



Thunder SLM-175

Unified User's Manual

Thunder Laser

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Introduction

This manual is specifically designed for the installation and operation of the Thunder Laser System. The relevant safety chapters of this manual detail the safety requirements for the use of 3D metal printers, and all information contained herein is provided by Thunder Laser Co., Ltd.

Strict adherence to the instructions in this manual is mandatory for the installation and operation of the machine. Failure to comply may result in equipment malfunction, reduced performance, shortened service life, increased maintenance costs, or severe damage to the machine or injury to the operators.

This manual outlines specific requirements and precautions regarding the laser system and 3D metal printer. We strongly recommend that all users fully understand these instructions prior to installation and operation to ensure the equipment is handled correctly. If you encounter any issues during installation, please do not hesitate to contact our technical support team for assistance.

Safety Instructions for 3D Metal Printer

1. Scope of Application

This instruction applies to all operators, maintenance personnel and managers of 3D metal printing equipment. Untrained personnel are not allowed to operate the equipment.

2. General Safety Principles

The equipment operation involves risks such as laser, high temperature, high-pressure gas and metal powder, and must be operated in strict accordance with the specifications.

Operators shall be familiar with the equipment structure, safety devices and emergency handling methods.

It is prohibited to arbitrarily modify equipment parameters, remove safety protection devices or operate the equipment with faults.

3. Laser Safety

The equipment is a high-energy laser device, and it is strictly prohibited to open the protective door during operation.

Approved laser safety goggles must be worn during operation.

Stop the machine immediately for laser abnormalities, optical path leakage or alarms.

4. Metal Powder Safety

Metal powders are flammable and explosive and must be used under the protection of inert gas.

Powder taking and cleaning must be carried out in a closed environment or with the ventilation and dust removal system turned on.

Open flame, static electricity, impact and dust-raising operations are prohibited on site.

Equip with a special metal powder fire extinguisher; it is strictly prohibited to use water to put out powder fires.

5. High Temperature & Mechanical Safety

The temperature of the build chamber and hot-end components is extremely high during printing; the cover can only be opened after the machine is shut down and cooled to a safe range.

Do not touch moving parts, transmission structures and high-temperature surfaces to prevent pinching or scalding.

6. Gas & Ventilation Safety

Keep the site well-ventilated when using gases such as argon and nitrogen to prevent oxygen deficiency.

The equipment's exhaust and filtration system must be in normal operation.

Immediately evacuate to a well-ventilated area if dizziness, difficulty breathing or other symptoms occur.

7. Electrical & Emergency Safety

The equipment must be reliably grounded; do not perform maintenance with power on.

Press the emergency stop button and cut off the power immediately in case of abnormal noise, smoke, error or fault.

Prioritize personal safety before handling the equipment in the event of an accident.

8. Liability Statement (Standard Manual Clause)

This equipment is only allowed to be used by trained and qualified personnel.

The user unit or operator shall bear full responsibility for personal injury, equipment damage and economic losses caused by improper operation, unauthorized modification or non-compliance with specifications.

The supplier shall not be liable for consequences resulting from non-compliance with safety requirements.

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Chapter 1. Chapter 1: Overview

1.1 General Information

READ AND FOLLOW ALL INSTRUCTIONS IN THIS MANUAL CAREFULLY BEFORE INSTALLATION AND OPERATION.

Failure to read, understand, and comply with this manual may result in serious injury, death, property damage, fire, electric shock, equipment malfunction, reduced performance, shortened machine lifespan, or critical failure.

Spare Parts: Consumables and accessories must be provided by the manufacturer. Do not install unauthorized third-party products on the Thunder Laser machine.

Auxiliary Equipment: All auxiliary equipment must be compatible with the machine. If in doubt, consult the dealer or manufacturer.

Symbol Guide:



CAUTION: Maintain vigilance while the machine is in operation.



HIGH VOLTAGE: Risk of injury or death. Extreme caution required.



LASER HAZARD: Laser operating zone. Risk of radiation.



DUST HAZARD: Anti-dust masks (respirators) must be worn.



NOTE: Information to simplify usage and enhance understanding.

1.2

Designated Application

The Thunder Laser SLM-175 is a metal 3D printing system designed to print complex metal parts using Selective Laser Melting (SLM) technology.

Compatible Materials: Metal powders including Mold Steel, Stainless Steel, Superalloys, and Cobalt-Chrome Alloys.



1. Calibration: Before printing, ensure the machine is properly calibrated. Do not move the Recoater or Build Cylinder after calibration to prevent collision during printing.
2. Laser Safety: The laser must only be operated with the chamber door securely closed.
3. Liability: The manufacturer assumes no liability for personal injury or equipment damage resulting from applications beyond the designated use.
4. Personnel: The machine must be operated, maintained, and repaired only by personnel familiar with the equipment and its associated risks.
5. Compliance: The manufacturer is not responsible for damage caused by failure to follow the operation, maintenance, and repair instructions in this manual.

1.3

Disposal Instructions



DO NOT dispose of this machine with general household waste.

Electronic equipment must be disposed of in accordance with local e-waste regulations. Please consult your supplier for specific disposal instructions.

1.4
Technical Specifications

SLM-175	Specification
Build Volume	175 (L) × 175 (W) × 200 (H) mm
Laser Type	Fiber Laser 500W
Dimensional Accuracy	±0.05 mm
Scanning Speed	8 m/s
Spot Diameter	40 ~ 100 μm
Build Efficiency	10-15 cm³/h
Materials	Stainless Steel, Mold Steel, CoCr Alloy, Superalloys, etc.
Layer Thickness	0.03 ~ 0.1 mm (Adjustable)
Power Requirements	220V, 50/60Hz, 3.5KW
Gas Supply	Argon (Ar) / Nitrogen (N ₂) Protection
Machine Dimensions	1200 (L) × 900 (W) × 1850 (H) mm
Weight	≤ 530 kg
OS	Windows 10 (64-bit)
Software	Thunder Make
Data Format	STL or other convertible formats
Industries	Training, Education, Research, Batch Manufacturing

1.5

Manufacturer Nameplate

The manufacturer's nameplate is located on the back of the machine.



It contains the Serial Number and Year of Manufacture. Please provide this information when contacting technical support.



Chapter 2. Safety

2.1

General Safety Information

All personnel must read and understand the "Safety" section of this manual before installation, setup, operation, or maintenance. It is recommended to designate qualified operators and document their training status.



Safety Protocols:

1. Authorized Personnel: Only trained and qualified personnel may operate the machine.
2. Scope of Use: Strictly adhere to the machine's designated application. Electrical work must be performed by professionals.
3. Prohibited Actions:
 - Do not use unsafe operating methods.
 - Do not operate the machine if external damage or defects are visible. Report defects immediately.
 - Do not remove or disable safety components (risk of severe burns or blindness). If safety components are removed for maintenance, they must be reinstalled immediately upon completion.
 - Do not perform unauthorized modifications to the machine.
4. Work Environment: Keep the machine and surrounding area clean and free of obstacles.

2.2**Laser Safety**

Class 4 Laser: The machine is classified as Safety Class 1. Improper operation or maintenance may compromise safety features and result in hazardous radiation exposure.

Invisible Radiation: The machine contains a high-intensity Class 4 laser (Fiber). Direct or scattered radiation is hazardous without protection.

Hazards: Direct laser exposure can cause skin burns, eye damage, and fire.

No Modifications: Do not start the machine if it has been modified or disassembled.

Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

2.3**Powder & Dust Safety**

PPE: Wear an N95 mask when entering the printing room.

Wear a Gas Mask (Model 6200 or higher) when operating the machine, sieving powder, or changing filters.

Pressure Differential: When adding powder mid-print, release the pressure slowly after opening the powder cylinder latch to prevent powder spray due to pressure differences.

Explosion Hazard: Metal powder can explode if suspended in air and exposed to static electricity or open flame. Store used powder in sealed plastic buckets. Do not scatter powder.

Special Caution: Aluminum and Titanium alloys are highly flammable/explosive.

Ash Disposal: Regularly clean the collection tank. Place ash in a designated container and wet it with water.

- For emptying the bucket for black slag and ash, please refer to Chapter 5.

2.4**Electrical Safety**

Grounding: The machine must be properly grounded.

Restricted Access: Only professional electricians may access the internal electrical cabinet components.

