goengineer

User Guide

stratasys

H350 3D Printer

A SAF Selective Absorption Fusion Powered Product

DOC-01005 Rev. C

Information

Before commissioning the machine, all information in this instruction handbook is to be carefully read and understood.

Make sure that the instructions below are read and understood, kept up to date according to the machine and that the instructions are always followed when working on or servicing the machine.

Attention

This instruction handbook contains instructions for installing, starting up, operating and maintaining the machine.

The instructions are made available by the manufacturer to provide information and to show the tasks that must be performed.

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Revision Log

Translations of this guide are updated periodically. If you are consuming a translated version, please check the English version for latest revision and list of updates.

Revision	Release Date	Description of Changes
A	DEC 2021	Initial Release (software version v0.92.6 and below)
B	MAY 2022	Updated vacuum cleaner reference. Added information for GrabCAD Print client. Clarified information for GrabCAD Print server.
C	OCT 2022	Updated powder-related information. Updated kit information. Updated various screens. Extensively changed post-build maintenance section to reflect changes to cleaning wizard. Updated roller cleaning procedure. (software version 1.0.5 and above)

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1 SERVICE AND SUPPORT

This chapter provides information on service and support for the H350™ SAF™ Selective Absorption Fusion™ Powered 3D printer as well as safety information and safety label locations.

Intended Use

Intended use for this printer is 3D printing. The H350 SAF Selective Absorption Fusion Powered 3D Printer uses two materials to create parts: High Yield Stratasys PA11 powder and High Absorption Fluid.

Reasonably Misuse

Any actions not complying with the directions contained within this guide will be considered a way to reasonably misuse the H350 SAF Selective Absorption Fusion Powered 3D Printer.

Objective

The objective fulfilled by this user guide is to ensure the correct use of the printer, including operation, handling, cleaning, maintenance, dismantling and scrapping.

The user guide is an integral part of the printer, providing the user the required information needed for correct and safe use.

If changes are made to the printer, the user guide and the risk assessment must be reviewed and corrected, if necessary.

Reading Instructions

The user guide has been prepared in accordance with the Machinery Directive 2006/42/EC and EN ISO 20607 – Safety of machinery – Instruction handbook – General drafting principles and is the manufacturer’s original user guide for the printer.

The user guide provides the user with the information necessary for the safe and efficient use of the printer during the life cycle of the printer. General safety instructions and conditions are described in a single chapter.

The instructions are for all users of the printer, where content is subdivided according to the user's function and use of the printer. Safety-related information and instructions appear at specific printer related tasks or as general information for all users.

Knowledge

It is the responsibility of the employer (the printer owner) to ensure that all users who are to operate, maintain, or disassemble the printer, have read the user guide or at least the parts relevant to their tasks.

In addition, everyone who has to operate or maintain the printer has a duty to search for all relevant information in the user guide.

Availability

The user guide must be kept in a place known to the staff, where it is easily accessible to relevant users.

Symbols Used

Symbols are used to highlight information, references and warnings of hazards during printer use or when performing specific tasks.

The following symbols are defined:

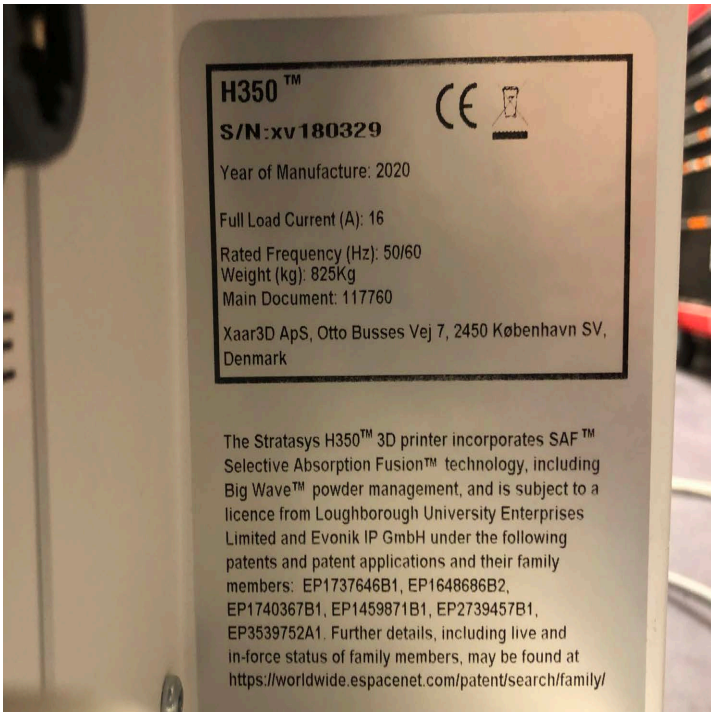
Symbol	Symbol Meaning
	Attention Attention required. Indicates required action, for establishment of safe working conditions or use.
	Reference to documentation Refer to relevant information in this or other manual or safety data sheet.
	Information aimed at operators Indicates chapters, information, etc. targeted, but not limited, to operators.
	**Warning:** Indicates a potentially hazardous situation which, if not avoided, may result in injury or death. **Warnings** and **Cautions** precede the paragraph to which they pertain.
	**Caution:** Indicates a situation which, if not avoided, could result in damage to equipment. **Warnings** and **Cautions** precede the paragraph to which they pertain.

Symbol	Symbol Meaning
	**Note:** Indicates additional information relative to the current topic. **Notes** follow the relative paragraph.

Safety markings and pictograms are used to warn and/or inform different user groups. Their meaning are interpreted as follows:

Geometric Shape	Meaning	Safety Color	Contrast Color	Graphical Symbol Color	Use Case Example
	Warning signs	Yellow	Black	Black	

Nameplate



Abbreviations

Abbreviation	Full Name
E-Stop	Emergency Stop

Abbreviation	Full Name
FMS	Fluid Management System
GUI	Graphical User Interface
HMI	Human-Machine-Interface
HPC	Head Personality Card
MD	Machinery Directive (2006/42/EC)
XPM	Xaar Print Manager

User Groups and Qualifications

Users of the printer must identify themselves with a user group. These are divided according to their user interface and tasks related to the use of the printer throughout the life cycle of the printer. The information and instructions in the user guide are divided according to user groups, and are symbolized by the use of symbols, see below.

Operator

Tasks, instructions, etc. addressed to operators are symbolized by:

Operators are people whom:

- Physically use the printer and/or its control system during normal operation.
  - Such as operating the printer and its controls.
- Use the printer under management and with the consent of the owner of the printer.
- Are able to make general adjustments, rearrangement, etc.

Operator Requirements and Qualifications

Operators must be trained/instructed in the use of the printer based on the following requirements:

- Must have read and understood the user guide as well as any attached instructions, safety instructions, etc.
- Gain knowledge of the printer’s functions and safety conditions. This may be achieved by employee-by-employee training, or by reading the user guide as well as any attached instructions, safety instructions, etc.
- Trained and/or instructed in the use, handling, etc. of the printer.
- Gain knowledge of the location of emergency stops and safety equipment.

Before starting or servicing the printer, operators must be informed of all installed safety measures. See “Overview of Printer Safety Functions” (page 11).

Before commencing maintenance work on the printer, maintenance personnel must be instructed in safety conditions around the printer. An experienced colleague must train new personnel.

Warning:
Improper maintenance can be dangerous, and in the worst-case lead to death!

Service

If you have a problem with your printer that is not covered in this guide, please contact Stratasys Customer Support. Contact information is available from the Stratasys website at: https://support.stratasys.com/en/contact-us.

When calling in for service, always have your printer’s software version (see “Updating Controller Software” (page 162)) and hardware serial number available (see “Identifying Your Printer” (page 18)).

Software Support

If you have a software problem that is not covered in this guide, please contact Stratasys Customer Support. Contact information is available from the Stratasys website at: https://support.stratasys.com/en/contact-us.

When calling in for service, always have your printer’s software version (see “Updating Controller Software” (page 162)) and printer serial number available (see “Identifying Your Printer” (page 18)).

User Guide Terms

Term	Definition
Build	The completed parts and the used powder which functions as support material.
Build chamber	The area in the printer where the build is created.
Build envelope	The available area where the build may be created as delineated by the H350 build processor software.
Build plate	The metal plate which forms the bottom of the build chamber and descends along the Z-axis during the build process.
Build removal box	This is used to remove the completed build from the printer.
H350 build processor	The software which slices the parts into layers.

Term	Definition
HAF™ high absorption fluid	The fluid which is jetted on to the powder surface to enable fusion of the powder when irradiated by a fusing lamp.
Layer	The 100µm layer of powder which is distributed with each pass of the distribution sled.
Powder retrieval station	The machine used to collect used powder.
Virgin powder	The fresh, unused powder used by the printer.

Safety Instructions

The printer may only be used as intended. If the printer is used for another purpose or changes are made to the design, the supplier does not guarantee the safety of the printer

Hazardous Situations During Intended Use

Hot Surfaces

Symbols	Meaning and Actions
	**Danger of Hot Surfaces!** During operation, the surfaces of the printer become hot and can cause burns or discomfort when directly touched. Exercise care when performing maintenance on or near hot printer surfaces. If hot surfaces are to be accessed, or work near hot surfaces is required, the following personal protective equipment must be used:
	**Wear Heat-Resistant Protective Gloves** Wear heat-resistant protective gloves where it is necessary to handle hot items or surfaces.

Contact with Fluid

Warning: Eye Contact Hazard

Various printer fluids in the tubes is subject to pressure and is hazardous if it touches the eyes. Do not continue before putting on protective eyewear and draining the fluid from the printer.

Warning: Skin Contact Hazard

Various printer fluids can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Contact with Powder

Warning: Inhalation Hazard

Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

Warning: Eye Contact Hazard

HAF in the tubes is subject to pressure and is hazardous if it touches the eyes. Do not continue before putting on protective eyewear and draining the fluid from the printer.

Warning: Skin Contact Hazard

HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Foreseeable Misuse

Safety-Related Guards

Warning: Serious Damage can Occur in Case of Missing or Defective Guards

Direct contact with the moving parts of the printer can result in serious injury or death when within the guards of the printer.

The printer is equipped with safety related guards to prevent access to dangerous areas on the printer. Bypassing, dismantling or neglecting guards can lead to serious injury or death.

Before starting the printer, the operator must inspect the printer for visible defects that affect safety during operation.

Restricted Access

Warning: Printer Surfaces May Not be Used as Access Ways, as This May Lead to Falls Resulting in Injury

It is not permitted to use the printer's surfaces as an access path unless designed for such.

- Do not stand or climb on the printer, etc.
- Do not use the printer's surfaces as storage, workspaces or similar.

Lack of Training

Warning: Lack of Knowledge of the Printer and its Safety Conditions can Lead to Irreversible Injury

Do not use the printer until you have received the necessary training and instruction in the use and service of the printer. Uncertainty about the safe and efficient use of the printer must not occur.

Special Conditions for Different User Groups

The printer owner may only hand over work on the printer to persons who are familiar with the basic regulations on occupational safety and accident prevention, and are instructed in the handling of the printer.

Only trained or instructed personnel may use the printer. Determine staff qualifications and responsibilities for operation, preparation, maintenance and repair. Regularly check that the personnel work in a safety and hazard-aware manner in accordance with the instruction handbook.

Personnel under the age of 18 must not operate the printer.

Suppliers of components may make stricter requirements, for age and qualifications.

Residual Risks

The following residual risks have been identified for the printer:

Symbols	Meaning and Actions
	**Danger of Electric Shock!** The printer contains dangerous voltage levels. Contact with dangerous voltages can result in serious injury or death. 1. Disconnect the supply through the supply disconnecting device. 2. Verify that the printer is in a de-energized state before starting maintenance. 3. Electrical related work may only be carried out by a trained expert or instructed person.
	**Danger of Hot Surfaces!** Contact with hot surfaces can cause burns or discomfort when touched directly. 1. Power down the printer. 2. Wait until the hot surfaces of the printer have cooled below 60°C, or use protective gloves.

Symbols	Meaning and Actions
	**Crushing Hazard!** Contact with moving parts can lead to squeezing or crushing of body parts.

Fluid Hazards

Warning: Eye Contact Hazard

Various printer fluids in the tubes is subject to pressure and is hazardous if it touches the eyes. Do not continue before putting on protective eyewear and draining the fluid from the printer.

Warning: Skin Contact Hazard

Various printer fluids can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Powder Hazards

Warning: Inhalation Hazard

Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

Warning: Eye Contact Hazard

HAF in the tubes is subject to pressure and is hazardous if it touches the eyes. Do not continue before putting on protective eyewear and draining the fluid from the printer.

Warning: Skin Contact Hazard

HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

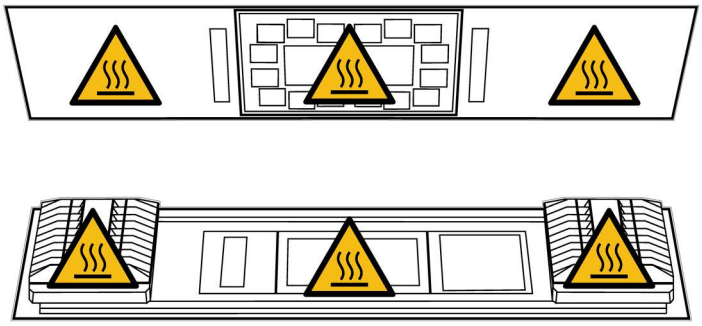
Location of Safety Symbols

The safety symbols used on the printer and their location are described in the table below:

Symbols	Meaning	Location
	Danger of electric shock.	Inside the printer.
	Danger of hot surface.	Inside the build chamber.
	Ground (earth) point/ Main ground (earth) point	Specific screws on the printer chassis and inside the printer.

Figure 1: High voltage safety labels

Figure 2: Build chamber safety labels



Renewal of Safety Symbols

- Replace damaged or missing safety symbols, warning, instruction signs and designations, in their original locations.
- Never remove warnings, instruction signs and designations from the printer, as these may relate important safety-related information.

Use of Personal Protective Equipment

The designated personal protective equipment must always be used according to company guidelines, the instruction handbook, and safety data sheets as well as applicable national rules.

Do not use loose clothing, jewelry, etc. while operating the printer.

Wearing nitrile gloves while handling the printer powder is strongly recommended.

Overview of Printer Safety Functions

Warning: Potential Injury.
The Emergency Stop does not shut down the printer.

Requirements for safety-related parts are determined in accordance with EN ISO 13849-1.

Warning Function	Description	Performance Level	Safety Category
Emergency stop	The printer is equipped with an emergency stop. If the emergency stop is activated, the printer stops immediately. The emergency stop remains in the stop position.	C	3
Top lid interlocks	The top lid are fitted with an interlock. If the top lid is opened, which breaks the interlock connection, the power to the sled motors and the IR lamps is disconnected.	C	3

The printer is equipped with the above mentioned safety devices, which are located on the exterior of the printer (Figure 3) and inside the top lid (Figure 4).

Figure 3: Emergency stop

Figure 4: Interlocks

Activation of safety devices stops the following equipment:

- The emergency stop safety function disconnects power to most of the printer, except for the main PC, the 24/30 volt PSU's, and the 2 extraction fans.
- The printer cover interlock safety function disconnects power to all the lamps on the sleds and the motors that can move the sleds in the process chamber.

Test of Safety Functions

If the following test limits are exceeded, the safety functions may no longer be considered active, and will not protect users from printer hazards.

Emergency stop

Dangerous situations may occur during operation where it is necessary to make an immediate stop to the printer or parts thereof. If such a situation occurs, activate the emergency stop to stop the printer immediately.

Emergency stop must never be used to prevent unexpected start-up.

Following situation may require an emergency stop of the printer:

- A dangerous situation
- The occurrence of sudden unknown conditions, e.g. abnormal noises (rumbling, knocking) or movements of printer parts.
- Faults in safety equipment that cannot be replaced/repaired during normal operation.

- In the event of breakages and leaks that cannot be immediately eliminated.

Restart after Emergency Stop

Before resetting the emergency stop, an inspection of all parts of the printer must be performed to find and remove the cause of the activation.

Before the printer can be restarted, the emergency stop must be reset by turning the knob or pulling it out, as well as resetting the emergency stop on the control panel, after which start-up is possible.

Verify that there are no personnel, items, tools, etc. at/on or around the dangerous parts of the printer before start-up.

Refer to the current operating instructions and workplace instructions.

Emergency Situations

In the event of accidents or breakdowns, personnel and users of the printer must:

- Assess the danger and sources of danger associated with the accident or breakdown, for example jamming, ejection of parts, etc. escape routes must be used, when personnel are exposed to immediate danger.
- Press the emergency stop button on the printer to stop the printer.
- Assess the extent of the damage.
- Contact emergency services in the event of serious accidents.
- Where appropriate, remove guards to facilitate access to the area and the injured personnel. Identify potential dangers associated with the removal of these e.g. sharp objects, components etc.

2 PRINTER SETUP

This chapter describes basic setup of the H350 SAF Selective Absorption Fusion Powered 3D Printer.

General Information

Weight and Dimensions

The approximate net weights and dimensions of the printer modules are provided below.

Table 1: Net size (Length, Width, Height) and weight

Module	Dimensions (mm) (Length x Width x Height)	Dimensions (inches) (Length x Width x Height)	Weight [kg/lb]
Printer (cover closed)	1900 x 940 x 1767.3)	74.8 x 37.0 x 67.3	825 / 1819
Removal box	380 x 290 x 395	15.0 x 11.4 x 15.5	6.0 / 13.2

Printer height is based on an installation height of 130 mm (5.1 in.) from the floor to the bottom surface of the printer.

Stratasys Required Additional Equipment

The following kits and individual items are required purchasing for any H350 printer owner.

Table 2: Key for Figure 1

Part Number	Mandatory for Installation (Yes / No)	Description
X3D-01011	Yes	HAF - High Absorption Fluid - 4l
X3D-01338	Yes	HAF Cleaning Bottle, pack of 6
X3D-01001	Yes	Stratasys H350 Build Removal box
X3D-01330-S	Yes	Powder scoop
X3D-01016-S	Yes	Stratasys H Cleaning Kit
X3D-01017	Yes	Stratasys H Consumables maintenance kit
X3D-01006-V	Yes	Stratasys H Trolley
X3D-01007	Yes	Stratasys H350 Powder Container

Basic Setup

The printer room and the powder preparation room should be cleaned daily when the printer is in operation to keep the airborne powder levels to a minimum.

Follow the Site Preparation Guide to ensure that your facility is effectively and safely prepared for printer installation. Do not proceed with the following sections until the “Unpacking the Printer” section of the Site Preparation Guide has been completed. When installation is complete, perform the following setup tasks.

Environmental Conditions

Printer Temperature and Humidity

The printer must be maintained in this condition at all times or the material will fail. Printer material must be stabilized for 48 hours in the conditions listed below.

The printer must be installed in a controlled environment as specified below.

Table 3: Room temperature and relative humidity specifications

Environmental Condition	Range
Temperature	20°C to 25°C (68°F to 77°F)
Relative humidity	40% to 55%

The humidity in the print room must be continuously recorded by the customer and the log data must be available upon request.

Powder Storage and Preparation

The open bags of virgin and used powder need to be stored in a room with the specifications provided in the table below.

Material Failure:

Storing open bags of virgin or used powder outside of these environmental conditions may result in failed or unacceptable build jobs.

Table 4: Temperature and relative humidity specifications for powder storage

Environmental Condition	Range
Temperature	20°C to 25°C (68°F to 104°F)
Relative humidity	40% to 55%

If powder is stored in conditions that deviate from the conditions described above, then the powder must be stored in the printer room for a minimum of 48 hours before use. After the powder that was stored outside of these environmental conditions is stored in the printer room for a minimum of 48 hours before use, perform “Test Powder Distribution” (page 246).

For storage conditions required for unopened virgin powder bags, refer to the MSDS.

Dust masks and any other means of safety should be enforced in this room, in accordance with local rules and regulations.

High Yield PA11 is packaged in 20 kg (44 lb) bags, which measure 70 cm x 40 cm x 20 cm (27.5 in. x 16 in. x 8 in.).

SAF™ PA12 is packaged in two 10 kg bags (44 lb. total weight), which measure 31 cm x 31 cm x 33 cm (12.2 in. x 12.2 in. x 12.9 in.).

The powder can be prepared for refilling the printer in the same room as it is stored.

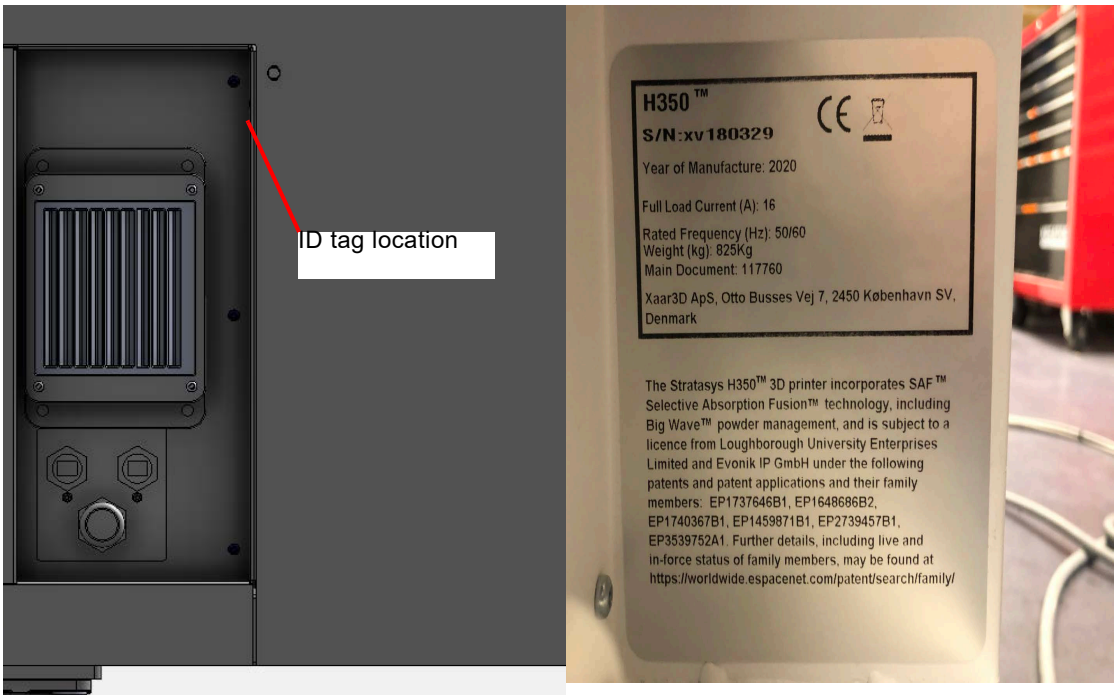
Moving the Printer

After the printer has been installed, do not move the printer for any purpose without assistance from your customer support representative. The service engineer must perform a validation of the new location before moving the printer, and verify the proper functioning of the printer after placing it in the new location.

Identifying Your Printer

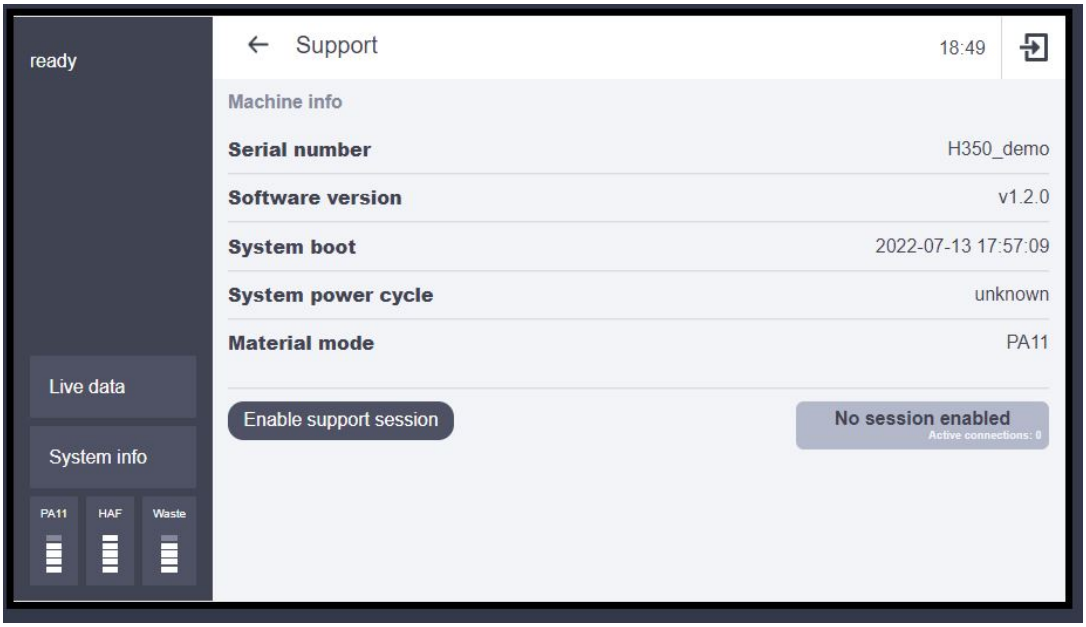
The printer can be identified by the serial number plate which is located at the back of the printer. The serial number plate is located next to the electrical cabinet filter.

Figure 1: ID Tag Locations



It is also possible to identify the printer through the GUI. At the touch screen press **System info** | **Support**.

Figure 2: ID printer through GUI



Making the Network Connection

Processed job files can be transferred to the H350 3D printer through your facility's Ethernet network. An RJ45 network connector is located on the right, rear corner of the printer (as viewed from the rear). See Figure 3 for the network connection location.

A 15 foot (4'.6m) network patch cable is supplied with the printer and located in the welcome kit. Facilities having network connection points further from the printer than can be reached by the supplied cable are responsible for the procurement of an appropriate cable.

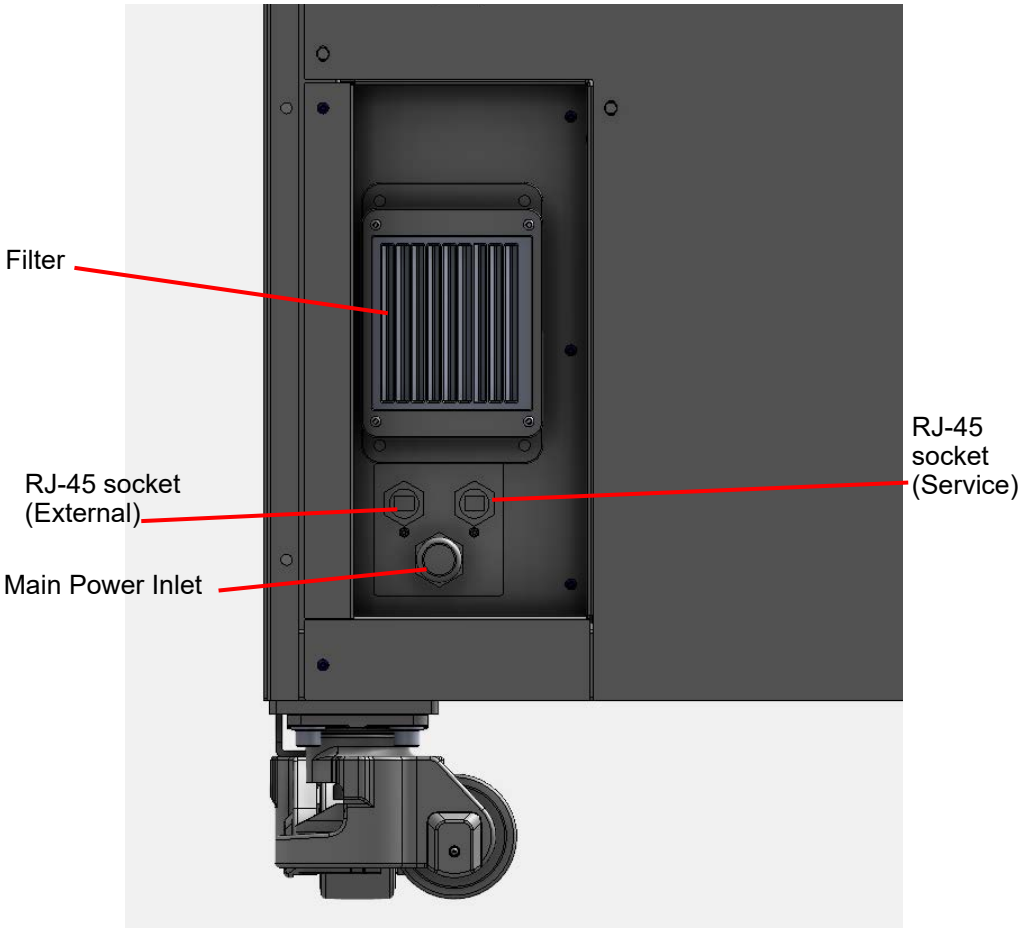
Back Panel Connections

The RJ-45 Ethernet socket for the connection of the printer to the local network and the RJ-45 Ethernet socket for service connection are located on the rear panel of the printer. See Figure 3

Warning: Electrical Shock Hazard.

The power cord serves as the disconnect device. The socket outlet must be easily accessible.

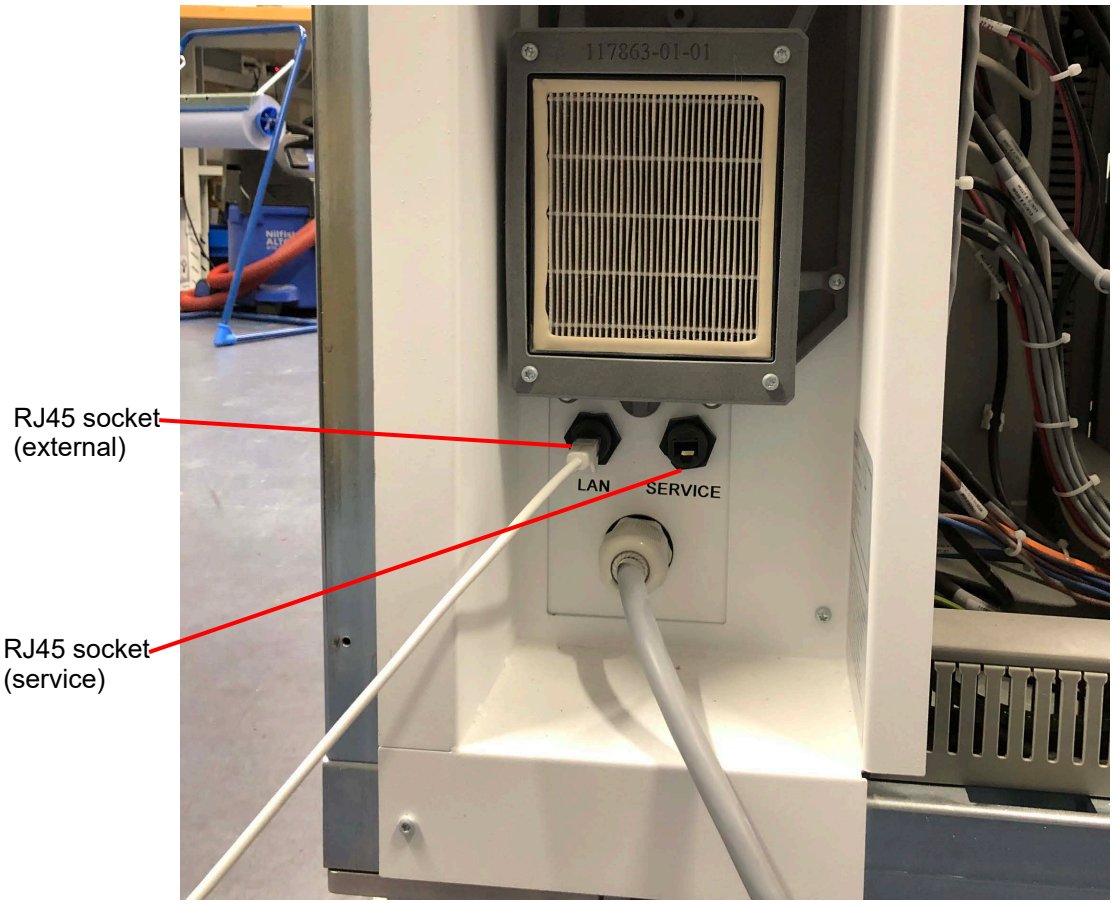
Figure 3: Rear Connections



Connecting to a Local Area Network (LAN)

1. To connect the printer to a local network, use a CAT5/CAT6 network cable and connect the RJ45 port labeled **EXTERNAL** to your facility's network port.

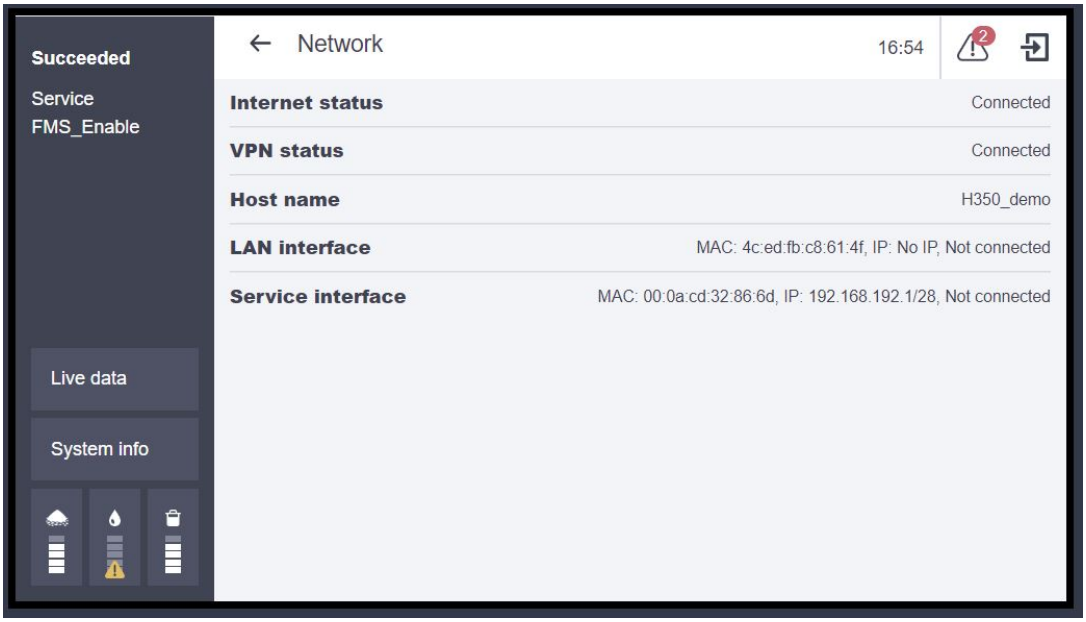
Figure 4: RJ45 connections



2. The printer now connects to the DHCP server and acquires an IP address. To see the connection status and the external IP address displayed on the Network screen, first press **System info** and then press **Network**.

Internet status: connected means that the printer is connected to the Internet. Without connection to the Internet, software updates and remote support are limited.

Figure 5: Connection status



3. In the screen capture above, when **Internet status** is **Connected** the printer is connected to the Internet. Without a connection to the Internet, software updates are not available. When the **VPN status** is **Connected** it is possible to provide remote support. If a LAN cable is connected to the printer, the **LAN interface** field shows the status **Connected**. If no cable is connected, or no connection is established, the status will be **Not connected**.

Installing and Connecting the H350 3D Printer to the GrabCad Print Server

- Install the GrabCAD Print software on a facility workstation. Navigate to https://help.grabcad.com/article/201-printing-monitoring-remotely.
- Add the H350 3D printer to the GrabCAD Print Server application according to the instructions.

GrabCAD Print Server Software

GrabCad™ print server software can be installed on a computer linked to the same network as the H350 printer.

Through this connectivity the customer will be able to see:

- Printer schedule
- Printer history
- Materials usage
- Printer utilization

Setting the Printer's Date and Time

The printer will update date and time automatically if it is online. The time zone will be set manually during installation. If the printer is offline, an interface is needed (pending)

Updating the Controller Software Version

Update the controller software if necessary. See "Updating Controller Software" (page 162).

Installing the H350 Job Preparation Software

Job preparation software is the software used to nest the parts into the available build volume and generate the buildjob file. The user can choose between GrabCAD Print for H350 (see “Installing and Connecting the H350 3D Printer to the GrabCad Print Client” (page 24)) or another software compatible with the Stratasys H350 Build Processor (see “Installing the Stratasys H350 Build Processor” (page 24)) such as Materialise™ Magics™ or Siemens™ NX™. For the GrabCAD Print solution only one license is required. For the other solutions a separate license for the nesting software and for the Stratasys H350 Build Processor, which functions as a slicer, is required. GrabCAD Print automatically sends the buildjob file to the printer, while the other solutions require the user to manually move the buildjob file over the network.

The technology does not require the existence of support structures. The non-fused powder works as support material.

Installing and Connecting the H350 3D Printer to the GrabCad Print Client

• Install the GrabCAD Print software on a facility workstation. Navigate to http:// help.grabcad.com/article/197-sign-up-download-and-install and follow the on-screen instructions.

• Add the H350 3D printer to the GrabCAD Print application. Navigate to http:// help.grabcad.com/article/198-connect-your-printers and follow the on-screen instructions.

Installing the Stratasys H350 Build Processor

In instances where GrabCAD Print is not used as the job preparation software, the Stratasys Build Processor is the software that enables third party job preparation software to create the slices in the build job file. Other build parameters created by the Stratasys Build Processor include scaling factors and wall growth compensation.

A sales representative provides the Stratasys H350 Build Processor as an executable (.exe) installation file.

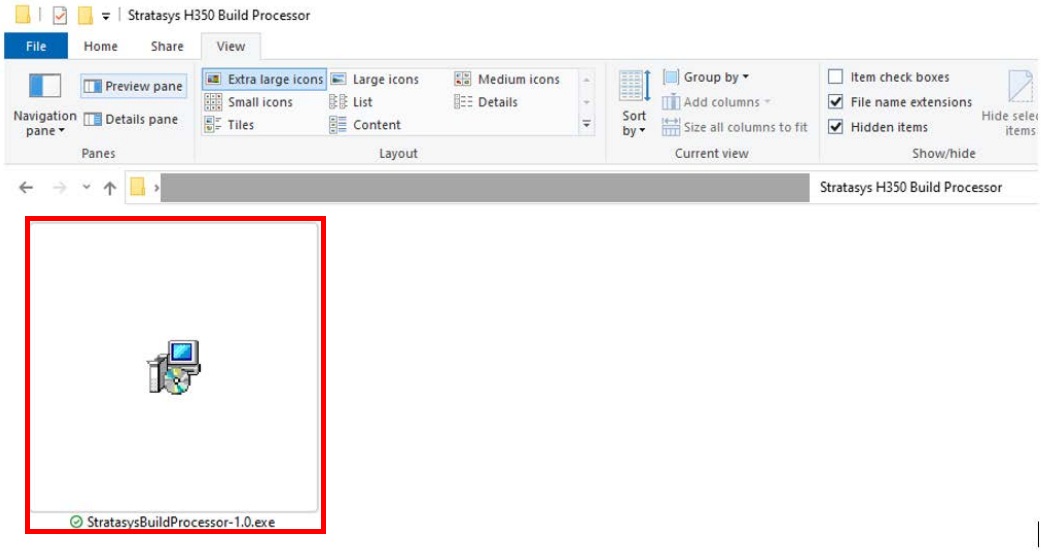
Your sales or service representative provides a license key that activates the build processor after it is installed on your computer. Install the build processor on the same computer as the build preparation software, for example Materialise™ Magics™.

Stratasys H350 Build Processor Installation Procedure

The build job file is not transferred from the build processor to the printer.

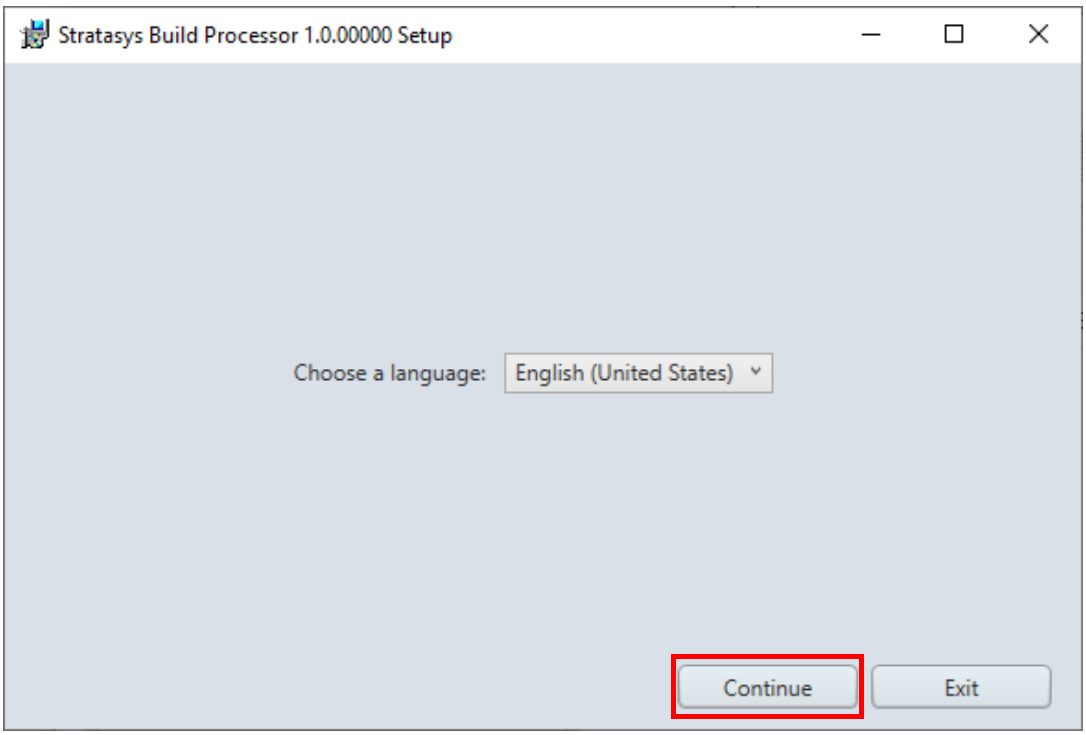
1. On the computer that will run the software, copy the installation file to the computer's local drive.

Figure 6: Installation file



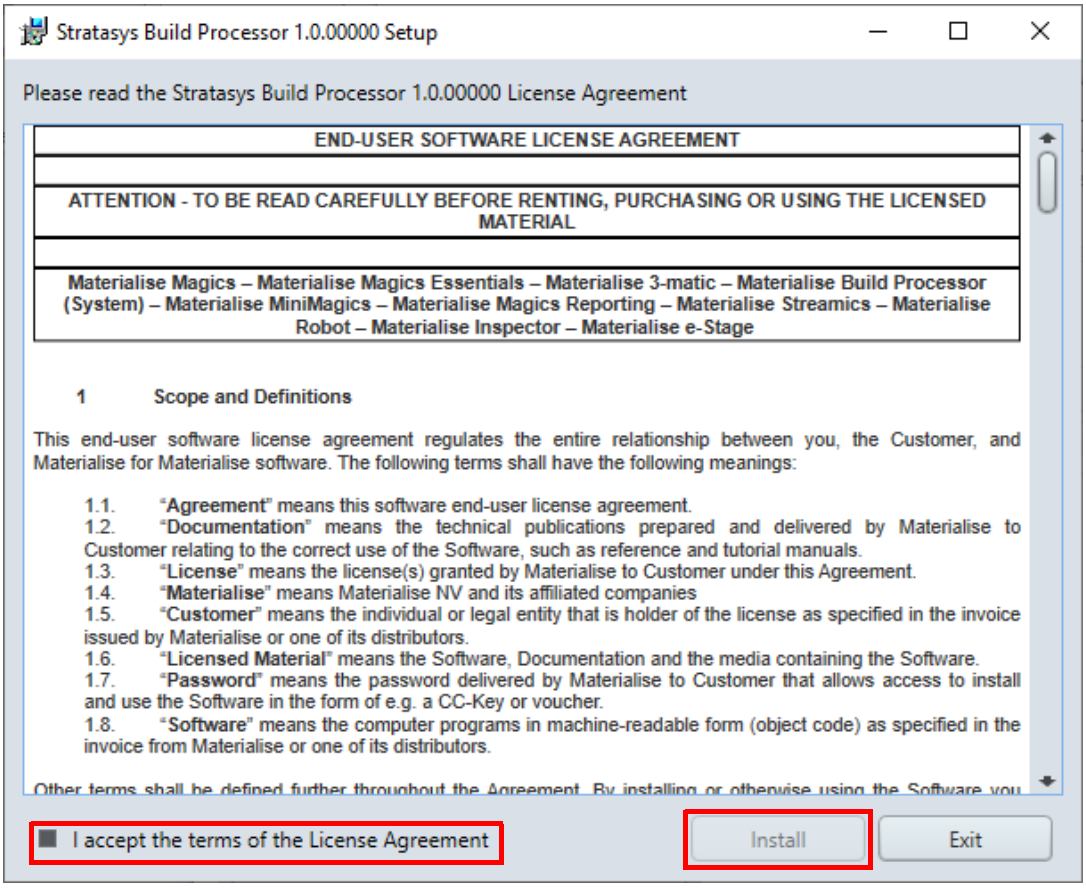
2. Double-click the file icon to initiate the setup procedure. Click **Continue** on the first pop-up window. See Figure 7.

Figure 7: Installation wizard screen 1



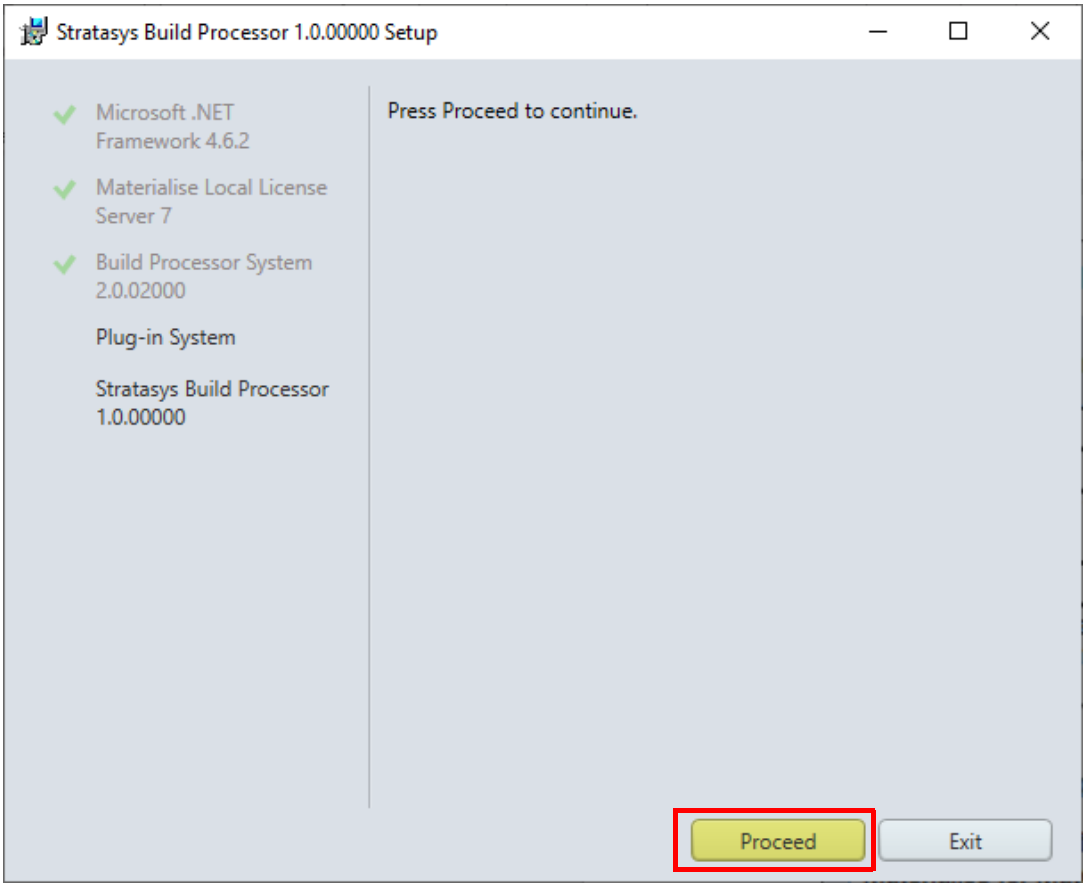
3. Check the **I accept the terms of the license agreement** box and click **Install**.

Figure 8: License agreement screen



4. On the next screen, click **Proceed**. For the installation to continue, the user must have administrator rights for the computer.

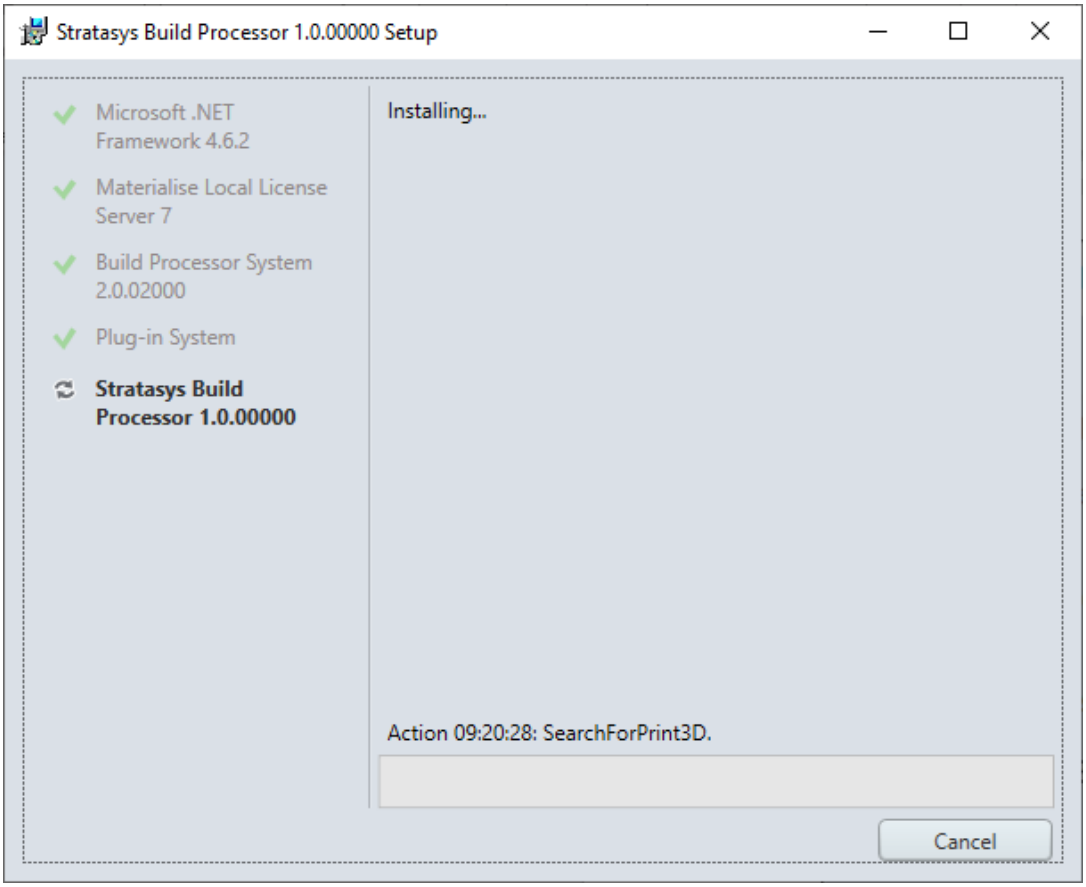
Figure 9: Installation screen



5. If the computer is limited by the IT administrator, the user will have to type the administrator user name and password before being able to proceed.

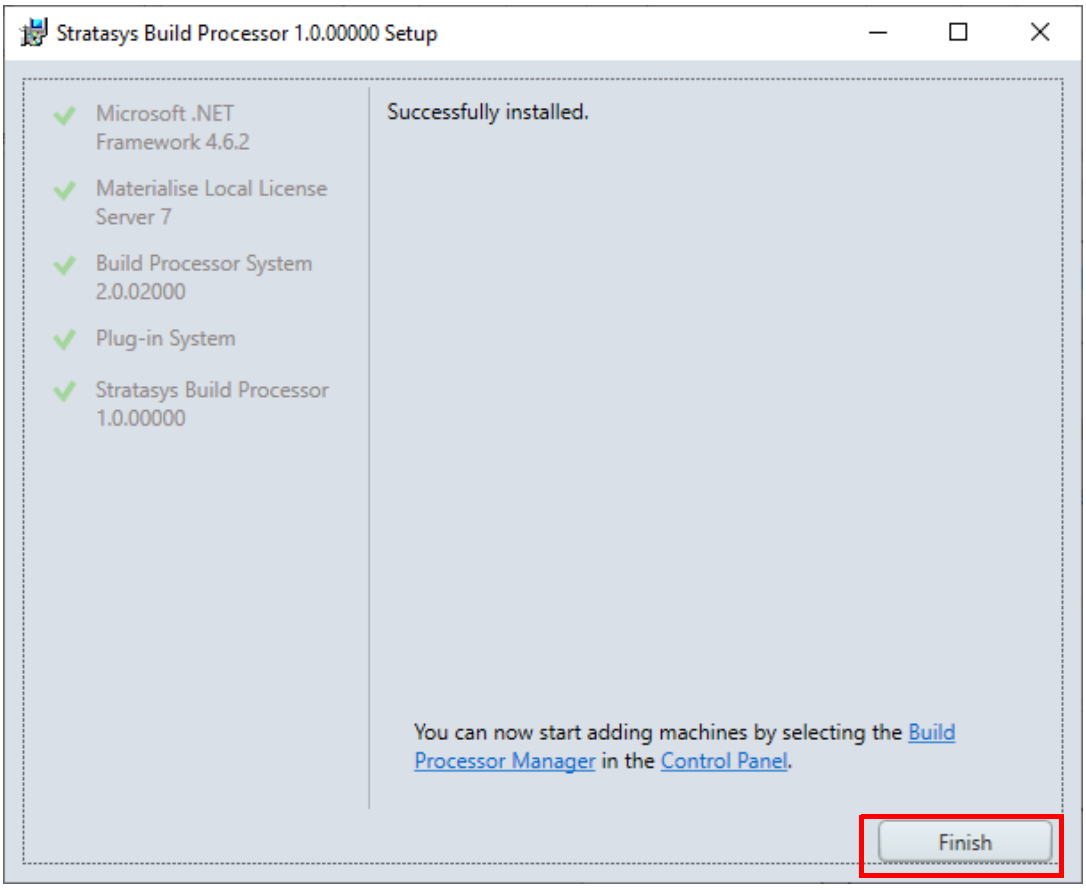
6. Once the administrator credentials, if required, are typed in, the installation begins. See Figure 10.

Figure 10: Installation in progress



7. When the installation is complete, click **Finish** to close the installation wizard.

Figure 11: Final installation wizard window

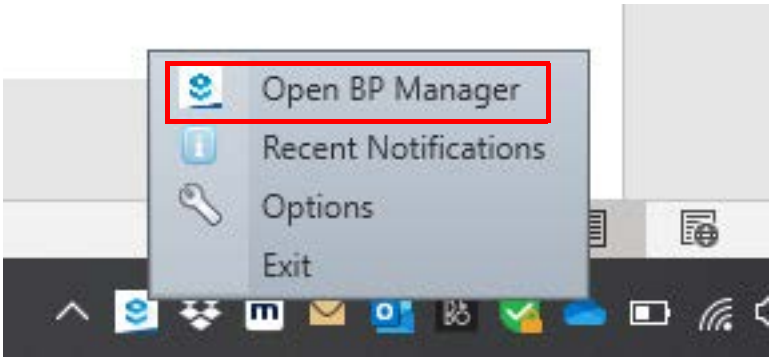


8. The Stratasys H350 Build Processor is now installed on the computer. The procedure imports the build processor into the nesting software, for example Materialise™ Magics™.

Adding the H350 Build Processor to Materialise™ Magics™

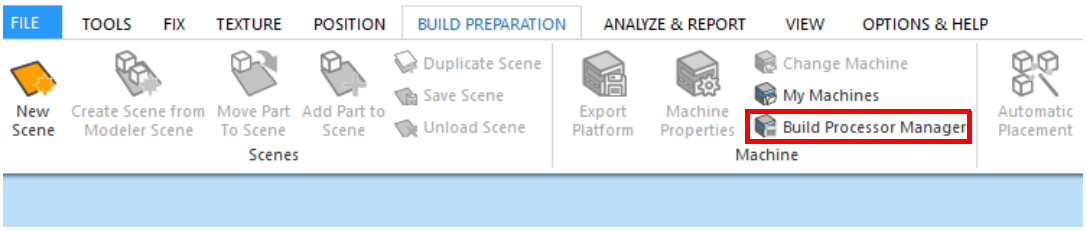
1. Open the **Materialise BP Manager**.
   a. If available, right click on the **Materialise** icon on the status bar.

Figure 12: Materialise icon



   b. If the status bar option is not available, start Materialise™ Magics™, click **Build Preparation,** and click **Build Processor Manager**.

Figure 13: Materialise™ Magics™ menu

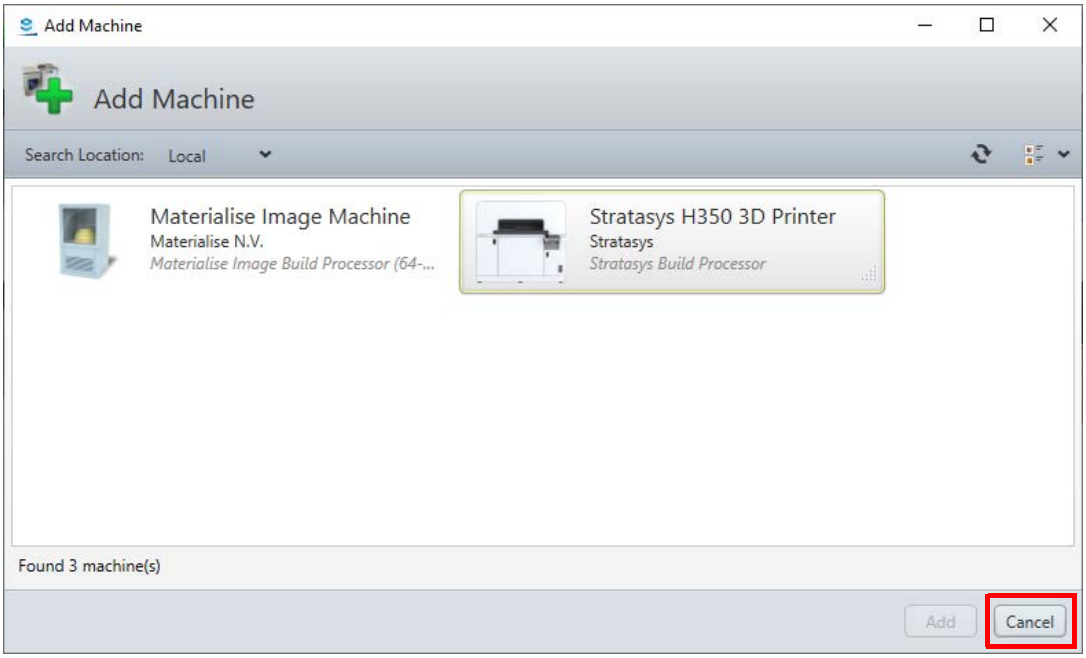


2. The Build Processor Manager is used to find all available printers. This is where the Stratasys H350 Build Processor must be added. Click **Add Machine**. See Figure 14.

Figure 14: Build Processor Manager screen

3. The next screen shows all available installed build processors. Choose the **Stratasys H350 3D printer** and click **Add**. See Figure Figure 15.

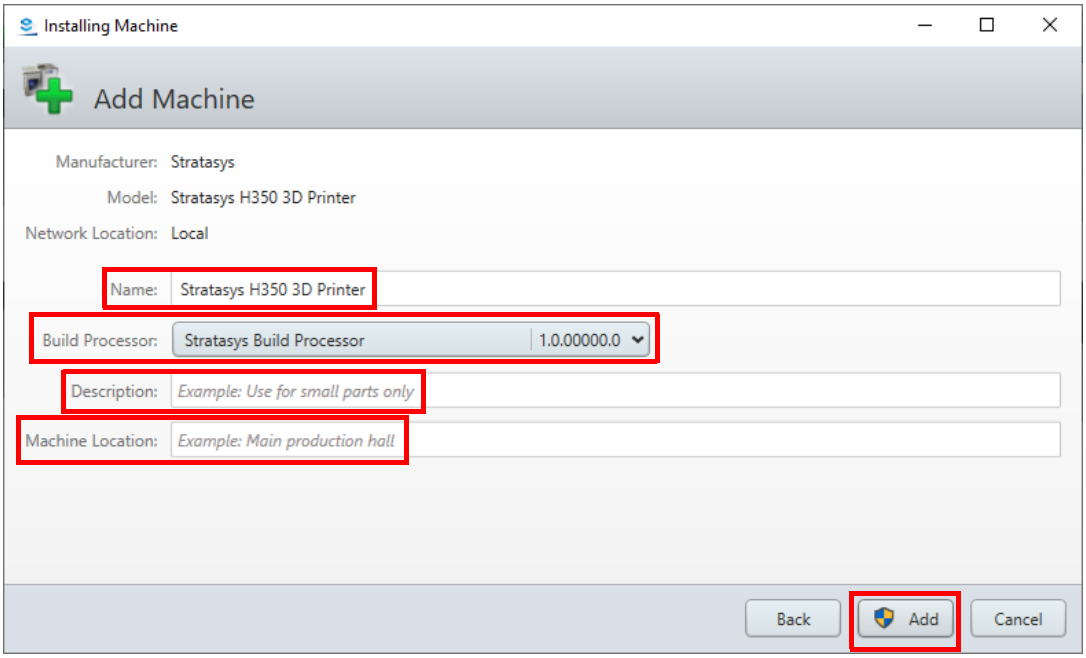
Figure 15: Add the H350 build processor



4. The next screen displays the Build Processor version, in this case 1.0.00000.0, and allows for the editing of some printer information such as:
   - Name, although keeping the default is recommended.
   - Description.

- Machine location.

Figure 16: Configuring Build Processor user information

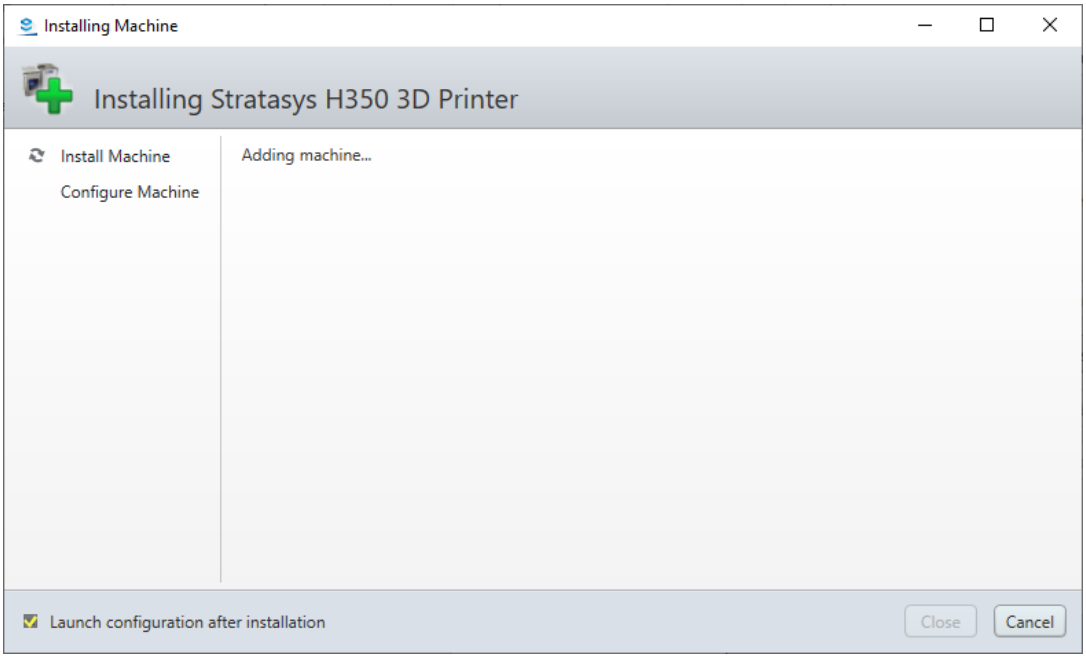


5. Click **Add** to add the Stratasys H350 Build Processor. See Figure 16.

Administrator rights may be required again.

6. On the next screen, the software adds the machine. See Figure 17.

Figure 17: Adding the machine



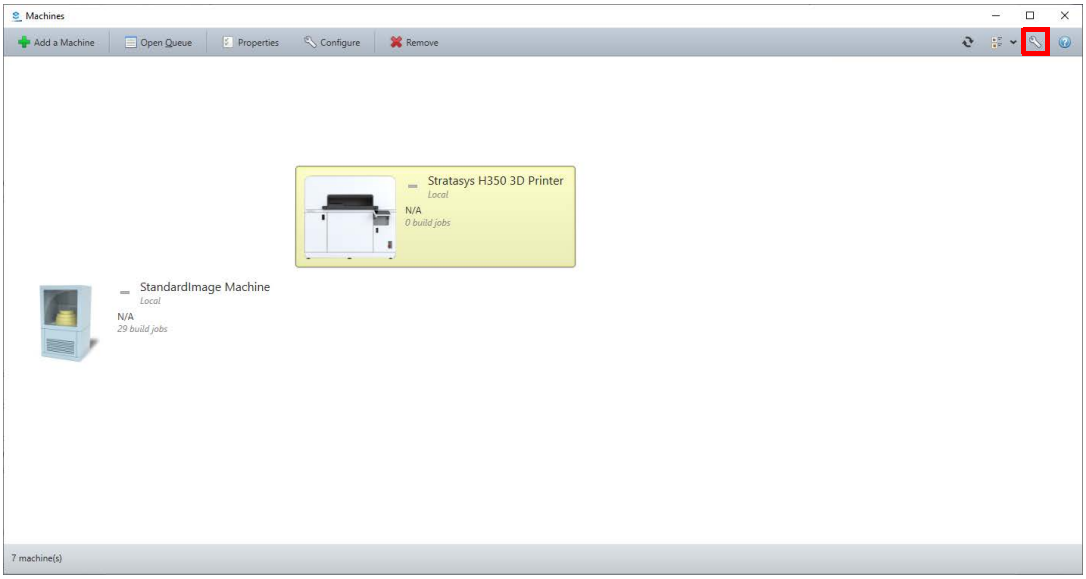
7. When the process is completed, click **Close**. See Figure 18.

Figure 18: Adding the build processor complete

Stratasys H350 Build Processor Configuration

After performing “Stratasys H350 Build Processor Installation Procedure” (page 25) and “Adding the H350 Build Processor to Materialise™ Magics™” (page 31), the Stratasys H350 Printer is available in the Build Processor (BP) Manager.

Figure 19: BP manager

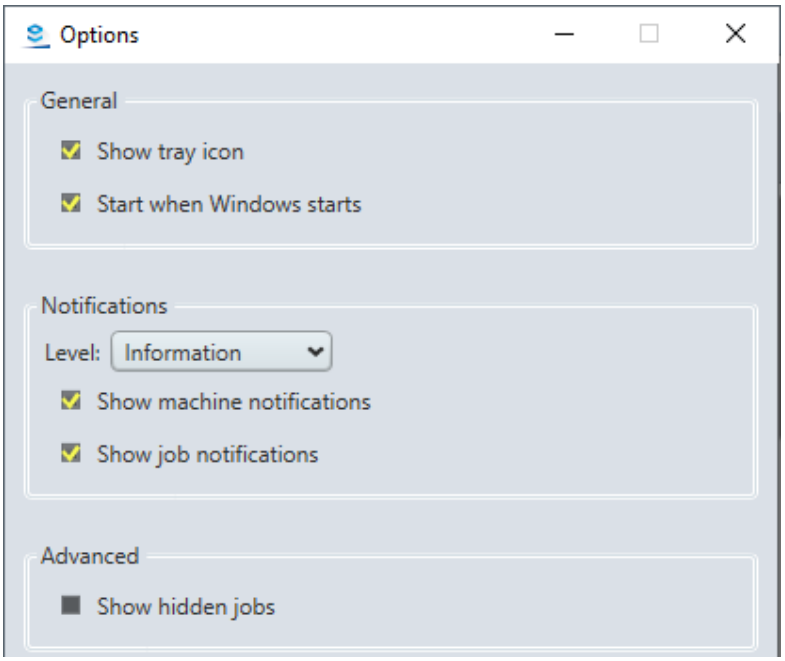


1. Click at the tool icon at the top right corner to modify options such as:

- Show tray icon
- Start when Windows starts

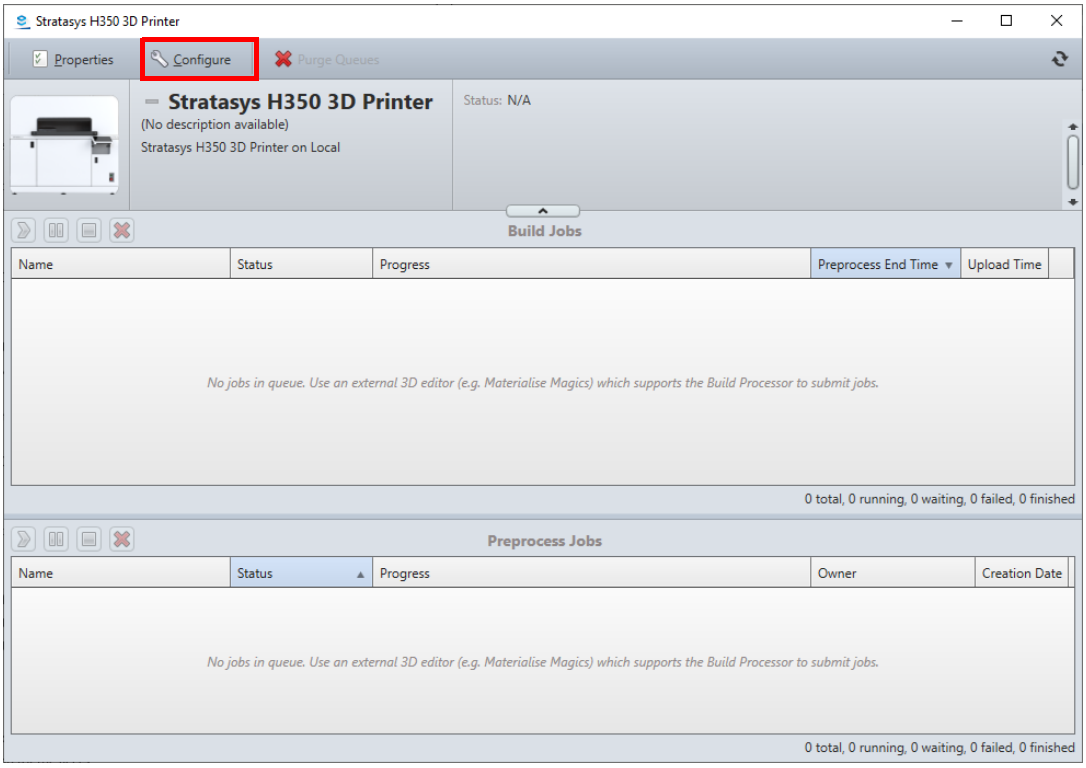
- Show notifications

Figure 20: BP manager options



2. From the build processor manager, double click the **Stratasys H350 3D Printer** icon to open the control panel. The control panel displays the jobs in queue and whether they are completed or failed.

Figure 21: Machine control panel



3. Click the **Configure** icon to open the configuration pop up window.

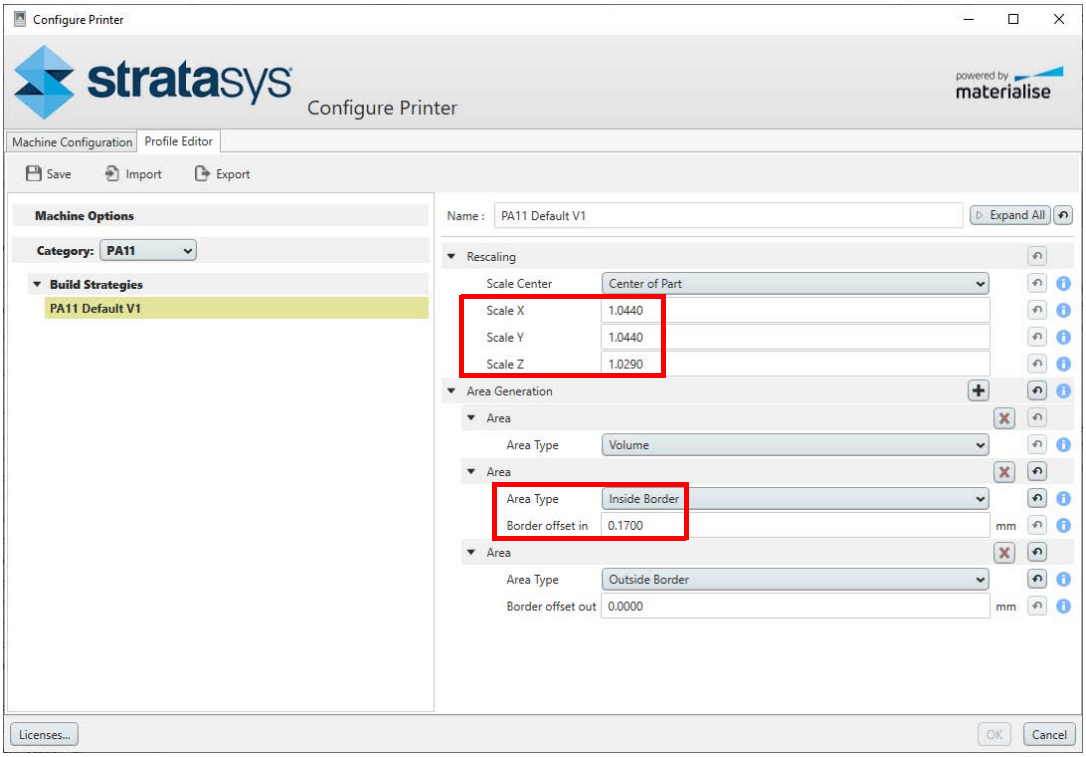
4. On the first tab, **Machine Configuration**, the folder where the generated build jobs will be saved must be entered into the **Upload folder** field. See Figure 22.

Figure 22: Stratasys H350 machine configuration (tab 1)

5. The second tab is the **Profile Editor** tab. This is where the options for scaling factors and wall growth compensation are found. See Figure 23.

Upon installation, the user receives the default build strategy file. In this case “PA11 Default V1”.

Figure 23: Stratasys H350 machine configuration (tab 2)



The build strategy file includes the X,Y,Z scaling factors and the wall growth compensation factor, **Border offset**.

The default values provided by Stratasys should not be changed without an in-depth understanding of the printing process and the printer configuration. For details please contact your Application Engineering representative.

