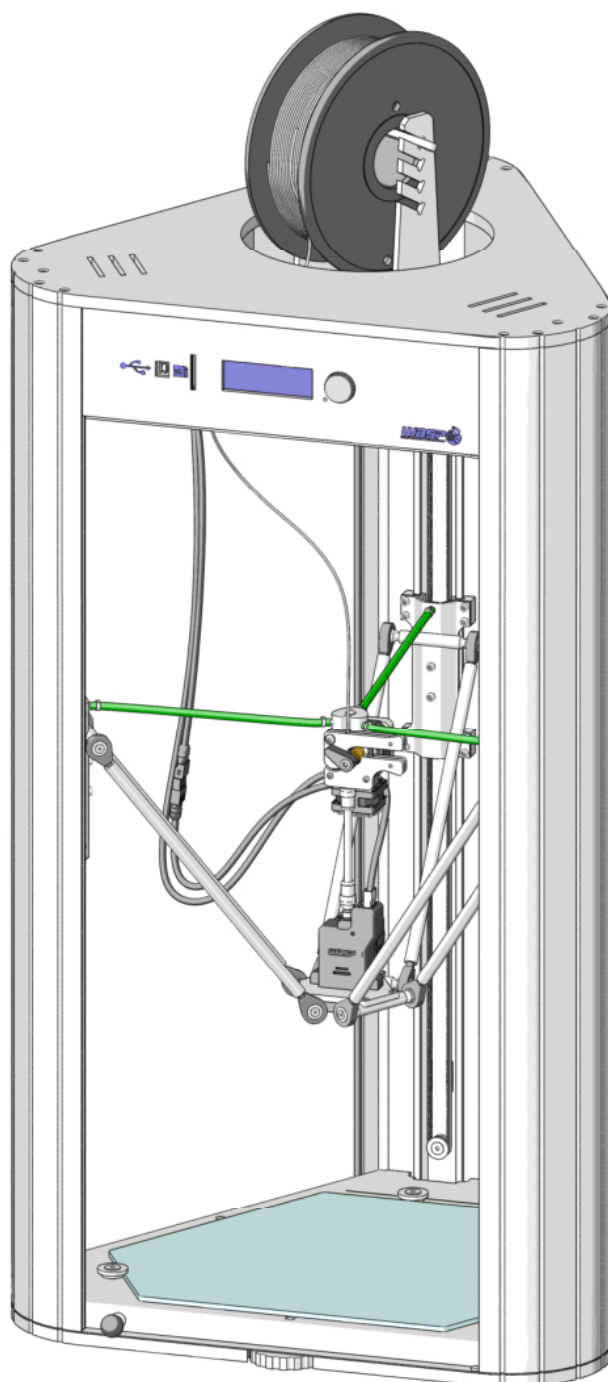# USE and MAINTENANCE MANUAL

DELTA 2040/4070
3D PRINTER

CE

Dear Customer,

First of all thank you for choosing a **WASP** 3D printer.

WASP is an industrial landmark for printers and 3D printing systems.
WASP products guarantee great reliability and safety.

All components of **WASP** 3D printers are designed and produced to ensure the best performances at all times.
In order to maintain a high quality standard and long reliability please use original spare parts only.

WASP 3D printers are designed and CERTIFIED according to the european Directive 2006/42/EC (Machinery Directive). All machines display the identification and **EC** Ruling conformity plate. The machines are also equipped with the instruction manual and the Declaration of Conformity to the European Directive 2006/42/EC and to its various amendments; this allows to sell **WASP** 3D printers freely in all Countries belonging to the European Community.

Entirely designed and produced in Italy.

We are therefore convinced to have fulfilled any safety need and to have contributed to further improve the quality of work.

<div align="right">The Management</div>

DELTA 2040/4070

GENERAL CONTENTS

DELTA 2040/4070

Informative letter

This instruction and maintenance manual is an integral part of the printer and must be easily available to the staff in charge of its installation and maintenance. The user must know the content of this manual. The descriptions and the pictures it contains are not to be considered as binding.

Although the main features of the machine described in this manual are not subject to change, CSP srl **(WASP)** reserves the right to change any part, detail and accessory it deems necessary to improve the printer or for manufacturing or commercial requirements, at any time and without being obliged to update this manual immediately.

DELTA 2040/4070

WASP printers are **NOT** manufactured to work in environments with danger of explosion and at high fire risk. In case of damages or uncorrect operating, the printers must not be used until they have been repaired.

DELTA 2040/4070

Customer Care Technical Service
Customer Care Technical Service Office
Viale Zaganelli n. 26 48024
Massa Lombarda (RA) - Italy
Tel: +39 0545 82966

Assistance Ticket: www.personalfab.it
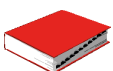Website: http://www.wasproject.it

⚠ WARNING

The original configuration of printer must not be changed at all.

On receiving the printer make sure:
+ The supply corresponds to what has been ordered.

In case of non conformity please inform WASP immediately.
Also make sure that the printer has not been damaged during transport.

Warranty

WASP 3D printer has a 24 month warranty from the date written on the last page of this manual for private customers and a 12 month warranty for companies or workers with VAT number, unless otherwise stated in writing.

The warranty covers all manufacturing and material defects. Replacements and repair operations are covered only if carried out by our company and at our servicing shop.

In case of return for repair under warranty, the customer must always send to WASP the whole printer or, if possible, only the place which must be replaced.

The material to be repaired will have to be sent CARRIAGE FREE.

Once the machine has been repaired, it will be sent to the customer CARRIAGE FORWARD.

The warranty covers neither the technicians' intervention on site nor the machine disassembly from the installation.

