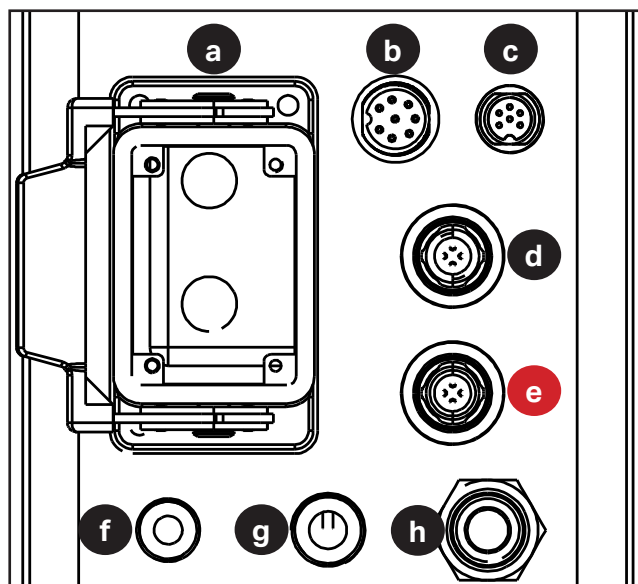


Fig. 3.3.4- LDM WASP Extruder 3.0 Cerebro connections

To connect the extruder to Cerebro attach the cables from the extruder to the corresponding outlet as shown in the figure



ATTENTION:

Make sure that the cables do not interfere with the movement during the printing process.

3.4.6. LDM WASP Extruder 3.0 assembly and use

At print finished it is necessary to cover with wet paper the nozzle to re-use it the following day.

After around a week the a complete cleaning of the extruder will be necessary, following this procedure:

1. Screw the fitting hose "a" with a 19mm key and clean it with water
2. Screw extruder body "b" from motor "c"
3. Fix the plate "e" to the supports
4. Mount the chosen nozzle "d" in the extruder
5. Fill the aluminium tank with the material as described in par. 3.4.9 - "LDM WASP Extruder 3.0 Material tank"
6. Fix the tank to its supports
7. Move the extruder where you want to collect the material
8. Extrude with the App until the material's flow becomes constant as described in par. 3.4.10 - "LDM WASP Extruder 3.0 loading/unloading the material"

To disassemble the extruder for cleaning repeat these steps backward.

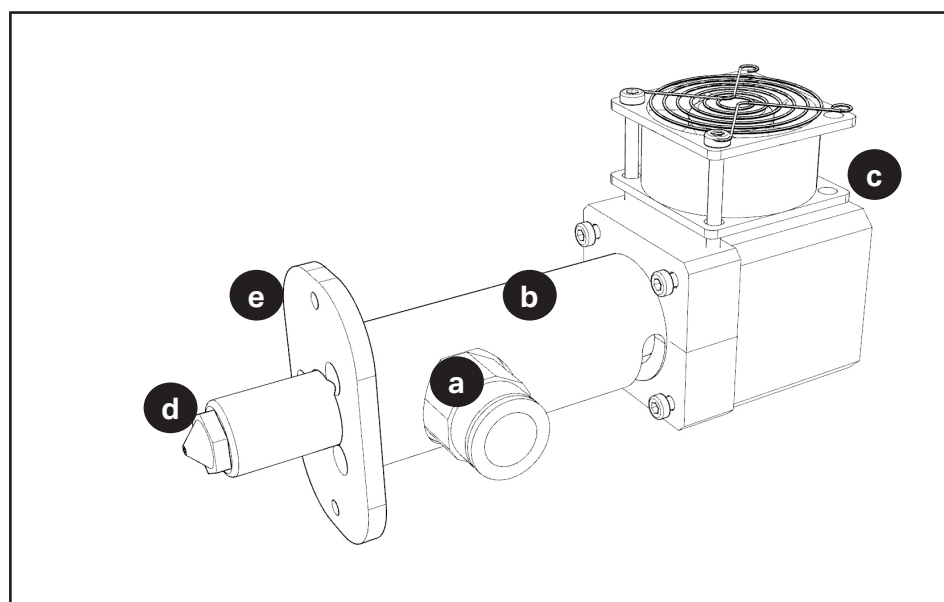


Fig. 3.4.6- LDM WASP Extruder 3.0 assembly and use

3.4.7. LDM WASP Extruder 3.0 cleaning

The entire extrusion system has been designed for fast disassembly to promote great speed during the cleaning phase. A through cleaning of all parts is required every time the product has not been used in 48 hours or whenever the material inside the continuous feeding system, the extruder or the hose starts to dry.

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 elastic joint between the motor and the screw conveyor

3.4.8. LDM WASP Extruder 3.0 maintenance

Periodic maintenance and correct use are essential factors to ensure the functionality, safe operation and life of the product. 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 product 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.

Involved part	Kind of intervention	Period	Procedure
Fan	Check the proper operation of the fan present on the motor	160 hours	//

3.4.9. LDM WASP Extruder 3.0 material tank

The aluminium tank contains the printing material. Using a nylon plunger and a compressed air system, the ceramic material is pushed through the feeding hose to the extruder, ensuring a constant flow of material. To fill the tank, follow the instructions below:

1. Mix the material with the water
2. Divide the material into smaller balls
3. Unscrew the knobs on the aluminium tank cover (fig. 3.4.9 a), and then slide off the base with the 4 bars (the side without the valve) (fig. 3.4.9 b)
4. Bring the white nylon plunger towards the bottom of the tank
5. Insert and compress the various portions of material into the tank (fig. 3.4.9 c)
6. Slide the base on and screw the knobs on the lid (fig. 3.4.9 d)
7. Attach the tank onto the supports and connect the feeding hose to the extruder
8. Connect the air compressor (described in par. 3.1.1 - "Air compressor") to the manometer and the manometer to the tank
9. Turn on the compressor to 8 bars and set the manometer to 5 bars
10. Follow the procedures described in par. 3.4.10 - "LDM WASP Extruder 3.0 loading/unloading the material" to load the material in the extruder



NOTE:

WASP provides a slurry to be mixed with water. The amount of water depends on the type of extruder, nozzle and external conditions.

With the equipment provided, it is possible to use most of the slurries involved in the traditional ceramic world.



ATTENTION:

- Before pressurizing make sure that the 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.