Export and save the profile for future reference.

Changes in the above parameters can be saved and exported as a profile.

Stratasys Online Resources

Stratasys encourages you to learn more about additive technologies and your Stratasys printer. A wealth of information is available on our online platforms.

Subscribe to our customer newsletter for quarterly updates on Stratasys knowledge and training. You can learn about the release of new documentation and learning resources.

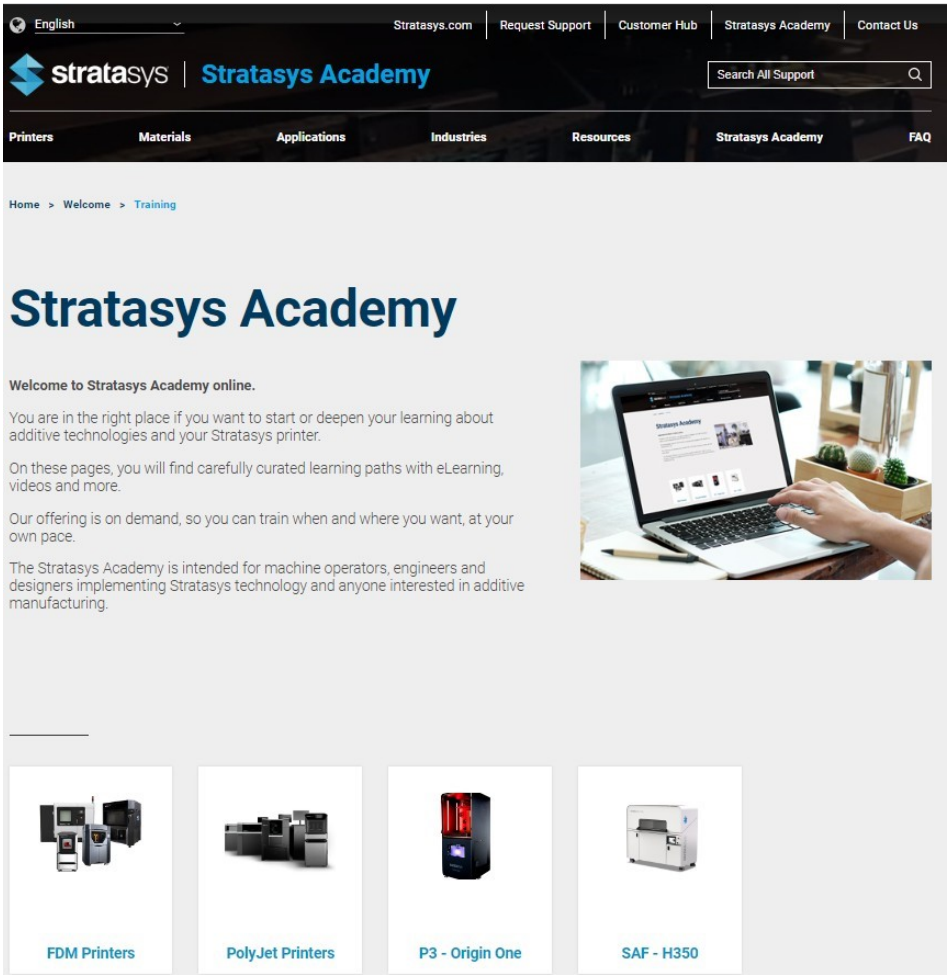
Stratasys Academy

Stratasys Academy is your online learning platform where you can quickly learn and acquire skills on additive technologies and your Stratasys printer.

To guide you in your learning, our online academy provides a variety of resources such as an extensive library of videos and eLearning modules. We periodically update the site with new content.

Start your learning journey today.

Figure 24: Stratasys Academy



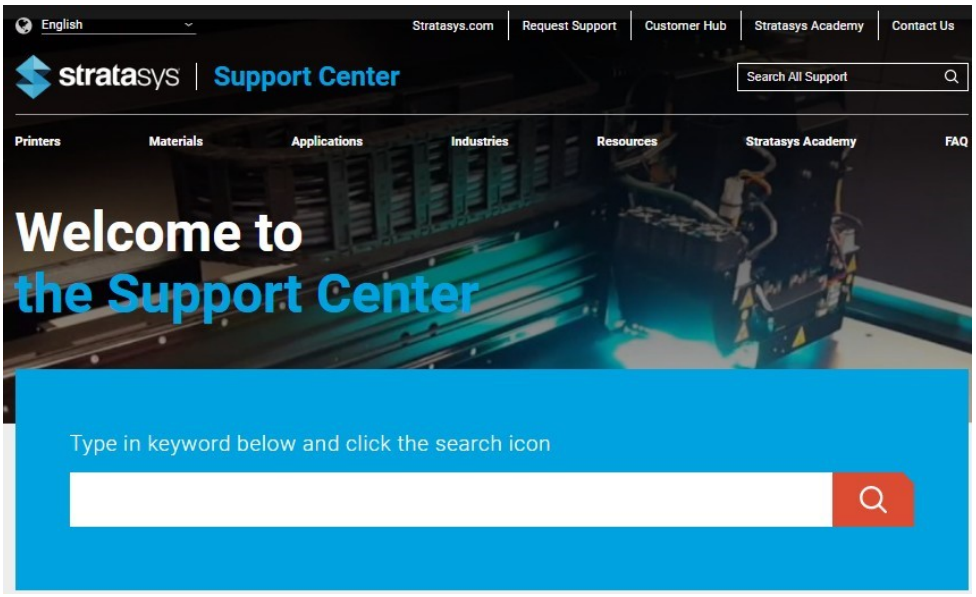
Stratasys Support Center

The Support Center is a knowledge base that includes information about design, applications, printing material, and links to many other resources.

In addition, you can check the latest revision of the user guide for your Stratasys 3D printer and download documents in different languages.

The Support Center is available in multiple languages. You can change the display language using the language drop-down menu in the top-left corner of the homepage.

Figure 25: Support Center

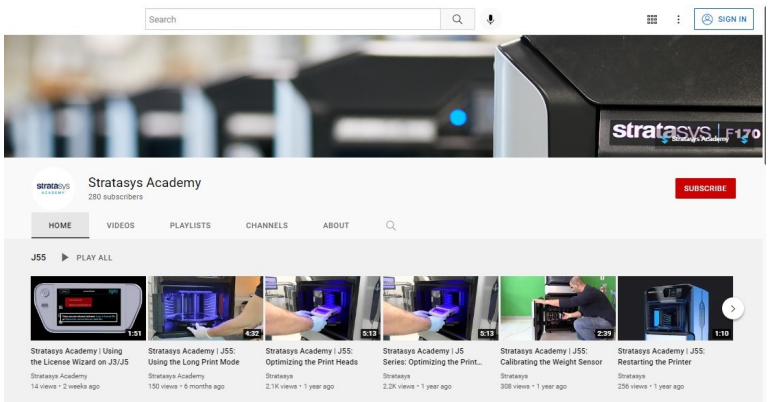


Stratasys Academy YouTube Channel

The Stratasys Academy YouTube Channel features instructional videos about how to operate and maintain Stratasys printers. The channel includes dedicated playlists for different printers and special topics like post-processing.

Make sure to check out this new Stratasys Academy Channel and remember to subscribe!

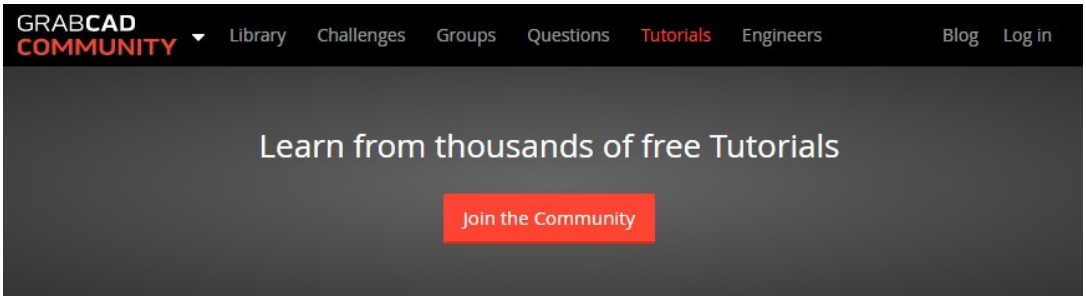
Figure 26: Stratasys Academy YouTube Channel



GrabCAD Community

The Tutorials section of the GrabCAD Community portal is a valuable resource for Stratasys-sponsored and user-generated 3D printing tips. You can also ask 3D-related questions on the portal and download free CAD files.

Figure 27: GrabCAD Community



3 SYSTEM COMPONENTS

This chapter describes the components of the H350 SAF Selective Absorption Fusion Powered 3D Pinter. Information regarding the materials and tips that can be used by the printer is also included in this chapter.

Printer Overview

Access Doors and Panels

Warning: Electrical Shock Hazard
Do not energize when the rear panel is not secured in place. Electrocution may result.

This printer has been designed to allow easy access to the most frequently accessed areas on the system. Doors and panels are highlighted in Figure 1 and Figure 2.

Figure 1: Access Doors and Panels - Front View

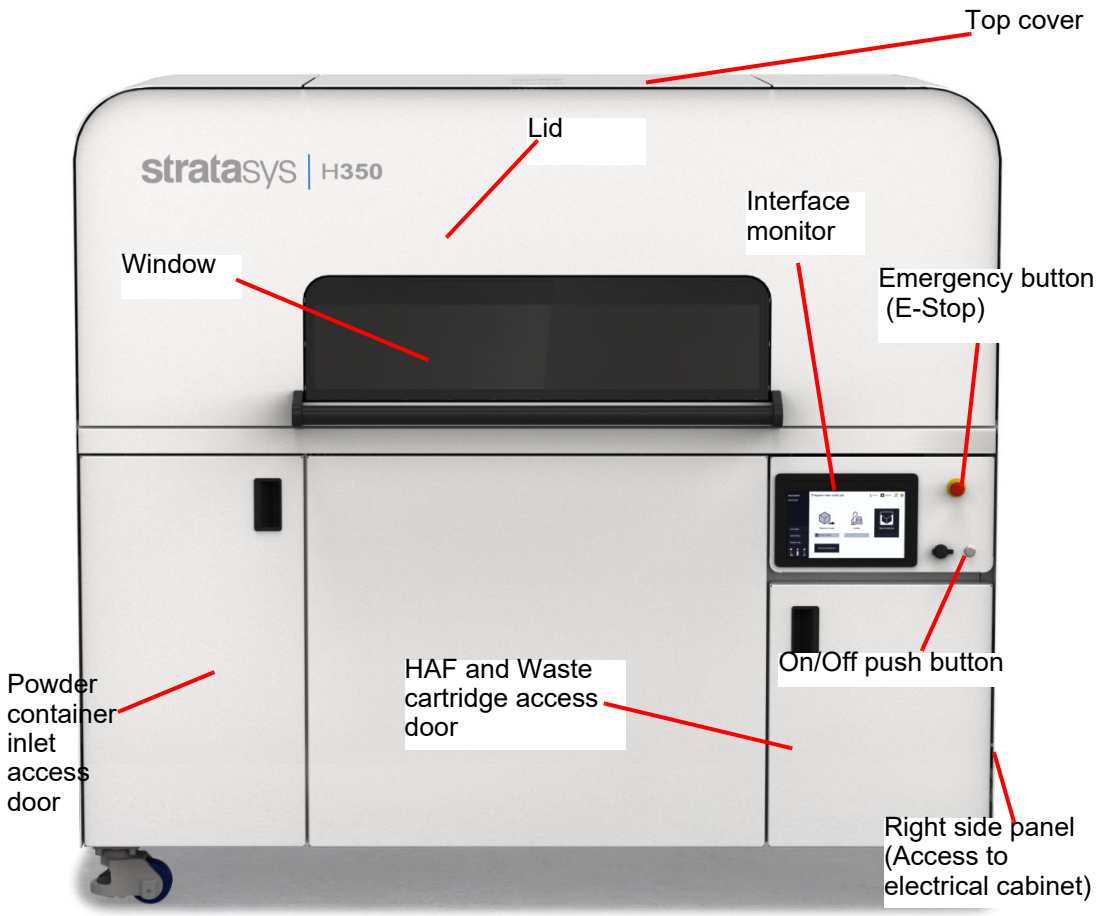
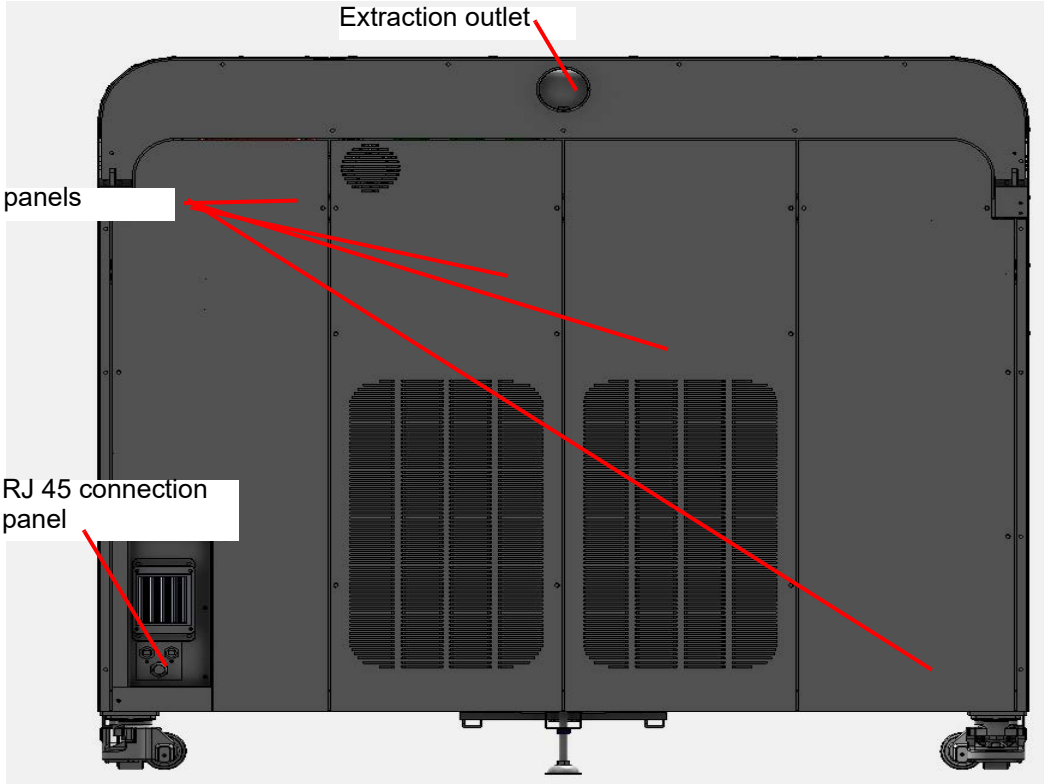


Figure 2: Access Doors and Panels - Rear View



Lid

The lid allows access to the build chamber, sleds, the thermal camera window, and completed builds for removal.

Powder container inlet access door

The powder inlet access door allows access to the printer’s powder container inlet and the vacuum powder extraction interface.

HAF and Waste cartridge access door

The HAF and Waste cartridge access door allows access to the two available cartridges: the four-liter HAF cartridge (top) and the four-liter Waste cartridge (bottom).

Right side panel

The right side panel allows access to the electrical cabinet.

Top cover

The top cover allows access to the thermal camera and other modules.

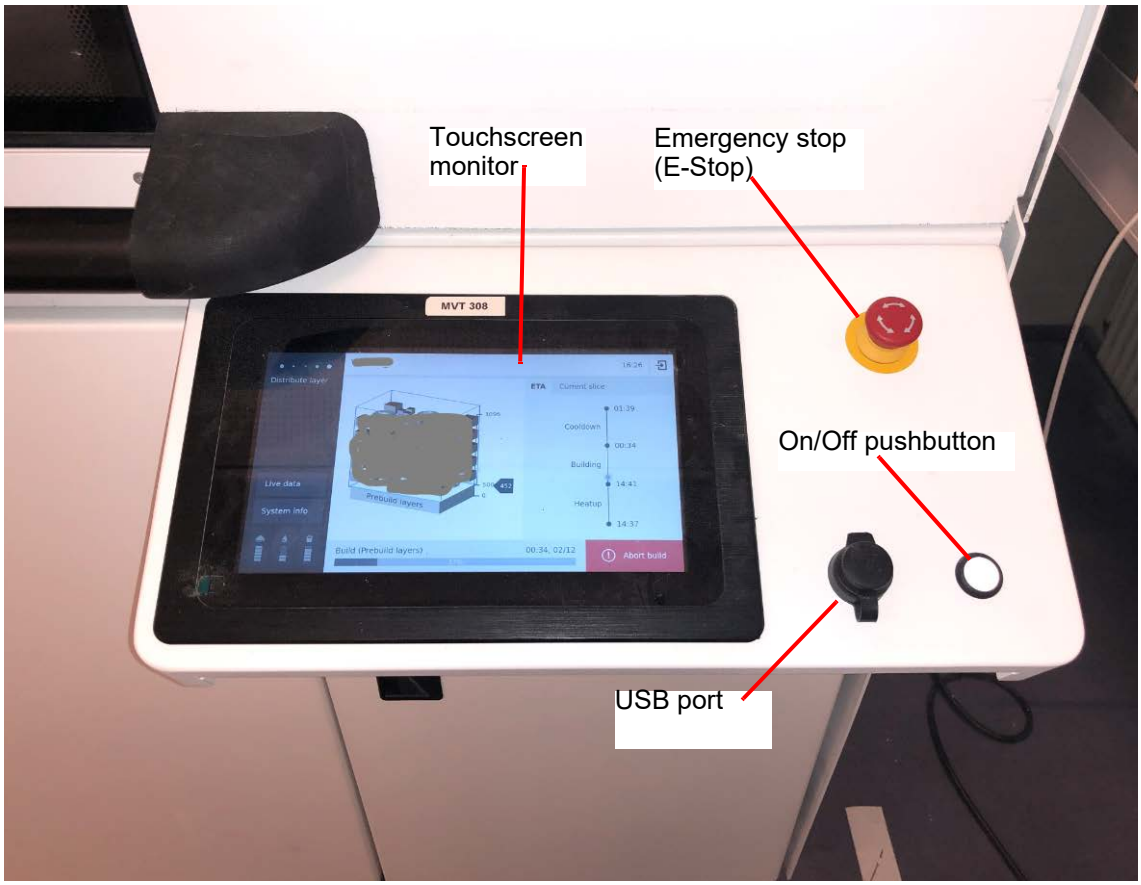
Rear panels:

The rear panels allow access to the powder system and other modules.

Interface Panel

The interface panel houses the printer's touchscreen user interface, power button, and USB ports.

Figure 3: Interface Panel



Touchscreen User Interface

The touchscreen user interface allows the user to control the printer. From the User Interface (UI) various screens and wizards are accessible. The main operations are split into three tasks:

- Start a build
- Remove the build
- Clean the printer

The touchscreen GUI (Graphical User Interface) visually displays the operational state of the printer as well as any warning information available. It provides access to sensor data, printer info, and service tasks.

See Chapter , 4 User Interface (page 79) for detailed information on the components and pages of the user interface.

Power Button

The power button allows you to power the printer ON and OFF (see “Powering ON the Printer” (page 101) and “Powering OFF the Printer” (page 105) for more information).

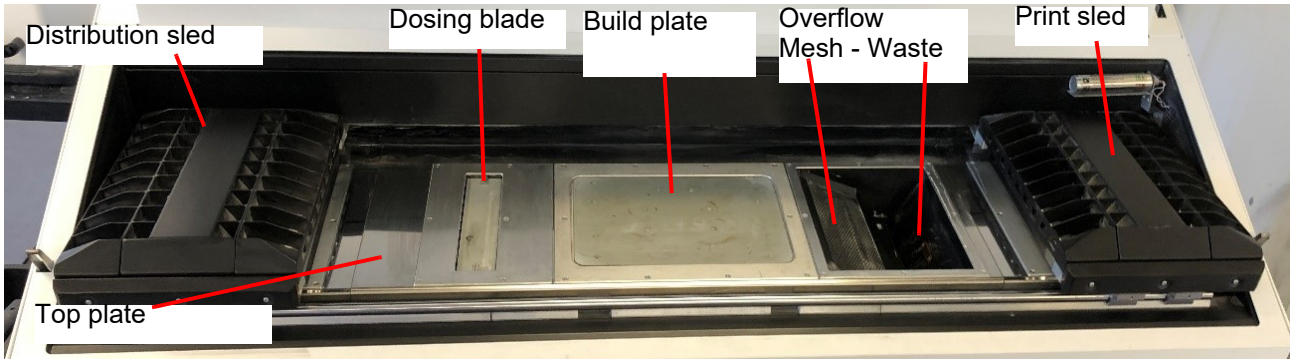
USB Port

The printer's USB port can be used for service activities.

Processing Chamber Components

Opening the lid allows access to the processing chamber. An interlock prevents motor movement if the lid is open. After completion of a build job, all processing chamber components are hot. Use caution when opening the lid after the completion of a build job.

Figure 4: Lower processing chamber components



Lower Processing Chamber Components

Distribution Sled

The distribution sled is equipped with two (one left, one right) infrared (IR) lamps and a distribution roller. Only one lamp is currently used.

Print Sled

The print sled is equipped with three printheads and two (one left, one right) infrared (IR) lamps. Only one lamp is currently used.

Dosing Blade

The dosing blade scoops a portion of the powder from the dosing chamber for each distributed layer.

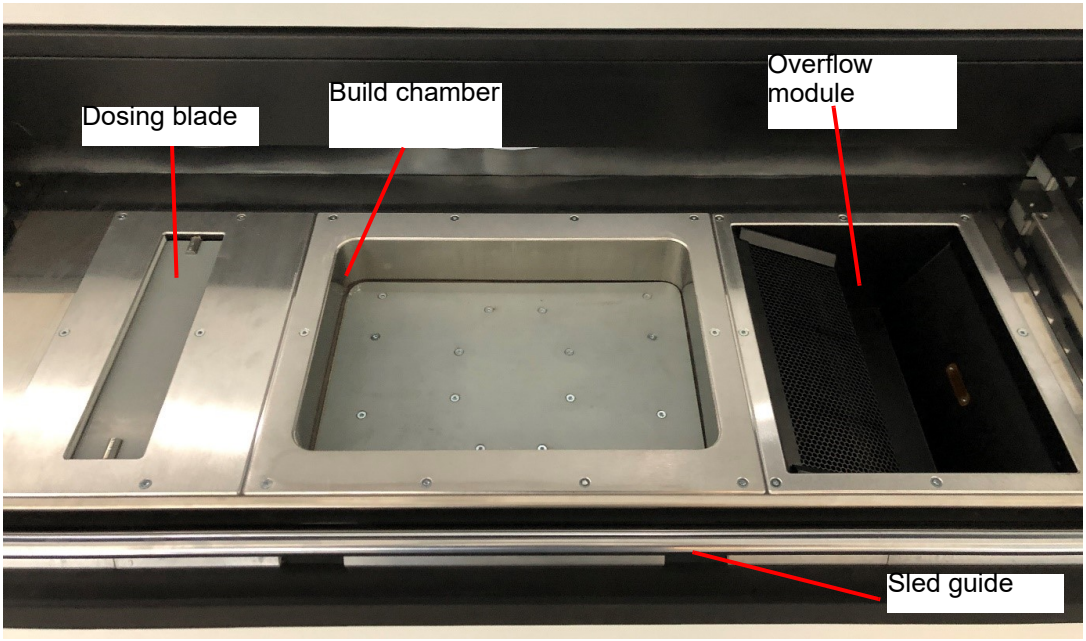
Build Plate

The build plate is heated and moves downwards. Each layer is 100 microns thick. The print sled deposits high absorption fluid onto the build plate. This fluid is then fused to create the parts.

Overflow

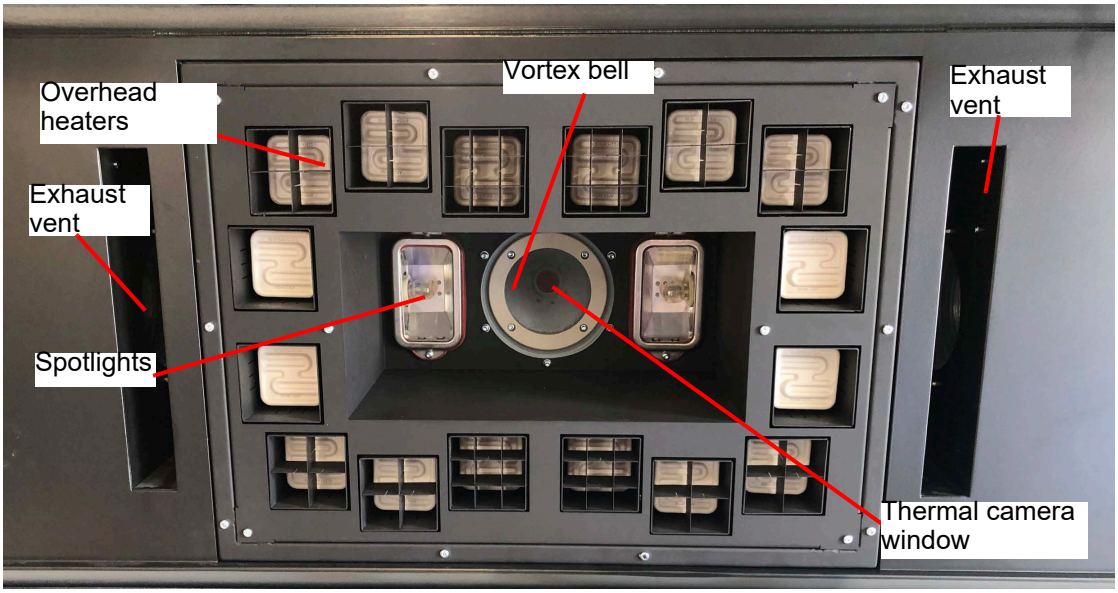
The overflow areas are where, during each sled pass, any excess powder is moved. Most of the powder will go through the mesh and return to the powder system for reuse. If the excess powder is fused, or if parts are being dragged, they will fall into the overflow module waste container.

Figure 5: Center of processing chamber (bottom)



Upper Processing Chamber Components

Figure 6: Upper processing chamber components



Overhead heaters

The overhead heaters are an array of 16 ceramic heaters that are grouped into four groups.

Vortex bell with thermal camera window

The vortex bell with thermal camera window is an assembly with a window for the thermal camera.

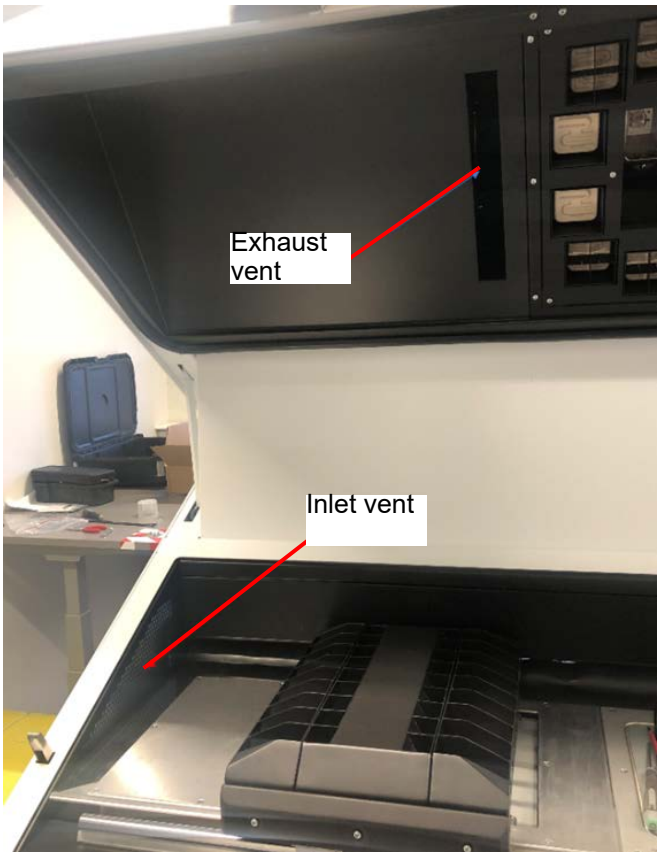
Spotlights

The spotlights are two lights that are used to illuminate the processing chamber.

Air vents

The exhaust air vents are located on the upper processing chamber. The inlet air vents are located on the lower processing chamber. Both vents permit air flow within the processing chamber. See Figure 7.

Figure 7: Air vents



Modeling Materials

Materials Used

The H350 printer uses two materials to create parts: powder and HAF high absorption fluid. The powder can be Stratasys High Yield PA11 or SAF™ PA12.The HAF is contained in a four-liter cartridge.

Powder

The two powders used in the H350 printer are Stratasys High Yield PA11 or SAF™ PA12. Printers are set up at the factory to run in PA11 Mode. A printer set up to run in PA11 Mode can be converted to run PA12 by following a simple procedure. Contact your Stratasys Customer Success representative to find out more about this conversion process.

An H350 printer cannot be converted from PA12 Mode to PA11 Mode.

High Absorption Fluid

HAF is jetted by the printheads onto the powder surface. HAF efficiently absorbs IR radiation from the fusing lamp, which causes the underlying powder to fuse.

Printing Overview

The parts are sliced into 100 micron thick layers by the Stratasys H350 Build Processor. For each left-to-right pass of the distribution sled, the printer deposits a 100 micron thick layer of powder onto the build bed. For each left-to-right pass, the print sled deposits high absorption fluid for the corresponding slice and the IR lamp mounted behind the printhead on the print sled fuses the powder that received HAF. This completes the printing process.

For every pass of the print sled, the printhead cleaning module is activated and cleans the printhead surface of excess fluid and powder. The fluid removed from the printeheads during cleaning is collected in the printhead cleaning module and moved to the waste cartridge.

The amount of fluid and powder used is monitored by the printer software. The current levels are available to the user at any time. Before starting a build job, the printer will estimate whether the available materials are sufficient for the completion of the build job. If the amount is insufficient, a warning displays.

The cartridges are controlled by an RFID chip and only approved materials should be used in the printer.

Reports

When the build job is completed, the software will issue a pdf report with all the relevant details. This occurs regardless if the print was successful.

Software

Printer Software

Printer software is installed during the manufacturing process. The printer software can be updated as new versions become available. Printer software is the software used to control the printer.

Build Preparation Using GrabCAD Print for H350

The printer builds parts by processing an original CAD or STL file into a Stratasys SAFB file which is then downloaded to the printer. GrabCAD Print is the preferred software used to process files and then transfer them to the printer to be built. As part of the initial installation and setup process, download and install GrabCAD Print software on the H350 printer. See “Installing and Connecting the H350 3D Printer to the GrabCad Print Client” (page 24).

The header of the SAFB file contains the processed job’s basic information.

GrabCAD Print help documentation includes detailed information on how to connect the H350 printer, process parts, and edit the job queue. The help file can be accessed from either the application’s Help menu or directly from the GrabCAD website.

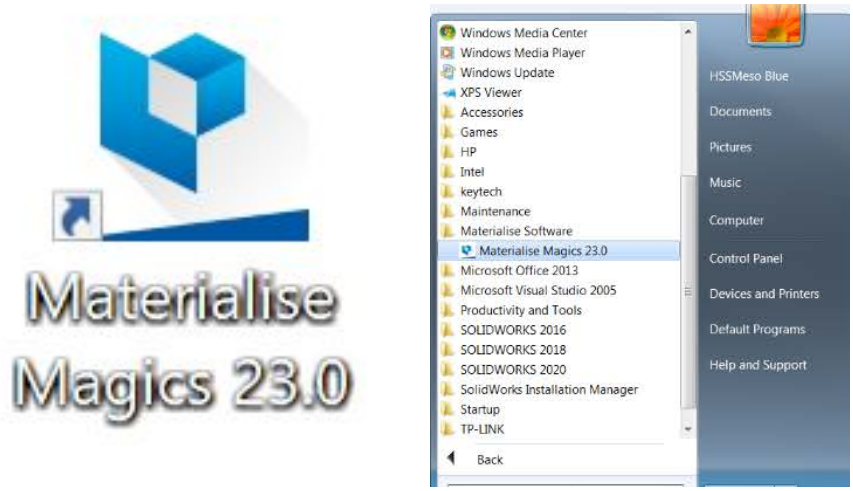
Build Preparation Using Materialise™ Magics™

You must purchase the Materialise Magics Sinter module to perform some of the tasks described below.

Opening the software

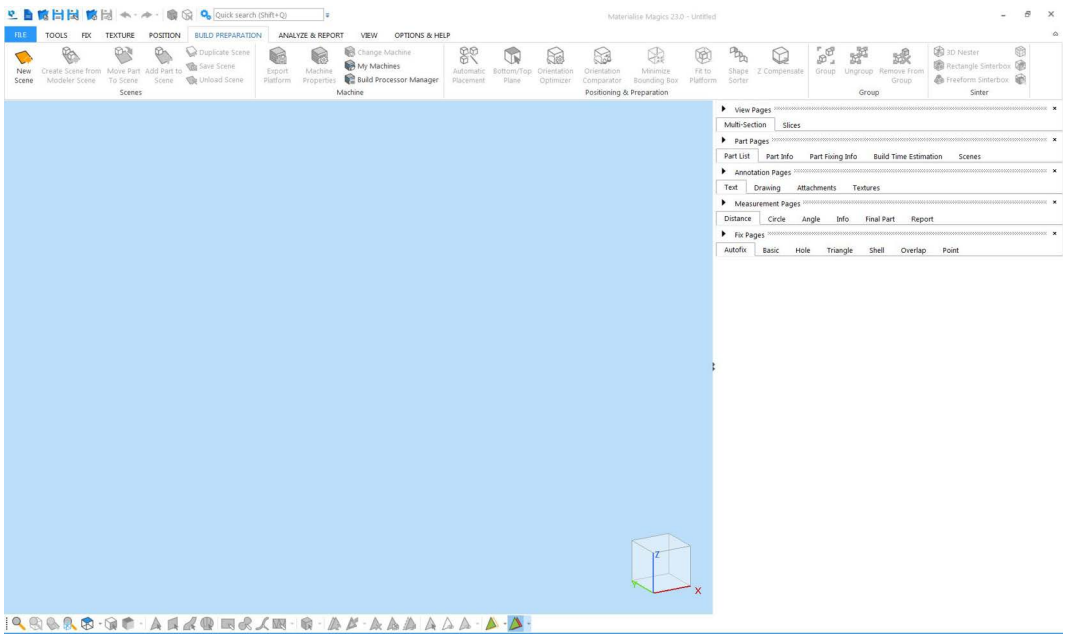
Open Magics software by clicking the desktop icon. Alternatively, open the software using the Start menu.

Figure 8: Open Magics screen



Once Magics has opened, the following screen displays.

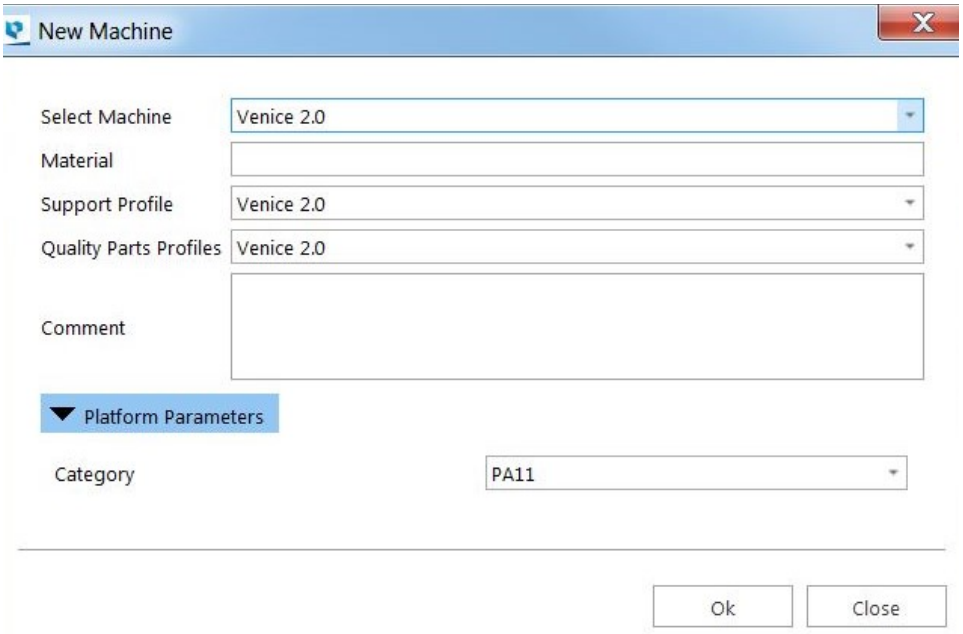
Figure 9: Magics home screen



Loading a scene

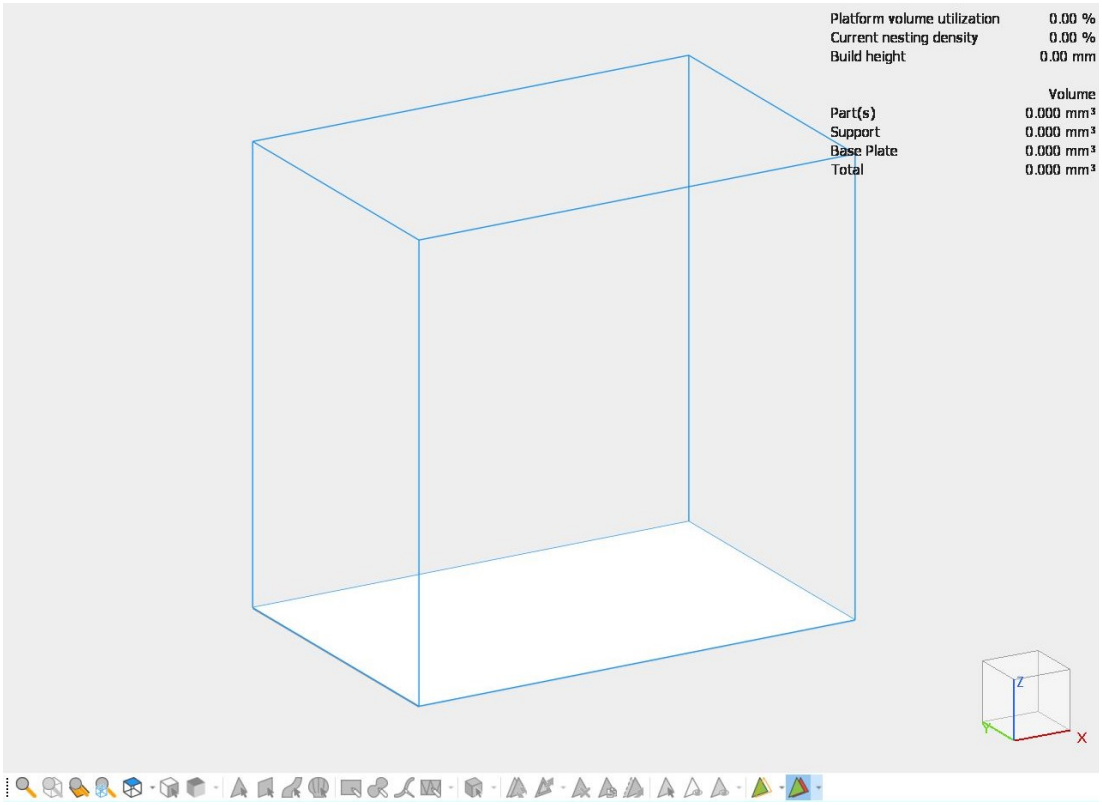
Loading a new scene enables the software to create a build volume that is specific to the model of printer being used. Create a new scene by selecting the **Build Preparation tab | New Scene button** | select the correct printer in the dialog box.

Figure 10: Load a scene



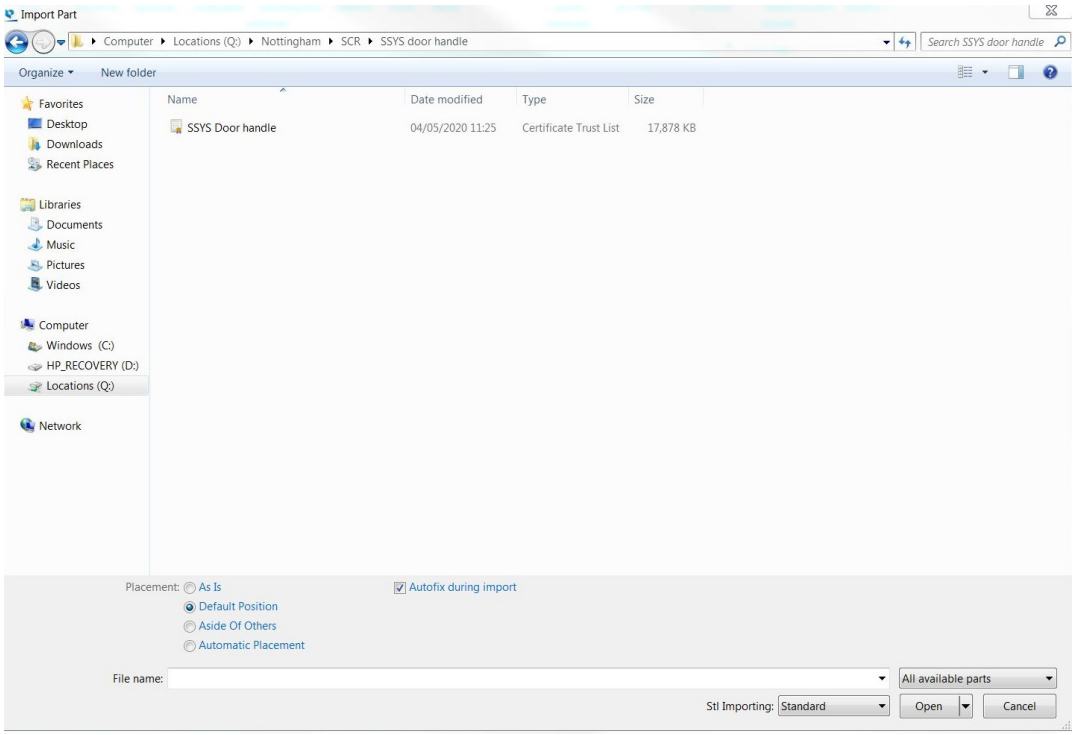
The build volume will be visible in the blue area of the screen.

Figure 11: Build volume



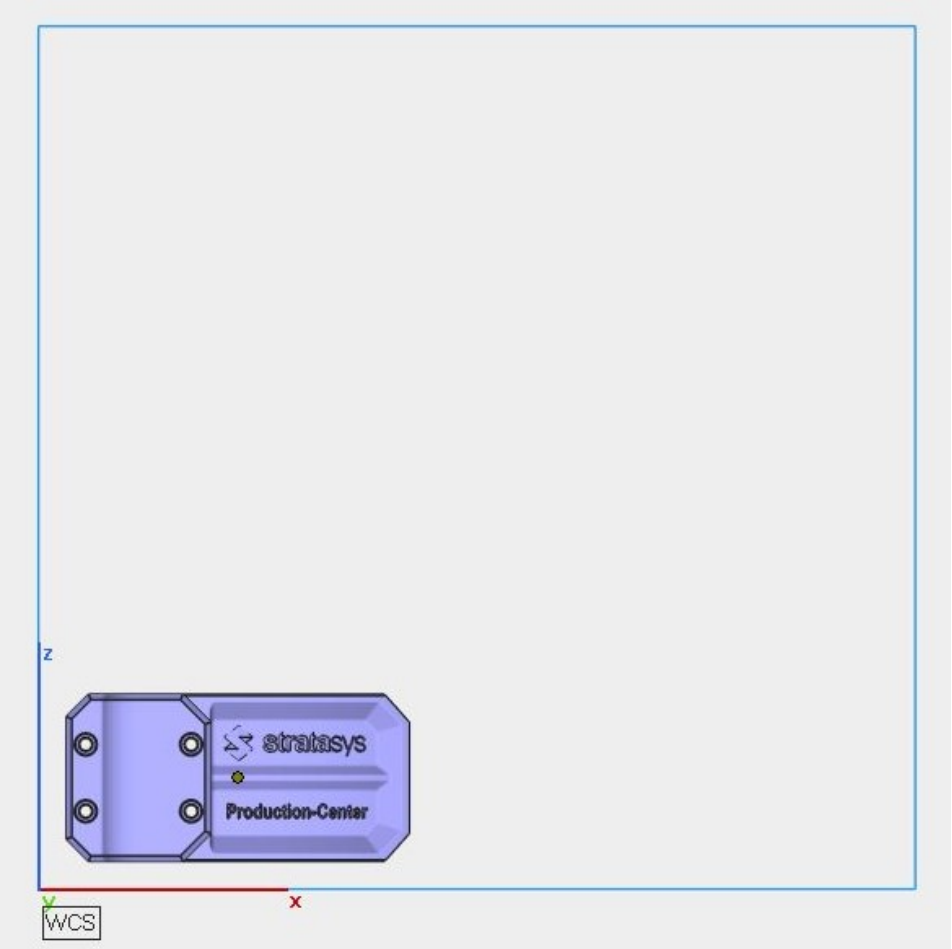
Importing a part

1. Using the  **Import Part** button at the top of the screen locate the desired part.



2. Once you have located the desired part, click **Open**. The part displays in the build area of the window.

Figure 12: Part in build window



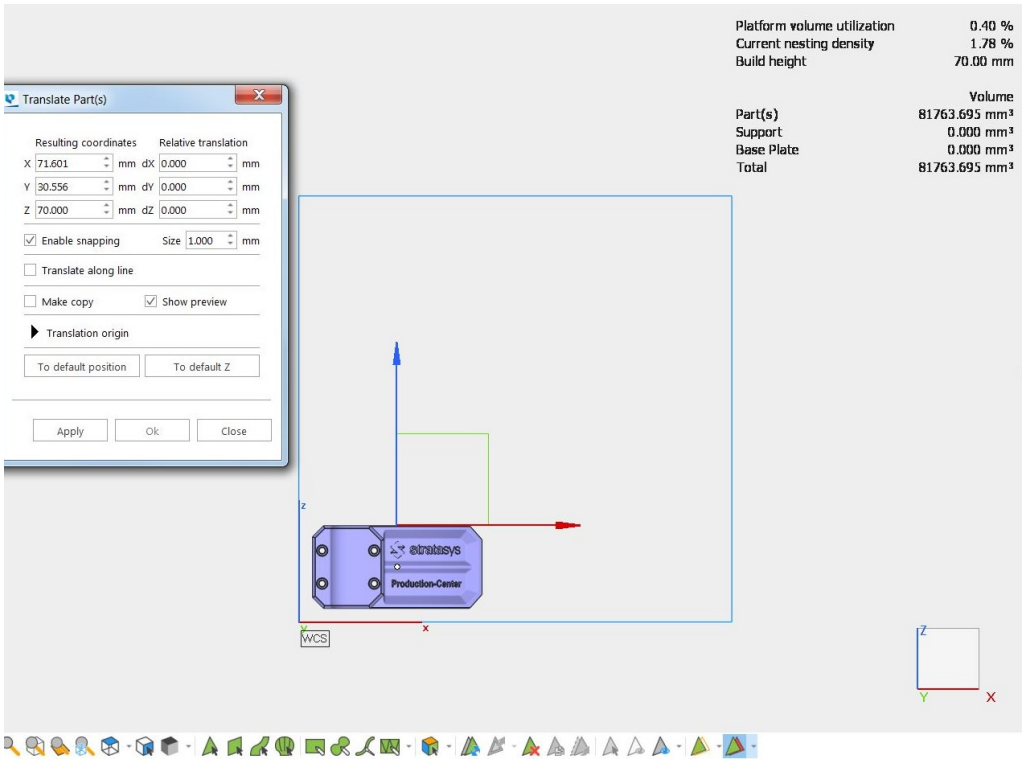
Translation and Rotation

To translate or rotate a part, first select the part by left-clicking on it. Multiple parts can be selected at once by clicking and dragging the box around them. The rotation center circle for that the selected parts will display white.

Once the part is selected, locate the **Position** tab and click **Translate**.

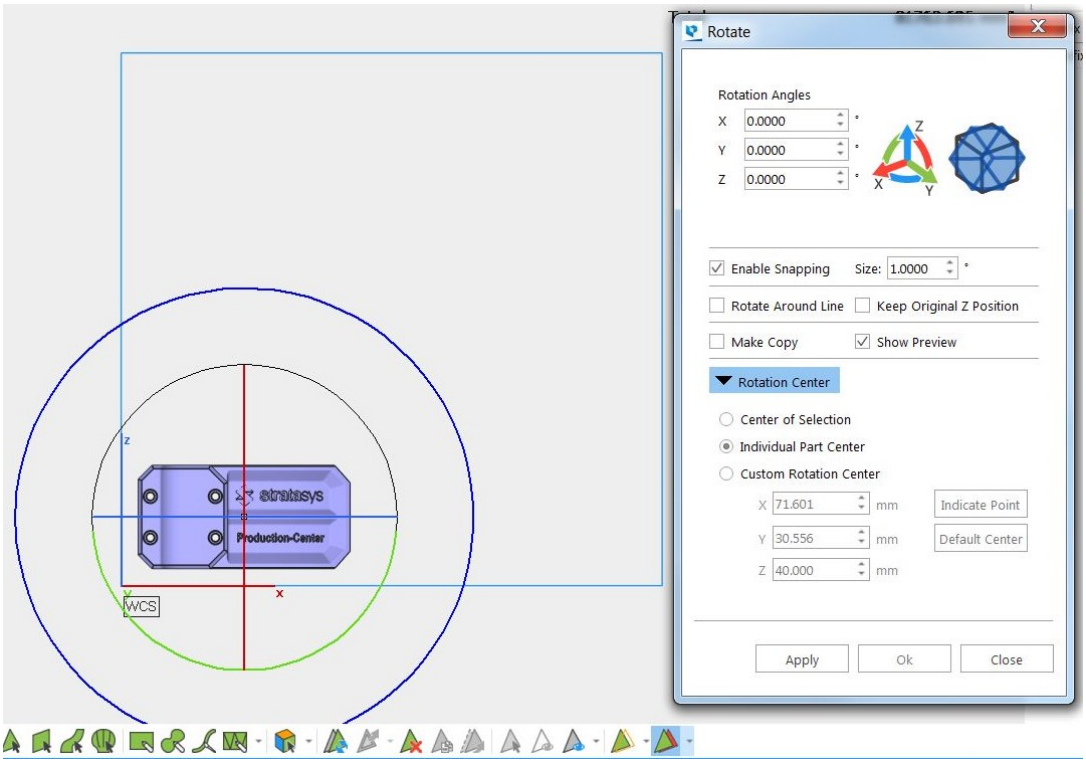
Clicking and dragging the X (blue), Y (red), and Z (green) arrows moves the part around the build volume. Typing in the X, Y, and Z field in the Translate dialog box will also accomplish this.

Figure 13: Translation



Rotation is accomplished in a similar manner; however, the **Rotate** button inside the **Position** tab is used. Also, Instead of arrows there are circles around the part.

Figure 14: Rotation

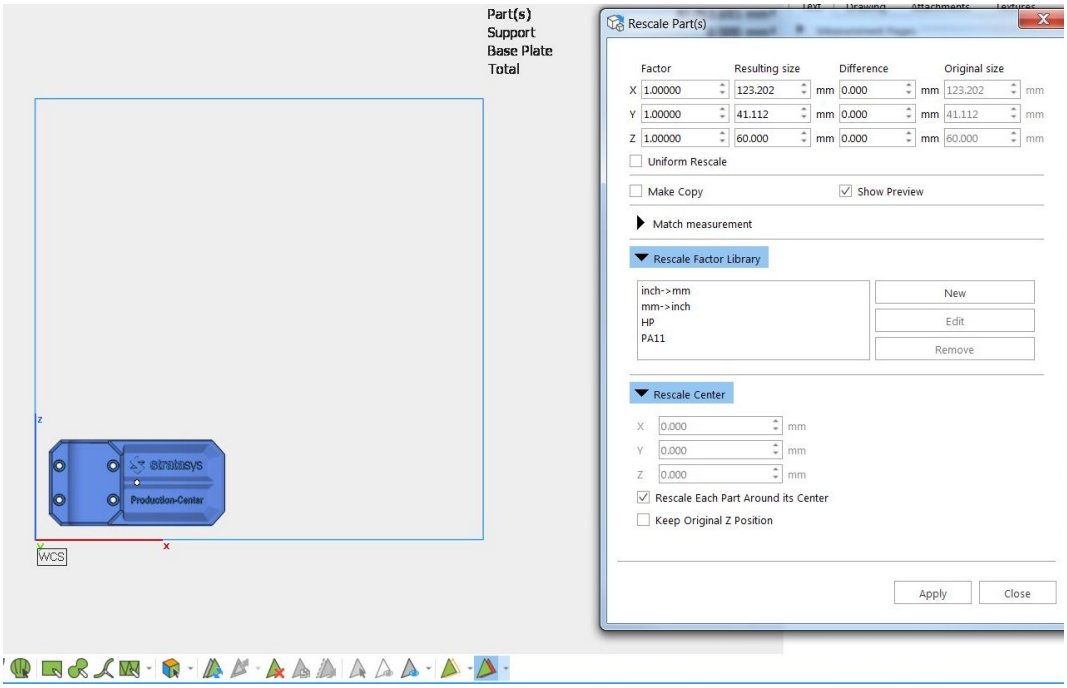


If a part or section of a part is red, it outside of the build volume. The area in red needs to be moved so that it is completely contained inside the build volume to be printed.

Rescaling

Rescale parts using the **Rescale** function found in the **Position** tab.

Figure 15: Rescale

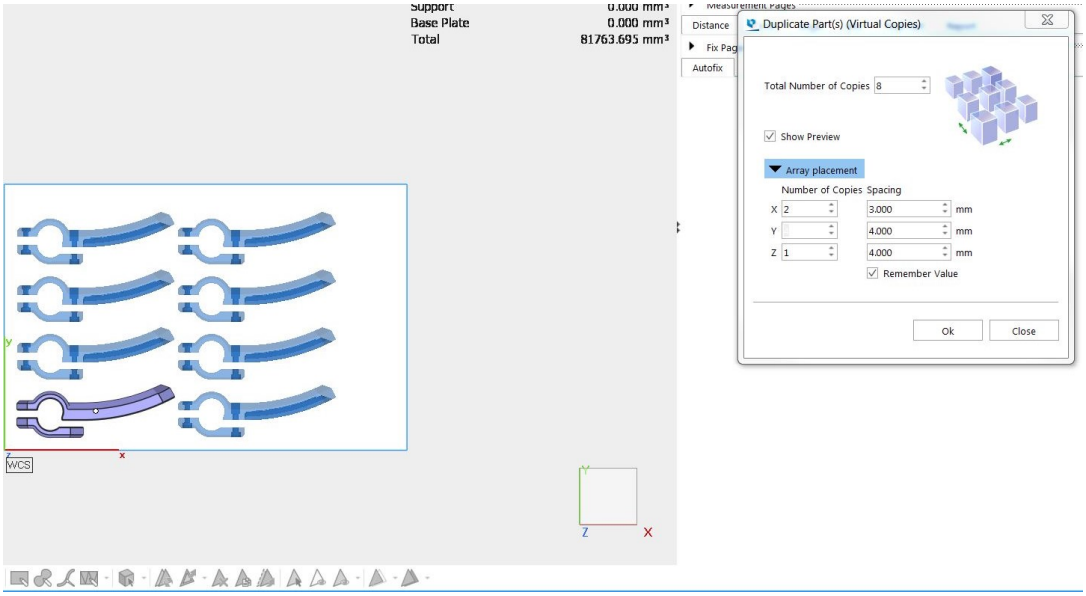


Duplication

You can add multiple copies of the same part using the **Duplicate** feature found within the **Tools** tab.

Enter the total number, including the original part, of required parts. Select an orientation for the parts. If the **show preview** button is selected, the blue, ghost parts indicate the positions of the duplicated parts.

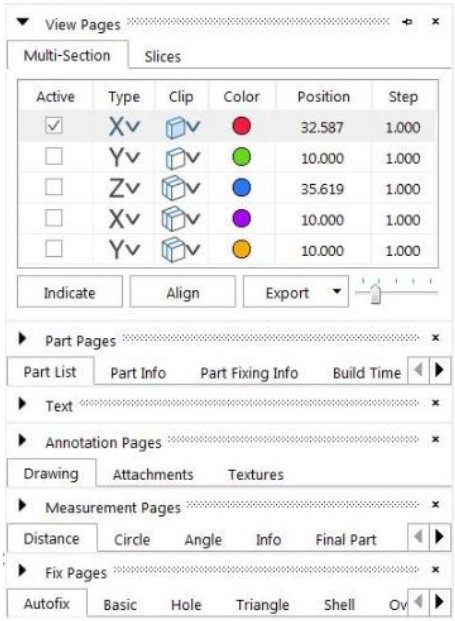
Figure 16: Duplication



Cross Sectional view.

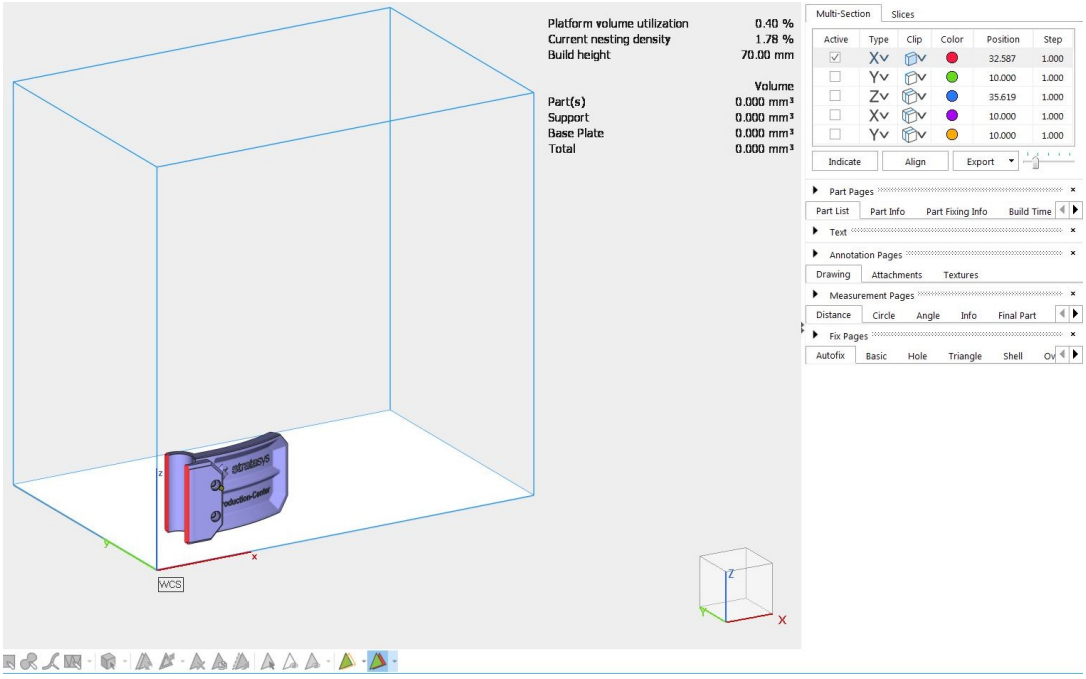
On the right side of the screen there are drop down menus labeled: **View Pages**, **Part Pages**, **Text, Annotation Pages**, **Measurement Pages**, and **Fix Pages.** Inside the **View Pages** drop-down menu you will see the following image.

Figure 17: Multi-Section tab



By checking the **Active** box next to **X,** the slider (next to **Export**) is used to move the view bisecting the part in the X direction. See Figure 18. The bisecting direction can be changed by checking the **Active** box corresponding to the axis along which you wish to see the cross-section.

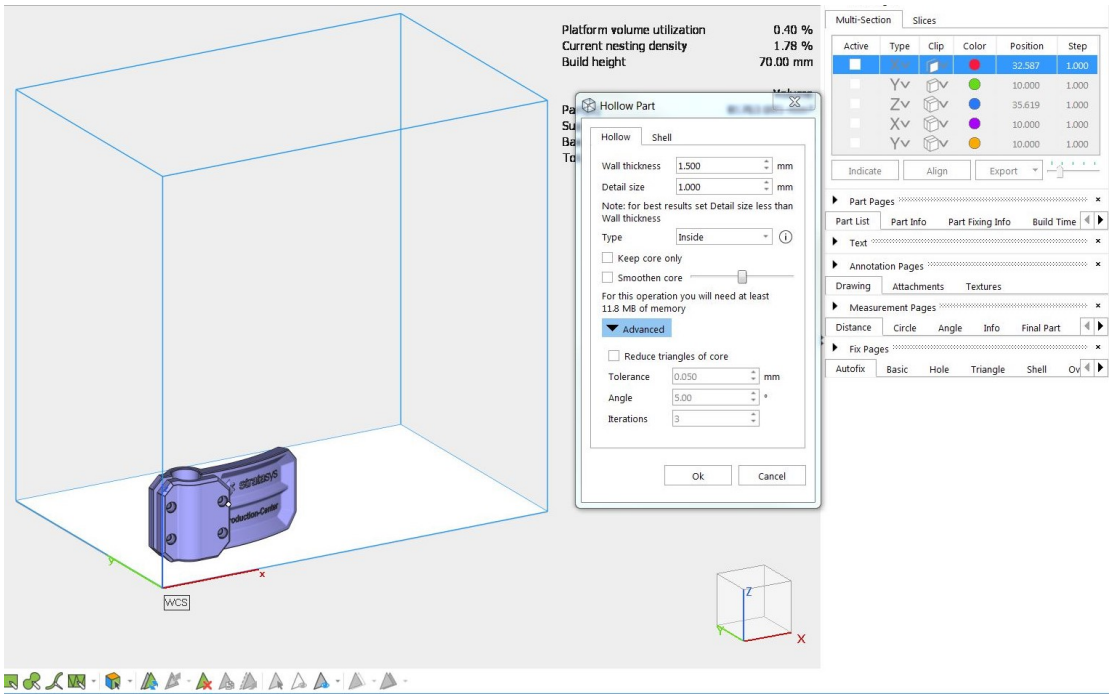
Figure 18: Viewing a cross-section



Hollowing

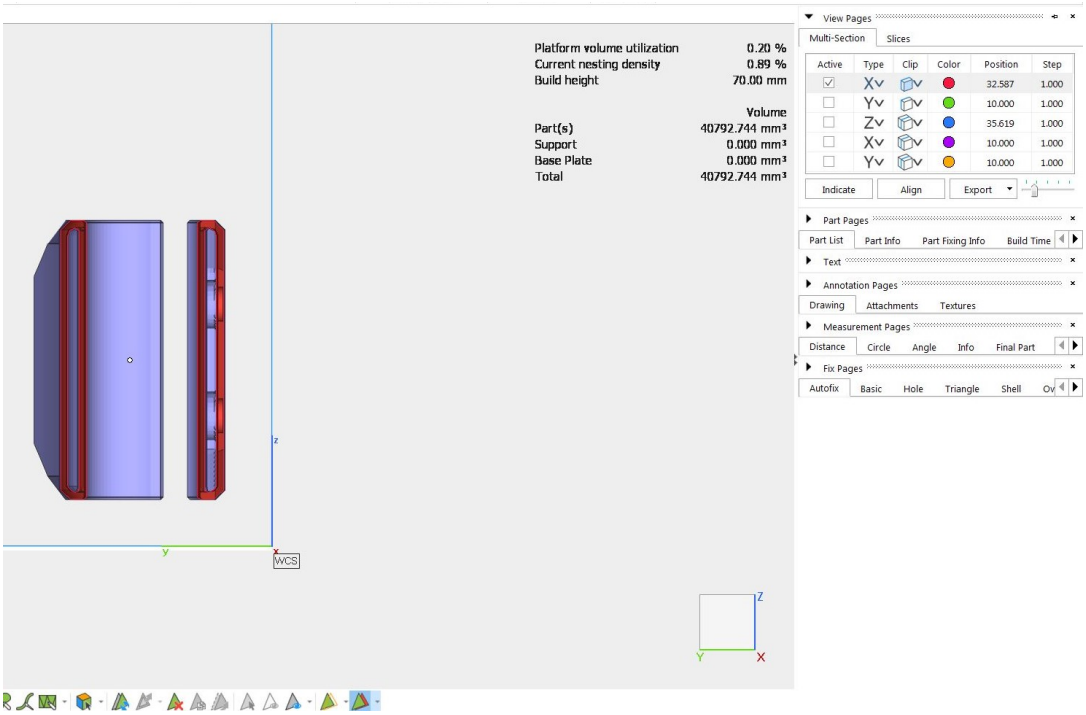
Select the part and click the **Hollow** button located in the **Tools** tab. Enter the desired wall thickness in the **Hollow Part** dialog box.

Figure 19: Hollowing a part



Once the hollowing has completed, use the cross-section views to confirm that the parts are hollow.

Figure 20: Confirming a hollowed part

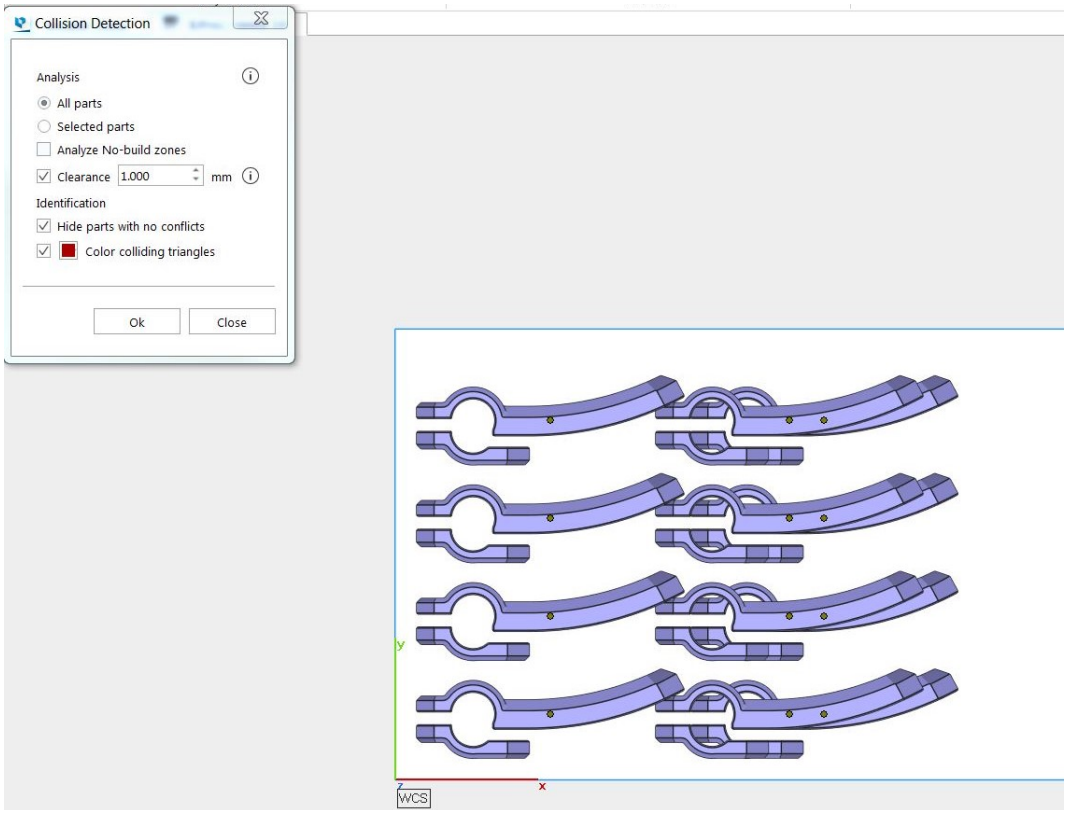


Collision Detection

This function allows quick and easy detection of overlapping parts within the build volume. If parts overlap on the screen, then the final printed parts will be attached to one another.

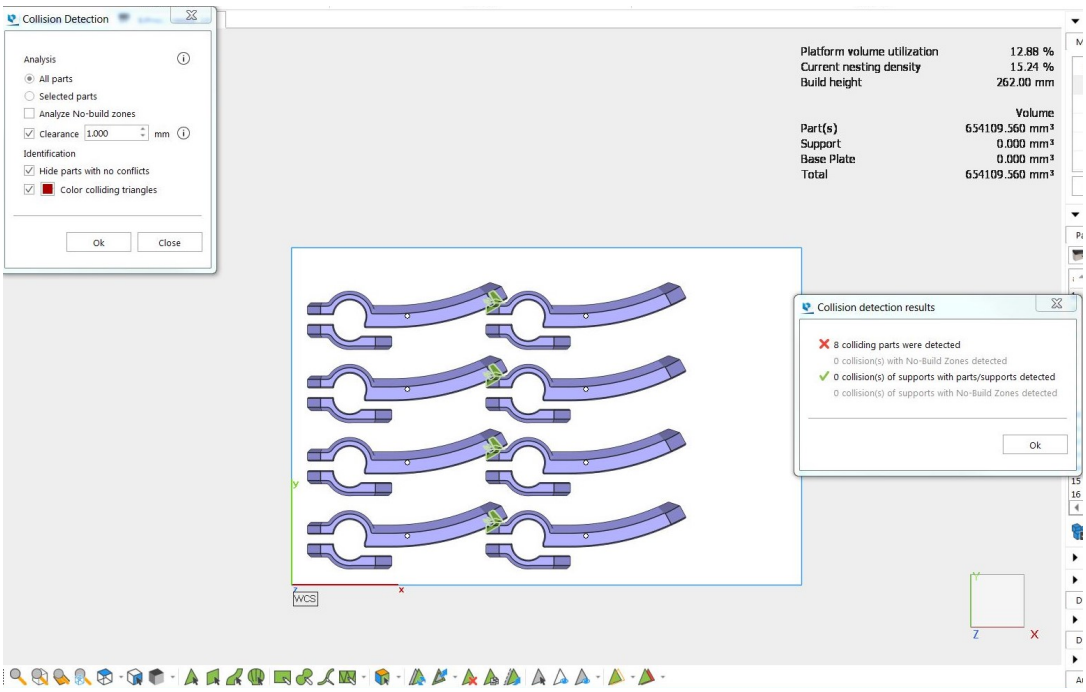
The **Collision Detection** function is found within the **Analyze & Report** tab. In the **Collision Detection** results dialog box, select some or all parts and click **OK**.

Figure 21: Collision Detection screen



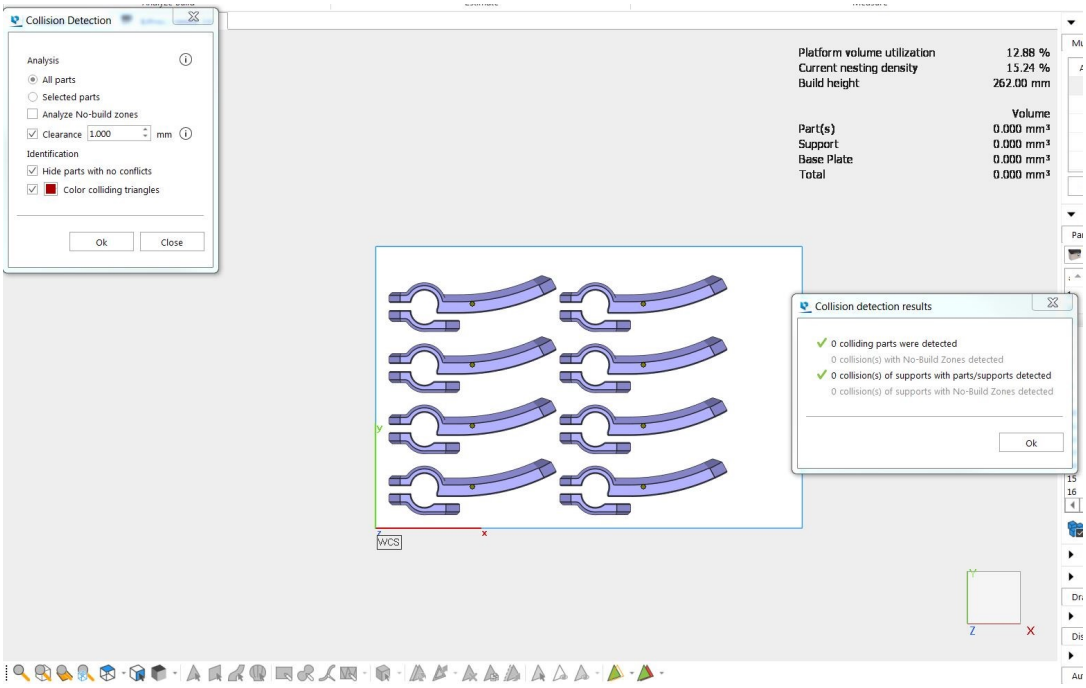
If the **Collision Detection** function finds a problem, the results are displayed in the **Collision Detection** results dialog box as shown below:

Figure 22: Collision detected



If no collision is detected, the results are displayed in the **Collision Detection** results dialog box as shown below:

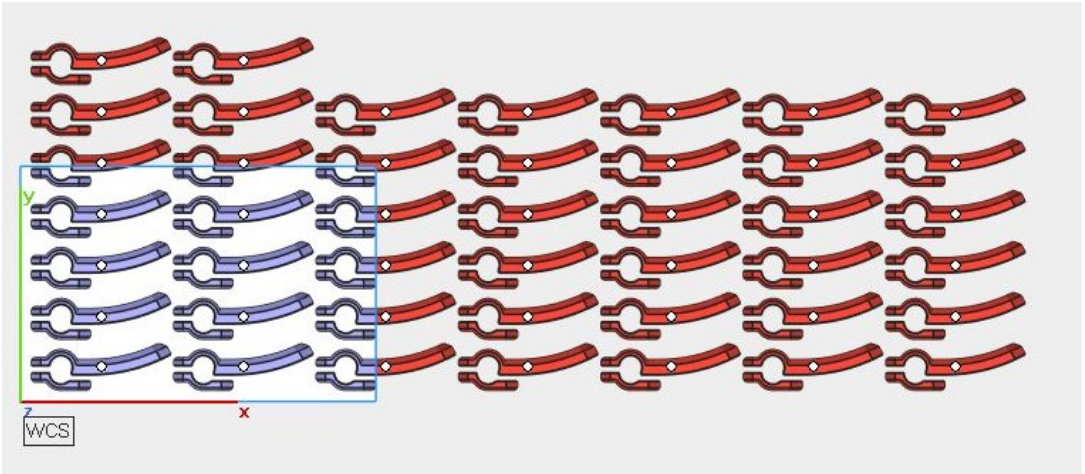
Figure 23: No collision detected



3D Nesting

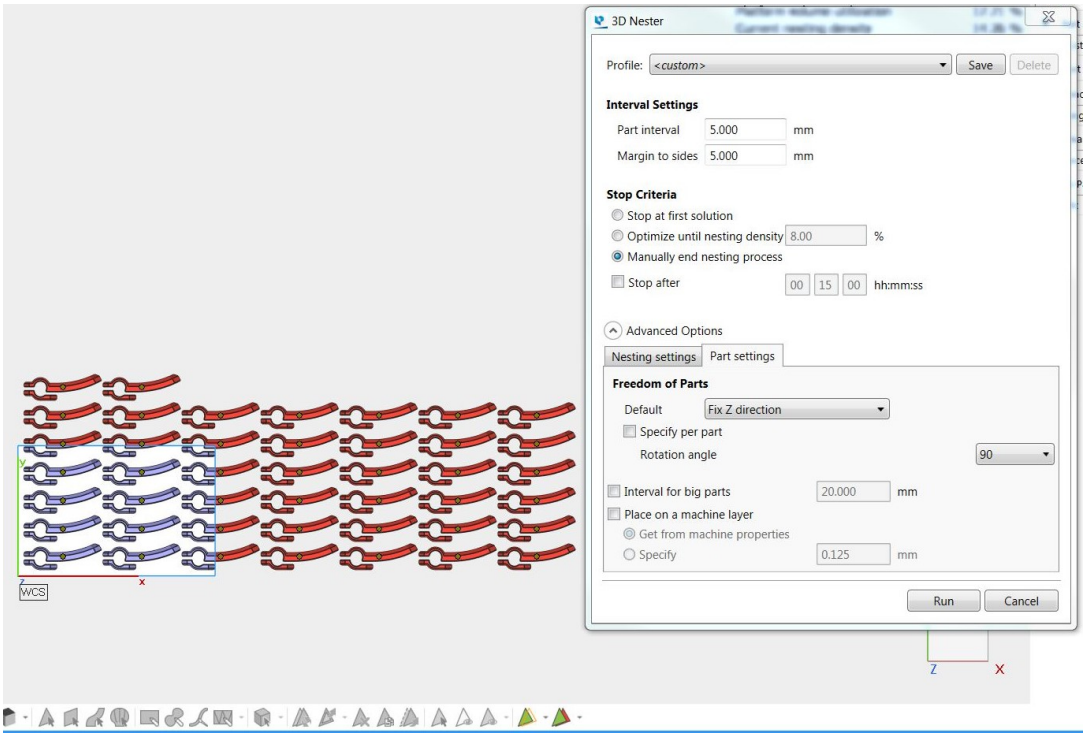
Magics software allows you to automatically nest multiple parts by using the 3D nesting feature. This feature is found under the **Position** tab.

