SHINING 3D®

FreeScan UE Pro

User Manual

V1.2.2

Foreword

General

The Manual introduces the information concerning the installation and the use of FreeScan UE Pro (hereinafter referred to as the "Scanner").

Safety Instructions

Signal	Meaning
📝	Additional information for particular situation.
⚠️	Improper actions or conditions that may damage the product or injury, and consequently void your warranty or service contract or lose the customer data or system data.
⚠️	The safety instructions that you must precisely follow to avoid injury. Failure to observe can cause damages to your product, or result in personal injuries.

About the Manual

The User Manual is related to your safety, lawful rights and responsibilities. Read it carefully before installing and using the product.

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- Images and diagrams in the Manual are presented to provide convenience to readers. In the event that any images or diagrams are inconsistent with the physical product, the latter shall prevail.

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- Disputes arising from the Manual and related Products thereof shall be governed by the laws of the People's Republic of China.

- In the event of any ambiguity and/or any advice on the contents of the Manual, contact us by the contact

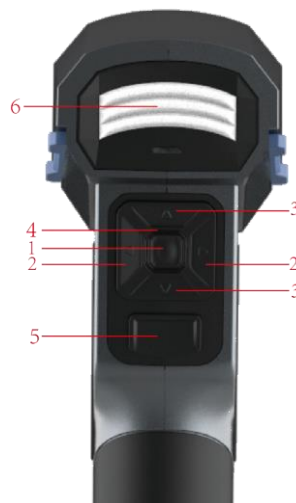information provided herein.

Contents

1. Hardware

1.1 Introduction

FreeScan UE Pro scanner is a handheld laser 3D scanner independently developed by SHINING 3D, featured in the fast scanning speed, complete data acquisition, light weight, and convenient handholding operation. Besides, the device supports repeatable high-precision operations, without discrimination on the material and color of the objects to be scanned. Therefore, black or reflective surfaces are still scannable. This device is mainly used in industries such as automobile industry, transportation, aerospace, mold inspection and machinery manufacturing.

1.2 Appearance

Read the content on the yellow sticker carefully before using the device.

Description of buttons on the Scanner

No.	Description	No.	Description
1	Menu	2	Camera brightness adjustment
3	Adjustment of the size of display in the software window	4	Power indicator: Only after the indicator of the Device lights on, the user can operate. 　　　　　　Standby 　　　　　　Preview 　　　　　　Scanning 　　　　　　Scanning paused
5	Scanning button ● Single click: Prescan/scan/pause ● Press and hold: Generate point cloud	6	Scanning distance indicator: 　　　　Too far 　　　　Suitable distance 　　　　Too close

1.3 Connect Cables
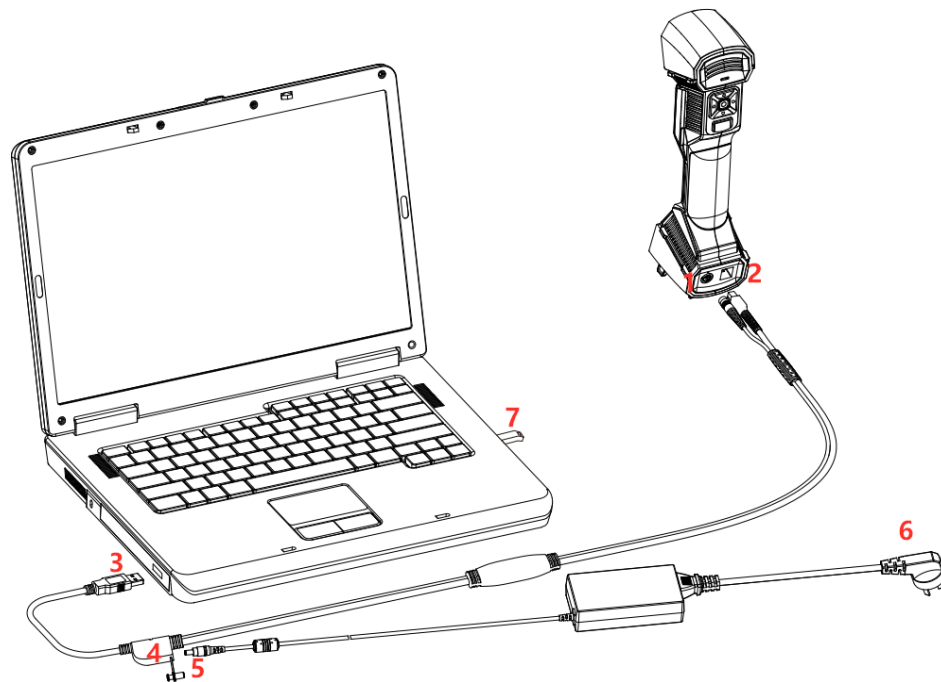
Step 1 Connect aviation cable (4) to power port (2) and USB port (1) on the Scanner.

Step 2 Connect power cord (6) and the power adapter (5).

Step 3 Connect power adapter (5) into aviation cable (4).

Step 4 Connect USB port (3) on the aviation cable to the PC USB 3.0 port.

Step 5 Insert the Dongle (7) into the PC USB port.

⚠ **Attention**:

Ensure that cables are not loose during the above operations. You are suggested to use fastening tools to prevent the device from being offline.

2. **Software**

2.1 Introduction

FreeScan software supports UE Pro scanners. With user-friendly software interface, full process scanning guidance, simplified software settings, you can operate the Scanner easily.

2.2 Operating Environment

Recommended operating environment of the software:
- Operating system: Windows 10 Pro. and above (64-bit only)
- CPU: Intel Core™ i7 and above
- Graphics card: NVIDIA standalone graphics card, RTX3060 (with 6G graphics card memory, RTX series recommended) and above
- Memory: 32G and above (Dual-channel is recommended)

Notes:
- Selecting single channel might cause decreased scanning frames.
- The device is only compatible with Windows 10. Mac is not available for now.

2.3 Installment

Notes:

Before installing the software, plug the dongle into the USB port of the computer for authentication of the encrypted software.

Open the USB flash drive and copy the installation package onto the computer. Then install the software according to the indication

Attention:

Do not install the software under the Program Files or Program Files (x86) folders where the windows system is. The software may work abnormally due to conflicts in authorizations.