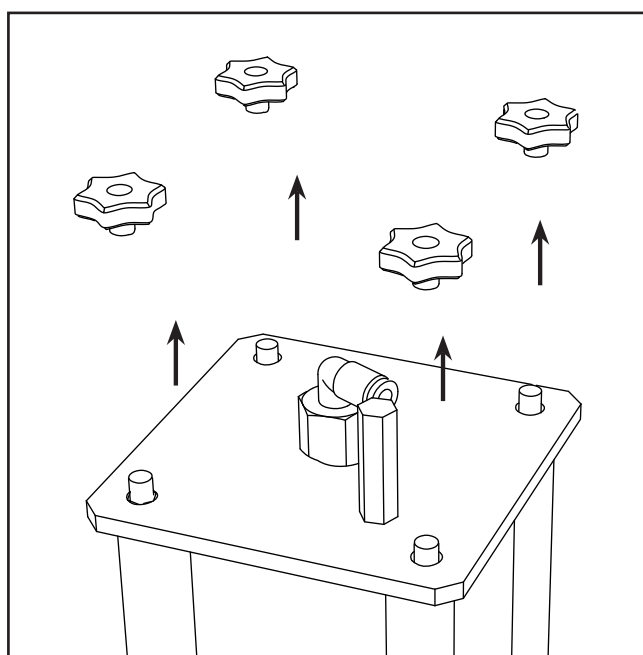


fig 3.4.9 a

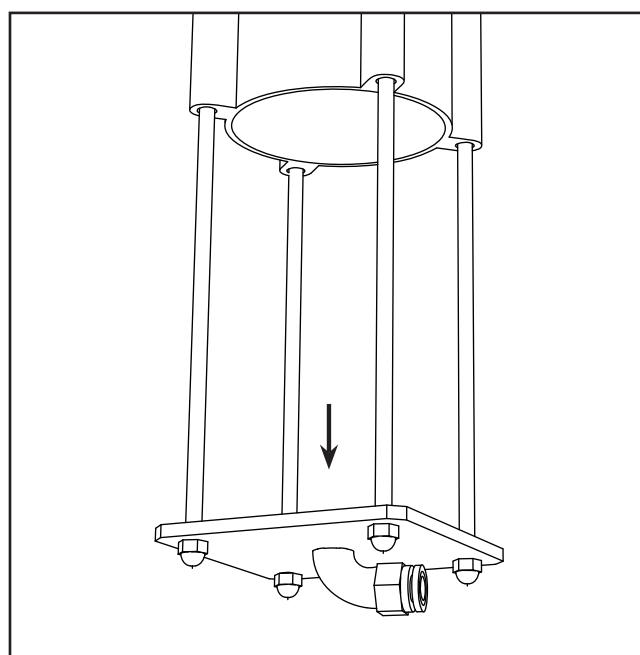


fig 3.4.9 b

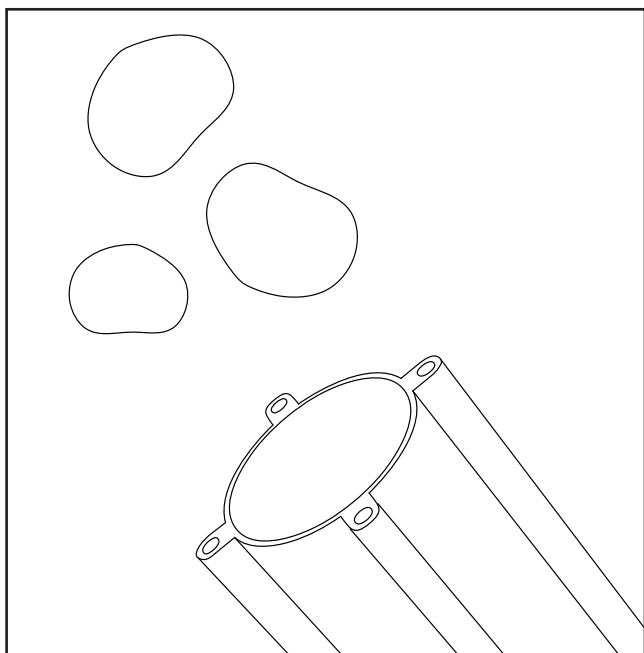


fig 3.4.9 c

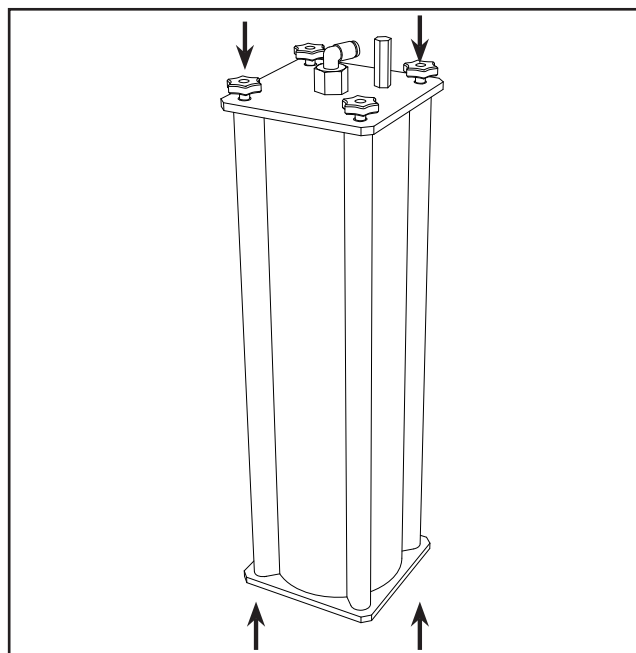


fig 3.4.9 d

Material tank cleaning

The periodic maintenance and the correct use are fundamental factors to guarantee the functioning, safety and reliability of the machine. The interventions of maintenance are carried out by the mechanical technician that must operate in total accomplishment of the safety warnings contained in this manual.

1. Reduce to zero the pressure in the tank by turning counter clockwise the controller of the pressure
2. Disassemble the tank following in reverse the passages described in par. 3.4.9 - " LDM WASP Extruder 3.0 material tank"
3. With closed fist (or with the help of some tool) push out the nylon piston.
4. Clean the piston with water
5. Remove the residual material inside the tank and in the feeding hose and clean both with water

3.4.10. LDM WASP Extruder 3.0 loading/unloading the material

Loading the material:

1. Check the connections with the material tank
2. Move the extruder where you intend to extrude the material
3. Select the manual mode from the app (as described in par. 6.4 - "Manual mode")
4. Select "Extrude" from the app
5. Extrude until the flow of material is consistent
6. Stop the extrusion from the app



ATTENTION:

Position the extruder in a place suitable for the material extrusion



ATTENTION:

Make sure that the extruder and the tank are at an appropriate distance for the feeding hose to not be stretched during the robot movements

3.4.11. LDM WASP Extruder 3.0 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 parts;



ATTENTION:

Please consult the most recent version of the manual available on our website for detailed and updated instructions on using the tool.

3.5. LDM WASP XL Extruder 3.0

3.5.1. LDM WASP XL 3.0 Extruder general safety warnings

**CAUTION:**

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

**NOTE:**

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

The purpose of this chapter is to indicate:

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

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

Possible operations on the product can include:

- Mechanical
- Electrical

**MECHANICAL NATURE INTERVENTIONS**

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

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

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

**ELECTRICAL NATURE INTERVENTIONS**

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

3.5.2. Personal protective equipment

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



ATTENTION:

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

Maintenance / Cleaning

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

3.5.3. LDM WASP XL Extruder 3.0 description

The WASP LDM Extruder XL 3.0 is designed to extrude clay or earth-based materials.

The material is transported from the tank to the extruder which regulates its flow with a motor attached to a screw that also allows to have retractions during the printing process.

The material is then printed in position after being pushed through a nozzle that defines the width of the extruded path.

The extruder supports nozzle of the diameter of 4mm, 6mm, and 8mm.

The WASP LDM Extruder XL 3.0 can work with the material tank described in par. - "LDM WASP XL Extruder 3.0 Material tank" or with the Continuous Feeding System described in par. 3.1.4 - "Continuous Feeding System".

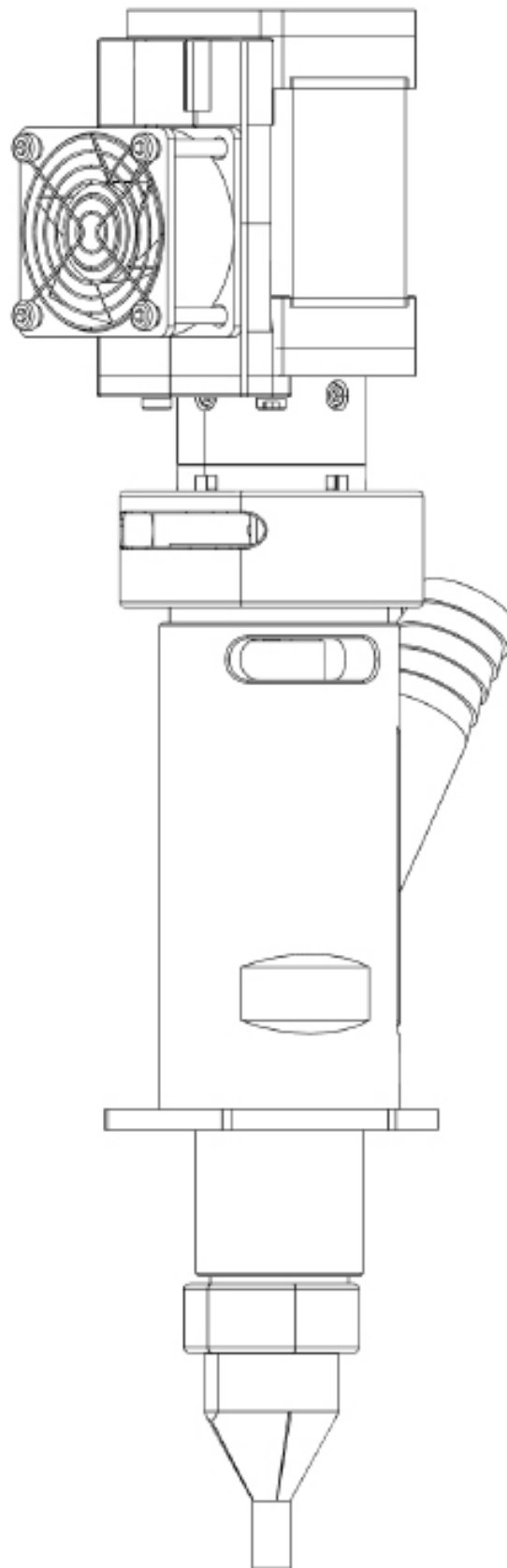


Fig. 3.5.3 - WASP LDM Extruder XL 3.0

3.5.4. LDM WASP XL Extruder 3.0 Cerebro Connection

Connections needed:

- GX 20-12 (e)

Continuous Feeding System connections needed (if used):

- GX 16-8 (b)

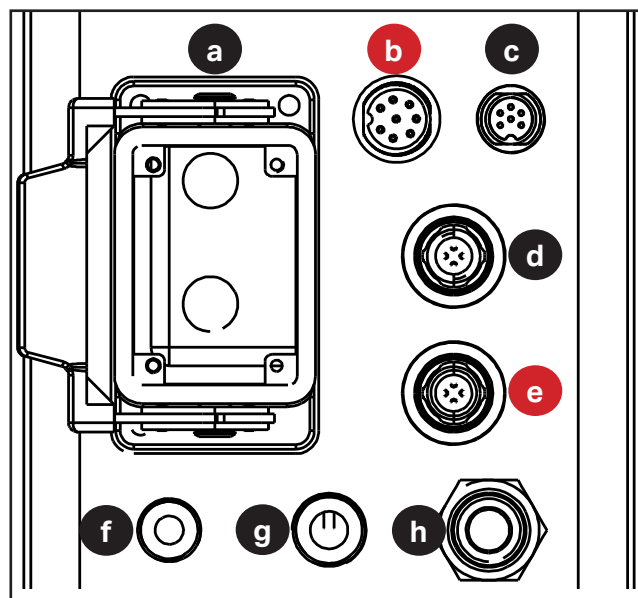


Fig. 3.5.4- LDM WASP XL Extruder 3.0 Cerebro connections

To connect the extruder to Cerebro attach the cables from the extruder and the Continuous Feeding System to the corresponding outlet as shown in the figure



ATTENTION:

Make sure that the cables do not interfere with the movement during the printing process.