Figure 24: 3D nesting



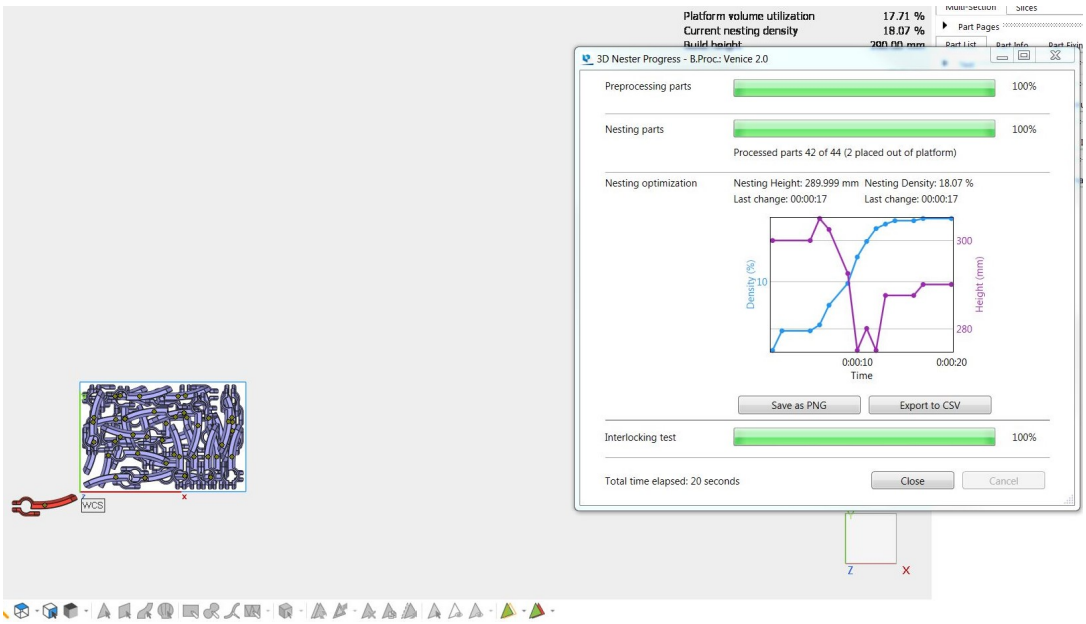
When performing 3D nesting, a dialog box displays where parameters such as part rotation, translation around the build volume, and space between parts are set.

Figure 25: Setting 3D nesting parameters



Once acceptable parameters have been set and the process has been run, the screen displays as follows:

Figure 26: Final 3D nesting

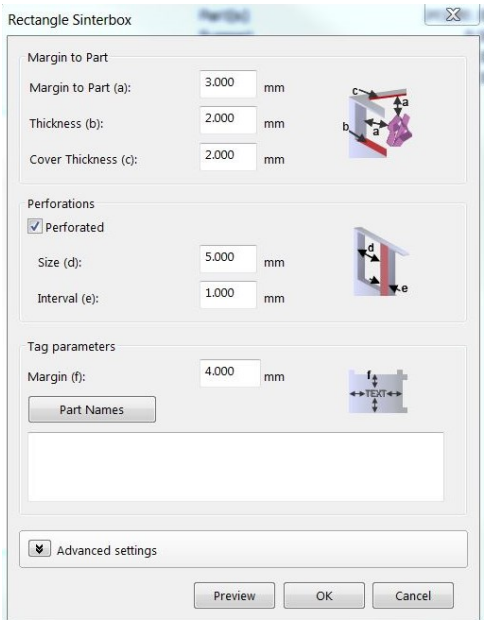


Here you can see two parts were placed outside of the nesting platform. This was done because the software algorithm could not nest those parts.

Sinter box

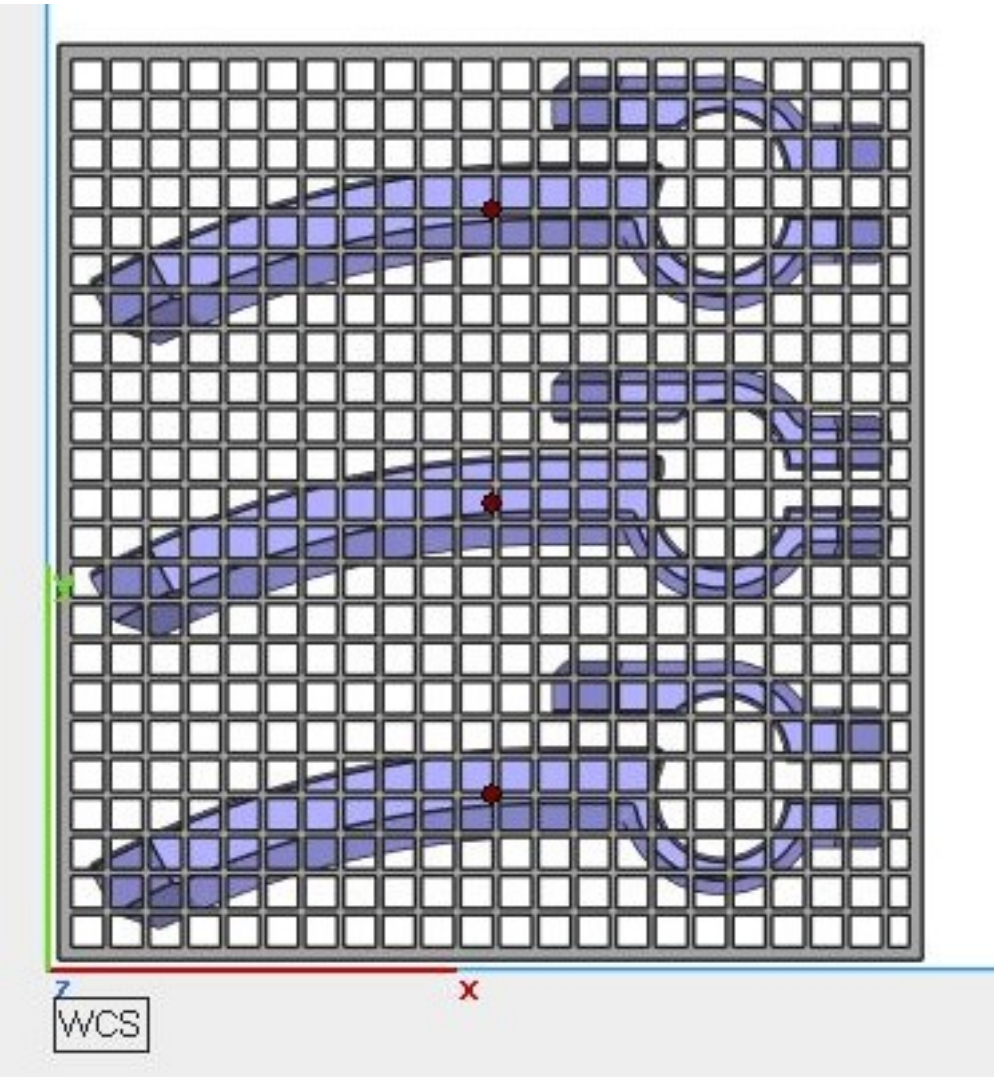
When performing a build job with groups of parts, it may be advantageous to surround them with a sinter box. This way, the parts will not be separated and lost during unpacking. Select the parts to be surrounded by the sinter box and locate the sinter box button under the **Build Preparation** tab. A dialog box displays allowing the sinter box parameters to be set.

Figure 27: Sinter box parameters



After creation, the sinter box looks as shown below:

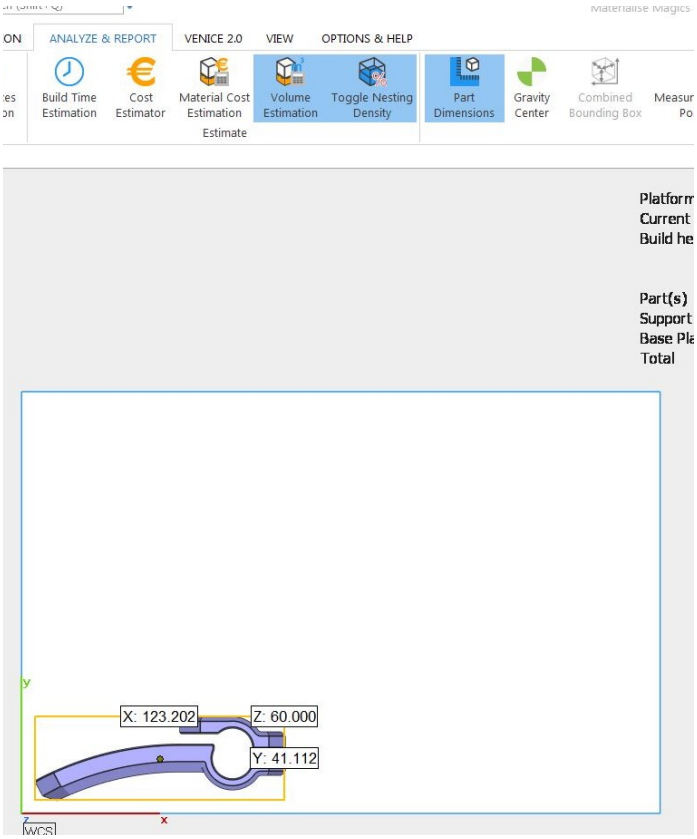
Figure 28: Completed sinter box



Dimensions

The part bounding box dimensions can be toggled on or off as needed. The **Part Dimensions** button is found under the **Analyze & Report** tab.

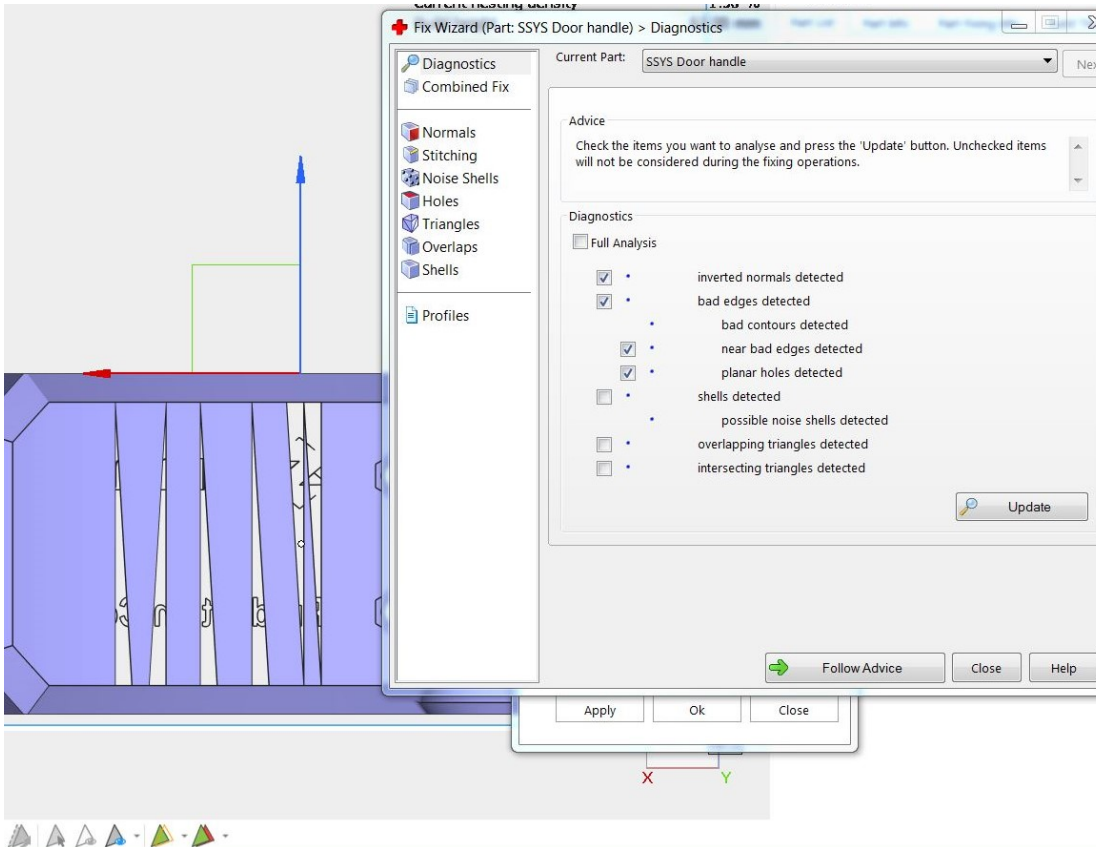
Figure 29: Part Dimensions



Fix Wizard

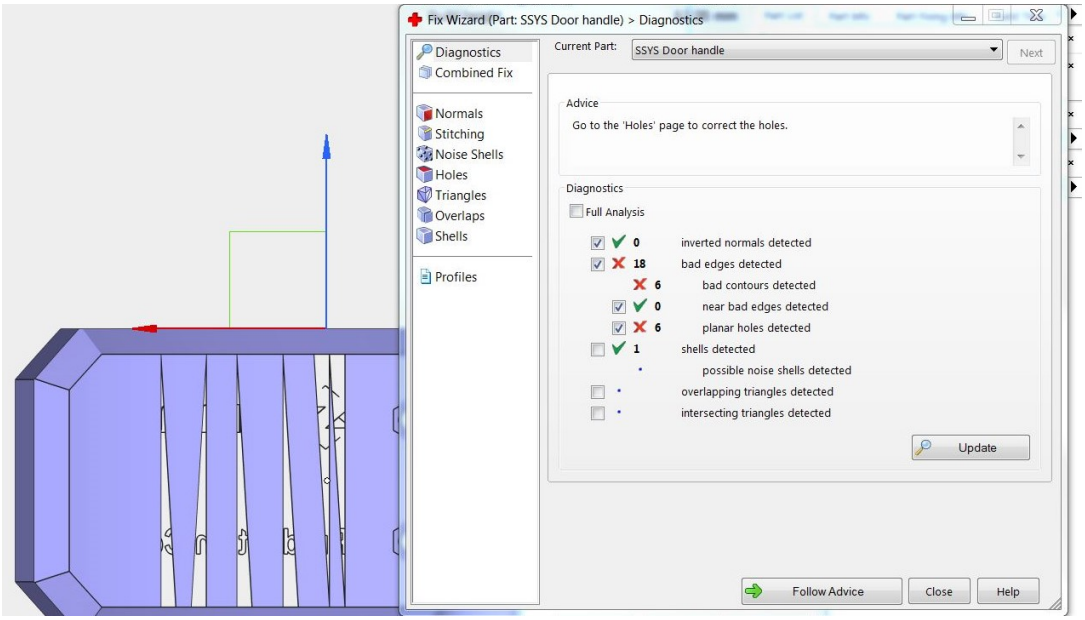
The **Fix Wizard** allows for correcting errors in a part before the build job is run. These can be errors such as holes or overlapping triangles. The **Fix Wizard** is found under the **Fix** tab.

Figure 30: Fix Wizard



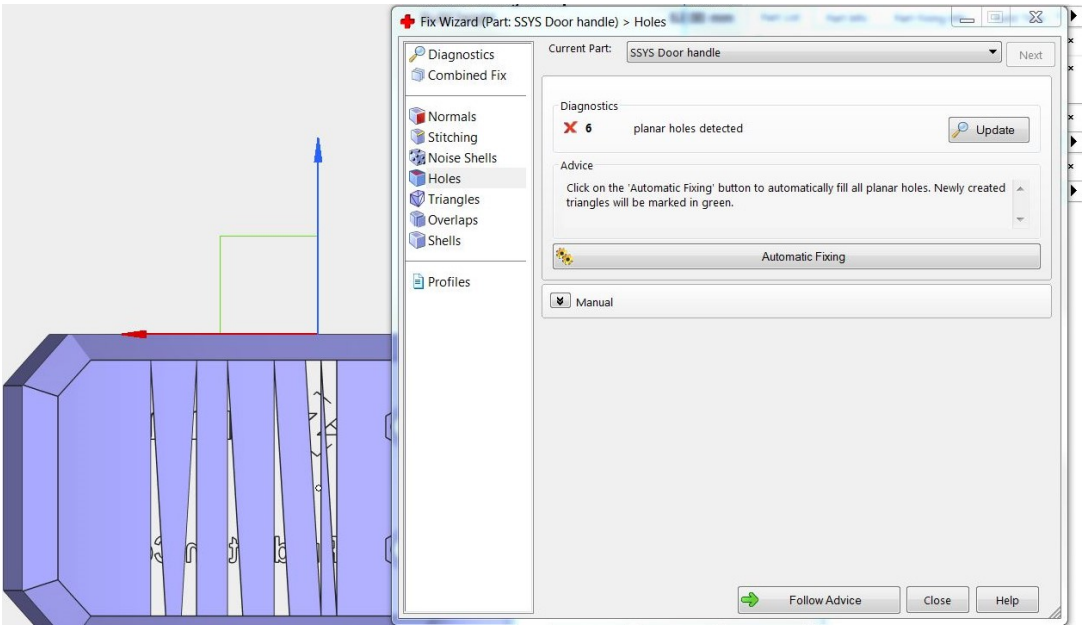
Search for specific errors by checking the appropriate boxes on the **Diagnostics** dialog box. Press **Update**.

Figure 31: Diagnostics window



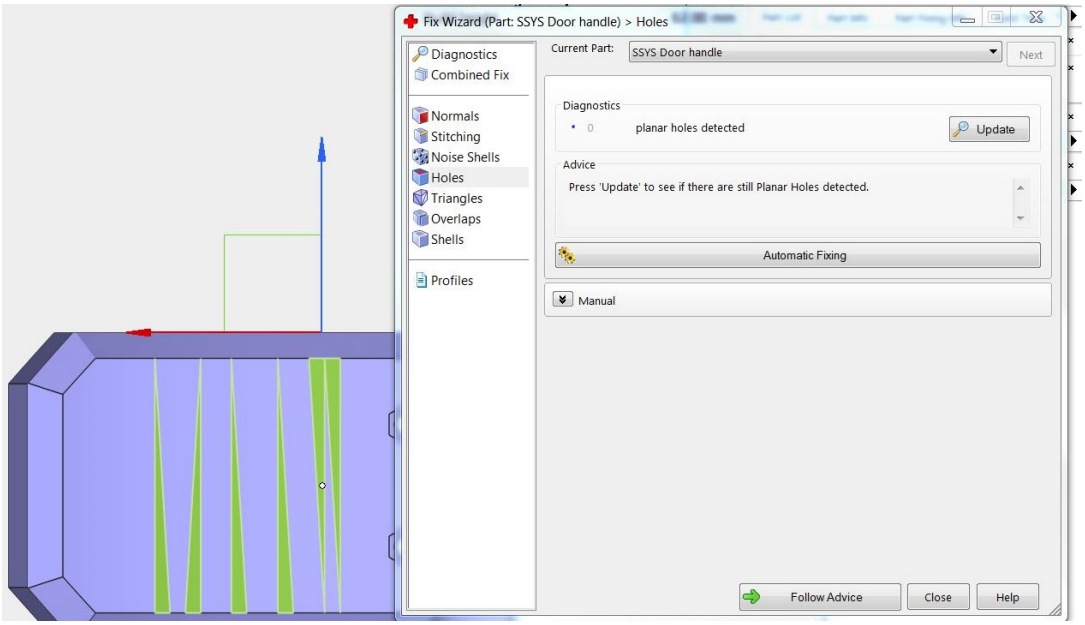
Magics™ software calculates and highlights the errors. Click the **Follow Advice** button to identify which errors can be fixed.

Figure 32: Follow Advice button



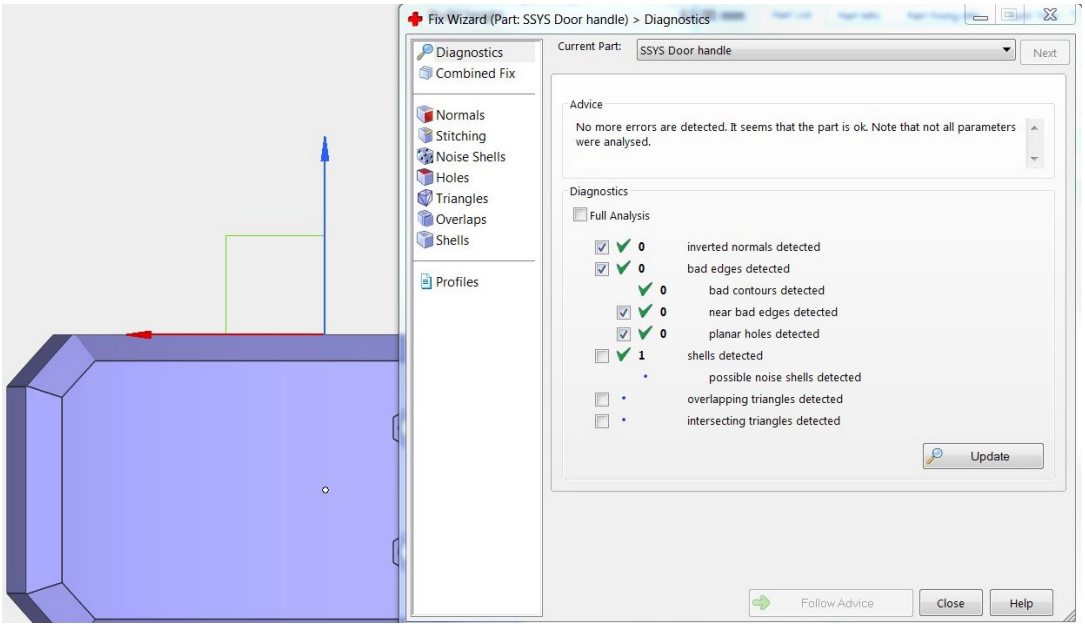
Click **Automatic Fixing** and allow the software time to calculate and fix the errors. It will highlight fixed holes in green as shown in the following:

Figure 33: Automatic Fixing



Once this process is complete, return to the **Diagnostics** page and click **update**. The screen should now display green checks and no errors.

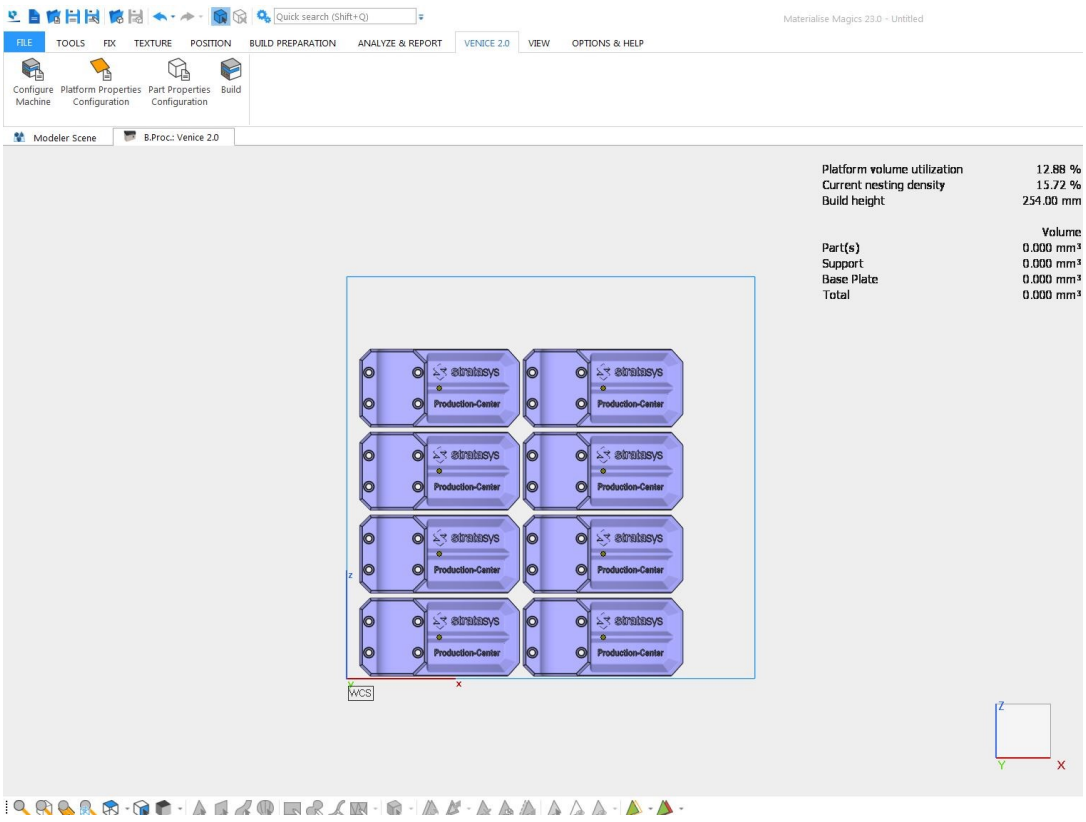
Figure 34: Updated Diagnostics



Submitting a Job

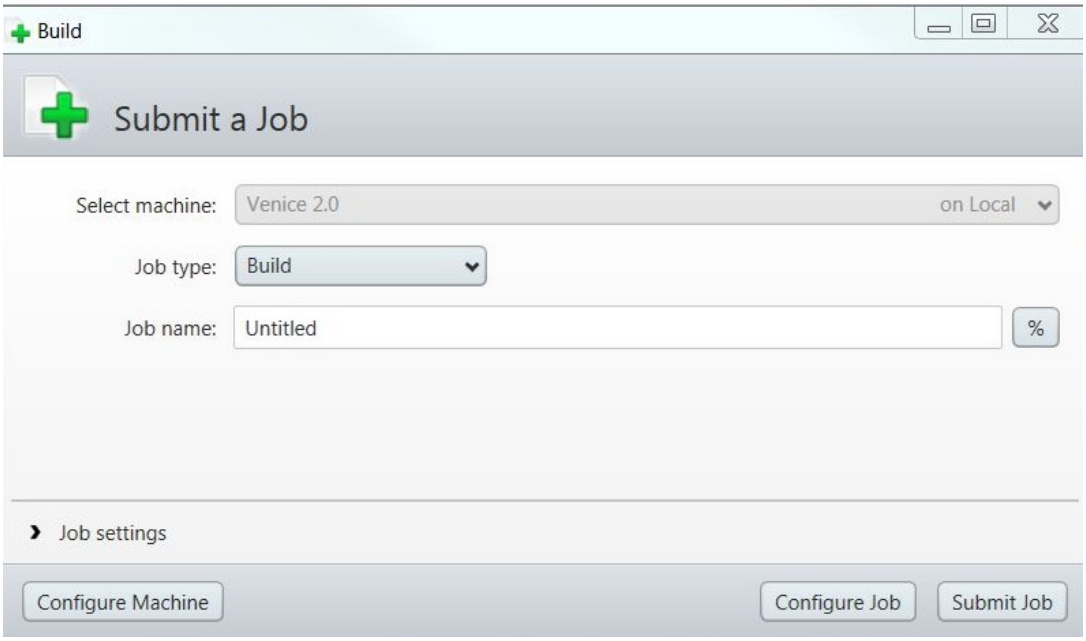
When the preparation process is complete, locate the **Build** button under the tab that contains the name of the printer upon which you are planning to run the build job.

Figure 35: Preparing to submit



The **Submit a Job** dialog box displays. This dialog allows for naming the build and, behind the **Configure Machine** button, choosing where to save the build file. Click **Submit Job** and the build will be sliced and saved for print.

Figure 36: Submit a build job



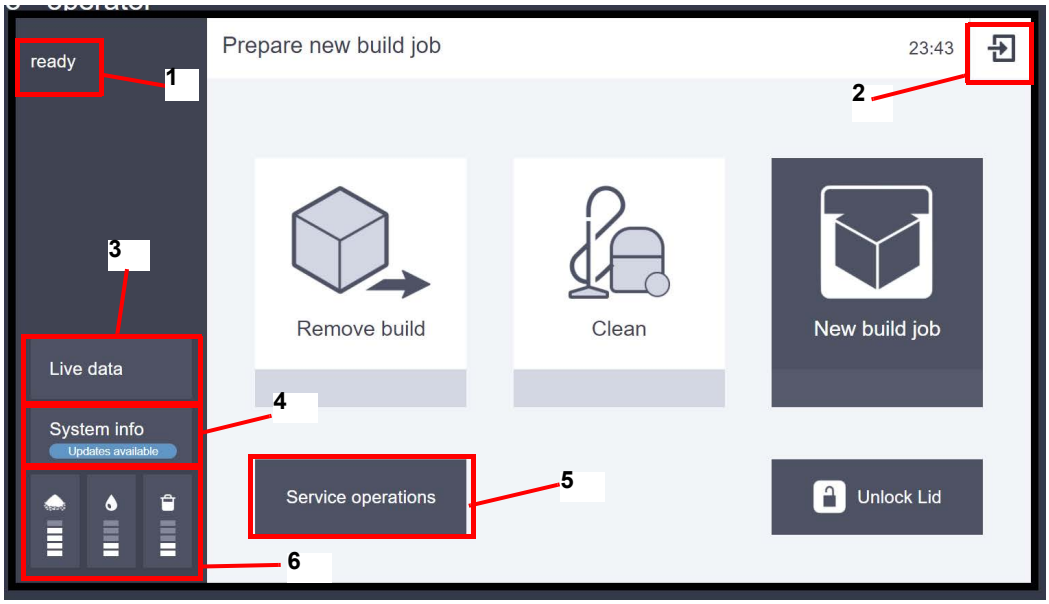
4 USER INTERFACE

This chapter provides an overview of the H350 3D Printer User Interface (UI). Specific printer operation information and procedures can be found in Chapter , 5 Operating the Printer (page 101). You must power ON the printer prior to using the touchscreen (see “Powering ON the Printer” (page 101) for instructions).

Overview

The printer is operated through the user interface from the touch monitor at the front side panel of the printer. Each page of the UI is composed of six main areas of functionality; these items are highlighted in Figure 1.

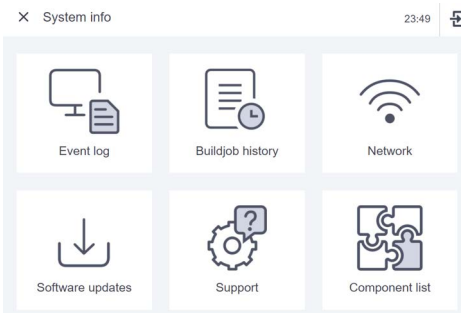
Figure 1: User Interface Overview



1. Current status/state: Any task in progress will be displayed at the top left corner.
2. Exit icon: Restart and Shut down the printer from this icon.
3. Live data: Several type of live data are displayed here such as information from temperature sensors, FMS (Fluid Mangement system), CAN Bus. and Images.
4. System info: Various pieces of system information are displayed on this screen. See Figure 2 for greater detail.
5. Service operations: Various service and module related tasks can be accessed by pressing this button.

6. Material level indicator: These icons indicate the Powder, HAF, and Waste levels.

Figure 2: System info screen



Loading a Build Job File

It is not possible to transfer the .BLD file from Magics to the printer. The web interface must be used to perform this task. It is possible to transfer a .SAFB file from GrabCAD Print to the printer. However, you cannot start the print in GrabCAD Print. The print must started on the H350 printer screen.

Magics will generate a .BLD file. This file is a buildjob file that is broken down into slices and is ready for printing. See “Build Preparation Using Materialise™ Magics™” (page 52).

1. Name the file as desired. The file name will display on the user interface.
2. Copy the file to the printer’s **buildfile_library** folder. This task is performed using the owner web interface. See “Owner Web Interface” (page 85)

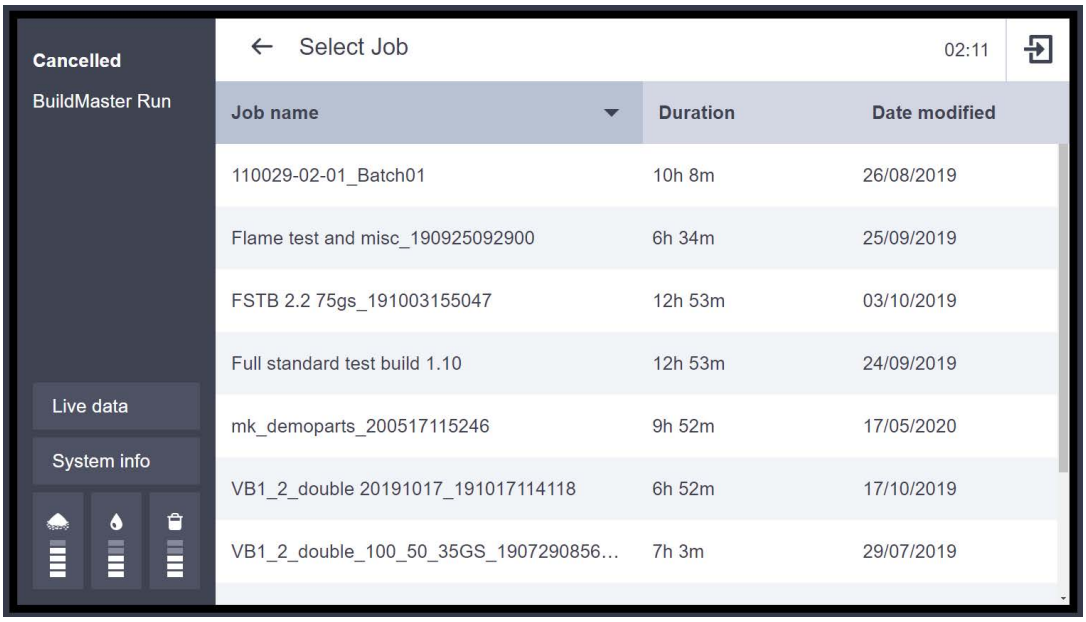
The job will appear the on the user interface as part of the new build job list: **New build job | Select from list** | **Select Job** screen:

Do not rename the build job file after it has been copied to the printer’s **buildfile_library** folder.

Deleting a Build Job File

Access the **Buildfile_library** using the owner web interface. See “Build file library” (page 94). Choose the file that corresponds to the job you wish to delete. Press **delete**.The file is now removed from the printer. After the file has been deleted, it will not be available on the **Select job** screen.

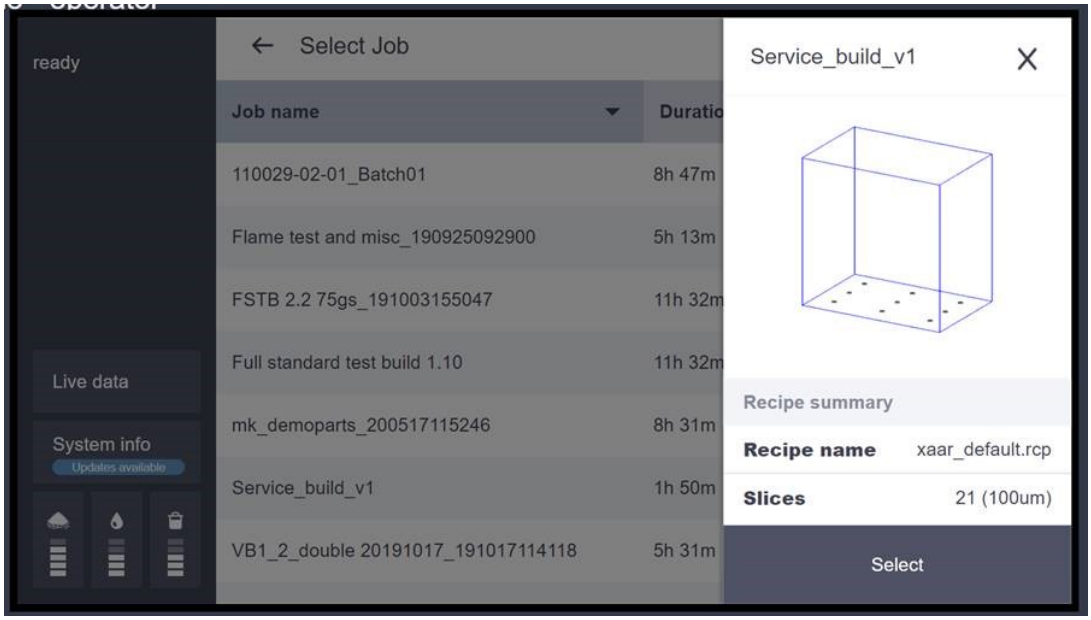
Figure 3: Printer screen build job list



Viewing Build Job Information

Build job information can be accessed from the Select Job section of the New Build Job screen. Select the build job for review from the list and press **Select**.

Figure 4: Build job information



Live Data Screens

The live data screen is broken up into four tabs: Temperatures, CAN Bus, Images, and FMS. The Temperatures tab displays all measured temperatures. See Figure 18. The CAN Bus tab displays firmware versions and names of all nodes in the CAN bus. See Figure 19. The Image tab is TBD. The FMS tab displays info about the fluid management system, pressures, rpm, and status. See Figure 20.

Figure 5: Temperatures tab

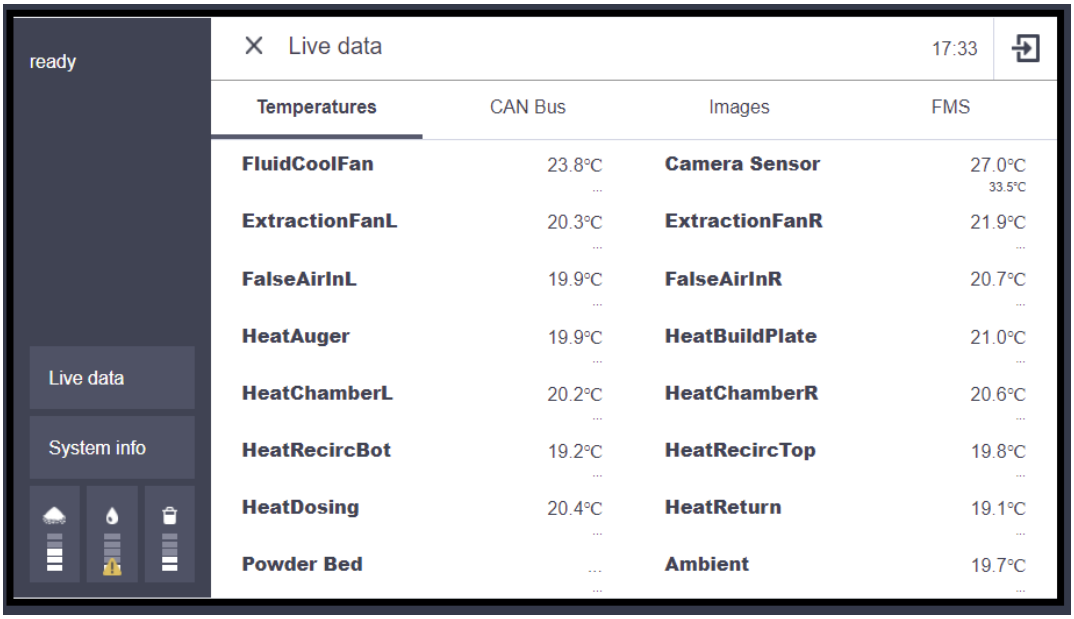


Figure 6: CAN Bus tab

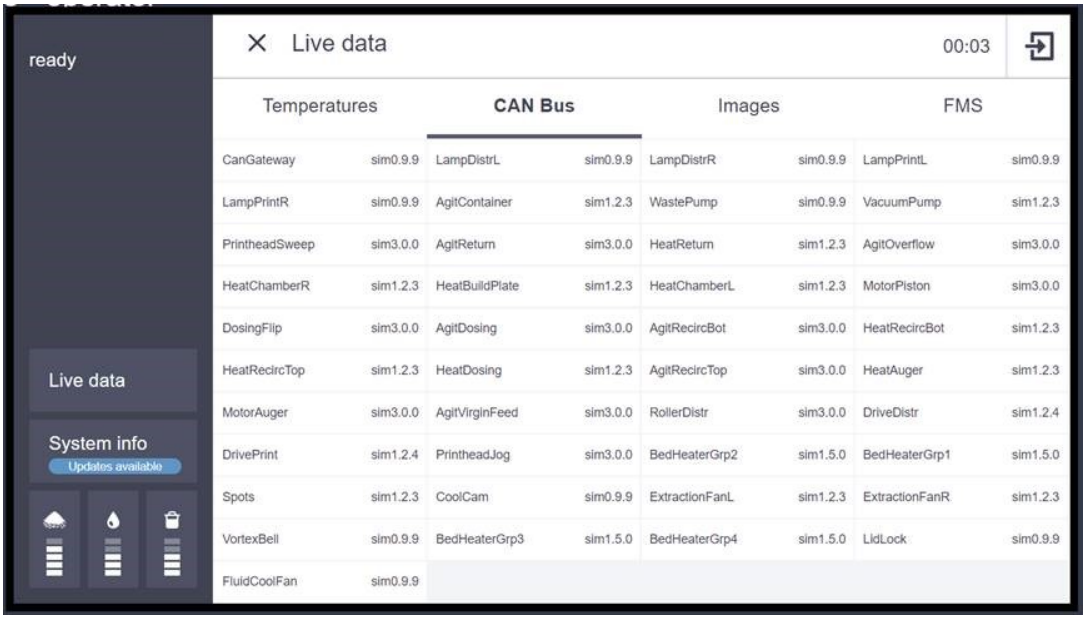
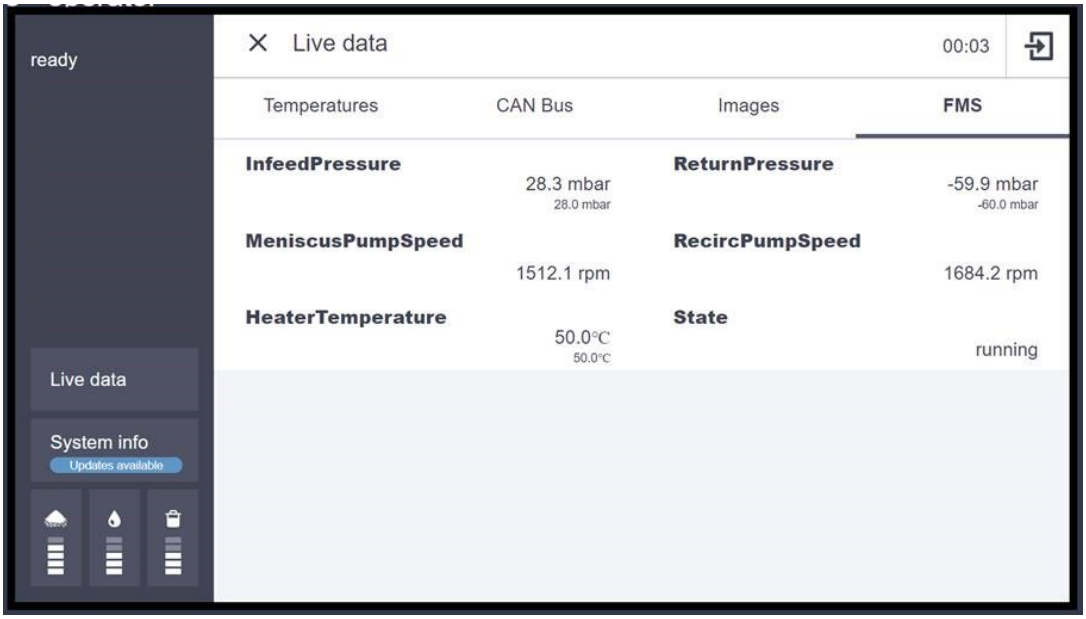


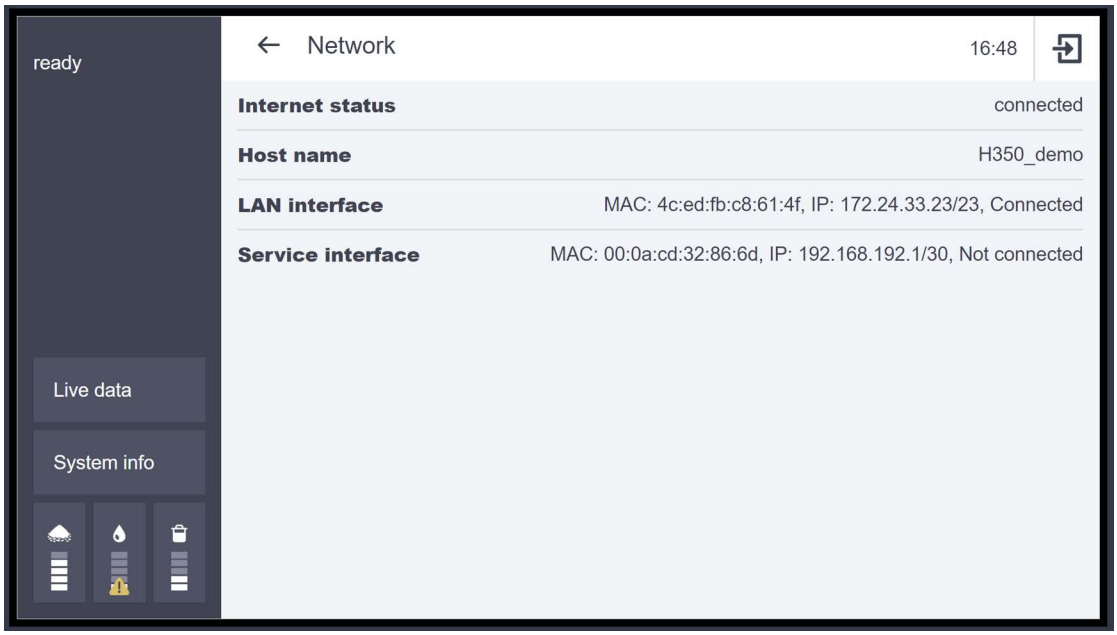
Figure 7: FMS tab



Owner Web Interface

In order to access the owner web interface, the printer must be connected to the local network, see chapter “Connection of the printer to the local network” and the external IP address must be known. See Figure 8 where the example is 172.23.32.131.

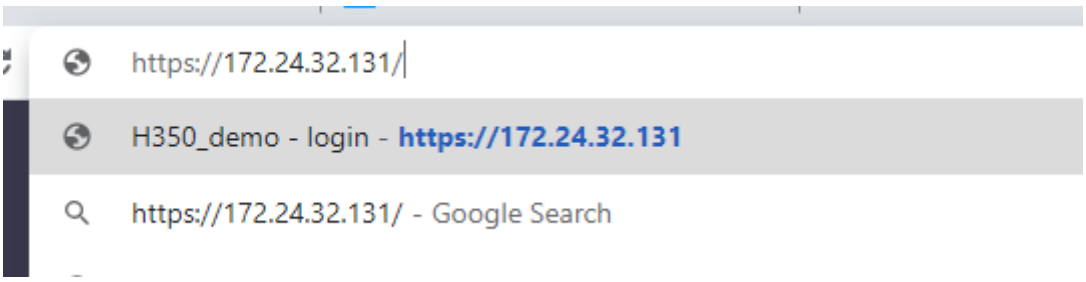
Figure 8: Network screen



Accessing the owner web interface

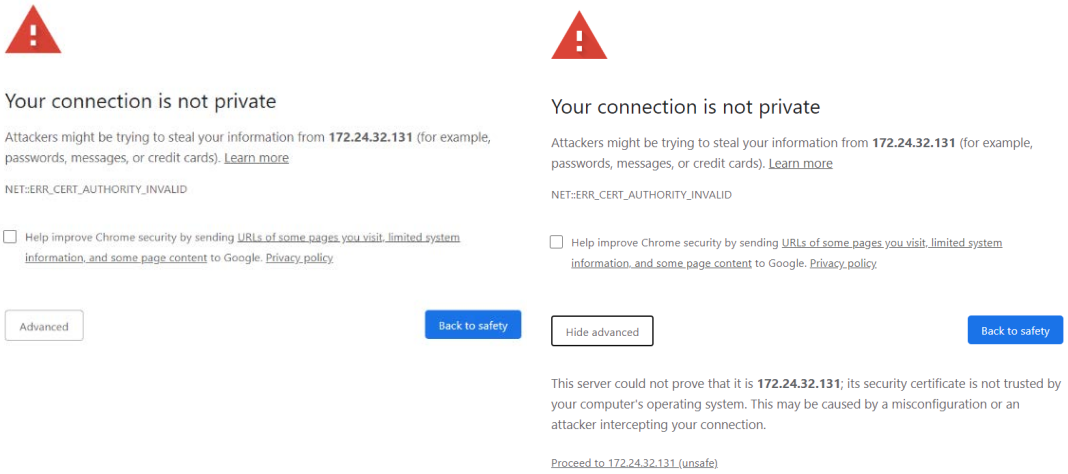
1. Open an internet browser from a computer that is in the same local network (LAN) as the printer.
2. Type the address **https://IP/** (for example **https://172.23.32.131**). See Figure 9.
3. Press **enter**.

Figure 9: URL field



4. The first time connecting to the printer it will be necessary to accept and approve a self-signed certificate. The browser displays a warning about the safety of the connection. It is safe to click **Advanced** and **proceed to XYZ.XYZ.XYZ.XYZ (unsafe)**. See Figure 10.

Figure 10: Security certificate screen shots



The password protected web interface for the printer, in this case printer **H350_demo**, is now accessible. See Figure 11 (page 87).

The username and password are fixed and cannot be changed.

User name: **owner**

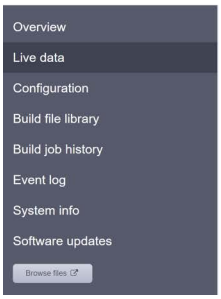
Password: **h350access**

Figure 11: Owner interface window

Owner web interface

When login is completed, the following menu displays. See Figure 12. The sub-menus and screens accessible from the owner web interface menu are discussed in the sections that follow.

Figure 12: Owner web interface menu



Overview screen

The **Overview** screen displays system information if the system is idle (see Figure 13) or running a build job (see Figure 14).

Figure 13: Overview screen (idle)

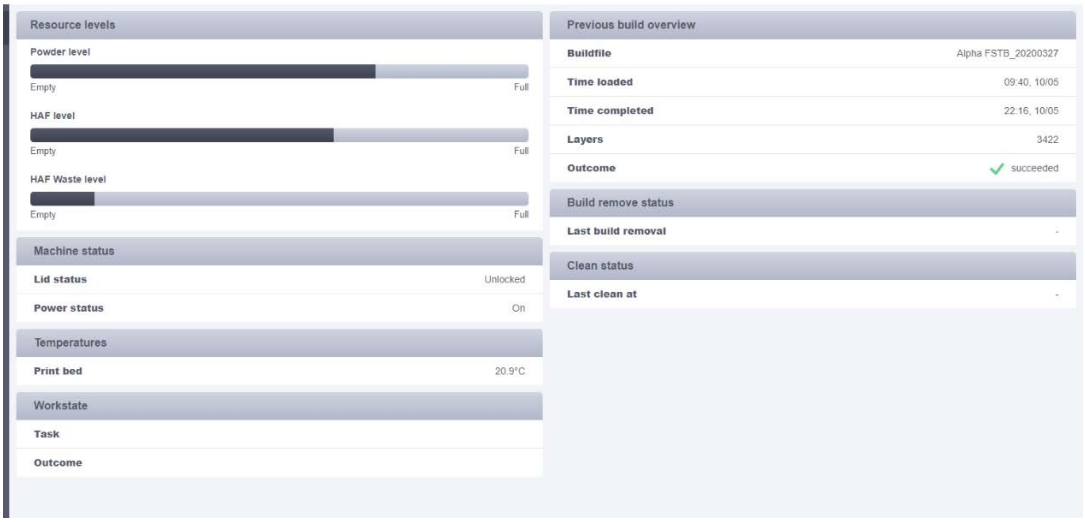
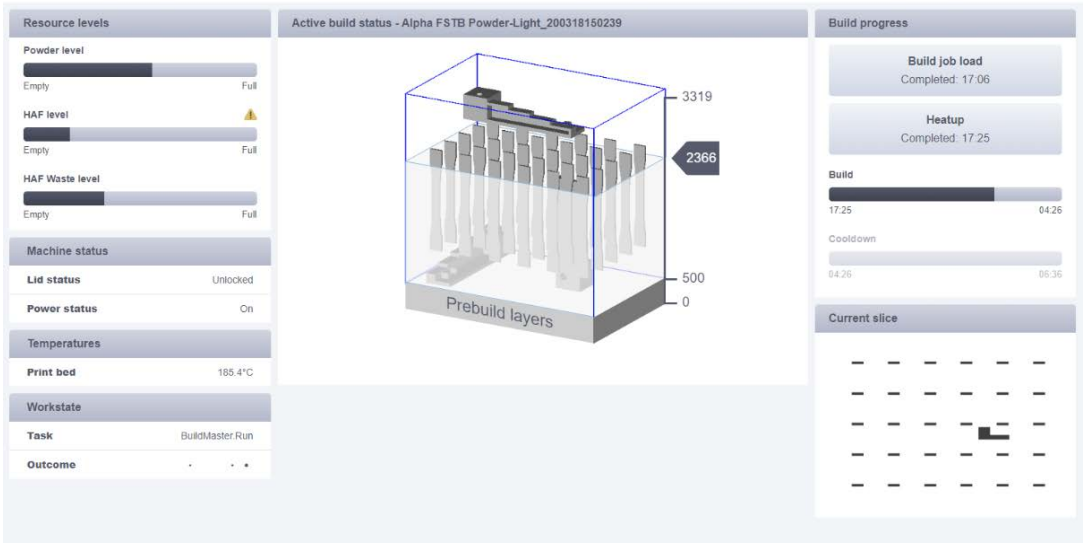


Figure 14: Overview screen (running)



Live Data screen

The **Live Data** screen displays information such as temperature readings of the different sensors in the printer (for example air temperature, powder module temperature, and fluid temperature). See Figure 15.

Figure 15: Live data screen

Temperature item	Actual value	Target value
FluidCoolFan	22.9°C	35°C
CameraHousing	37°C	37°C
ExtractionFanL	23.7°C	...
ExtractionFanR	25.2°C	...
FalseAirInL	23.1°C	...
FalseAirInR	24.3°C	...
HeatAuger	23.7°C	...
HeatBuildPlate	-273.1°C	...
HeatChamberL	22.6°C	...
HeatChamberR	23.3°C	...
HeatRecircBot	21.3°C	...
HeatRecircTop	23°C	...
HeatDosing	24.5°C	...
HeatReturn	21.2°C	...
Powder Bed	...	...
Ambient	21.1°C	...

When the build job is running, the target values for the different modules are accessible. See Figure 16.

Figure 16: Module live data

Temperature item	Actual value	Target value
FluidCoolFan	31.1°C	35°C
CameraHousing	...	...
ExtractionL	111.1°C	...
ExtractionR	111.1°C	...
FalseAirInL	29.1°C	...
FalseAirInR	29.4°C	...
HeatAuger	162.7°C	160°C
HeatBuildPlate	175.1°C	180°C
HeatChamberL	18°C	0°C
HeatChamberR	18°C	0°C
HeatRecircBot	157.5°C	160°C
HeatRecircTop	157.5°C	160°C
HeatDosing	160°C	160°C
HeatReturn	157.5°C	160°C
Powder Bed	179.5°C	179.5°C
Ambient	29.8°C	...

Live Data Screens

The live data screen is broken up into four tabs: Temperatures, CAN Bus, Images, and FMS. The Temperatures tab displays all measured temperatures. See Figure 17. The CAN Bus tab displays firmware versions and names of all nodes in the CAN bus. See Figure 18. The Image tab is shown in Figure 19. The FMS tab displays info about the fluid management system, pressures, rpm, and status. See Figure 20.

Figure 17: Temperatures tab

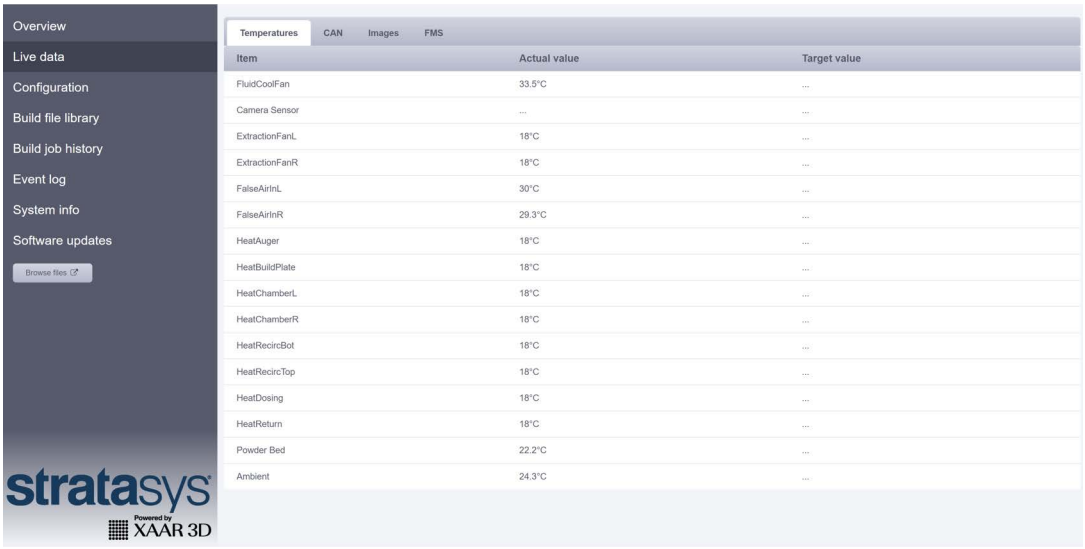


Figure 18: CAN Bus tab

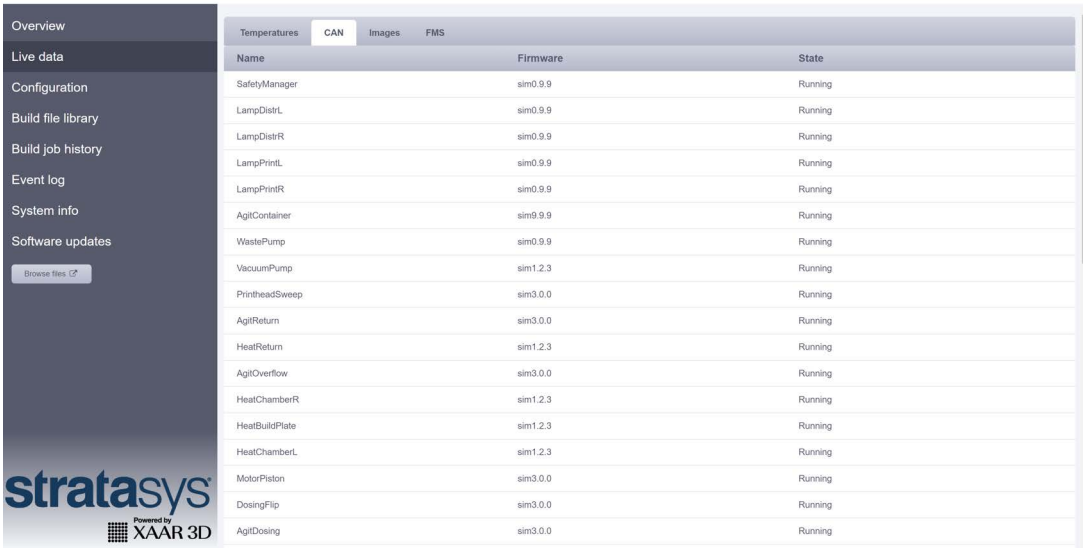


Figure 19: Images tab

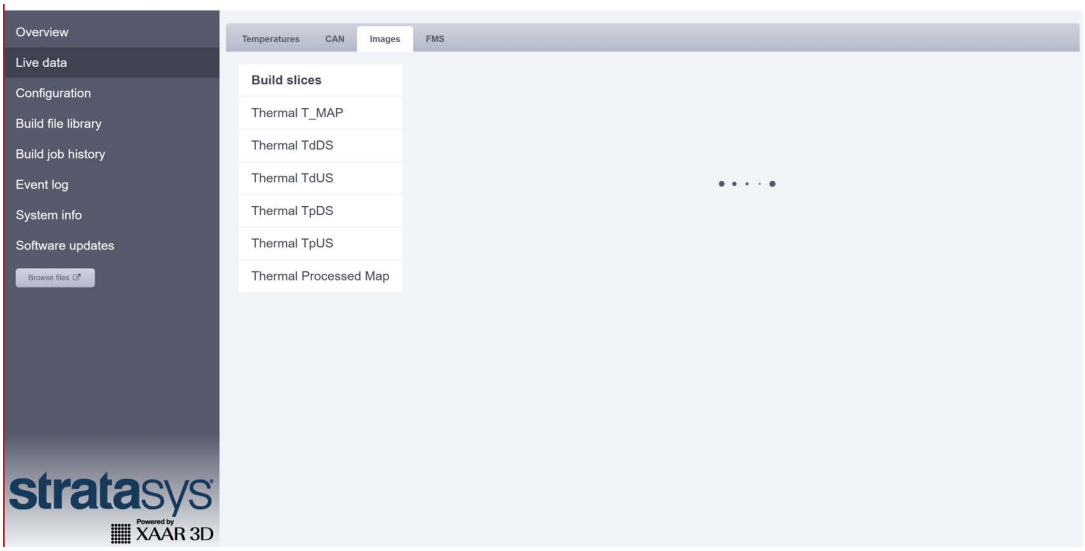
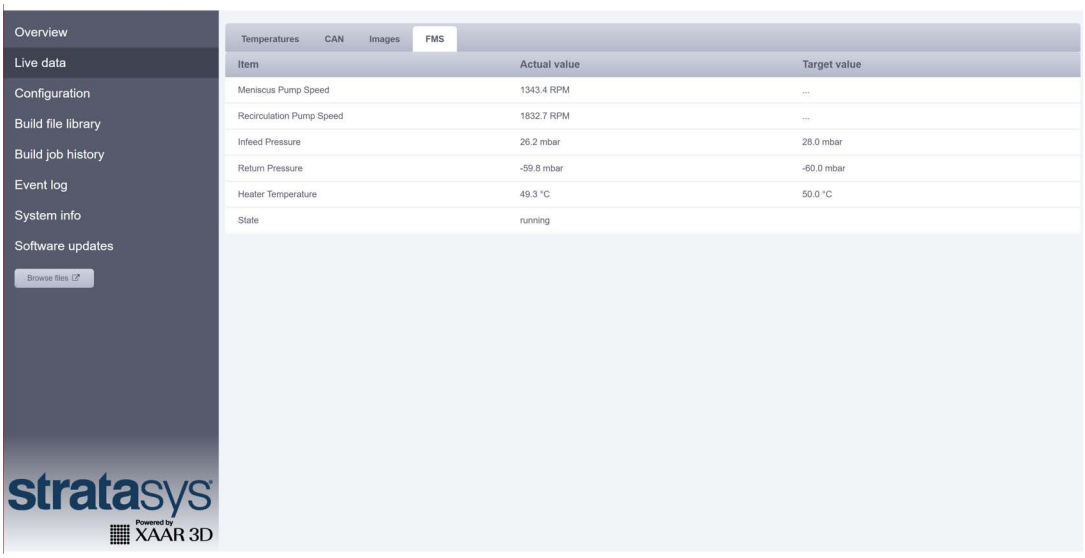


Figure 20: FMS tab



Configuration menu

The **Configuration** menu provides access to the **Recipe tuning**, **Spotlight**, and **Buildjob notifications** sub menus. These are discussed in detail in the following paragraphs.

Recipe tuning

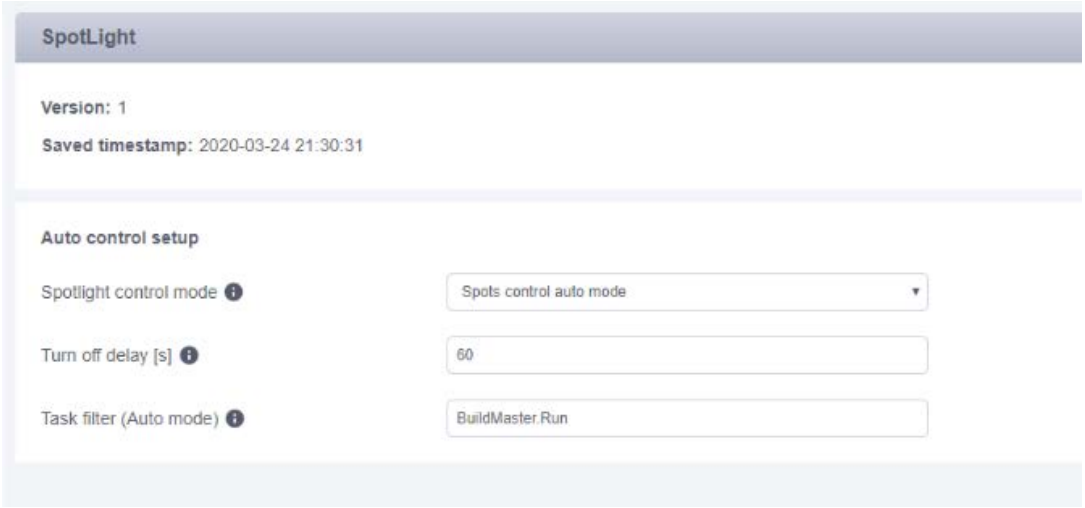
The **Recipe tuning** screen allows for tuning the build bed temperature. See Figure 21.

Figure 21: Recipe tuning screen

Spotlight

The **Spotlight** screen allows for adjusting the configuration options for the lid lights. See Figure 22.

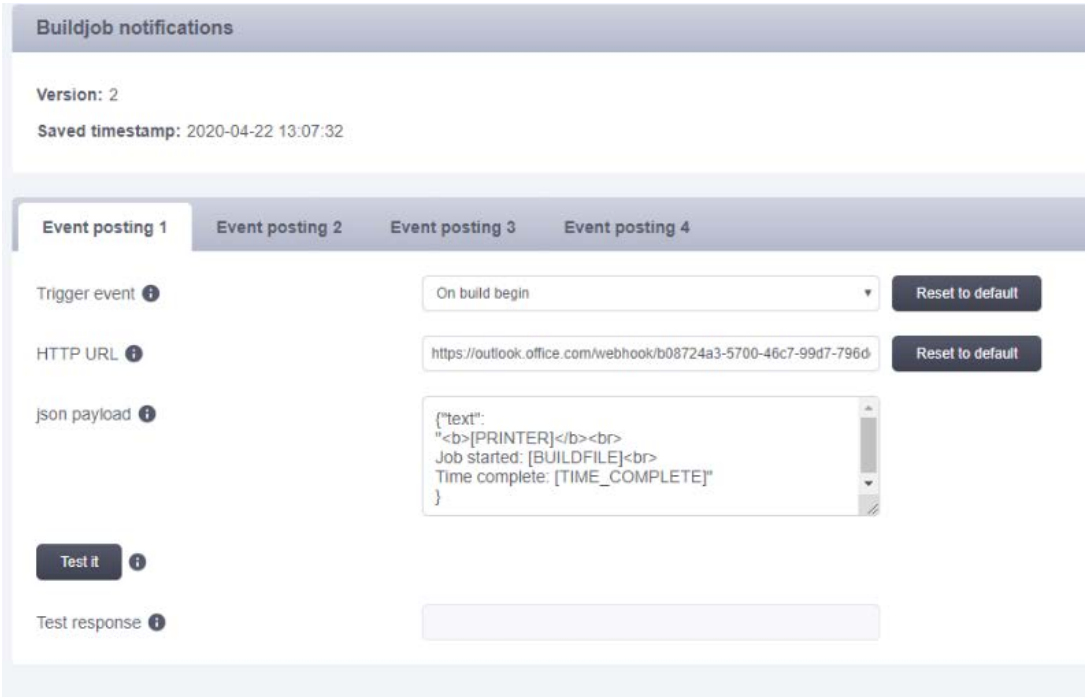
Figure 22: Spotlight screen



Buildjob notifications

The **Buildjob notifications** screen allows the option to setup broadcast notifications in certain network applications (for example, Microsoft Teams). See Figure 23. The printer can broadcast when a job has started, finished, as well as the error code in case a failure occurs.

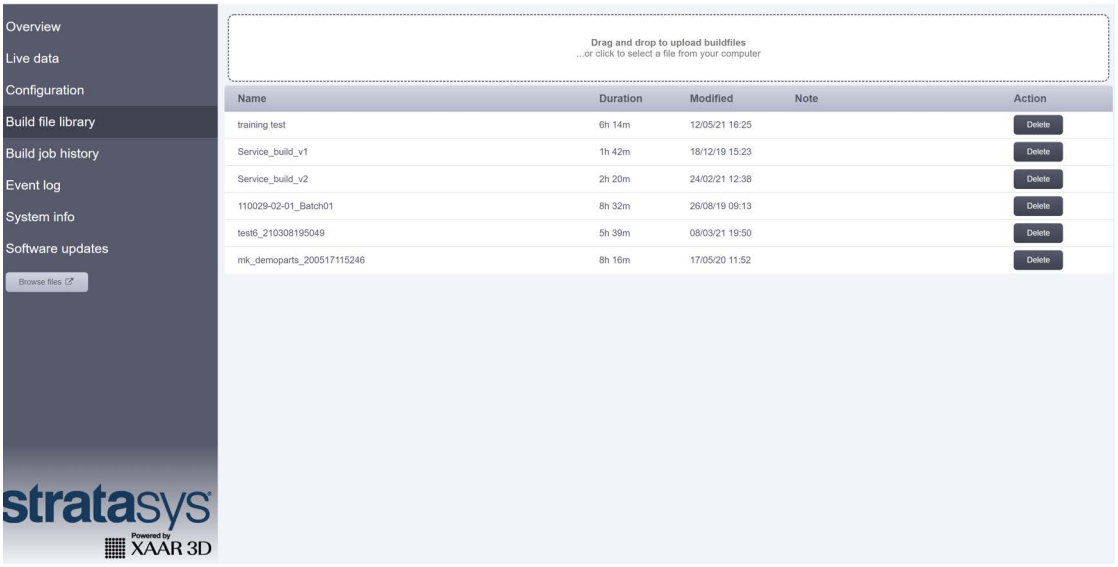
Figure 23: Buildjob notifications screen



Build file library

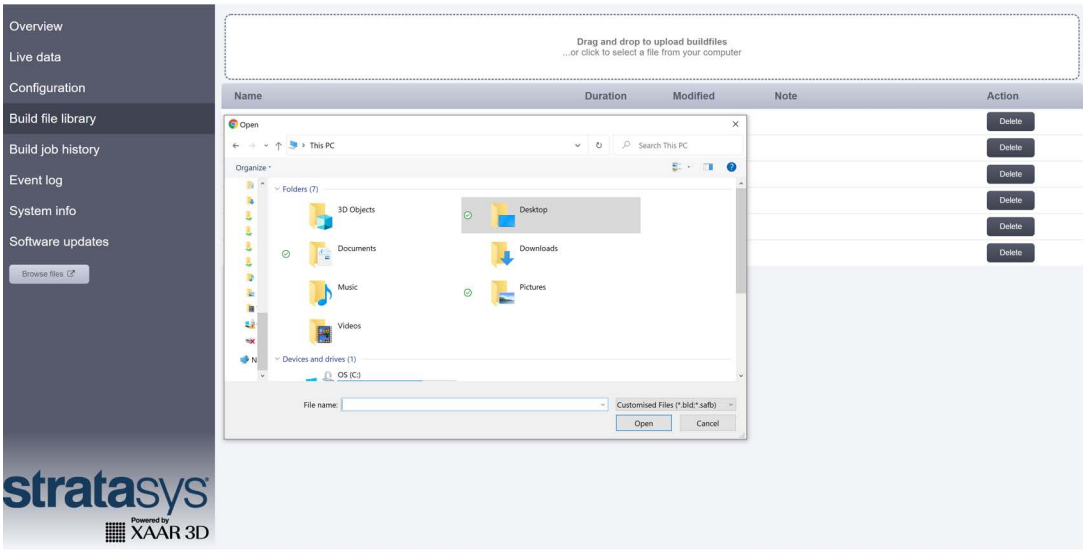
The **Build file library** displays the available buildjob files on the printer. Files can be loaded via drag and drop or by clicking the Browse files button.

Figure 24: Build file library



Clicking the **Browse files** button allows files to be uploaded via the web interface.