Notes:

Check "Run FreeScan UE 1.2.X.X", then click "Finish". The software will run automatically after installation.

2.4 Configure Shining Pass

Double-click to enter the Shining Pass interface.

After successful login, auto login will be implemented next time.

2.4.1 Register an Account

Register an account if you do not have a Shining account or access to the software interface for the first time.

🖹

To register an account, ensure your PC is networked.

Step 1 Click **Register**.

Step 2 Enter account information and user information.

Step 3 Select **Read and agree to Privacy Policy (Mandatory)** and **Read and agree our Marketing and Promotion Agreement (Optional)**.

Step 4 Click **Sign up**.

🖹

Use your registered account to log in. Log in by password or verification code.

2.4.2 Activate the Scanner

Activation before first-time usage helps us ensure you have purchased an authorized Scanner. Then you can use it normally. Both online activation and offline activation available.

Online Activation

If the PC is networked, activate the Scanner online.

Offline Activation

If the PC cannot be networked, activate the Scanner offline.

Step 1   Export C2SN3D file.

🖹

Prepare a USB flash drive or portable hard disk.

1) Insert the dongle to your PC.
2) Enter the device serial number.
3) Click **Export**. And save the C2SN3D file to a USB flash drive.

Step 2   Upload C2SN3D file.

1) Find a networked computer and enter https://passport.shining3d.com/login. Then log in or register a new account.
2) Click **OFFLINE ACTIVATION**.
3) Upload the C2SN3D file.

Step 3   Export the SN3D2C file corresponding to your Scanner account to your USB flash drive.

Step 4   Import the SN3D2C file to your Shining Pass (in your PC with the software). Then insert the dongle to the PC to enter the software main interface.

2.5 Upgrade

2.5.1 Upgrade Firmware

The firmware is the basis of the software. To upgrade the firmware when the firmware version is too low, and the system is incompatible.

Preparation before firmware upgrade:

● Make sure that the device is powered on during the upgrade; avoid interruption of the upgrade due to

power cuts.

- Back up the original firmware so as to retrieve it in case of upgrade failure or in case that the user finds the new version unsatisfactory.
- Download the new firmware files to the local computer where the software has been installed.

Upgrading process:

The software will automatically detect the firmware. If the firmware does not match, the software will prompt you to upgrade the firmware, as shown in the figure below. Click "Yes" to upgrade.
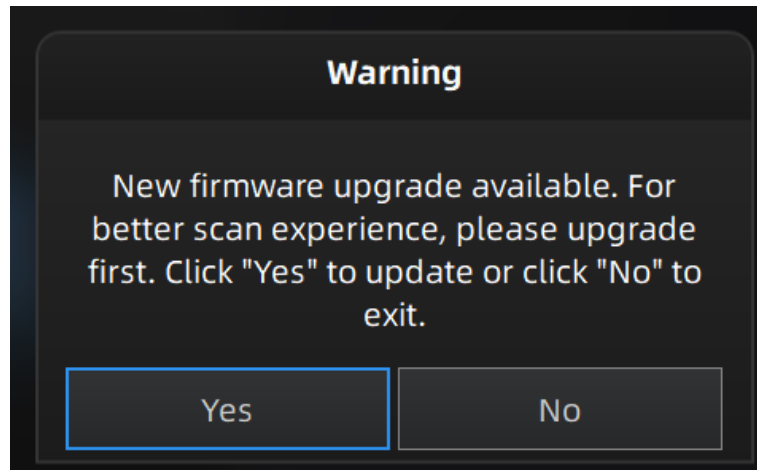

📋 **Notes:**

- After clicking "Yes" to upgrade, the software will be shut off automatically.
- The upgrade takes about 5 minutes.
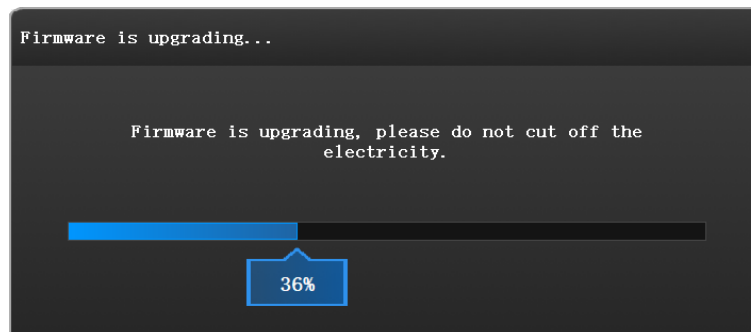
2.5.2 Upgrade Software

Software upgrade is to better meet the needs of users, by downloading patches to optimize software performance or append new functions.

Make sure that the software in use is of the latest version. If not, a reminder will pop up immediately after opening the software
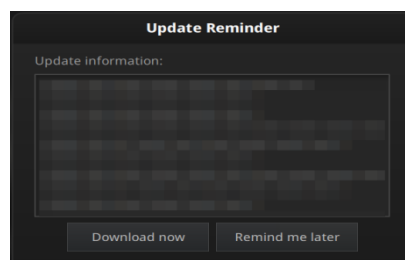
Click "Download Now". The software will automatically download the installation package in the background. Do not close the software during the download. When the download is completed, a window automatically pops up for users to decide whether the new version shall be installed immediately. Click "Yes" to start installing the new updates.
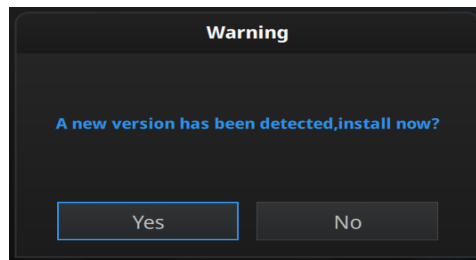
3. Operation

This Chapter mainly explains how to perform scanning, editing, and setting to the models through the software.

Double-click ![Fs] to enter the operational interface.