3.5.5. LDM WASP XL Extruder 3.0 assembly and use

1. Install the WASP LDM Extruder XL 3.0 to the specific support
2. Insert the screw in its place and mount the extruder motor on top of it making sure it is properly connected with the red connector (fig. 3.5.5 a)
3. Mount the junction and the paper gasket (fig 3.5.5 b)
4. Mount the desired nozzle and its adaptor (fig 3.5.5 c)
5. Prepare the material and load it in the tank (as explained in par.) or in the Continuous Feeding System as explained in its manual
6. Attach the hose of the desired feeding system and to the extruder (fig 3.5.5 d)
7. Move the extruder where you want to collect the material
6. Extrude with the app until the material's flow becomes constant

To disassemble the extruder for cleaning repeat these steps backward.



ATTENTION:

Position the extruder in a place suitable for the material extrusion



ATTENTION:

Make sure that the extruder and the tank are at an appropriate distance for the feeding hose to not be stretched during the robot movements



Fig. 3.5.5 a

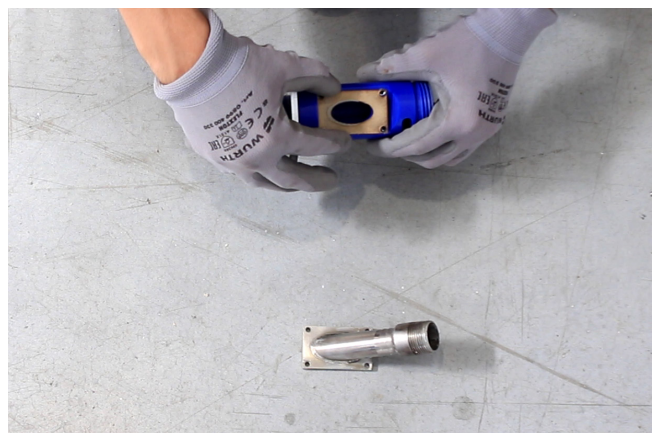


Fig. 3.5.5 b

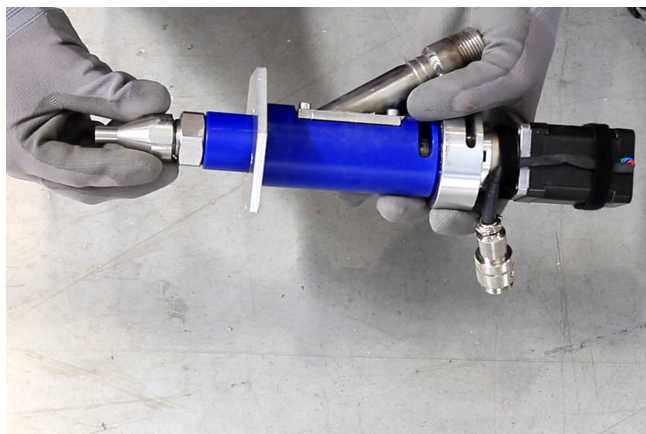


Fig. 3.5.5 d



Fig. 3.5.5 e

3.5.6. LDM WASP XL Extruder 3.0 cleaning

The entire extrusion system has been designed for fast disassembly to promote great speed during the cleaning phase. A thorough cleaning of all parts is required every time the product has not been used in 48 hours or whenever the material inside the continuous feeding system, the extruder or the hose starts to dry.

Ordinary cleaning is described in the continuous feeding system's manual.

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 elastic joint between the motor and the screw conveyor

3.5.7. LDM WASP Extruder 3.0 material

Loading material is a basic procedure required for printing.

The machine is compatible with material such as earthenware, stoneware and porcelain which has the aggregates up to 0.5mm.

Consider that also the moisture of the material effect the final result: having a more fluid material could give better results but the risk of piece collapse needs to be taken in consideration.

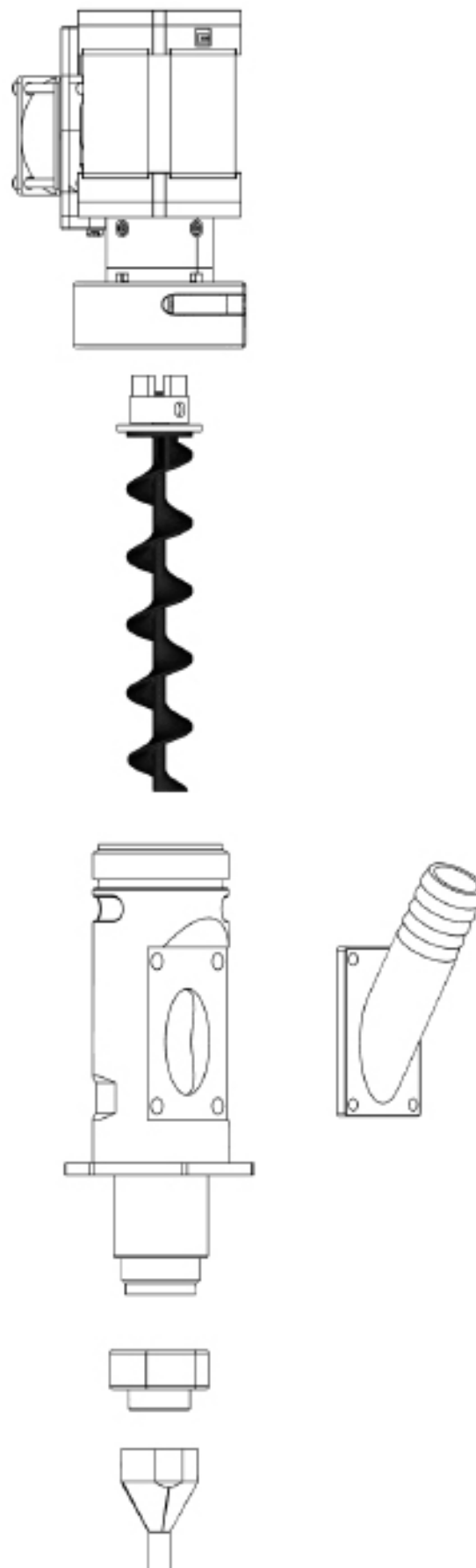


Fig.3.5.6 - WASP LDM Extruder XL 3.0

3.5.8. LDM WASP XL Extruder 3.0 maintenance

Periodic maintenance and correct use are essential factors to ensure the functionality, safe operation and life of the product. 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 product 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.

Involved part	Kind of intervention	Period	Procedure
Fan	Check the proper operation of the fan present on the motor	160 hours	Contact WASP assistance service

3.5.9. LDM WASP XL Extruder 3.0 material tank

The aluminium tank contains the printing material. Using a nylon plunger and a compressed air system, the ceramic material is pushed through the feeding hose to the extruder, ensuring a constant flow of material. To fill the tank, follow the instructions below:

1. Mix the material with the water
2. Divide the material into smaller balls
3. Unscrew the knobs on the aluminium tank cover (fig. 3.5.9 a), and then slide off the base with the 4 bars (the side without the valve) (fig. 3.5.9 b)
4. Bring the white nylon plunger towards the bottom of the tank
5. Insert and compress the various portions of material into the tank (fig. 3.5.9 c)
6. Slide the base on and screw the knobs on the lid (fig. 3.5.9 d)
7. Attach the tank onto the supports and connect the feeding hose to the extruder
8. Connect the air compressor (described in par. 3.1.1 - "Air compressor") to the manometer and the manometer to the tank
9. Turn on the compressor to 8 bars and set the manometer to 5 bars
10. Follow the procedures described in par. 3.5.10 - "LDM WASP XL Extruder 3.0 loading the material" to load the material in the extruder



NOTE:

WASP provides a slurry to be mixed with water. The amount of water depends on the type of extruder, nozzle and external conditions.

With the equipment provided, it is possible to use most of the slurries involved in the traditional ceramic world.



ATTENTION:

- Before pressurizing make sure that the 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.