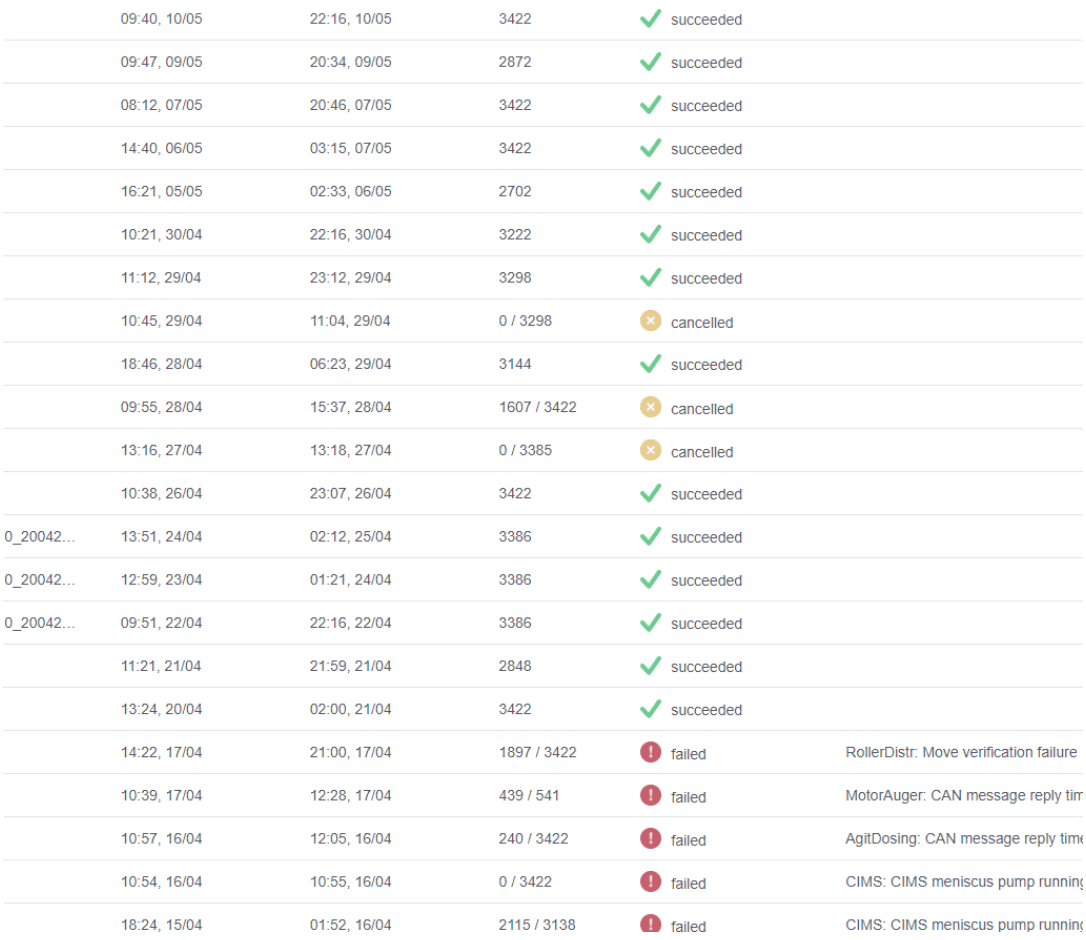
Figure 25: Browse files



Build job history

The Build job history screen displays the history of the buildjobs that have run successfully or have failed. See Figure 26.

Figure 26: Build job history (populated)



	09:40, 10/05	22:16, 10/05	3422	succeeded	
	09:47, 09/05	20:34, 09/05	2872	succeeded	
	08:12, 07/05	20:46, 07/05	3422	succeeded	
	14:40, 06/05	03:15, 07/05	3422	succeeded	
	16:21, 05/05	02:33, 06/05	2702	succeeded	
	10:21, 30/04	22:16, 30/04	3222	succeeded	
	11:12, 29/04	23:12, 29/04	3298	succeeded	
	10:45, 29/04	11:04, 29/04	0 / 3298	cancelled	
	18:46, 28/04	06:23, 29/04	3144	succeeded	
	09:55, 28/04	15:37, 28/04	1607 / 3422	cancelled	
	13:16, 27/04	13:18, 27/04	0 / 3385	cancelled	
	10:38, 26/04	23:07, 26/04	3422	succeeded	
0_20042...	13:51, 24/04	02:12, 25/04	3386	succeeded	
0_20042...	12:59, 23/04	01:21, 24/04	3386	succeeded	
0_20042...	09:51, 22/04	22:16, 22/04	3386	succeeded	
	11:21, 21/04	21:59, 21/04	2848	succeeded	
	13:24, 20/04	02:00, 21/04	3422	succeeded	
	14:22, 17/04	21:00, 17/04	1897 / 3422	failed	RollerDistr: Move verification failure
	10:39, 17/04	12:28, 17/04	439 / 541	failed	MotorAuger: CAN message reply tim
	10:57, 16/04	12:05, 16/04	240 / 3422	failed	AgitDosing: CAN message reply time
	10:54, 16/04	10:55, 16/04	0 / 3422	failed	CIMS: CIMS meniscus pump running
	18:24, 15/04	01:52, 16/04	2115 / 3138	failed	CIMS: CIMS meniscus pump running

Event log

The **Event log** screen displays system warnings and errors. See Figure 27.

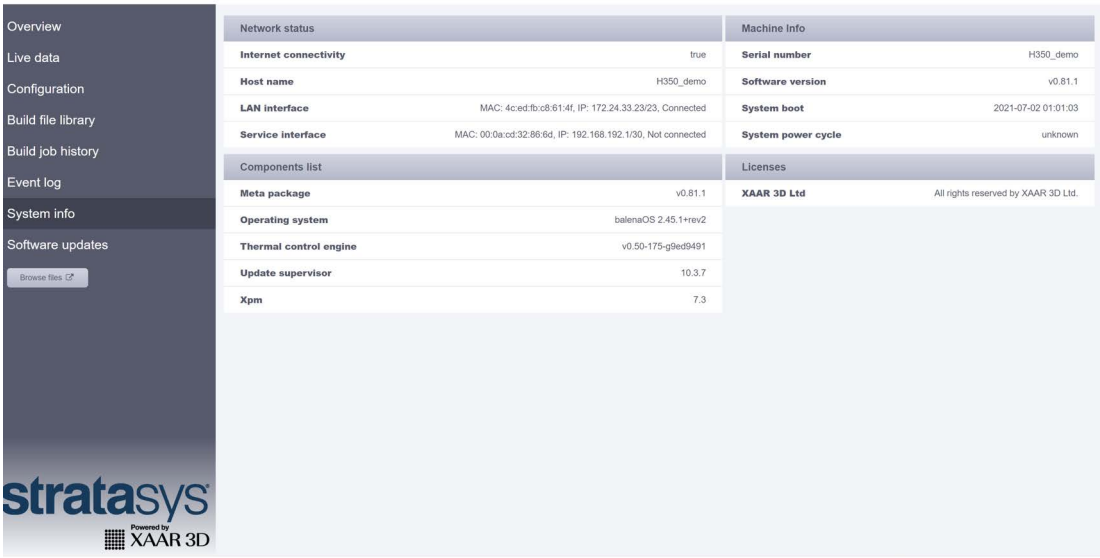
Figure 27: Event log screen

Received	Message	Name
17:52:38	AlarmSet: /Ambient\Watchdog: AmbientTemperatureLow[3210]: Ambient temperature too low: 18.5C	/watchdogs

System info

The **System info** screen displays information of the printer such as network settings, software versions, and other relevant information. See Figure 28.

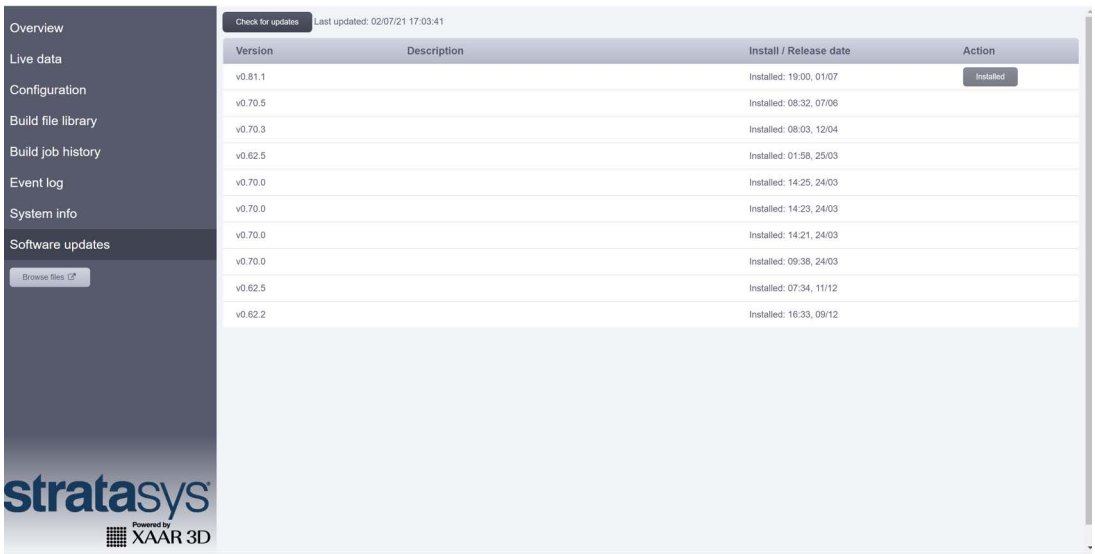
Figure 28: System info screen



Software updates

The **Software updates** screen displays the current software version and the software update history. See Figure 29.

Figure 29: Software updates screen



Click the **Check for updates** button to see if any uninstalled updates are available. If there is an available update, it will apear as displayed in Figure 30. Click the **Update info** button to install the update.

Figure 30: Check for updates

Browse files

Clicking the Browse files button opens a window which allows for viewing the printer related files. The system provides access to three main folders:

- **Buildfile_library**: the folder that contains the build job files.

- **Buildjob_reports**: the folder that contains pdf reports for every job that has run in the printer.
- **Log**: the folder that contains the printer log files.

Figure 31: Browse files screen

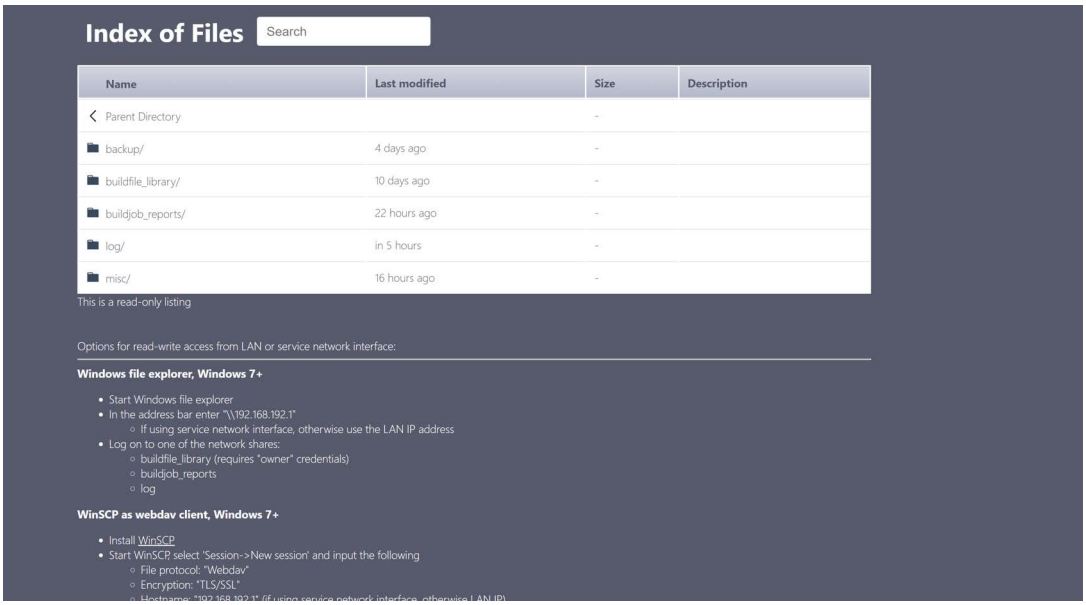


Figure 32: Browsing the Buildfile_library

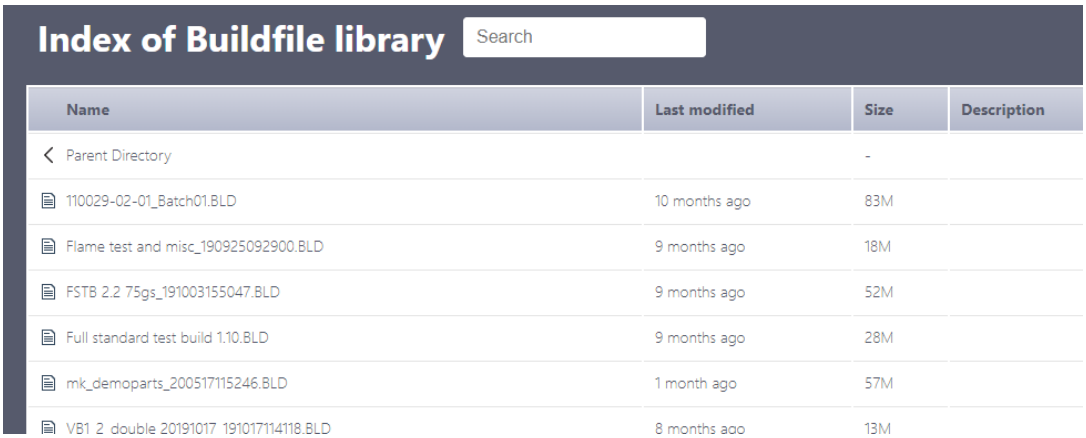
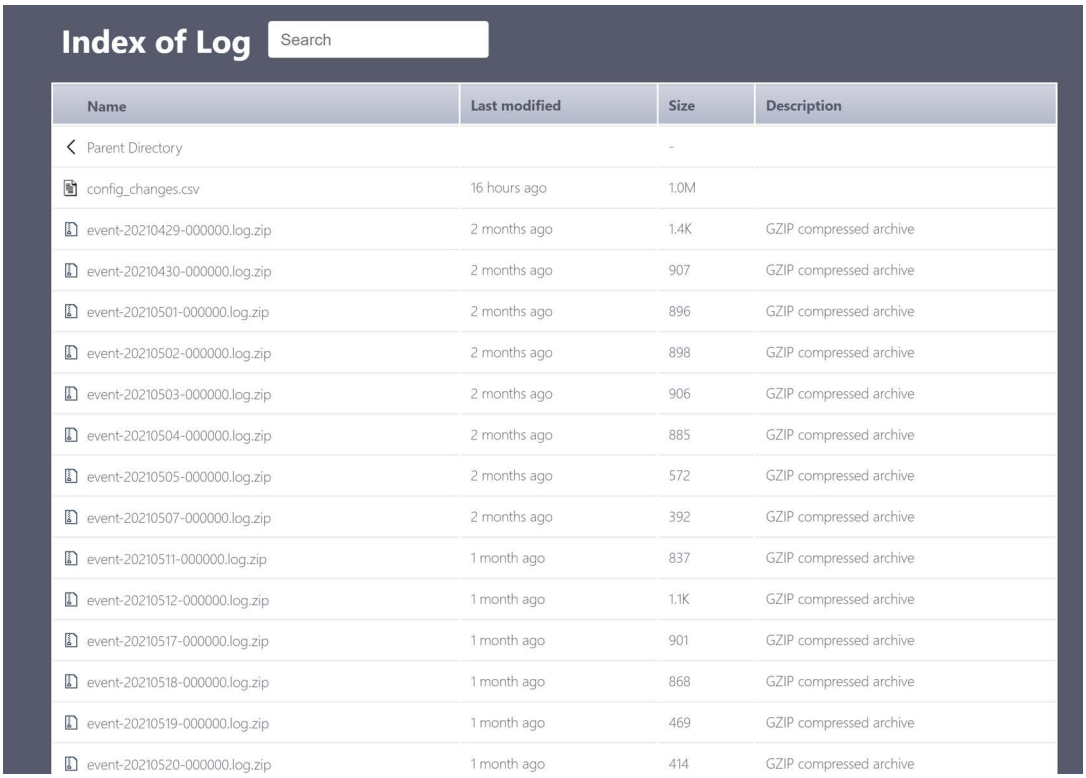


Figure 33: Browsing the Log folder

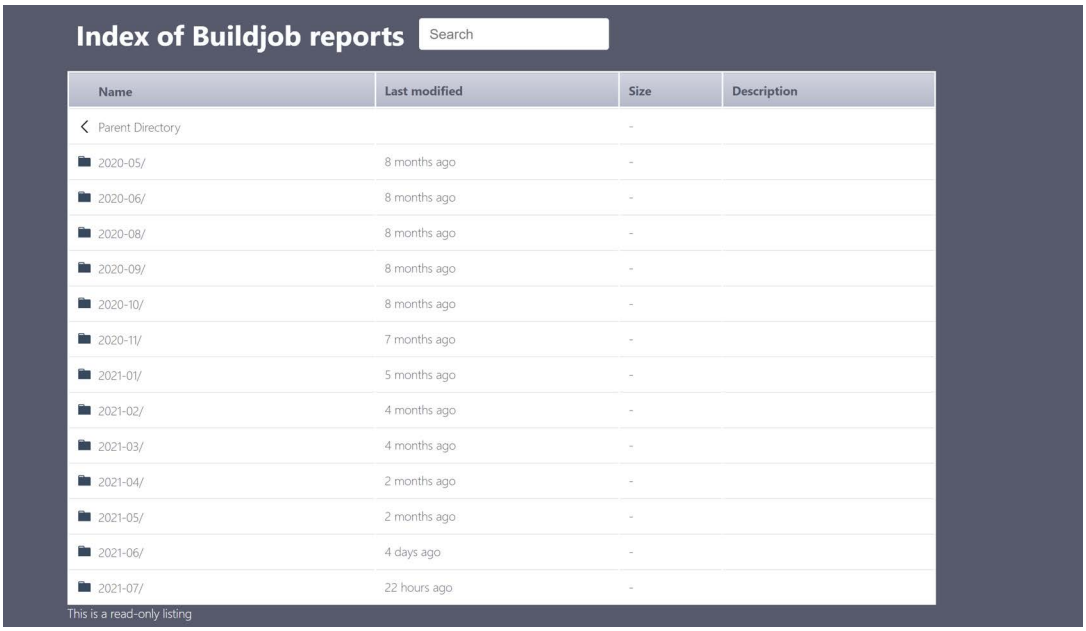


Index of Log

Search

Name	Last modified	Size	Description
Parent Directory		-	
config_changes.csv	16 hours ago	1.0M	
event-20210429-000000.log.zip	2 months ago	1.4K	GZIP compressed archive
event-20210430-000000.log.zip	2 months ago	907	GZIP compressed archive
event-20210501-000000.log.zip	2 months ago	896	GZIP compressed archive
event-20210502-000000.log.zip	2 months ago	898	GZIP compressed archive
event-20210503-000000.log.zip	2 months ago	906	GZIP compressed archive
event-20210504-000000.log.zip	2 months ago	885	GZIP compressed archive
event-20210505-000000.log.zip	2 months ago	572	GZIP compressed archive
event-20210507-000000.log.zip	2 months ago	392	GZIP compressed archive
event-20210511-000000.log.zip	1 month ago	837	GZIP compressed archive
event-20210512-000000.log.zip	1 month ago	1.1K	GZIP compressed archive
event-20210517-000000.log.zip	1 month ago	901	GZIP compressed archive
event-20210518-000000.log.zip	1 month ago	868	GZIP compressed archive
event-20210519-000000.log.zip	1 month ago	469	GZIP compressed archive
event-20210520-000000.log.zip	1 month ago	414	GZIP compressed archive

Figure 34: Browsing the Reports folder



Index of Buildjob reports

Search

Name	Last modified	Size	Description
Parent Directory		-	
2020-05/	8 months ago	-	
2020-06/	8 months ago	-	
2020-08/	8 months ago	-	
2020-09/	8 months ago	-	
2020-10/	8 months ago	-	
2020-11/	7 months ago	-	
2021-01/	5 months ago	-	
2021-02/	4 months ago	-	
2021-03/	4 months ago	-	
2021-04/	2 months ago	-	
2021-05/	2 months ago	-	
2021-06/	4 days ago	-	
2021-07/	22 hours ago	-	

This is a read-only listing

This interface provides read only access to the files.

There is a search function, which allows for searching for available files. There are also on-screen instructions for connecting via a webdav client that provides read-write access.

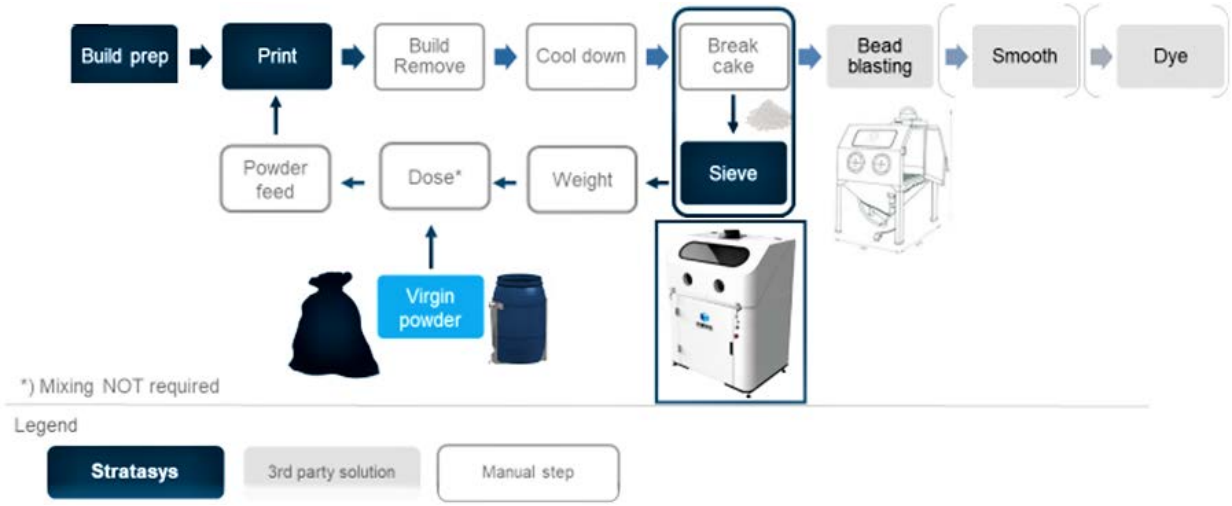
5 OPERATING THE PRINTER

This chapter explains basic steps in operating the H350 SAF Selective Absorption Fusion Powered 3D Printer.

Workflow

Figure 1 illustrates the workflow from build preparation to final parts.

Figure 1: Workflow illustration



Basic User Operations

The E-Stop button is used in cases of catastrophic failure. When the E-Stop button is depressed, the printer will not be completely powered OFF. One of the electrical phases will be active keeping the printer PC and the main exhaust fan running.

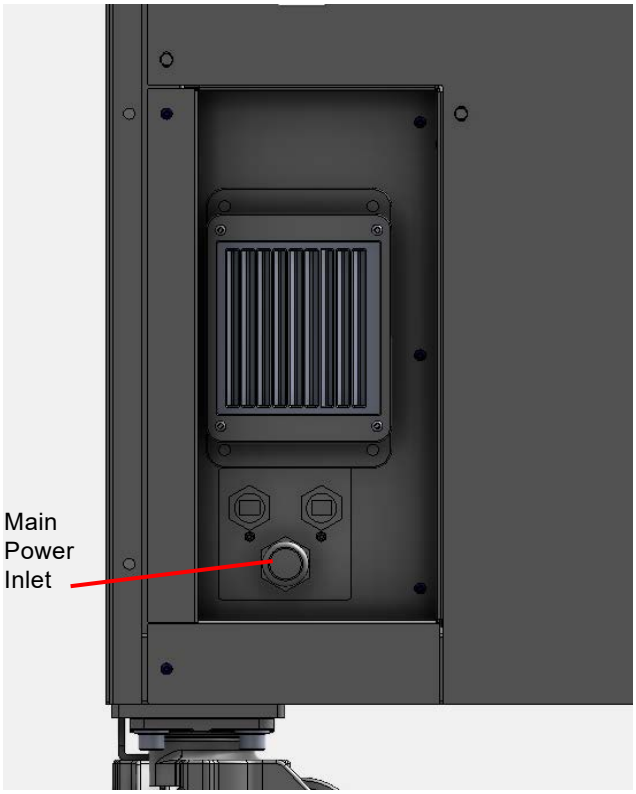
Powering ON the Printer

The ON/OFF push button will turn ON and OFF the main printer PC together with the main exhaust fan.

To power the printer ON:

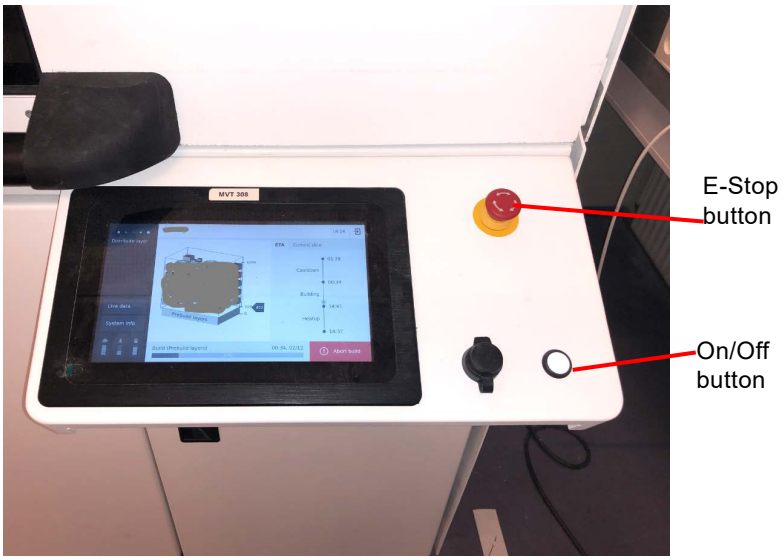
1. Make sure the printer plug is connected to the power socket.

Figure 2: Main power switch



2. At the bottom right corner, under the touch monitor, is located the E-Stop button and the ON/OFF push button. Press the On/Off button located at the bottom right corner of the printer to start the printer. The printer software loads while the printer powers on.

Figure 3: On/Off and E-Stop buttons



Before loading the user interface, the software will confirm that all boards have the correct firmware loaded. If the firmware check fails for any board, the board will be updated before the software is fully loaded.

Ensure the E-Stop button is not depressed. If the E-Stop button is depressed while the printer powers on, the main screen will display several alarms after the software loads.

The Startup screens shown below display while the system software loads. The software is checking the installed firmware version.

Figure 4: Firmware check screen

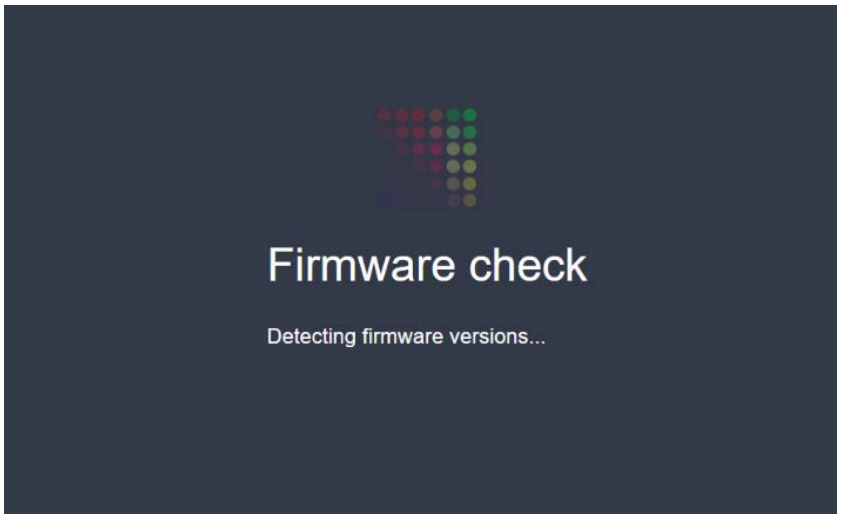
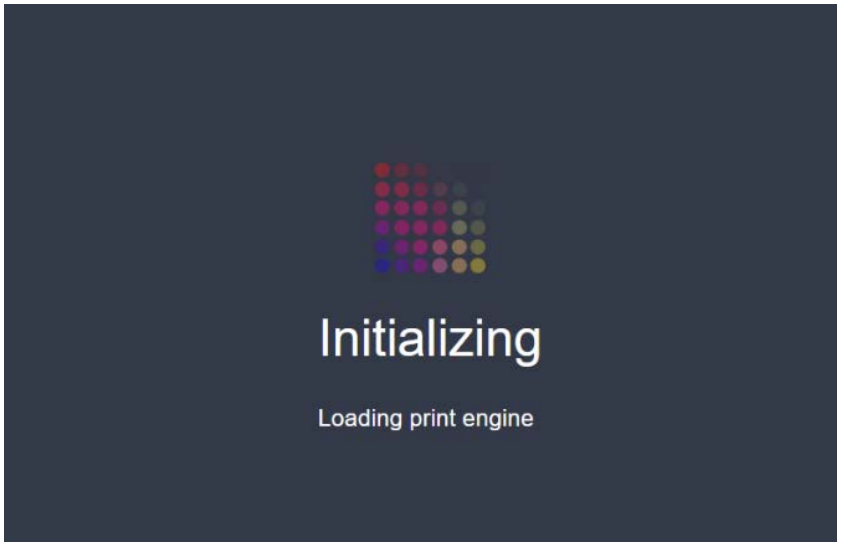


Figure 5: Initializing screen



Reactivating a Dormant Printer

If the H350 printer has been powered up but unused for a period of two weeks or longer, it is strongly recommended that a paper print test is performed as a reactivation procedure before beginning a new build job. Perform “Printhead User Maintenance” (page 169).

Perform first the full black image test and the full test image afterwards. Confirm the nozzles are not blocked or deviating, and there is not an alignment issue with the printhead.

Stratasys recommends archiving the paper print tests and using the tests as reference of the system performance over time.

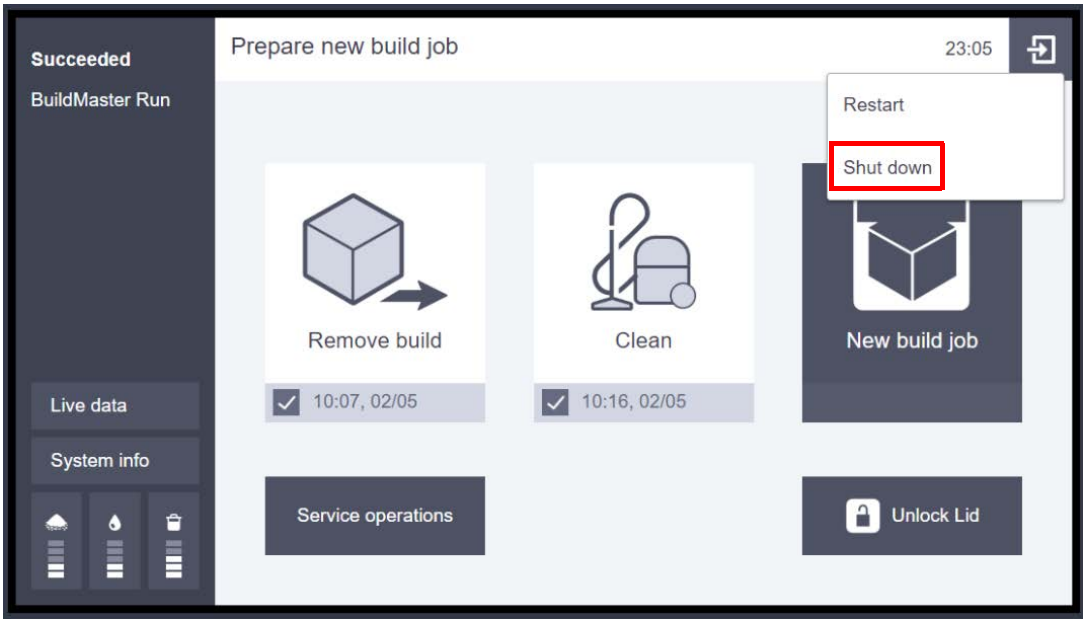
Powering OFF the Printer

Before powering OFF the printer, confirm the distribution sled and print sled are at their park positions. If required, use the touch screen menu to position the sleds to their park positions.

To power the printer OFF:

1. Press the **Exit** icon at the top right corner of the home screen. From the drop-down menu, select **Shut down**.

Figure 6: Home screen



2. When the computer is shut down, the monitor and the On/Off button turn off.
3. To fully power off the printer, disconnect the power plug from the socket.

If the printer will be turned off for longer than 24 hours, follow the procedures for cleaning and maintenance of the printheads.

Accessing Printer Folders

It is possible to access files in the printer using two protocols:

- Web interface
- WEBDEV client

The first protocol is web-based and provides read-only access. It was described in “Administrator web interface > Browse files”. The second protocol allows both read and write access to the buildfile_library. This enables the user to copy and delete buildfiles.

Table 1: Folders and protocols

Folder	Web interface
Buildfile_library	Read/Write
Buildjob_reports	Read only
Log	Read only

Loading Material

Caution: Damage to Printer

The H350 printer is material specific, and is set up to use either High Yield PA11 or SAF™ PA12. Do not load the wrong material as it will cause damage to the printer.

The information within this section will walk you through the process of loading material in the H350 printer.

Load Material Cartridges

The H350 printer is equipped with two slots for 4-liter cartridges.

- The top slot: where the cartridge with HAF is loaded.
- The bottom slot: where the cartridge collecting waste is loaded.

In order to operate, the printer must have an HAF cartridge with enough fluid to run the selected build job and a waste cartridge with enough room to collect the fluid waste generated during the job.

The software monitors the levels of the HAF cartridge and the waste cartridge. The levels of the two cartridges are indicated at the bottom left corner of the main screen in the GUI. Each line corresponds to a 20% range. In the example seen below, HAF and waste levels are in the range of 40%-60%.

Figure 7: Material levels (screen 1)

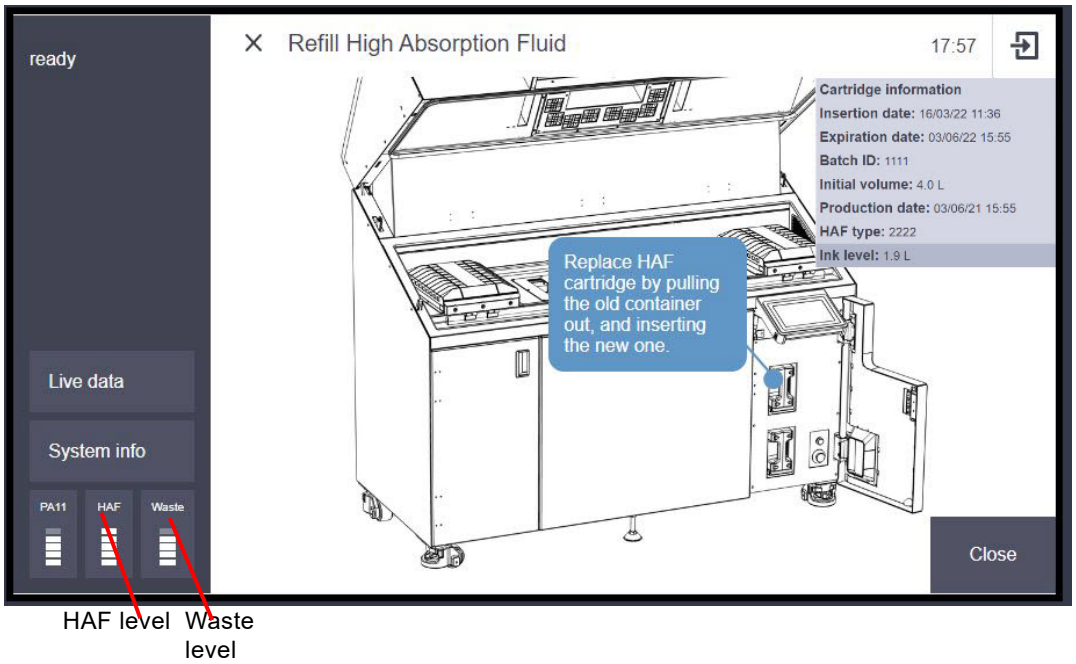
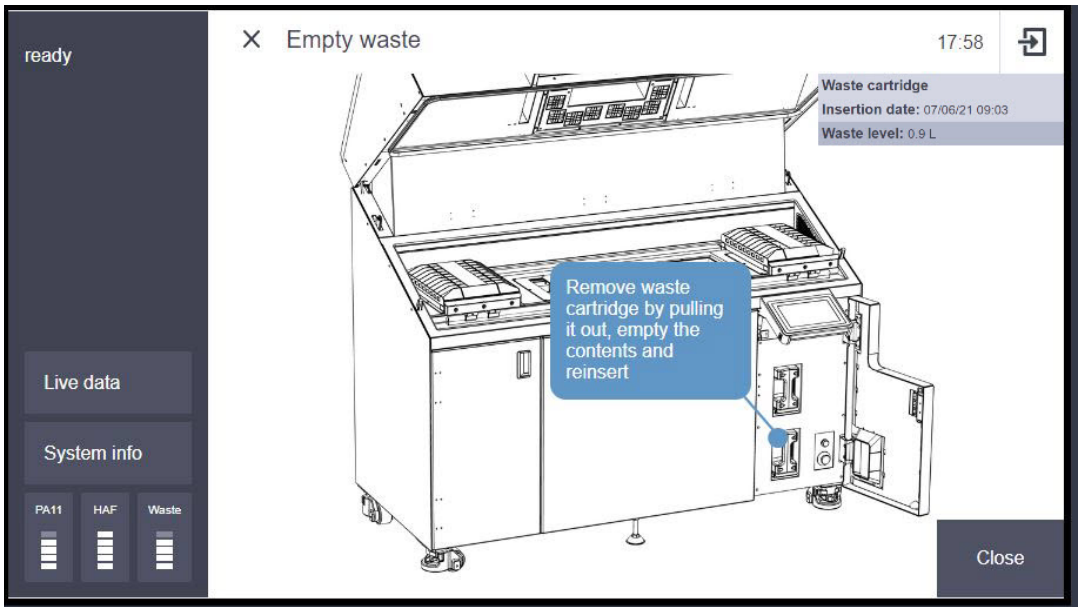
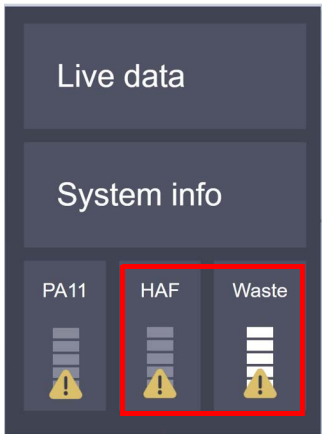


Figure 8: Material levels (screen 2)



If the HAF level is too low and the waste level is too high, the software displays a yellow icon with an exclamation mark. In the example shown, the HAF level is below 20% and waste level is above 80%.

Figure 9: HAF and waste level warnings

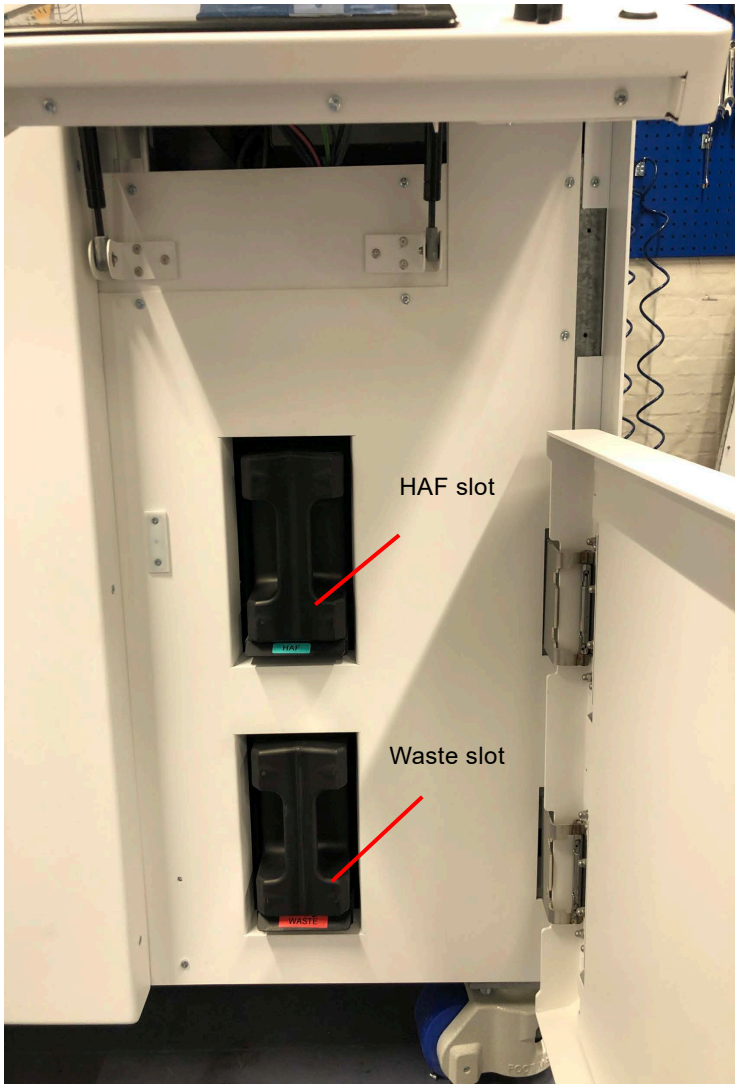


Attempting to start a print job while the HAF level is too low will result in a warning.
Attempting to start a print job while the waste level is too high will result in a warning.

The material slots are located at the right side of the printer behind the front right door.

Figure 10: Material slot location

Figure 11: Material slots



To load a cartridge:

1. Hold the cartridge from the handle. Make sure the correct side is facing down (see Figure 12).
2. Open the right front door.
3. Insert the cartridge into the slot. Confirm the cartridge is fully inserted. If not, the software will issue a warning.

4. Close the door.

Figure 12: Cartridge (side view)

Unloading and Replacing a Cartridge

To unload or replace a cartridge:

1. Open the right front door.
2. Remove the cartridge from the slot.
3. Insert a new cartridge.
4. Close the door.

Refilling Powder

Caution: Damage to Printer

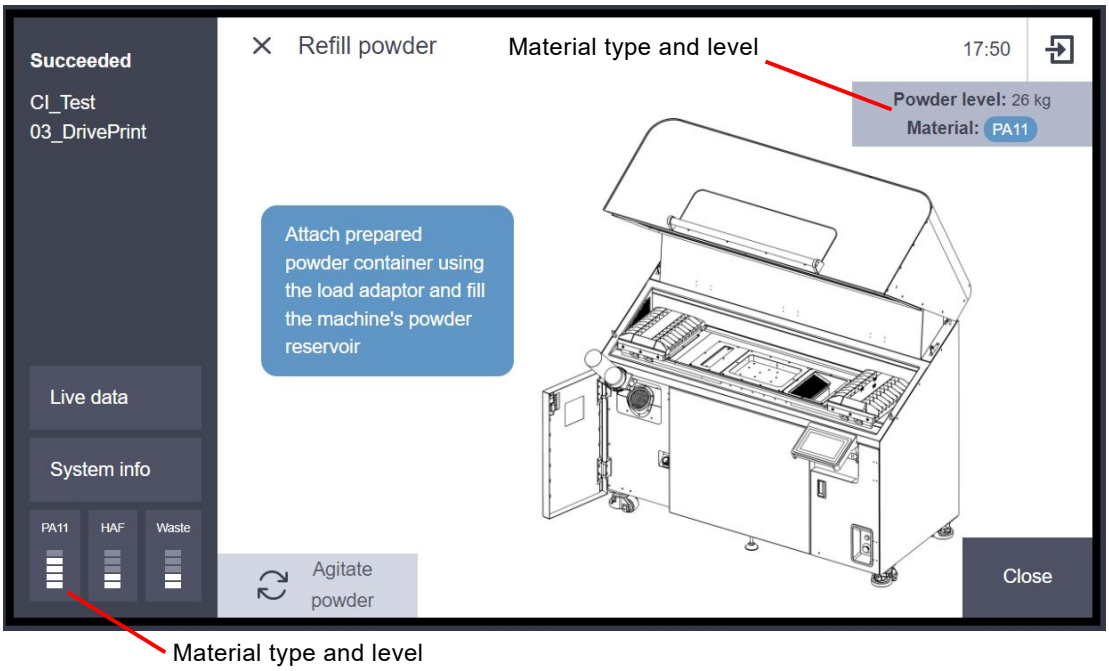
The H350 printer is material specific, and is set up to use either High Yield PA11 or SAF™ PA12. Do not load the wrong material as it will cause damage to the printer.

The H350 printer is equipped with a powder container that can hold 50 kg (110 lbs.) of powder, which is the equivalent to the amount typically needed for two full builds. There is a mixing wheel inside the powder container that mixes the powder after the container is filled and keeps the power mixed during the build.

In order to operate the printer, the amount of powder in the container must be enough to complete the selected build.

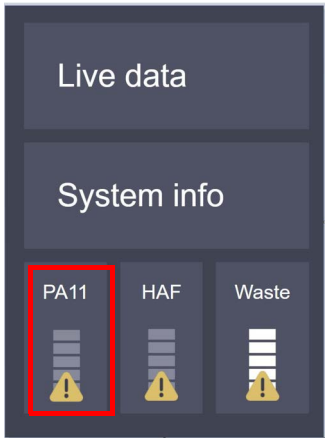
The software monitors the level of the powder in the container. This value is displayed at the bottom left corner of the main screen in the GUI. Each line corresponds to a 20% of the total volume. In the example shown below, the powder level is in the range of 60%-80%.

Figure 13: Powder level



If the level of the powder is too low, the software displays a yellow icon with an exclamation mark. In the example shown, the powder level is below 20%.

Figure 14: Powder level



Attempting to start a print job without enough powder to complete the print will result in a warning.

The printer powder container is located at the left side of the printer behind the left front door.

Figure 15: Powder container location

Preparing the Powder Mixture

Warning: Inhalation Hazard
Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

Warning: Skin Contact Hazard
HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

The powder that is loaded to the printer is a mix of virgin (unused) powder and previously used powder coming from the printer. The weight ratio of virgin to previously used powder is 30 to 70. A floor scale is required for this procedure.

The used powder is collected at the powder retrieval station and should not be mixed with any other media such as glass pellets.

To prepare the powder mix:

1. Remove the Stratasys H350 powder container from the powder retrieval station.
2. Weigh the container to determine how many kilograms of used powder are in the container.
3. Calculate how much new powder to add.

   Virgin powder (kg/lbs.) = 0.43 X Used Powder (kg/lbs.)

   An example of calculating the proper ratio of virgin to used powder is as follows: Remove the Stratasys H350 powder container from the Powder Retrieval Station. Weigh the container. In this example we have collected 10kg (22 lbs.) of used powder. Therefore, we need to add 0.43x10kg (22 lbs.) = 4.3kg (9.5 lbs) of virgin powder.

4. Apply the Stratasys H350 powder load adapter.

Loading the Printer with Powder

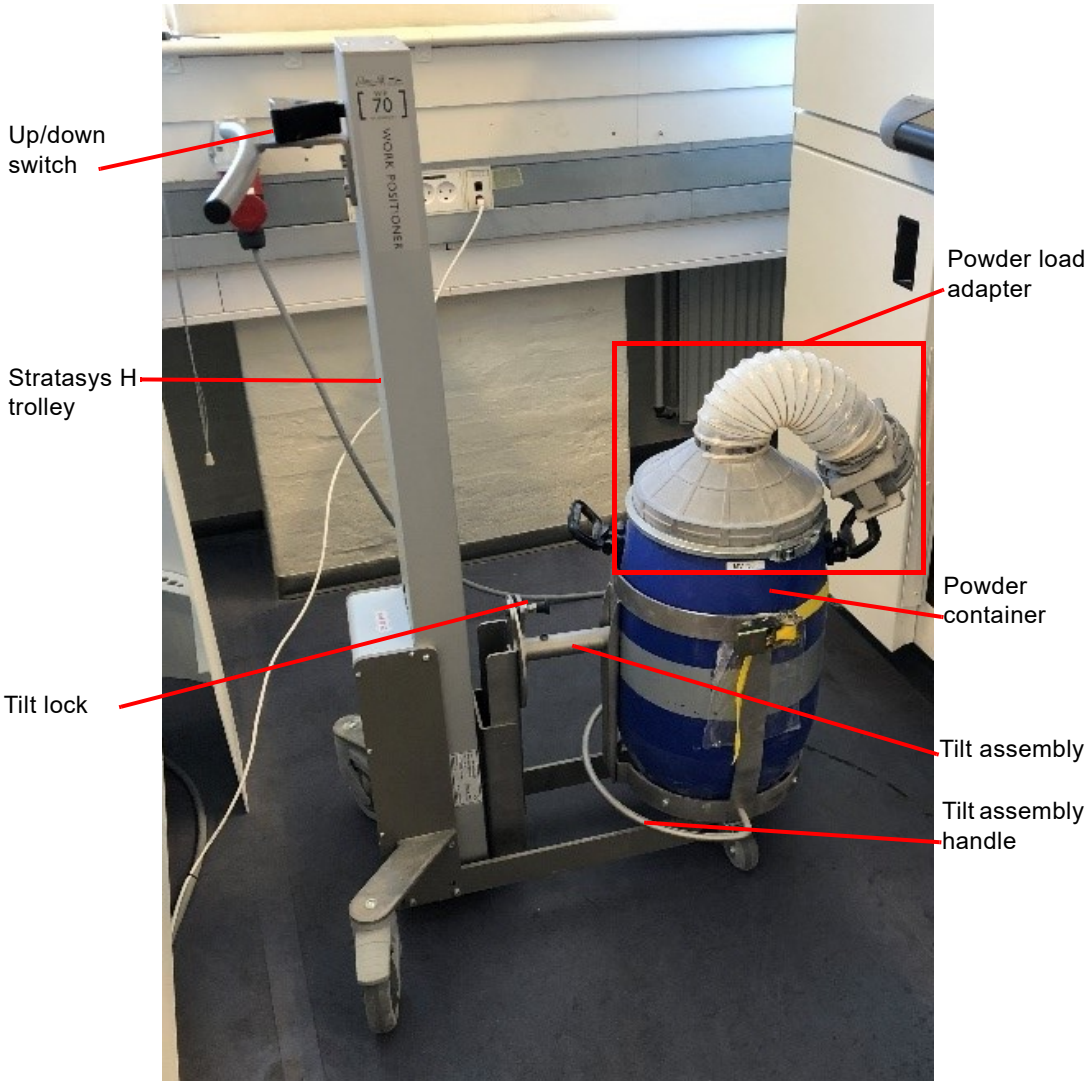
Warning: Skin Contact Hazard
HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Warning: Inhalation Hazard
Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

The following accessories are needed to complete this task:

- Stratasys H trolley (part number X3D-01006-V): This is a trolley with an electric motor for lifting the powder container. The trolley includes the powder container tilt assembly, which is a metal bracket mounted on the trolley with quick release bracket. The bracket can be rotated 180 degrees in order to facilitate powder flow from the container to the printer.
- Powder container: The blue powder container is filled with the correct ratio of used/virgin powder.
- Powder load adapter: This is a two-way adapter; one side mounts to the blue powder container and the other side mounts to the printer powder container. The interface is closed and does not allow the powder to be airborne during transfer.

Figure 16: H Trolley with powder container



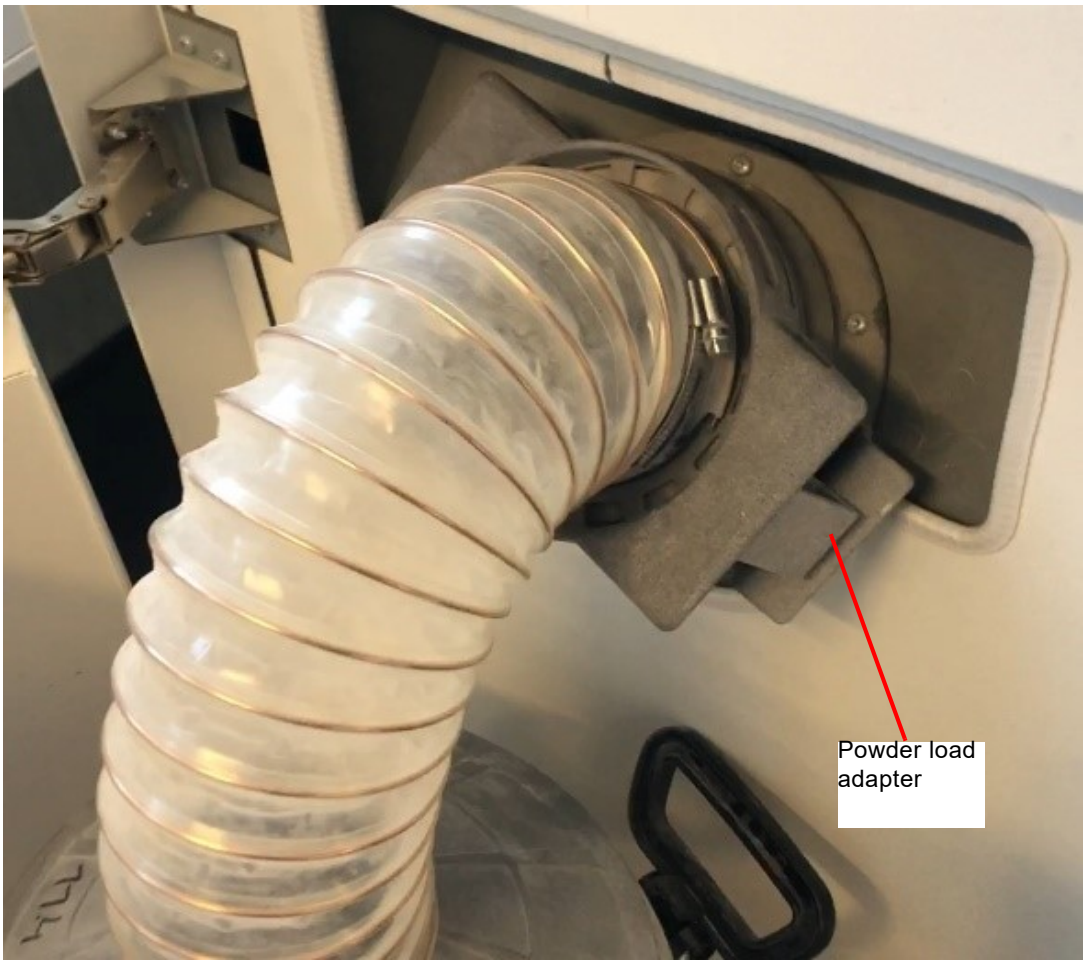
To load the printer with powder:

1. Prepare the trolley:
   a. If required remove the removal box bracket.
   b. Mount the powder container tilt assembly.
2. Prepare the powder container.
   a. See “Preparing the Powder Mixture” (page 114).
   b. Confirm the powder load adapter is properly mounted.
3. Attach the powder container to the Stratasys H trolley and securely lock in place.
4. Position the trolley near the printer.
5. Open the printer lid. If the lid is kept closed, there is a risk of scratching the printer panel.
6. Open the printer powder container access door and remove the lid.

Figure 17: Powder container load port

7. Mount the front end of the powder container adapter to the inlet of the printer.

Figure 18: Powder load adapter connected to printer



8. Position the Stratasys H trolley so it may be rotated vertically. See Figure 19.

Figure 19: Position trolley

9. Begin raising the powder container. See Figure 20. The powder container will begin to tilt while it is being raised. Raise the container to the maximum height.

Figure 20: Raise the powder container

10. Raise the powder container to its maximum height. Lock the powder container so it will remain inverted vertically. See Figure 21. The powder will start flowing from the powder container into the printer.

Figure 21: Vertically inverted powder container

11. If needed, reposition the trolley.
12. Allow at least 5 min for the powder container to empty. If needed, lightly shake the powder container.

When the powder container is empty, perform the steps below to finish the powder filling process:

1. Unlock the tilt assembly.
2. Lower the powder container. Allow the tilt bracket to return to its normal position.
3. Lock the tilt assembly.
4. Disconnect the powder load adapter from the printer.
5. Replace the powder inlet lid.
6. Store the trolley and close the door to the printer powder container.

Basic Job Build Tasks

Starting a Build Job (Select From List)

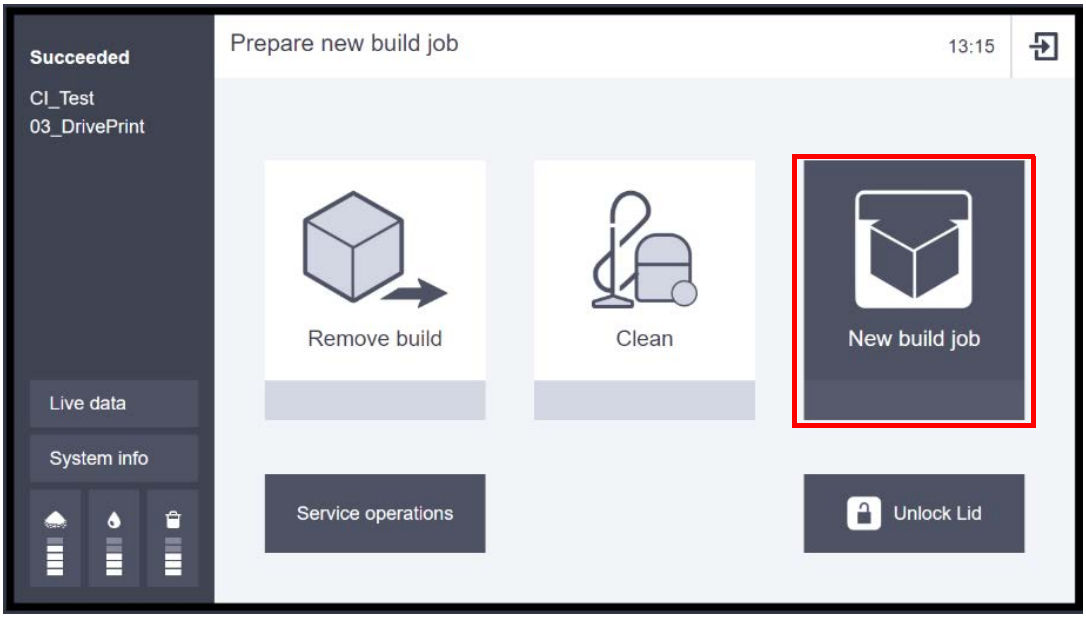
Before starting a build job, confirm that the powder to be used has been stored at a temperature of 20°C to 25°C (68°F to 104°F) and relative humidity of 40% to 55%. If the powder has been stored outside these parameters or if it has been stored under unconfirmed conditions, perform “Test Powder Distribution” (page 246).

To start the build:

1. Initiate the process by clicking the **New build job** button on the home screen and follow the guide on the touch screen.

The printer will start the build job if there is enough powder and HAF loaded and there is enough space in the waste cartridge.If these criteria are not met, a warning will display.

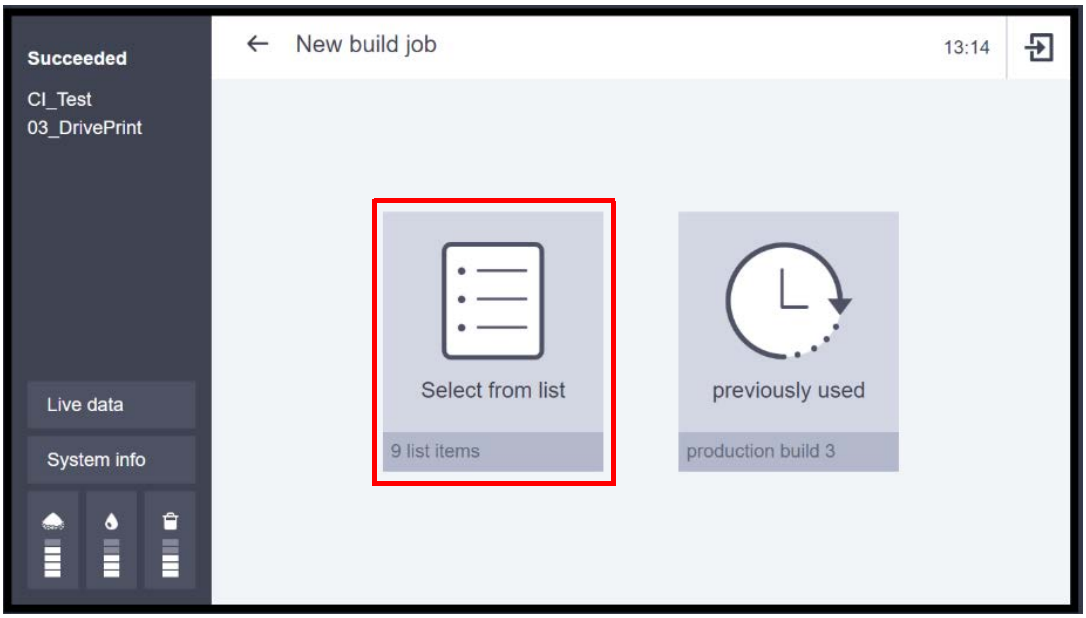
Figure 22: New build job



2. Select one of the two options: 1) a list of jobs loaded to the printer or 2) the last job that ran on the printer.

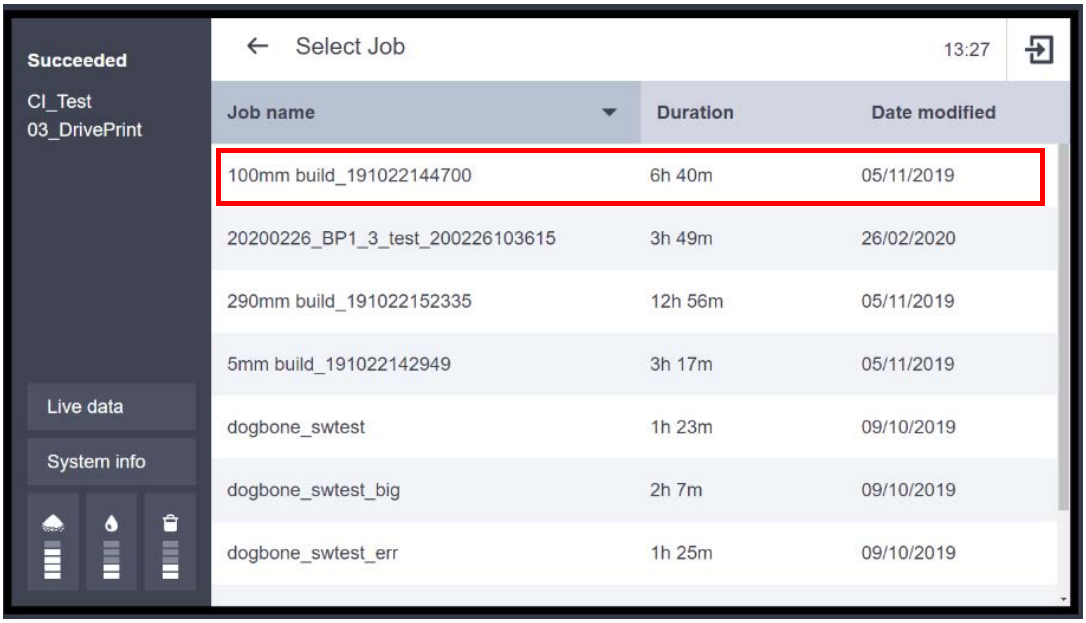
3. Press **Select from list**.

Figure 23: New build job type



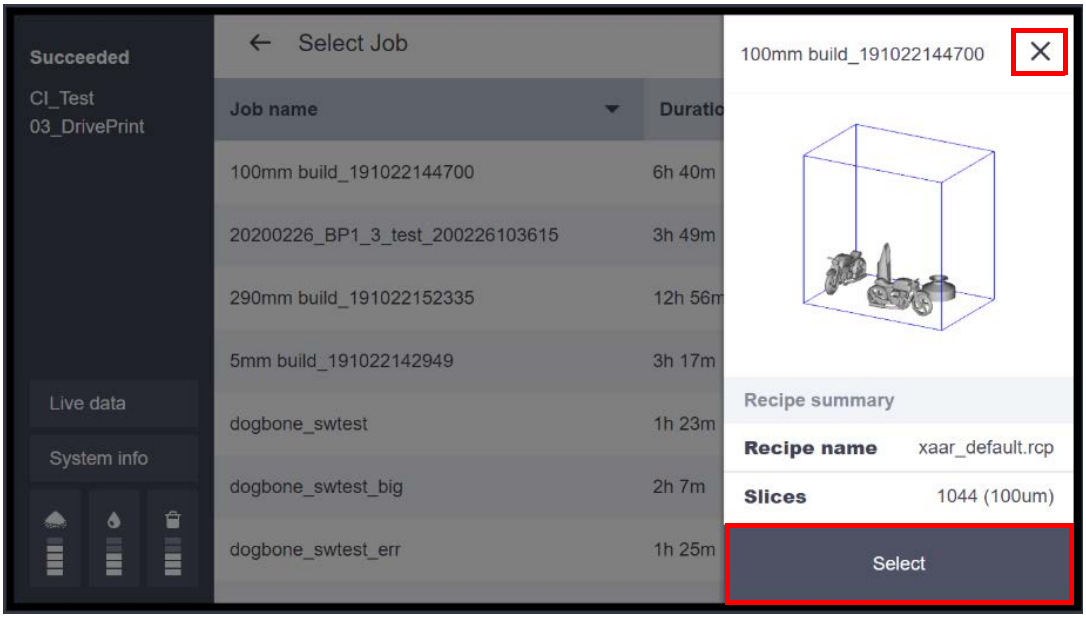
4. After pressing **Select from list**, all the build jobs loaded on the printer are listed. Press the name of the desired job.

Figure 24: Select a listed build job



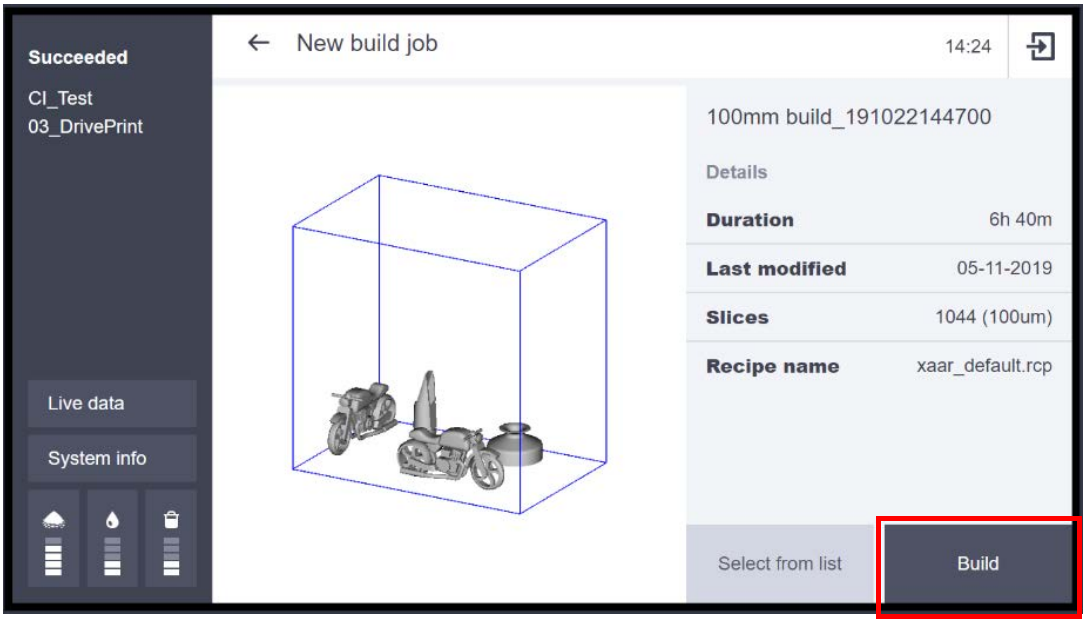
5. The details of the job will display on the right side of the screen. Press **Select** to verify and load the build job. Press the **X** at the top right corner to go back to the previous screen.

Figure 25: Verify build



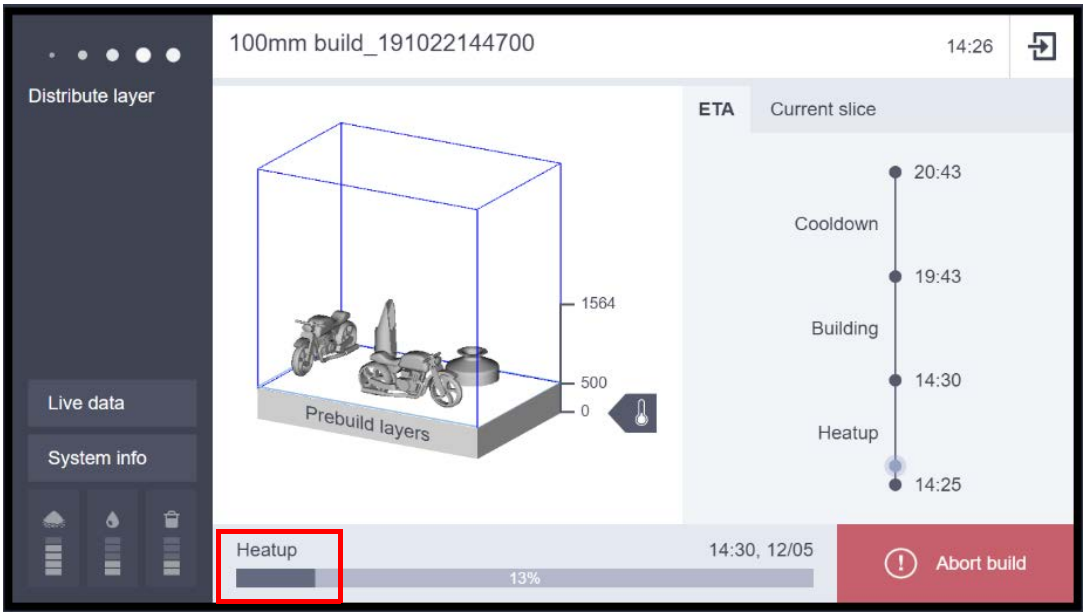
6. Press **Build** to start.

Figure 26: Press Build



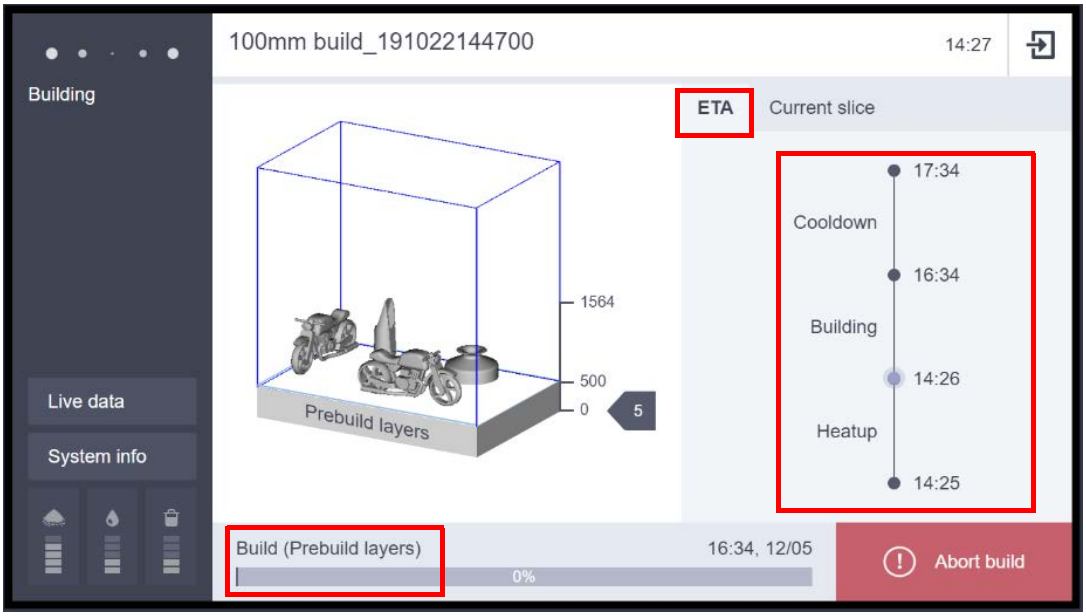
7. The printer now enters the heatup phase of the build. The printer distributes powder on the build bed until thermal stability is reached and the build is positioned to start. The build bed remains in the top position during this step.

Figure 27: Build screen during heatup



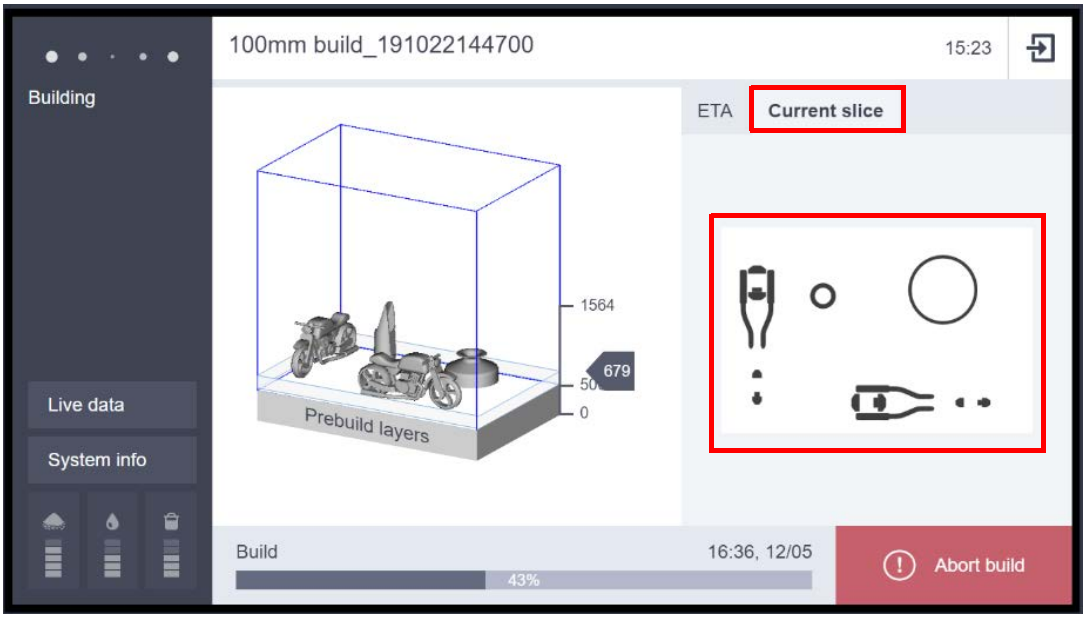
8. After heatup is completed, the build job begins. The first stage is pre-build. During this phase, 500 layers of power are placed on the build bed. During this phase, the estimated time to build completion can also be viewed.