If for practical reasons, one of our technicians is sent on site, the customer will be charged the costs plus the travelling expenses.

The warranty does not include:
+ failure caused by wrong use or assembly,
+ failure caused by external agents,
+ failure caused by lack of maintenance or carelessness,
+ the use of non suitable materials and of printing filaments which can not be used with Delta 2040 printers.

WARRANTY FORFEITURE:
+ In case of arrearage or other breaches of contract,
+ Whenever changes or repairs are carried out on our printers without our prior authorization
+ Whenever the serial number is tampered with or cancelled,
+ Whenever the damage is caused by improper use, bad treatment, bumps, falls and other causes not due to normal working conditions,
+ Whenever the machine seems tampered with, dismantled or previously repaired by unauthorized staff.
+ Whenever the printer is sent back to the company inside a different packaging from the one provided at the time of purchase.
+ Whenever components not produced by WASP are added or mounted on the printer.

The repairs under manufacturer's warranty do not interrupt it.

All disputes will be settled in the court of justice of Ravenna (Italy).

We thank you in advance for the attention you will pay to this manual and we invite you to inform us of any improvement you will think necessary to make it more complete.

DELTA 2040/4070
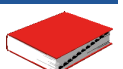
Introduction to our company

CSP (Centro Sviluppo Progetti) was born about twenty years ago out of the brilliant mind of Massimo Moretti, and this company deals with the development of innovative projects. As background to this birth lays a 50 years lasting experience: since Massimo was a child, he used to observe his father working in the workshop, and was fascinated by that small world which enables to create finished parts starting from the raw material; they built toys together, learning how to do them.

The company is marked by the continuous search of brand new ideas and projects to be developed. This business is centred on new innovative ideas, curiosity and research are the main characteristics of every project developed by Massimo and his team.

WASP is CSP, Centro Sviluppo Progetti, is university, is research, is passion. These elements are perfectly integrated and combined together in order to work for Makers research and innovation. The final products are printing and milling machines, which aim also to make a better world.

This approach allows users to build on their own objects according to their imagination, by creating them in 3D using CAD software or by downloading open source projects from internet. This project is self-financed by producing small but versatile and low cost 3D printers, and at the same time the spread of technologies and knowledges can support micro-enterprises and change the attitude towards the work, just by creating it.

Craftsmen, creative people, hobbyists, laboratories, schools, everybody can have access to advanced technologies like 3D drawing and printing, computer numeric control machining (milling machines, cnc), trasforming own ideas into objects.

WASP produces as well as Delta 2040 printer, also the following devices:

- DeltaWASP 4070 with printing area 400mm x 600mm, printing definition 100 micron
- DeltaWASP 60100 with printing area 600mm x 1000mm, printing definition 100 micron
- Delta Open
- PowerWASP EVO (the first 3D printer which becomes also milling machine CNC)

(The management)

1.0 Transport

To transport the 3D printer only the method below can be used. Make sure the means of transport and the lifting device can bear the weight of the machine with its packaging (about 25 Kg):

+   Transport in cardboard box.

⚠ WARNING

The staff in charge of handling must use protective gloves.

⚠ WARNING

While lifting or handling the 3D printer or any of its parts, clear the working area, by leaving a sufficient safety area around it to avoid injuring people or damaging objects that could be inside it.

⚠ WARNING

All the options ordered with the printer are packed separately or inserted in the same packaging.

1.1 Transport in cardboard box

The printer is inserted inside a cardboard box with the following dimensions 51cm x 58cm x 100cm (see picture 1). In order to avoid any movement of the printer, two casings made of polyethylene foam are added inside the box to make the printer more stable and to protect it from any impact.
The printer is covered inside by a cellophane tape. In some cases for the delivery the strapping is needed. The box can also be lifted manually (since the weight has a low value) but at least by two people.

⚠ WARNING

Follow the directions on the packaging before handling and opening it.
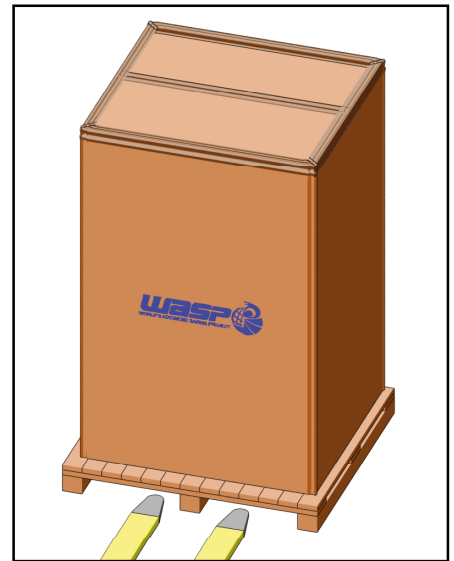
Picture 1

DELTA 2040/4070

1.2 Content

Standard Delta 2040 printer is supplied with use manual, SD card, power cable with schuko plug, glass surface, reel support.