3.1 Workflow

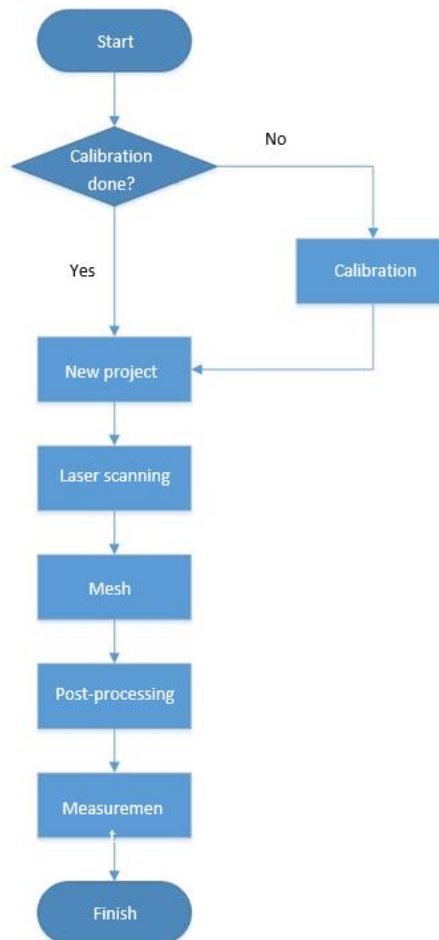If it is the first time you operate the system, refer to the following process.

Figure 3-1 Operation flowchart

3.2 Calibration

Through calibration, the device parameters are recalculated, which not only ensures the accuracy of the Device, but also improve the quality of its scanning.

### 3.2.1 Notes

Preparations before calibration:
Note:

To get higher accuracy, please start to calibrate when the temperature of the device get high enough(35℃).

Accuracy of calibration directly affects the scanning accuracy. Re-calibration is required Under the following conditions:

- When the scanner is used for the first time, or when it is reused after being laid idle for a long period of time (1-2 weeks).
- The scanner was severely shaken or shocked during transportation.
- Severe accuracy reduction, such as frequent errors in alignment or unrecognized markers, is observed during the scanning.
- Incomplete data is acquired during the scanning or serious deterioration of the quality of scanned data.

● Always make sure that the working side of the calibration board is clean and free of scratches.
● Do not place heavy objects or sundries on the calibration board to avoid damage of the calibration board.
● Keep the calibration board away from corrosives, metals and sharp objects to avoid corrosion or damage.
● It is not recommended to wipe the calibration board. When cleaning the board becomes very necessary, gently wipe it with a piece of a clean damp cloth. Do not use a cloth with chemicals or alcohols to wipe the calibration board.
● After using the calibration board, put it in a flannel bag.

3.2.2 Introduction to the Calibration Interface

Calibration shall be performed when it is the first time to use the device.
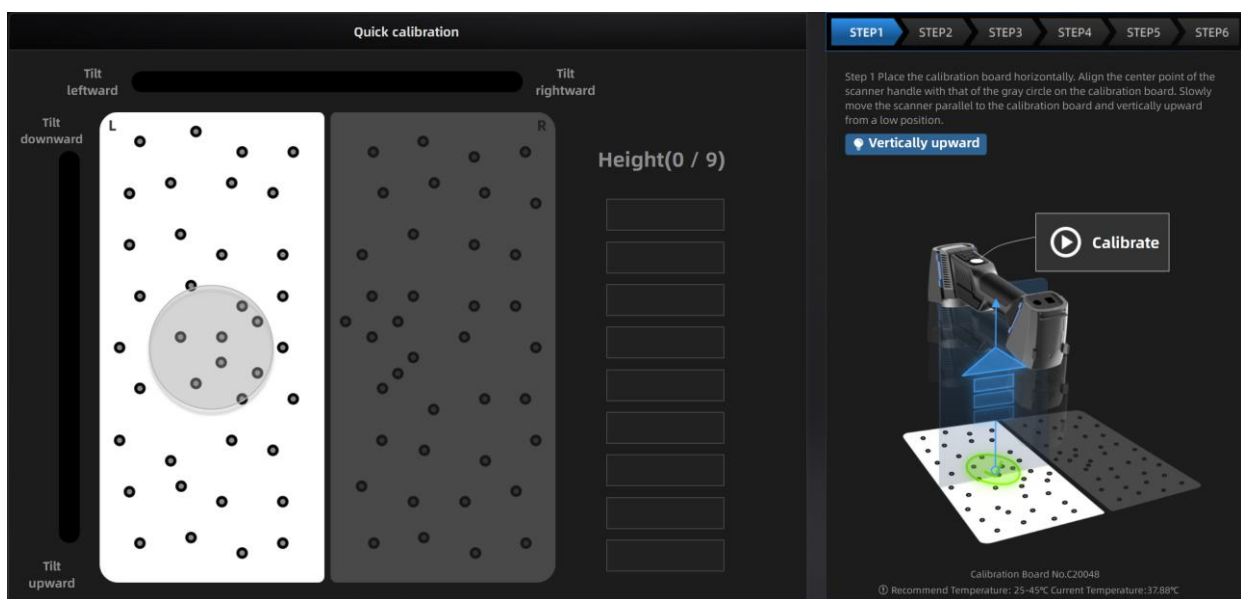
Three dimensions shall be taken into consideration during calibration: tilt leftward and rightward, tilt upward and downward, and height. When the height requirement is met, the blue bordered box becomes green; when tilting leftward/rightward or upward and downward all meet the requirements, the sliders in the bar box overlap and become green.

Refer to the steps and diagram shown on the right.

3.2.3 Quick Calibration

The system directly enters the calibration interface when it is used for the first time. Alternatively, users can

select "Calibration" on the navigation bar to switch to the calibration interface.

Follow the steps provided by the calibration wizard on the right side of the interface.

Step 1 Place the calibration board horizontally.

Step 2 Align the center point of the Device's handle with the center point of the gray circle on the calibration board.

Step 3 Place the scanner in the same direction as shown in the figure.

Step 4 Press the scan button on the scanner to start to collect.

Step 5 Move the device slowly and adjust the distance between the scanner and the calibration board according to the height indicating box.

Step 6 Keep moving until all height boxes turn green.

3.3 Create a Project

Create a project (or import multi-projects) before scanning any objects. A newly created project provides a path to save the scanned model data, which facilitates the users to process the acquired data.