Figure 28: Pre-build



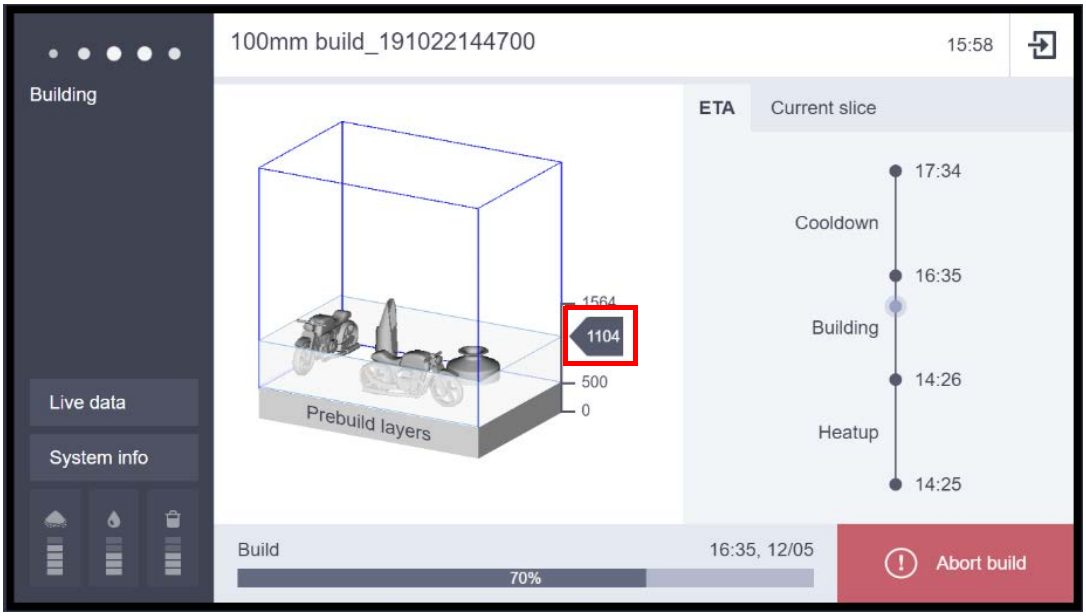
It is also possible to view the slice being currently printed by selecting the **Current slice** tab." and see the image of the slice that is being printed. This screen is also useful for verifying there are no major issues with the jetting of the fluid.

Figure 29: Current slice



The primary graphic on the build page provides a counter with the number of the current layer being printed.

Figure 30: Current layer

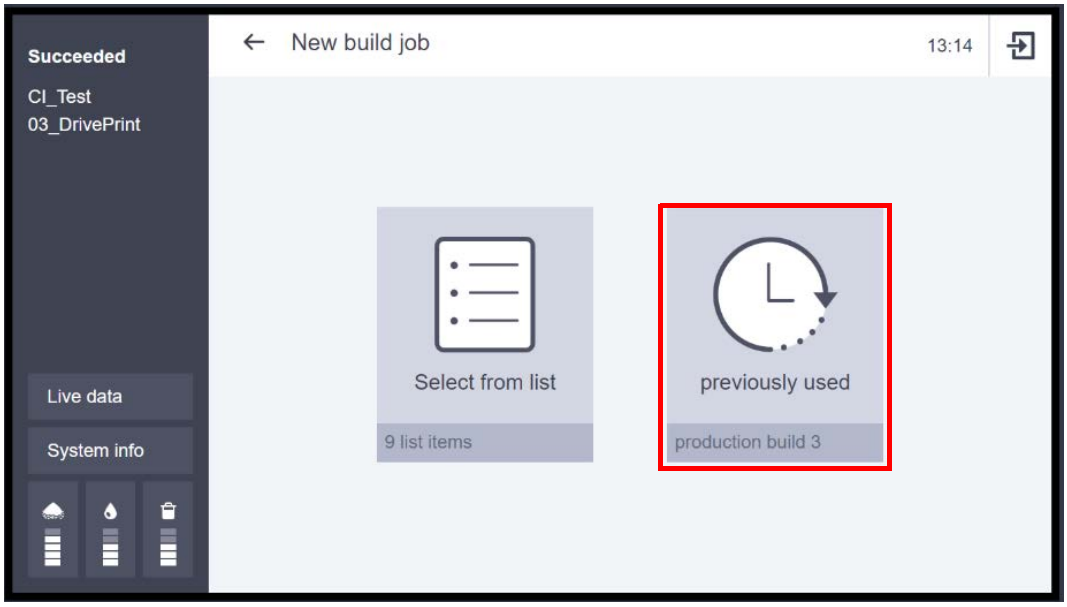


When the build is complete, 20 additional layers of powder are added on top of the build job.

Starting a Build Job (Previously Used)

1. Choosing **Previously used** option runs the build job that was last printed.

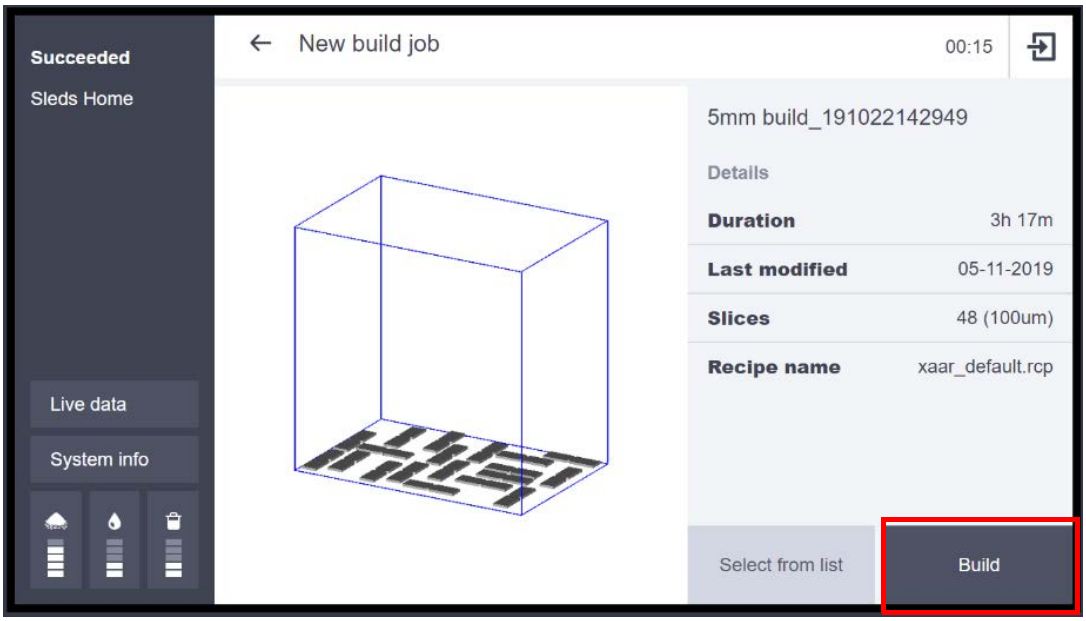
Figure 31: Previously used build job



2. Once the previously built job is selected, the rest of the procedure is the same as the procedure described. in section (page 120).

3. Press **Build** to start the build job.

Figure 32: Start previously used build



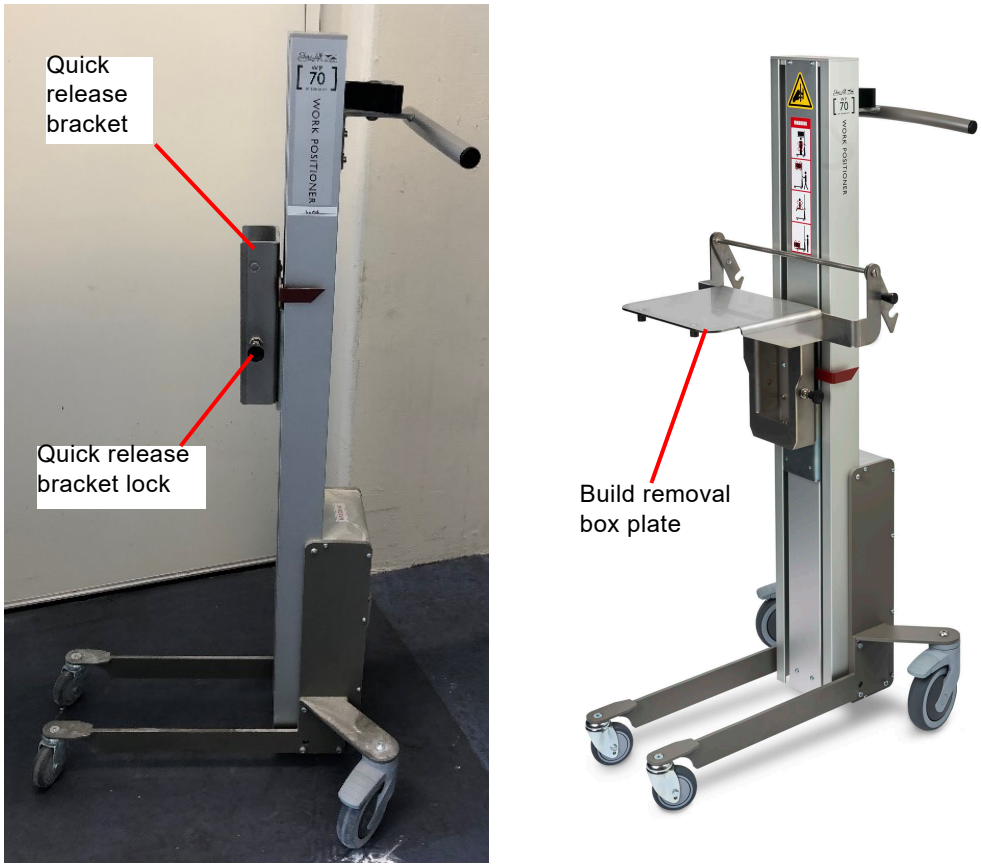
Removing a Build

If the job was completed successfully, both sleds should be in their corresponding parked positions. If not, position both sleds as required.

The accessories required to remove a build job are:

- Stratasys H trolley (part number X3D-01006-V): This is a trolley with an electric motor for lifting the powder container. The trolley also includes a build removal box plate. A quick release bracket is used to mount the build removal box plate to the H trolley. The bracket allows the placement of the of the build removal box on the trolley and the safe transfer to or from the printer.

Figure 33: Stratasys H trolley with and without build removal box plate



- Stratasys H350 Build Removal box (part number X3D-01001). The removal box consists of two parts: a box and a removable bottom plate.

Figure 34: Build removal box and build removal box plate

The build can be removed once the build job is finalized, successfully completed, canceled, or fails.

Warning: Hot surfaces.
Printer chamber components are hot and could cause severe injury. In lieu of thermally protective gloves, wait for the print chamber to cool before handling.

Prepare the Stratasys H trolley and build removal box

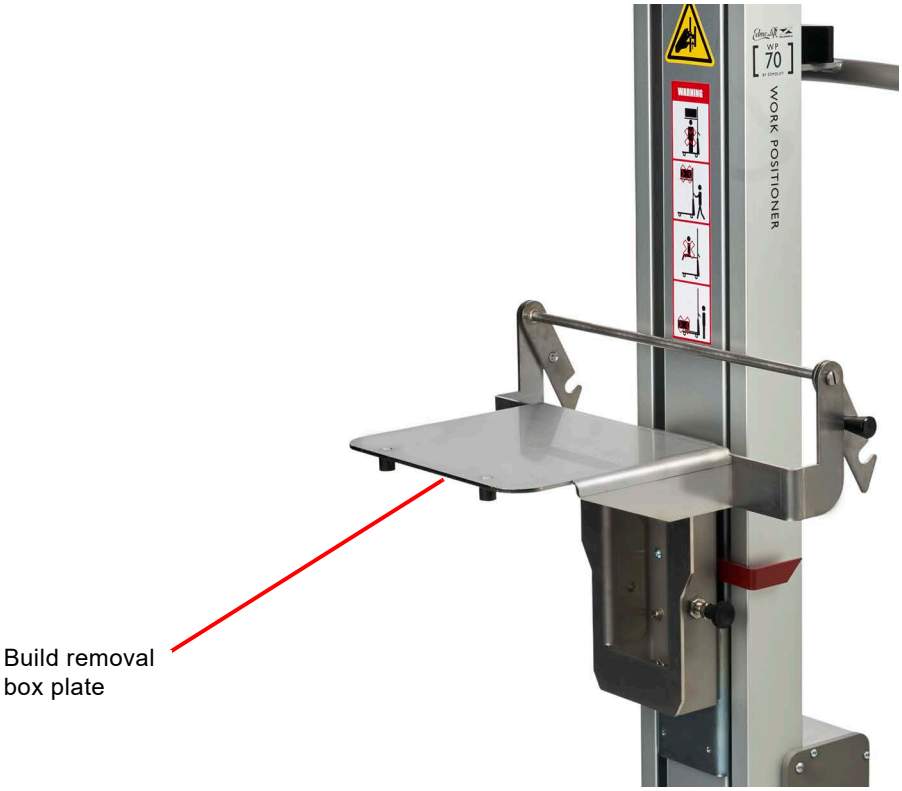
1. Prepare the Stratasys H-trolley.
   a. If required, remove the tilt bracket for the powder container.

b. Mount the removal box plate bracket. See Figure 35.

Figure 35: Mounting the build removal box bracket to the H-trolley

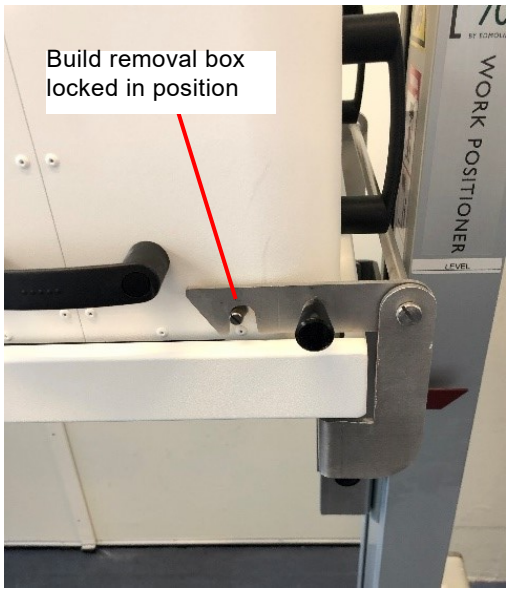
2. Confirm the bracket is locked properly in position using the lock pin. See Figure 36.

Figure 36: Build removal box bracket mounted and locked



3. Place the build removal box on the trolley and lock it in position. See Figure 37.

Figure 37: Build removal box positioned and locked



Placing the build removal box on the printer

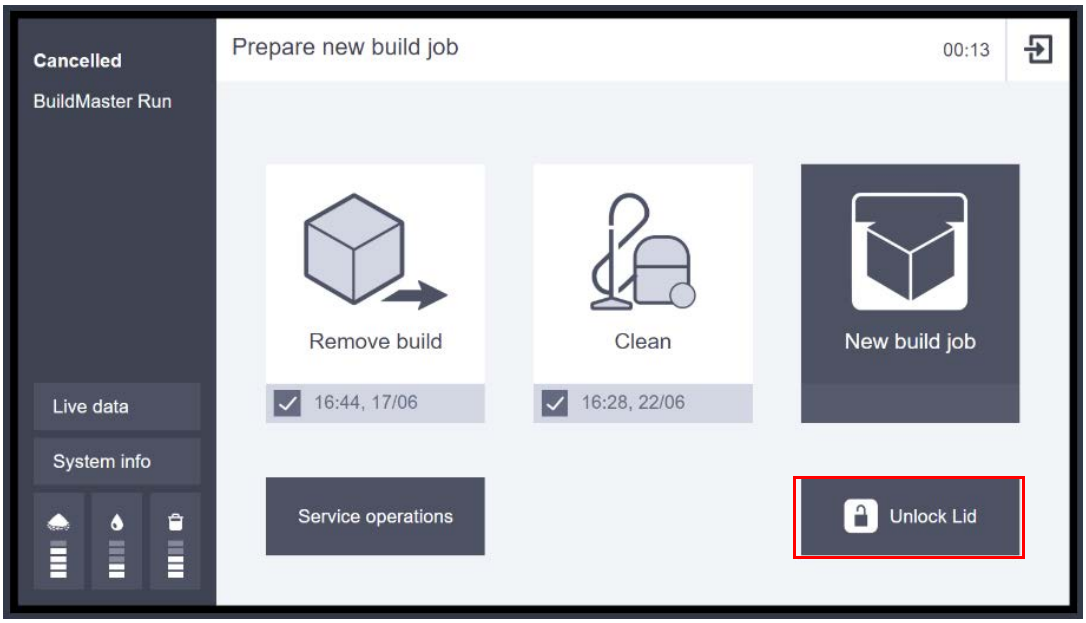
Warning: Inhalation Hazard
Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

Warning: Skin Contact Hazard
HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Warning: Hot Surface Hazard
The processing chamber can reach a temperature of 100ºC (212ºF) and could cause injury. Put on heat resistant gloves before handling.

1. Position the Stratasys H-trolley, with the build removal box, in close proximity to the printer. From the Home screen, press Unlock Lid to open the printer lid. See Figure 38.

Figure 38: Unlock lid



2. Raise the build removal box by extending the trolley I-beam beyond the position markers.

3. Move the trolley towards the center of the printer. See Figure 39. The printer has a positioning bracket that will align the trolley to the printer. See Figure 40.

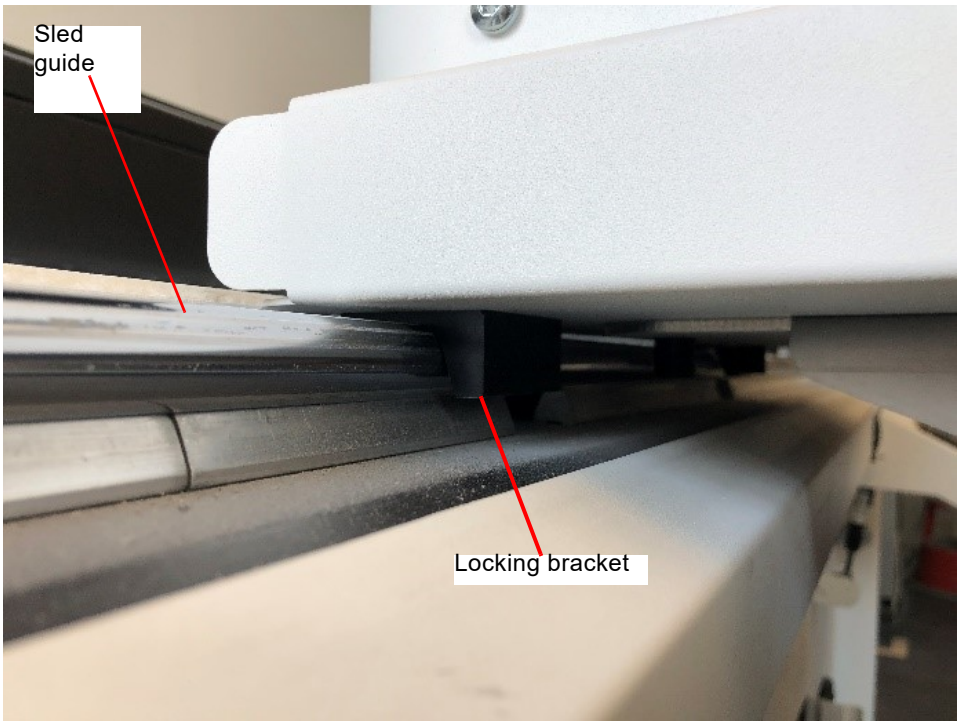
Figure 39: Position the H-trolley

Figure 40: Positioning bracket

Figure 41: Build removal box lifted above the level of the printer top plate

4. Once the trolley is in position, lower the tray until the build removal box bracket is locked in position on the sled guide. See Figure 42.

Figure 42: Bottom plate locked in position



5. When the bracket is level with the printer, the indicator is close to the marked level. See Figure 43.

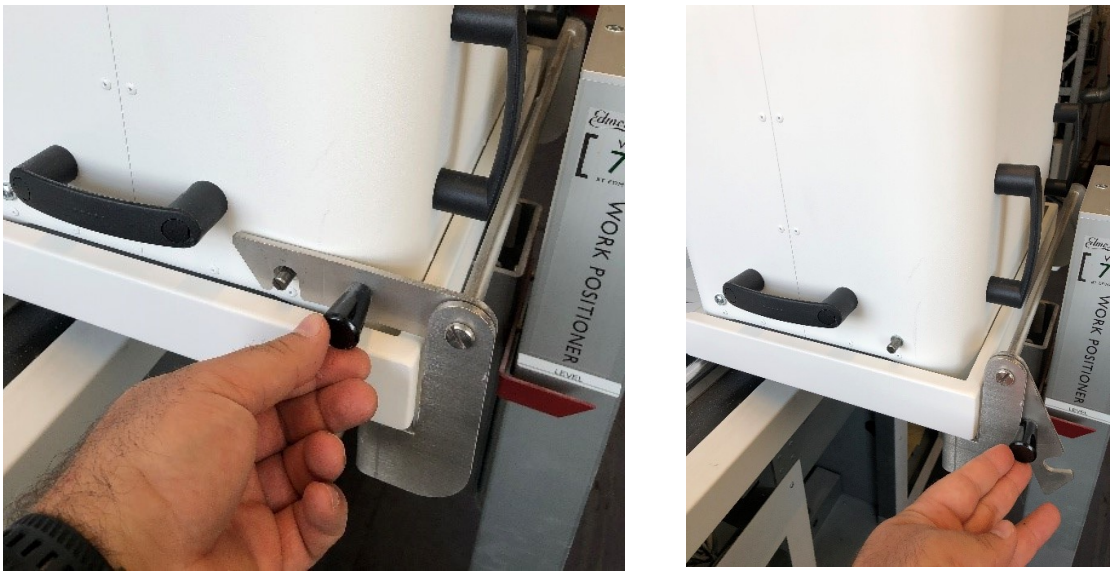
Figure 43: Indicator and marks

6. If the build removal box is not level, the markers will appear as shown below. See Figure 44.

Figure 44: Build removal box not level

7. Unlock the build removal box. This will enable it to be slid over the build plate. See Figure 45.

Figure 45: Unlock build removal box

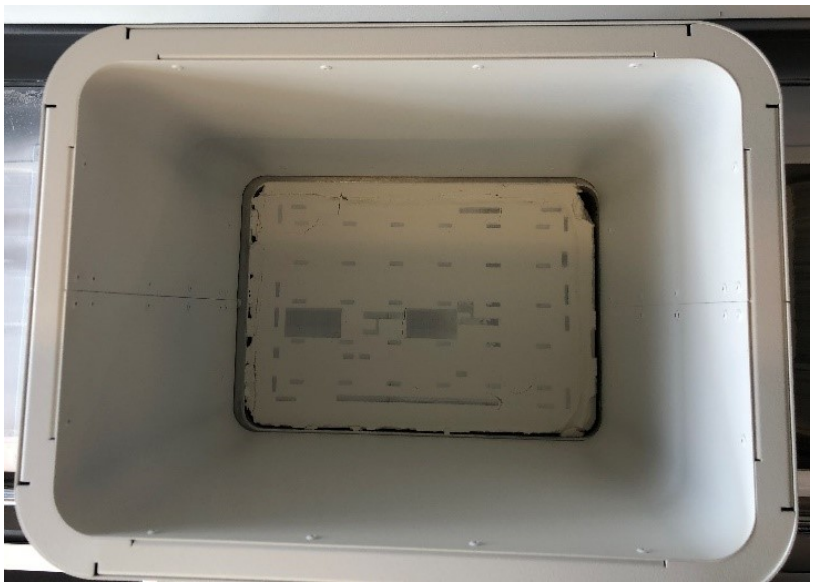


8. Push the build removal box from the top plate to over the build plate. See Figure 46.

Figure 46: Build removal box on printer

9. The build removal box alignment over the build is not very critical. As long as the build removal box is roughly aligned around the build chamber the build will be easy to remove. See Figure 47.

Figure 47: Position build removal box

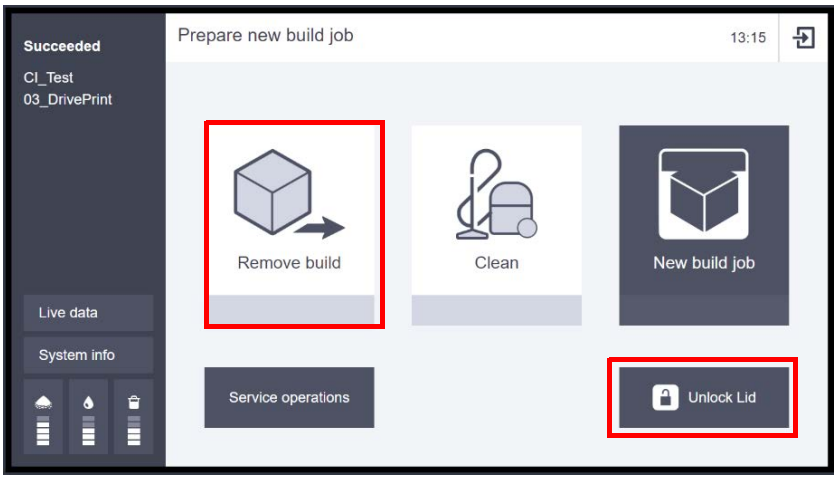


10. The remove build wizard can now be initialized. Follow the on screen instructions to perform this task.

Remove the Build Using the Wizard

1. Press **Remove build** to start the process.

Figure 48: Home screen

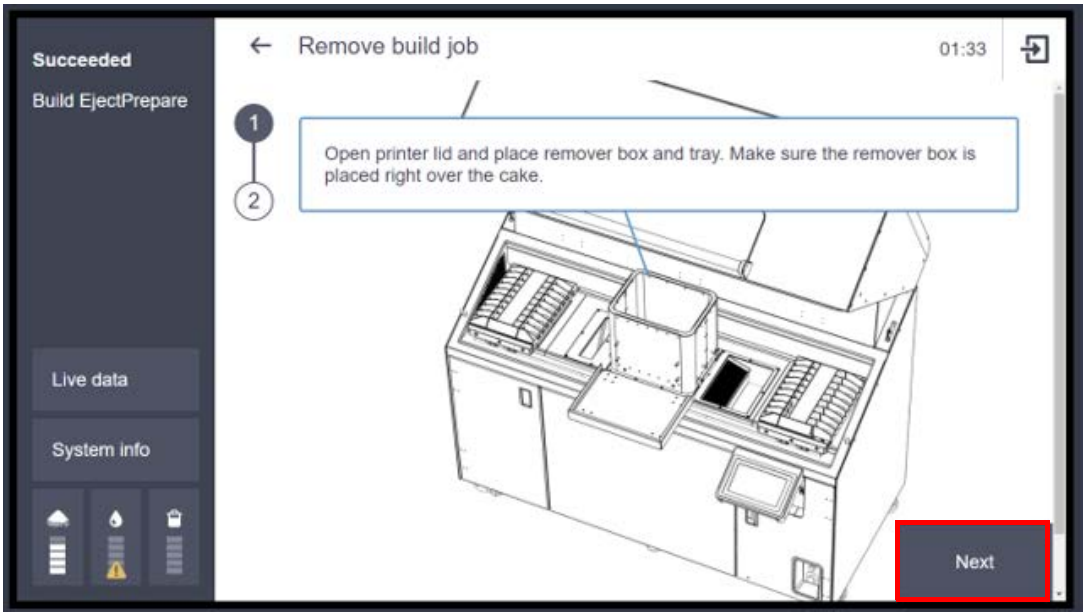


2. The sleds should be in their parked positions, which are located at the left and right side of the processing chamber.

> The sleds must be positioned away from the build plate to allow the placement of the build removal box.

3. Press **Next**. See Figure 49. The the build plate moves upwards and places the powder inside the remover box.

Figure 49: Build job removal from Home screen



4. When the build plate has moved fully upward and stops moving, pull the build removal box, which now contains the build, onto the Stratasys H-trolley.

Figure 50: Press Finish

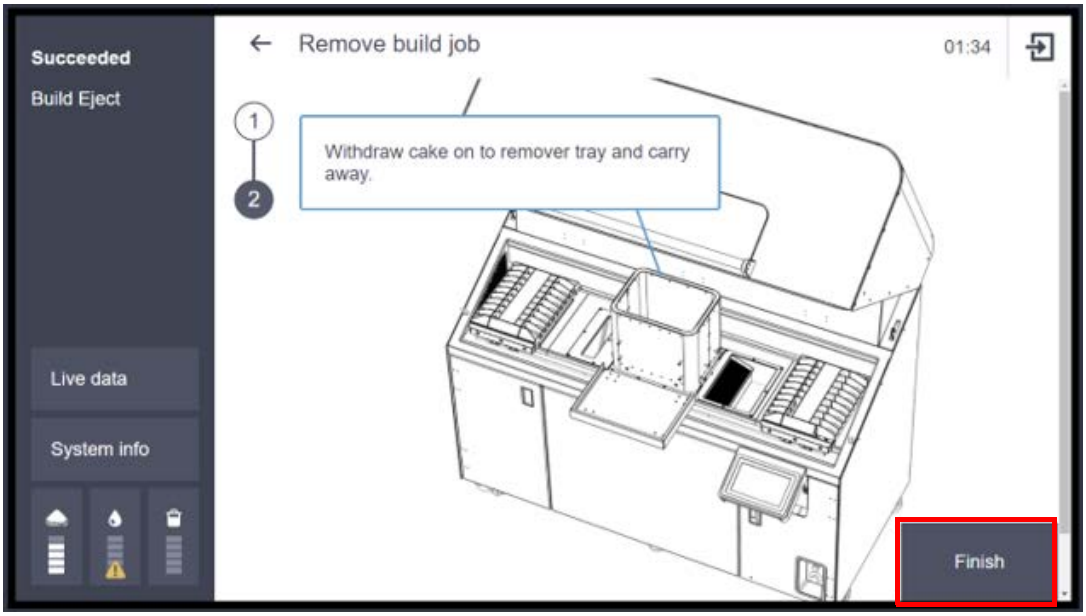
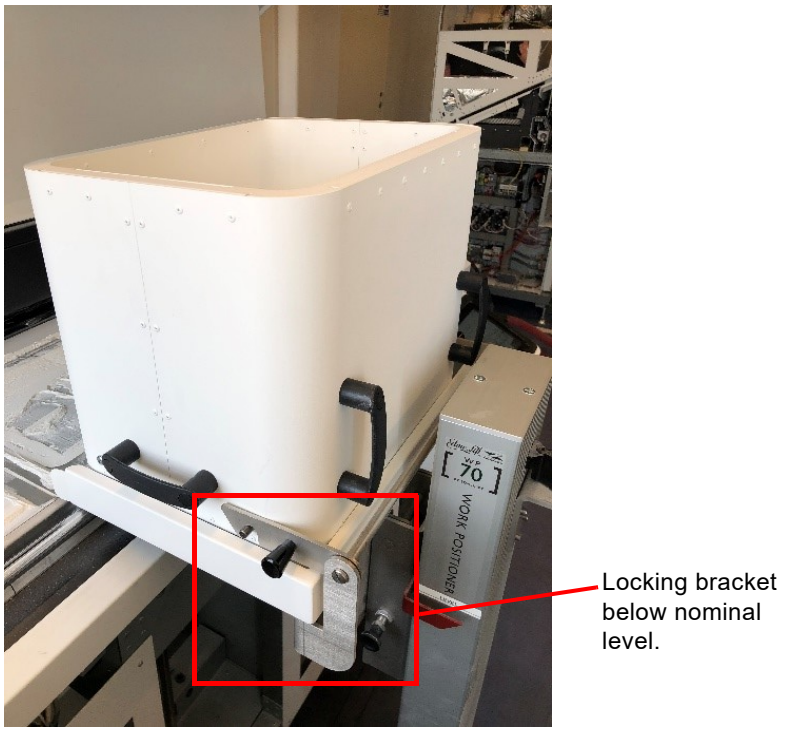


Figure 51: Build removal box placed on tray

5. When the build removal box is properly positioned on the tray, engage the lock that secures the build removal box to the Stratasys H-trolley.

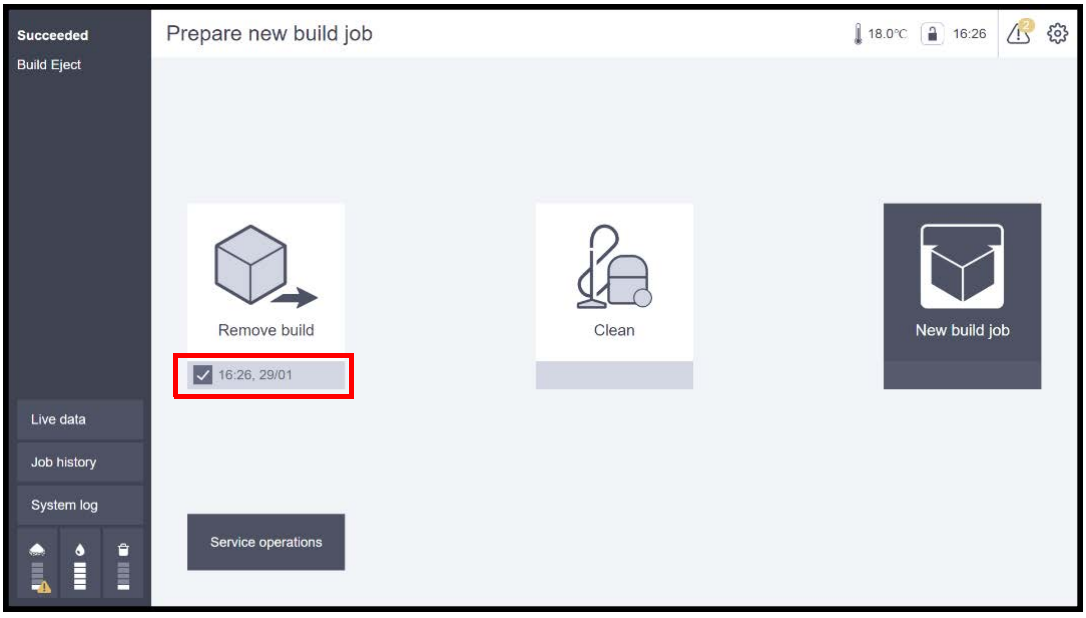
Figure 52: Lock engaged



6. Press **Finish** to complete the process and close the wizard. The software will add a date/time stamp documenting when the build was removed from the printer. See Figure 53.

Once the build has been removed, the printer can be cleaned and the next build job can be started.

Figure 53: Time stamp on a successful build job



Remove the Build Removal Box From the Printer

1. Lift the tray above the top plate level of the printer to release from the sled guide. See Figure 54.

   Figure 54: Tray lifted above the printer and build removal box released from sled guide

2. Pull the Stratasys H-trolley backwards and away from the printer.

Figure 55: Trolley retracted from printer

3. For safer transport of the build removal box, lower the Stratasys H-trolley tray.

Figure 56: Build removal box ready for transfer

The Stratasys H-trolley can safely and stably carry the build removal box even when fully extended.

Once the build has been removed, the printer can be cleaned and the next build job can be started.

Cooldown

Once the build itself is complete, the cooldown stage is an important part of the process. If parts cool too quickly, this induces thermal stress and may cause parts to warp and distort. To avoid this, and ensure high fidelity to the CAD, the cake should be cooled slowly before the parts are unpacked.

Once the build process itself is complete, the printer will automatically perform a controlled cooldown step that brings the top layer to a certain temperature with a specific rate: 1 C° (34 F°) per min. This is sufficient that the build may be removed from the printer, however, the inside of the build will still be hot.

Once the build is transferred to the build removal box, the operator can move the box to the dedicated room and place it on self.

The build should be left to cool naturally for at least 24 hours.

A timer can be used to log the cooldown time and inform the user when the build is ready for breakout.

Post-Processing Considerations

Warning: Inhalation Hazard

Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

Warning: Skin Contact Hazard

HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Once the build is completed:

1. Depowder the build. Manually or with an automated assist removing parts from the build, and air blasting to remove powder.
2. Bead blasting to remove support powder from the finished parts.
3. Finish the build. Dyeing and smoothing.

Depowdering the Build

Caution: Damage to Printer

Do not use the same Powder Retrieval Station for PA 11 and PA 12. Damage to the printer may result.

Once the build has cooled, the parts may be broken out by hand. Personal Protective Equipment (PPE) and a downdraft bench are recommended. To maximize powder recovery the build should be placed in a large tray. The build can be broken apart by hand and the parts removed. Any recovered powder can then be sifted and reused.

Figure 57: Unpacking station

Once unpacked, the parts will still have some powder remaining on the surface. If this powder is recovered in an uncontaminated state it may be reused. One way to recover powder without contamination is to use a blast cabinet to blast the parts with air. Powder recovered this way will not be contaminated and can then be sifted and reused. Although this method can be time consuming and may not be sufficient to move all unfused powder, it does offer the opportunity to maximize powder recovery.

Powder Reuse

Any uncontaminated powder must be sifted using the powder retrieval station before it is reused. See “Powder Storage and Preparation” (page 16) for additional information about powder storage conditions.

During unpacking and part cleaning, any powder that is not contaminated may be reused after processing using the powder retrieval station. If handled properly, powder recovery can be maximized for reuse in subsequent builds. A minimum of 30% unused powder is recommended to ensure high quality parts. If the powder begins to look yellow, brittle parts can result.

Bead Blasting the Build

Automated Bead Blasting

To remove the final trace of unfused powder, the parts may be blasted with glass media. This can be done by hand in a hand blasting cabinet or by using an automated off-the-shelf piece of equipment. The DyeMansion™ PowerShot C™ is an example such a piece of equipment. It is

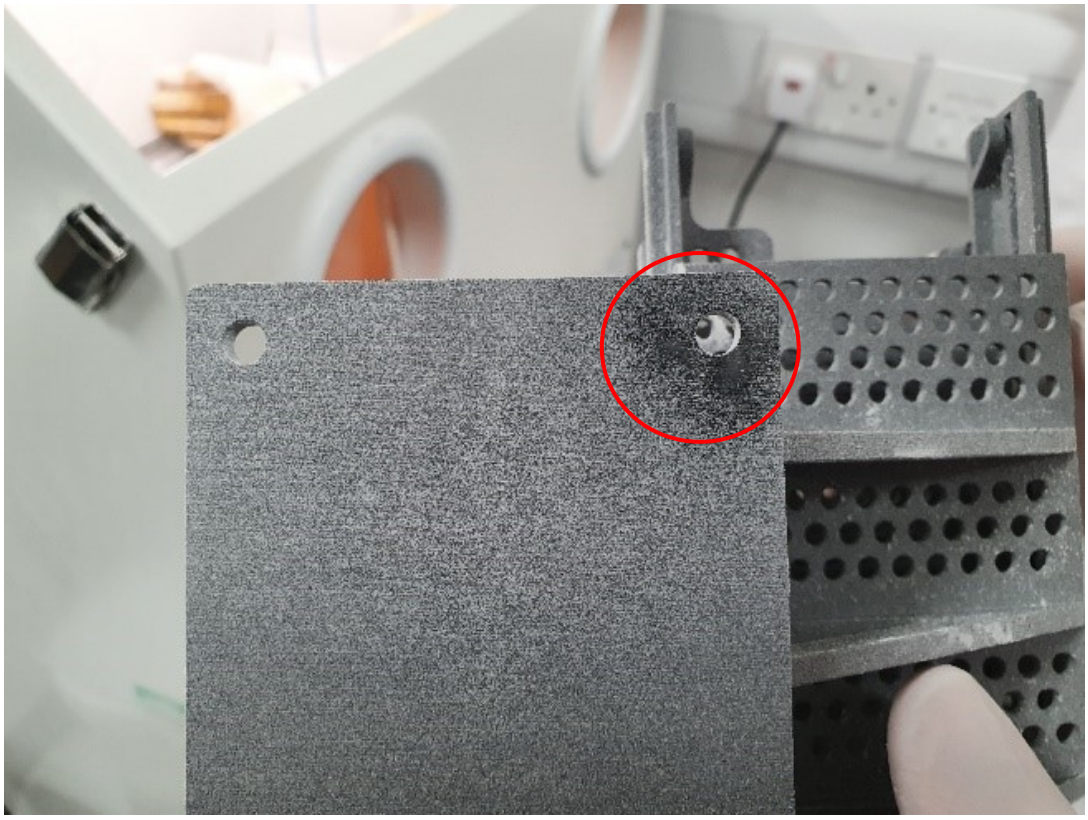
important not to mix heavy, thick parts with any small parts or parts with small features. The reason for this is that as the heavy parts tumble in the machine, they may collide with delicate parts and cause them to break.

Figure 58: Bead basting machine (sample)

Manual Bead Blasting

Take special care when bead blasting by hand, particularly when trying to remove powder from negative features such as holes. If glass beads are blasted in the same area for too long, the part surface may burn (see Figure 59). To avoid this, keep the blasting focal point moving by moving the part, moving the nozzle, or moving both at the same time. This will remove by powder in a more gentle fashion and will reduce the risk of burning.

Figure 59: Burned printed part



In addition to burning parts, it is also possible to burn/melt the powder you are trying to remove. If this occurs, it may effectively seal the powder in place. This makes it very difficult or even impossible to remove. Avoid doing this by carefully blasting the powder as described above. If glass beads or any type of abrasive media is used to remove powder, it is likely any recovered powder will be contaminated with the blast media. Therefore, this powder should not be reused.

Build Warnings

TBD

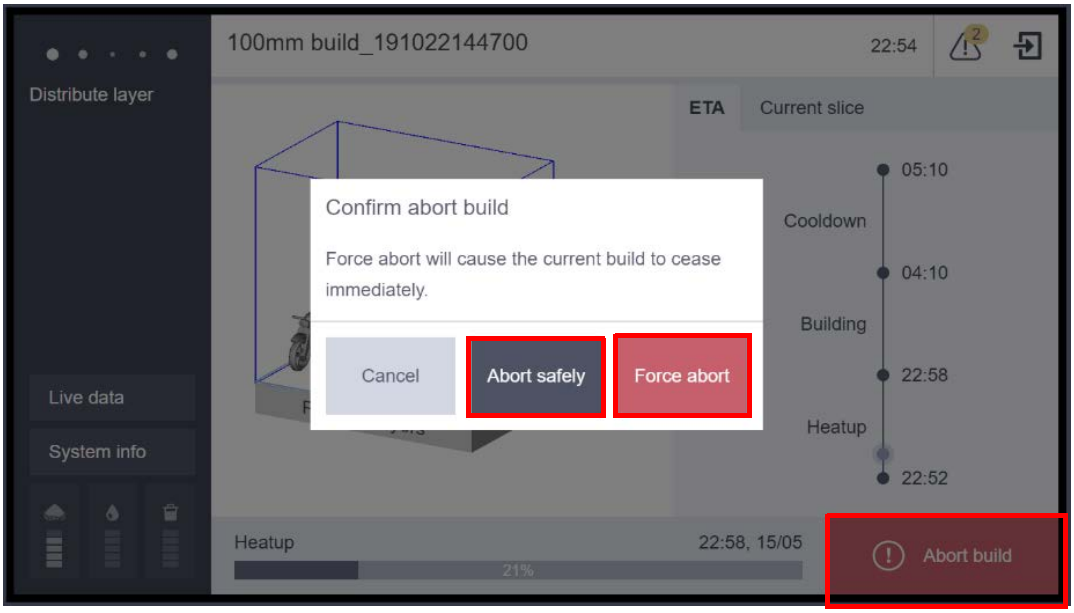
Aborting a Build

At any point during the printing process, it is possible to abort the print job. Pressing the **Abort build** button on the lower right part of the touchscreen initiates the **Abort build** wizard. The wizard displays a popup window with three abort options. See Figure 60. The options are:

- Cancel
- Abort safely
- Force abort

In the event that **Abort build** was inadvertently pressed, pressing **Cancel** stops the wizard and allows the build to proceed.

Figure 60: Abort print job



Abort safely

Abort safely is pressed when the user wishes to stop the build in a controlled manner. After the build is stopped, both sleds move to a safe position.

Depending on when **abort safely** was initiated in the build process, the two sleds will pass over the build plate while moving to the end of the printer to which they are closest and stop there.

Force abort

Force abort is pressed in case of a serious failure. During a forced abort, the sleds are stopped immediately and stay at their current position. At this point, the user can evaluate the situation and move the sleds to their park positions using the user interface.

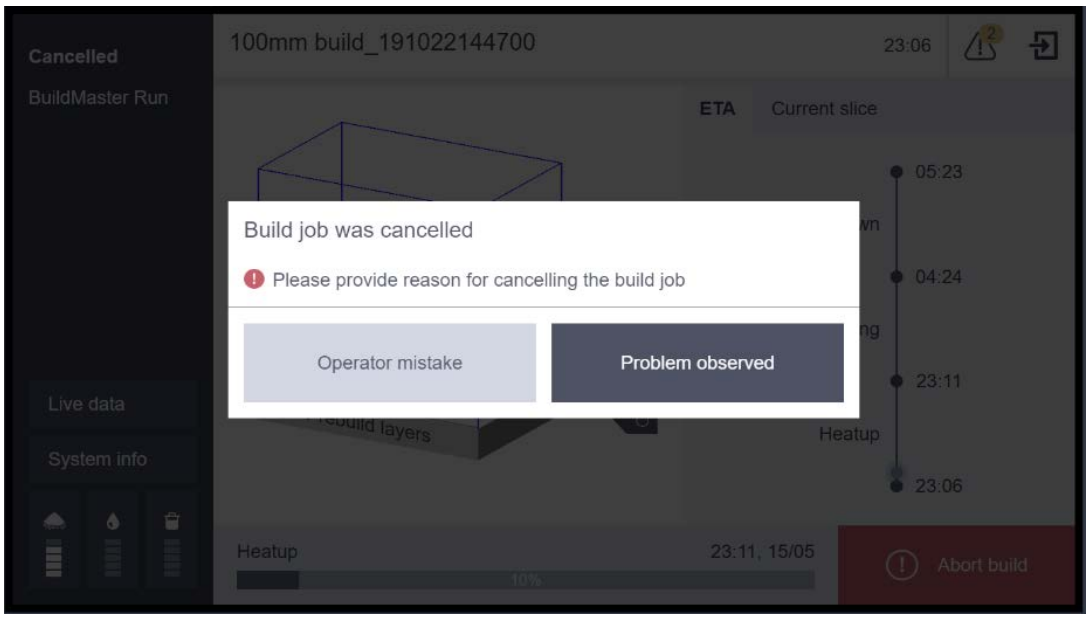
Next steps

On the second popup window of the wizard, the user can identify the reason for canceling the job:

- Operator mistake. For example, the wrong print job was started.

- A problem is observed by the operator. For example, powder short feeding, parts curling etc.

Figure 61: Abort justification



During the final step of the build, the controlled cooldown, the user is presented with a third option when trying to abort the build: Force build complete.

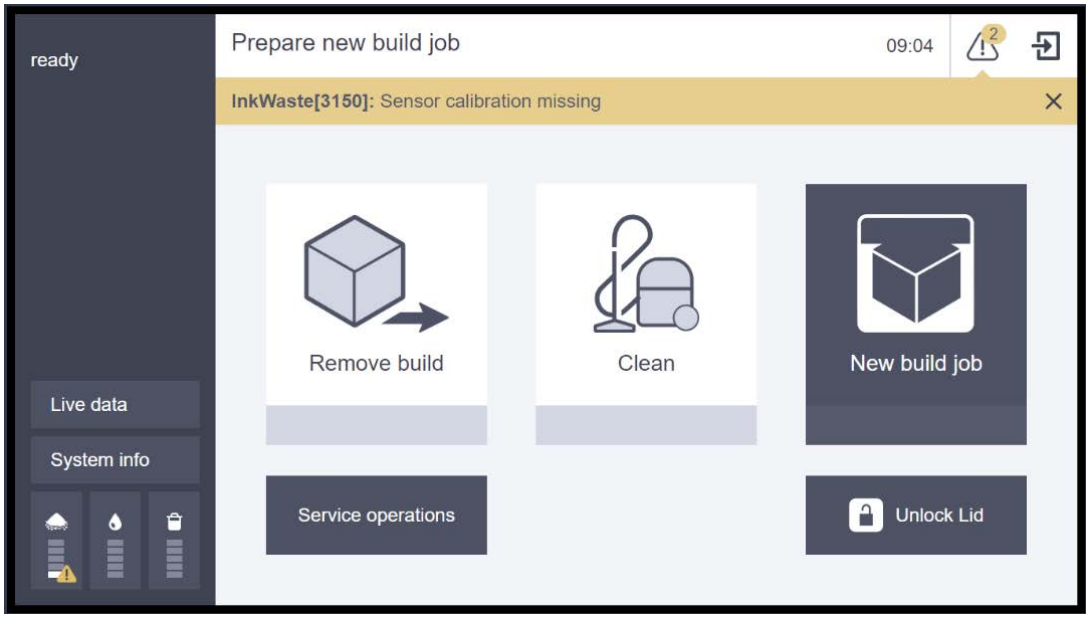
In this case, the controlled cool down is stopped and the user is allowed to remove the build. This, however, is not recommended.

6 CALIBRATION AND ADJUSTMENTS

Load Cell Calibration

Load cells are sensors that measure the weight of the HAF cartridge and the HAF waste cartridge in the printer. It is important to periodically check that the weight measurements are accurate. This will prevent the unnecessary waste of printing materials. It is recommended that the load cells are calibrated once a month.

Figure 1: Calibration warning display



To fully calibrate the load cell, two sub-calibrations must be performed:

- Full cartridge calibration
- No cartridge calibration

The following tools are required to complete a calibration:

- Full HAF cartridge, part number HAF X3D-01011.

Procedure

1. From the home screen, press **Service operations** and then **Module Test**. See Figure 2 and Figure 3.

Figure 2: Press Service operations

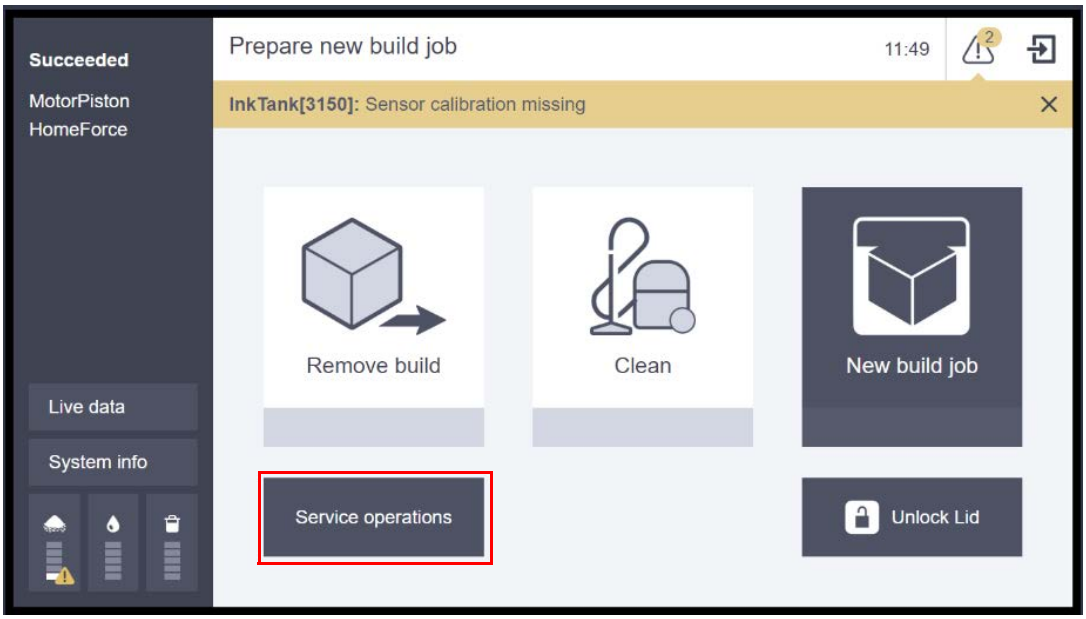
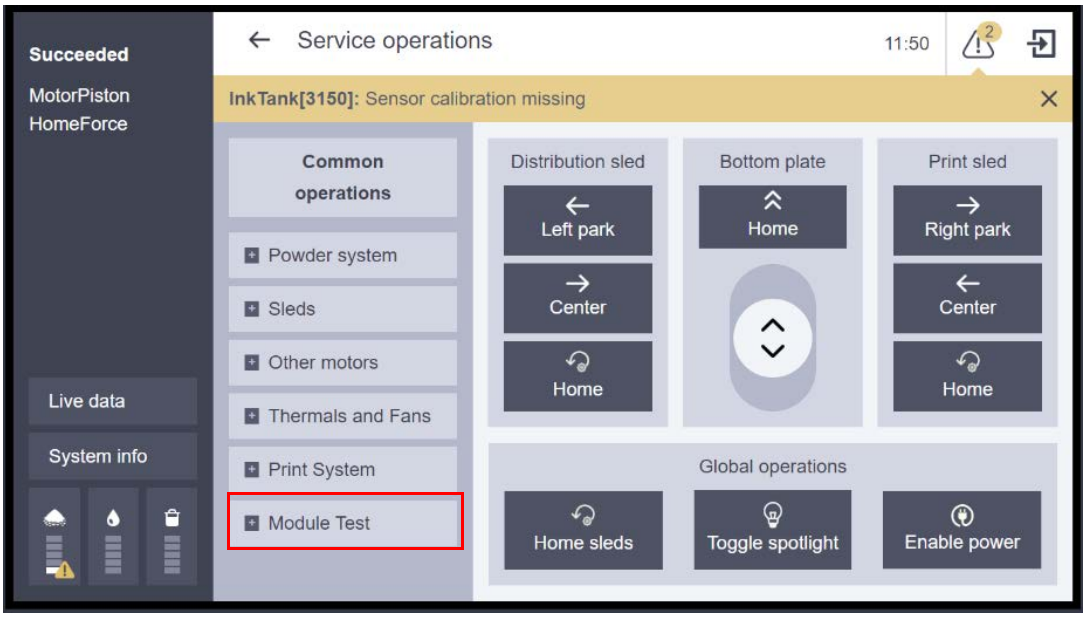


Figure 3: Press Module Test

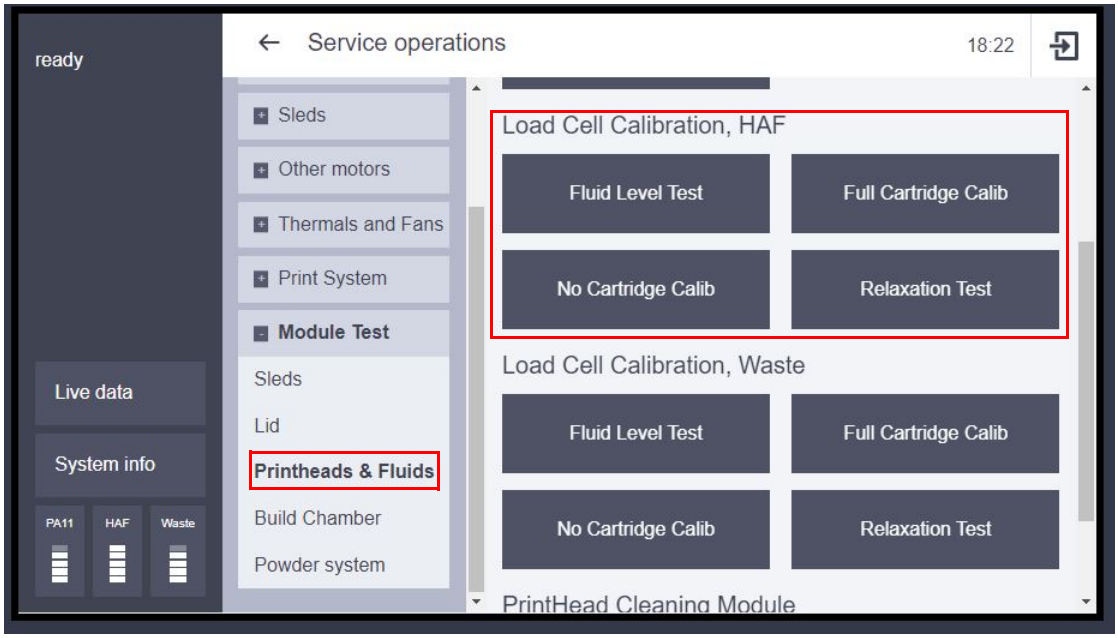


2. Click on **Printheads & Fluids** to access the calibration tasks for the two load cells.

- Cartridge HAF
- Cartridge Waste

3. See Figure 4.

Figure 4: Load cell calibration screen



HAF Load Cell Calibration

1. Insert a full cartridge into the Load Cell and press **Full Cartridge Calib**. See Figure 4. Follow the instructions on the screen. See Figure 5.

Figure 5: Full cartridge calibration

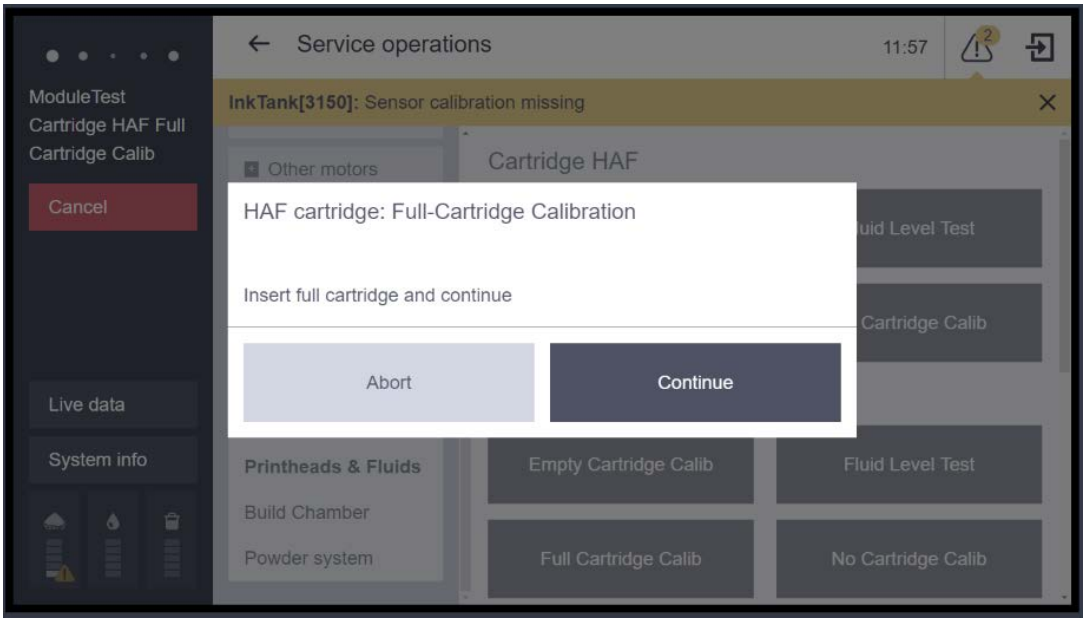
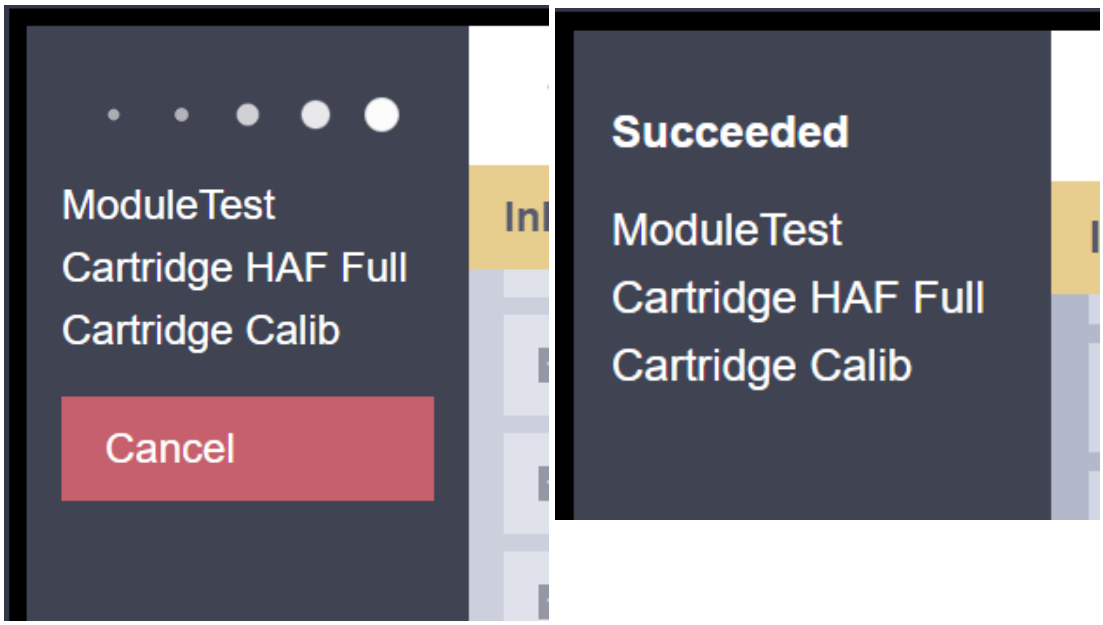
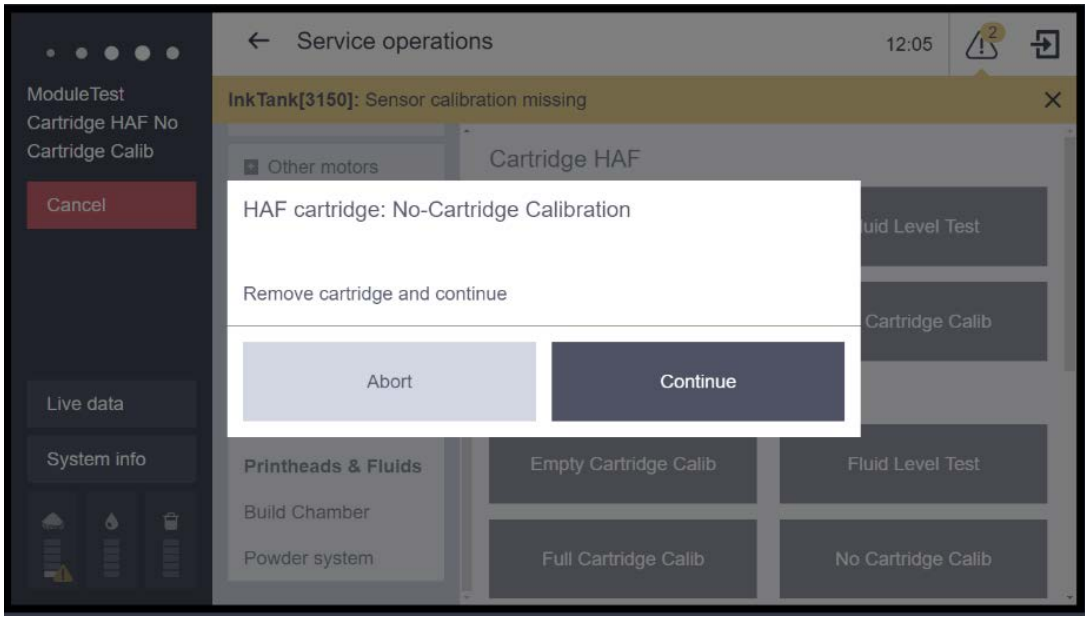


Figure 6: Status message displays



2. The full cartridge calibration is now complete.
3. Remove the empty cartridge and press **No Cartridge Calib.** See Figure 4. Follow the instruction on the screen. See Figure 7.

Figure 7: No cartridge calibration



4. When all three calibrations are completed (full cartridge, empty cartridge, and no cartridge), the **"[3150]:Sensor calibration missing** warning will disappear.

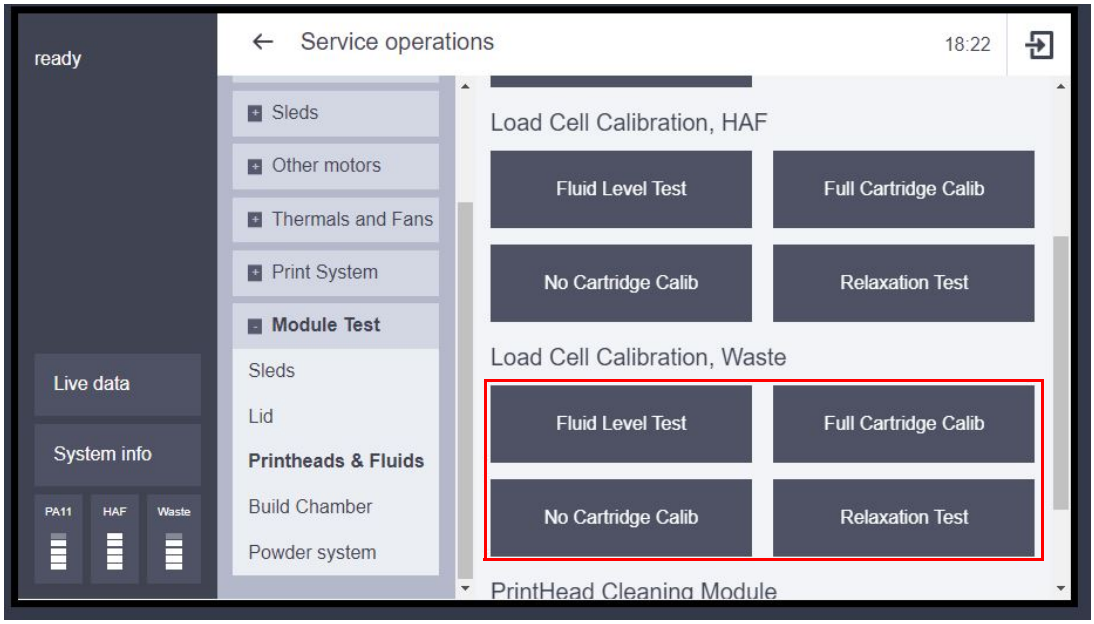
Waste Load Cell Calibration

The procedure for the waste load cell calibration is identical to the procedure for the Figure "HAF Load Cell Calibration" (page 157). Perform the following steps for the waste load cell. See Figure 8.

- **Full Cartridge calibration**

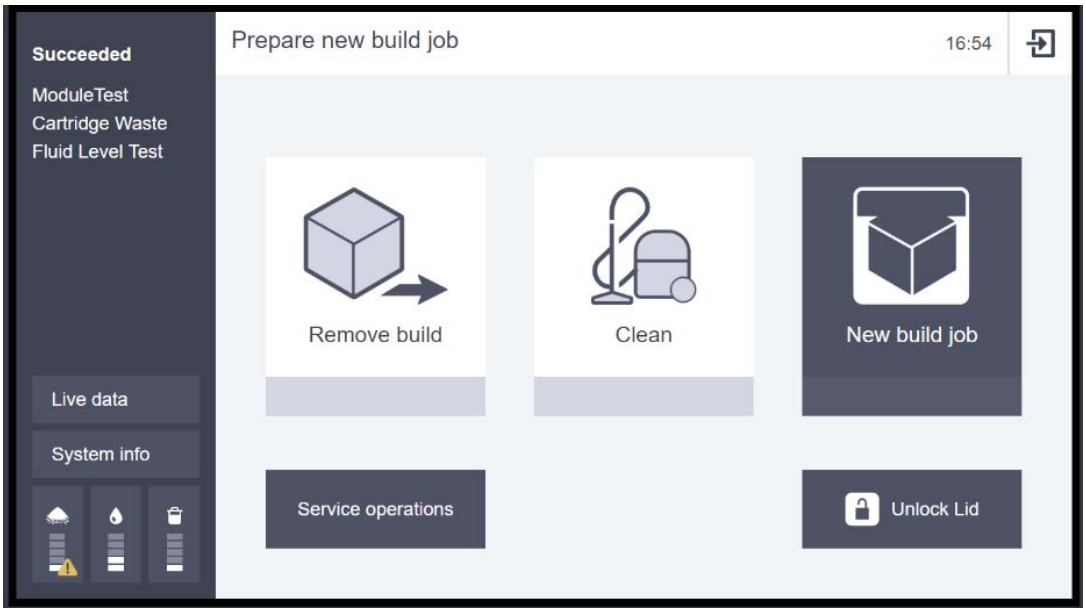
- **No cartridge calibration**

Figure 8: Waste load cell calibration screen



When all calibrations have been successfully completed, the warning disappears from the home screen. See Figure 9.

Figure 9: System fully calibrated



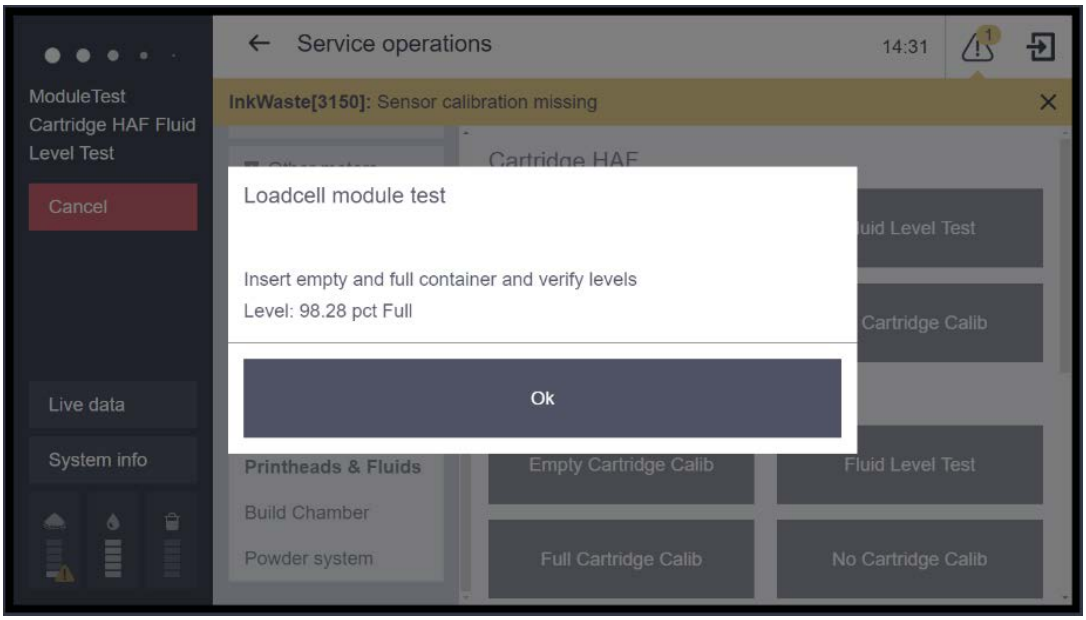
Test Load Cell Calibration

1. To verify the load cell calibration, run the **Fluid level test**. This test can only be performed with a full or an empty cartridge.
2. Press **Fluid level test** and the popup window will display the reading from the load cell as a percentage: 0% empty cartridge - 100% full cartridge.
3. Wait for 10 seconds after inserting the cartridge before initiating the test.

The readings can vary 1%-2%

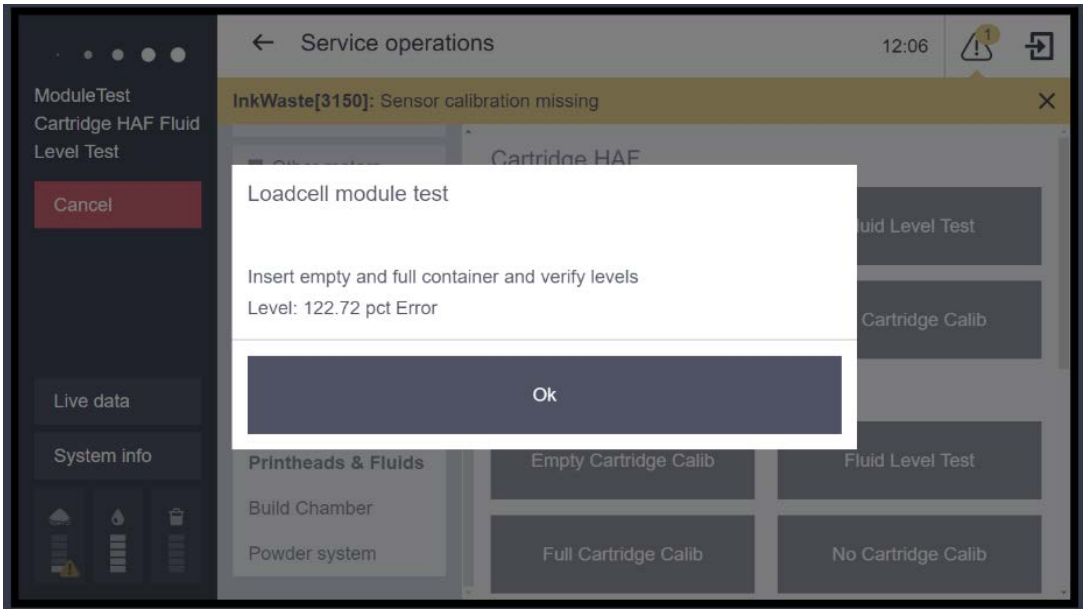
- For a full cartridge the reading can be 98-100%
- For an empty cartridge the reading will be in the range 0-2%

Figure 10: Fluid level test



4. If the calibration is not successful, the fluid test will give an incorrect number. See Figure 11. If this occurs, the calibration needs to be repeated. For example, this fluid level test for a full cartridge gave the result of 122.72%

Figure 11: Fluid level test showing a calibration error



7 MAINTENANCE

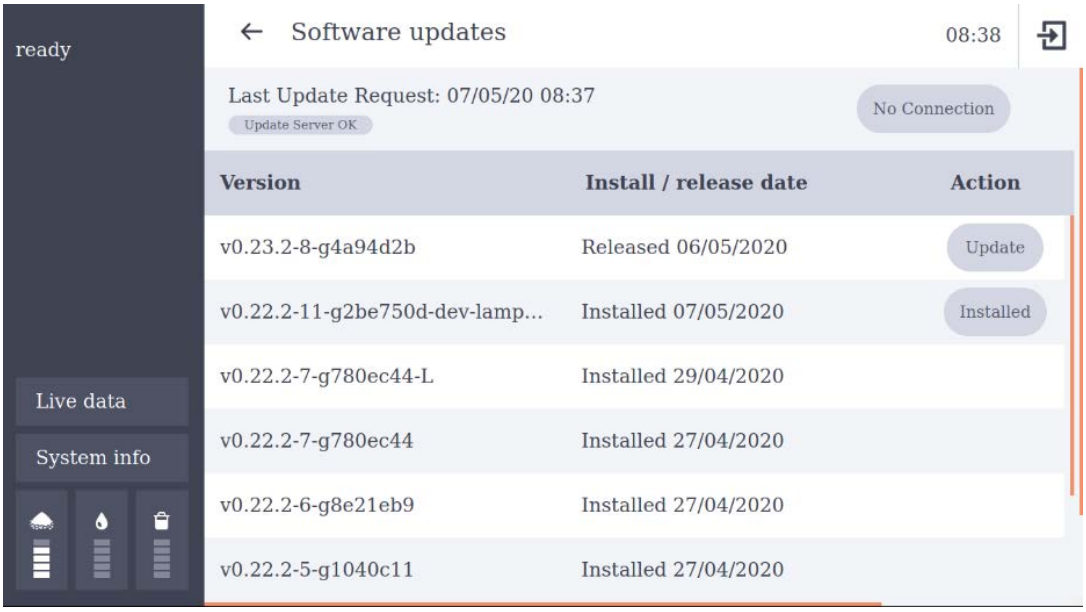
This chapter describes various maintenance tasks that will routinely need to be performed on the H350 SAF Selective Absorption Fusion Powered 3D Printer.