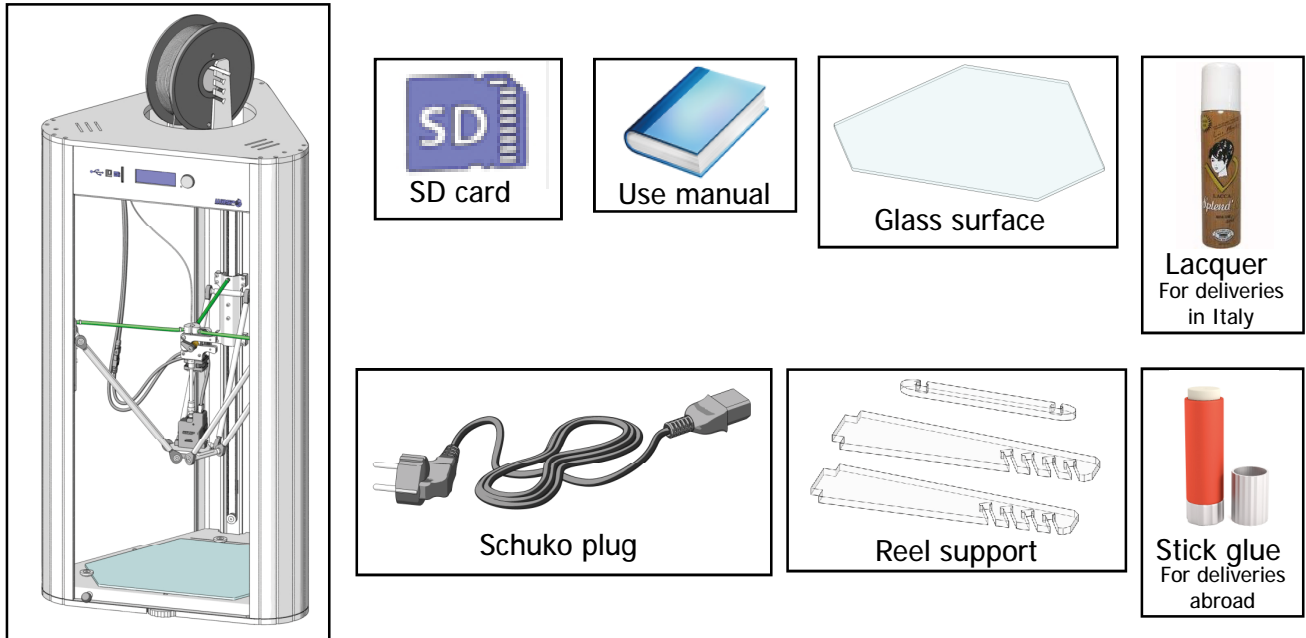|			
SD card	Use manual	Glass surface	Lacquer For deliveries in Italy
Schuko plug		Reel support	Stick glue For deliveries abroad

1.3 Unpacking

If the printer is sent in a cardboard box, unpack it by means of a cutter. Lift the four upper cardboard wings, then lift the printer and extract it from the packaging.
Before removing the printer, extract the upper polyethylene foam casing and the two cardboard corner protectors.

⚠ WARNING

+ Keep the original packaging in order to use it in case the printer must be sent back to the company.
+ Always pay attention to the glass surface.
+ The packaging must be delivered to associations in charge of its disposal and recycling.
+ Check from above to see if any units or accessories have been inserted into the sides of the packaging, then decide which wall of the packaging to remove first so as not to damage the contents of the box.

1.4 Storage

When transporting and storing the machine, make sure that the temperature is between -5 and 50°C.
Whenever the printer has to be stored, make sure that it is not put in areas with an excessive relative humidity.

⚠ WARNING

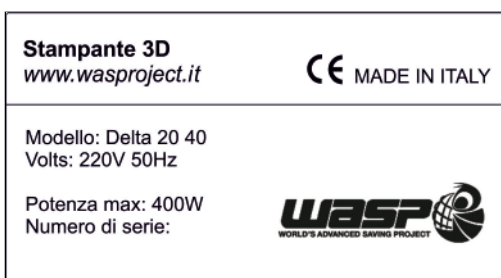During the storage never overlap the cases containing the equipment.

2.0 Labelling data

The manufacturer's identification and EC standard 2006/42/EC conformity plate (see picture 2) is on the internal upper part of the printer.

The plate must not be removed at all, even if the printer is resold. Always refer to the serial number (written on the plate itself) when contacting the manufacturer.

Several safety warnings are placed on some components of the printer; they must be strictly followed by everyone dealing with the machine.

The company is not to be held responsible for damage to property or accidents to people which might occur if the above-mentioned warnings are not observed. In such a case, the operator is the only person responsible.

DELTA 2040/4070

Stampante 3D
www.wasproject.it   CE MADE IN ITALY

Modello: Delta 20 40
Volts: 220V 50Hz

Potenza max: 400W
Numero di serie:

HOT SURFACE

HOT SURFACE

DO NOT REMOVE THE SAFETY DEVICES

READ THE USE MANUAL
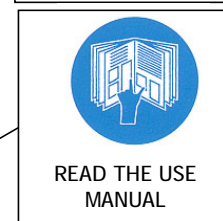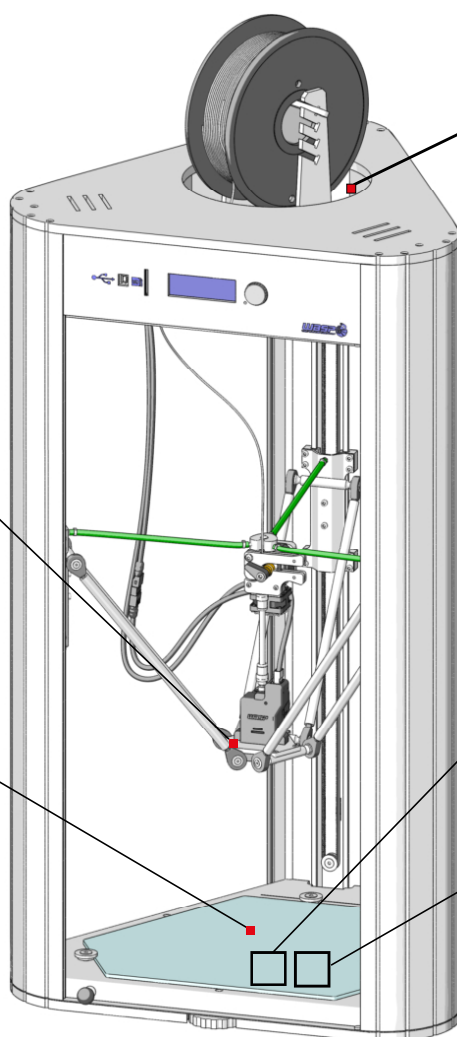
Picture 2

2.1 Description of the 3D printer

The printer is provided with an heated extruder mounted on a delta robot structure, a working surface and a reel unit.

