

## ARISTO ROBOT EXERCISES

### Exercise 1: Palletizing Pick and Place Operation

#### Aim:

The aim of the experiment is to teach the robot palletizing operation by picking the job from pallet1 and placing it in pallet2.

#### Materials Required:

- Robot Experiment Table.
- Pallet1 (horizontal row pallet).
- Pallet2 (5×3 column pallet).
- Aristo Robot.
- MRobot Software.

## Types of Robot:

Robots are classified as per coordinate system as follows

### **1. Cartesian or XYZ Co-ordinates (Three Linear Axes)**

Cartesian Robot which have three linear (P, as opposed to rotational R joints) axes of movement (X,Y,Z). Used for pick and place task and to move heavy loads. They can trace out rectangular volumes in 3D space

### **2. Cylindrical coordinates (Two Linear and one Rotary Axis)**

The position of these robots are controlled by a radius, a height and an angle (that is, two P joints and one R joint). These robots are commonly used in assembly tasks and can trace out concentric cylinders in 3D space.

### **3. Spherical coordinates**

Spherical robots have two rotational R axes and one translational P (radius) axis. The robots' end-effectors can trace out concentric spheres in 3D space.

### **4. Revolute and articulate coordinates**

The positions of articulated robots are controlled by three angles, via R joints. These robots assemble the robot arms (anthropomorphic). They are the most versatile robots, but also the most difficult to program.

## Coordinate System:

In the Aristo Robot Program, all the menus contain two types of co-ordinates System. They are,

### **1. World Co-ordinate system:**

Three co-ordinates x, y, z are arranged at right angles. The origin of these co-ordinates systems is situated at the center point of the BASE. Co-ordinate axes measured in mm.

### **2. Axial Co-ordinate system:**

There are 6 axes or joints which are helpful to determine position of the end-effector. Co-ordinate axes are measured in degrees.



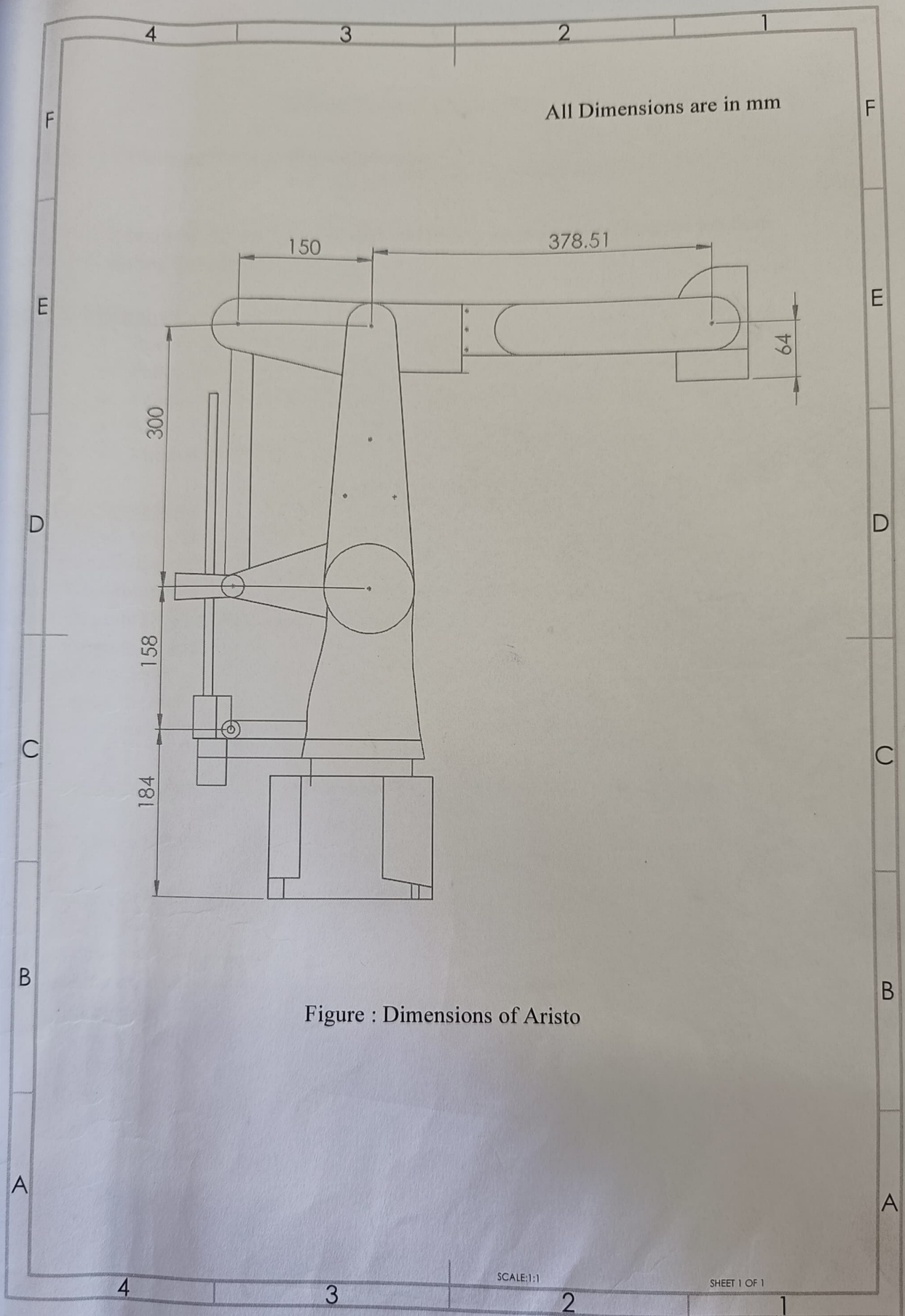
**Aristo Specification Details:**

Number of Axes/Height			6/522mm
Joint Actuator			Servo Motor(With Encoders)
Transmission			Belt drives, Ball Screws, Elbow & Gear drive
Joints			Ball Bearings
Gripper			Angular Jaws Type(Detachable)
Gripper Actuator			Pneumatic
Axis	Waist	J1	340 degrees
	Shoulder	J2	45 degrees
	Elbow	J3	45 degrees(dependent on shoulder)
	Wrist	J4	340 degrees
	Pitch	J5	180 degrees
	Roll	J6	340 degrees
Control Software			Specially Developed Robot Programming Language
Path Type			Point-to-Point, Continuous Path, Linear & Circular
Communication			Ethernet
Power Supply			230V/110V, 50/60 Hz and 5A
Pay Load (Including Gripper)			3kg
Repeatability			+0.3mm
Horizontal Reach			654mm
Tip Speed			0.2m/sec
Position Feedback			Optical Encoder(HP 2phase 500 PPR)
Operation Temperature			18°C to 40°C
Mounting Method			Floor
Controller			PC Based Ethernet Port
Applications			Pick & Place Applications Palletizing Kit, Stacking, Assembly, Testing switch Banks
Weight	Body		35kg
	Control Box		35kg