Updating Controller Software

The customer has the possibility to update the printer's controller software via the GUI. The software upgrade is possible only if the printer is connected to the Internet. The software upgrade is available on a cloud drive and the customer is able to choose the software packages that will be installed.

If the printer is not on-line, the update buttons are greyed out and no update options are displayed. See Figure 1.

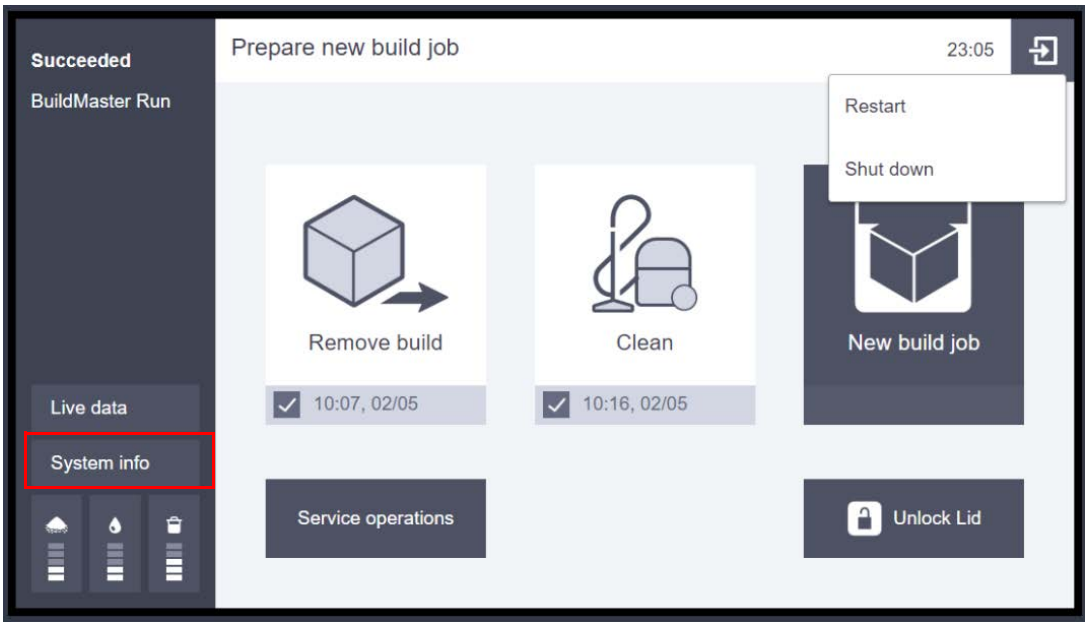
Figure 1: Off-line software update screen



Procedure

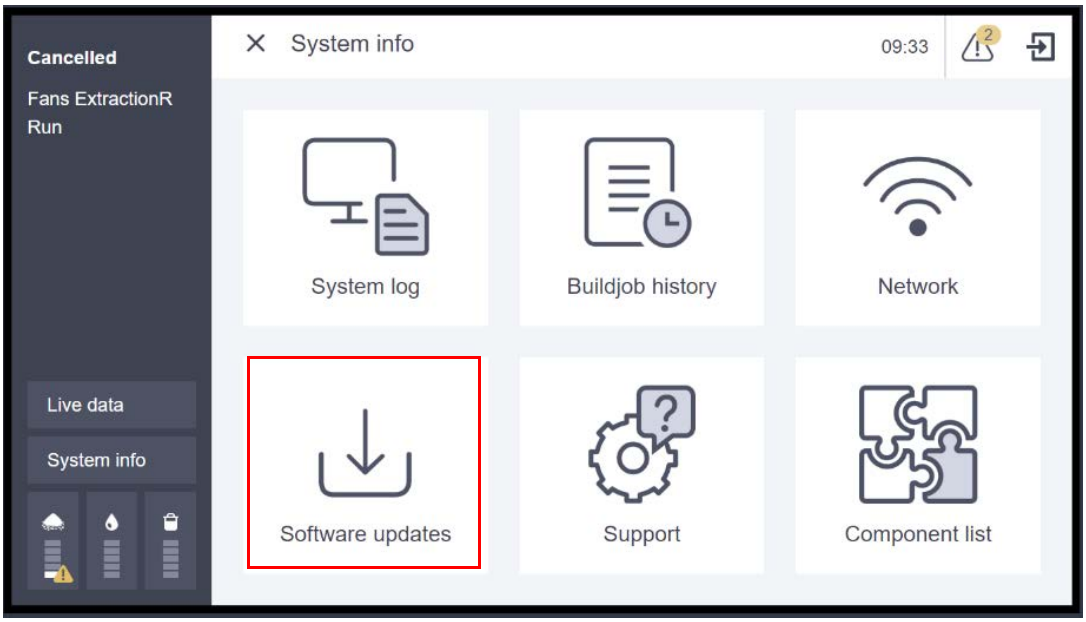
1. From the home screen, press System info. See Figure 2.

Figure 2: Home screen



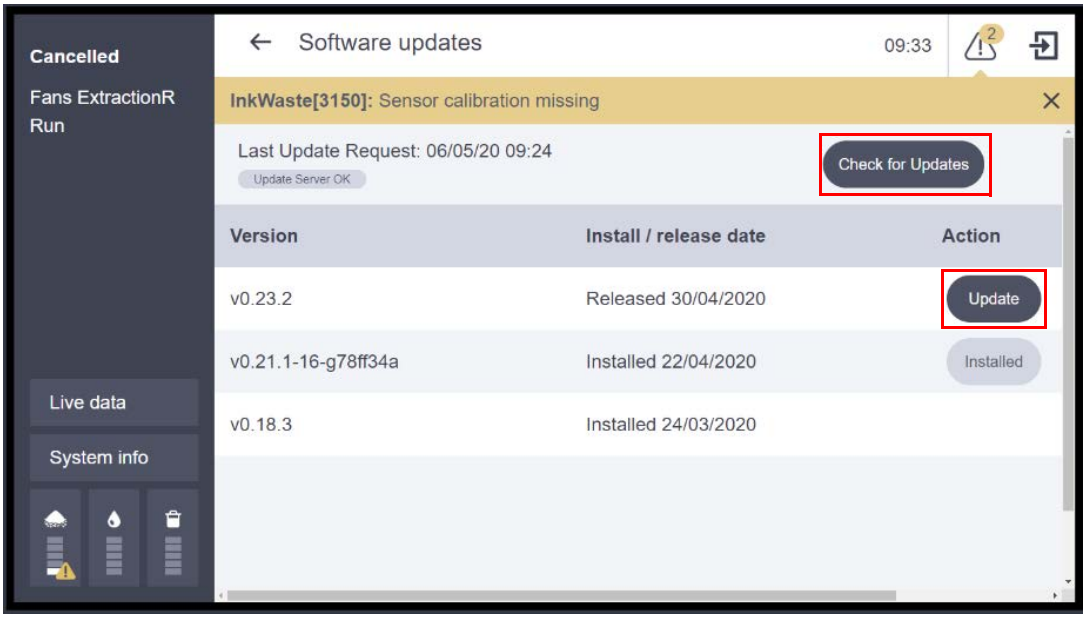
2. Choose Software updates. See Figure 3.

Figure 3: System info screen



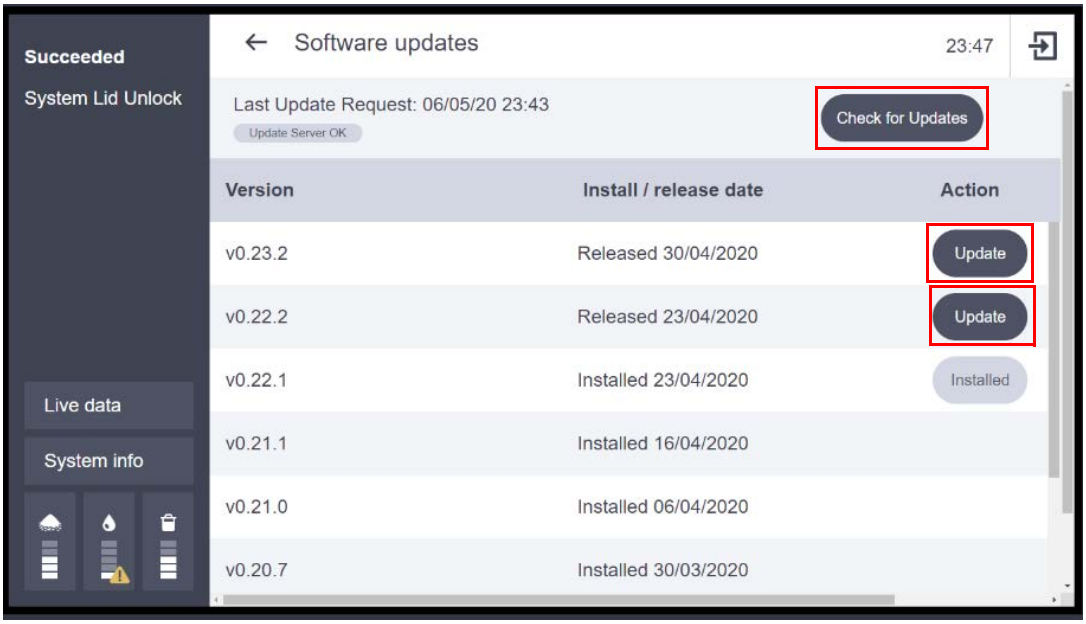
3. If a new software update is available, it will appear on the Software updates screen in a list with the Action state **Update**. Pressing the **Check for Updates** button manually initializes a search if an updated software version is available to download and install. It is possible to see a list of all previous software packages previously installed. See Figure 4.

Figure 4: Software updates screen



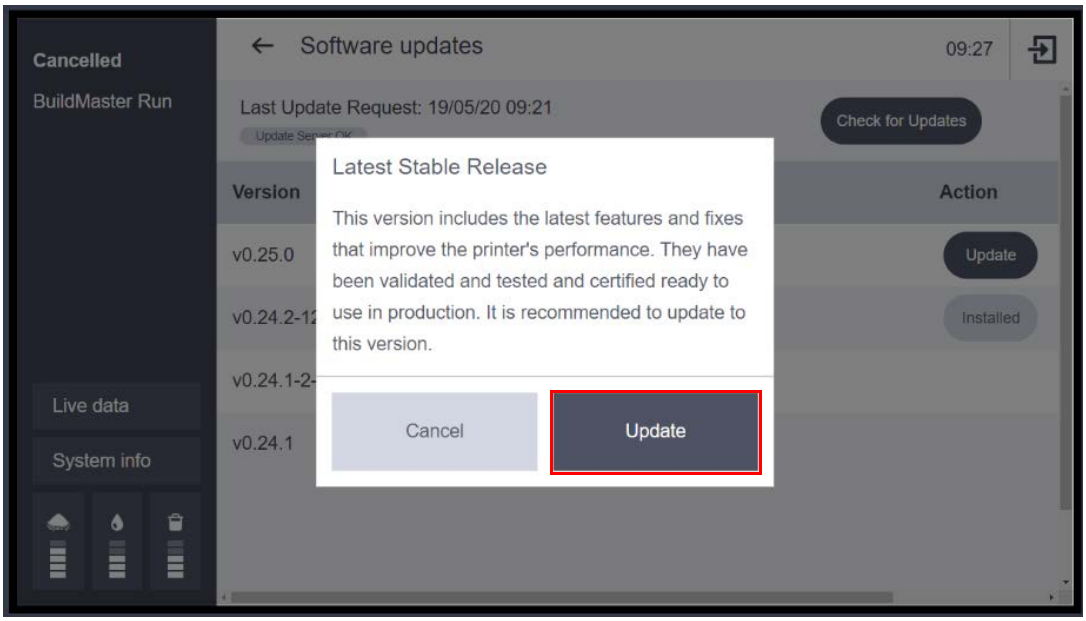
4. If there are multiple software updates available, the Software updates screen will display as shown in Figure 5.

Figure 5: Multiple software updates available



5. Press update. A popup window displays. Press update again to initiate the software update procedure. See Figure 6.

Figure 6: Initiate software update procedure



6. The printer will initiate the software download. See Figure 7 and Figure 8.

Figure 7: Initiate software download 1

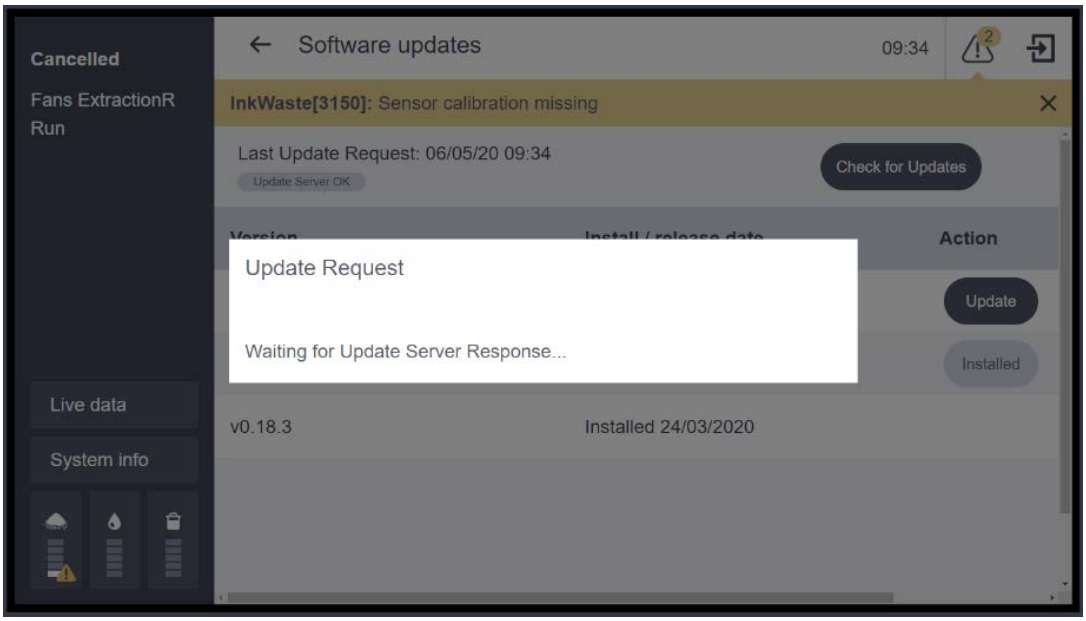
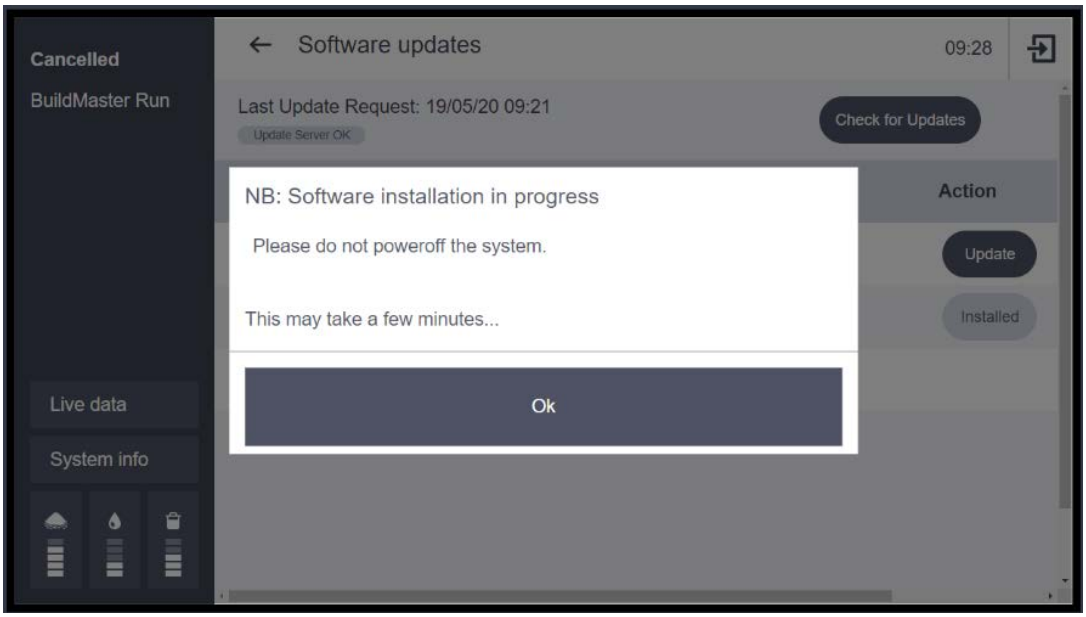
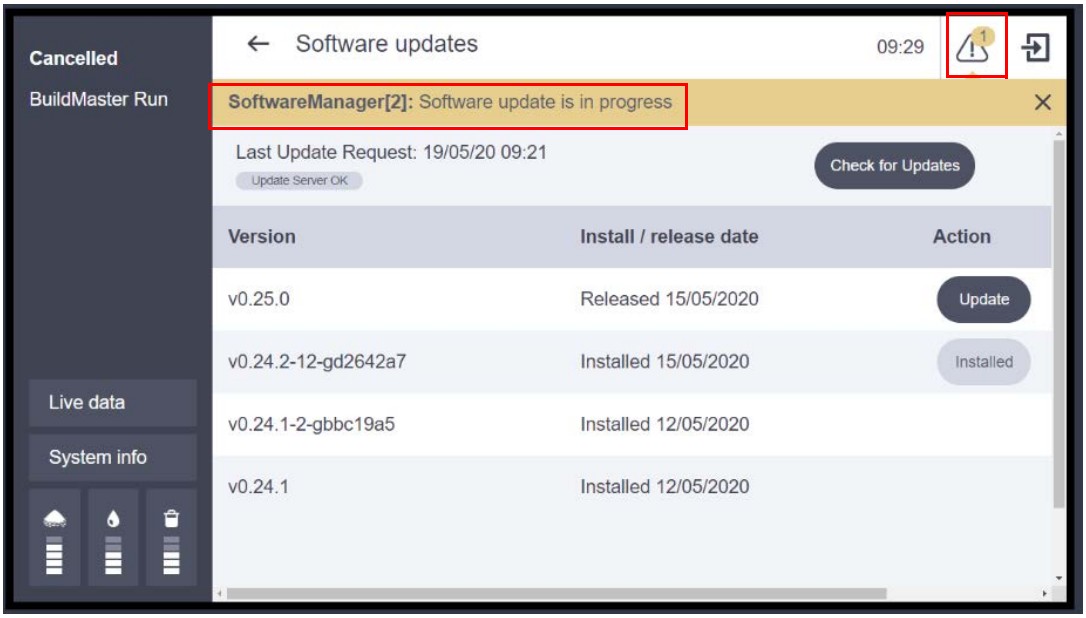


Figure 8: Initiate software download 2



7. Press the “exclamation mark icon” to check that the software upgrade is in progress. See Figure 9.

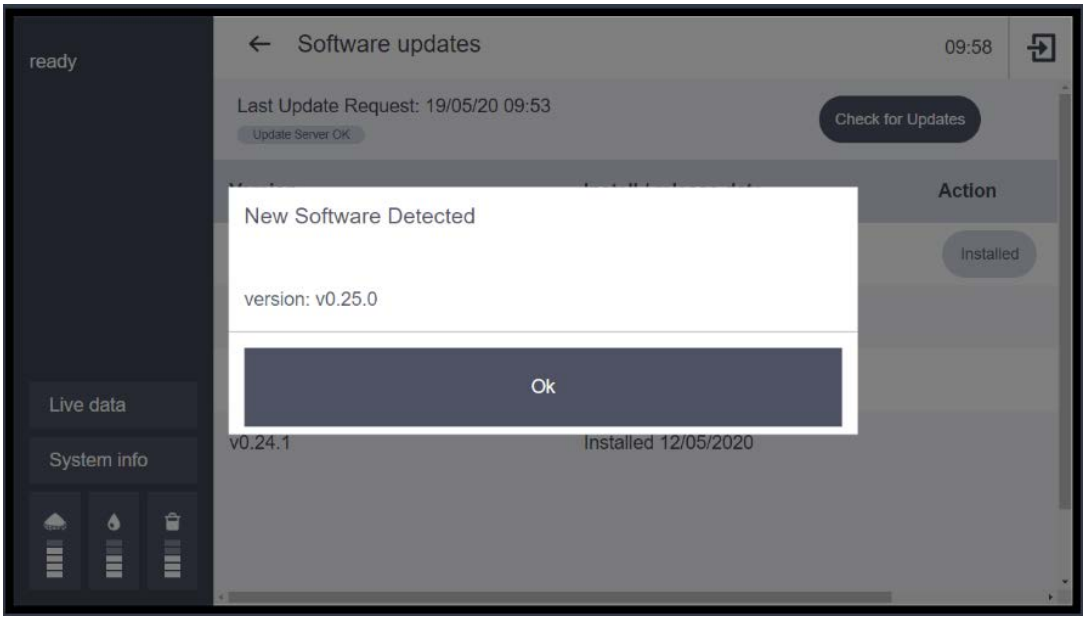
Figure 9: Software update progress



8. When the software is downloaded, the printer PC reboots. The software installation begins as the pinter PC boots.

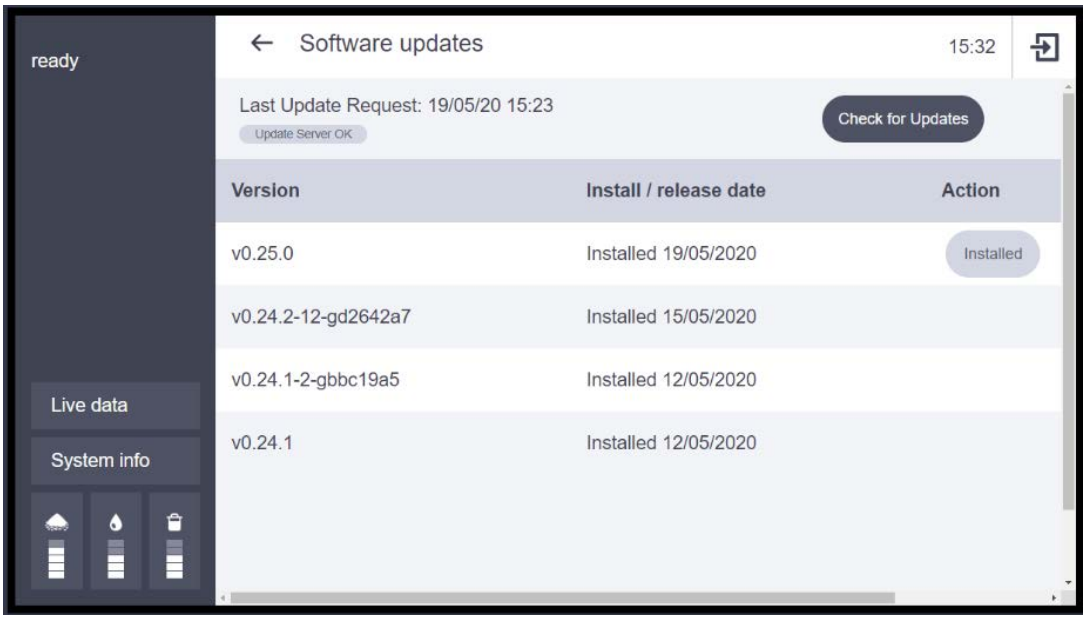
9. After the new printer software is loaded a popup window displays with a message that the updated software is installed. See Figure 10 .

Figure 10: Software upgrade message



10. At any time it is possible to go back to the Software update screen and verify the software version currently installed. See Figure 11.

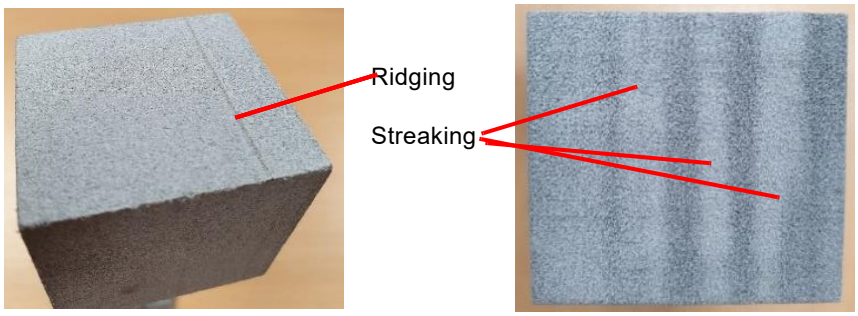
Figure 11: Software upgrade installed



Printhead User Maintenance

If during the printing process, streaking or ridging is visible in the build job, the printhead nozzles may be blocked or the spray may be deviating from its normal pattern. Blocked nozzles result in streaking, while deviated nozzles result in ridging.

Figure 12: Ridging and streaking



To recover from blocked or deviated nozzles, perform the following procedure:

First Sequence

1. Select **Print System** | **Paper Test** | "**Full Black Image**" to print a full black image on a A3 paper.
2. Select **Print System** | **FMS** | "**Hard Purge**" to purge fluid through the nozzles.
3. Select **Print System** | **Printhead Clean** | "**Deep Clean**" and **x 200** to run 200 cleaning sweeps.
4. Select **Print System** | **Paper Test** | "**Full Black Image**" to print a full black image on a A3 paper.

Print a "**Full Test Image**" and determine if the blocked or deviating nozzles are still present. If they are present, perform the following procedure:

Second Sequence

1. Prepare a build job with full packing density using all nozzles. The job should have at least 1,000 layers.
2. Run the buildjob.
3. Print a "**Full Black Image**".

Print a "**Full Test Image**" and determine if the blocked or deviating nozzles are still present. If they are present, perform the second sequence again.

Maintenance Schedule

Warning: Hot Surface Hazard

Always wear proper heat protective gloves and clothing when handling items inside the oven, as surfaces within the oven can be very hot.

Maintenance tasks must be performed on a regular basis in order to maintain optimal system operation. Table 1 outlines the general maintenance schedule for the H350 3D printer. Detailed instructions for each task make up the rest of this chapter.

Table 2 lists part numbers for various replacement consumable items. Use the part numbers listed in this table when ordering replacement parts from Stratasys or your regional Stratasys office.

Table 1: Maintenance Schedule

Post-Build	Every 10 Builds	Every 40 Builds	As Needed	Maintenance Task
X				"Cleaning IR Lamps #1 and #2" (page 219)
X				"Cleaning IR lamp #3" (page 221)
X				"Cleaning the Printer Using the Cleaning Wizard" (page 171)
X				"Cleaning the Printheads: Full Black Image Test" (page 210)
X				"Full Test Image Print" (page 213)
		X		"Cleaning the Extraction Outlet" (page 224)
		X		"Cleaning the Front Sled Guide" (page 228)
			X	"Cleaning the Vortex bell and the thermal camera window (lens)" (page 233)
			X	"Cleaning Blocked Nozzles on the Printhead Cleaning Module" (page 237)

Table 2: Replacement Consumables

Part Number	Description
X3D-01104-S	Scraper tip
X3D-01301-S	Lamp blade
X3D-01103-S	Sled protection strip

Post-Build Maintenance

Warning: Inhalation Hazard

Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

Warning: Skin Contact Hazard

HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Warning: Hot Surface Hazard

The processing chamber can reach a temperature of 100ºC (212ºF) and could cause injury. Put on heat resistant gloves before handling.

Cleaning the Printer Using the Cleaning Wizard

The printer must be cleaned before every build job. To properly clean the printer, run the cleaning wizard from the main screen and follow the on-screen steps and the instructions of this guide.

The cleaning procedure includes removing powder from:

- The printer chamber including: the top plate, the top surfaces of the sleds, the lid, and the window
- The walls of the build chamber
- The printhead cleaning nozzles

Required Tools:

- TX20 Screwdriver
- Gloves
- Isopropyl Alcohol Wipes
- Paper towels
- Roller Cleaning Tool (scraper tool)
- An industrial vacuum cleaner with a dust class H filter (such as Nilifisk ATIX 332HIC, or equivalent not provided by Stratasys).

- Anti-static vacuum cleaner tube and nozzles (not provided by Stratasys). Example shown below.

Figure 13: Vacuum cleaner nozzle

- Lens cleaning tissues (contained in cleaning kit X3D-01016)
- Heat protective gloves for use if the printer is to be cleaned while warm (contained in cleaning kit X3D-01016).
- Wet tissues for cleaning fluid from the top plate

Printer clean wizard

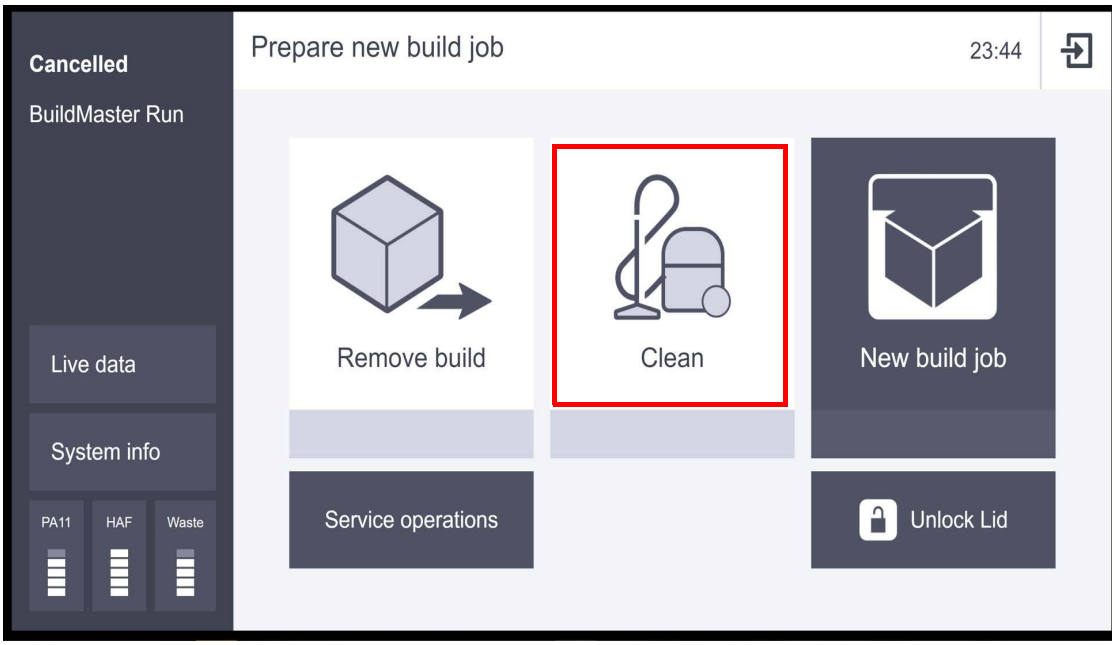
The **Clean** wizard, in a linear, step-by-step way, assists the user in cleaning the printer and preparing it for the next build job.

After the completing the wizard, the user may need to perform a few extra tasks. For example, an inspection and additional cleaning may need to be performed.

NOTE: For safety reasons, the printer software prevents the sleds from being moved when the printer lid is open. For some of the cleaning steps, in order to move the sleds to the required position, closing the printer lid is required. When the sled movements are completed, the printer will unlock the lid automatically.

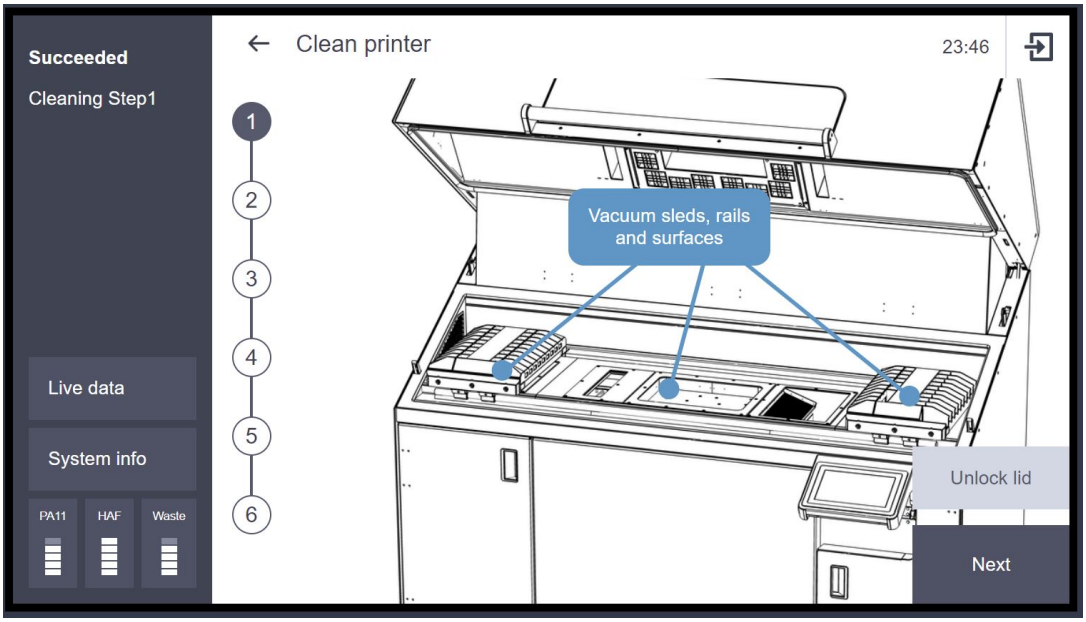
1. Initiate the **Clean** wizard from the Home screen. Follow the instructions as they are displayed.

Figure 14: Clean wizard home screen



2. If a sled is not at the parked position, manually move the sleds to their parked positions. If the sleds are in a position allowing for convenient cleaning, proceed with the cleaning process.

Figure 15: Cleaning wizard Step 1



3. Vacuum sleds, rails, and surfaces. Clean the area in between the sleds and the top surfaces of the sleds. Confirm the printer top plate area is free of powder.

Figure 16: Cleaning the printer top plate area

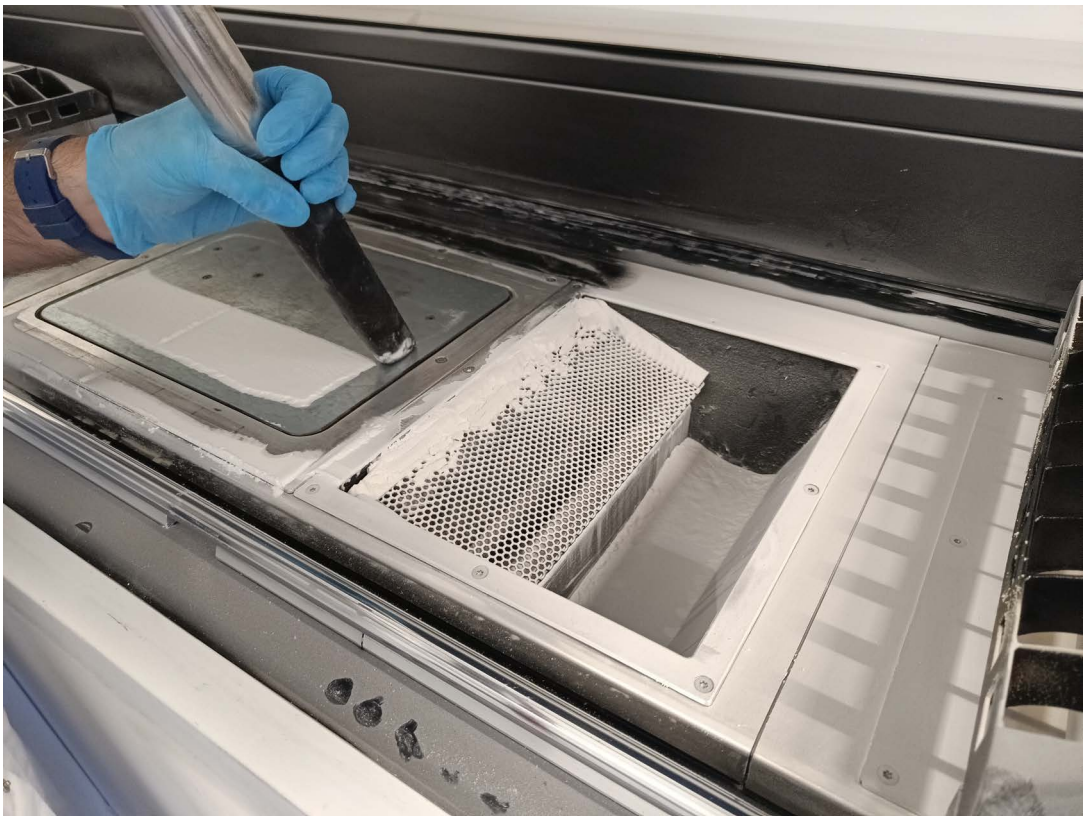
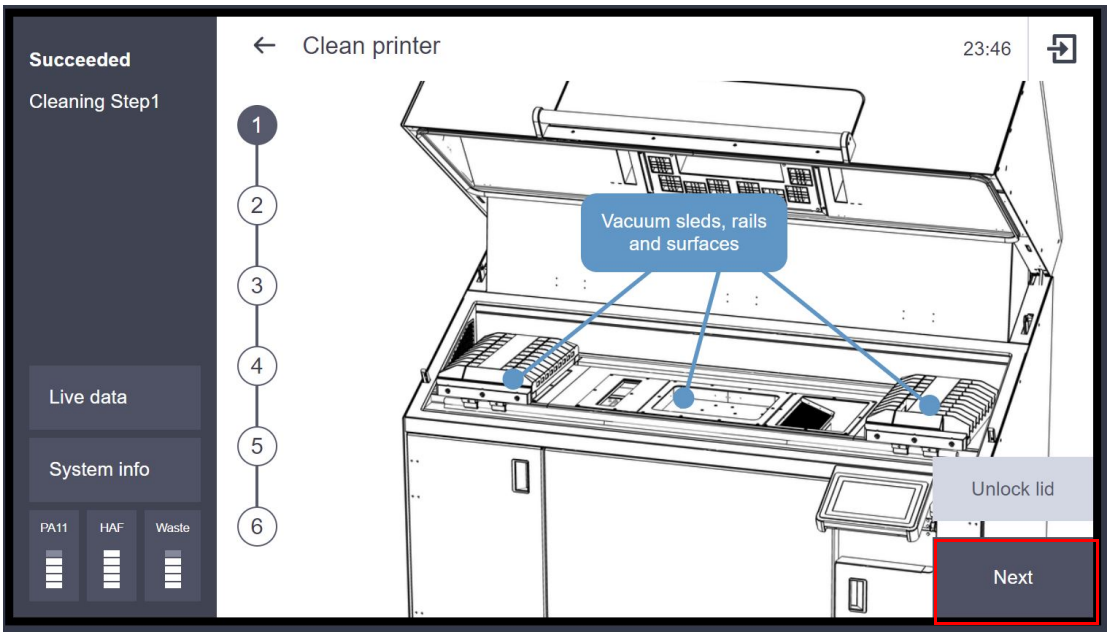


Figure 17: Printer top plate before and after cleaning

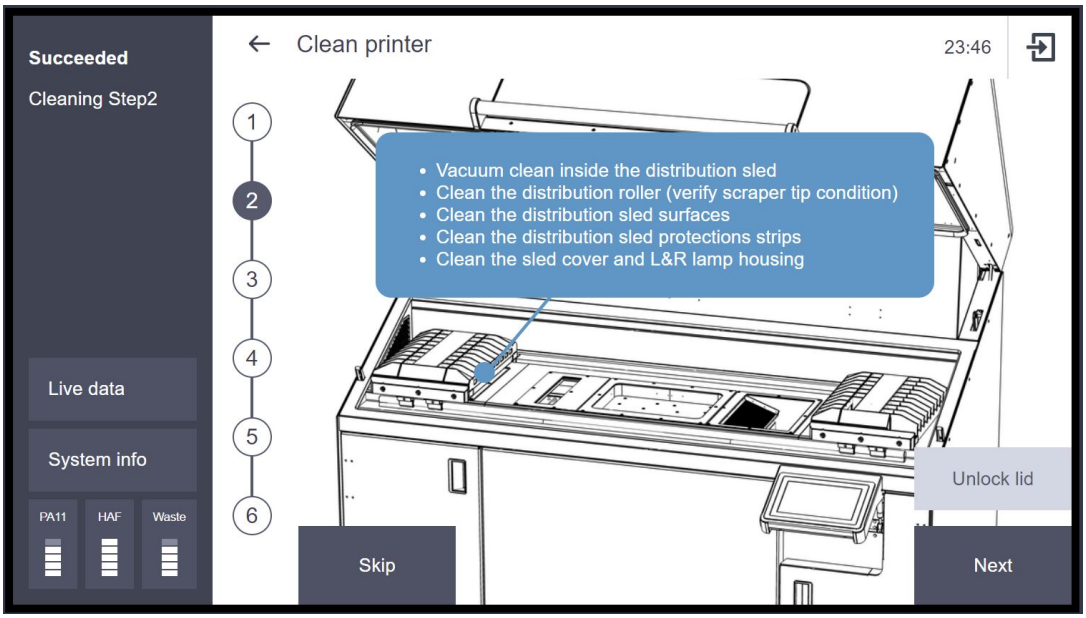
4. When this area is clean, press **Next**.

Figure 18: Press next



5. The Step 2 wizard image displays.

Figure 19: Step 2



Warning: Inhalation Hazard

Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

Warning: Skin Contact Hazard

HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Warning: Hot Surface Hazard

The processing chamber can reach a temperature of 100ºC (212ºF) and could cause injury. Put on heat resistant gloves before handling.

Cleaning the Distribution Sled

A thorough cleaning of the distribution sled is required on daily basis. The cleaning comprises the following tasks:

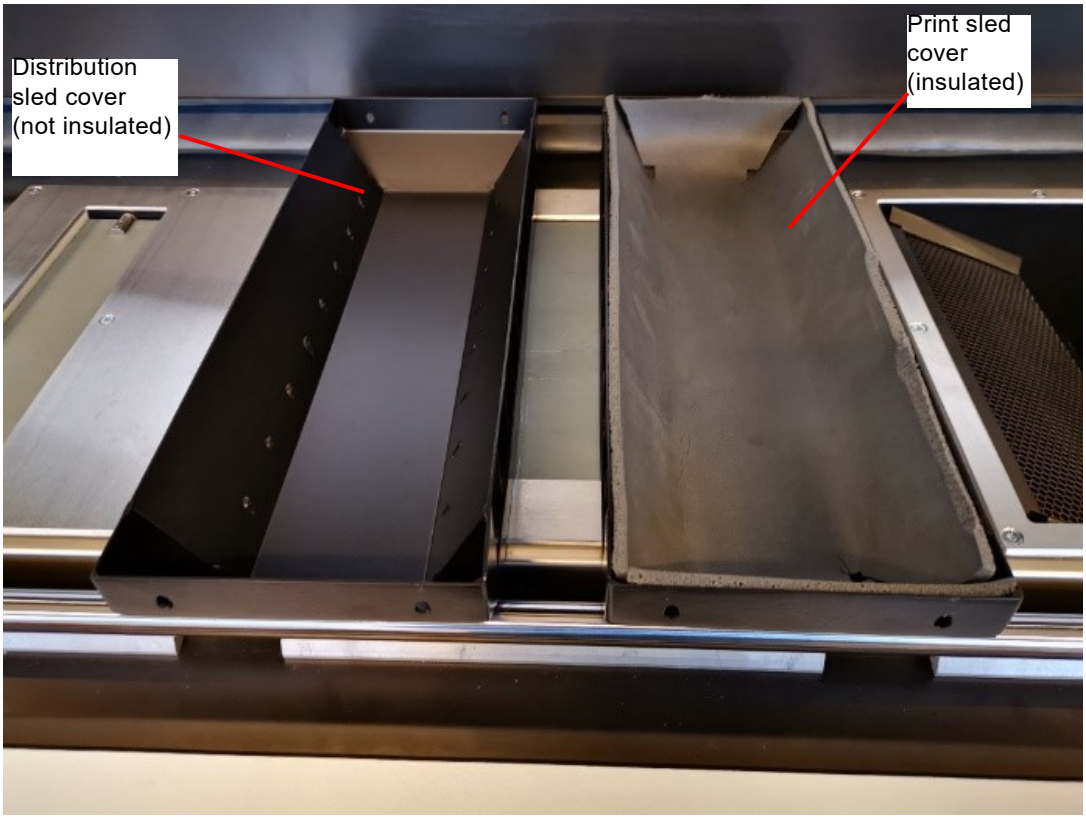
1. Vacuum cleaning the distribution sled.
2. Cleaning the distribution roller.
3. Cleaning the distribution sled surfaces.
4. Cleaning the distribution sled protections strips.

Removing and Cleaning the Distribution Sled and Print Sled Covers

Removing the distribution sled and print sled covers is a preliminary task required for all the areas of distribution sled maintenance. The covers are not identical. The print sled cover is insulated while the distribution sled cover is not.

Before removing any screws, confirm the printer is powered down.

Figure 20: Distribution and Print Sled Covers (underside view)



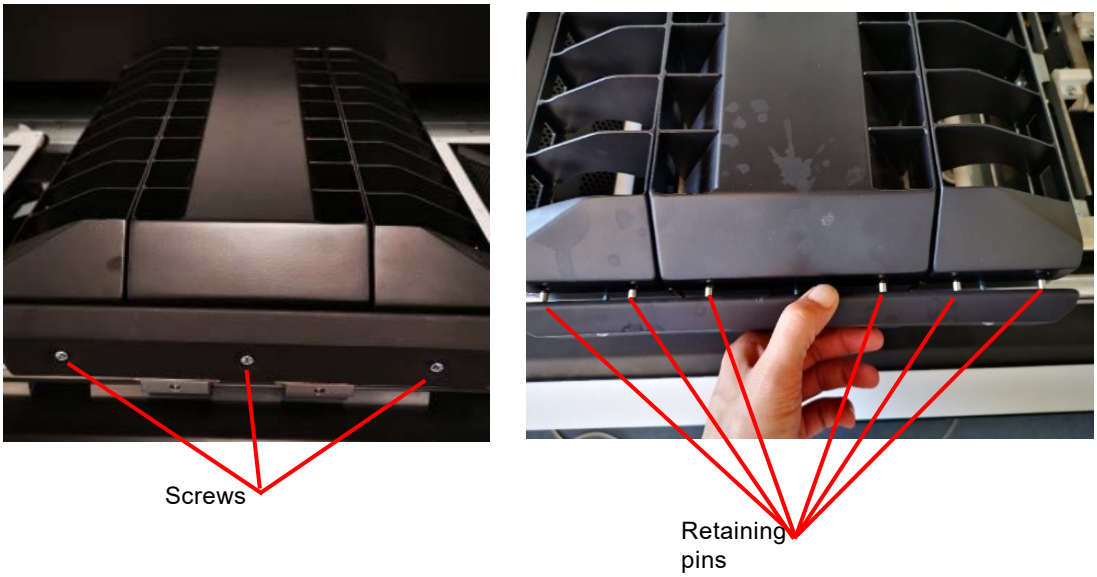
Required Tools:

- TX20 Screwdriver

Procedure

1. Using a TX20 screwdriver, partially remove three screws holding the sled cover in place. Loosen the screws until the retaining pins are free from the sled cover. See Figure 21.

Figure 21: TX20 screws and retaining pins

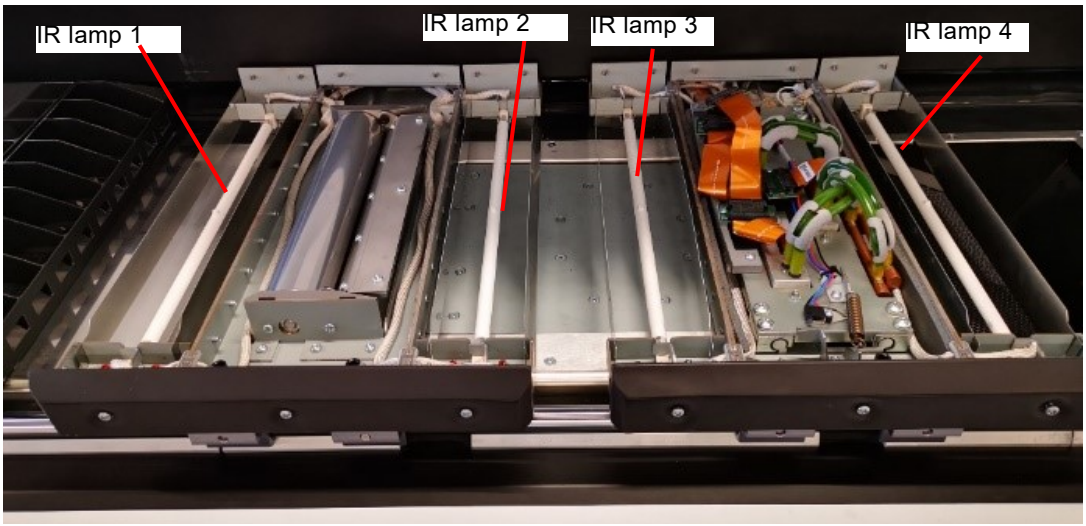


2. Lift and remove the sled cover.

Extra attention required when working with the lamp covers removed. The lamps are sensitive to contact with tools and other hard objects. See Figure 22.

Figure 22: Removing the print sled lamp cover

Figure 23: Distribution sled and Print sled with covers removed



3. The covers are now removed and both the distribution sled and print sled are ready for cleaning.

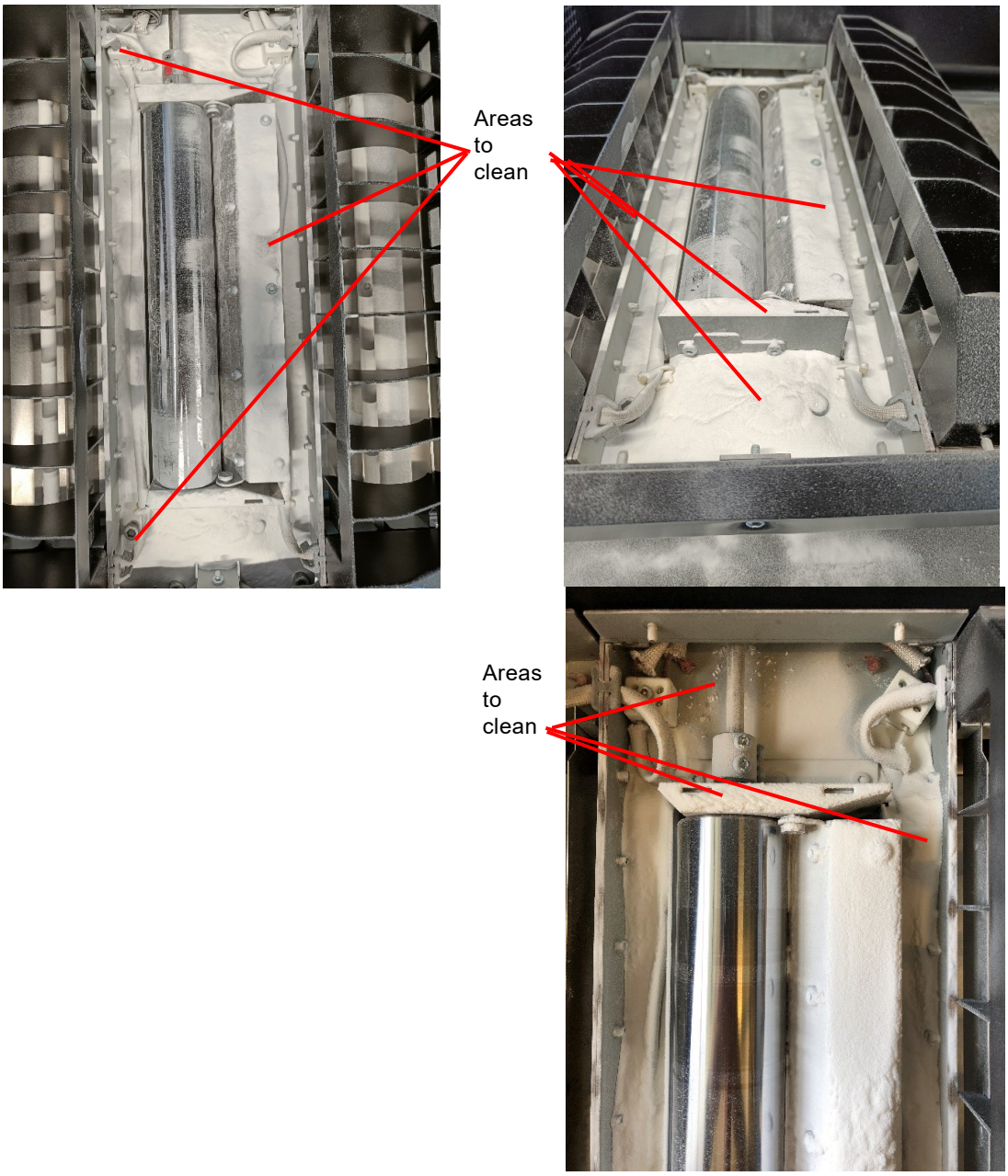
4. To prevent powder contamination of the printer surfaces, place the covers in an area a safe distance from the printer. Use the spatula to scrape off powder collected on the surfaces.

Figure 24: Cleaning the sled covers

Vacuum Cleaning the Distribution Sled with Covers Removed

1. During printing, powder collects in the flat areas under the center cover and under the lamp covers of the distribution sled.

Figure 25: Areas where powder most commonly collects



Cleaning the Distribution Roller

Warning: Potential injury to user
The procedure for cleaning the rotor requires the printer to be operated with the power on.

1. Remove the sled cover and the right lamp cover of the distribution sled.
2. For printers running PA12, remove the scraper by lifting it off.
3. While rotating the roller manually, clean the entire roller with an isopropyl alcohol wipe.

Figure 26: Cleaning the distribution roller with IPA

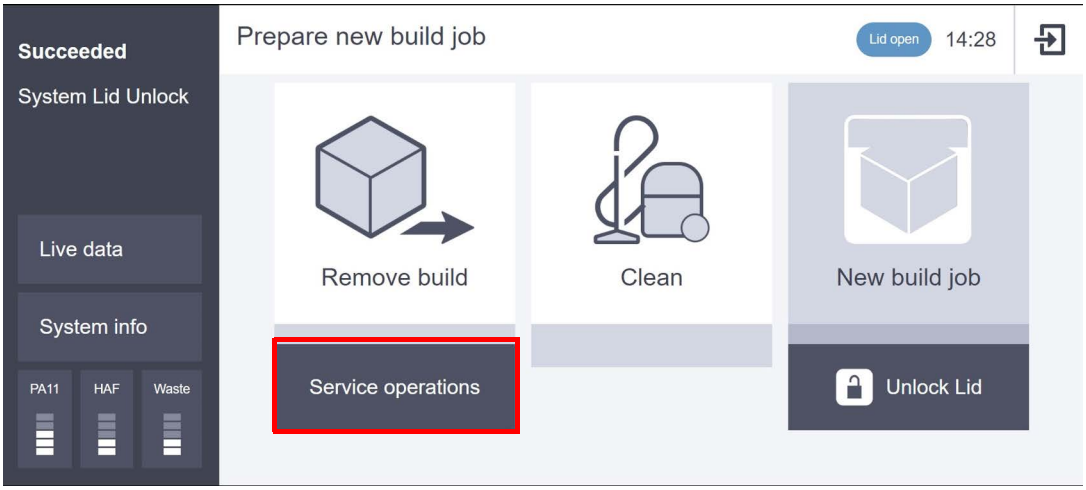
Caution: Damage to the powder distribution system
Gloves must be worn during the entire cleaning procedure. Oil and grease from skin-to-roller contact can impact the powder distribution.

4. Manually rotate the roller and use dry paper towels to remove any remaining isopropyl alcohol.

Figure 27: Use paper towels to remove IPA

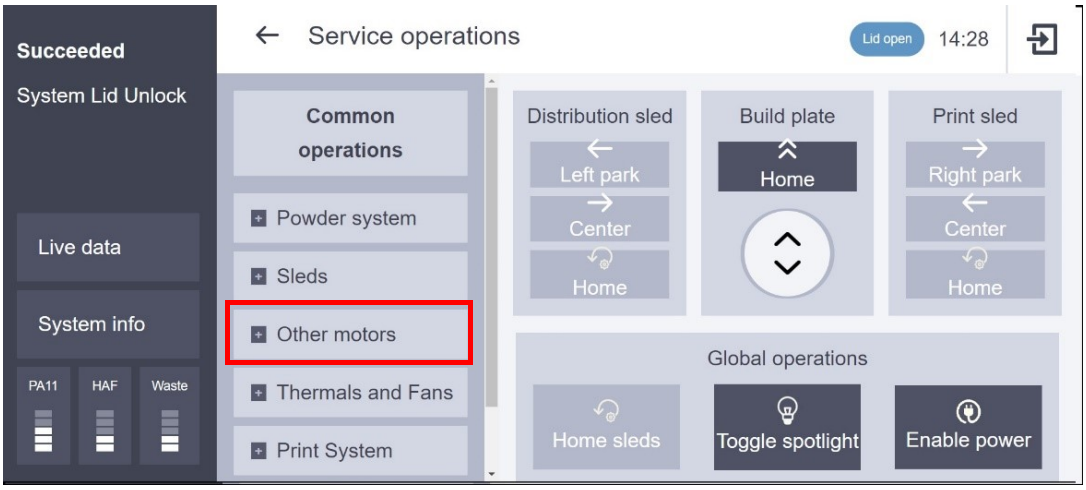
5. On the touch screen main menu press **Service operations**.

Figure 28: Service operations



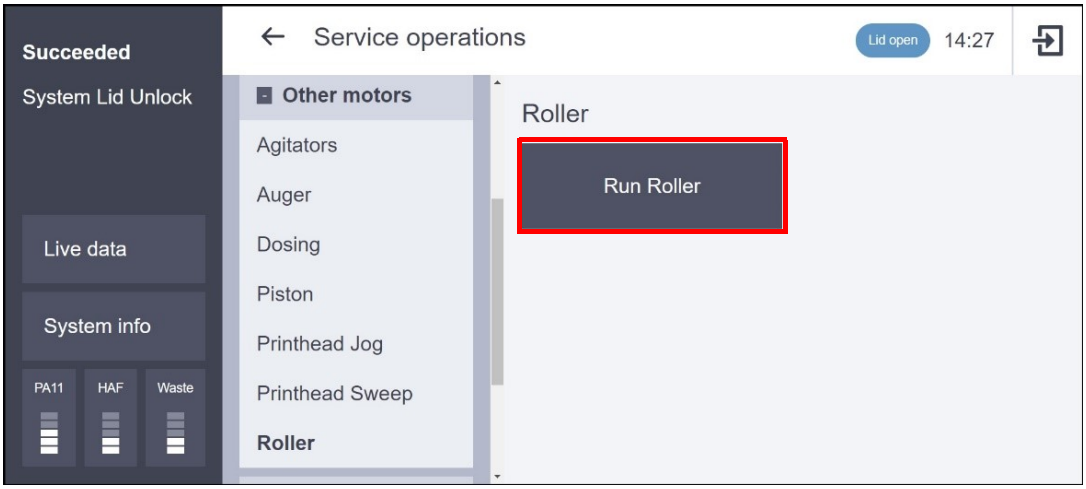
6. Next, press **Other motors**.

Figure 29: Other motors



7. Press **Run Roller** to turn the roller on.

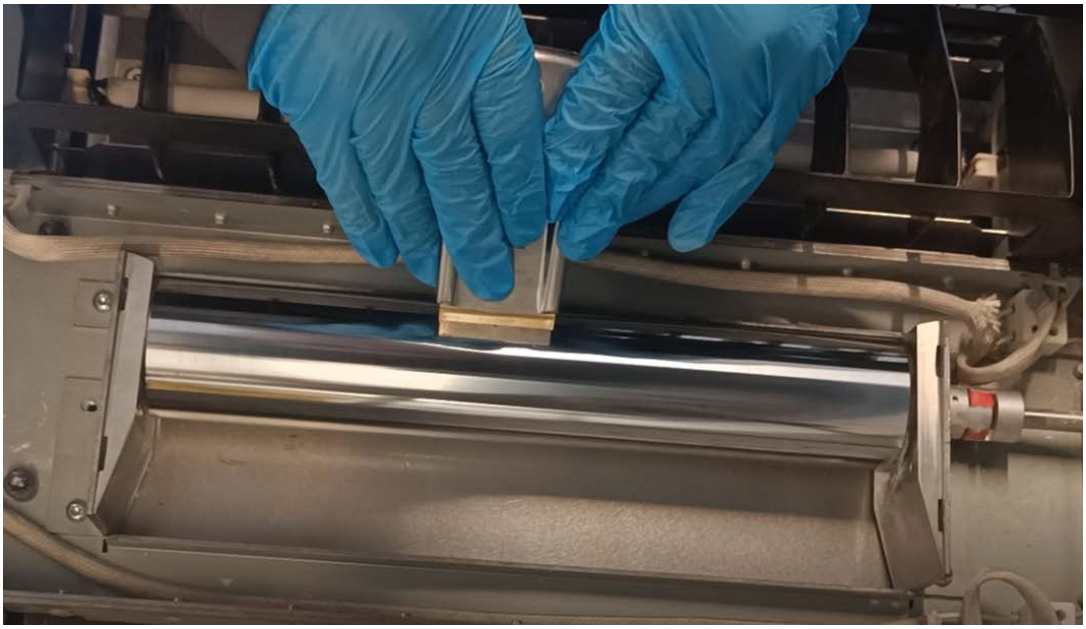
Figure 30: Run Roller



If excessive resistance is applied to the spinning roller, the roller will stop. Press **Run roller** to restart the roller and continue the cleaning process.

8. With a firm grip on the roller cleaning tool and using the lamp cover as support, scrape away any fused powder attached to the roller.

Figure 31: Scraping the roller



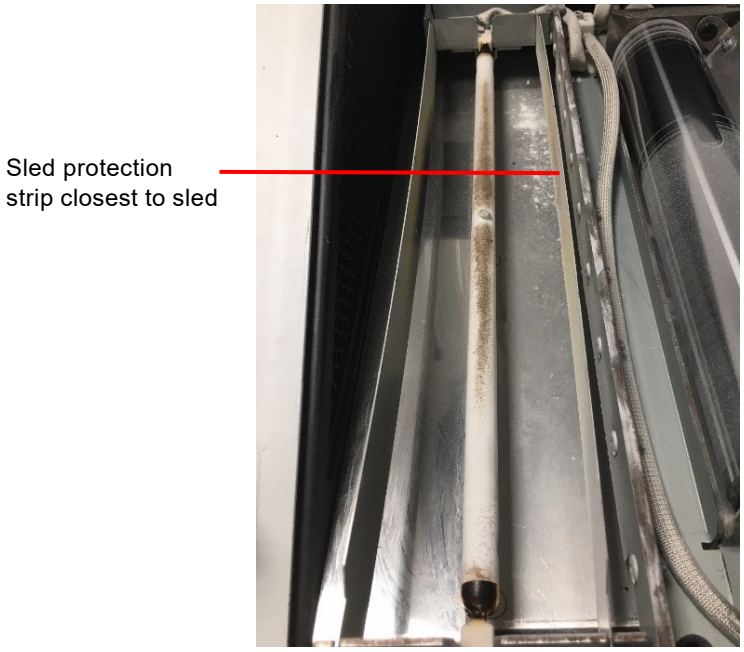
Warning: Potential injury to user.
Use caution while cleaning the roller with the roller cleaning tool.

9. Shut off the roller by pressing **cancel** on the top left corner of the UI sidebar.
10. Repeat steps 7-8 if any fused powder is observed to be attached to the roller.
11. Reinstall the sled covers.

Cleaning the Distribution Sled Surfaces

1. With the lamp cover removed, remove the sled protection strip closest to the distribution sled.

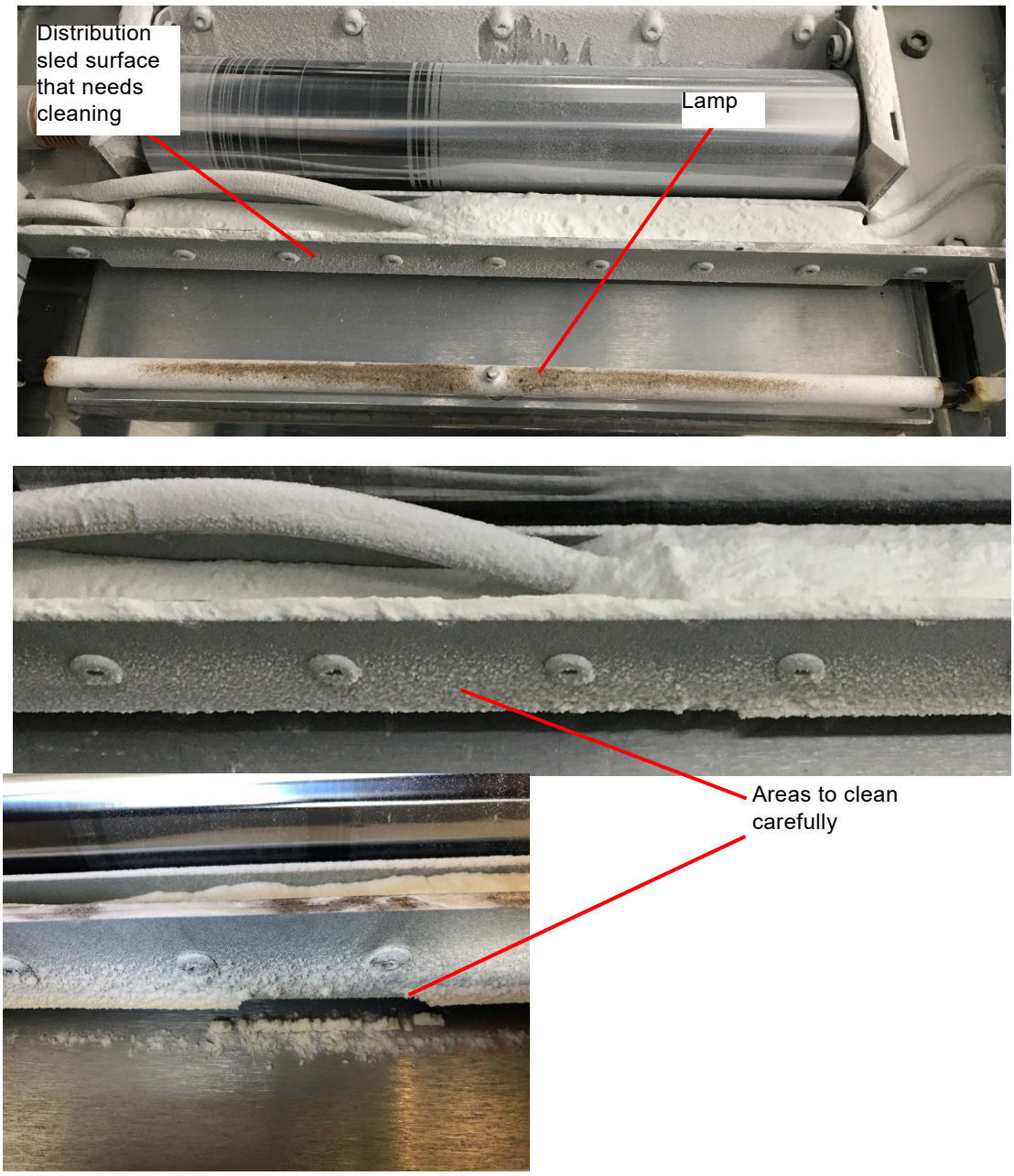
Figure 32: Sled protection strip closest to distribution sled



2. When the strip is removed, clean the distribution sled surface of all powder.

Use caution when operating a vacuum cleaner or any other tool around the unprotected lamp. The lamp is easily damaged from any hard contact.

Figure 33: Areas for careful cleaning



Cleaning the Distribution Sled Protection Strips

1. Remove the distribution sled protection strips for lamps #1 and #2.
2. If the protection strips are covered with fused powder, use a spatula to scrape away the fused material.

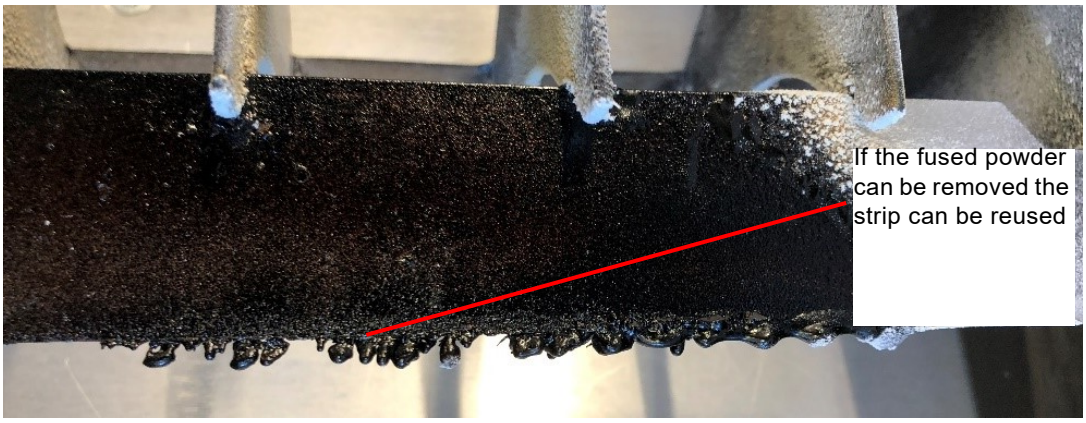
Remember to perform this cleaning procedure away from the printer top plate surfaces. Failing to do this may result in melted hard powder entering the powder system from the dosing blade area or the overflow area.

Figure 34: Sled protection strip before cleaning

Figure 35: Sled protection strip after cleaning

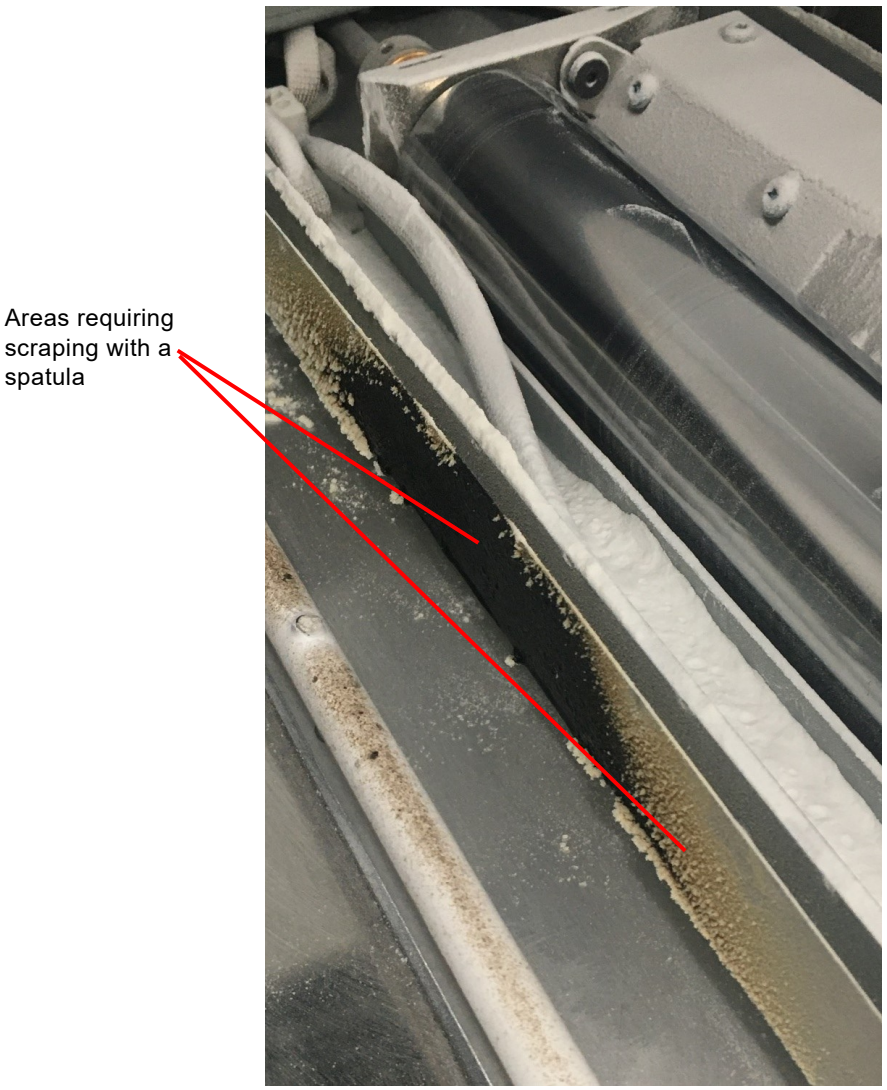
3. If the sled protection strip cannot be properly cleaned, it must be replaced.

Figure 36: Sled protection strip requiring replacement



4. Figure 37 shows an example of sled protection strip that requires cleaning. The burned powder (black area) and the fused powder (yellow area) need to be scrapped carefully with a spatula after the strip is removed from the sled.

Figure 37: Dirty sled protection strip

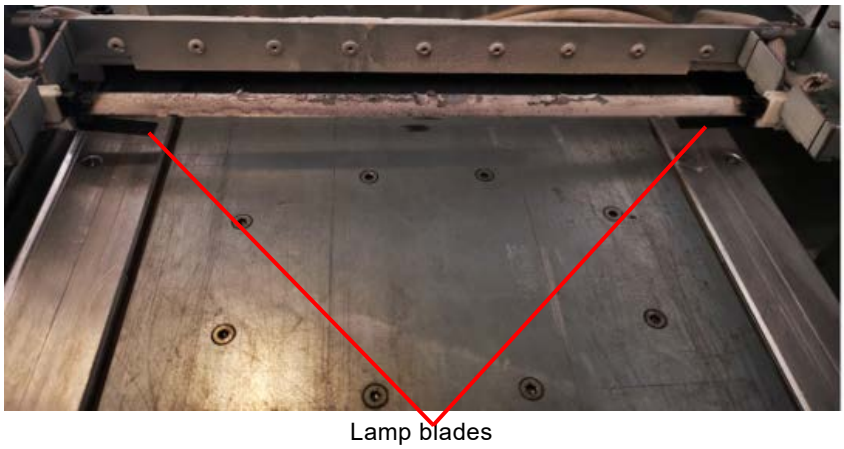


It is recommended to replace the dirty sled protection strips with clean ones during weekly maintenance. The removed, dirty sled protection strips can then be cleaned while the printer is operating.

Cleaning the Distribution Sled Lamp Blades

1. Determine if the lamp blades need to be replaced. If fused powder is encrusted on the lamp blades, they must be changed. See Figure 38.

Figure 38: Lamp blades



2. Loosen the screw for the lamp bracket, carefully lift the lamp with one hand, while taking out the lamp blades with the other.

Figure 39: Lamp bracket

3. The purpose of the blades are to cover the reflection from the middle top fixture plate, so make sure the blades cover those.