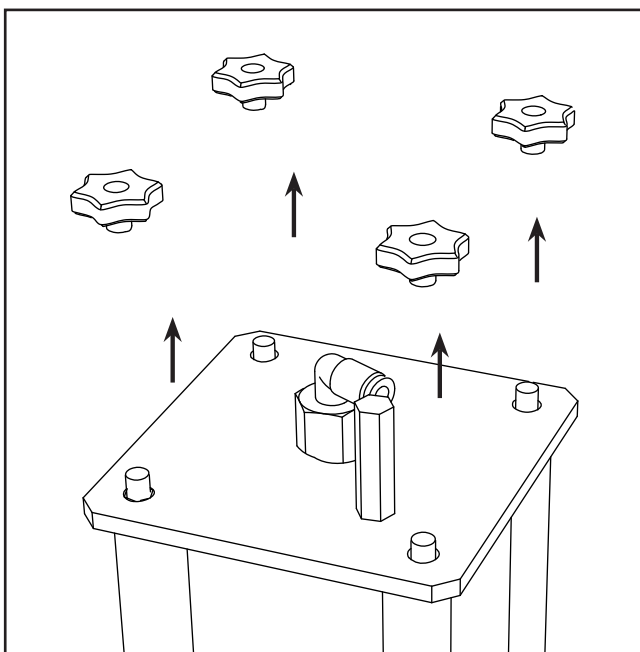


fig 3.5.9 a

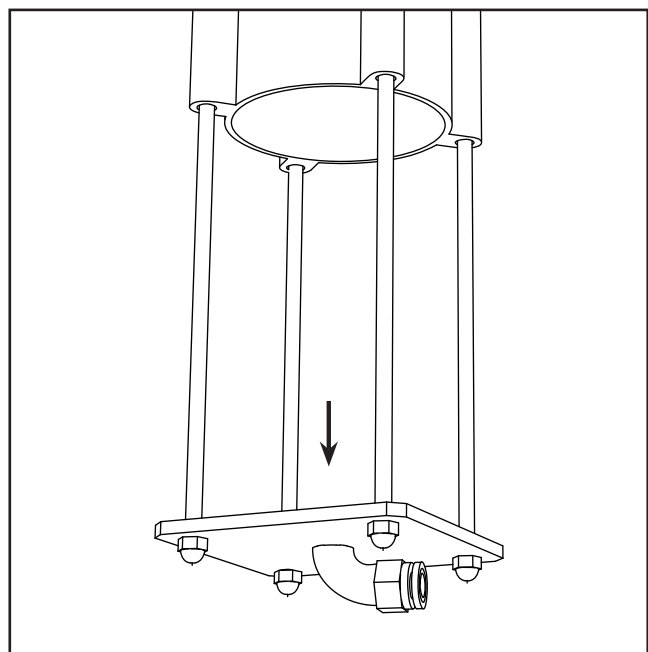


fig 3.5.9 b

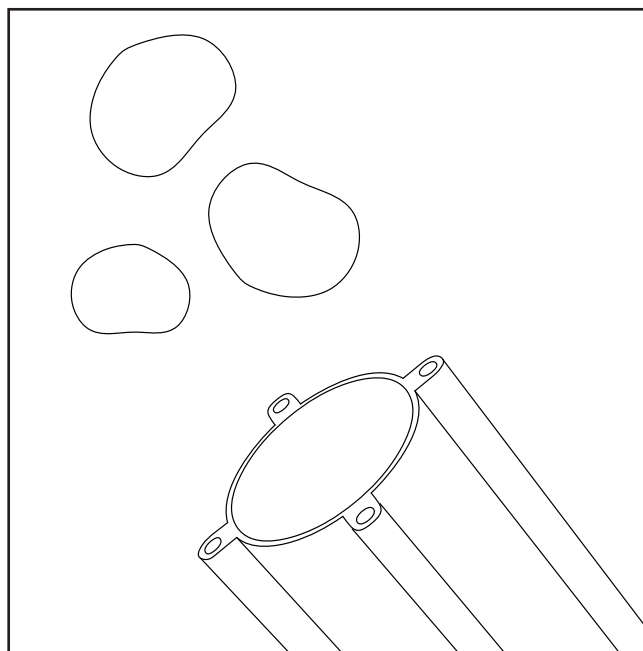


fig 3.5.9 c

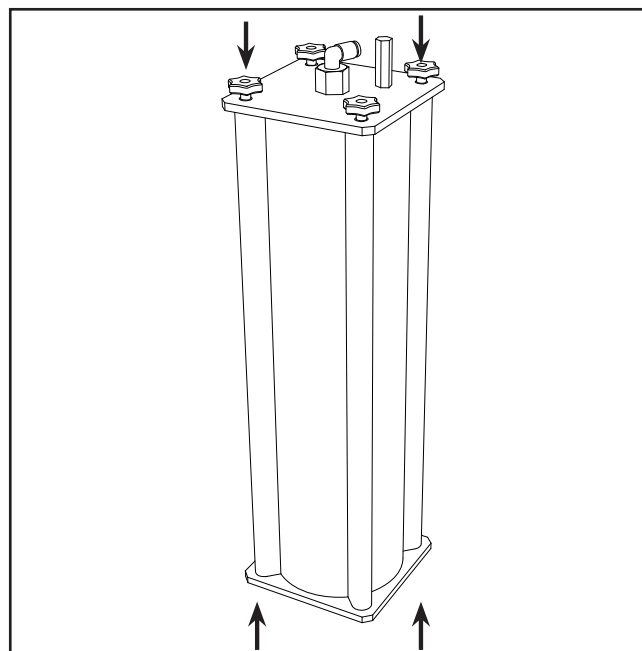


fig 3.5.9 d

Material tank cleaning

The periodic maintenance and the correct use are fundamental factors to guarantee the functioning, safety and reliability of the machine. The interventions of maintenance are carried out by the mechanical technician that must operate in total accomplishment of the safety warnings contained in this manual.

1. Reduce to zero the pressure in the tank by turning counter clockwise the controller of the pressure
2. Disassemble the tank following in reverse the passages described in par. 3.5.9 - " LDM WASP XL Extruder 3.0 material tank"
3. With closed fist (o with the help of some tool) push out the nylon piston.
4. Clean the piston with water
5. Remove the residual material inside the tank and in the feeding hose and clean both with water

3.5.10. LDM WASP XL Extruder 3.0 loading material

To load the material in the extruder follow the procedure:

1. Check the connections with the material tank
2. Move the extruder where you intend to extrude the material
3. Select the manual mode from the app (as described in par. 6.4 - "Manual mode")
4. Select "Extrude" from the app
5. Extrude until the flow of material is consistent
6. Stop the extrusion from the app



ATTENTION:

Position the extruder in a place suitable for the material extrusion



ATTENTION:

Make sure that the extruder and the tank are at an appropriate distance for the feeding hose to not be stretched during the robot movements

3.5.11. LDM WASP XL Extruder 3.0 extraordinary maintenance



ATTENTION:

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

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

Extraordinary maintenance interventions are those that are carried out:

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

For additional information, support and FAQs on our website: www.3dwasp.com/support



ATTENTION:

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



ATTENTION:

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



ATTENTION:

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



ATTENTION:

Please consult the most recent version of the manual available on our website for detailed and updated instructions on using the tool.

3.6. LDM WASP XXL Extruder 3.0

3.6.1. LDM WASP XXL 3.0 Extruder general safety warnings

**CAUTION:**

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

**NOTE:**

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

The purpose of this chapter is to indicate:

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

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

Possible operations on the product can include:

- Mechanical
- Electrical

**MECHANICAL NATURE INTERVENTIONS**

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

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

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

**ELECTRICAL NATURE INTERVENTIONS**

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

3.6.2. Personal protective equipment

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

**ATTENTION:**

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

Maintenance / Cleaning

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

3.6.3. LDM WASP XXL Extruder 3.0 description

The WASP LDM Extruder XXL 3.0 is capable to extrude fluid-dense materials such as concrete mortars, clay and other raw earth-based mixtures.

The WASP LDM Extruder XXL 3.0 is connected through a hose to a fluid-dense material pump. The feeding of the material is controlled by the parameters on the pump.

The material is then conveyed by a screw that controls the extrusion flow, then is pushed through a nozzle that defines the width of the extruded path.

The WASP LDM Extruder XXL 3.0 supports nozzles of standard diameter 17mm with other diameters available on request.

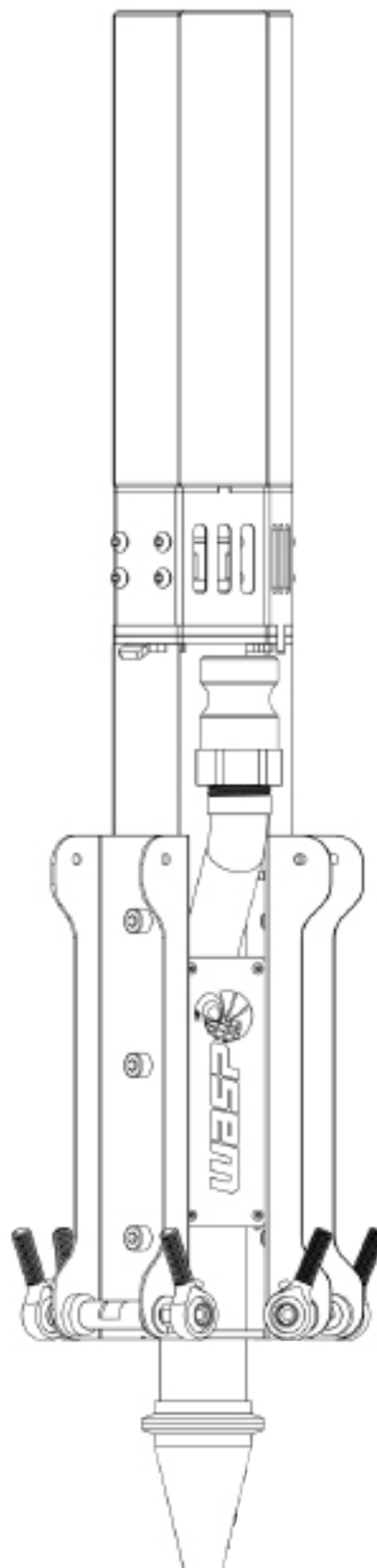


Fig. 3.6.3 - WASP LDM Extruder XXL 3.0

3.6.4. LDM WASP XXL Extruder 3.0 Cerebro Connection

Connections needed:

- GX 20-12 (e)

Concrete HD Continuous Feeding System connections needed:

- GX 16-8 (b)

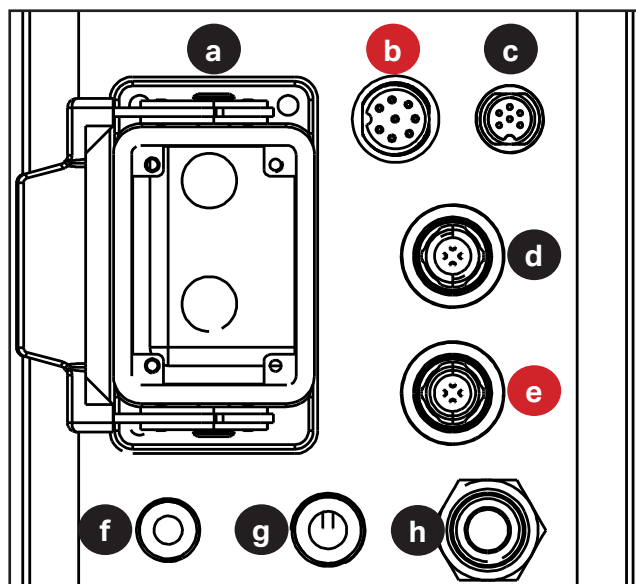


Fig. 3.6.4- LDM WASP XXL Extruder 3.0 Cerebro connections

To connect the extruder to Cerebro attach the cables from the extruder and the Continuous Feeding System to the corresponding outlet as shown in the figures



ATTENTION:

Make sure that the cables do not interfere with the movement during the printing process.

3.6.5. LDM WASP XXL Extruder 3.0 assembly and use

To assemble the LDM WASP XXL Extruder 3.0 follow the steps:

1. Attach the extruder to the specific supports
2. Insert the extruder's screw holder on the machine (fig 3.6.5 a)
3. Install the chosen nozzle and its gasket to the extruder (fig 3.6.5 b) (fig 3.6.5 c)
4. attach the screw to the extruder's motor, fit both of them inside the holder and secure them with the red levers (fig 3.6.5 d) (fig 3.6.5 e)
5. Prepare the mix in sufficient volume to fill at least the continuous transport system
6. Attach the feeding hose to the Continuous Feeding System Concrete HD
7. Activate the Continuous Feeding System Concrete HD in manual mode and extrude the material until it comes out from the hose and then turn off the system
8. Attach the hose to the extruder and secure it (fig 3.6.5 f) (fig 3.6.5 g)
9. Turn on the Continuous Feeding System Concrete HD and set it in automatic mode
10. Move the extruder where you want to collect the material
11. Extrude with the App until the material's flow becomes constant

To disassemble the extruder for cleaning repeat these steps backward.



ATTENTION:

Position the extruder in a place suitable for the material extrusion



ATTENTION:

Make sure that the extruder and the tank are at an appropriate distance for the feeding hose to not be stretched during the robot movements



fig 3.6.5 a



fig 3.6.5 b



fig 3.6.5 c



fig 3.6.5 d



fig 3.6.5 e



fig 3.6.5 f



fig 3.6.5 g

3.6.6. LDM WASP XXL Extruder 3.0 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.

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 all camlock couplings
- greasing and periodic cleaning of the elastic joint between the motor and the screw conveyor

3.6.7. LDM WASP XXL Extruder 3.0 material

Loading material is a basic procedure required for printing.

The machine can handle various materials such as 3D printing ready-mixes, dry mortars, fibre filled mixtures, natural plasters and concrete with particle sizes up to 3mm and promises delivery rates up to 3L/minute.

Consider that also the moisture of the material and the environment may effect the final result.

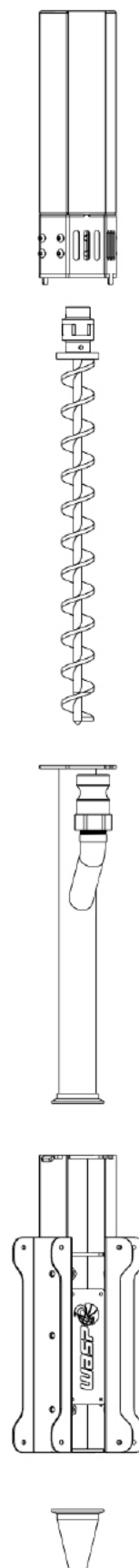


Fig. 3.6.7 - WASP LDM Extruder XXL 3.0

3.6.8. LDM WASP XXL Extruder 3.0 maintenance

Periodic maintenance and correct use are essential factors to ensure the functionality, safe operation and life of the product. 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 product 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.

3.6.9. LDM WASP XXL Extruder 3.0 loading material

To load the material in the extruder follow the procedure:

1. Check the connections between Cerebro and the LDM WASP XXL Extruder 3.0 and between Cerebro and the Concrete HD Continuous Feeding System
2. Move the extruder where you intend to extrude the material
3. Connect the Concrete HD Continuous Feeding System's feeding hose and fill it with material
4. Select the manual mode from the app (as described in par. 6.3 - "Manual mode")
5. Select "Extrude" from the app
6. Extrude until the flow of material is consistent
7. Stop the extrusion from the app



ATTENTION:

Position the extruder in a place suitable for the material extrusion

**ATTENTION:**

Make sure that the extruder and the tank are at an appropriate distance for the feeding hose to not be stretched during the robot movements

3.6.10. LDM WASP XXL Extruder 3.0 extraordinary maintenance

**ATTENTION:**

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

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

Extraordinary maintenance interventions are those that are carried out:

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

For additional information, support and FAQs on our website: www.3dwasp.com/support

**ATTENTION:**

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

**ATTENTION:**

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

**ATTENTION:**

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

**ATTENTION:**

Please consult the most recent version of the manual available on our website for detailed and updated instructions on using the tool.

4 TRANSPORT AND HANDLING

4.1. General warnings

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

Furthermore, the specific requirements for safe interaction with the product, 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).



4.2. Delivery of the product

Upon receipt, make sure that:

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



ATTENTION:

During storage, never stack the boxes containing the equipment.

4.3. Content

The product is supplied with:

- Cerebro console
- Power supply cable (220v)
- 3m Ethernet cable
- Printed user's manual

4.4. Unpacking, lifting and handling of the product



ENVIRONMENTAL NOTE:

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



ATTENTION:

The weight of the product is shown in paragraph 2.6 "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 product is not completely raised, it is advisable to check the correct balance of the same. During lifting, all the area around the product is considered dangerous.



ATTENTION:

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



ATTENTION:

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

With the help of a screwdriver or a electric screwdriver remove carefully all the screws on the box. Remove the walls one by one, paying attention not to damage them. Set the product in a suitable place.

5 INSTALLATION

5.1. General warnings

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

Furthermore, the specific requirements for safe interaction with the product, 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.

5.1.1. Placement

The product must be installed in a suitable place, ie such as to allow normal operations of the product, 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.

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



ATTENTION:

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

Do not install the product without the appropriate protections.

5.2. Electrical connection



ATTENTION:

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


ATTENTION:

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


ATTENTION:

The product 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 product can be found in the manual, see paragraph 2.4 "Technical data".

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

5.3. Pneumatic connection

The pneumatic connection is required for the following tools:

- WASP HDP Extruder
- WASP HDP XL Extruder
- LDM WASP Extruder 3.0
- LDM WASP XL Extruder 3.0 (if the material tank is in use)


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 hose mechanically against any crushing or sources of wear according to the type of installation made.


ATTENTION:

The product must be powered by a compressor with at least 100 liters of capacity and minimum pressure 6 bars. The hose for the connection must be 8 mm in the external diameter.

When the product is turned on the air pressure must be provided.