**Controller:**

MTAB 8860 Controller is a multi-purpose and programmable 6 axis motion controller (PMC-program motion control) with PLC function. It supports offline operating mode, online real time operating mode and console operating mode, and is widely used in various automation control equipment.





### **Operating Procedure:**

Step 1: Switch ON the control box.

Step 2: Release the emergency button.

Step 3: Open the MRobot software login "User Name" and "Password"

Step 4: Program the robot to pick and place the job.

#### **Program syntax:**

Set Speed 50

Home the robot

Command: Gripper Open

.....

Teach the robot to pick the job in pallet1

.....

Command: Gripper close

.....

Teach the robot to place the job in pallet2

.....

Command: Gripper open

***To repeat the experiment more than 10times, use the IF command,***

**Result:**

The *Aristo* robot successfully completes the palletizing experiment.

## PICK & PLACE OPERATION WITH ARISTO XT 6 AXIS ARISTO ROBOT

```
SPEED 80
HOME_ALL
LET A = 0
LABEL A
LABEL B
GRIPPER OPEN
JOINT A1= 50.95 A2= -89.7 A3= 91.18 A4= 2.55 A5= 77.71 A6= 0.01
JOINT A1= 48.27 A2= -54.3 A3= 58.83 A4= 2.55 A5= 77.71 A6= 0.02
JOINT A1= 48.27 A2= -46.71 A3= 54.06 A4= 2.55 A5= 76.58 A6= 0.01
GRIPPER CLOSE
JOINT A1= 48.27 A2= -48 A3= 50.71 A4= 2.55 A5= 76.58 A6= 0.01
JOINT A1= 48.27 A2= -69.6 A3= 70.56 A4= 2.55 A5= 63.56 A6= 0.01
JOINT A1= -110.08 A2= -69.6 A3= 70.56 A4= 2.55 A5= 63.57 A6= 0.01
JOINT A1= -110.08 A2= -78.37 A3= 91.92 A4= 2.55 A5= 63.57 A6= 0.02
JOINT A1= -107.58 A2= -78.74 A3= 93.31 A4= 2.55 A5= 63.57 A6= 0.02
GRIPPER OPEN
JOINT A1= -107.58 A2= -89.68 A3= 90.18 A4= 2.55 A5= 63.57 A6= 0.02
IF A < 4 JUMP B
ADD A = A + 1
JUMP B
```

Submitted by:-  Regd. No. - Group – Section – Semester – 2 <sup>nd</sup>	Department of computer science and engg. VSSUT, Burla. Lab – robotics lab Dt.:- 20/03/24
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MROBOT (ARISTOROBOT) - MTAB Engineers Pvt. Ltd.

FileEditViewHelp

ONLINE

Guide

Set Axis 1 to -90 Degree for Cartesian Movement

STOP

SIMULATION

JOG CO-ORDINATES

A1 : 0 [(90) - (-250)]  
A2 : 0 [(-90) - (-45)]  
A3 : 0 [(45) - (115)]  
A4 : 0 [(0) - (340)]  
A5 : 0 [(90) - (-90)]  
A6 : 0 [(0) - (340)]

CARTESIAN CO-ORDINATES

X : 0  
Y : 0  
Z : 0  
W : 0  
P : 0  
R : 0

Execution - (NewProgram 1(DEE... ErrorList HARDWARE

1 SPEED 80  
2 HOME ALL  
3 LET A = 0  
4 LABEL A  
5 LABEL B  
6 GRIPPER OPEN  
7 JOINT A1= 50.95 A2= -89.7 A3= 91.18 A4= 2.55 A5= 77.71 A6= 0.01  
8 JOINT A1= 48.27 A2= -54.3 A3= 58.83 A4= 2.55 A5= 77.71 A6= 0.02  
9 JOINT A1= 48.27 A2= -46.71 A3= 54.06 A4= 2.55 A5= 76.58 A6= 0.01  
10 GRIPPER CLOSE  
11 JOINT A1= 48.27 A2= -48 A3= 50.71 A4= 2.55 A5= 76.58 A6= 0.01  
12 JOINT A1= 48.27 A2= -69.6 A3= 70.56 A4= 2.55 A5= 63.56 A6= 0.01  
13 JOINT A1= -110.08 A2= -69.6 A3= 70.56 A4= 2.55 A5= 63.57 A6= 0.01  
14 JOINT A1= -110.08 A2= -78.37 A3= 91.92 A4= 2.55 A5= 63.57 A6= 0.02  
15 JOINT A1= -107.58 A2= -78.74 A3= 93.31 A4= 2.55 A5= 63.57 A6= 0.02  
16 GRIPPER OPEN  
17 JOINT A1= -107.58 A2= -89.68 A3= 90.18 A4= 2.55 A5= 63.57 A6= 0.02  
18 IF A < 4 JUMP B  
19 ADD A = A + 1  
20 JUMP B  
21

Cycles :  
Line :