Step 1 In the project management window, click "New project group", and the window of creating new projects will pop up.
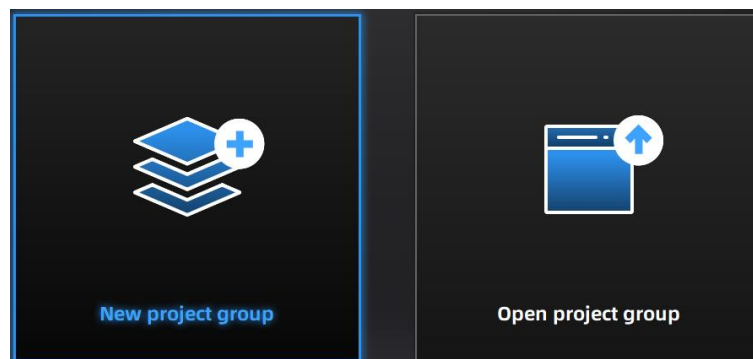

Step 2 Create a new folder or select an existing folder as the path for the storage of the project data. The folder name is the same as the project name.

Step 3 Enter the resolution setting window, where "High Detail", "Medium Detail" or "Low Detail" can be selected for default resolution options; alternatively, the slider can be dragged to set the resolution.

● Resolution: The higher the resolution, the finer the scanning effect. Models scanned at lower resolution can be easily distorted. In contrast, models scanned at high resolution occupy larger amount of storage space and take longer time to scan. Small models with high requirements on accuracy and fine details, such as gears, are recommended to be scanned under high resolutions. On the other hand, larger models without high requirements on detail, such as doors of automobiles, are recommended to be scanned under lower resolutions.

● Point distance: Refers to the distance between points in the point cloud. Drag the slider on the right to adjust the point distance. The higher the resolution is, the smaller the point distance shall set to
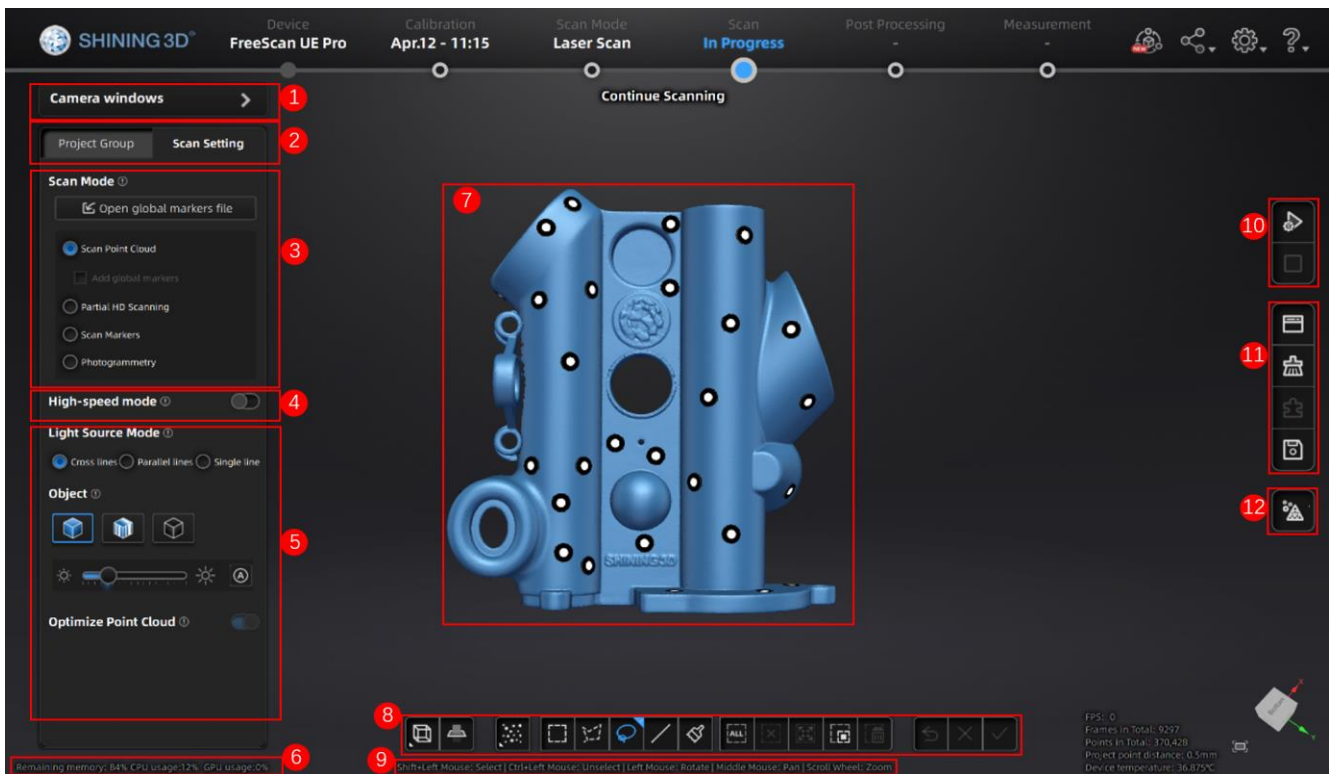
be.
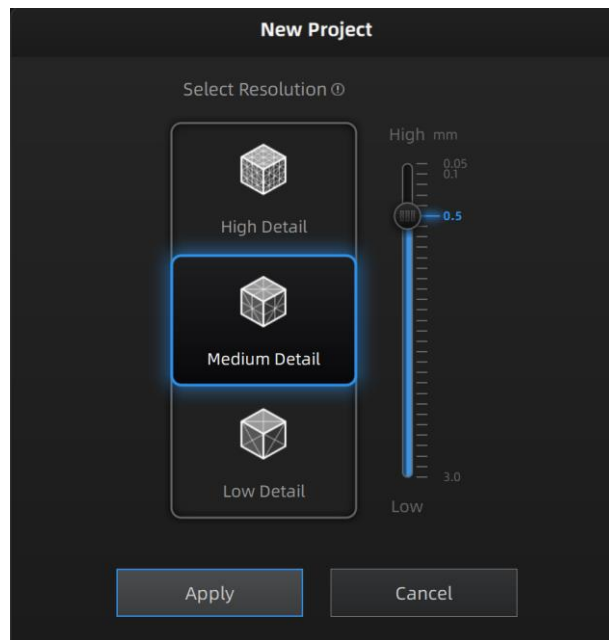
Step 4 Click "Apply".