Live Operation: Do not touch internal components while the machine is powered on.

Cooling System: Do not move the chiller while the machine is powered on.

2.5**Gas Safety**

The machine uses inert gas (Nitrogen or Argon).

Cylinder Safety: Secure gas cylinders in a dedicated safety cabinet.

Monitoring: An Oxygen Concentration Alarm must be installed in the printing room.

Pressure Limits: Input pressure < 0.5 KPa; Chamber pressure < 20 KPa.

Access: Do not open the chamber door until internal pressure drops to 0. Wait for the inert gas to disperse before removing parts.

2.6**Operational Safety Measures**

Door Interlock: Opening the chamber door during operation will trigger the safety system and stop the machine. Use the "Pause" button if interruption is necessary.



Fire Safety: Keep a CO2 fire extinguisher nearby. Do not store flammable materials inside the machine.

Ventilation: Ensure airflow around the machine. Do not cover the machine during operation.

Supervision: NEVER operate the laser unattended.



Eye Protection: Wear safety goggles during maintenance.

2.7

Warning Labels

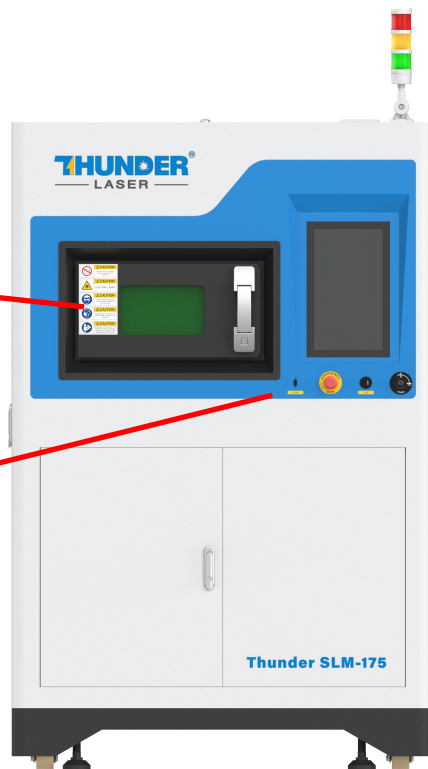


Adhere strictly to all warning labels on the machine. Replace lost or damaged labels immediately.



USB

HDMI



Chapter 3. Installation

3.1 Unboxing

Tools Required: Forklift (Fork length > 1.5m, Capacity > 1t), Unboxing tools, PPE.

Procedure:

1. **Transportation Path:** Ensure the path width is >1.2m (packaged) or >1.0m (unpacked), and height is sufficient. Ensure floor load capacity is adequate.

2. **Unpacking:**

- Place the crate on a flat surface for unpacking.
- Remove the crate, foam, zip ties, and protective films.
- Retrieve keys, toolkit, and accessories. Check against the packing list.



- Keep the wooden crate for potential future transport.

3.2

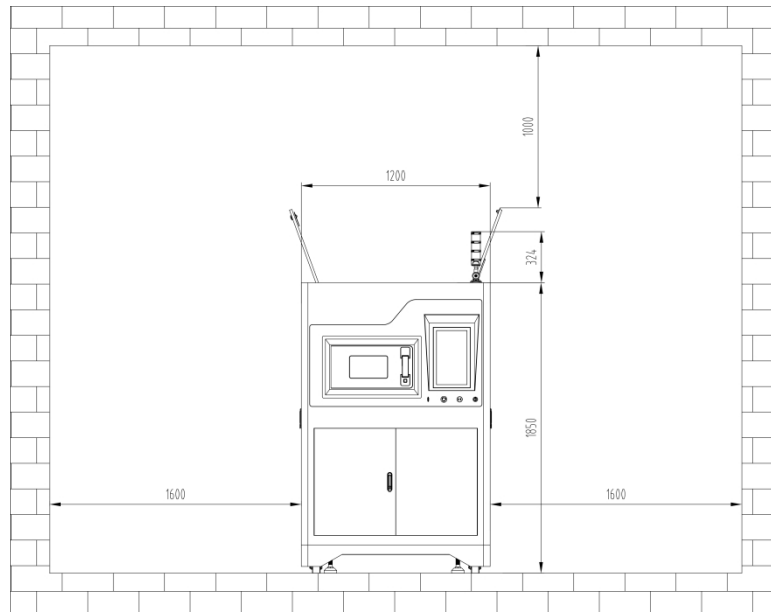
Positioning and Environment

Floor: Hard, flat (unevenness $\leq 5 \text{ mm/m}^2$), vibration-free, anti-static, and solvent-resistant.

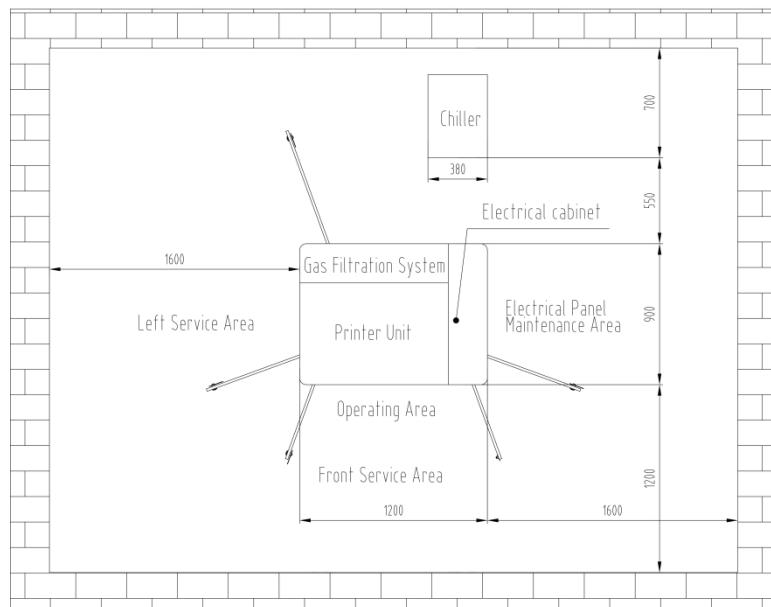
Clearance: Maintain sufficient space for door opening, maintenance, and auxiliary equipment (Computer, Post-processing, Gas supply).

Equipment installation space size requirements:

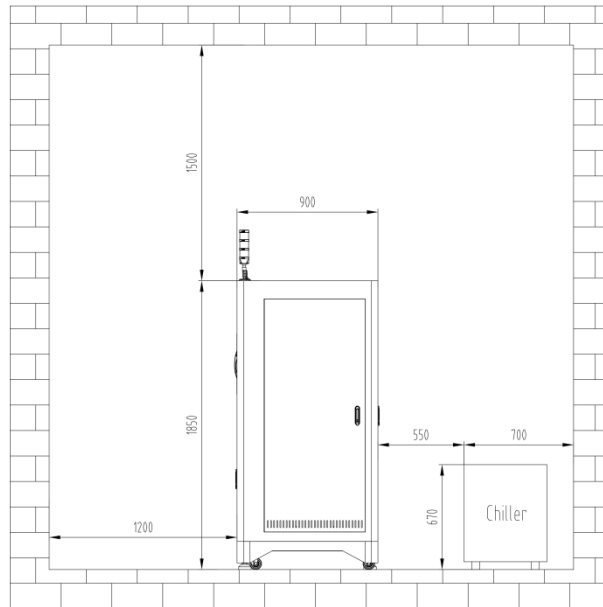
Mainframe equipment installation dimensions are shown in Figures 1, 2 and 3:



Figures 1 Vertical Mounting Diagram



Figures 2 Horizontal Mounting Diagram



Figures 3 Side Mounting Diagram

Environment:

- Ventilation: Room must have good ventilation and Oxygen sensors (due to N₂/Ar displacement risk).
- Dust Control: Explosion-proof dust extraction required.
- Temp/Humidity: 21-25°C, Humidity < 40%.
- Interference: Keep away from vibration sources, electromagnetic interference, and direct sunlight.
- keep away from flammable/explosive substances.
- Noise: <70dB(A)
- Altitude: <3000m

Utility Requirements:

- **Gas:** Ar/N₂, Purity > 99.95%, Pressure 0.2-0.5 KPa, Flow > 50L/min.
- **Water:** Purified/Distilled water for the chiller.
- **Power:** AC 220V ±10%, 50/60Hz, 3.5kW (Actual normal operating power: 2.8 kW).
- **PC:** Windows 10 (64-bit), i5 CPU, 8GB RAM, Dedicated GPU, Ethernet.