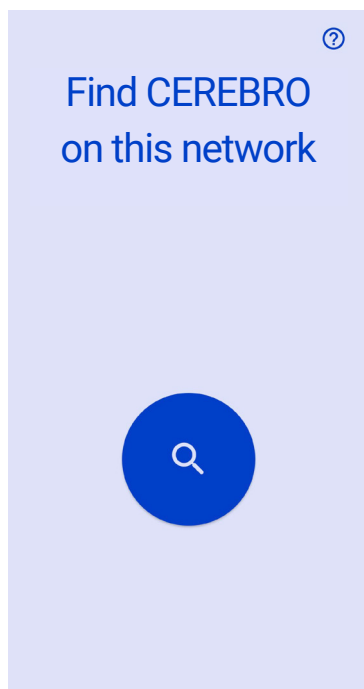


Fig. 6.1.2 a

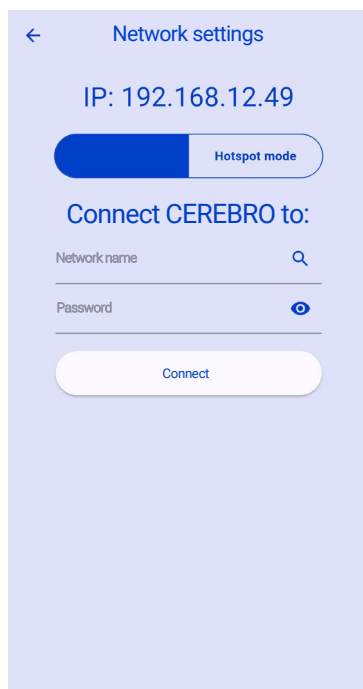


Fig. 6.1.2 b

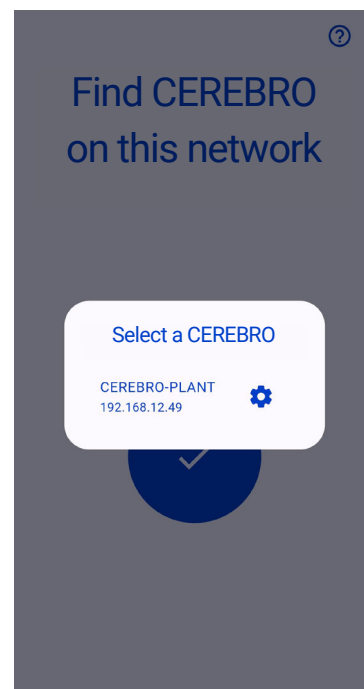


Fig. 6.1.3

6 APP MYCEREBRO

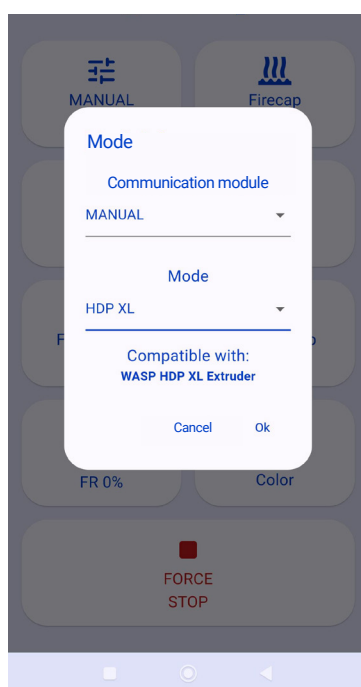


Fig. 6.1.4

6.1. First use

The app MyCerebro is a fundamental part in the use of Cerebro, it allows to control the extruder during printing, regulating the flow of material and setting the different temperatures.

6.1.1. Download and installation

MyCerebro is available on the Playstore, you can download it here



6.1.2. Connection to Cerebro

To connect the app MyCerebro to Cerebro follow the procedure indicated:

1. Power on Cerebro
2. Press and hold the Wi-Fi button (see par. 2.2 - "Connections") on Cerebro for five seconds
3. Connect the device with the MyCerebro app to the newly generated Wi-Fi network:

Network name	cerebro-ap
Password	cerebro1

4. Press the scan button on the app to find Cerebro (Fig. 6.1.2 a)
5. Once the scan it is done select the Cerebro's IP button to start using it on this network, otherwise select the settings button to open the network settings menu (Fig. 6.1.2 b)

6.1.3. Network settings

Allows to connect Cerebro to an existing Wi-Fi network inserting the name and the password (Fig. 6.1.3).

Once Cerebro is connected to the desired network do as follow:

1. Connect the device with the MyCerebro app to the previously selected Wi-Fi
2. Press the scan button on the app to find Cerebro (Fig. 6.1.2 a)
3. Once the scan it is done select the Cerebro's IP button to start using it on this network

6.1.4. Mode selection menu

Allows the user to change the current mode (according to mounted extruder) and change or activate a module. The default module will always be Manual

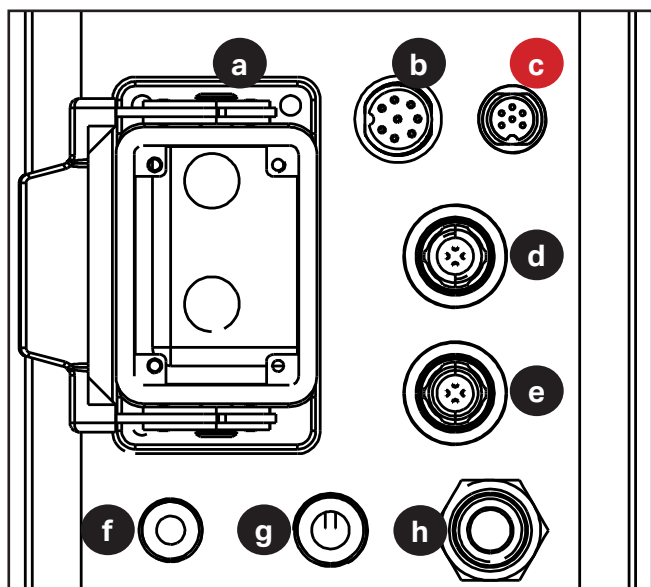


Fig. 6.4.1 a

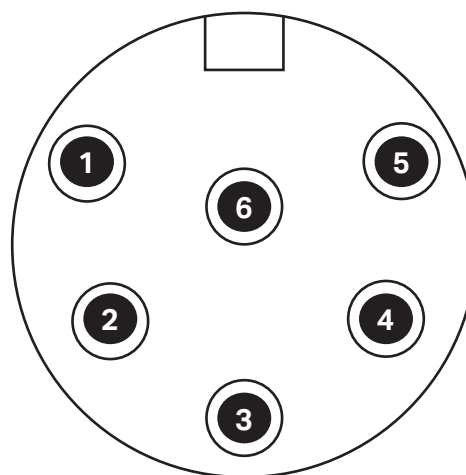


Fig. 6.4.1 b

6.2. Robot modules description

The operating module is the core of Cerebro, enabling it to interface with various robots. You can run a module by selecting it from the "tool and mode selection" menu on the App.

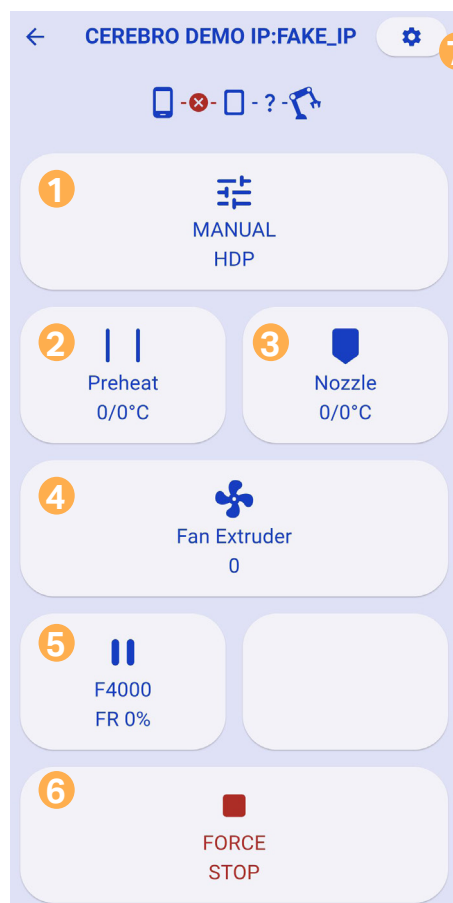


Fig.6.5.1 - HDP main board

The main board appears when you connect the App to Cerebro. It is intended to be the principal tool for the monitoring and control of the product.

Legend:

1. Tool mode and module selection
2. Preheat temperature (click to set new target temperature)
3. Nozzle temperature (click to set new target temperature)
4. Fan speed (click to set new target speed)
5. Option menu (see par. 6.5.3 - "HDP Option")
6. Force stop (stops the extrusion and closes any running module)
7. Advanced settings (see par. 6.5.2 - "HDP Advanced settings")

Once a module is loaded and its requirements are fulfilled, it will be shown as running in the main menu and the extrusion will now be in control of the module itself. To deactivate a module, select the manual mode. Returning to manual mode is required when transitioning between modules. If any communication error should occur, the module will stop its execution. The button "Force Stop" will always attempt to disable any running module