The material is unrolled from the reel and led towards the heated nozzle, where it melts and drips through a nozzle which leaves extra-small quantities of material on the working surface. The material goes out from the printing head layer on layer and each "layer" is defined by the file created by means of a slicing software. Therefore it is possible to create any form and any object according to the limits of this technology.

DeltaWASP guarantees the best results in final printing thanks to the heated surface, the controlled temperature environment and the shock absorbing bowden.

High quality products, sturdiness and construction quality allow minimizing maintenance time.
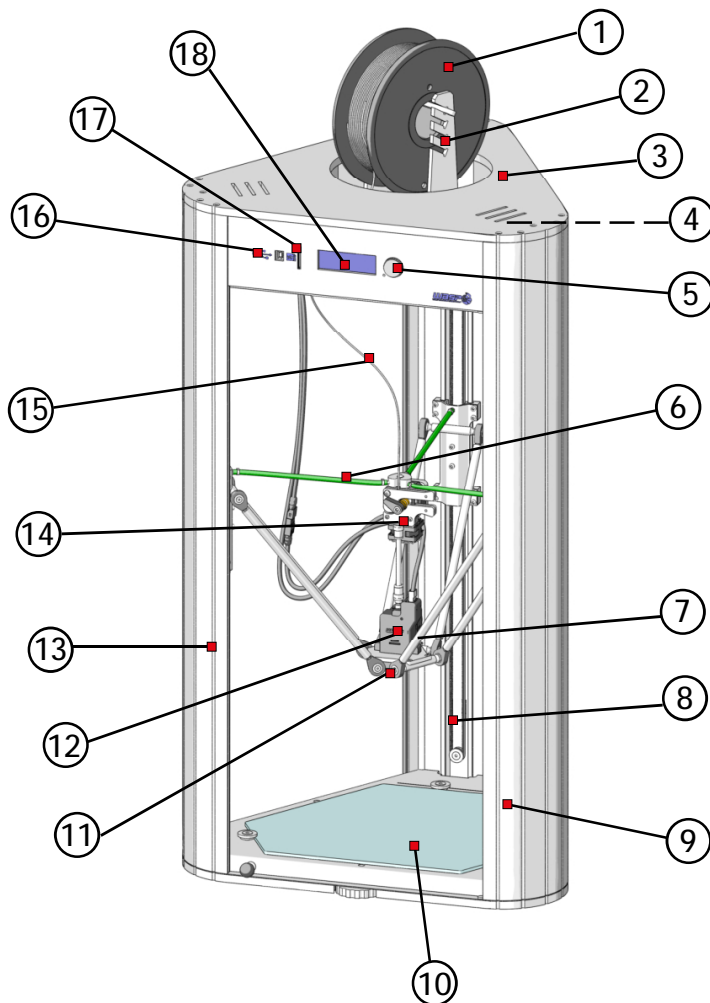
1	Material holder reel
2	Reel support
3	Upper covering
4	Stepper motors
5	Navigation button
6	Filament puller support elastic bands
7	Arms with double connecting rod
8	Axis movement toothed belt
9	Machine structure with aluminium profiles
10	Heated surface with height adjuster
11	0.4 mm nozzle
12	Extruder
13	Machine lighting Led
14	Filament puller
15	Filament to be melted
16	B type USB port
17	SD card port
18	Liquid crystal display

Picture 3

2.2 Technical features

Sturdiness and working precision are the main characteristics of WASP 3D printers. Delta mechanics guarantees higher precision and stability keeping a high production speed.

The heated surface and the complete protection carter ensure a homogeneous and constant temperature.

Furthermore WASP Delta printers can start again the production of a piece from the moment it had stopped for any reasons.

The printer can be connected to a computer or a SD card can be inserted in order to allow working with the printer completely disconnected from the computer. A filament holder, an external reel holder for non-standard size reels and an internal led lighting system are supplied with the machine and it is possible to use filaments of any manufacturers.

Thanks to the Open Source phylosophy, Wasp printers can be managed by any software which accepts gcode files (preparatory code in the programming language of the numerical control).

DELTA 2040/4070

TECHNICAL FEATURES	Delta 2040
MECHANICS	
Frame and cover:	Aluminium, polycarbonate and plexiglass
Printing bed:	Glass
Movements:	Industrial guides on aluminium slides
Motors:	Stepper Nema 17, 1/16 micro stepping
PHYSICAL DIMENSIONS	
Dimensions:	470x470x870 mm
Machine weight:	20 kg
SUPPLY	
Input:	240V 50-60Hz
Power consumption:	80W Print - 300W Heated bed
TEMPERATURE	
Use:	20-30 C°
Warehouse:	0-30 C°
Nozzle:	max 260 C°
Heated floor:	max 100 C°
INFORMATION ON 3D PRINTING	
Technologies:	fused filament fabrication
Cylindric print area:	ø 200 mm - h 400 mm
Max print height:	445 mm
Max dimension:	24 cm base triangle
Nozzle diameter:	0,4 mm
Print resolution:	0,05 mm < 0,25 mm
Axis accuracy:	X,Y 0,012 mm / Z 0,005 mm
Maximum speed:	300 mm/s
Filament diameter:	1,75 mm*
Filaments used:	ABS, PLA, PET, Nylon, Flex, Polystyrene, Laywood, Experimental
SOFTWARE	
Operating systems:	Windows XP-7-8, Mac OSX, Linux
Software slicing:	Cura - Slyc3r
Software interface:	Printrun - Repetier Host
Firmware:	Marlin
File type:	.stl - .obj - .gcode
INTERFACE	
SD Card - LCD screen	

2.3 Field of application

Wasp 3D printers have been designed and manufactured to produce objects in plastic material through the deposition of a melted filament.
It is possible to use materials like ABS, nylon, PLA, PS, PET, FLEX, EXPERIMENTAL (nozzle 0,7), clay, silicone, resins.
The warranty is not valid anymore and the manufacturer is not responsible if the printer is used with materials or purposes different from the above-mentioned ones.