1. Circuit Breaker Protection: Please connect peripheral equipment strictly according to the labels on the power interface. Do not connect unauthorized or unrelated devices to the machine's power output ports.

2. Do not disconnect the power supply or any system circuit connections while the equipment is powered on.

3.3

Pre-Installation Steps

1. **Leveling:** Secure the 4 bottom casters and lower the leveling feet to fix the machine in place.



The tool box contains a set of keys for the machine doors and the key switch.

2. **Initial Power Setup:** Unlock the Emergency Stop and turn the Key Switch to ON (Required before first use).

3.4**Cooling System Requirements**

Chiller: S&A CWFL-1000 (Provided).

Importance: Maintains Laser and Galvo head temperature. Overheating causes irreversible damage.

Caution: The standard chiller only has cooling function. Therefore, it is crucial to ensure that the laser and the mirror do not freeze!



DO NOT operate the machine without the cooling system.



3.5

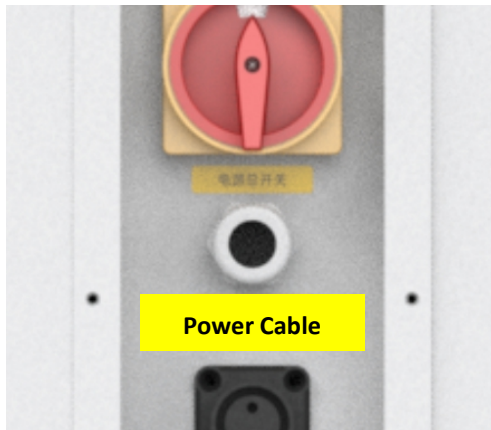
Connections



WARNING: Follow this order to prevent static damage.

3.5.1 Power Connection

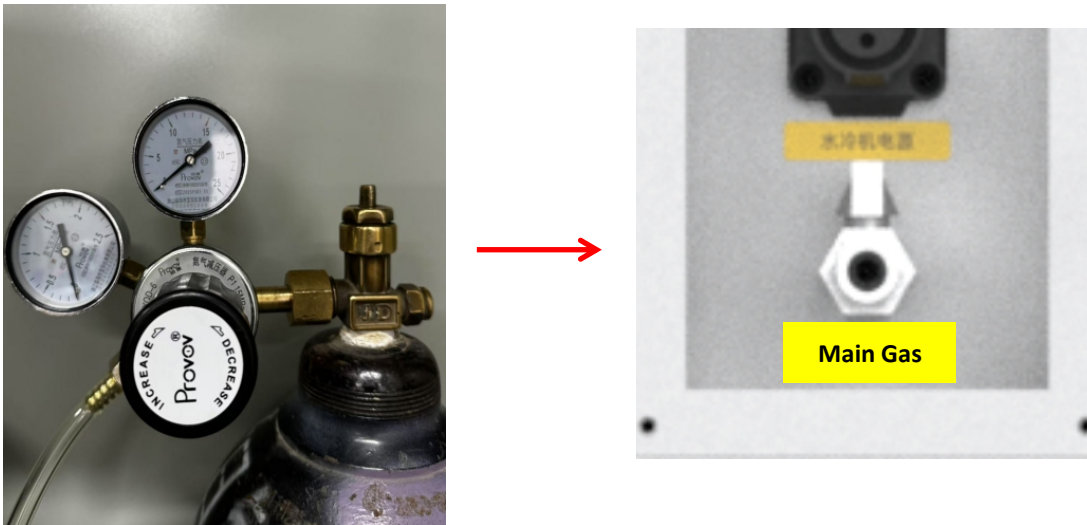
Connect to a grounded AC 220V outlet.



Do not start if voltage specifications do not match.

3.5.2 Gas Connection

Install a pressure reducing valve on the gas cylinder. Connect the gas hose from the valve to the machine inlet.

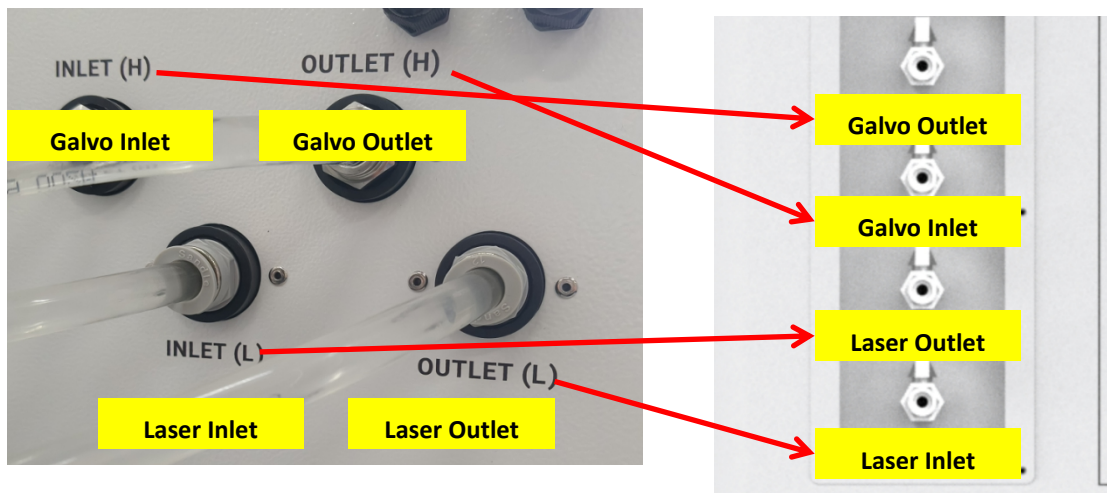


3.5.3 Chiller Connection

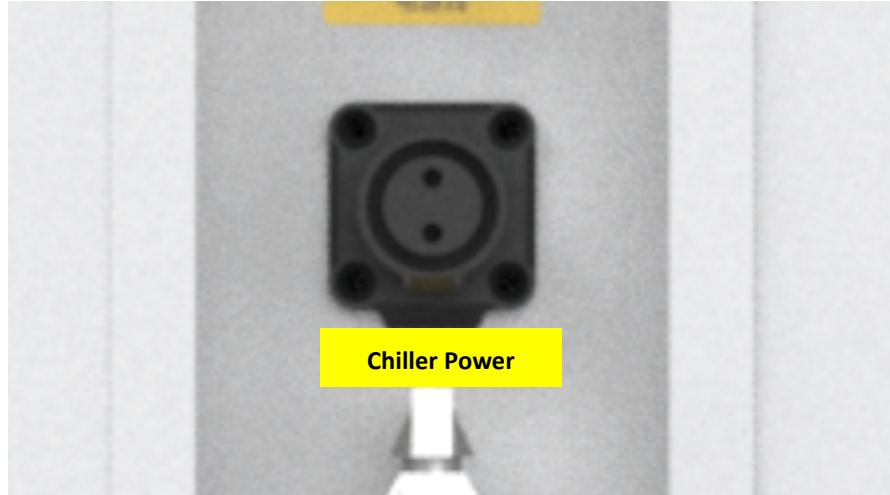
- Connect Water Hoses, respectively for cooling the laser source and Galvo head (packed in the packet of the chiller)

Chiller "Outlet" -> Machine "Inlet".

Chiller "Inlet" -> Machine "Outlet".

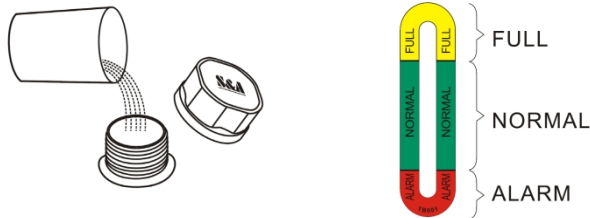


- Connect the Chiller Power aviation plug to the machine's interface.



- **Fill with Distilled Water** until the gauge is in the green zone.

Please refill the water to keep the water level within the green zone after initial circulation as partial distilled water goes through the water hose.