CONTROL PANEL

JOG

AXIS CONTROL

AX1 + AX2 + AX3 + AX4 + AX5 + AX6 +  
AX1 - AX2 - AX3 - AX4 - AX5 - AX6 -

GRIPPER: OPEN CLOSE MOVE TO POS

CARTESIAN CONTROL

X + Y + Z + W + P + R +  
X - Y - Z - W - P - R -

INCREMENT  
10 MM

Speed  
70 %

COORDINATES

AXIAL COORDINATES

AX1	90.00	AX2	-90.00	AX3	90.00
AX4	00.00	AX5	90.00	AX6	00.00

CARTESIAN COORDINATES

X	00.00	Y	379.00	Z	394.00
W	-90.00	P	00.00	R	180.00

TEACH

Command : JOINT Enter

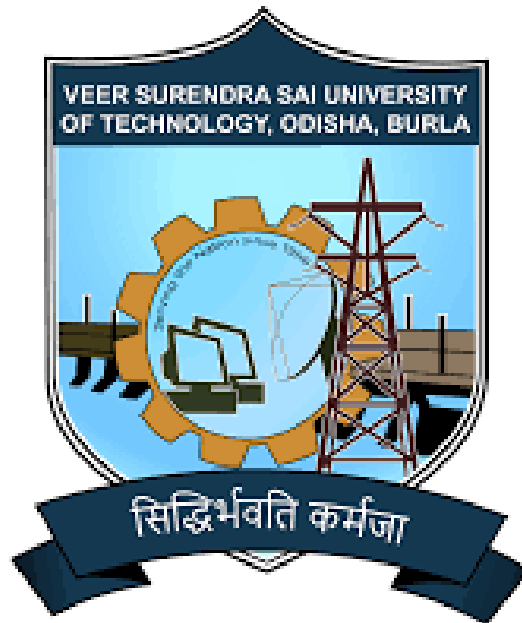
HOME

ALL AX1 AX2 AX3 AX4 AX5 AX6

ADMIN Ready - - EMERGENCY STOP Sensor Status : 2 3 4 3 7 0 NUM OVR



**LAB MANUAL  
OF  
WORKSHOP ON DIGITAL MANUFACTURING  
(HP JET FUSION 540 3D PRINTER)**



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**DEPARTMENT OF PRODUCTION ENGINEERING  
VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, ODISHA,  
BURLA**

# General Safety

## Introduction:

- Before using the printer, read the following safety precautions and operating instructions to make sure you can use it safely.
- You are expected to have the appropriate technical training and experience necessary to be aware of hazards to which you may be exposed in performing a task, and to take appropriate measures to minimize the risks to yourself and to others.
- Perform the recommended maintenance and cleaning tasks to ensure the correct and safe operation of the printer.
- The printer is stationary, and should be located in a restricted-access area, for authorized personnel only.

## General safety guidelines:

### Explosion hazard

- Smoking, candles, welding, and open flames should be forbidden close to the printer or material storage area.
- Inside and outside the printer should be cleaned regularly with an explosion-protected vacuum cleaner to avoid dust accumulation. Do not sweep the dust or try to remove it with a compressed-air gun.
- An explosion-protected vacuum cleaner certified for collection of combustible dust is required for cleaning. Take measures to mitigate material spillage and avoid potential ignition sources such as ESD (Electro Static Discharges), flames, and sparks. Do not smoke nearby.
- Check the air filters and the sealing of the heating lamps regularly.
- Use HP-certified and HP-branded material and agents only. Do not use unauthorized third-party material or third-party agents.

### Electrical shock hazard

- Do not attempt to dismantle the internal circuit enclosures, heating or fusing lamps, or e-cabinet except during hardware maintenance tasks. In that case, follow the instructions strictly.
- Do not remove or open any other closed system covers or plugs.
- Do not insert objects through slots in the printer.

### Heat hazard

- Take special care when accessing the printing area. Let the printer cool down before you open the covers.
- Take special care with zones marked with warning labels.
- Wait for at least the minimum cooling time before retrieving parts from the printer. HP recommends wearing safety gloves to retrieve parts after printing, as the parts may be hot.
- Remember to let the printer cool down before performing some maintenance operations.

### Fire hazard

- Connect the power cord to a dedicated line, protected by a branch circuit breaker according to the information detailed in the site preparation guide.
- Do not use aerosol products that contain flammable gases inside or around the printer. Do not operate the printer in an explosive atmosphere.
- Do not attempt to modify the heating, fusing, build chamber, e-cabinet, or enclosures.
- Proper maintenance and genuine HP consumables are required to ensure that the printer operates safely as designed. The use of non-HP consumables may present a risk of fire.
- Do not leave tools or other materials inside the printer after maintenance or servicing.
- Do not place objects covering top cover, enclosures, or air ventilation.

**Mechanical hazard**

- Keep your clothing and all parts of your body away from moving parts.
- Avoid wearing necklaces, bracelets, and other hanging objects.
- If your hair is long, try to secure it so that it will not fall into the printer.
- Take care that sleeves or gloves do not get caught in moving parts.
- Avoid standing close to the fans, which could cause injury and could also affect print quality (by obstructing the air flow).
- Do not operate the printer with covers bypassed.

**Light radiation hazard**

- Infrared (IR) radiation is emitted from the heating and fusing lamps. The enclosures limit radiation in compliance with the requirements of the exempt group of IEC 62471:2006, *Photo biological safety of lamps and lamp systems*. Do not modify the top cover enclosure, nor the glasses or windows.

**Chemical hazard**

- See the Safety Data Sheets available to identify the chemical ingredients of your consumables (material and agents). Sufficient ventilation needs to be provided to ensure that potential airborne exposure to these substances is adequately controlled. Consult your usual air conditioning or EHS specialist for advice on the appropriate measures for your location.
- Use HP-certified material and agents only. Do not use unauthorized third-party material or third-party agents.

**Ventilation**

- Fresh air ventilation is needed to maintain comfort levels. For a more prescriptive approach to adequate ventilation, you could refer to the latest edition of the ANSI/ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) document *Ventilation for Acceptable Indoor Air Quality*.
- Adequate ventilation needs to be provided to ensure that potential airborne exposure to materials and agents is adequately controlled according to their Safety Data Sheets.
- Ventilation should meet local environmental, health, and safety (EHS) guidelines and regulations.