⚠ WARNING

Read the instructions carefully as written on page 18.

2.4 Optional equipment / spare parts

The printers are supplied with many options. For any information about them apply to WASP and to the dealer.

Optional equipment:

- 0.7mm - 0.9 mm extruder nozzle
- Porcelain kit (mixtures)

Spare parts:

- Filament puller
- Extruders
- Glass surface
- Belts
- Stepper motors nema 17

Consumable materials:

Reels in ABS, nylon, PLA, elastic polymers, Polystyrene, Laybrick (0,7 nozzle), Laywood (0,7 nozzle), PET.
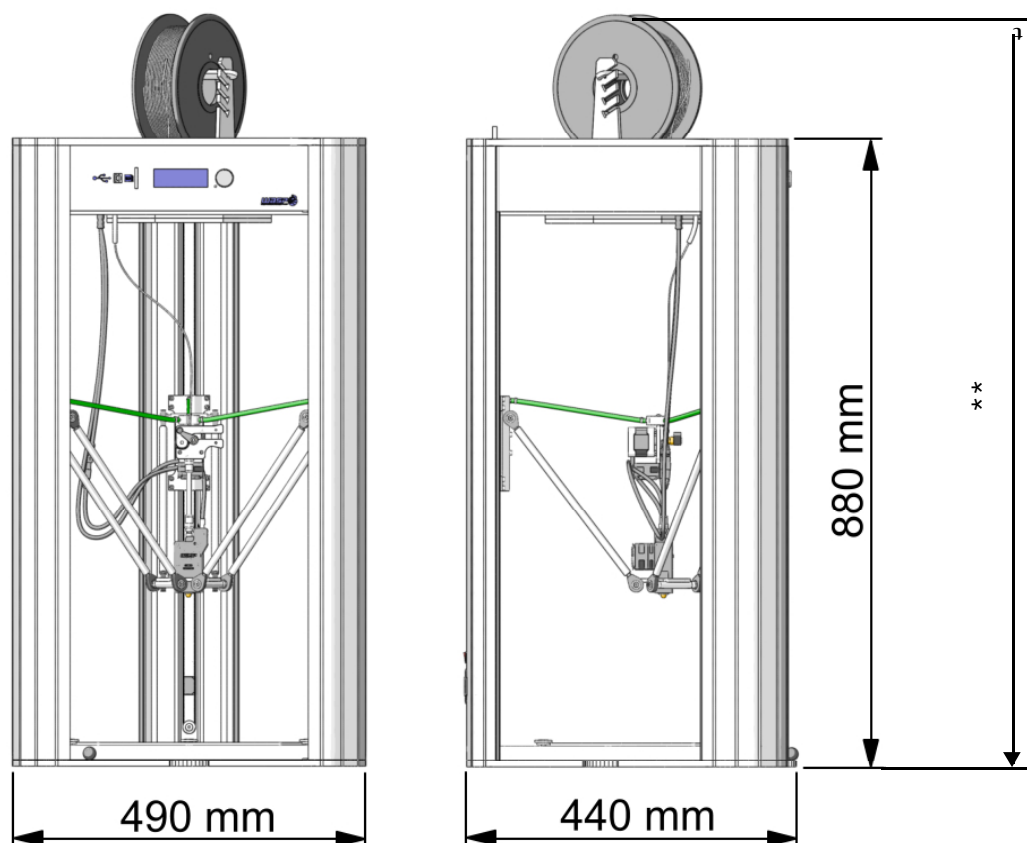For any information about many further materials that the printer can process apply to WASP dealer.

2.5 Dimensions and positioning

The printer dimensions, in millimeters, are indicated in picture 4.

490 mm

440 mm

880 mm

**

Picture 4

OTHER FEATURES:

MINIMUM LIGHT FOR WORKING OPERATIONS   LUX   400
MAXIMUM NOISE: db (A) 60 dB*

* Noise tests have been carried out in compliance with Standard UNI EN ISO 11202:2010.
** Maximum height varies according to the used reel dimensions.

3.0 General safety rules

This section describes the minimum safety rules that must be followed by the user in order to install and use the printer:

⚠ WARNING

+ Do not wear rings, watches, jewels, unbuttoned clothes, scarves, unbuttoned jackets or blouses with open zips that can get entangled in the moving parts.

+ Never use petrol, gas oil or other inflammable liquids such as detergents to clean the printer; use some nonflammable and atoxic solvents.

+ Do not smoke, do not use naked flames and do not create sparks near the printer when handling easily flammable materials.

+ Do not use compressed air to clean the details.

+ **KEEP HANDS AWAY FROM ANY MOVING PARTS.**

+ Do not remove fixed guards.

+ Never disable safety devices or make them non operating.

+ Do not modify or add any devices to the electric system, without written authorization or upon WASP technical intervention, which describes the change made.