Figure 40: This side up

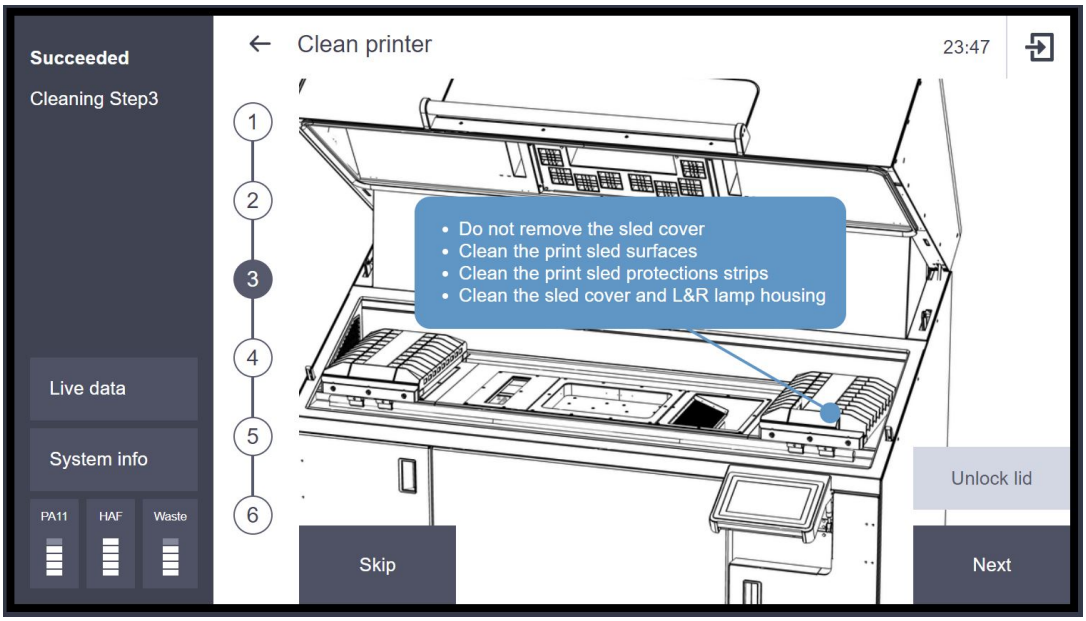
4. If the powder is fused to the sled surface and cannot be vacuumed clean, move the lamp covers to a designated cleaning area away from the printer and use a spatula to scrape the powder from the sled surface. After doing this, use the vacuum cleaner to clean the powder from the sleds and other printer surfaces.

Figure 41: Lamp cover with fused powder

Cleaning the Print Sled

Step 3 is cleaning the print sled.

Figure 42: Cleaning the print sled



- Do not remove the sled cover.
- Vacuum the print sled only when the printer is powered down.
- Vacuum the print sled daily.
- Inspect the print sled monthly.

Cleaning the print sled includes the following tasks:

1. Cleaning the print sled surfaces
2. Cleaning the sled protection strips

Figure 43: Pint sled

Cleaning the Print Sled Surfaces

1. Remove the four protection strips.
2. After removing the protection strips, clean the print sled surface of all powder.

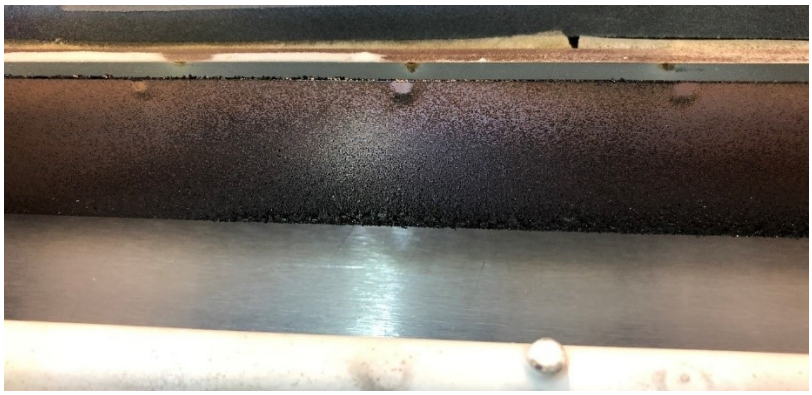
Figure 44: Cleaning the protection strips

Used (white) and fused (yellow) powder collects on the areas around all three lamps during the printing process. The powder that collects around the fusion lamp (lamp #3) is often hardened and difficult to remove due to the higher duty cycle. In this case use, a spatula to remove the fused powder from the sled surface.

Cleaning the Print Sled Protection Strips

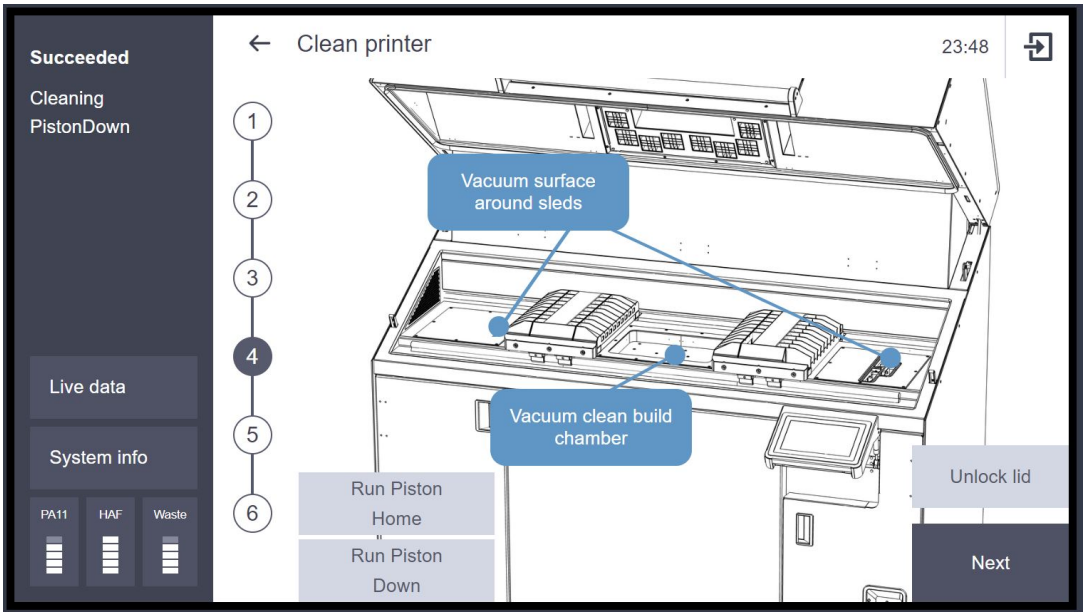
Cleaning the print sled protection strips is performed similarly cleaning the distribution sled protection strips. See “Cleaning the Distribution Sled Lamp Blades” (page 193).

Figure 45: Fusion lamp (lamp #3) before cleaning



1. When the print sled protection strips are cleaned, press next. The printer will display **Close the lid to allow the movement of the sleds**. Step 4 also displays.
2. With the lid closed, the sleds will move towards the center. This allows for cleaning access to the areas under the printers parked position as well as the print head cleaning nozzles.
3. The lid automatically unlocks when sleds stop moving.

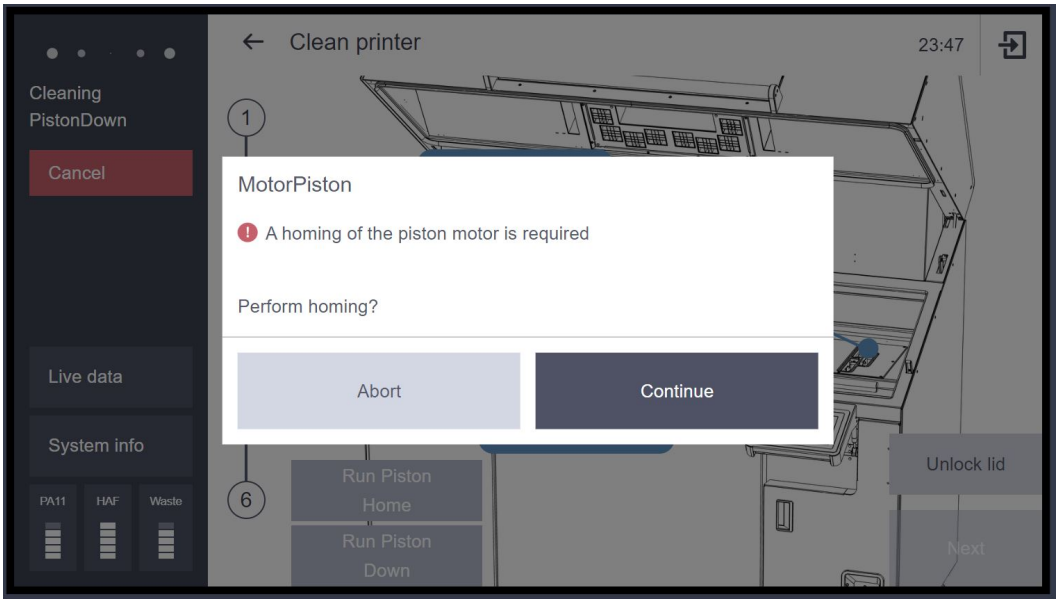
Figure 46: Step 4



4. Vacuum the surfaces around the sleds and the build chamber.
5. Wipe away any spilled HAF. Wipe away any HAF from the printhead cleaning nozzles.

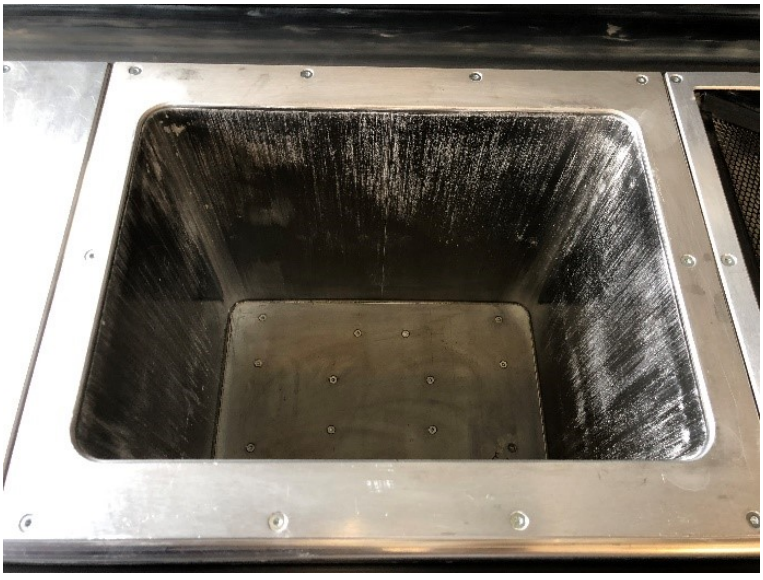
The build chamber automatically moves to its lower position. If the piston is not in the home position, a pop up will display stating **A homing of the piston motor is required.** If this popup displays, press **Continue** to home the piston.

Figure 47: Perform homing



6. The piston in the build chamber moves to the bottom position.

Figure 48: Build chamber walls



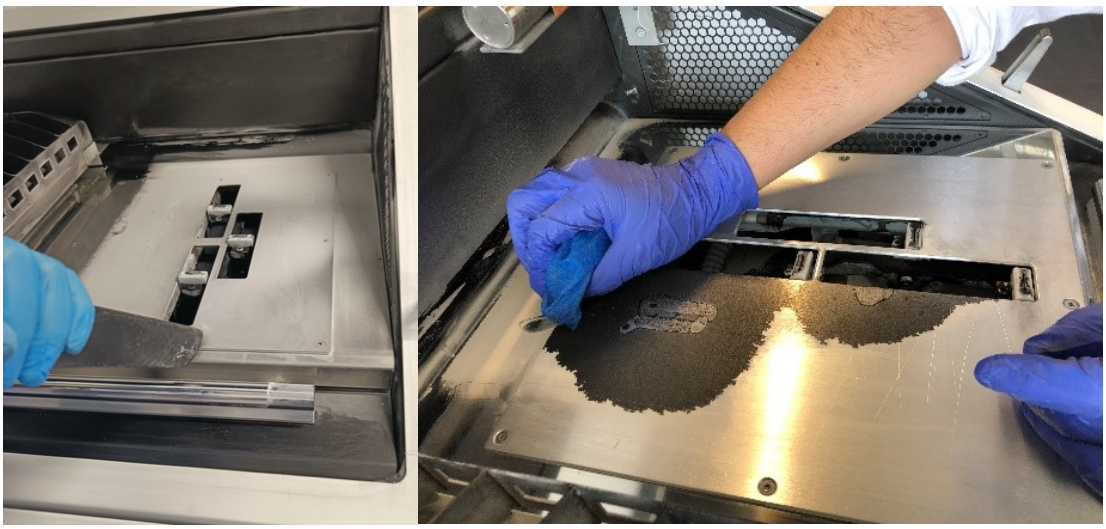
7. Vacuum the walls of the build chamber from excessive amounts of powder. See Figure 49.

Figure 49: Vacuum build chamber walls

Figure 50: Cleaning the pinthead cleaning module

8. In some cases, there will be dried fluid under the parked print sled. Use a wet wipe to remove the dry fluid. See Figure 51. Wipe the surface with dry paper towel in order to avoid powder sticking to the wet surface.

Figure 51: Cleaning the printhead cleaning station area



9. Wipe away any HAF from the pinthead cleaning nozzles.

Figure 52: Cleaning the nozzles

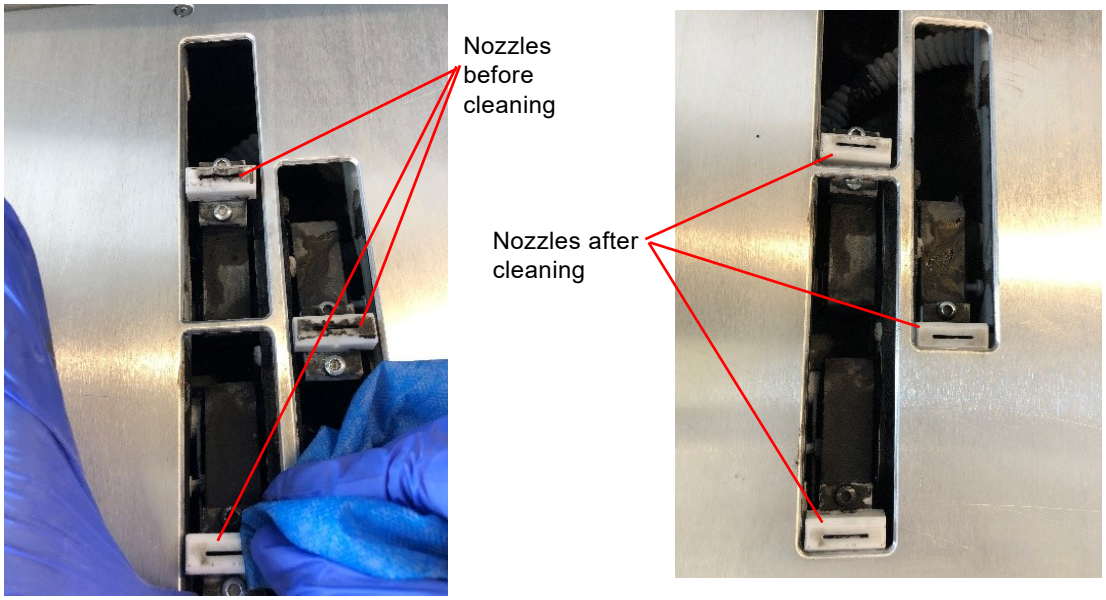
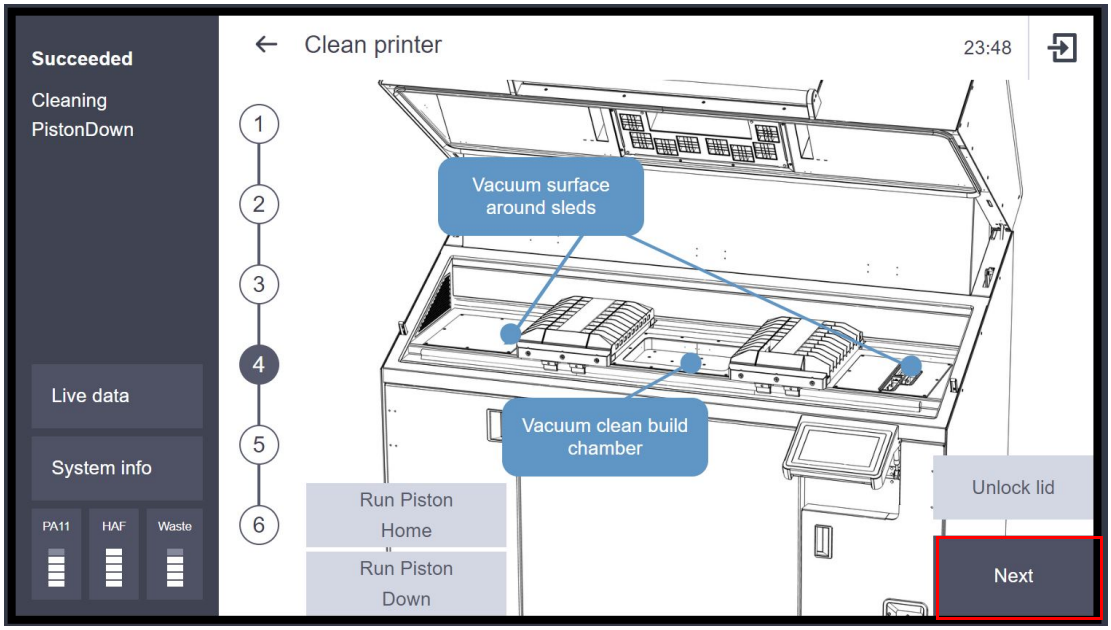


Figure 53: Cleaning the nozzles (continued)

10. After the nozzles are cleaned, press **Next**.

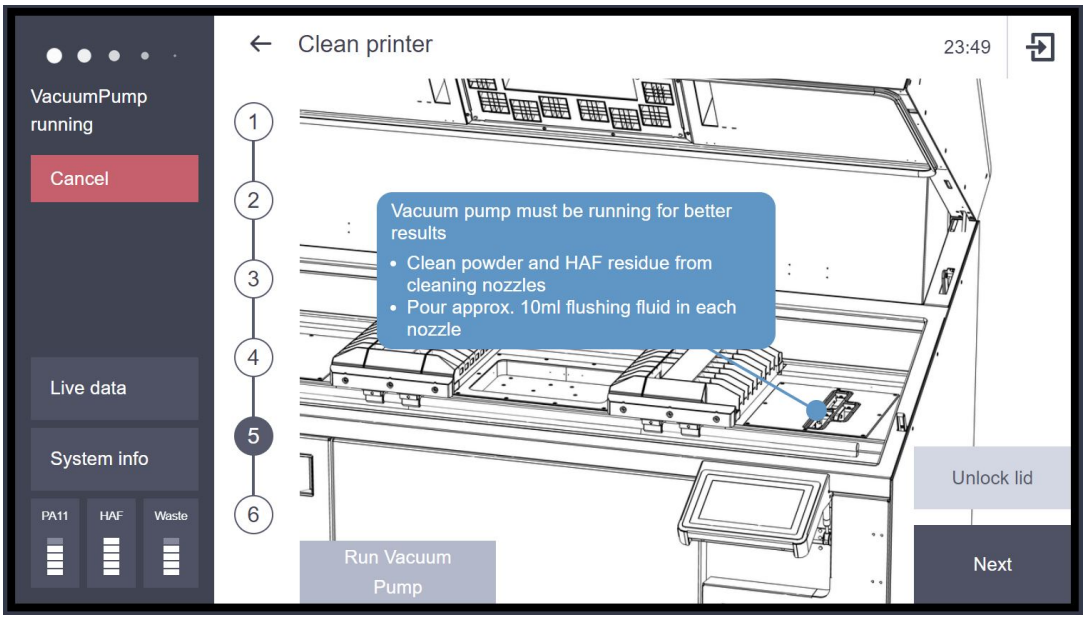
Figure 54: Press next



11. After pressing next, the wizard moves to Step 5. The vacuum pump starts automatically.
12. Check that vacuum is present on each nozzle.
13. Use the pick tool for deep cleaning.
14. Using a squeeze bottle, pour approximately 10ml flushing fluid into each nozzle.

15. If necessary, use a vacuum cleaner to remove powder from the nozzle tip.

Figure 55: Step 5

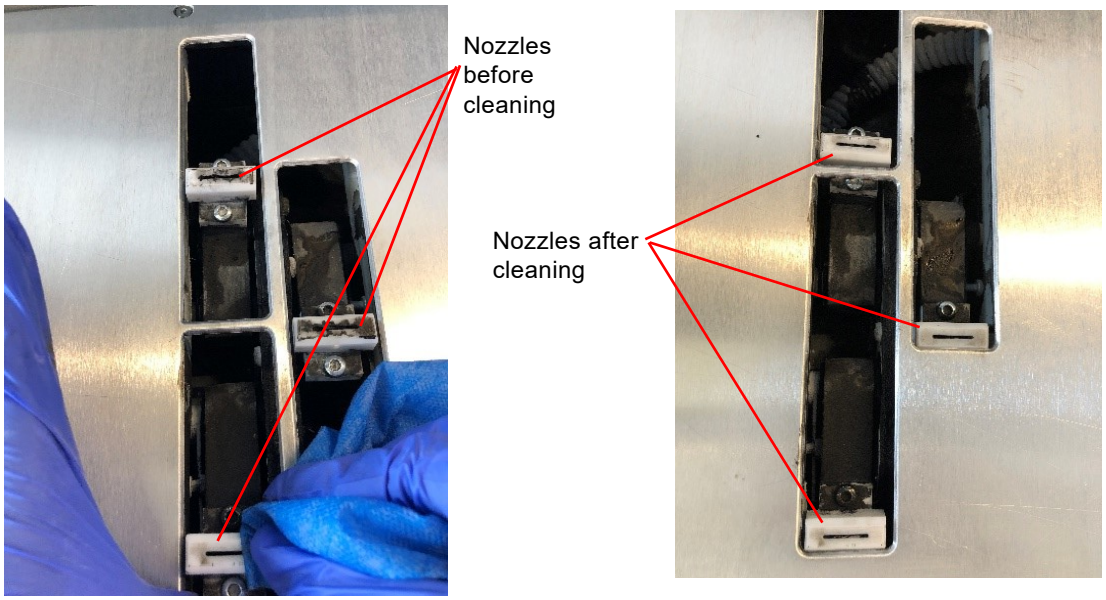


16. While the vacuum pump is running, using a squeeze bottle, inject approximately 10 ml of flushing fluid into each nozzle.

If the pump stops it can be reactivated by pressing **Run Vacuum Pump** on the screen.

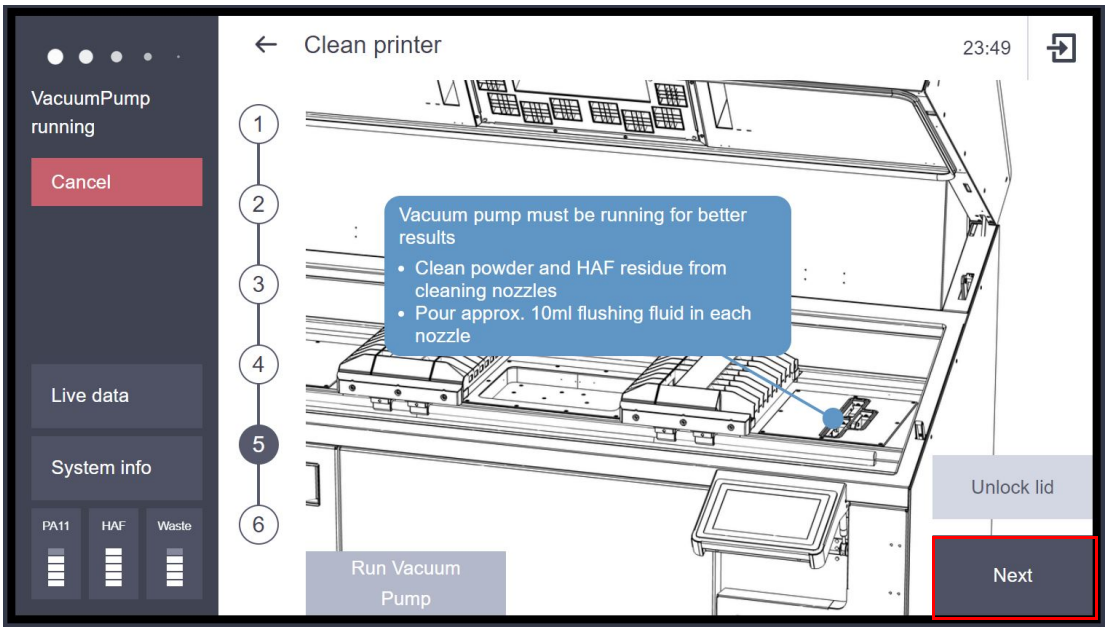
Figure 56: Flushing the nozzles

Figure 57: Cleaning the nozzles



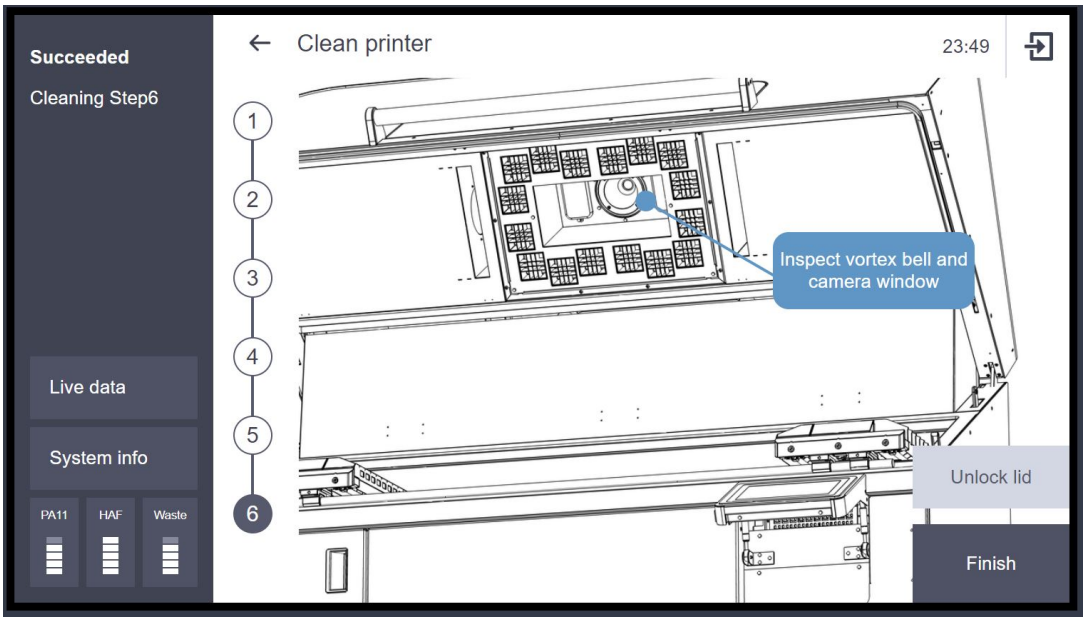
17. Press **Next**. See Figure 58.

Figure 58: Press next



18. Step 6 displays on the wizard.

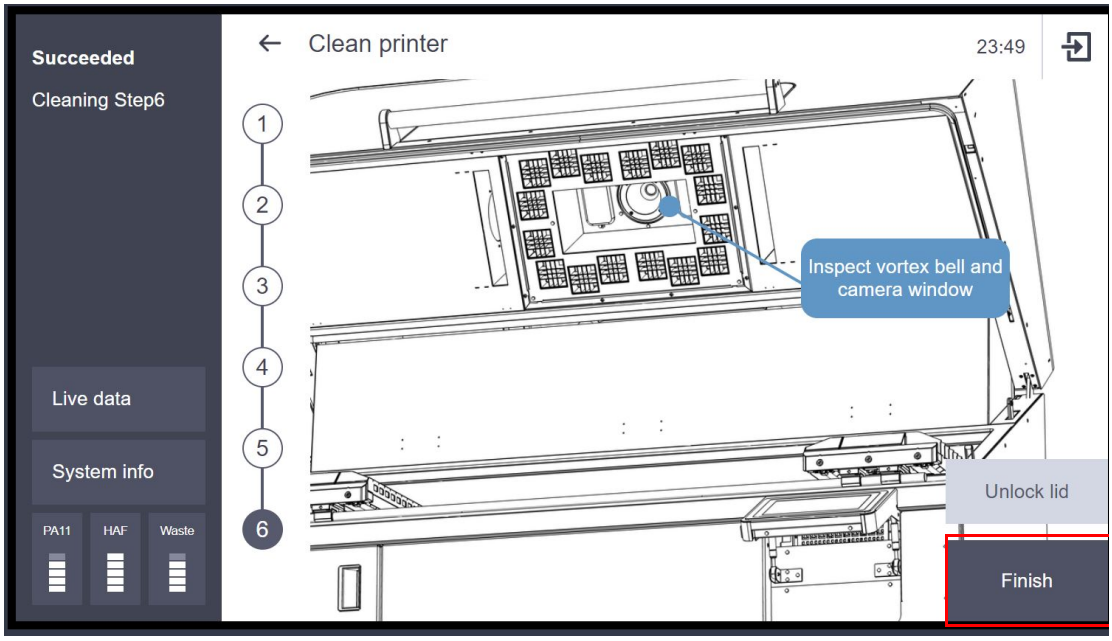
Figure 59: Step 6



19. Inspect the vortex bell and thermal camera window. Confirm both are free of powder and any other contamination. Clean as required.

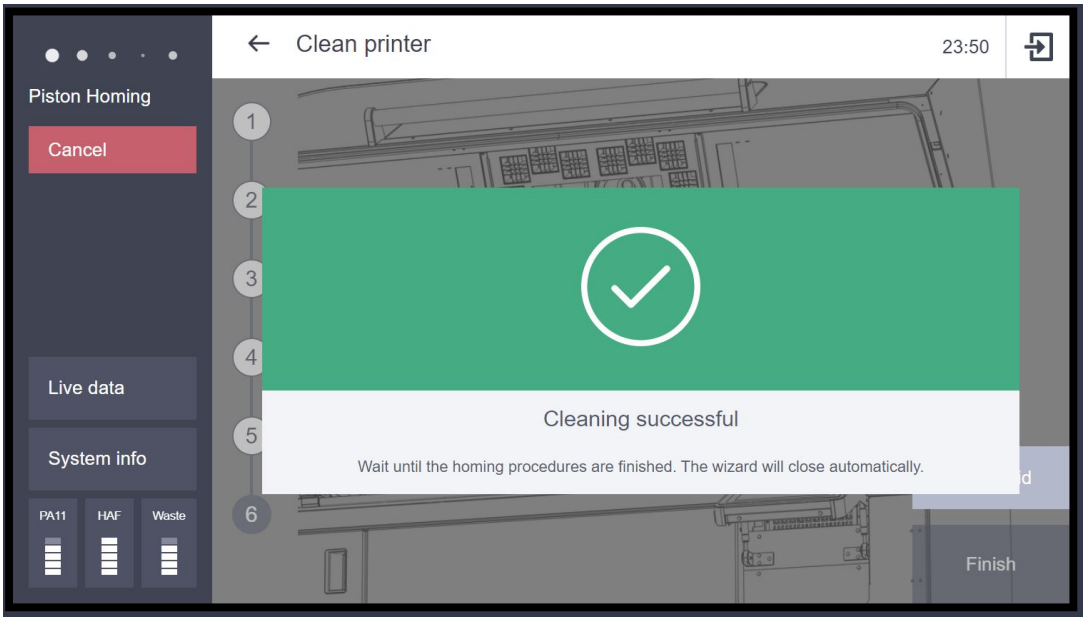
20. Press **Finish** to complete the procedure, The printer will prompt **Close the lid to allow the movement of the sleds**. See Figure 60.

Figure 60: Press Finish



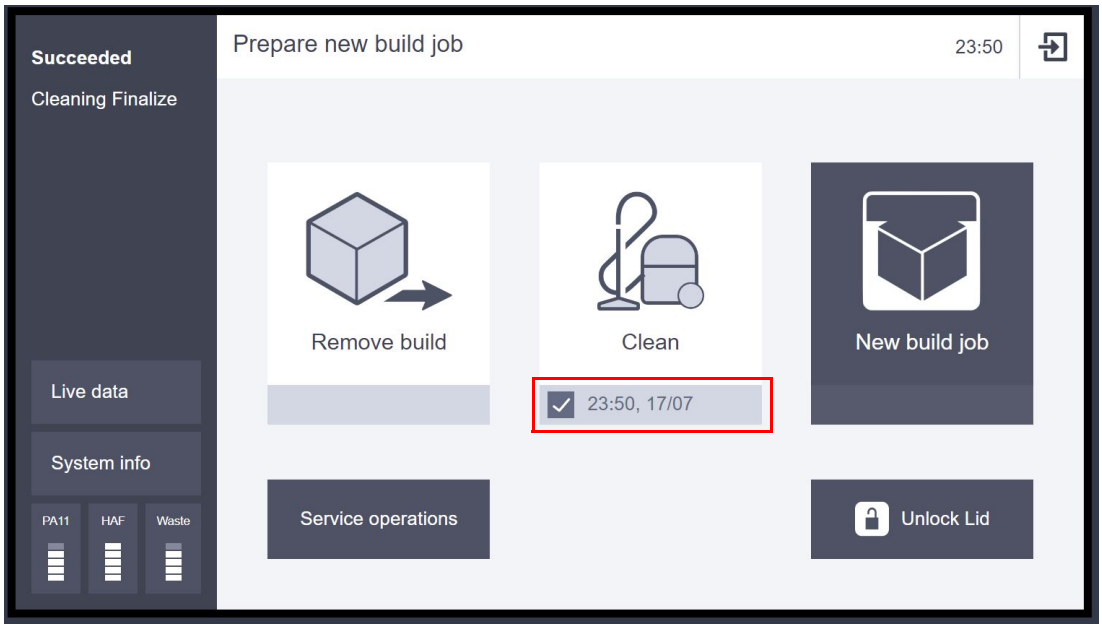
21. The printer will show a pop up window with the message “Cleaning successful”, while the piston will start homing. See Figure 62.

Figure 61: Cleaning successful screen



22. If the clean procedure is completed successfully, a date/time stamp will be printed below the “Clean” icon. See Figure 62.

Figure 62: Home screen after successful cleaning



Cleaning the Printheads: Full Black Image Test

Warning: Skin Contact Hazard
HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

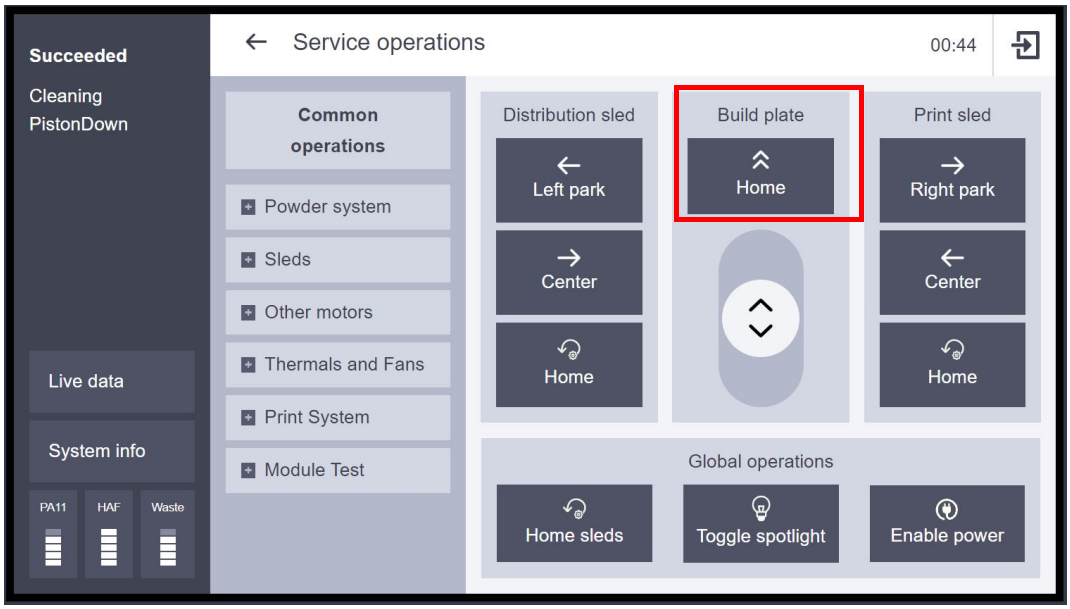
Warning: Hot Surface Hazard
The processing chamber can reach a temperature of 100ºC (212ºF) and could cause injury. Put on heat resistant gloves before handling.

This maintenance procedure describes how to clean contaminants from the print head nozzles located on the printhead external plate. Perform this procedure after each build.

Procedure

1. In the Build plate area press **Home** to confirm the piston is in the home position.

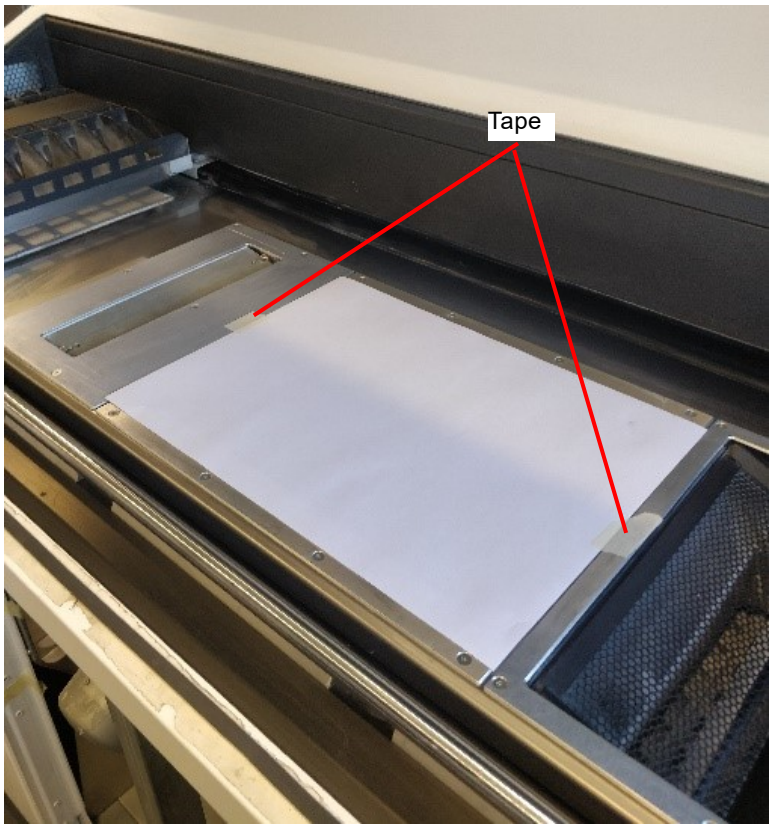
Figure 63: Common operations screen



The full black image test helps to keep the printhead nozzles clear of particles.

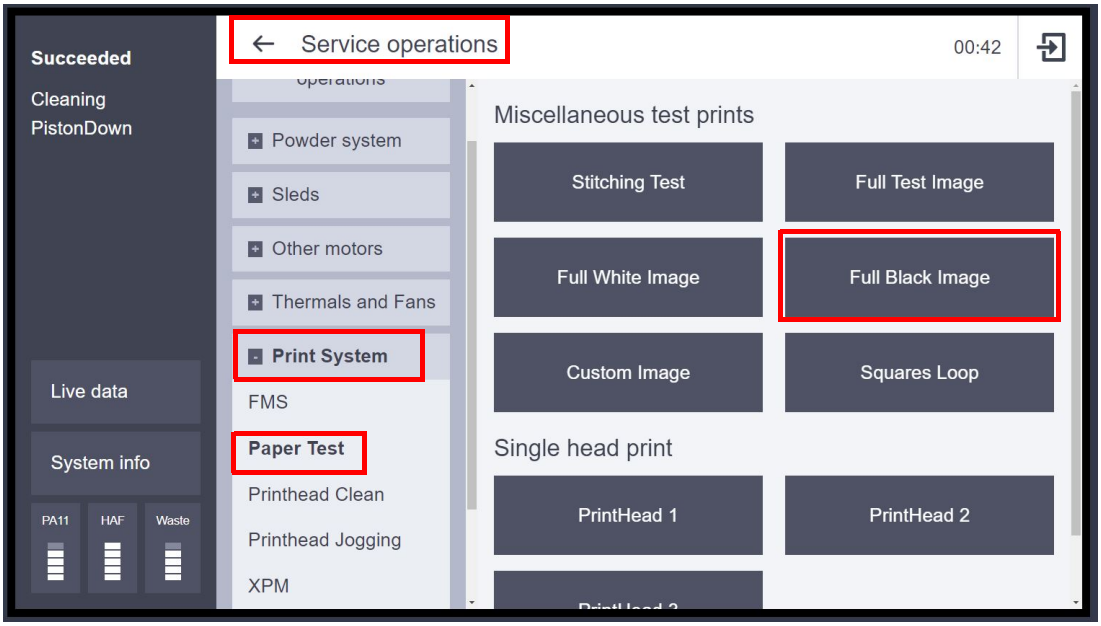
2. Place a sheet of A3-size paper on the build plate. Confirm the paper is placed evenly on the build plate surface without any corners sticking up. Secure the sheet of paper to the build plate using two pieces of tape as shown in Figure 64.

Figure 64: A3 paper placed on build plate and secured with tape



3. On the Service operations screen, press **Print System** | **Paper Test** | **Full Black Image**. See Figure 65.

Figure 65: Service operation screen for the paper test tasks



4. Remove the paper from the build plate.

Full Test Image Print

Warning: Skin Contact Hazard

HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Warning: Hot Surface Hazard

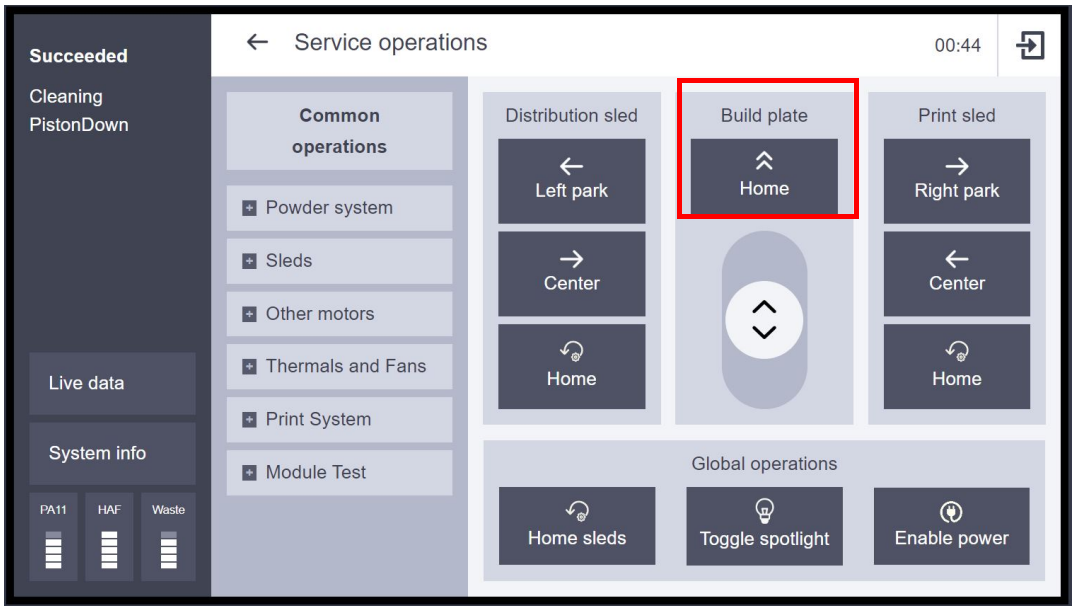
The processing chamber can reach a temperature of 100ºC (212ºF) and could cause injury. Put on heat resistant gloves before handling.

This procedure describes how to print a full test image and evaluate the condition of the printheads.

Procedure

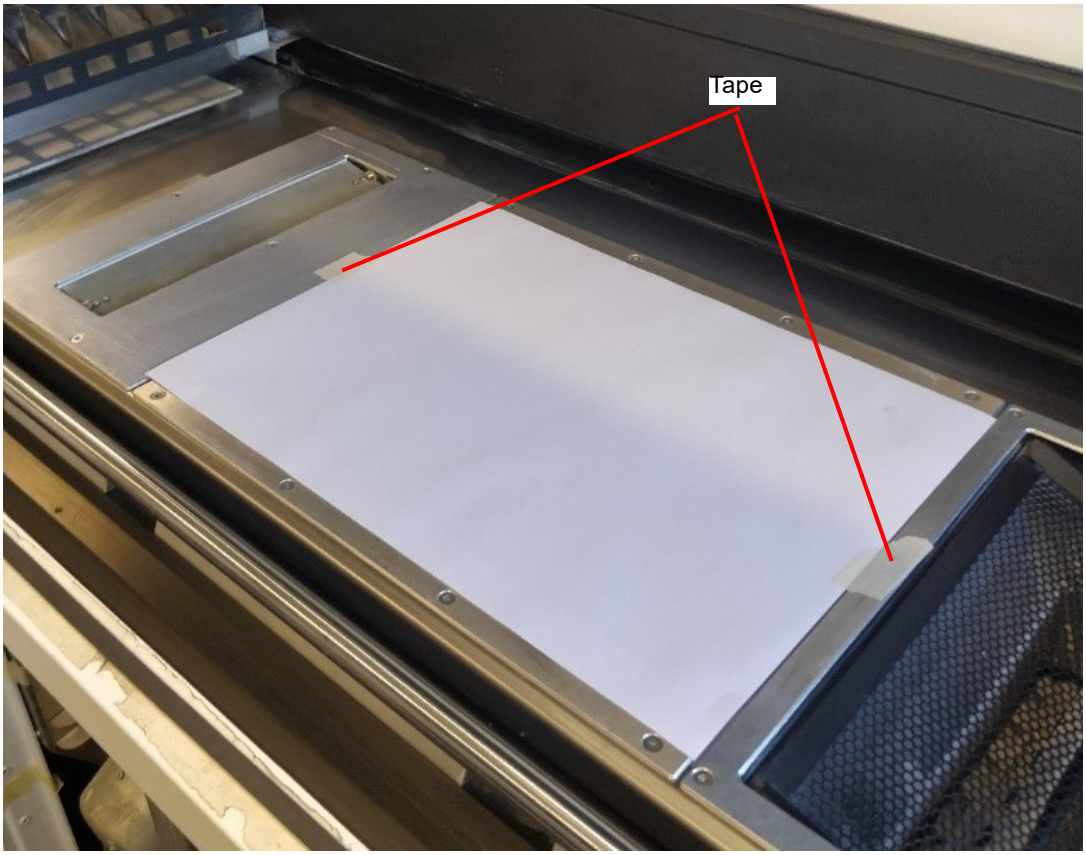
1. Under the Build plate heading press **Home t**o confirm the piston is in the home position.

Figure 66: Common operations screen



2. Place a sheet of A3-size paper on the build plate. Confirm the paper is placed evenly on the build plate surface without any corners sticking up. Secure the sheet of paper to the build plate using two pieces of tape as shown in Figure 67.

Figure 67: A3 paper placed on build plate and secured with tape



3. On the Service operations screen, press **Print System** | **Paper Test** | **Full Test Image**. See Figure 68.

Figure 68: Service operation screen for the paper test tasks

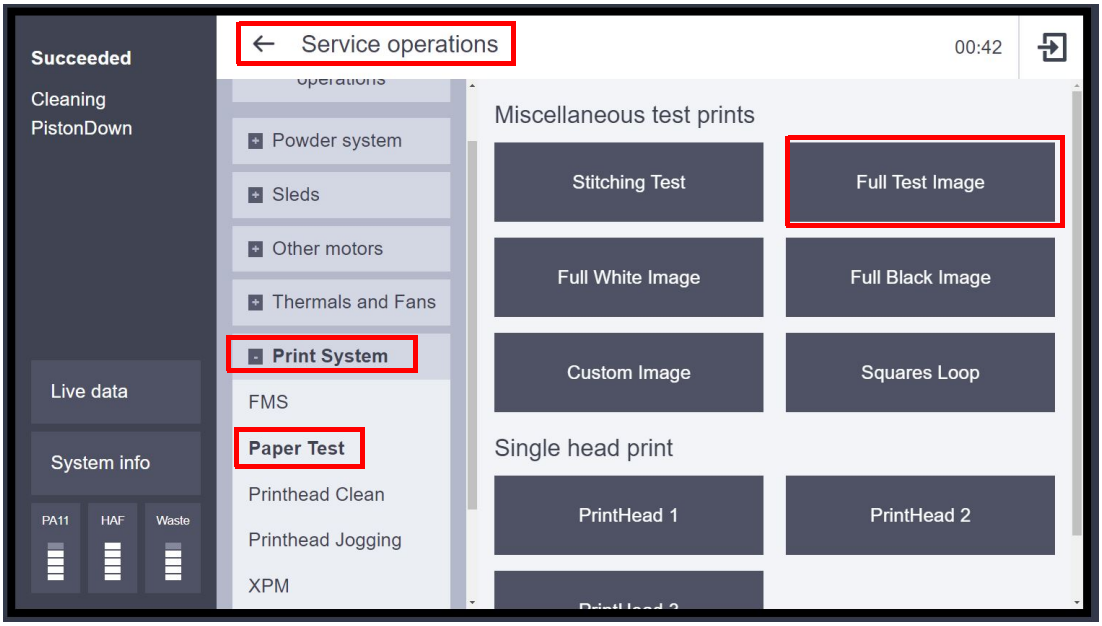
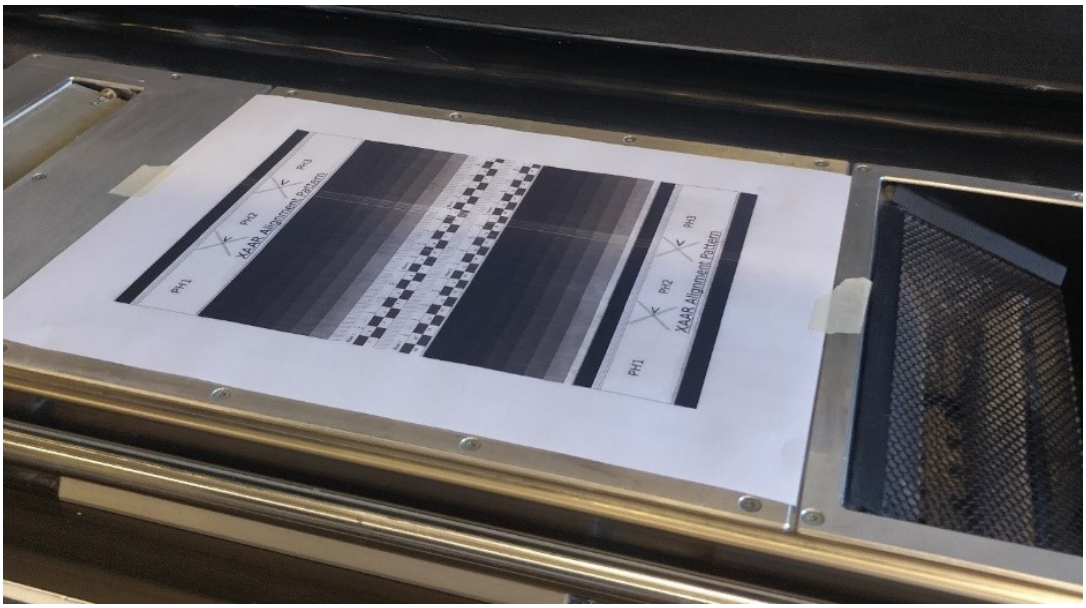


Figure 69: View of the completed full image test

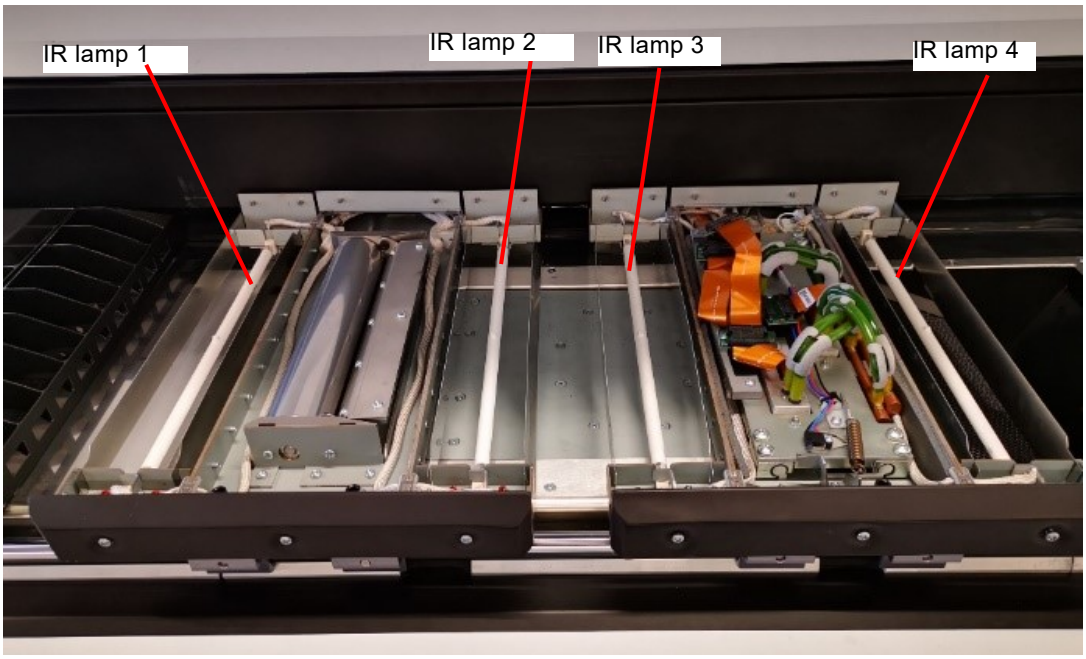


4. Remove the paper from the build plate.
5. Refer to the H350 service manual for how to interpret a full test image print.

Cleaning Infrared (IR) Lamps #1, #2, and #3

The printer has four IR lamps. Two lamps are located on the distribution sled and the two on the print sled. The lamps are numbered as shown in Figure 70.

Figure 70: Infrared lamps #1, #2, #3, and #4 and printer sleds (covers removed to show lamps)

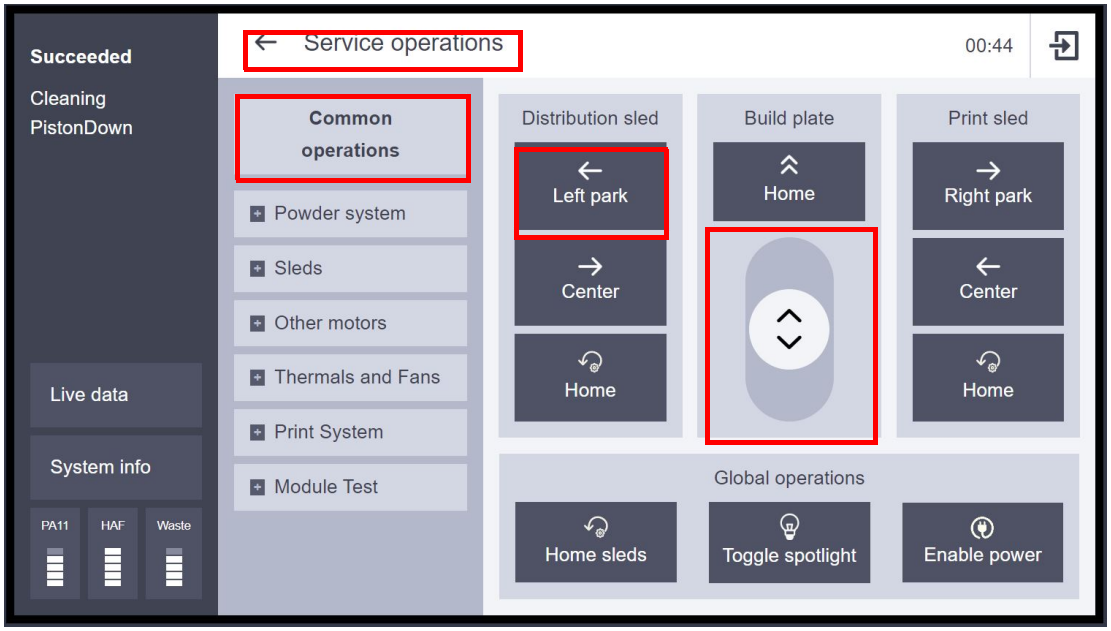


This maintenance procedure describes how to clean the lamps used in the printing process. Lamps #1, #2, and #3 accumulate small amounts of powder on their surfaces. As lamp #4 is not used, no powder collects on its surface. The process for cleaning each of the three lamps involves turning each lamp on for 10 second. This is the time required to burn any containments. The residue is removed by the extraction.

Preparation

1. Close the printer lid.
2. Lower the build plate approximately half way by accessing the **Service operations** screen and pressing the **Build plate** slider until it is approximately half way down. See Figure 71.

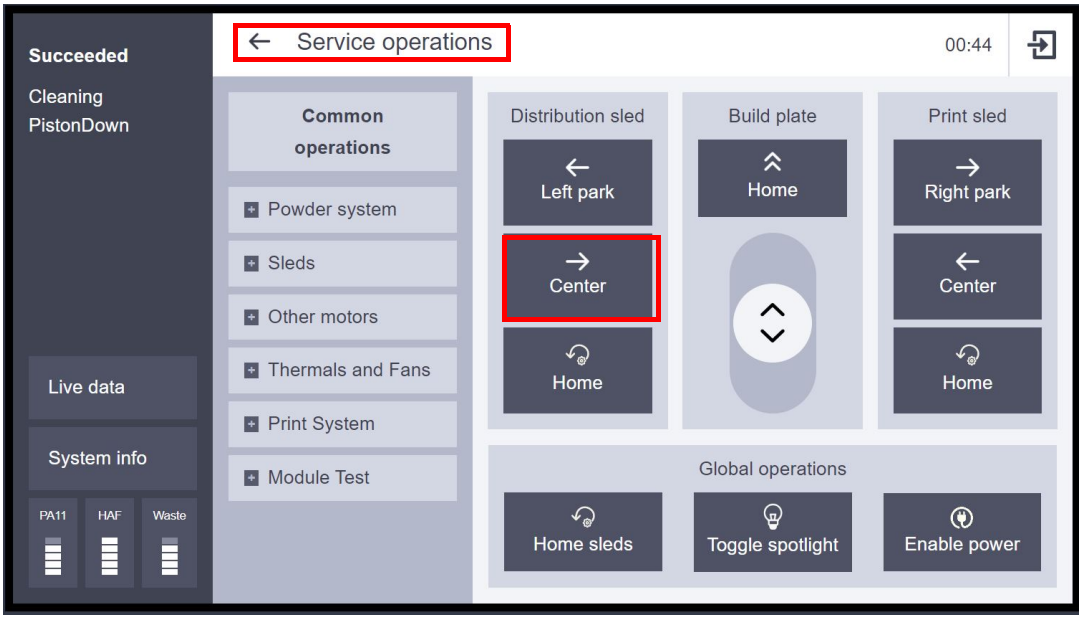
Figure 71: Service operations screen for lowering build plate and parking distribution sled



Cleaning IR Lamps #1 and #2

1. On the **Service operations** screen, press **Center** to move the distribution sled to the center of the process chamber. See Figure 72.

Figure 72: Service operations screen



2. Once the distribution sled is moved to the center, press **Module Test** | **Sleds** | **Distribution sled**. See Figure 73.
   a. Press **Lamp left**. The software turns on IR lamp #1 for 10 seconds.
   b. Repeat four times
   c. Press **Lamp right**. The software turns on IR lamp #2 for 10 seconds.
   d. Repeat four times.

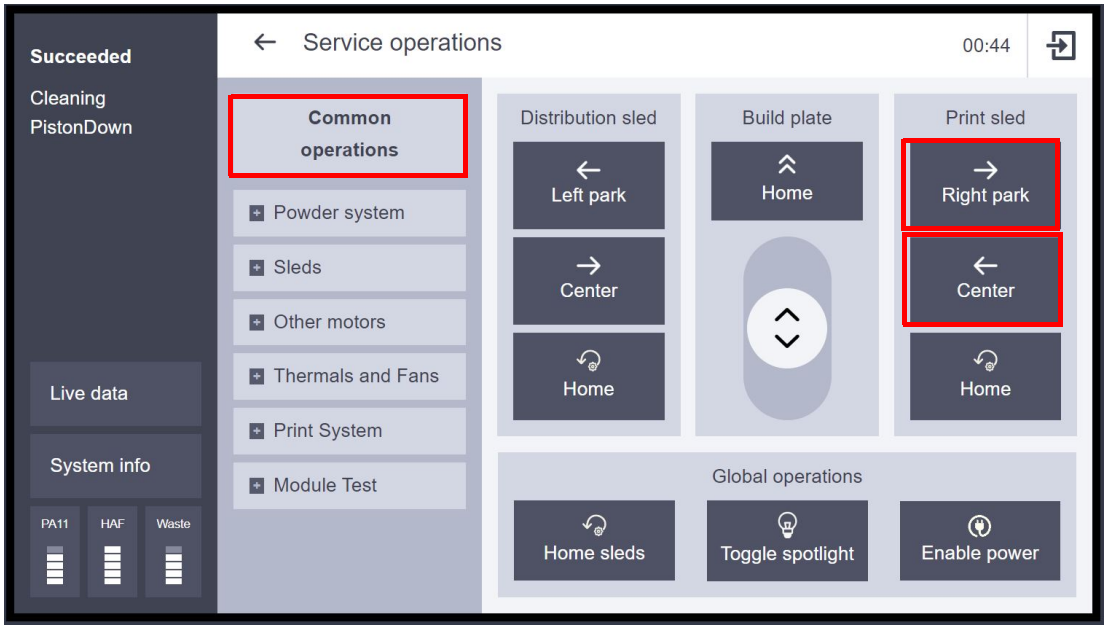
Figure 73: Sled module test screen

e. When both lamps have been lit once for 10 seconds, move the distribution sled back to the park position by pressing **Common operations** at the top of the operations list and then **Left park**. See Figure 71.

Cleaning IR lamp #3

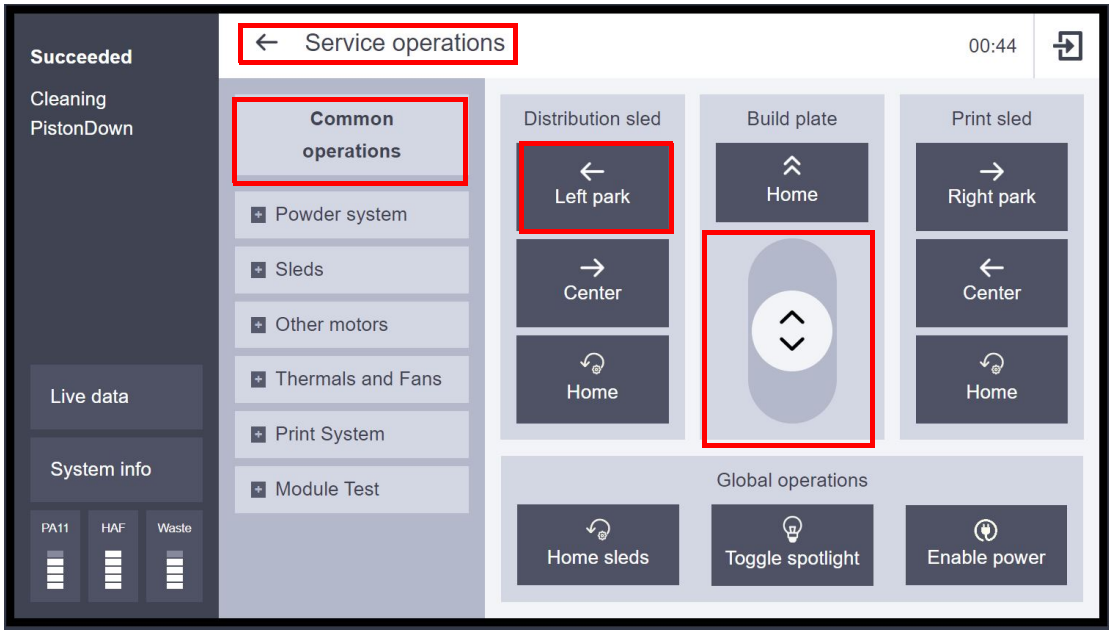
1. On the Service operations screen, press **Center** to move the print sled to the center of the process chamber. See Figure 74.

Figure 74: Service operations screen



2. Lower the build plate fully by accessing the **Service operations** screen and pressing the **Build plate** slider until build plate is at its lowest position. See Figure 71.

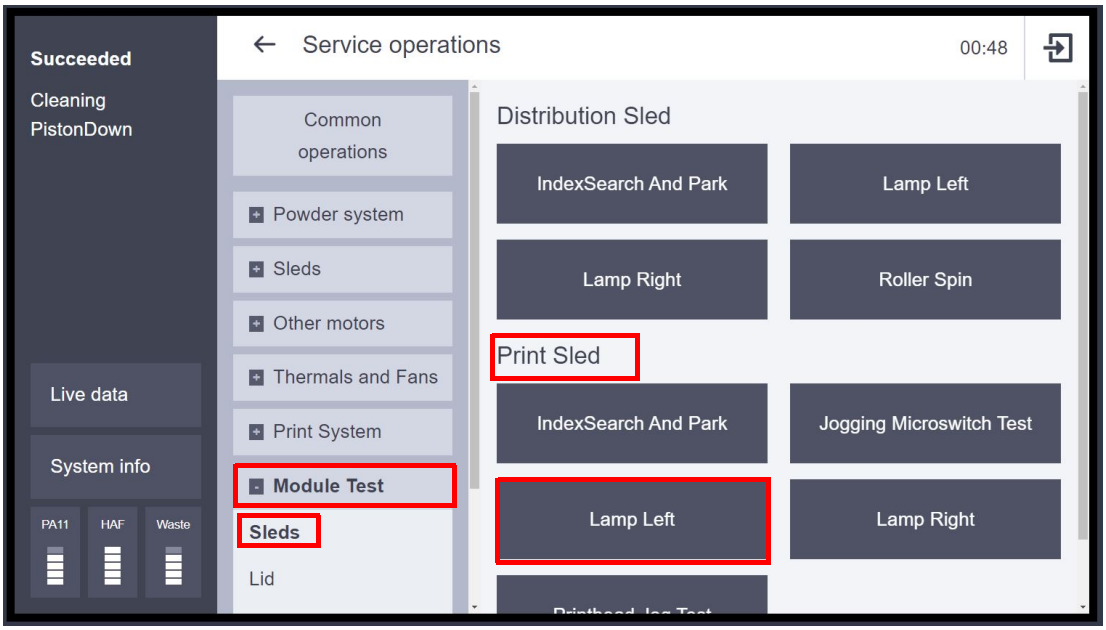
Figure 75: Service operations screen for lowering build plate and parking distribution sled



3. Once the print sled has moved to the center, press **Module Test** | **Sleds** | **Print sled**. See Figure 76.
   a. Press **Lamp left**. The software turns on IR lamp #3 for 10 seconds.

b. Repeat four times.

Figure 76: Sled module test screen



c. When the lamp is lit once for 10 seconds, move the print sled back to the park position by pressing **Common operations** at the top of the operations list and then **Right park**. See Figure 74.

Every 40 Build Cycle Maintenance

Warning: Inhalation Hazard

Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

Warning: Skin Contact Hazard

HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Cleaning the Extraction Outlet

This procedure describes how to vacuum debris from the printer extraction pipe in the area close to the extraction outlet. This procedure needs to be repeated monthly.

Required Tools

The following tools are required:

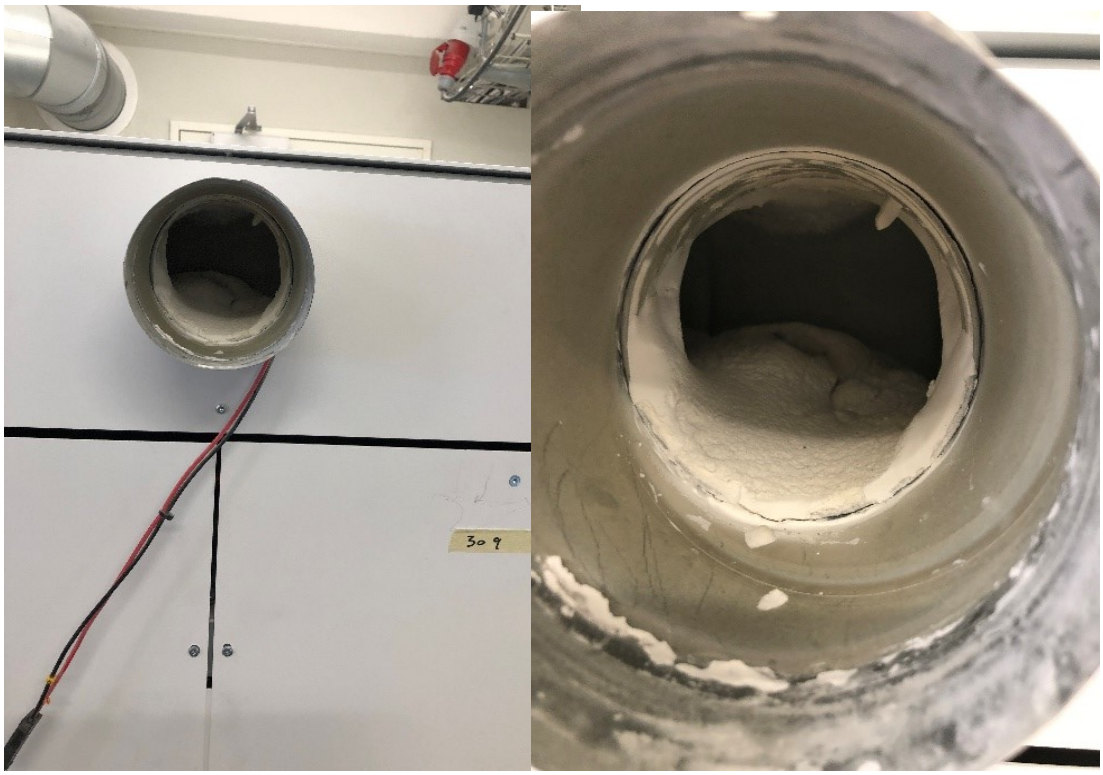
- Screwdriver or other tool for disconnecting the extraction tube from the printer
- Vacuum cleaner

Procedure

1. Disconnect the extraction tube from the rear of the printer.

> When removing the exhaust tube, there is a risk that small amounts of powder will be dislodged. Airborne powder will be generated during this procedure.

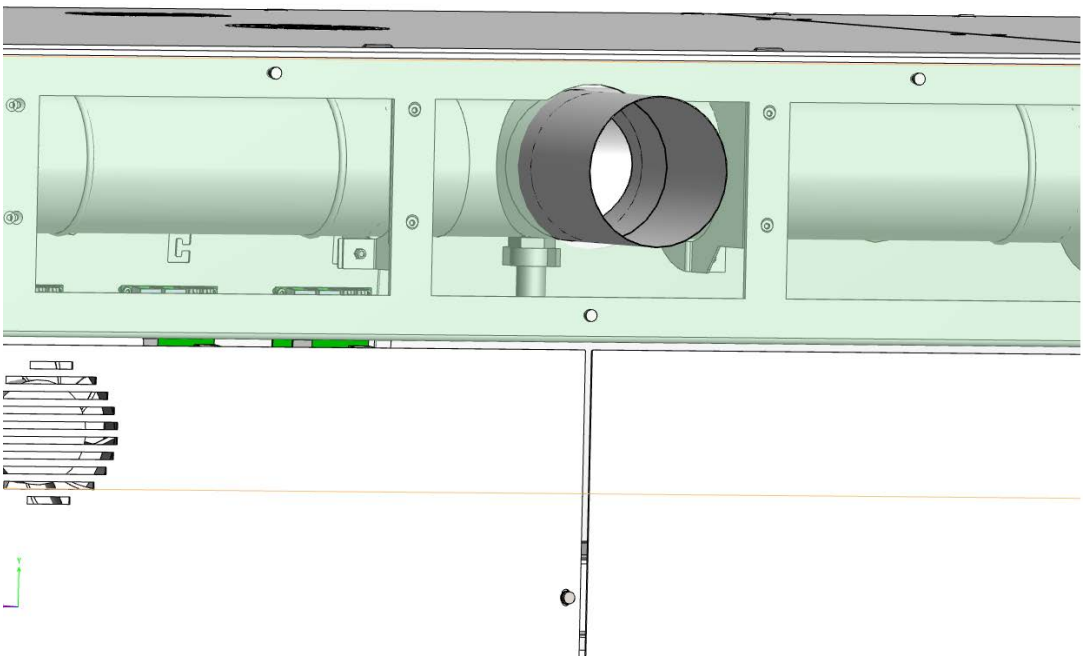
Figure 77: Extraction outlet



2. Use the vacuum cleaner to clean the area around the extraction outlet.

The extraction outlet is a T-shaped junction and all three sides must be cleaned. The bottom of the T-junction connects to a tube from the waste cyclone separator. See the red arrow in Figure 78.

Figure 78: Extraction outlet in printer



Vacuum the right side of the T-junction. See Figure 79.

Figure 79: Vacuum extraction outlet

3. After cleaning, the extraction outlet (left) and the tube connection from waste cyclone separator (right) should look as shown in Figure 80.

Figure 80: Outlet after cleaning

4. When all loose powder has been removed, connect the extraction tube to the extraction outlet.

Cleaning the Front Sled Guide

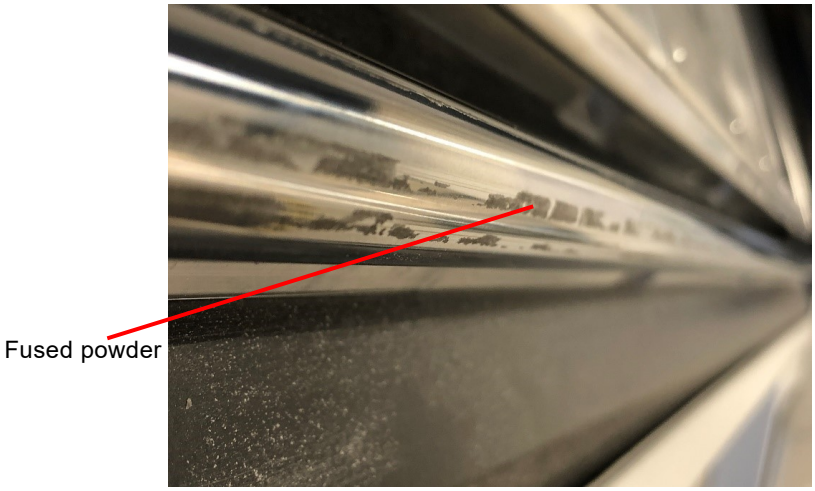
Warning: Inhalation Hazard
Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

Warning: Skin Contact Hazard
HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Warning: Hot Surface Hazard
The processing chamber can reach a temperature of 100ºC (212ºF) and could cause injury. Put on heat resistant gloves before handling.