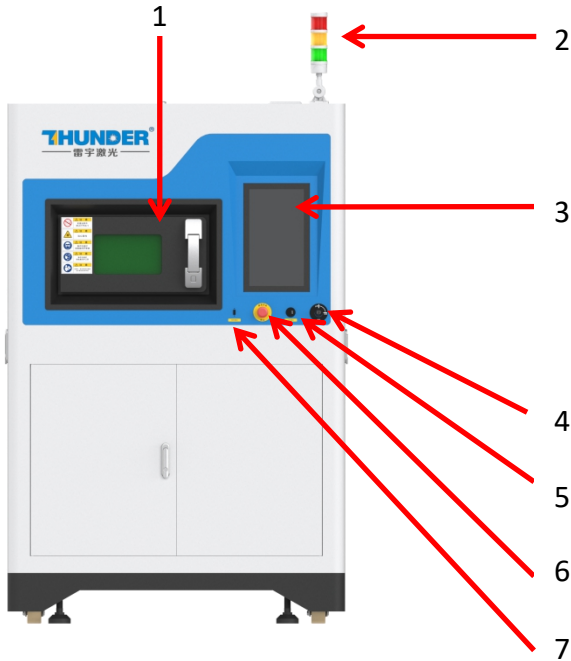


Ensure the water supply and return lines are correctly connected between the machine and the chiller before powering on.

Chapter 4. Operation

4.1

Machine Overview



1.Sealed Chamber

2.Indicator Light

3.Display Screen

4.Key Switch

5.USB Interface

6.Emergency Stop Switch

7.HDMI Interface

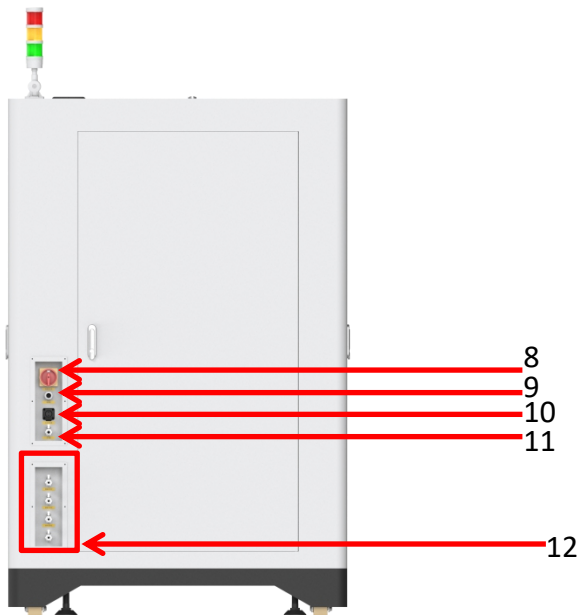
8.Main Load Switch

9.Main Power Cable

10.Chiller Power Interface

11.Gas Inlet

12.Cooling Water Inlet/Outlet



1. Sealed Chamber

Complete all pre-print preparations and close the chamber door before initiating the "Print Preparation" sequence.

- Safety Interlock: If the chamber door is opened while the machine is operating, the system will automatically stop.
- Manual Intervention: If you need to open the door during operation, you must press the "Pause" button first.

2. Indicator Light

1) **Red Light:** Indicates a DANGER state. The operator must remain on-site.

Causes:

- Emergency Stop button pressed.
- Low powder level in the Dosing Cylinder (Buzzer sounds for 20 seconds).
- Servo alarm (Recoater, Build Cylinder, or Dosing Cylinder).
- Laser alarm.
- Chiller alarm.
- Inverter alarm.
- Action timeout alarm (Build Cylinder or Dosing Cylinder).
- Over-travel limit alarm (Build Cylinder or Recoater).

Audio Alarm: When the red light is active, the buzzer will sound (Approx. 80dBA at 1m, 75dBA at 5m, 65dBA at 10m; volume decreases with distance).

2) **Yellow Light:** Indicates a WARNING or WAITING state.

Causes:

- Atmosphere system prerequisites not met.
- Oxygen content is too high during printing.
- Chamber pressure is too high or too low.
- Low powder level in the Dosing Cylinder.
- Chamber door is not closed.
- Filter pressure differential alarm (Clogged filter).
- Print finished (Buzzer beeps 3 times).

3) **Green Light:** Indicates a **READY** state.

Cause:

- Atmosphere system prerequisites are met; printing is allowed.

3. Display Screen

The touch screen display for the Industrial Personal Computer (IPC)

4. Key Switch

Controls the machine's ignition status.

- OFF Position: The machine cannot be started.
- ON Position: The machine is enabled and can be started normally.

5. USB Interface

Port for inserting a USB flash drive to import files into the machine's computer.

6. Emergency Stop Switch

In case of an emergency (e.g., fire or laser leakage), press this button immediately. It cuts power to the motion system and the laser system.

7. HDMI Interface

Connects to external computers, monitors, or projectors to output synchronized high-definition video.

8. Main Load Switch

After connecting the power supply and verifying that the voltage meets the machine's requirements, turn this switch to start the equipment.

9. Main Power Cable

Connect to a secure, grounded power outlet.

Requirement: The power supply voltage must match the operating voltage (AC 220V, 50/60Hz).

10. Chiller Power Interface

Connect the water chiller's power cable here, following the label instructions.

11. Gas Inlet

Install a pressure-reducing valve on the gas cylinder first, then connect the gas hose from the valve to this inlet port on the machine.

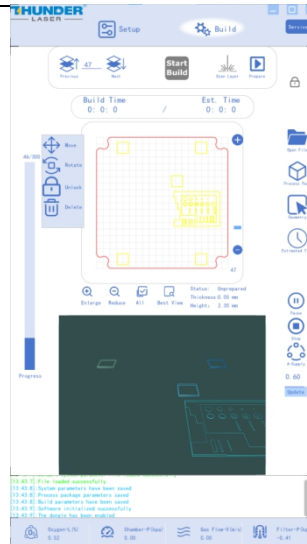
12. Cooling Water Inlet/Outlet

Ports used for connecting the water chiller hoses to the machine.

4.2

Main Load Switch

- Turn Main Load Switch to ON.
- Turn Key Switch to ON.
- Release Emergency Stop.
- Launch software once the PC boots.



4.3 How to use the software

4.3.1 Key Functions



- **Setup / Build:** Switches between the manual control interface ("Machine Setup") and the job monitoring interface ("Processing Page").



- **Dosing Cylinder:** Lowers the powder supply piston.



- **Recoater:** Resets the Recoater (wiper) to its zero/home position.

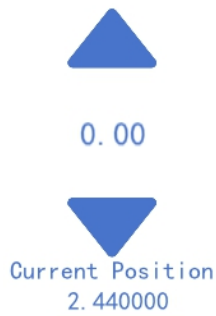


- **Recoater Position:0.000000 Recoater Movement Controls:** Enter a numerical value in the center field and click the Left/Right arrows to move the Recoater.

CAUTION: The maximum left travel limit is 308mm and maximum right limit is -20mm. Do not input values exceeding this limit.



- **Build Cylinder:** Resets the Build Cylinder to its zero (home) position.



- **Build Cylinder Movement Controls:** Enter a numerical value in the center field and click the Up/Down arrows to adjust the Build Cylinder height.



- **Light:** Toggles the internal chamber lighting On/Off.



- **Atmosphere:** Opens the settings menu for critical parameters, including Oxygen Content, Gas Flow Speed, Pressure Upper Limit, and Pressure Lower Limit.



- **Clear Limit:** Used to resolve over-travel errors for the Build Cylinder or Recoater.

Action: Click Clear Limits, then click Recoater Home or Build Cyl. Home to reset the axis and clear the error.



- **Backflush:** Initiates the filter cleaning cycle.

Note: When the filter pressure differential reaches 3 KPa, the system will trigger an alert. Click this button to perform a back-blow and resolve the issue.



- **Open File:** Imports the required print files (slice data) into the software.



- **Process Pack:** Selects and loads different material or process parameter packages (Process Packs).



- **Geometry:** Enables manipulation of the sliced model.

Instruction: Click the Unlock icon to enable functions such as Move, Rotate, or Delete for the model.



- **Estimated Time:** Calculates and displays the estimated duration for the current print job.



- **Pause:** Temporarily pauses the active printing process.