+ Do not use the printer for a purpose other than the one for which it is intended, specified in the use and maintenance manual.

+ Do not use the printer with highly toxic or viral products.

+ Do not use the printer with food products unless previous agreement.

+ Do not clean the printer while it is running.

+ Minors can not use the printer.

+ Do not touch the printing head after the use because it could be overheated.

3.1 Check on the purchased product

Before using the printer make sure it has not been damaged during transport or storage. Check also that all the ordered optional elements and all the standard components are inside the packaging. In case of damage, inform the forwarding agent and the manufacturer or the dealer. While checking, pay attention to the correct connection of the nylon tube located between filament puller and extruder, because eventual schocks can compromise the functioning of the printer.

3.2 Conditions for the installation

The installation of the printer does not require special care and it must be carried out by specialized personnel only. Please read the following instructions carefully.

⚠ WARNING

Keep the printer away from heat, water or other fluids.
Do not install the printer without the suitable protections.

3.3 Installation area

The printer must be placed on a table (not supplied with the printer) which can bear its weight.

▌ Place the printer in an area with a good air circulation in order to avoid exhalations when using some experimental filaments.

▌ The printer has been designed to be placed on a table or on a desk.

▌ Observe the free spaces required and specified in this manual.

▌ The printer must be as much as possible protected from dust, noxious vapours and humidity.

▌ The printer surface is supplied with a heating system. For a perfect working result, the external temperature should be kept at around 20°C. Higher or lower temperatures could damage the quality of the printed elements.
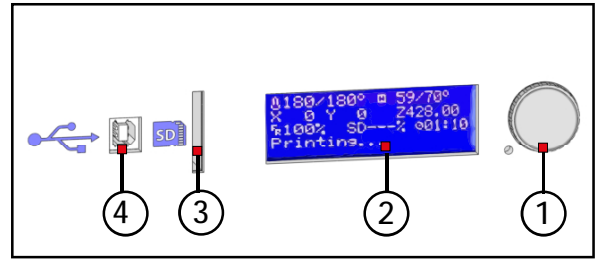
DELTA 2040/4070

4.0 Use

The printer is supplied with a small display and a menu navigation button, which are placed on the upper part of the printer.
With reference to picture 5, button "**1**" is available for menu navigation, display "**2**", SD card "**3**" and USB port of type B "**4**" are placed on the upper part as well.
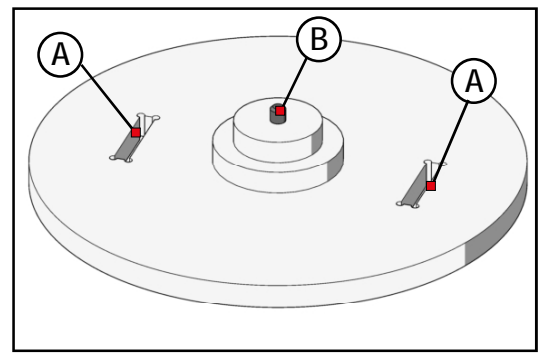

Picture 5

REEL HOLDER

According to the filament reel dimensions the reel can be placed inside the seat on the upper part of the printer or by means of the plexiglass brackets supplied with the printer, which must be inserted into proper seats "**A**" (see picture 6) on the filament holder circular plate.

Screw "**B**" placed on the filament holder circular plate allows the height adjustment (see picture 6).

Reel "**C**" can be placed inside the seat in printer upper part "**D**" (see picture 7).

Usually the seat allows loading standard reels with maximum height of 100mm and maximum diameter of 200mm.
For bigger reels, the external support can be used, as described on the following page.
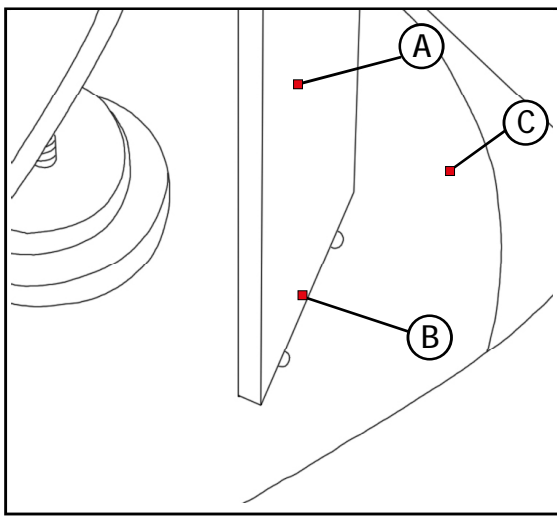

Picture 6

Picture 7

DELTA 2040/4070
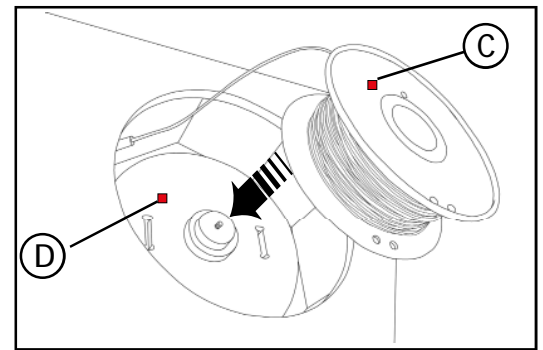
LARGE-SIZE REEL PLACEMENT