**Air conditioning**

- As with all printer installations, to maintain ambient comfort levels, air conditioning in the work area should take into account that the printer produces heat. Typically, the printer's power dissipation is in the range of 4–6 kW (13.6–20.5 k BTU/h).
- Air conditioning should meet local environmental, health, and safety (EHS) guidelines and regulations.

**Sound pressure level**

- The HP VCVRA-1804 maximum A-weighted sound pressure level over bystander positions while printing is 80 dB (A). Hearing protection may be required as per local laws; consult your EHS specialist.



Printer transport hazard

- Special care must be taken to avoid personal injury when moving the printer.
- Move the printer over smooth, flat surfaces without steps.
- Move with care and avoid shocks during transport, which could spill the material.
- Lock the front casters when not moving the printer. Remember to unlock them before moving it.
- If you move the printer between different rooms, bear in mind that it should be kept in constant environmental conditions, and recalibrated when it reaches its new location: recalibrate the load cells, check the spacing between the spreader roller and the preheat plate, and check print head alignment, realigning if necessary.


3D part retrieval

- Wear heat-resistant gloves when retrieving 3D printed parts manually. Safety gloves are also recommended when retrieving 3D printed parts after auto-extraction, as the parts may still be hot.

Personal protective equipment

- A pair of heat-resistant gloves per person.
- Conductive or electrostatic-dissipative footwear and clothing.
- Mask or goggles if the environment is dusty.
- Hearing protection if necessary.
- Chemical protection gloves to clean possible condensates.

Warning labels

Label	Explanation
 <p><b>ELECTRIC SHOCK HAZARD</b> Heating modules operate at hazardous voltages. Disconnect all power sources before servicing. Caution! Double pole. Neutral fusing.</p> <p><b>WARNING</b> High leakage current. Earth connection essential before connecting supply. Before connecting Power Supply cord to the unit, refer to the Installation Instructions to determine proper input voltage configuration.</p> <p>Before starting, read and follow the operating and safety instructions. Avant de commencer, lisez et suivez les instructions de fonctionnement et de sécurité. Lesen und befolgen Sie bitte die Bedienungs- und Sicherheitsanweisungen, bevor Sie starten. Antes de empezar, lea y siga las instrucciones sobre funcionamiento y seguridad. 开始之前，请阅读并遵循以下操作和安全说明。 在开始之前，請先閱讀並依照操作與安全指引進行。</p>	<p><b>Electric shock hazard</b></p> <p>Heating modules operate at hazardous voltage. Disconnect power source before servicing.</p> <p><b>CAUTION:</b> Refer servicing to qualified service personnel.</p> <p>In case of operation of the fuse, parts of the printer that remain energized may represent a hazard during servicing. Before servicing, turn off the printer using the Branch Circuit Breakers located in the building's Power Distribution Unit (PDU).</p> <p><b>WARNING!</b> High leakage current. Current leakage may exceed 3.5 mA. Earth connection essential before connecting supply. Equipment to be connected to earthed mains only.</p> <p>See installation instructions before connecting to the supply. Ensure that the input voltage is within the printer's rated voltage range.</p> <p><b>Before starting</b></p> <p>Read and follow the operating and safety instructions before starting the printer.</p>

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## EXERCISE

### Objective:

To study the Basic Features of HP Jet Fusion 540 3D Printer.

To make a sample product using 3D printer practically.

### Apparatus/Equipments/Material Required:

- PC supported Windows 10 64 bit installed with 3D Build Manager Software
- HP Jet Fusion 540 3D Printer Machine
- Sand Blasting Machine
- Abrasive Powder for Sand Blasting Machine
- 3D Printing Materials (HP PA 12 )
- Vacuum Cleaner Machine
- Personal Protective Equipment's for Operator.
- LAN Connectivity requirement and remote monitoring (IPv4 or IPv6).

### Theory:

#### 3D Printer Machine

A 3D printer is a type of material design printer that designs and builds 3D models and products of devices and components using an additive manufacturing process. 3D printers design three-dimensional prototypes and create the end product by directly building them using computer aided design (CAD) or software-created 3D design diagrams, figures and patterns.

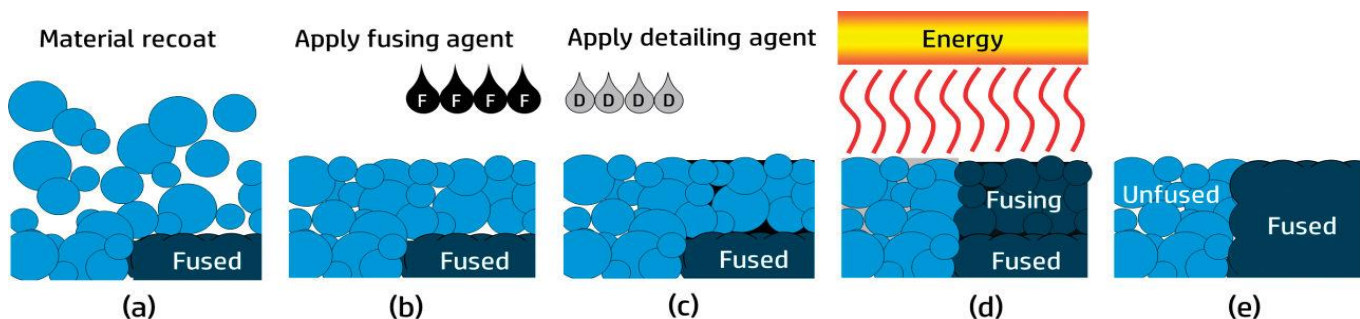
3D printers may also be called additive manufacturing printers or fabrication printers.

#### HP Jet Fusion 540 3D Printer Technology

Multi Jet Fusion is an additive manufacturing method invented and developed by the company Hewlett-Packard (HP). It creates parts additively thanks to a multi-agent printing process. Your plastic part will be created layer by layer, according to your 3D model.