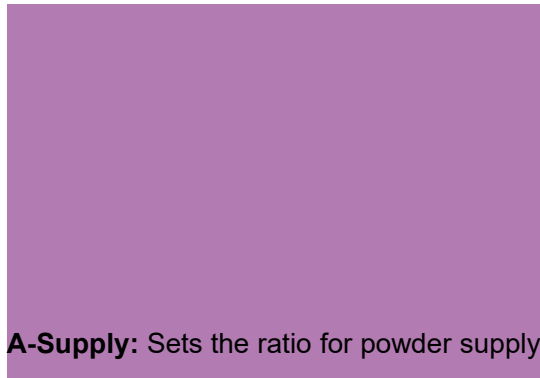


- **Stop:** Terminates the current printing process completely.



0.60

Update



A-Supply: Sets the ratio for powder supply.

●

Purpose: Ensures the correct amount of powder is dispensed per layer. Adjust this to prevent short feeds (insufficient powder) or excessive waste (depleting the dosing cylinder too quickly).



Prepare

●

Prepare: Initiates the automatic gas purging cycle (inflation and exhaust) based on the preset atmosphere values.



Scan Layer

●

Scan Layer: Performs a laser scan of the current layer (usually the first layer) to verify the scanning path is correct before start printing.



●

Start Build: Starts the automated printing process from Layer 0 or a specified Layer N.



Previous

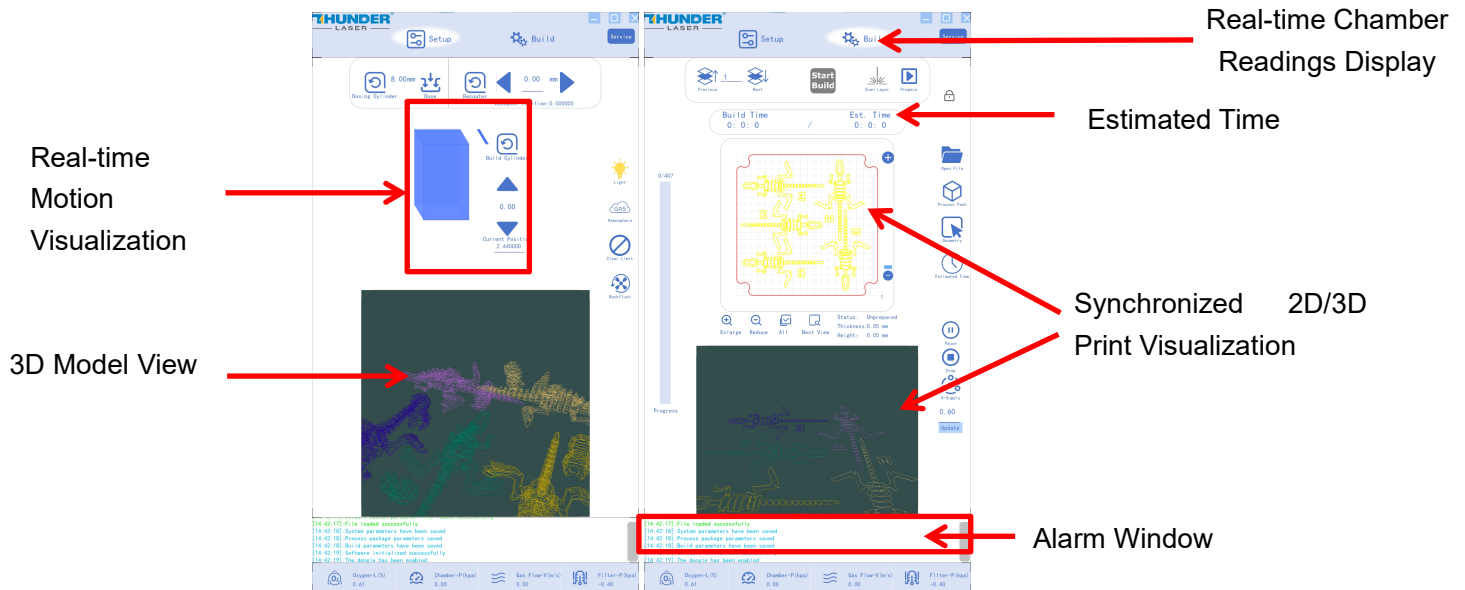
Next

●

Start Layer Setting: Input a specific layer number here. When Start Build is clicked, the machine will resume or start printing from this specified Layer (N).

4.3.2 Software Interface Overview

Once the file import is complete, the interface will appear as shown in the figure below:

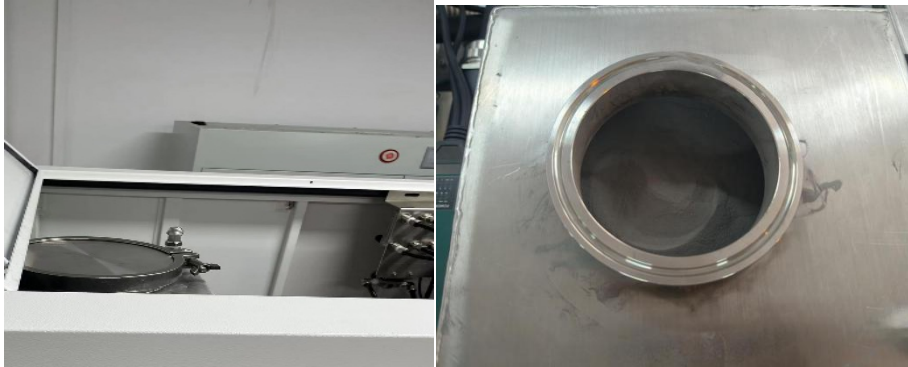


4.4

First Run Procedure

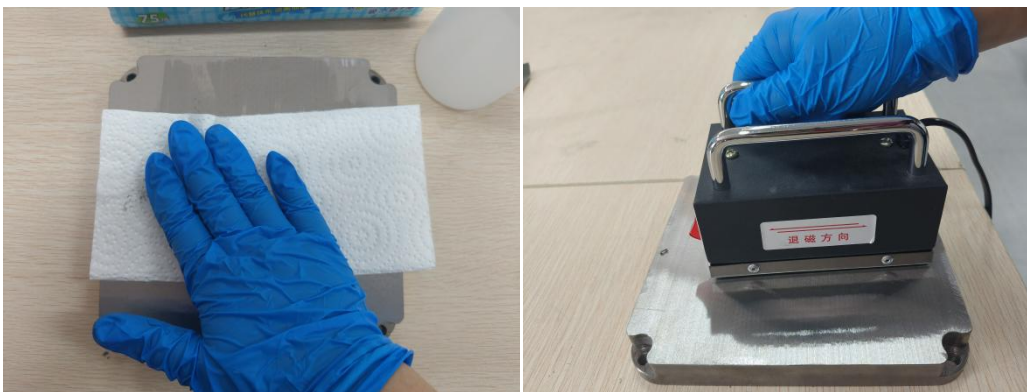
4.4.1 Pre-Print Preparation

1. Powder Check: Ensure powder is dry (oven-dry if necessary) and sieved.
2. Loading Powder: Open the top sheet metal, unlatch the dosing cylinder cap, add powder, and re-seal securely.

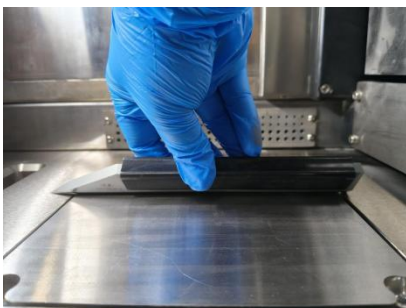


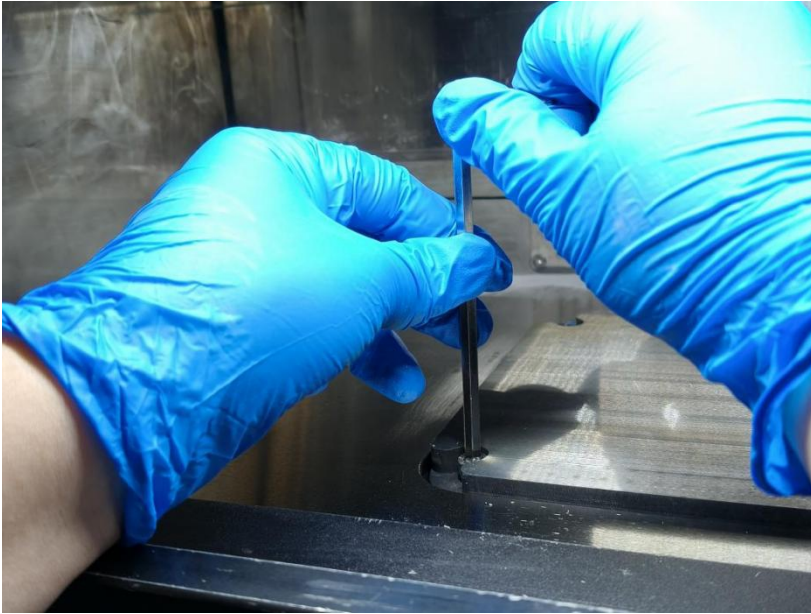
3. Substrate Preparation:

- ① Demagnetize and clean the substrate.