In order to place reels with diameter larger than 200mm or higher than 100mm, install the external support supplied with the machine.
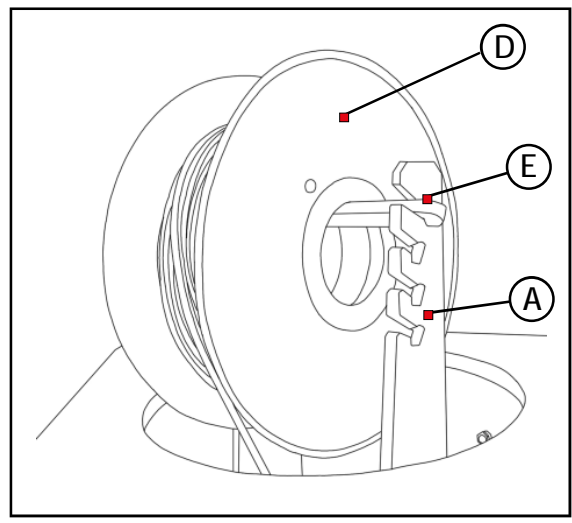Insert support brackets "**A**" into seats "**B**" on plate "**C**" (see picture 8).
Then insert reel "**D**" on crossbar "**E**" and place it in one of the seats on brackets "**A**" (see picture 9).
Bracket "**A**" is supplied with four seats which allow installing reels with diameter from 100 mm to 150 mm and with height from 20 to 100mm.
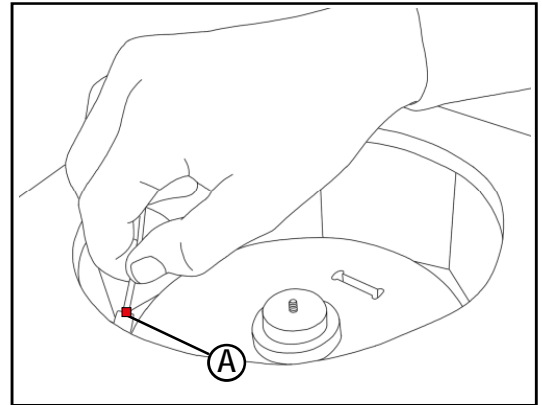
DELTA 2040/4070

Picture 8

Picture 9

FILAMENT LOADING

In the printer side with the seat for the filament reel, a small transparent teflon tube "**A**" is located. Insert the filament and push it until it goes out from the lower part. Then place the reel inside the seat (see picture 10).
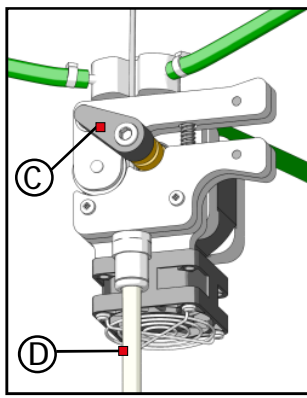

Picture 10

Open the printer front door and take thread "**A**", press levers "**B**" of the filament puller and slide the thread until it enters completely inside the dragging unit (see picture 11).
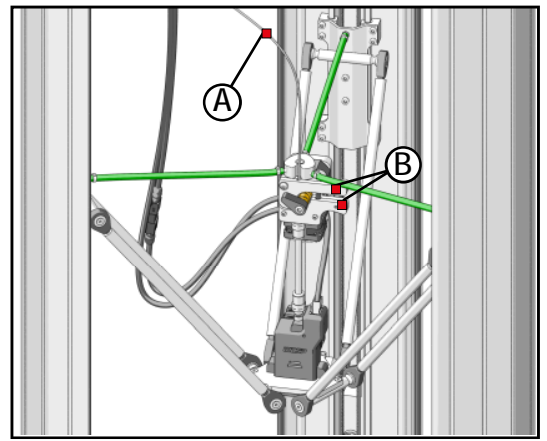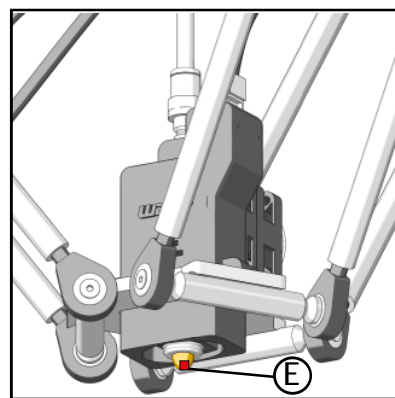

Picture 11

Turn knob "**C**" and slide the thread through transparent tube "**D**" until it reaches the extruder (see picture 12). Enable the heating, wait until the desired temperature is reached, turn knob "**C**" and check that the material goes out from nozzle "**E**" (see picture 13).

Picture 12

Picture 13

Note: do not touch the printing head after the use because it could be overheated.

DELTA 2040/4070

PRINT TEST

Printing objects is really easy and does not require any particular precautions. The settings described below can be followed also once and the maintenance can be checked after a considerable time.

Spray some lacquer provided with the printer on the glass surface. In case of deliveries abroad use the stick glue supplied with the printer.

⚠ WARNING

The lacquer must be sprayed on the glass surface, keeping it out of the printer to prevent damages to the extruder and to the handling axis.

Make sure that the SD card with gcode has been inserted in the printer. In the provided card, in the "gcode" folder there are some files which are ready to be printed.

From the LCD display select "menu_print from sd" and choose the desired file by pushing the button.

The zero of the bed may sometimes need to be adjusted so that the filament can stick correctly. Use external wheels "**A**" placed under the printer bed.

For model 4070 the zero of the bed is adjusted by screwing/unscrewing the three screws located near the extruder placement during calibration, by menas of a screwdriver which is not supplied.