3.4 Scan

Laser scanners can quickly and accurately obtain 3-dimensional data of objects scanned. Laser scanners are featured in non-contact measurement, high data sampling rate, active emission of scanning lights and strong environmental adaptability. These devices can be used in the complex environments and spaces for scanning, and directly and completely acquire the 3D data of physical objects with various sizes. Then the scanners can quickly reconstruct the 3D model of the projects as well as various geometric data concerning the points, lines, surfaces, and solids. 3D data of the objects' surfaces are obtained in form of point clouds, which is convenient for multiple subsequent processes.

For the first scan, operate by following the procedures below.
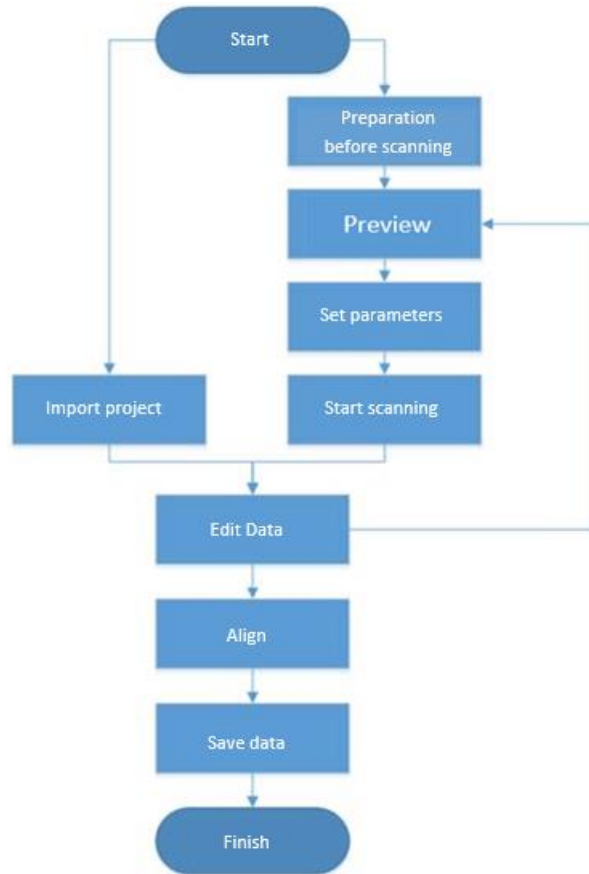
Introduction to the scanning interface:


Introduction to the scanning interface

No.	Item	Description
1	Camera windows	It is used to preview the actual scene during scanning. Parameters can be adjusted accurately through the camera window.
2	Project group and scan setting	For project group settings, see 3.4.6 Project Management. For scan settings, set scan mode and parameters.
3	Scan Mode	Through scanning settings, the scanning mode and parameters can be set. Default is scan point cloud. You can choose scan point cloud, scan markers or open global markers file. ● Scan point cloud: Acquire the data as point cloud. It could be switched to scan point cloud mode after scanning markers. It is also feasible to import the generated global marker file and then scan the point cloud. ● Scan markers: Only scan markers. Acquire marker data fast. There is no laser line in the scanning process. Markers can be scanned to supplement in the global marker file generated before. ● Partial HD Scanning: Partial HD Scanning means selecting the area to be rescanned when the requirement of accuracy is high. Targeted scanning can save scanning time and make the data obtained completer. ● Photogrammetry: Photogrammetry refers to a scanning technique that uses a scar bar and DSLR camera to measure the size and spatial position of an object.
4	High-speed mode	On: the scanning speed will be improved (only supports 6 diameter markers)
5	Parameter settings	See 3.4.3 Parameter Setting.
6	Remaining memory, CPU usage and GPU usage	● Remaining memory: the remaining space of the memory is displayed. ● CPU occupancy rate: this is the display of the computer's memory occupied by the active programs. If running programs occupy a large proportion of the computer's memory, it is recommended to close other non-scanning related programs and wait patiently. ● Video memory occupancy rate: the is the rate of utilization of the graphics card.
7	Preview window	Window for viewing the preview and scanning model.
8	Data editing	Editing and perspective adjustments to the model can be performed. For related operations, please refer to 3.4.9 Data Editing.
9	Shortcut keys	Quickly move the model or adjust its angles through shortcut keys.
10	Scan and generate point clouds	Click ▶ to start scanning; click ❚❚ to pause scanning. Click ◻ to generate a point cloud data file.

| 11	Functions	Project import, manual alignment, data deleting, and data saving can be performed. For related content, please refer to 3.4.6 Project Management and 3.4.8 Alignment.
12	Mesh	See 3.4.9 Mesh.

3.4.1 Preparation

To obtain better scanning effects, please pay attention to the following details when scanning:

● Markers shall be attached to models. If the device fails to catch markers, it will not emit laser lines.

- Attach the markers evenly and randomly.

- Four markers are required for the alignment at communal areas.

- Ensure that the device's camera can scan at least 4 markers within the normal scanning range.

- Please attach markers (smaller than 3mm) on the edges and/or at small facets of the model.

- Do not attach the markers on the surface with high curvature.

- Do not use damaged or incomplete markers.

- Do not use greasy, dusty, or dirty markers.

- The calibration board is only used for calibration.
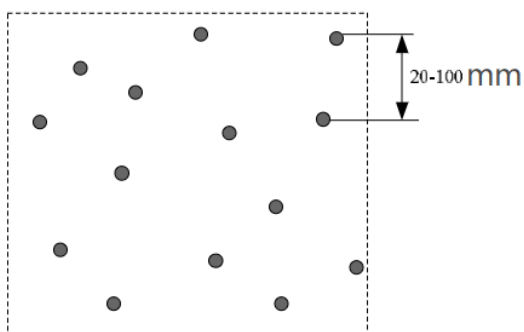