- ② Install the substrate and tighten the screws in a diagonal pattern. Use a precision straightedge to ensure the substrate is perfectly level with the build platform.





4.Recoater Adjustment: (Only if damaged)

- ① Move the recoater to the center of the substrate. Loosen the blade/recoater fixing screws and allow the blade to descend naturally until it rests on the substrate surface.
- ② Retighten the screws (CAUTION: Do not overtighten to prevent blade deformation). Once the adjustment is complete, return the recoater to its initial (home) position.

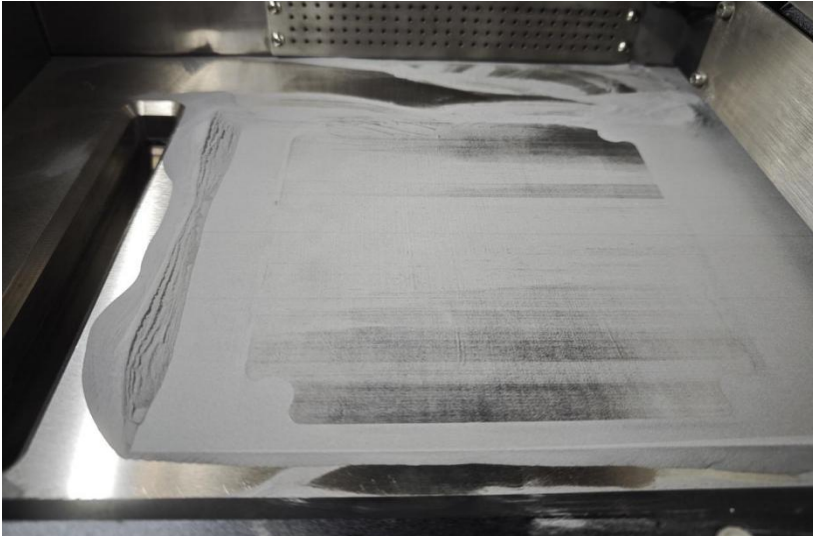


5. Powder Spreading Test

On the "Machine Setup" panel, operate the Dosing Cylinder to dispense powder. Next, operate the Recoater: input a travel distance of 305 and move to the left to spread the powder. Click "Home", and the other side of the blade will spread the powder on the return stroke.

- **Action:** Observe the thickness of the powder layer and slowly raise the Build Cylinder.
- **CAUTION:** Monitor this process closely to prevent the Recoater blade from colliding with the substrate (Build Plate).

- **Goal:** Continue to scrape and thin the powder layer until the substrate is clearly visible.
- **Note:** Once this step is complete, do not perform a spreading action for the next dosing cycle (the system will handle it during the print start).



6. Cleaning the Laser Window

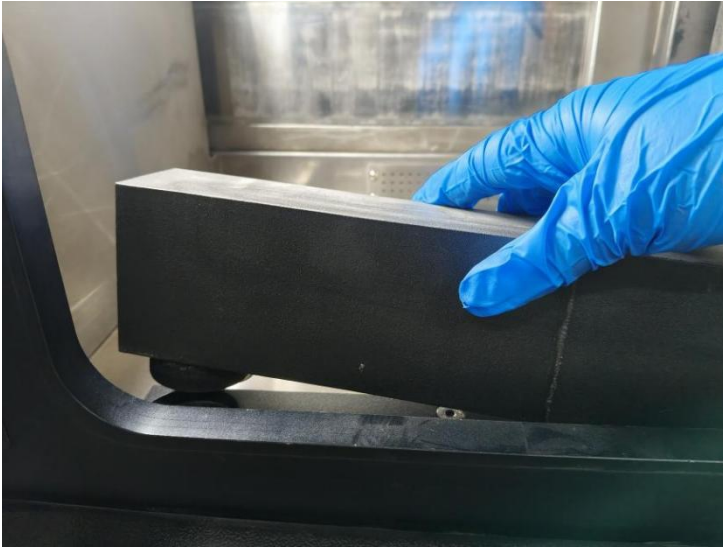
Use lens cleaning tissue to clean the protective glass cover located at the top of the chamber.

- **Method:** Wipe from the center outwards.
- **Requirement:** Ensure the surface is perfectly clean and free of smudges or dust.



8. Installing the Suction Box

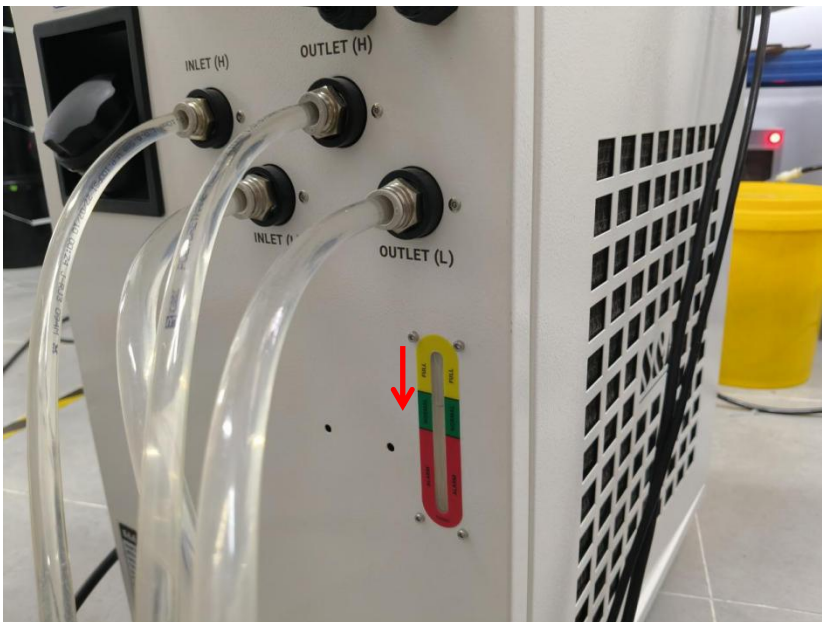
Install the Suction Box into position. The air outlet should face inward. Then close the door.



9. Final Inspection

Before starting, perform the following checks:

- ①Chiller: Verify that water hoses are securely connected and not kinked or bent. Ensure the water level is within the green zone on the gauge.



- ②Closures: Confirm that the machine chamber door and powder hopper lids are securely closed.
- ③Check that the handle of the bucket below is open.



④Supply Check: Verify that there is sufficient powder in the Dosing Cylinder and that the Nitrogen/Argon gas cylinder has adequate pressure.