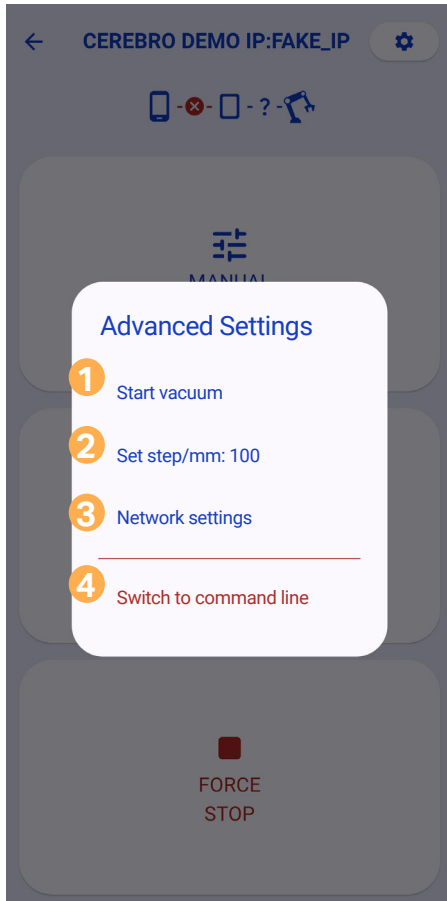


Fig. 6.5.2 a - HDP Advanced Settings

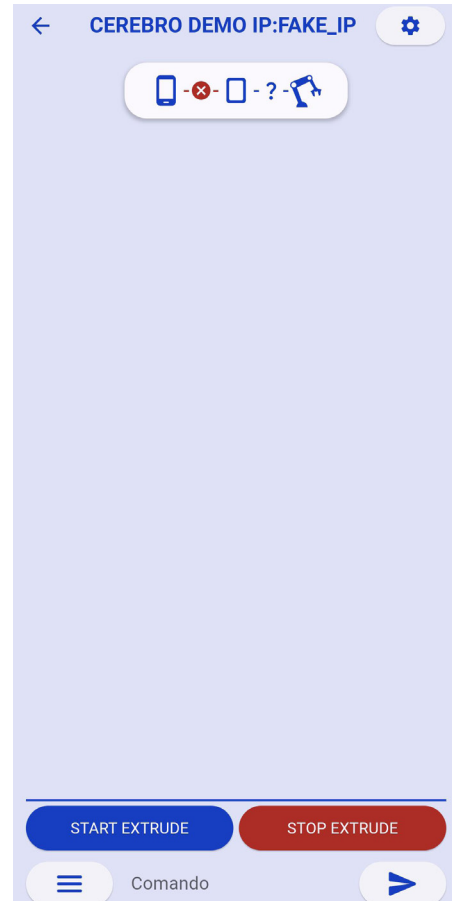


Fig. 6.5.2 b - HDP Command Line

The advanced settings menu allows the user to set advanced functionalities, activate the V.A.C.S. (Vacuum Active Control System) and open debug features.

Legend:

1. Starts the V.A.C.S. (Vacuum Active Control System)
2. Sets the steps/mm of the extruder
3. Opens the network setting menu (see par. 6.1.3 "Network settings")
4. Opens the command line panel (fig. 6.5.2 b)

alongside stopping the extrusion.

For general use purpose, the PLC module offers users with access to digital and analogue control signals for the extrusion, the ability to 3D print with any robotic device.

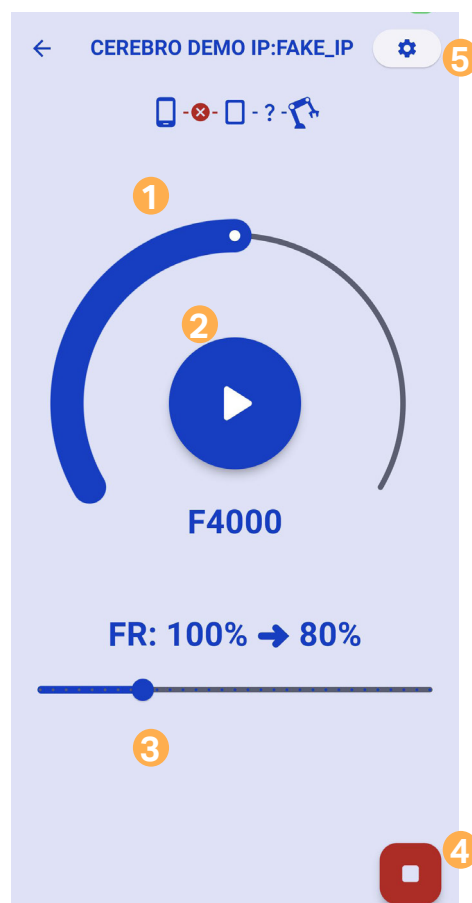


Fig. 6.5.3 - HDP Options

The Option panel allows to modify the extrusion speed of the extruder

Legend:

1. Sets the extrusion speed (set in mm/sec)
2. Starts and stops the extrusion
3. Sets the flow rate with a percentage multiplier
4. Force stop (stops the extrusion and closes any running module)
5. Advanced settings (see par. 6.5.2 - "HDP Advanced settings")

The strength of Cerebro, however, lies in its ability to set it and the robot on the same LAN (usually done with an Ethernet cable directly plugged into the robot console) and, thanks to a specific module, have the integration be managed by a logical communication.



Fig.6.6.1 - HDP XL main board

The main board appears when you connect the App to Cerebro. It is intended to be the principal tool for the monitoring and control of the product.

Legend:

1. Tool mode and module selection
2. Firecap temperature (click to set new target temperature)
3. Preheat temperature (click to set new target temperature)
4. Nozzle temperature (click to set new target temperature)
5. Fan speed (click to set new target speed)
6. Firecap fan's speed (click to set new target speed)
7. Option menu (see par. 6.6.3 - "HDP XL Option")
8. Force stop (stops the extrusion and closes any running module)
9. Advanced settings (see par. 6.6.2 - "HDP XL Advanced settings")


NOTE:

In order to be able to choose the correct module for a specific type of robotic arm, it is necessary to interface with WASP technical support.

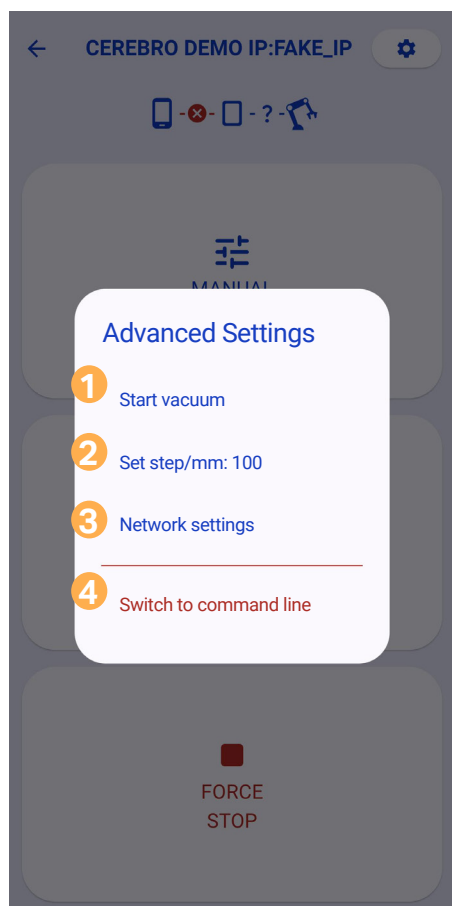


Fig. 6.6.2 a- HDP XL Advanced Settings

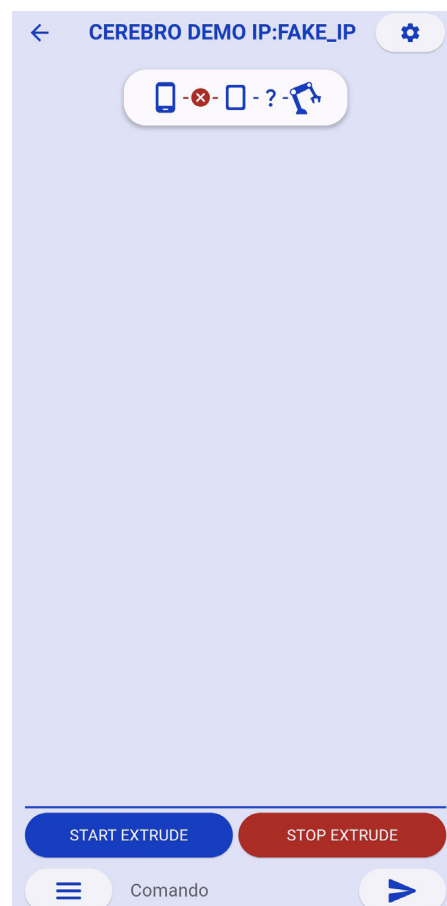


Fig. 6.6.2 b- HDP XL Command Line

The advanced settings menu allows the user to set advanced functionalities, activate the V.A.C.S. (Vacuum Active Control System) and open debug features.

Legend:

1. Starts the V.A.C.S. (Vacuum Active Control System)
2. Sets the steps/mm of the extruder
3. Opens the network setting menu (see par. 6.1.3 - "Network settings")
4. Opens the command line panel (fig. 6.6.2 b)

**NOTE:**

It is possible to change the module from the main board of the App.

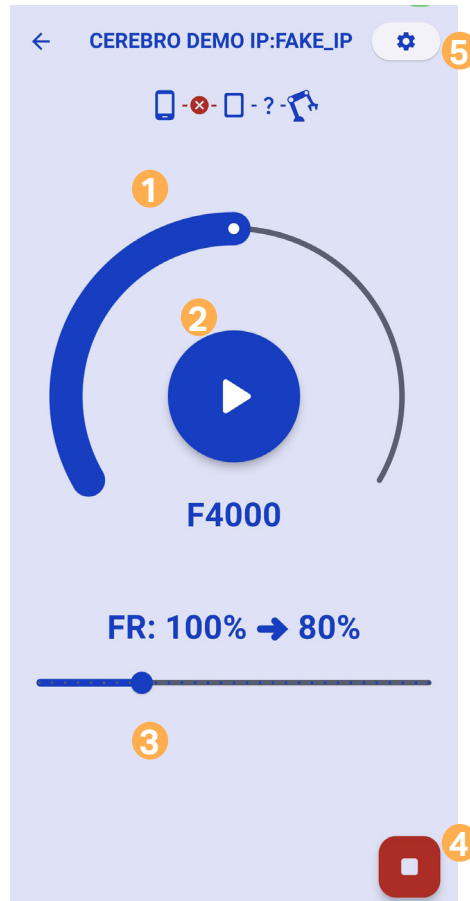


Fig. 6.6.3 - HDP XL options

The Option panel allows to modify the extrusion speed of the extruder

Legend:

1. Sets the extrusion speed (set in mm/sec)
2. Starts and stops the extrusion
3. Sets the flow rate with a percentage multiplier
4. Force stop (stops the extrusion and closes any running module)
5. Advanced settings (see par. 6.6.2 - "HDP XL Advanced settings")

6.3. Manual mode

It's the default Cerebro operating mode. Suited for initial prints or simpler tasks. Extrusion is fully controlled by the user through the app.