Markers are attached correctly

Error 1- artificial grouping of markers	Error 2- Attach markers only on one line
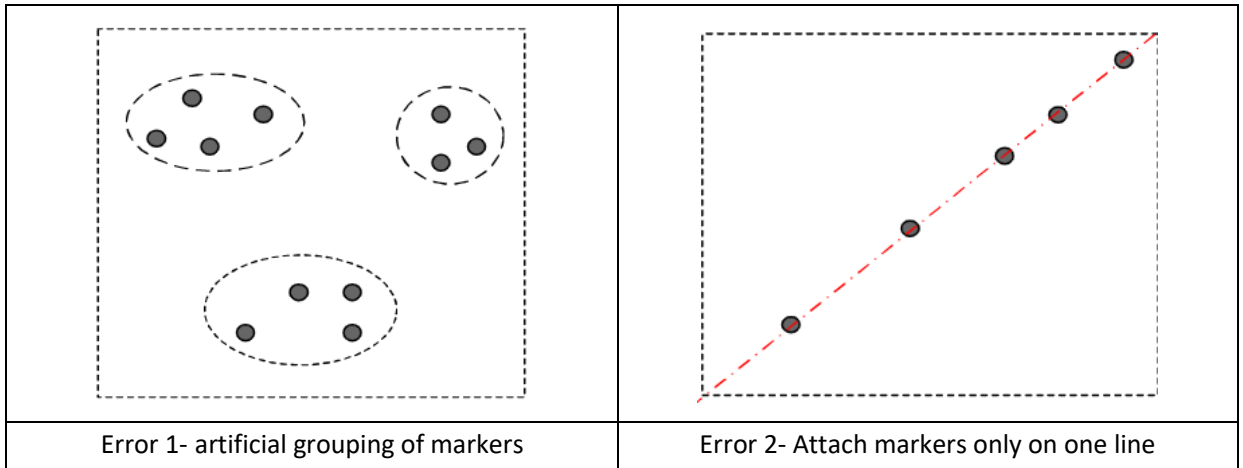
- When scanning a model prone to being deformed, make sure deformation does not occur.

3.4.2 Preview

To acquire better scanning effects through previewing and adjusting the parameters.

Click on the right side of the interface or press the Scan button on the Device to enter the preview mode.
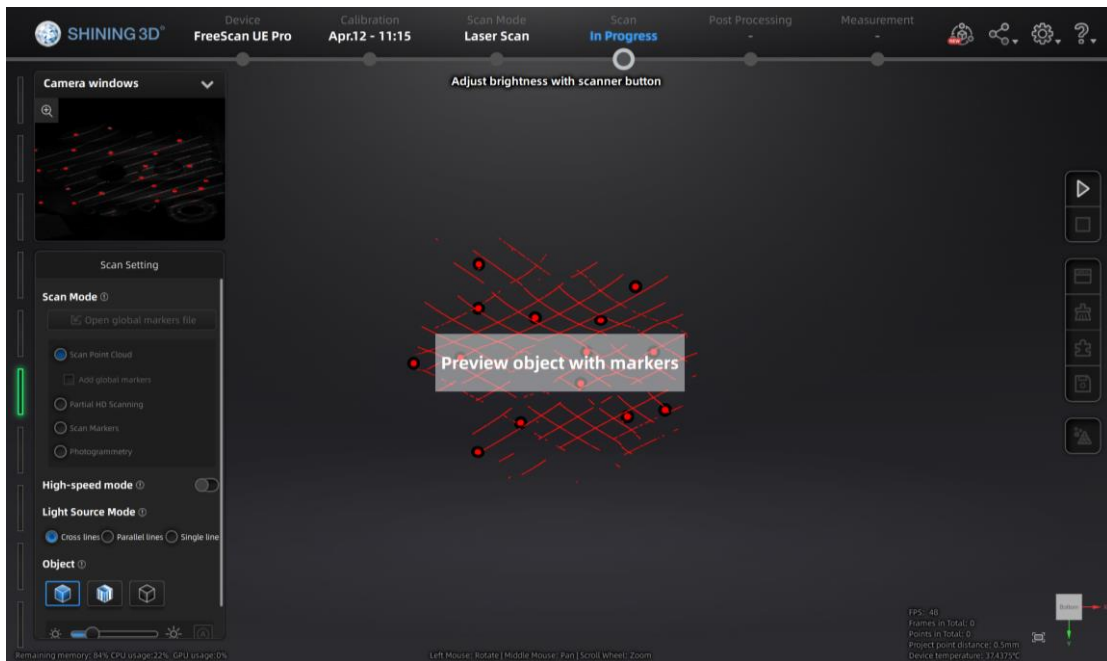
📋 **Notes**:

- Under the preview mode, model data are not collected.
- The preview mode can be switched on after operations such as creating a new project, importing a project, pausing scanning, and finishing scanning.

Click or press the Scan button on the Device again to exit the preview mode and start scanning.

3.4.3 Parameter Setting

Scanning parameters can be set during preview or scanning, including setting of scanning distance, light source modes, scanning objects, brightness.

- Adjustment of the scanning distance: There is a bar on the left side of the preview interface, displaying the scanning distance. Green means the distance is the best; red means the distance is too close; blue means the distance is too far. Adjust the scanning distance according to these color messages until the best scanning distance is achieved. Lights indicating the scanning distance are also available on the handle of the Device. When the indicator is green, the distance is the best; if it is blue, the distance is too far; if red, too close.

| Too close | Suitable distance | Too far |
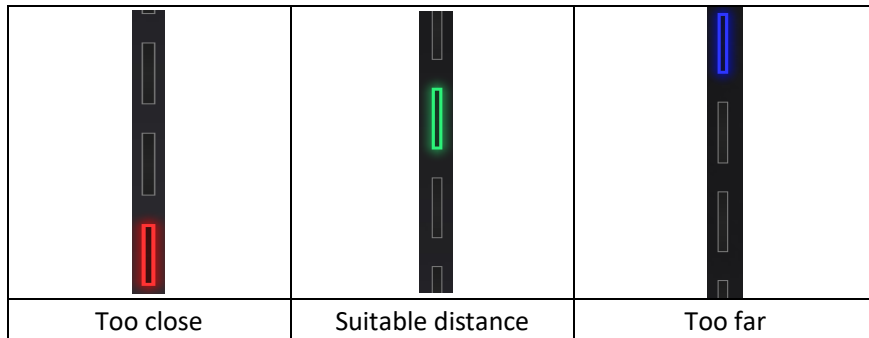
- High-speed Mode: The high-speed mode of the scanner will lose some details. Please turn off the mode when the point distance is less than 0.1mm.