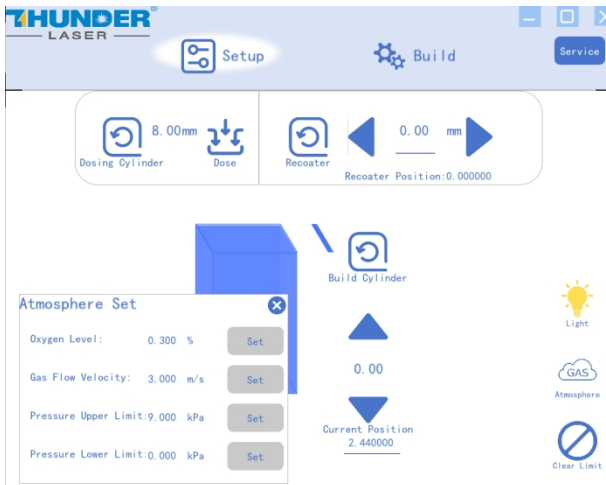


9. Software Operation

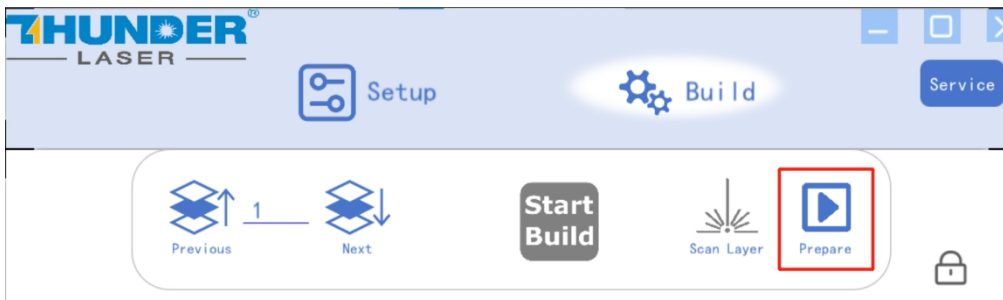
① Click Atmosphere System. Set the following parameters:

- Oxygen Level: 0.300%
- Gas Flow Velocity: 3.000 m/s
- Pressure Upper Limit: 9.000 (kPa)
- Pressure Lower Limit: 0.000 (kPa)

IMPORTANT: After entering the values, click the **Set** button next to them to apply the settings.



② Confirm all physical checks are passed. Click Print Prep to initiate the automatic gas purging cycle. (The system will automatically vent gas if the chamber pressure exceeds 9 kPa).



③ On the **Build** page, click the **Open File**, select your slice file, and click Select All to import the data into the software.

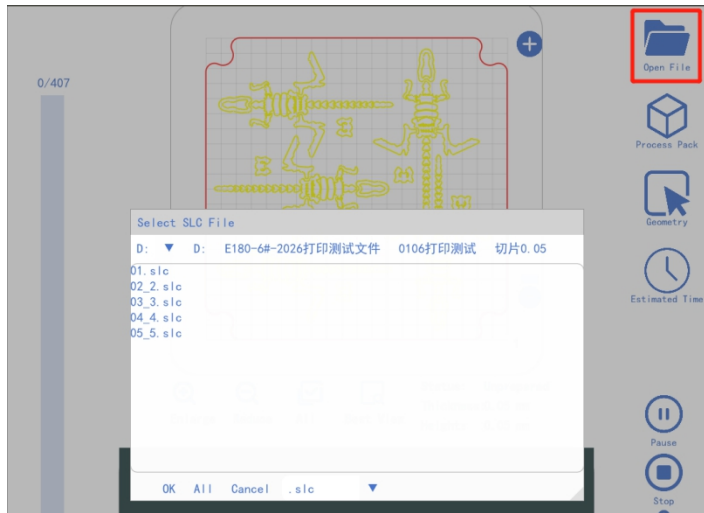
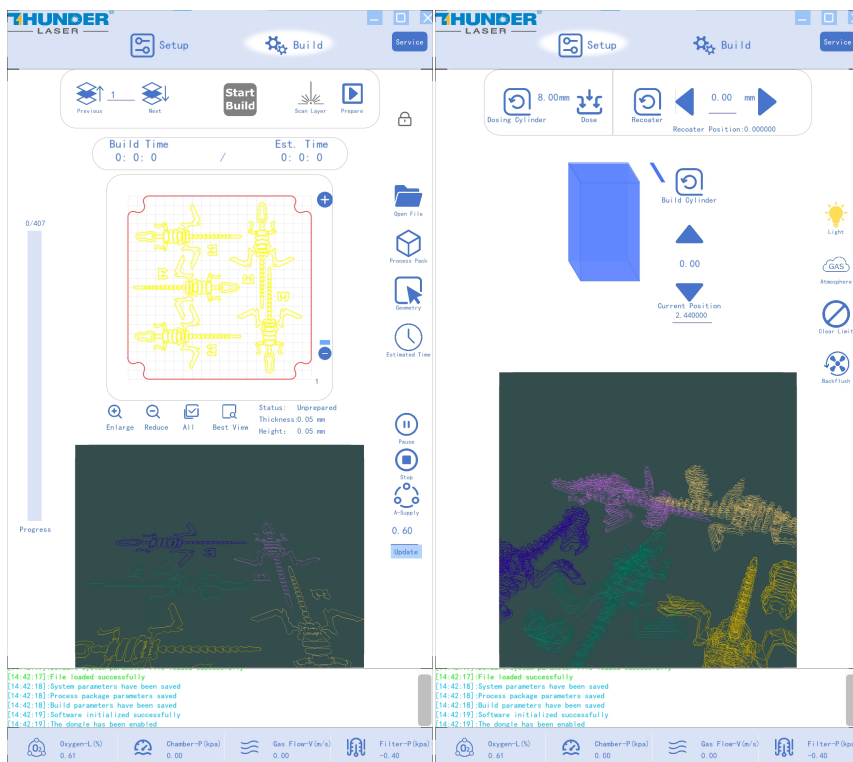
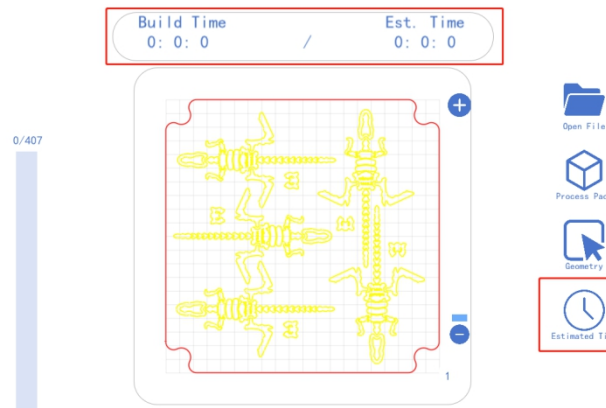


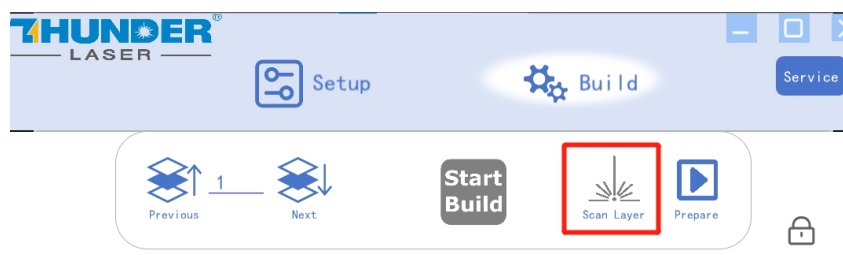
Image: Software interface after import



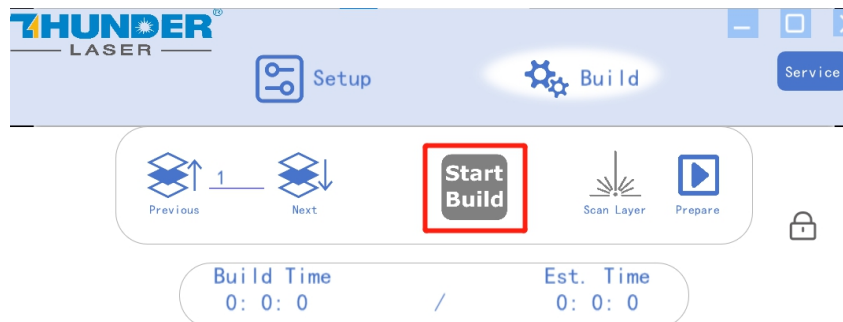
④Verify the slice file is correct, then click the Estimated Time to calculate the building/ printing duration.



⑤Once the software indicates "Purging Complete," click the **Scan Layer**. The machine will scan the first layer path to verify the laser path.



⑥Confirm the scan path is correct. Click Start Print and select Start from Layer 1.



Monitoring During Build/Print:

During the building/ printing process, continuously monitor the Powder Level in the Dosing Cylinder and the Gas Supply. Replenish immediately if low. Additionally, check the Powder Storage Bucket underneath the machine; empty it if it approaches capacity.

4.4.2 Unloading Procedure

1. **Depressurization:** After printing is complete, wait for the chamber pressure to drop to a safe level (below 5 KPa) before opening the door.