At the end of the print collect the piece by means of a palette knife which is not supplied.
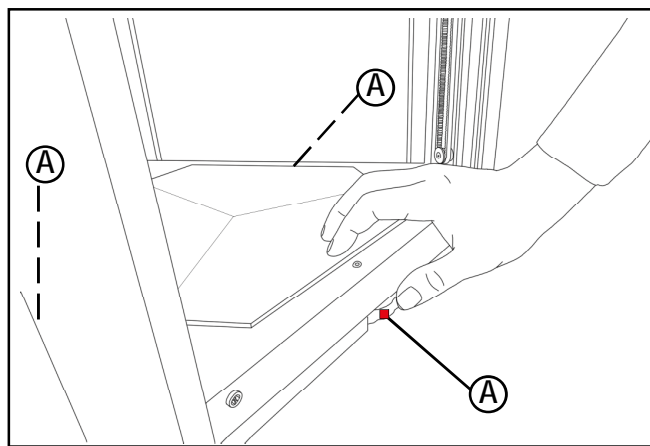
Picture 14

FILE SETTING
Bring the printer up to temperature.

Push the button next to the dispaly.

```
§180/180°  □ 59/70°
X   0 Y 0     Z428.00
ℝ100% SD---%   01:10
Printing...
```

In the menu which appears on the display select Prepare by turning the button and pushing it.

```
Display          ↰
>Prepare         ↝
Control          ↝
SD Card Menu     ↝
```

According to the filament type, select the correct pre-heating function (the ABS option is correct also for different filaments such as Nylon or Polystyrene).

```
Motors OFF
Auto Home
PLA Pre-heating
>ABS Pre-heating
```

DELTA 2040/4070

Before carrying out a print, make sure that the bed is on 0 level.
In order to put the bed on 0 level:

Push the button next to the display.

```
180/180°    59/70°
X   0 Y 0      Z428.00
100% SD--%    01:10
Printing...
```

In the menu which appears on the display select Prepare by turning the button and pushing it.

```
Display           ↑
>Prepare          ~
Control           ~
SD Card Menu      ~
```

Turn the button and select "Auto Home".

```
Motors OFF
>Auto Home
Move axis         ~
Move extruder     ~
```

After the selection of "Auto Home" turn the button and select "Manual leveling.".

```
Auto Home
Move axis         ~
Move extruder     ~
>Manual Leveling  ~
```

Level the bed on positions: 1, 2, 3, 0 by means of the external wheels placed under the bed.

```
Position->:       00
```

DELTA 2040/4070

5.0 Ordinary and preventive maintenance

A suitable maintenance is very important for a longer duration of the printer in very good working and efficiency conditions and it ensures safety from a functional point of view. The design and the materials used to manufacture WASP machines reduce maintenance interventions to a minimum.

5.1 Safety rules during maintenance

The main precautions to adopt in case of maintenance operations on the printer are the following:

+ Before carrying out any operations on the printer, make sure it is on safety conditions.
+ After the maintenance operation, remove all the tools and the rags used eliminate any material residue.
+ Pay attention not to damage the nozzle and the connection tubes.
+ Do not wear rings, watches, chains, bracelets, etc. during maintenance operations.
+ Do not use naked flames, pointed instruments or pins for cleaning operations.
+ Do not smoke.
+ Work on the printer ONLY AFTER the printing head is at room temperature.
+ No printer component needs greasing or lubrication.
+ The only printer element which requires maintenance after every printing process is the printing bed which can be cleaned with water and soap, paying attention not to damage/scratching the surface.

DELTA 2040/4070

Maintenance technical data sheets, troubleshooting and anything required
in order to carry out disassembling, maintenance and tool replacements
are available by the dealer.

5.2 Printer documentation and files

The company Wortwert provides the Customers with a dedicated server where they have easy access to the documentation about the 3D printer.

Dear Customer,

We inform you that you have a NAS server (Network Attached Storage) at your disposal, in which paper or video files of the maintenance procedures to be carried out on the machines/equipment are saved. **Wortwert** updates, implements and completes the maintenance operations saved in this internet file folder periodically. The files are at your disposal 24h/24. You can enter the files useful for the maintenance operations of the machines and the equipment you bought by following the short procedure below:

1 - From website **http://217.133.65.215:8080/** you can access the "**RESERVED AREA**" and then click the icon "**ENTER**".
2 - Enter Username: **guestwasp** and Password: **wasp** in the Home Page.
3 - Then click the icon to enter the folder where you will find all the files available for download.

It is also available the app for Android and iOS devices so that you can enter the files even by your own mobiles.

6.0 Putting out of service

If the printer is not to be used for a certain period, carry out the following operations:

+   Clean the printer by removing any residues or scraps.

+   Cover the equipment with a waterproof tarpaulin.

+   Keep the equipment in a dry place.

If, for any reason, the printer must be put out of service, follow some important rules to safeguard the environment.
Sheaths, flexible ducts, plastic or non-metal components will have to be disassembled and disposed of separately.

DELTA 2040/4070
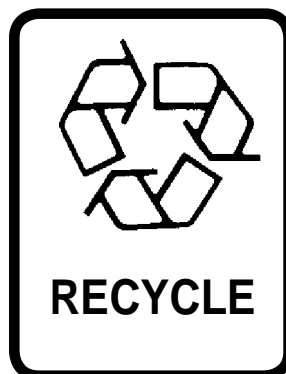
EC DECLARATION OF CONFORMITY FOR MACHINERY

CE

Manufacturer: **CSP SRL- Viale Zaganelli, 26 Massa Lombarda (RA) Italy**

Machine description and identification:
DeltaWASP 2040
DeltaWASP 4070

Modelling 3D printer for deposition of melted material.

Model   **D2040/D4070**
Serial number _____

The machine complies with all the relevant requirements:
with particolar reference to CEI EN 60335-1 Electromagnetic Compatibility Directive 2004/108/CE, Low Voltage Directive 2006/95/CE contained in the Directive 2006/42/CE

Massa Lombarda,_____   Legal Representative

                                    Legale Rappresentante