This procedure describes how to clean fused powder from the front sled guide. The fused powder could inhibit the smooth movement of the sled. This procedure needs to be repeated monthly.

Figure 81: Sled guide with fused powder



Required Tools

The following tools are required:

- Spatula
- Vacuum cleaner
- Wet wipes
- Dry cloths/napkins

Use a spatula made of steel or any other standard, hard material. Do not use a ceramic spatula a spatula made from a similarly hardened material. Although the guides are quite resistant, do not use the corners of the spatula.

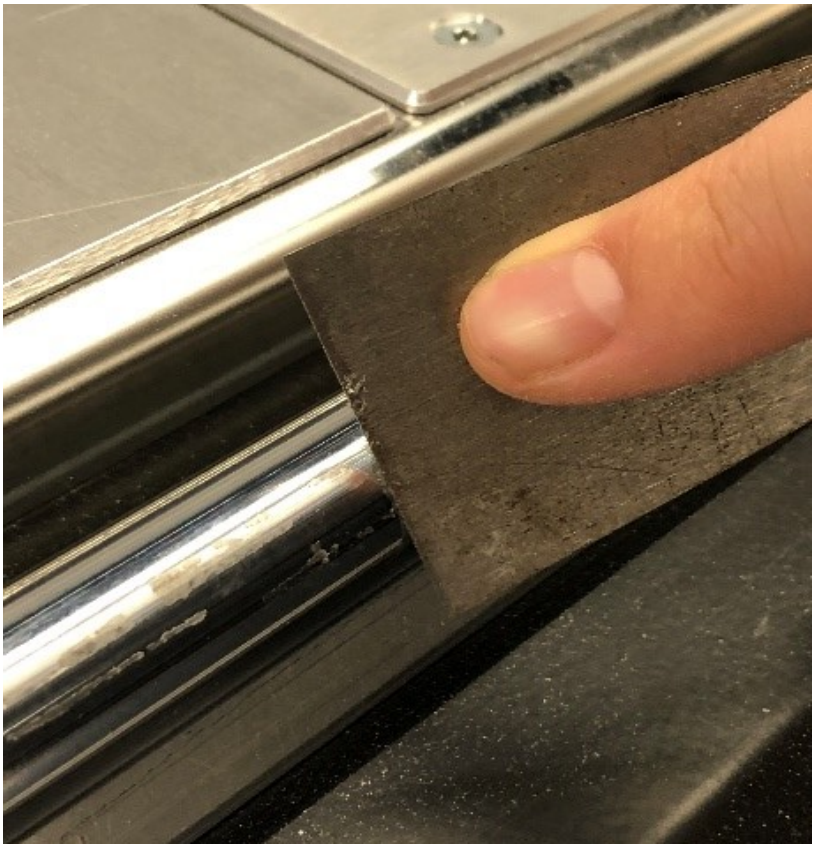
Procedure

1. Open the lid of the printer. When the lid is open, the sled motors are deactivated.

It is recommended to perform this procedure after cleaning powder from the top plate and sled guide areas.

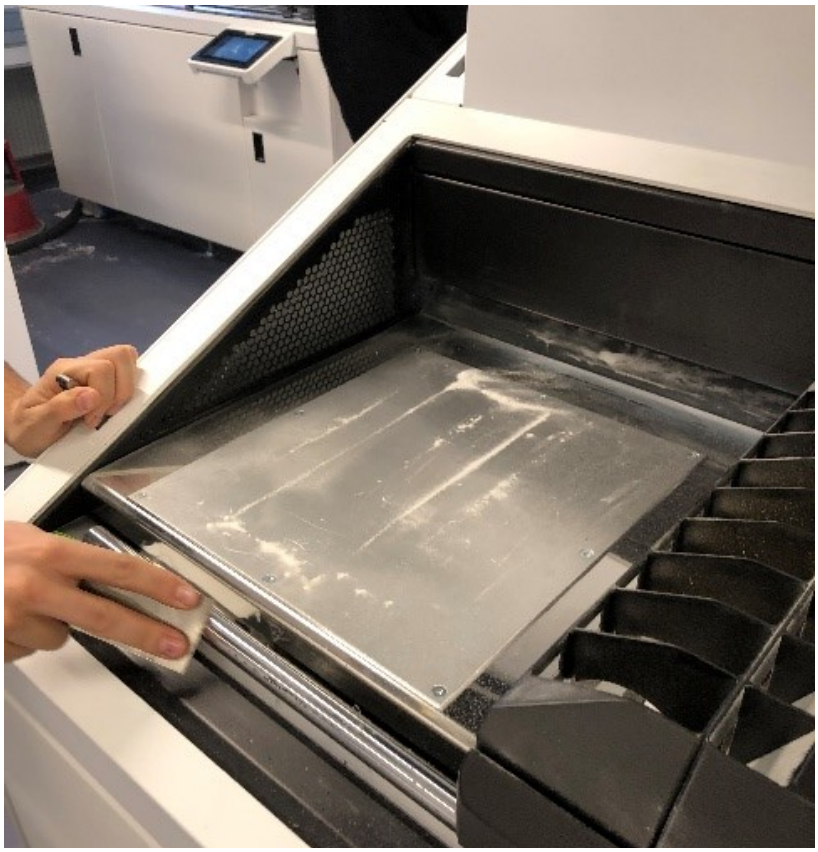
2. Scrape away the fused polymer from the guide surfaces.

Figure 82: Removing fused polymer



3. Scrape away the fused polymer from the guide surfaces. Move the sleds by hand to access the entire length of the guide. See Figure 83.

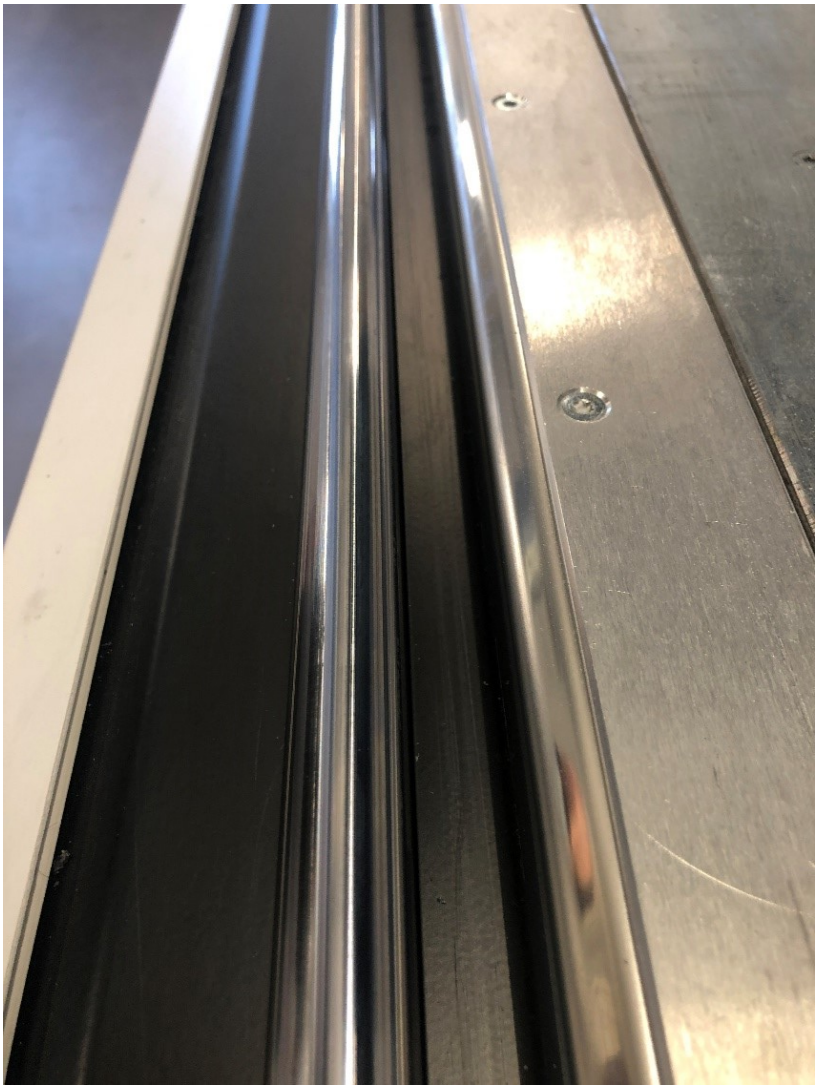
Figure 83: Accessing entire guide



4. Use a wet wipe to clean waste from the guide.
5. Use a dry cloth to dry the guide.

6. Use your hand to check if the guides are smooth and free of fused powder.

Figure 84: Cleaned sled guides



As-Needed Maintenance

Cleaning the Vortex bell and the thermal camera window (lens)

Warning: Inhalation Hazard

Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

Warning: Skin Contact Hazard

HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Warning: Hot Surface Hazard

The processing chamber can reach a temperature of 100ºC (212ºF) and could cause injury. Put on heat resistant gloves before handling.

CAUTION:

If it is necessary to clean the lens, do not apply any direct force to the glass.

Remove contamination without rubbing the lens surface.

Figure 85: Vortex bell and thermal camera window

1. If there are visible particles on the thermal camera window, use the canned air, to remove as many particles as possible, before using any wet wipes.

Figure 86: Cleaning using canned air

2. Keeping the thermal camera window clean is very important for the process control. Start by cleaning the powder from the Vortex bell surface with a wet wipe.

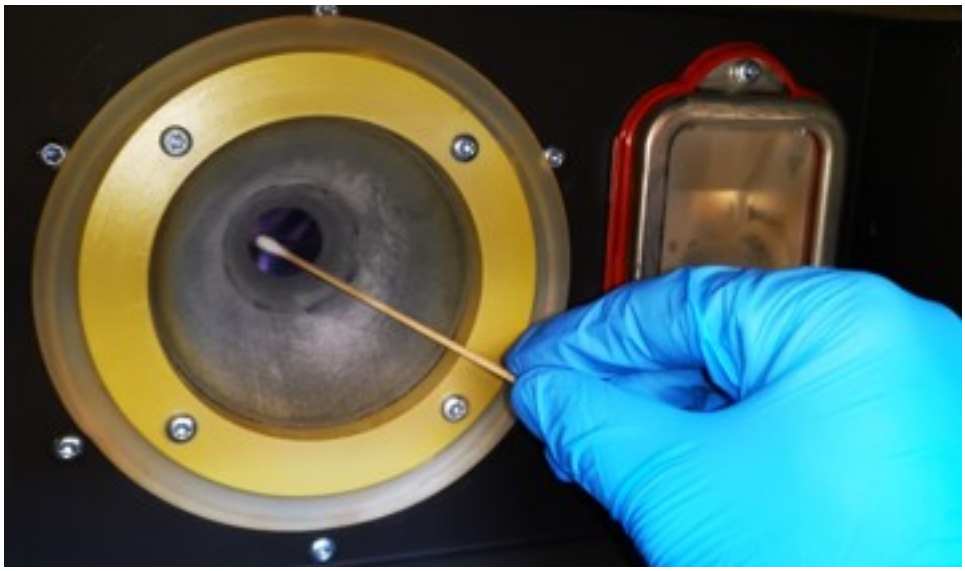
Figure 87: Cleaning the vortex bell surface

3. Once all soft particles have been removed, clean the thermal camera window with lint free pre-moistened towelettes. Use a gentle circular motion and apply very little pressure. See Figure 88.

Figure 88: Clean the thermal window

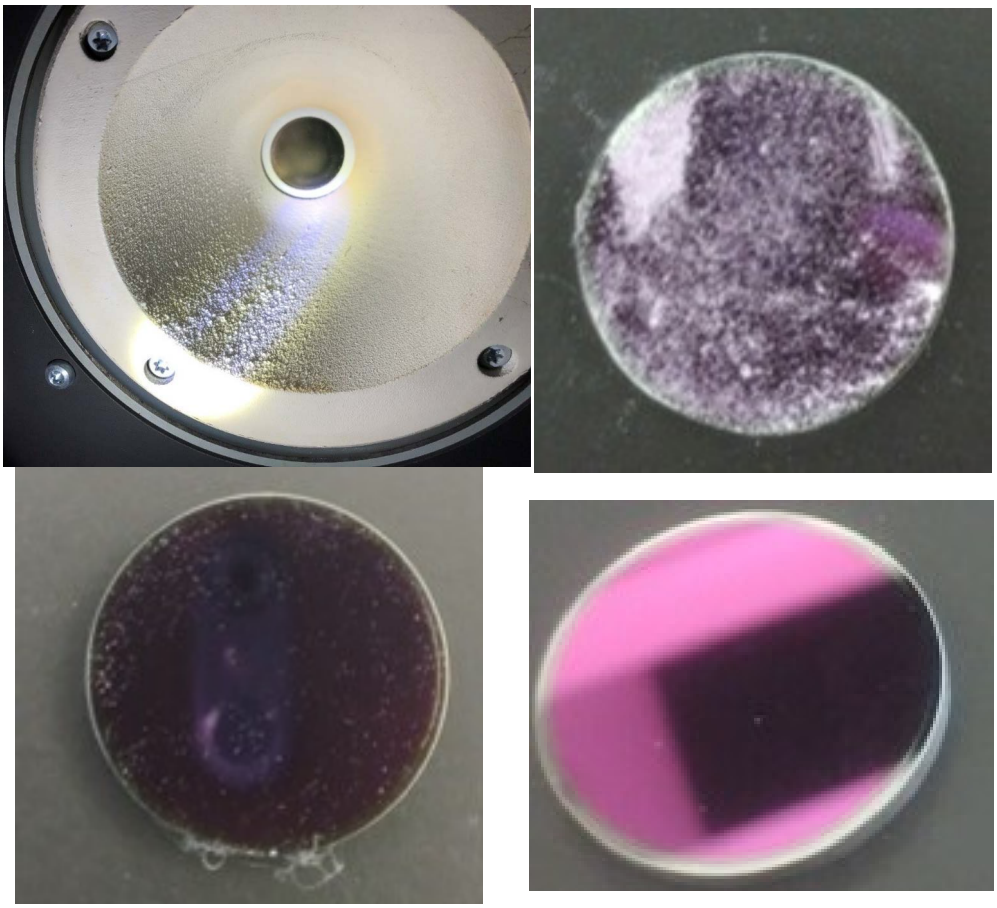
4. Before the liquid from the towelettes evaporates, use a swab to wipe the thermal window dry using a gentle circular motion and applying very little pressure. See Figure 89.

Figure 89: Swab the thermal window



5. Below are examples of example of the vortex bell and thermal camera window contaminated with powder. The surface of the bell needs to be cleaned with a wet wipe or vacuum cleaner before cleaning the thermal camera window. See Figure 90.

Figure 90: Vortex bell and thermal camera window contaminated with powder



Cleaning the Touchscreen Display

Caution:

Using a cleaner which contains ammonia and/or alcohol can damage the touchscreen. Only a suitable LCD cleaning solution and microfiber cloth (included in the Welcome Kit) should be used to clean the touchscreen display.

As needed, to remove smudge marks and buildup, clean the touchscreen display using the LCD cleaner and microfiber cloth provided in the Welcome Kit.

Apply an adequate amount of LCD cleaning solution to the provided microfiber cloth, and then gently wipe the exterior surface of the touchscreen display to clean its surface. It is recommended that you apply LCD cleaner to the microfiber cloth rather than applying cleaner directly to the touchscreen display, as excess moisture may damage the display.

Cleaning Blocked Nozzles on the Printhead Cleaning Module

Warning: Skin Contact Hazard

HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Warning: Hot Surface Hazard

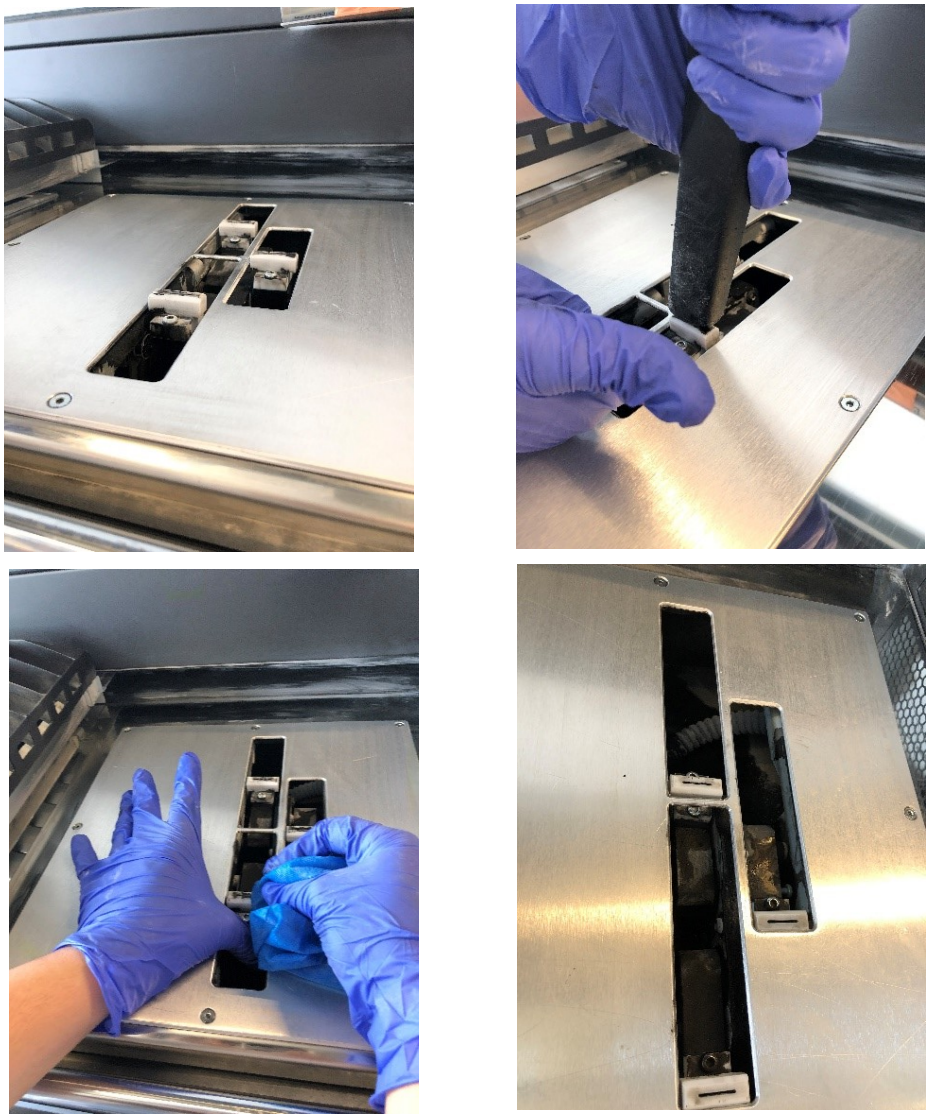
The processing chamber can reach a temperature of 100ºC (212ºF) and could cause injury. Put on heat resistant gloves before handling.

When the print sled is not in the parked position, the printhead cleaning nozzles can be inspected and cleaned.

1. Move the nozzles to the middle position. In this position they are raised above the level of the top plate.
2. Use a wet wipe to clean away any residual fluid.

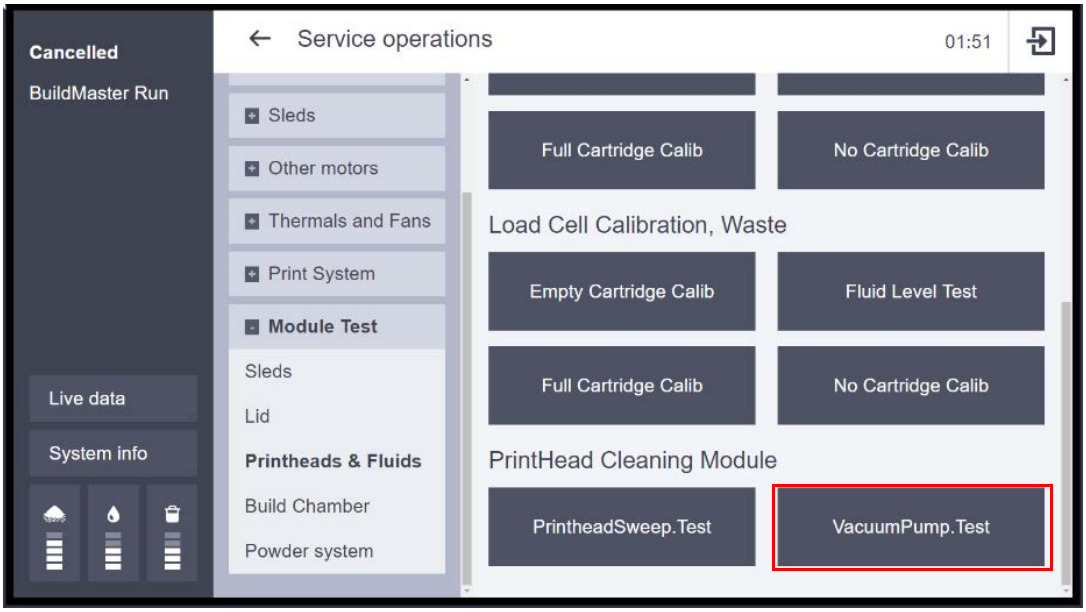
3. Use a vacuum cleaner to remove any powder particles present at the top of the nozzles.

Figure 91: Vacuum cleaning the blocked printhead cleaning nozzles



4. To test if the printhead cleaning nozzles are unobstructed, perform a module test: **Service operations** | **Module Test** | **Printheads & Fluids** | **Printhead Cleaning Module** | **VacuumPump.Test**.

Figure 92: Printhead cleaning vacuum test.



5. While the test is running, verify the presence of vacuum when blocking the tip(s) of the printhead cleaning nozzles.

Additional Areas Requiring Cleaning

Warning: Inhalation Hazard

Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

Warning: Skin Contact Hazard

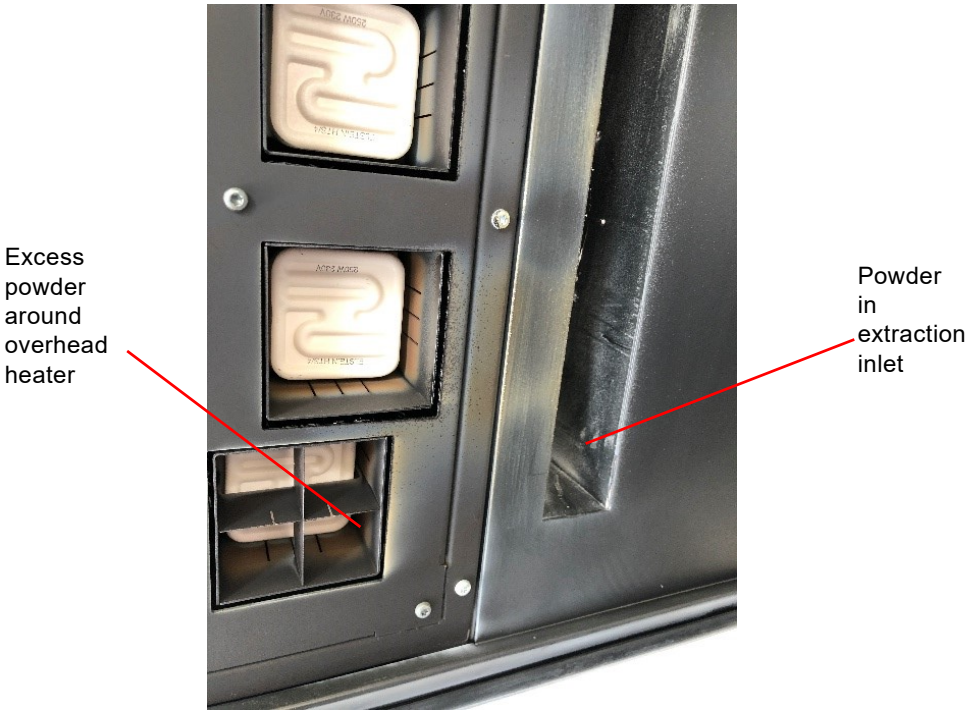
HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Warning: Hot Surface Hazard

The processing chamber can reach a temperature of 100ºC (212ºF) and could cause injury. Put on heat resistant gloves before handling.

1. Vacuum any excess powder from the lid area, including the overhead heater and the extraction inlet.

Figure 93: Vacuum overhead heater and extraction inlet



2. Vacuum the lid clean. This will remove powder from the extraction inlet and powder from and around the window.

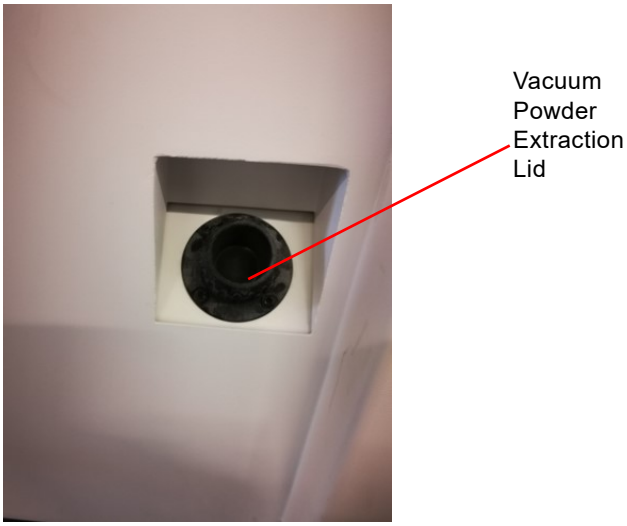
Figure 94: Vacuum the lid

3. Clean powder from the vortex bell and the thermal camera window as needed.
4. Clean fused powder from the sled protection strips or replace the sled protection strips as required.
5. Wipe excess powder from the sled guides as needed.

Clean the Powder System

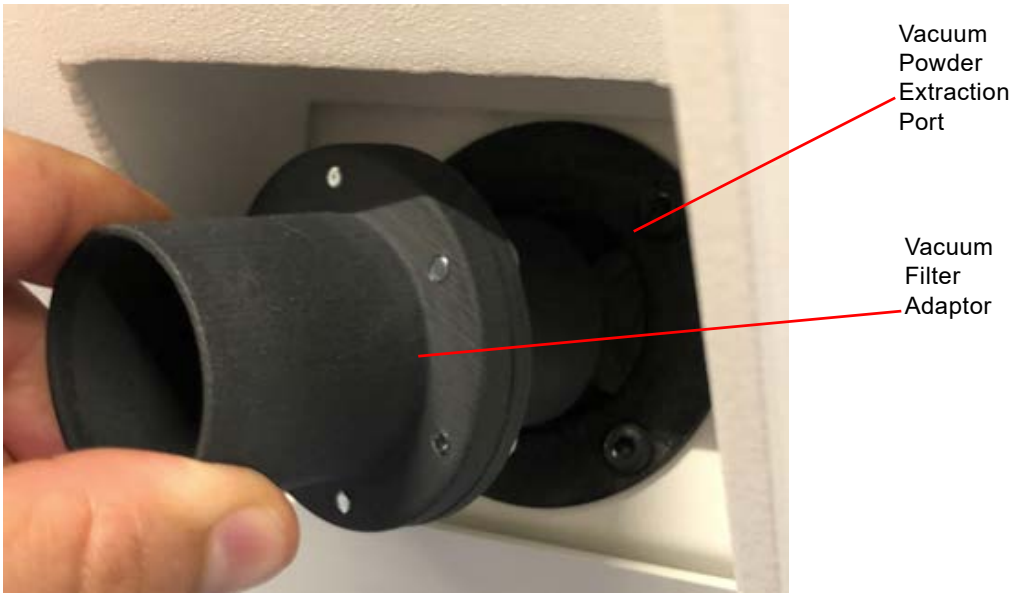
1. Open the powder container door and remove the vacuum powder extraction lid.

Figure 95: Remove vacuum powder extraction lid



2. Insert the vacuum filter adapter into the vacuum powder extraction port.

Figure 96: Vacuum filter adapter insertion

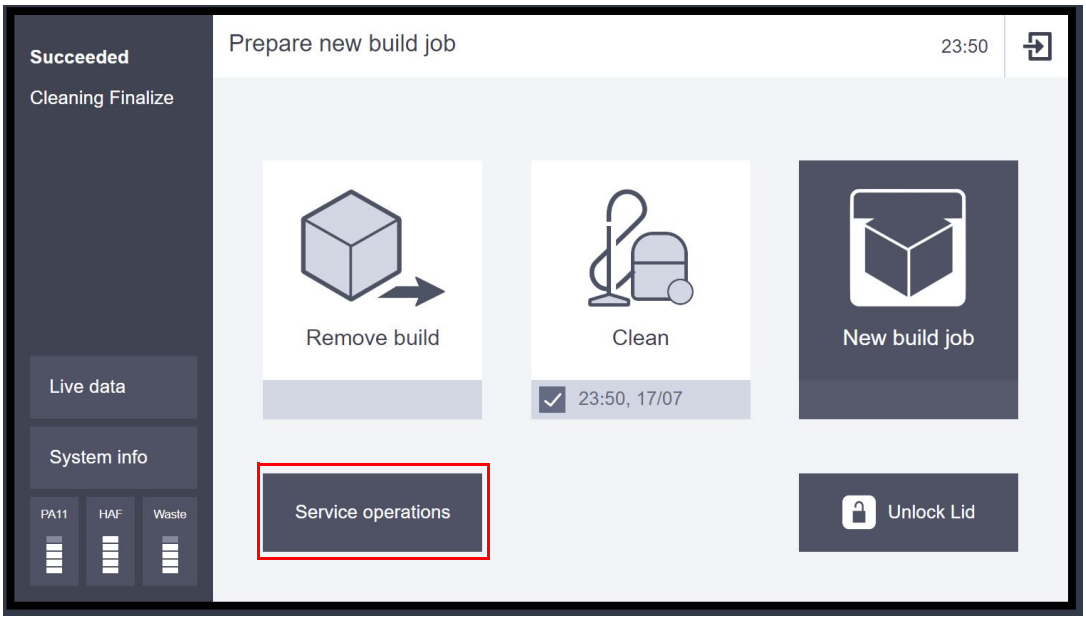


3. Insert the vacuum tube into the vacuum filter adapter and start the vacuum cleaner. If the powder needs to be re-used, connect a cyclone to the vacuum outlet.

Figure 97: Vacuum tube

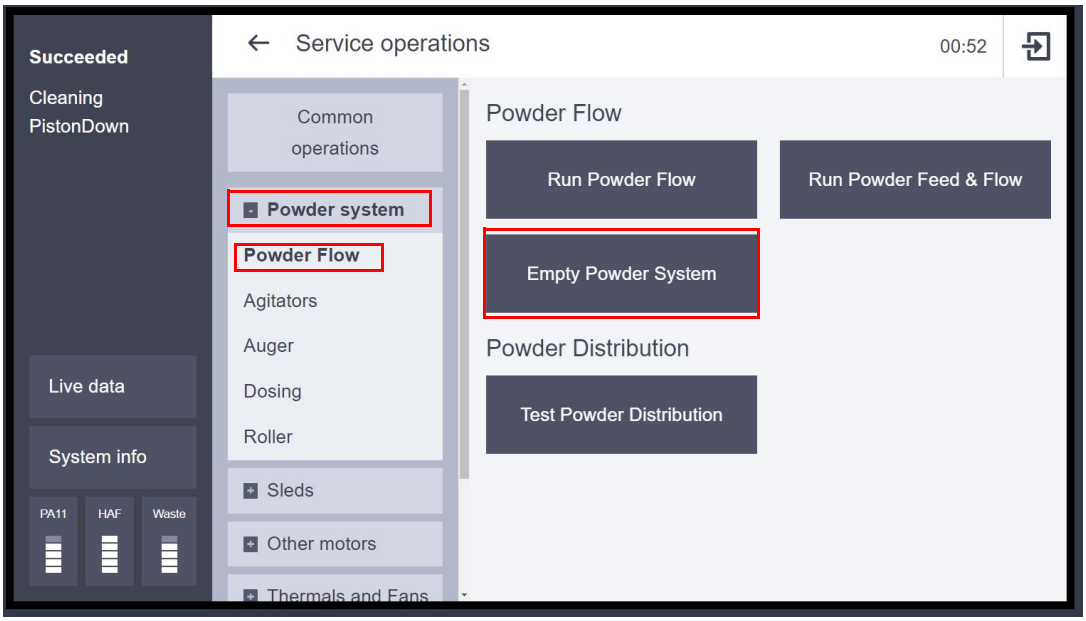
4. On the touch screen select Service Operations.

Figure 98: Service operations



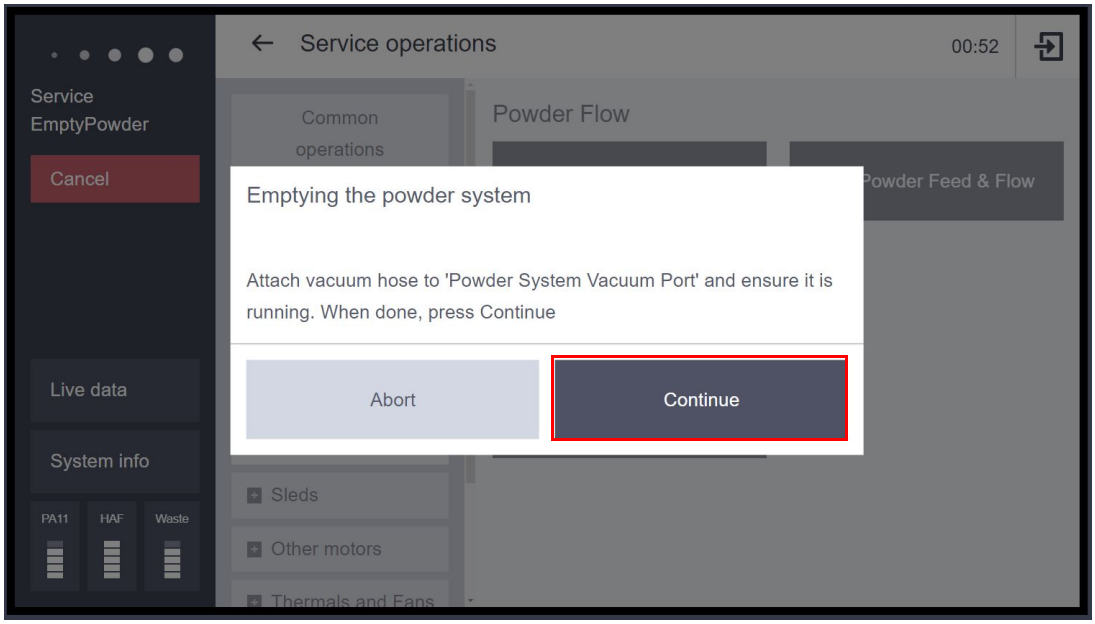
5. At the Service Operations screen, press **Powder System** | **Powder Flow** | **Empty Powder System**.

Figure 99: Empty powder system



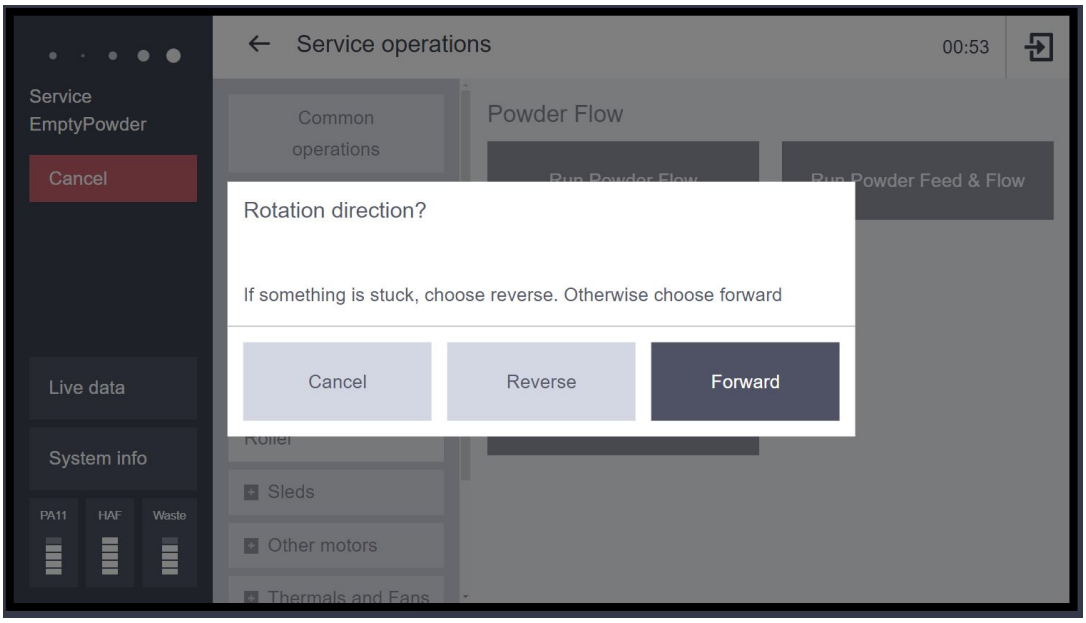
6. Press **Continue**.

Figure 100: Continue



7. If something is stuck in the powder system, choose **Reverse**. This will cause the agitators and auger to reverse rotation. In all other cases, choose **Forward**.

Figure 101: Rotation direction



8. Let the system run for approximately five 5 minutes. Confirm there is no powder in the auger and dose module by manually flipping the dose blade.

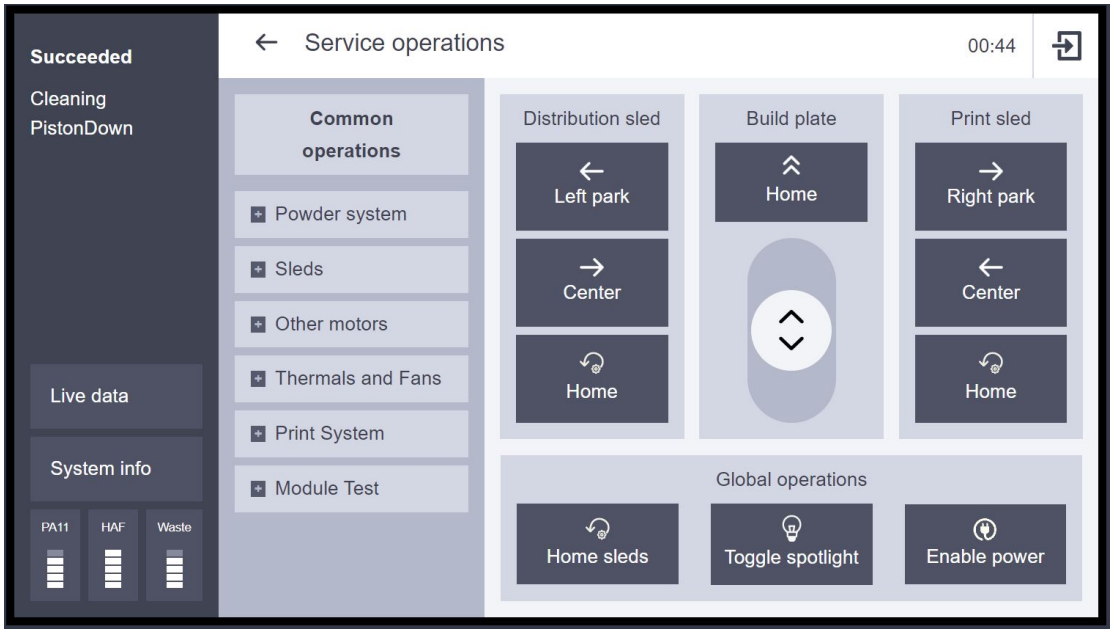
Figure 102: Dose blade

Test Powder Distribution

The following task should be performed for approximately 15 minutes whenever powder is stored in conditions that deviate from a temperature of 20°C to 25°C (68°F to 104°F) and relative humidity of 40% to 55%. Even if the powder that was stored outside of these environmental conditions is stored in the printer room for a minimum of 48 hours before use, it is still recommend that the test powder distribution task is performed.

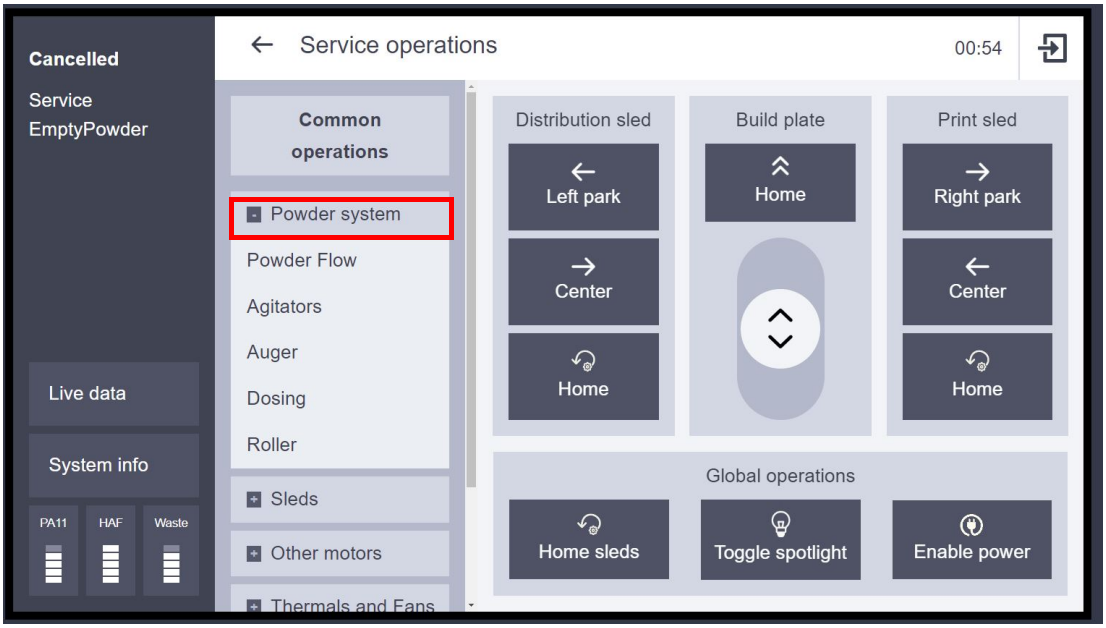
1. Access the Service operations screen.

Figure 103: Service operations screen



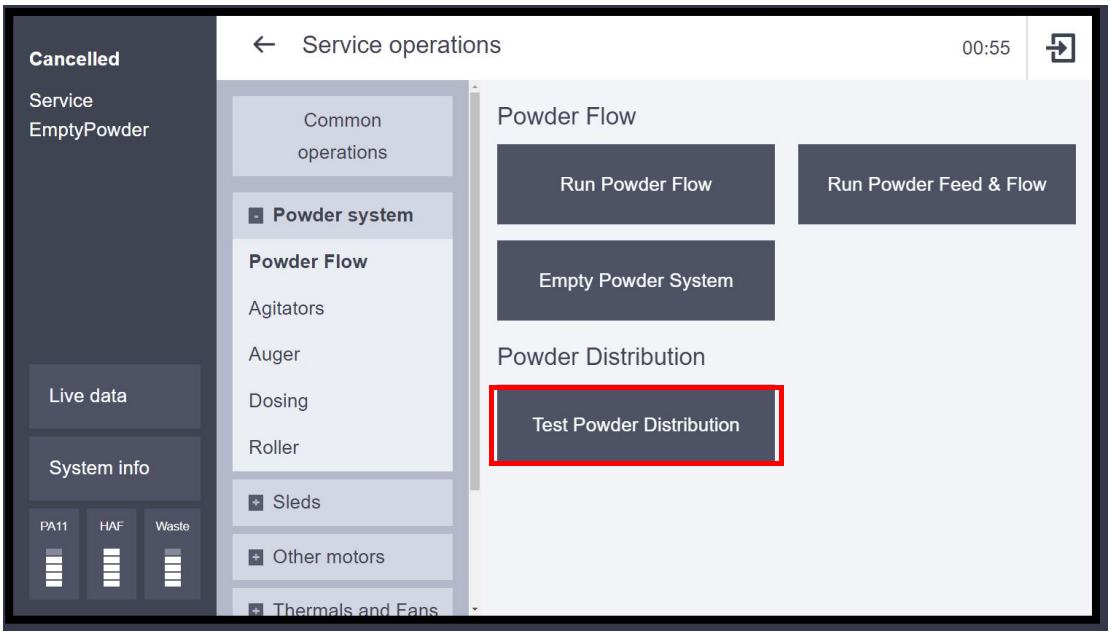
2. Press the Powder system button.

Figure 104: Press Powder system button



3. The Powder Flow sub menu displays. Press the Test Powder Distribution button. Run the test for at least 15 minutes.

Figure 105: Test powder distribution



Customer Replaceable Units

The following service procedures outline the replacement instructions for the customer replaceable units of the H350 3D printers.

Replacing Spot Light Bulb

Warning: Electrical Shock Hazard

Contact with live circuits could cause serious electric shock. Do not continue before disconnecting the power cable.

Warning: Hot Surface Hazard

The processing chamber can reach a temperature of 100ºC (212ºF) and could cause injury. Do not continue before disconnecting the power and verifying that the processing chamber has cooled.

The 2 spot lights are located inside the printer cover.

Required Tools

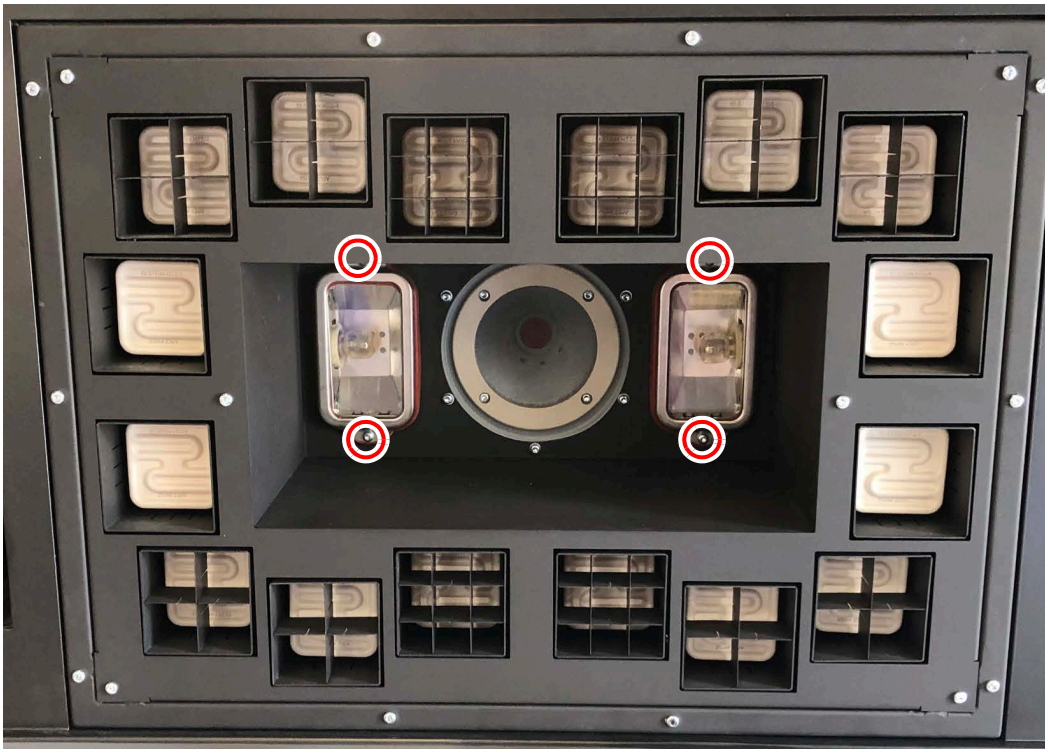
The following tools are required:

- TX20 screwdriver
- Replacement bulb (P/N 113579)

Procedure

1. Lift the printer cover, and, using the TX20 screwdriver, loosen the 2 screws securing the spot light cover.

Figure 106: Spot light cover



2. Remove the spot-light cover and unscrew the bulb.

Warning: Hot Surfaces
To prevent injury, verify that the bulb(s) are cool before removing them.

3. Replace the bulb, and secure the light cover with the 2 screws.

Replacing the Sled Protection Strips

Warning: Inhalation Hazard
Inhalation of airborne particles could result in serious respiratory injury. Do not continue before putting on a dust mask that complies with local regulations.

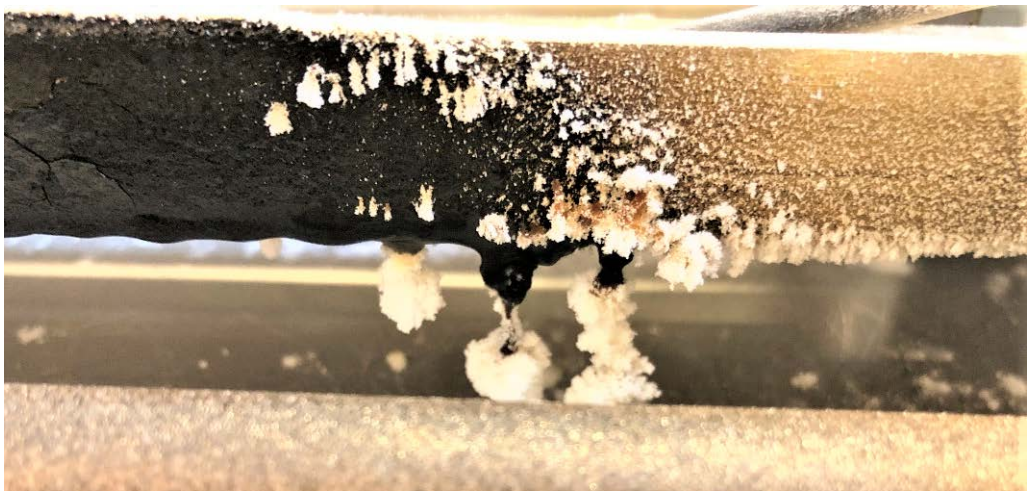
Warning: Skin Contact Hazard
HAF can cause skin irritation after prolonged contact. Do not continue before putting on protective gloves.

Warning: Hot Surface Hazard
The processing chamber can reach a temperature of 100ºC (212ºF) and could cause injury. Put on heat resistant gloves before handling.

Replace the protection strips if they become deformed, or begin to collect melted powder, which might cause fused powder to accumulate on the build bed.

Figure 107: Example of dirty sled protection strips

Figure 108: Example of powder accumulation on the strip and build bed



Required Tools

The following tools are required:

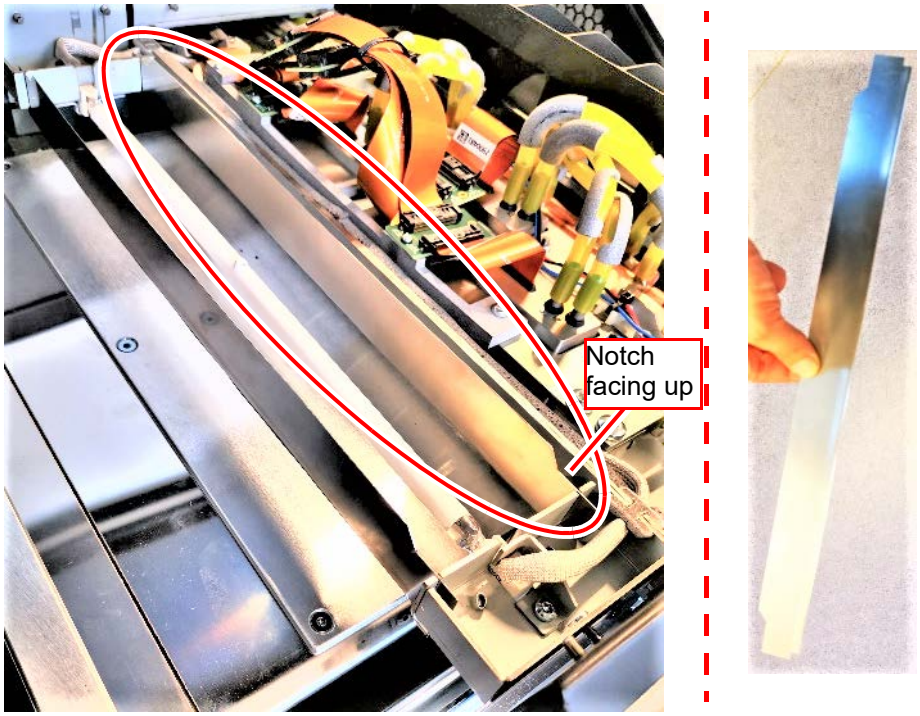
- TX20 screwdriver

Procedure

Warning: Crushing Hazard
To prevent injury, before removing any of the sled screws, press the emergency stop button or turn off the power to the printer.

1. Remove the cover of the sled where you need to replace the protection strip, as described in “Removing and Cleaning the Distribution Sled and Print Sled Covers” (page 178).
2. Lift the protection strip straight up to remove it.

Figure 109: Mounted (left), and removed protection strip (right)

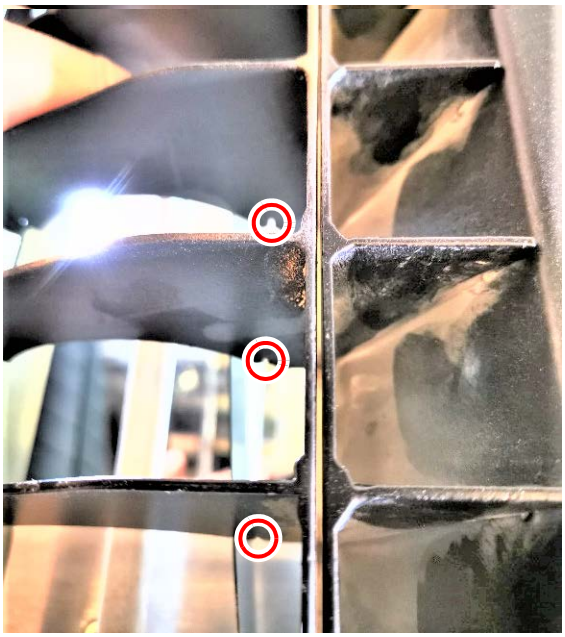


3. Insert the new sled protection strip with the notches on the ends facing upwards, as shown in Figure 109.

4. Place the sled cover in its location, and verify that the protection strip is inserted into each of the grooves in the cover, as shown below.

The protection strip will bend if not inserted into each of the grooves in the cover.

Figure 110: Grooves for protection strip in cover



8 TROUBLESHOOTING

This chapter describes troubleshooting steps that can be performed to correct basic problems with the H350 SAF Selective Absorption Fusion Powered 3D Printer.

Getting Help

If you have a problem with your printer or the printer's materials that is not covered in this guide, or if you need to order replacement parts, please contact Customer Support for your region. Contact information is available from the Stratasys website at: http://www.stratasys.com/customer-support/contact-customer-support.

If needed, you can write to Customer Support North America at:

Stratasys, Inc.
Customer Support
7665 Commerce Way
Eden Prairie, MN 55344 USA

Before calling for service or supplies, always have the following information ready:

- Your printer's software version (see "Updating Controller Software" (page 162) for instructions on obtaining this information).
- Your printer's serial number (see Figure 1 (page 18)) for information on locating the printer's serial number).

Fault Codes

The following table contains system-wide error codes.

Table 1: Fault Codes

Error Name	ID	Error Description
GenericError	1000	Generic error
GenericWarning	1002	Generic warning
ProgramError	1010	Program error
NotSupported	1015	Not supported
StaleError	1020	Stale error
GenericTimeout	1030	Generic timeout
SoftwareUpdateTimeout	1032	Software update timeout

Table 1: Fault Codes

Error Name	ID	Error Description
IllegalRequest	1102	Illegal request
ConfigError	1200	Configuration error
TaskLoadFailure	1300	Task load failure
TaskFailure	1310	Task failure
BuildJobError	2000	Build job error
BuildJobWarning	2001	Build job warning
BuildJobLoadError	2002	Build job load error
SliceError	2003	Slice error
SliceDownloadError	2004	Slice download error
TemperatureInvalid	3110	Temperature reading invalid
ThermistorMalFunction	3111	Temperature reading unreliable
TemperatureUnstable	3112	Temperature unstable
TemperatureControlWarning	3113	Temperature control warning
TemperatureControlError	3114	Temperature control error
TemperatureMaxError	3115	Temperature above max. limit
TemperatureExtFailure	3120	Temperature Ext sensor failure
TemperatureExtHigh	3121	Temperature Ext above max. limit
SensorNotCalibrated	3150	Sensor calibration missing
ExtractionInsufficientWarning	3200	Extraction insufficient, Warning
ExtractionInsufficientError	3201	Extraction insufficient
AmbientTemperatureLow	3210	Ambient temperature too low
AmbientTemperatureHigh	3211	Ambient temperature too high
CANInterfaceError	4000	CAN Interface error
CANSendError	4001	CAN bus send error
CANBoardNoConnection	4002	No CAN board connection
CANBoardLostConnection	4003	Lost CAN board connection

Table 1: Fault Codes

Error Name	ID	Error Description
CANProtocolError	4004	CAN Protocol error
CANInvalidNodeID	4005	CAN invalid node ID
CANReplyTimeout	4010	CAN message reply timeout
CANErrorReply	4011	CAN message error reply
CANBoardReset	4012	CAN board was reset
CANSendRetry	4013	CAN message send retry
CANErrorCounter	4014	CAN bus error counters are nonzero
BoardInitFailure	4016	Board initialization failed
BoardTemperatureHigh	4018	High board temperature
NoPower24VDC	4020	No 24V Power
NoPower230VAC	4021	No 230V Power
NoBoardPower24VDC	4025	No 24V Power for board
NoBoardPower230VAC	4026	No 230V Power for board
PowerDisabled	4028	Power disabled
LogicPowerWarning	4030	Logic power outside normal range
HighLogicCurrent	4031	High Current for 24V logic power
PowerWarning24VDC	4032	24V driver power outside normal range
PowerWarning230VAC	4033	230V power outside normal range
HighCurrent24VDC	4036	High Current for 24VDC
HighCurrent230VAC	4037	High Current for 230VAC
CameraConnectionError	5000	Camera connection error
CameraInvalidReading	5001	Camera reading invalid
CamCoolingError	5002	Camera cooling problem
FMS_InitializationError	5100	FMS initialization error
FMS_ConnectionError	5101	FMS connection error

Table 1: Fault Codes

Error Name	ID	Error Description
FMS_MeniscusSensorFault	5102	FMS Meniscus sensor fault
FMS_FillPumpTimeout	5103	FMS Fill pump timeout
FMS_InkLevelWarning	5104	FMS Ink level warning
FMS_InkBottleEmpty	5105	FMS Ink bottle empty
FMS_ThermoCoupleFault	5106	FMS ThermoCouple fault
FMS_DegassFault	5107	FMS Degass fault
FMS_RecircSensorFault	5108	FMS Recirculation sensor fault
FMS_FailsafeAlarm	5109	FMS Failsafe alarm
FMS_MeniscusPumpTooSlow	5110	FMS Meniscus Pump running too slow
FMS_MeniscusPumpTooFast	5111	FMS Meniscus Pump running too fast
FMS_RecircPumpTooSlow	5112	FMS Recirc Pump running too slow
FMS_RecircPumpTooFast	5113	FMS Recirc Pump running too fast
FMS_Draining	5114	FMS Draining is active
FMS_MeniscusPumpTooSlowWarning	5115	FMS meniscus pump running too slow
FMS_MeniscusPumpTooSlowError	5116	FMS meniscus pump running too slow
FMS_MeniscusPumpTooFastWarning	5117	FMS meniscus pump running too fast
FMS_MeniscusPumpTooFastError	5118	FMS meniscus pump running too fast
FMS_RecircPumpTooSlowWarning	5119	FMS recirc pump running too slow
FMS_RecircPumpTooSlowError	5120	FMS recirc pump running too slow
FMS_RecircPumpTooFastWarning	5121	FMS recirc pump running too fast
FMS_RecircPumpTooFastError	5122	FMS recirc pump running too fast
FMS_InfeedPressureTargetWarning	5123	FMS infeed pressure off target

Table 1: Fault Codes

Error Name	ID	Error Description
FMS_InfeedPressureTargetError	5124	FMS infeed pressure off target
FMS_ReturnPressureTargetWarning	5125	FMS return pressure off target
FMS_ReturnPressureTargetError	5126	FMS return pressure off target
FMS_FillPumpDisabled	5127	FMS fill pump disabled
FMS_AutoControlError	5128	FMS auto control error
InkCoolingError	5130	Ink cooling problem
XpmError	5200	XPM error
XpmWarning	5201	XPM warning
XpmConnectionError	5204	XPM connection error
XpmInitializationError	5206	XPM initialization error
XpmPrintFailure	5210	XPM print failure
XpmImageDownloadError	5214	XPM image download error
LoadcellConnectionError	5300	Loadcell connection error
LidNotProperlyClosed	5350	Only one latch is locked
LidSensorError	5351	Latch is closed while switch is open
LidSwitchError	5352	Lid microswitch not connected
CartridgeHafSwitchError	5400	HAF cartridge microswitch not connected
CartridgeWasteSwitchError	5401	Waste cartridge microswitch not connected
RFID_ConnectionError	5450	RFID reader connection error
MoveTimeout	5600	Move timeout
MoveFailure	5601	Move failure
MoveStartTriggerError	5602	Move did not start on trigger
MoveStopTriggerError	5603	Move did not stop on trigger
HomeFailure	5604	Homing failure

Table 1: Fault Codes

Error Name	ID	Error Description
InvalidMove	5620	Invalid move commanded
CAN_Common_EGeneric	8000	EGeneric
CAN_Common_ENotHandled	8001	ENotHandled
CAN_Common_ENotImpl	8002	ENotImpl
CAN_Common_ERange	8003	ERange
CAN_Common_EInvalidData	8004	EInvalidData
CAN_Common_EBusy	8005	EBusy
CAN_Common_ENotRunning	8006	Board not in running mode
CAN_Common_ECANError	8050	ECANError
CAN_Common_ECANRxQueueFullError	8051	ECANRxQueueFullError
CAN_Common_ECANTxQueueFullError	8052	ECANTxQueueFullError
CAN_Common_ECANInterpQueueFullError	8053	ECANInterpQueueFullError
CAN_Common_ECANTxError	8054	ECANTxError
CAN_Common_ECANMsgError	8055	ECANMsgError
Bldc_EGeneric	8100	EGeneric
Bldc_ENotHandled	8101	ENotHandled
Bldc_ENotImpl	8102	ENotImpl
Bldc_ERange	8103	ERange
Bldc_EInvalidData	8104	EInvalidData
Bldc_EBusy	8105	EBusy
Bldc_ENotHomed	8106	Motor is not homed
Bldc_EMoveBlocked	8107	Speed zero detected during move
Bldc_ENotMoving	8108	No move registered
Bldc_ECollisionDetect1	8109	Collision detected on sensor 1
Bldc_ECollisionDetect2	8110	Collision detected on sensor 2
Bldc_ENo24VPower	8111	No 24V driver voltage

Table 1: Fault Codes

Error Name	ID	Error Description
Bldc_EEncoderAlarm	8112	Encoder alarm detected
Bldc_ESpuriousIndexMark	8113	Spurious index mark detected
CanGateway_EGeneric	8200	EGeneric
CanGateway_ENotHandled	8201	ENotHandled
CanGateway_ENotImpl	8202	ENotImpl
CanGateway_ERange	8203	ERange
CanGateway_EInvalidData	8204	EInvalidData
CanGateway_EBusy	8205	EBusy
CanGateway_ESafetyTimeout	8206	ESafetyTimeout
CanGateway_EUsbReinitialized	8207	EUsbReinitialized
CanGateway_ENo24VPower	8208	No 24V driver voltage
HighPowerAc_EGeneric	8300	EGeneric
HighPowerAc_ENotHandled	8301	ENotHandled
HighPowerAc_ENotImpl	8302	ENotImpl
HighPowerAc_ERange	8303	ERange
HighPowerAc_EInvalidData	8304	EInvalidData
HighPowerAc_EInvalidParam	8305	EInvalidParam
HighPowerAc_EBusy	8306	EBusy
HighPowerAc_ESafetyTimeout	8307	Safety timeout
HighPowerAc_ELampOnTimeout	8308	Lamp-On safety timeout
HighPowerAc_EMaxTemperature	8309	Maximum temperature exceeded
HighPowerAc_ENo24VPower	8310	No 24V driver voltage
HighPowerAc_EGoalNotReachedTimeout	8311	Pos-duty profile goal not reached in time
LowPowerAc_EGeneric	8400	EGeneric
LowPowerAc_ENotHandled	8401	ENotHandled

Table 1: Fault Codes

Error Name	ID	Error Description
LowPowerAc_ENotImpl	8402	ENotImpl
LowPowerAc_ERange	8403	ERange
LowPowerAc_EInvalidData	8404	EInvalidData
LowPowerAc_EInvalidParam	8405	EInvalidParam
LowPowerAc_EBusy	8406	EBusy
LowPowerAc_ESafetyTimeout	8407	Safety timeout
LowPowerAc_EMaxTemperature	8408	Maximum temperature exceeded
LowPowerAc4Ch_EGeneric	8500	EGeneric
LowPowerAc4Ch_ENotHandled	8501	ENotHandled
LowPowerAc4Ch_ENotImpl	8502	ENotImpl
LowPowerAc4Ch_ERange	8503	ERange
LowPowerAc4Ch_EInvalidData	8504	EInvalidData
LowPowerAc4Ch_EInvalidParam	8505	EInvalidParam
LowPowerAc4Ch_EBusy	8506	EBusy
LowPowerAc4Ch_ESafetyTimeout	8507	Safety timeout
LowPowerDc_EGeneric	8600	EGeneric
LowPowerDc_ENotHandled	8601	ENotHandled
LowPowerDc_ENotImpl	8602	ENotImpl
LowPowerDc_ERange	8603	ERange
LowPowerDc_EInvalidData	8604	EInvalidData
LowPowerDc_EInvalidParam	8605	EInvalidParam
LowPowerDc_EBusy	8606	EBusy
LowPowerDc_ESafetyTimeout	8607	Safety timeout
LowPowerDc_EMaxTemperature	8608	Maximum temperature exceeded
LowPowerDc_ENo24VPower	8609	No 24V driver voltage
StepperDr_EGeneric	8700	EGeneric

Table 1: Fault Codes

Error Name	ID	Error Description
StepperDr_ENotHandled	8701	ENotHandled
StepperDr_ENotImpl	8702	ENotImpl
StepperDr_ERange	8703	ERange
StepperDr_EInvalidData	8704	EInvalidData
StepperDr_EBusy	8705	EBusy
StepperDr_EMaxTriggers	8706	EMaxTriggers
StepperDr_ESwitch	8707	Microswitch error
StepperDr_EMoveVerification	8708	Move verification failure
StepperDr_E24VOffWhileMoving	8709	24V lost during move
StepperDr_EUndervoltageLockout	8710	Too low voltage of powerSTEP01
StepperDr_EThermalWarning	8711	Stepper driver thermal warning
StepperDr_EThermalShutdown	8712	Stepper driver thermal shutdown
StepperDr_ENo24VPower	8713	No 24V driver voltage
StepperDr_EMoveRetry	8714	Move retry attempt made
InkWaste_EGeneric	8800	EGeneric
InkWaste_ENotHandled	8801	ENotHandled
InkWaste_ENotImpl	8802	ENotImpl
InkWaste_ERange	8803	ERange
InkWaste_EInvalidData	8804	EInvalidData
InkWaste_EInvalidParam	8805	EInvalidParam
InkWaste_EBusy	8806	EBusy
InkWaste_ENo24VPower	8807	No 24V driver voltage
InkWaste_EPumpTimeout	8808	Pump timeout
InkWaste_EMicroSwitchInkContainer	8809	Ink container microswitch state unknown
InkWaste_EMicroSwitchWasteContainer	8810	Waste container microswitch state unknown

Table 1: Fault Codes

Error Name	ID	Error Description
FanControl_EGeneric	8900	EGeneric
FanControl_ENotHandled	8901	ENotHandled
FanControl_ENotImpl	8902	ENotImpl
FanControl_ERange	8903	ERange
FanControl_EInvalidData	8904	EInvalidData
FanControl_EInvalidParam	8905	EInvalidParam
FanControl_EBusy	8906	EBusy
FanControl_ESafetyTimeout	8907	Safety timeout
FanControl_EMaxTemperature	8908	Maximum temperature exceeded
FanControl_ENo24VPower	8909	No 24V driver voltage
LidLock_EGeneric	9000	EGeneric
LidLock_ENotHandled	9001	ENotHandled
LidLock_ENotImpl	9002	ENotImpl
LidLock_ERange	9003	ERange
LidLock_EInvalidData	9004	EInvalidData
LidLock_EInvalidParam	9005	EInvalidParam
LidLock_EBusy	9006	EBusy
LidLock_ESafetyTimeout	9007	Safety timeout
LidLock_ENo24VPower	9008	No 24V driver voltage
LidLock_ENotRunning	9009	Board not in running mode

Warnings and Errors

FMS Fill pump timeout

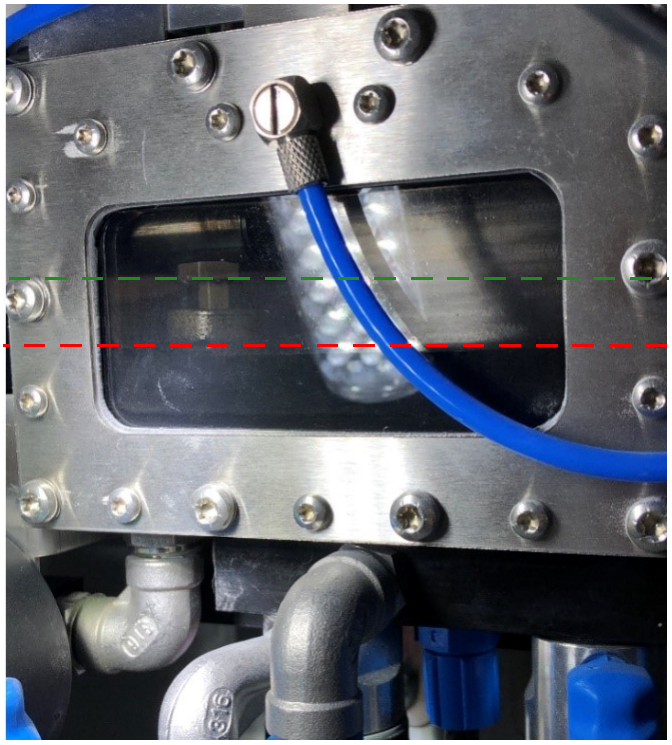
Background information

The FMS will try to keep the fluid chamber full at all times. The software-controlled fill pump is triggered to transfer fluid from the cartridge to the FMS chamber.

If, after the pump has run for a specific time period, the software detects the FMS chamber is not full, it will issue the **FMS- Fill pump timeout** error.

Current level of fluid in the FMS tank isillustrated with red line. The FMS tank will be full when the fluid raises to the level of the green line.

Figure 1: FMS Tank



The possible causes for this failure are:

- The printer has been running with empty HAF cartridge.
- The printer has been emptied from fluid as part of service activities and not properly primed.

9 SUPPLEMENTARY INFO

Declaration of Conformity

Declaration of Conformity information is available from your Stratasys representative. Please contact your local regional office for a copy of this document.

Dismantling, Disabling and Scrapping

Energy isolation

Isolation of energy supply

The supply disconnection device must be isolated and the machine disconnected from the energy source before dismantling is commenced.

Special Risk Reduction Measures

The printer is dismantled, sorted and disposed of in categories as required by applicable environmental requirements at the time of scrapping.

The product is subject to Directive 2012/19 / EU on waste electrical and electronic equipment (WEEE).

The product must not be disposed of with unsorted household waste. Use local WEEE collection points for disposal of this product and ensure compliance with all applicable regulations.

Personal protective equipment

The following equipment must be used during dismantling, disabling and scrapping of the machine.

Head protection

Use head protection when there is a risk of objects falling or when loads are transported above shoulder height.

Safety footwear

Wear safety shoes where there is a risk of objects falling and where feet are generally exposed.

Eye protection

Wear eye protection during dismantling, disabling and scrapping, and when eye are exposed to hazards.

Protective gloves

Wear protective gloves during dismantling, disabling and scrapping, and when hands exposed to hazards.

Sequence or Chronology for Decommissioning

The owner must take precautions to limit the amount of waste, especially with the use of environmentally friendly technology and products that can be recovered and recycled.

Disassembly

Before disassembling the printer, a plan for disassembly must be prepared. The plan must include a risk assessment for the work, as well as for the disposal of the printer and its parts.

The risk assessment must include the following aspects:

- Disconnection of energy sources.
- Hidden dangers (e.g. potential energy charges).
- Sequence for disassembly.
- Suitable means (brace, lift/crane/truck).
- Sorting machine parts.
- Proper disposal/recycling.

The plan and risk assessment must be prepared in accordance with current rules at the time of dismantling.

If the switchboards contain frequency converters, work must be started at the earliest after the specified time, because the dangerous residual voltage of the frequency converter has passed after the interruption of supply.

Prior to disassembly, a de-energized state must be detected, using appropriate measuring equipment.

When disassembling, the specified lifting and hooking points of the machine must be used.

Disposal, Destruction and Recycling

It is the owner's responsibility to ensure that waste is disposed of and recycled properly.

When disposing of the materials, a careful sorting must be done:

- Materials: Printer frame and all mechanical plant and printer components consist of steel, light metal and plastic. These materials must be returned for recycling. This also applies to non-metals, composite materials and consumables.
- Problematic substances such as batteries, accumulators, cables, electronic waste and printed circuit boards must be handed in at places that accept this type of waste.
- Drainage of liquids: e.g. Refrigerants, oils and greases must also be handed in at sites that accept this type of waste.

When disposing of waste and used parts, always comply with applicable national and regional health, safety and environmental regulations.

Regulatory and Environmental Information

EMC Class A Warning

Warning:

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Statements (U.S.A.)

The U.S. Federal Communications Commission (in 47 cfr1 5.105) has specified that the following notices be brought to the attention of users of this product.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Stratasys contact information is available from the Stratasys Support Center.

Caution:

Pursuant to Part 15.21 of the FCC Rules, any changes or modifications to this equipment not expressly approved by Stratasys, ltd. may cause harmful interference and void the FCC authorization to operate this equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense.

Canada Electromagnetic compatibility (EMC)

Normes de Sécurité (Canada)

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe A prescrites dans le réglement sur le brouillage radioélectrique édicté par le Ministère des Communications du Canada.

DOC Statement (Canada)

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

MSDS (Material Safety Data Sheet)

You can obtain current Material Safety Data Sheets for printer materials from the Stratasys website at: http://www.stratasys.com/materials/material-safety-data-sheets.

Disposal of Waste Equipment by Users in Private Households in the European Union

This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

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