Manual mode is selectable in every main board with the button "tool and mode selection".

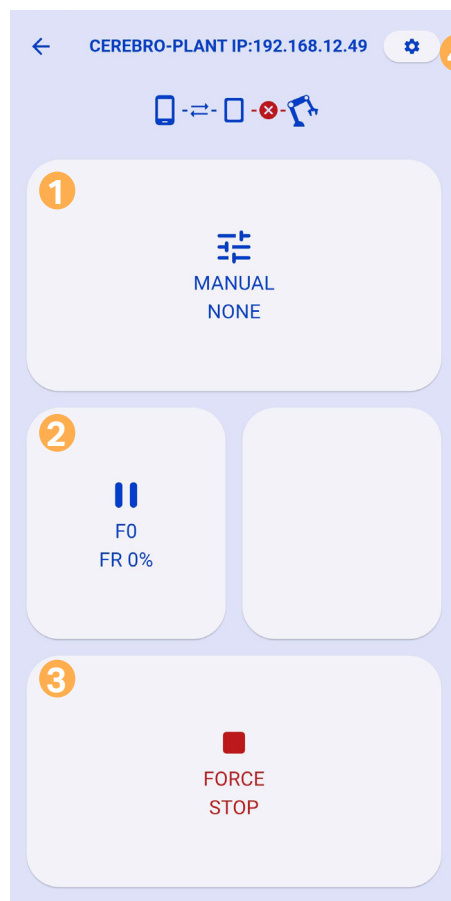


Fig. 6.7.1 - LDM main board

The main board appears when you connect the App to Cerebro. It is intended to be the principal tool for the monitoring and control of the product.

Legend:

1. Tool mode and module selection
2. Option menu (see par. 6.7.3 - "LDM Option")
3. Force stop (stops the extrusion and closes any running module)
4. Advanced settings (see par. 6.7.2 - "LDM Advanced settings")

6.4. GPIO Module

This module allows the user to control the extrusion through digital and analogue signals. The GPIO Module

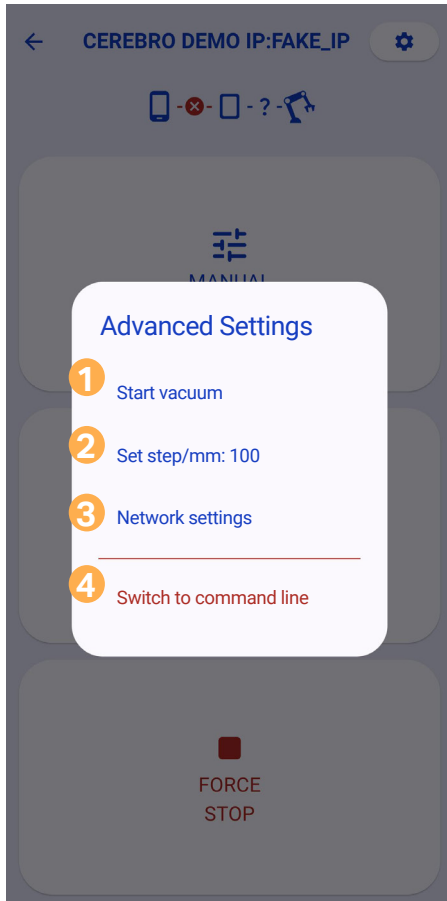


Fig. 6.7.2 a- LDM Advanced Settings

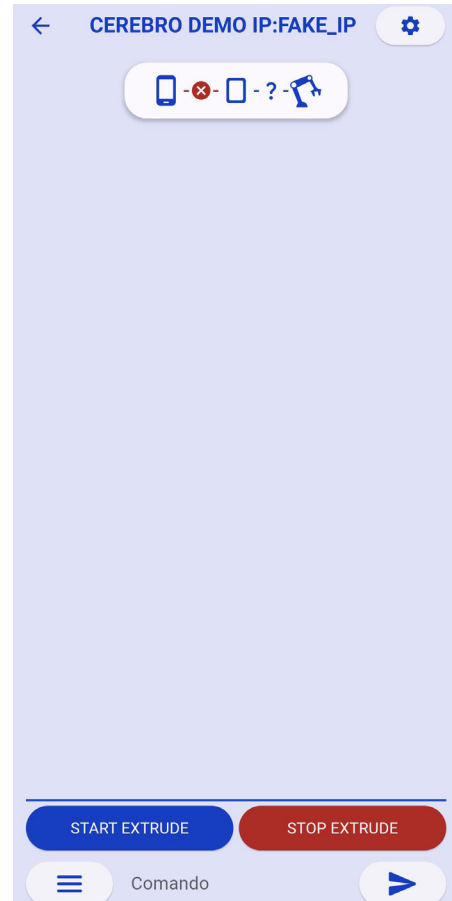


Fig. 6.7.2 b - LDM Command line

The advanced settings menu allows the user to set advanced functionalities, activate the V.A.C.S. (Vacuum Active Control System) and open debug features.

Legend:

1. Starts the V.A.C.S. (Vacuum Active Control System)
2. Sets the steps/mm of the extruder
3. Opens the network setting menu (see par. 6.1.3 - "Network settings")
4. Opens the command line panel (fig. 6.7.2 b)

connector is the GX12-6 (fig. 6.4.1 a connector "c").

The GPIO Module is selectable in every main board with the button "tool and mode selection".

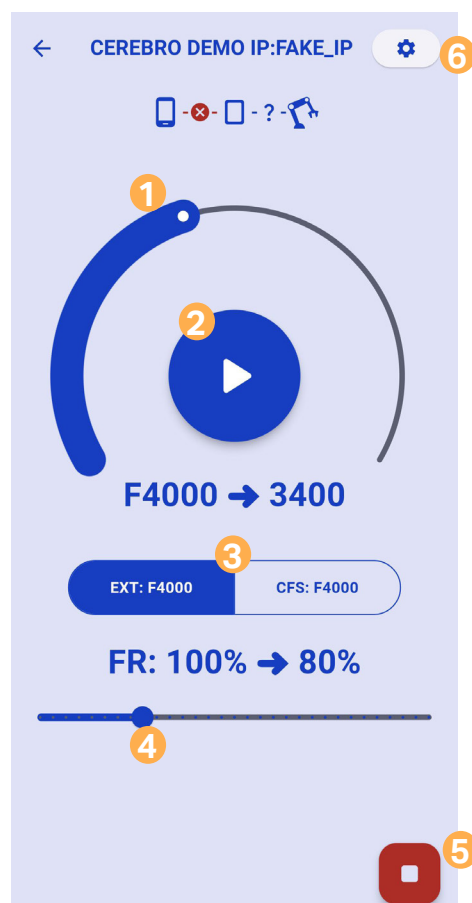


Fig. 6.7.3 - LDM options

The Option panel allows to modify the extrusion speed of the extruder

Legend:

1. Sets the extrusion speed (set in mm/sec)
2. Starts and stops the extrusion
3. Sets the flow of the extruder (EXT) or the Continuous Feeding System (CFS)
4. Sets the flow rate with a percentage multiplier
5. Force stop (stops the extrusion and closes any running module)
6. Advanced settings (see par. 6.7.2 - "LDM Advanced settings")

6.4.1. Signals

See fig. 6.4.1 b for reference:

Pin 1: Ground

Pin 2: analogue input for extrusion speed control (from 0 to 10V).

Pin 4: digital input for turning on and off the extrusion.

6.5. User interface HDP

6.5.1. HDP main board

6.5.2. HDP advanced setting

6.5.3. HDP options

6.6. User interface HDP XL

6.6.1. HDP XL main board

6.6.2. HDP XL advanced setting

6.6.3. HDP XL options

6.7. User interface LDM

6.7.1. LDM main board

6.7.2. LDM advanced setting

6.7.3. LDM options

7 ORDINARY AND EXTRAORDINARY MAINTENANCE

7.1. General warnings

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

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



ATTENTION:

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



ATTENTION:

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



ATTENTION:

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



7.2. Ordinary maintenance

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



ATTENTION:

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



NOTE:

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

7.3. Extraordinary maintenance

**ATTENTION:**

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

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

Extraordinary maintenance interventions are those that are carried out:

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

For additional information, support and FAQs on our website: www.3dwasp.com/support

**ATTENTION:**

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

**ATTENTION:**

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

**ATTENTION:**

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

8 ADDITIONAL INSTRUCTIONS

8.1. General warnings

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

Furthermore, the specific requirements for safe interaction with the product, 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).



8.2. Disposal and dismantling

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



ATTENTION:

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

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



NOTE:

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



ATTENTION:

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



ATTENTION:

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

[illegible]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



WASP S.R.L.

Via Castelletto, 104 - 48024 Massa Lombarda (RA) Italia
www.3dwasp.com - info@3dwasp.com