- Light Source Mode: Select Cross lines, parallel lines or single line. There are 13 cross laser lines to scan large objects quickly, 5 parallel laser lines to scan fine details and single laser line for deep holes and pocket area scanning.
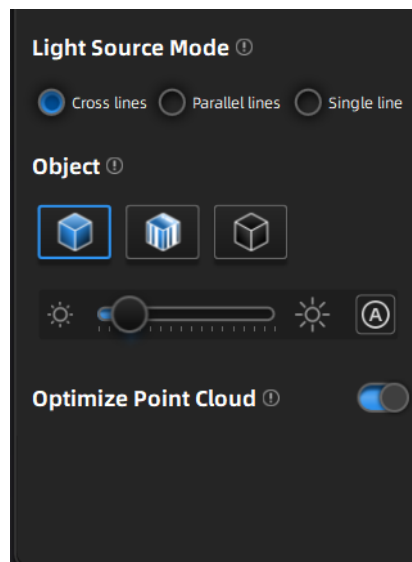
- Scanning objects: Select different brightness levels according to the materials of different objects. Select "Reflective" when scanning reflective objects and select "Black" when scanning dark or black objects.

- Brightness: By sliding the slider , the scanning brightness can be adjusted. Adjust

the brightness on the camera window until the data and markers are clearly visible.

⚠️ **Attention:**

If the brightness is too high, a large amount of noise can occur to the scanned data.

The parameters are inappropriately adjusted. Please adjust the scanning distance and/or scanning brightness	Parameters are appropriately adjusted.

- Auto Exposure: Auto exposure can be enabled when pausing scanning. When the function is enabled, the brightness can be adjusted automatically according to the material and color of the object.
- Optimize Point Cloud: When Optimize Point Cloud is enabled, the point cloud data will be optimized but the processing time will be longer.

3.4.4 Point Cloud Scanning

A point cloud is a set of data points in the coordinate system. In a 3D coordinate system, these points are defined by values on axis X, Y, and Z, and are used to identify the external surface of the objects to be scanned. When the device scans a large number of markers on the surface of an object, it acquires a point cloud data file. Users can obtain a large amount of point cloud data by scanning an object, which is convenient for the subsequent model rendering and measurement.

⚠️ **Attention:**

After scanning the point cloud, switching to scanning global markers or importing global markers files will clear the current scanning data.

Step 1 After completing the preview, click ▷ on the right side or press the Scan button on the Device to start scanning.

Click ⏸ or press the Scan button on the Device to pause scanning; click ▷ again or press the Scan button on the Device again to resume scanning.

📋 **Notes**:

During the scanning, make sure that the scanner directly faces the object and keeps a proper distance from it. Adjust the brightness according to the characteristics of the object and the ambient light.

Step 2 After scanning, click ![icon] on the right to generate point clouds. After the point clouds data is generated, the system will automatically optimize and generate point clouds. This function can also be used under offline mode.

| Point clouds not generated | Point clouds generated (scanning data optimized) |
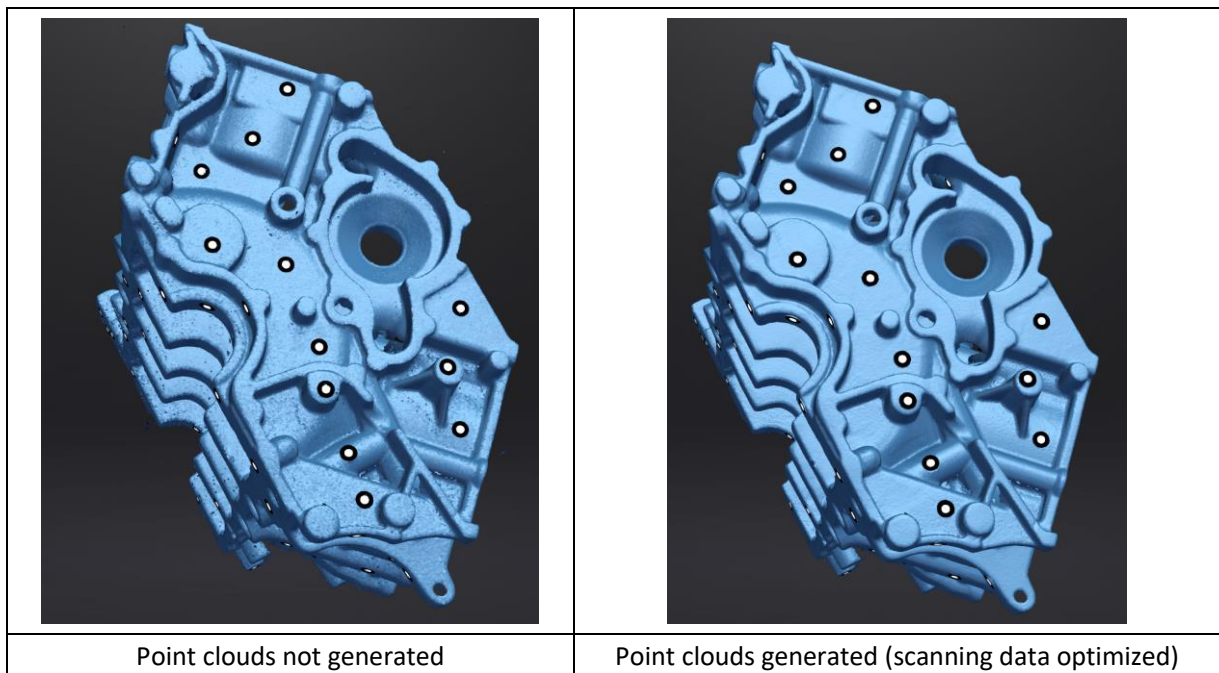
Step 3 Click ![icon] to save the scanned data in .asc or .p3 format.

3.4.5 Partial HD Scanning

Partial HD Scanning means selecting the area to be rescanned when the requirement of detail is high. Targeted scanning can save scanning time and make the data obtained completer. Generally, a user failing to obtain complete data of an area through the point clouding method can switch to the Partial HD Scanning mode for a rescanning of that area. Alternatively, after importing a data file, if a user finds that some data is missing, he can also select this mode for a rescan.

Step 1　After obtaining an object's data through the point cloud scanning mode, switch to the Partial HD Scanning mode.

![icon] **Notes**:

　　Under the Partial HD Scanning mode, the light source mode will automatically be switched to 5 lines, which can be changed by the user to cross lines or single line mode according to the actual situation.

Step 2　View the data of the scanned object and determine the areas that need to be rescanned.

Click ![icon] to view the object from various perspectives or press and hold the left and middle buttons of the mouse to rotate and translate the object, so as to determine the areas that need to be finely scanned.