Cleaning: Open the door. Use a specific vacuum cleaner and brush to remove black residue (soot) from the door and the Suction Box. Tilt and remove the Suction Box, emptying the residue into a designated waste container.

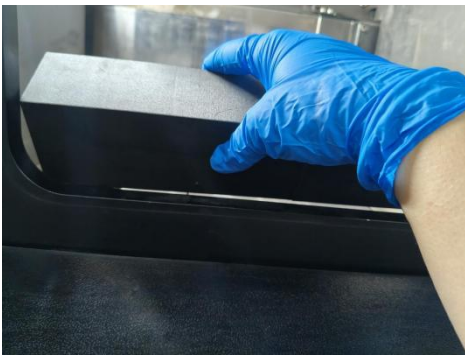
For Non-Reactive Metals (e.g., Stainless Steel, Superalloys):

A Standard Industrial Vacuum is permitted for cleaning Coarse Residue (Black Slag) only.

For Reactive/Lightweight Metals (e.g., Aluminum, Titanium):

An Explosion-Proof Vacuum (certified for combustible dust) is MANDATORY for cleaning Coarse Residue (Black Slag).

DO NOT use any type of vacuum cleaner to clean Ultrafine Condensate (Black Ash/Filter Ash).



2. **Powder Recovery:** Raise the Build Cylinder in small increments until it reaches the home position. Brush the unsintered powder into the Powder Storage Bucket (this powder can be sieved and reused). Once clean, remove the substrate with the part.

Reason for Raising the Build Cylinder Incrementally:

During the printing and recoating process, metal powder can fall into the gaps around the build cylinder and enter the clearance of the substrate (build plate). This accumulation significantly increases mechanical friction. If the cylinder is raised continuously in one single motion, it may jam, ultimately triggering a motor thermal overload alarm.



3. **Final Cleaning:** Use a specific vacuum and brush to thoroughly clean the Build Cylinder and the substrate mounting

NOTE : Protective masks and gloves must be worn at all times when handling powder.

The selection of vacuum cleaners should be based on the type of metal materials being printed.

4. **Powder Storage Bucket Emptying:** Check the storage bucket underneath the machine.

To remove powder:

- Pull down the handle and release the bottom latch.
- Collect powder in appropriate containers.
- Powder Storage Bucket: All powder in the powder storage bucket requires sieving if for reuse.



4.4.3 Post-Processing

1. Wire EDM Cutting:

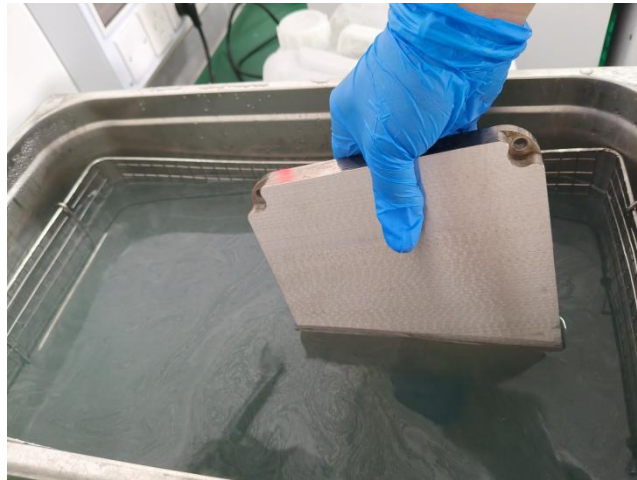
- Use a dial indicator to calibrate the flatness of the printed surface relative to the cutting wire.
- Proceed to cut and separate the printed parts from the substrate.

2. Substrate Resurfacing:

If the substrate surface has ridges or depressions after cutting, use a surface grinder to flatten it for future use.

3. Cleaning:

- Clean the substrate and models thoroughly (using an ultrasonic cleaner or manual washing).
- After drying the substrate, test it for magnetism using metal powder. If magnetic, perform demagnetization.



4.4.4 Shutdown Procedure

- Exit the control software and Turn off the computer.
- Turn off the Key Switch.
- Turn off the Main Power Switch(located on the electrical cabinet).
- Finally unplug the power cord.

4.5

Work Area Status Indicators

Right View

Operator Area



Chapter 5. Maintenance

5.1

Cleaning the Machine



WARNINGS:

- **Radiation Hazard:** Failure to maintain the machine according to the specified procedures may result in hazardous laser radiation exposure.
- **Electrical Safety:** Always turn off the power and unplug the machine before starting any cleaning or maintenance work.
- **General Upkeep:** Keep the machine clean at all times.

Routine Maintenance:

Inspect the machine at least once a week for dust accumulation. To prevent wear and component failure, dust must be cleaned promptly. The frequency of cleaning depends on operating hours and the materials used. A clean machine ensures optimal performance.

Standard Cleaning Steps:

Ensure the machine is powered off and unplugged. Open the chamber door.

Recover and clean up excess powder from the chamber.

Use alcohol wipes (lens tissue) to clean the internal laser window lens and the chamber door glass.

5.2

Filter System Maintenance (Back-Blowing)

When the filter pressure differential reaches **3 kPa**, the system will alert that the filter is clogged. A back-blow operation must be performed immediately.

Operation Procedure:

Navigate to the "**Setup**" page on the software interface.

Click the "**Backflush**" button.

The equipment will automatically complete a 3-minute back-blowing process.

Note: It is suggested to perform **Backflush** at least once every six months. Usually the filter can continue to be used after backflushing/ back-blowing.

Critical Safety Rules for Back-Blowing:

Machine Status: The operation must ONLY be performed when the equipment is in a STOPPED state. It is strictly prohibited during operation.

Post-Print Maintenance: If there will be a long interval before the next print job, it is recommended to perform the back-blow operation after the machine has settled following the last print. This prevents black ash from adhering to the filter surface for extended periods, which can form stubborn deposits that are difficult to remove later.

5.3

Waste Disposal & Cleaning Procedures

WARNING: Proper PPE (Personal Protective Equipment) is mandatory.

Operators must wear anti-static clothing, anti-static shoes, safety goggles, dust masks (N95/P100), and abrasion-resistant gloves.

(1) Cleaning the Black Ash Bucket (Ultrafine Condensate)



Target: The fine dust collected from the filter system.

Settling Time:

① After Backflush/ back-blowing process completed, ensure the black ash in the bucket has settled for at least 4 hours before opening, to avoid the suspended dust/ ash floating out.

② After Printing is completed, ensure the black ash in the bucket and pipes has settled for at least 10 minutes before opening, to avoid the suspended dust/ ash floating out.

Isolate the Bucket:

Pull the handle UP to the HORIZONTAL position. This closes the valve and cuts off the material channel.

(Note: Handle DOWN in VERTICAL position = Valve Open / Channel Connected).



Disposal Process:

Pull the handle UP to the HORIZONTAL position.

Open the latch and carefully transfer the black ash into a sealed metal bucket.

Handling Standard: Treat this waste as Hazardous/Reactive Metal Waste.

Note: Minimize exposure to air. You may pour water into the collection bucket to soak/wet the ash (proceed with caution as this will be dirty) to prevent dust clouds. This type of ash accumulates slowly; it can be stored and handed over to a professional metal recycling station for disposal.

Reset: Clean the sealing surfaces and lock the bucket back in place.

SAFETY WARNING: NEVER use a vacuum cleaner or high-pressure air on filter ash. It is highly flammable/explosive.

(3) Cleaning the Black Slag Bucket (Coarse Residue)



Target: Heavier waste particles.

Preparation: Stop the equipment and open the black slag bucket.

Note: If you have just clicked to process the 3-minute Backflush/ back-blowing for the filter, remember to settle the machine for at least 4 hours before opening the slag or ash bucket, to minimize the suspended dust from floating into air.

If it is just after print processing, let it stand for about 10 minutes to minimize the suspended dust from floating into air.

Cleaning:

carefully transfer the black slag into a sealed metal bucket, If you need to use a vacuum.

Iron-based materials only: A standard industrial vacuum cleaner may be used to clean residual slag.

(Note: For reactive metals like Aluminum/Titanium, use an explosion-proof vacuum).

Disposal Process:

Open the latch and carefully transfer the black slag into a sealed metal bucket.

Handling Standard: Treat cleaned slag as general industrial solid waste.

Reset: Seal and lock the black slag bucket back in place.