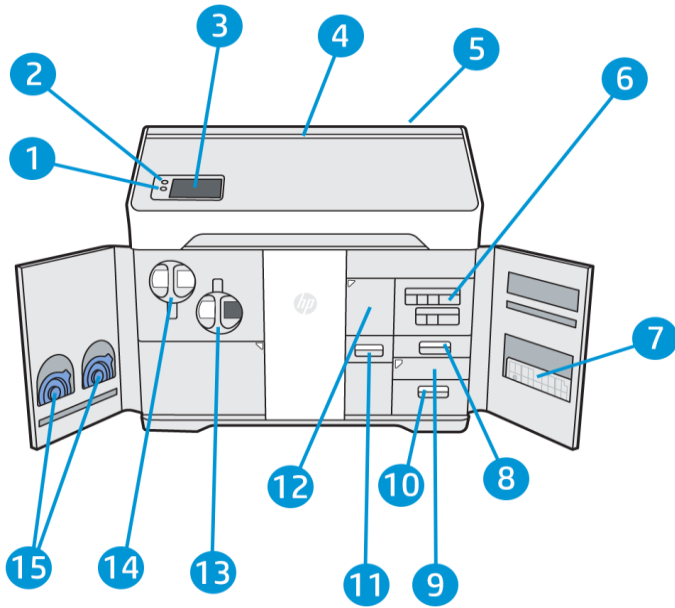
HP Additive created MJF in 2016 by using its proficiency in inkjet printing technology and precise mechanics. HP created a system that manufactured components layer by layer in a large bed of powder material at their global AM center in Barcelona


HP Multi Jet Fusion technology offers control over part and material properties and speed advantages beyond those found in other 3D printing technologies. The HP MJF printing process begins by depositing a thin layer of material in the printer's work area. Next, the carriage containing an HP Thermal Inkjet array passes over the full work area, printing chemical fusing and detailing agents. During another pass of the carriage, the work area is exposed to fusing energy, which bonds part layers together. The process continues, layer-by-layer, until a complete part is formed.



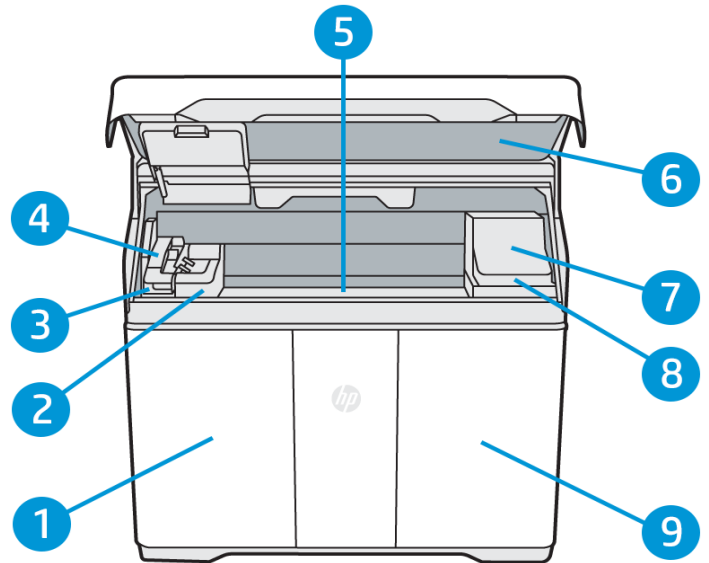
**Main components**

1. Rearm button
2. Emergency stop button
3. Front panel
4. Status beacon (500 series only)
5. Air intake filter (backside)
6. Agent cartridges
7. Alignment plate
8. Distilled water tank (B3)
9. Scanner (B4)
10. Air exhaust compartment and filter (B5)
11. Material reclamation sieve (B2)
12. Material reclamation filter (B1), and access to the Reclamation intermediate tank.
13. Reusable material cartridge
14. Fresh material cartridge
15. Cartridge caps



The power button  is beside the front panel, just below the rearm button.

1. Material door
2. Fusing lamp
3. Recoating roller and cover
4. Fusing carriage (C1)
5. Build platform and build chamber
6. Top cover and viewing window (500 series only)
7. Print carriage (C2)
8. Print head cleaning roll (under the print carriage)
9. Agent door





## Machine Specifications:

### Technical information

#### HP Jet Fusion 540 3D Printer

Printer performance	Technology	HP Multi Jet Fusion technology
	Effective building volume	Up to 332 x 190 x 248 mm (13.1 x 7.5 x 9.8 inches)
	Building speed <sup>2</sup>	1,817 cm <sup>3</sup> /hr (111 in <sup>3</sup> /hr)
	Full build job time for 248-mm (9.8-in) buildable height	As fast as 14 hours: Fast Cool and Reclaim profile <sup>3</sup> As fast as 20 hours: Auto Cool and Reclaim profile <sup>4</sup>
	Layer thickness	0.08 mm (0.003 inches)
	Printhead resolution	1200 dpi
Dimensions (w x d x h)	Printer	1565 x 955 x 1505 mm (61.6 x 37.6 x 59.3 inches)
	Shipping	1770 x 1143 x 2013 mm (69.7 x 45 x 79.3 inches)
	Operating area	2785 x 2530 x 2440 mm (109.6 x 99.3 x 96 inches)
Weight	Printing	650 kg (1433 lb)
	Shipping	850 kg (1874 lb)
Environmental ranges	Operating temperature	20-30° C (68-86° F)
	Operating humidity	20-70% RH without condensation
Acoustics <sup>5</sup>	Front operating position	72 dB (without muffler) / 70 dB (with muffler)
	Rear bystander position	80 dB (without muffler) / 75 dB (with muffler)
Network <sup>6</sup>	Gigabit Ethernet (10/100/1000Base-T), supporting the following standards: TCP/IP, DHCP (IPv4 only), TLS/SSL	
Hard disk	HDD 1TB (AES-256 encrypted, disk wipe DoD 5520M) & SSD 1TB (AES-256 encrypted)	
Software	Included software	HP SmartStream 3D Build Manager HP SmartStream 3D Command Center
	Supported file formats	3MF, STL, OBJ, VRML v.2
Power	Consumption	6300W
	Requirements	One dedicated circuit configuration: input voltage 221 - 240 V, 32 A or 200 - 220 V, 36 A, 50/60 Hz
Certification & Statement	Safety	NA (US & Canada): IEC 61010-1 compliant, NRTL certified; EU: Machinery Directive, EN 61010-1, EN 60204-1, EN ISO 12100 and EN ISO 13849-1 compliant
	Electromagnetic compatibility	EN 55032:2012 Class A; CISPR 32:2015 Class A; FCC CFR 47 Part 15 Class A; ICES-003, Issue 6 Class A; EN 61000-3-12:2011; IEC 61000-3-12:2011; EN 61000-3-11:2017; IEC 61000-3-11:2017; EN 55024:2010; CISPR 24:2010
	Environmental statement	REACH compliant
Warranty & service coverage included	One-year limited hardware warranty	

### Ordering information

Printer	M2K86A	HP Jet Fusion 540 3D Printer
Printer accessories	5RD52A	HP Jet Fusion Muffler
Recommended post-processing solution	Guysen MultiBlast3D	HP recommended bead and air blast solution <sup>10</sup> (Recommended for EMEA and AMS regions)
Recommended printer cleaning accessories	Delfin 300 BL	HP recommended explosion-proof vacuum. <sup>10</sup> (Recommended for EMEA region)
	Tiger-Vac C-10 EX (4W) HP2	HP recommended explosion-proof vacuum. <sup>10</sup> (Recommended for AMS region)
Original HP printheads	V1Q67A	HP 3D400 Printhead Kit
Original HP agents	V1Q80A	HP 3D400 500-ml Detailing Agent
	V1Q71A	HP 3D400 500-ml Fusing Agent
	V1Q81A	HP 3D400 250-ml Bright Fusing Agent
Original HP 3D high reusability materials	V1R30A	HP 3D HR CB PA 12 10L (4 kg) <sup>11</sup>
HP Jet Fusion 3D Solution Services	U9ZR4E	HP Ready-to-print Service for HP Jet Fusion 500/300 Series 3D Printers
	U9ZN9E	HP Advanced Operation Training Service for HP Jet Fusion 500/300 Series 3D Printers (HP Training Center)
	U9ZQ7E	HP 3 Year 2 <sup>nd</sup> Business Day Onsite HW Support with DMR* Foundation Care for HP Jet Fusion 540 3D Printer
*Defective Media Retention		
HP 3D long-term consumables	8WA27A	HP Jet Fusion 500/300 Series 3D Printer Air Inlet Filter
	8WA28A	HP Jet Fusion 500/300 Series 3D Printer Print Area Filter
	8WA29A	HP Jet Fusion 500/300 Series 3D Printer Air Exhaust Filter
	8WA30A	HP Jet Fusion 500/300 Series 3D Printhead Cleaning Roll
	8WA31A	HP Jet Fusion 500/300 Series 3D Printer Lamp Module



reddot award 2018  
winner

HP Jet Fusion 500 Series 3D Printers were awarded the "Seal of Design Quality" at the 2018 Red Dot Awards, an honor that is only awarded to products that display outstanding design quality and innovation.

### Advantages of HP Jet Fusion 540 3D Printer:

- **Fast printing:** MJF prints an entire layer at once, saving time and money.
- **Reusability:** The Process offers reusability, which can offset the cost of materials.
- **Complex parts:** MJF can build highly complex parts.

### Disadvantages of HP Jet Fusion 540 3D Printer:

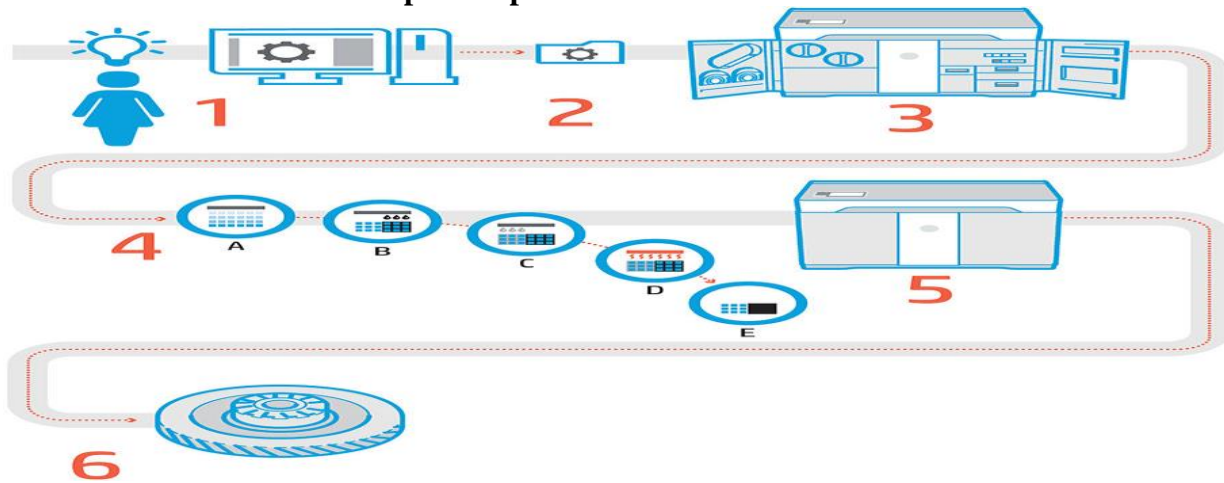
- **Initial investment:** MJF Printers can be expensive, and materials can also be expensive depending on the properties required.
- **Surface Quality:** MJF Produces fair surface quality, but parts have rough surface.
- **Dyes:** Raw parts are grey, but can be easily dyed black.

### Limitation:

MJF uses an inkjet array to apply fusing and detailing agents across a bed of nylon powder. The powder is then fused by heating elements into a solid layer.

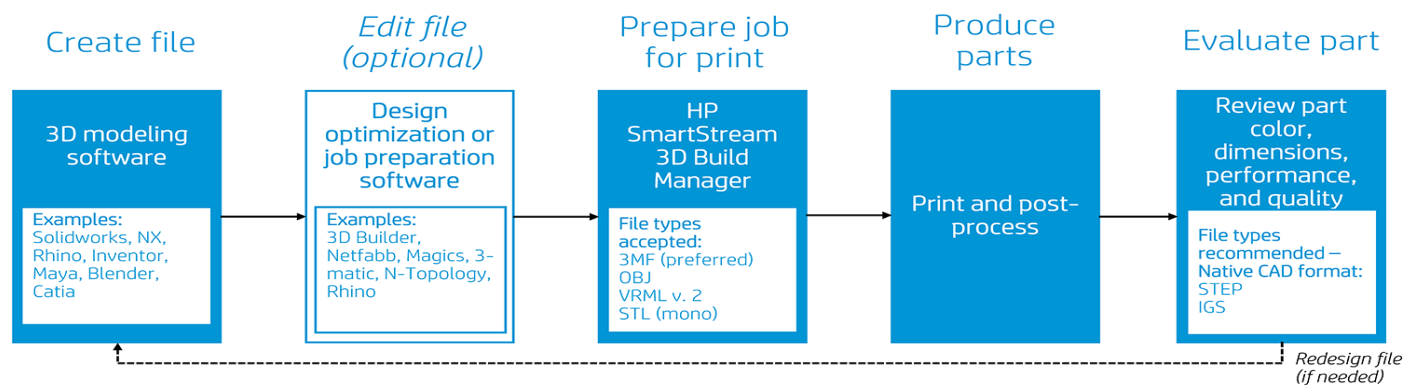
- **Dimensionally accuracy** :  $\pm 0.3\%$  with a lower limit of  $\pm 0.2$  mm
- **Minimum wall thickness** : 0.6 mm
- **Minimum detail**: 0.25 mm
- **Part Volume** :  $190 \times 332 \times 248$  mm
- **Accuracy** : 80 microns
- **Detection Limit**: 2.5 ppm

#### Procedure for creation of 3D printer products:



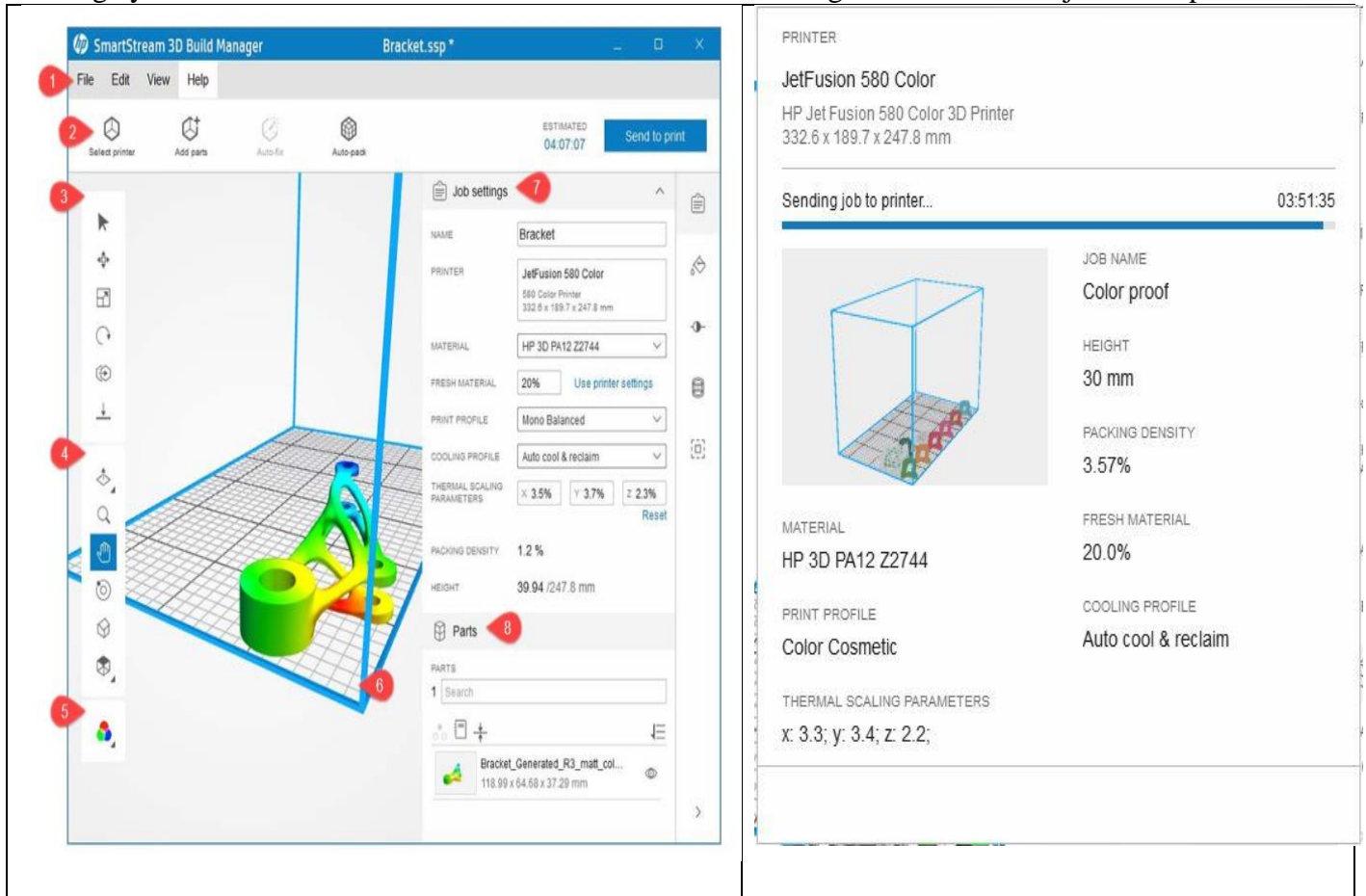
#### I) *Prepare design:*

In the end-to-end workflow of the printing process, the files pass through different software applications. For example, the first design may be done in a CAD program, while the job preparation will be handled in HP Smart Stream 3D Build Manager. If required, the printed part can be scanned in 3D and compared with the original design.



## II) Pack models and send to printer:

Arrange your 3D models in the HP Smart Stream 3D Build Manager and submit the job to the printer.



1. **Menu bar:** Provides file management tools, editing tools and preferences, viewing controls, and learning content.
2. **Action bar:** Provides common tasks for preparing jobs to print and estimating printing times.
3. **Transform toolbar:** Provides tools for manipulating parts in the build volume.
4. **Viewing toolbar:** Provides tools for manipulating the view and navigating within the viewport.

5. **Color view mode:** Offers a choice between geometry view, color view, and print view.
6. **Viewport:** The work area that includes the build volume. The build volume, typically indicated by blue boundary lines, is the printable volume.
7. **Content panel:** Contains five tabs along the right-hand side the provide access to groups of related tools.
8. **Parts panel:** Provides a list of all the items in the job, including actions to manipulate the list and interact with the parts and cages.

The application uses the following file formats:

- 3MF, OBJ, STL, and WML (VRML): These file formats can be added into the viewport with color and textures shown as authored.
- SSP: This file format is used to save a job.



**Job settings**

- NAME:** Untitled
- PRINTER:** JetFusion 580 Color  
580 Color Printer  
332.6 x 189.7 x 247.8 mm
- MATERIAL:** HP 3D PA12 Z2744
- FRESH MATERIAL:** 20% [Use printer settings](#)
- PRINT PROFILE:** Mono Balanced
- COOLING PROFILE:** Auto cool & reclaim
- THERMAL SCALING PARAMETERS:** X 3.5% Y 3.7% Z 2.3% [Reset](#)
- PACKING DENSITY:** 0 %
- HEIGHT:** 0 / 247.8 mm

1. **JOB NAME:** The name of the job.
2. **PRINTER:** Identifies the selected printer.
3. **MATERIAL:** Some printers enable you to select a material.
4. **FRESH MATERIAL:** Some printers used recycled material. This setting enables you to select the amount of new material to be used.
5. **PRINT PROFILE:** Identifies the selected group of print settings.
6. **COOLING PROFILE:** Select a preset to determine how long the printer should wait to cool the parts.
7. **THERMAL SCALING PARAMETERS:** Compensation factor for distortion based on the print volume. The correct setting depends on the material. Change here if results are not as expected. Parts are scaled to accommodate the distortion.
8. **PACKING DENSITY:** The occupied proportion of the build volume up to the height of the highest positioned part.
9. **HEIGHT:** The height of all parts in the job. The maximum build volume height is also indicated. The build height updates as parts are added, moved, and removed.

### Create a part report

**Optional:** Once the job has been sent to the printer, click View job report to see the PDF summary of the parts included in the print job. You can create a part report in any of these ways:

- Right-click a part or selection and click Part report.
- In the parts panel, click.
- In a part's error dialog box, click Part report.

### HP 3D print job-PartReport-2017-03-08 08-56-46

Error-affected parts (4)

Tablet Support Waffle - TABLET-SUPPORT-WAFFLE  
2016-04-25-1

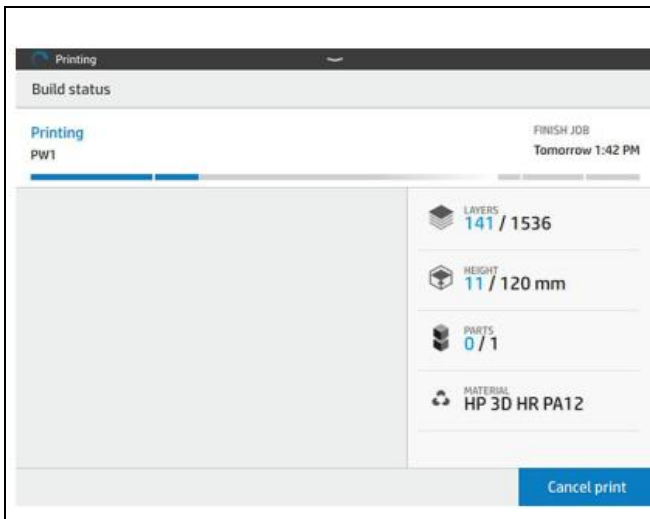
173 x 198.2 x 164 mm  
414102 mm<sup>3</sup>  
ERROR TYPE  
• Mesh not closed.

Tablet Support Waffle - Wheel

78 x 78 x 13.15 mm  
54144 mm<sup>3</sup>  
ERROR TYPE  
• Mesh not closed.

### II) Prepare printer:

Clean your printer, check your long-term consumables, and automatically check mechanical systems.



Before printing, the printer performs some checks to ensure that it is ready to print the whole build. Printer clean

- 1) Printer clean
- 2) Job compatible with device
- 3) Print head ready
- 4) Cloud connected
- 5) Enough agent and materials
- 6) Enough water in the distilled water tank
- 7) Print head cleaning roll ready
- 8) Filters ready and Lamp clean
- 9) Lamp clean

If the printer finds any problem, it may ask you to contact your support representative for assistance.

#### ***IV) Printing with voxel-level control:***

Just tap Start to start building parts with extreme dimensional accuracy and fine detail, thanks to HP's unique multi-agent printing process.

The minimum printable features in planes X, Y, and Z are as follows :

Minimum hole diameter at 1 mm thickness	0.5 mm
Minimum shaft diameter at 10 mm height	0.5 mm
Minimum printable font size for embossed or debossed letters or numbers	6 pt
Minimum Clearance at 1 mm thickness	0.5 mm
Minimum slit between walls	0.5 mm

#### ***V) Automated material management:***

After printing is finished, the printer automatically extracts and reclaims unfused material for future builds. You can use up to 80% reusable material in builds while maintaining consistent performance.\*

#### ***VI) Retrieve and clean parts:***

The beacon and front panel indicate when parts are ready for retrieval. Retrieve your parts from the build chamber and remove excess material with a bead and air blast system.

Bead blasting consists of applying compressed air mixed with an abrasive material to the part in order to remove the attached material.

**Note:** HP recommends blasting parts with glass beads of diameter 210–297  $\mu\text{m}$  (50–70 mesh).

#### **Application of 3D Printer:**

Automotive, Medical, Engineering, Customizing Parts, Less Transport, Freedom for design, Replica model.

#### **Conclusion:**

From this exercise we are able to know about the basic features, operating procedure and required product is created using HP MJF 540 3D Printer.

**Submitted by:**

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