Step 3　Select the area to be rescanned

　　1. According to the shape of the area to be rescanned, click ![icon] to select rectangle, ![icon] for polygon or ![icon] for lasso.

2. Press and hold Shift + left button of the mouse to select an area on the object to be scanned. The selected area will be displayed in red.
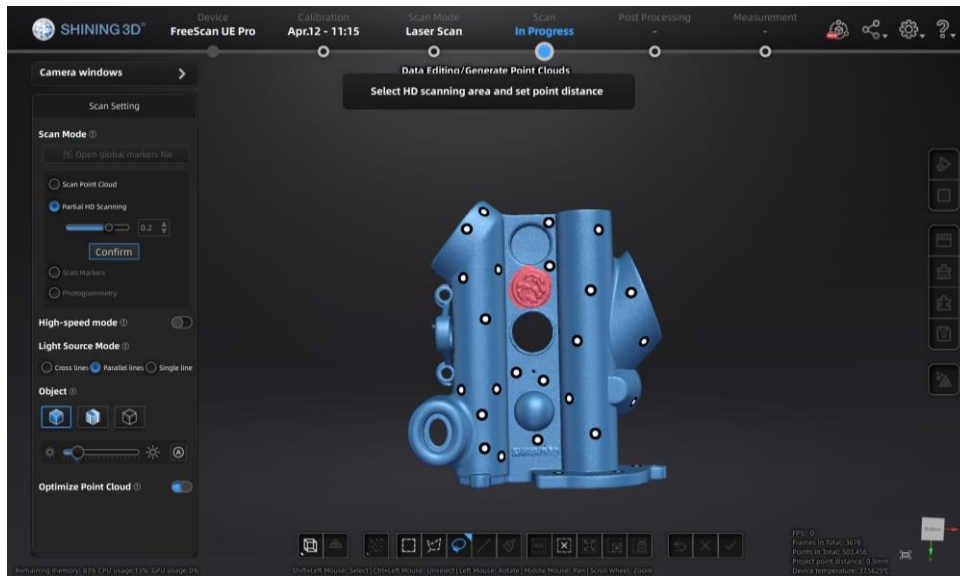
Step 4   Set point distance.

1. Click or drag the slider located under Partial HD Scanning or use the up/down arrows on the right to adjust the point distance, ranging from 0.03mm to 0.4mm.

2. Click "Confirm".

⚠ **Attention:**

After "Confirm" is clicked, the data of the selected area will be removed.

Under the non-advanced mode, the point distances of Partial HD Scanning range from 0.03mm to 0.4mm.

Step 5   Click "Confirm" in the new pop-out window.

Step 6   Click [icon] located on the right-hand side of the interface or press Scan button on the Device to enter the preview mode. The scanning parameters are adjustable.

Step 7   Start to scan. Click [icon] located on the right-hand side or press Scan button on the device to start fine scanning.

Step 8   After the scanning, click [icon] located on the right-hand side to generate point clouds.

Step 9   Click [icon] to save the scanned data in .asc or .p3 formats.

3.4.6 Scanning Global Markers

Scanning global markers refers to the data collection of the markers. By collecting such markers, the global markers data of an object can be quickly obtained. During the scanning, no laser lines are emitted. Continual scanning or rescanning can be done after importing the global markers. After the global markers are scanned, users can switch to point cloud scanning, which makes point cloud scanning easier.

Step 1   Select the global markers scanning mode.

Step 2   Click located on the right-hand side of the interface or press the Scan button on the Device to enter preview mode. The scanning parameters are adjustable.

Step 3   Start scanning. Click on the right-hand side or press the Scan button on the Device to start collecting markers.

Step 4   After scanning, click on the right-hand side to optimize the global markers.

Step 5   Click to save.

Notes:

Scan point cloud mode is usually applied after scanning markers or importing global markers files. Under this mode, checking "add global markers" option would enable the system to recognize and import the markers out of the original scanning area while unchecking the option would not. The system is to check "add global markers" option by default.

3.4.7 Photogrammetry

Photogrammetry can improve the accuracy of global markers data. According to the size of the scanned object, import suitable scale bar files and place the matching scale bar near the scanned object before starting the scanning. Photogrammetry is recommended for objects longer than 1.5 meters. Generally, photogrammetry is suitable for measurements for big parts in industrial applications that require high accuracy.

Step 1   Select the photogrammetry mode.

Step 2   Under the photogrammetry down, click "Import scale bar files", select up to 20 scale bar files maximum.

Step 3   Properly place the object to be scanned and the scale bar.

Attention:

Do not move the scale bar during global markers scanning.

Step 4   Click on the right side of the interface or press the Scan button on the device to enter the preview mode. The scanning parameters are adjustable.

Step 5   Start scanning. Click on the right side or press the Scan button on the device to start collecting markers.

Step 6   After scanning, click on the right side to generate complete data and save the scanned data.

Step 7   Click to save.

3.4.8 Project Management
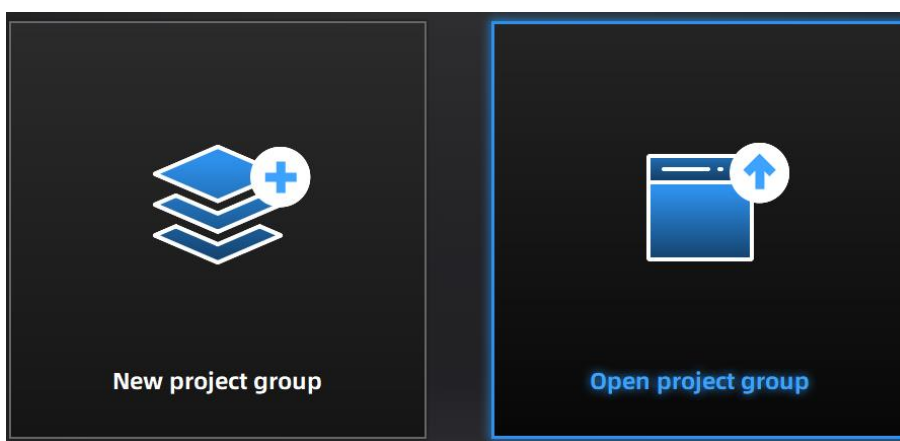
Import a Project

The system allows to create a project instantly by importing the existing scanned data into it.

In the project management window, click "Open project group"; or in the scanning interface, click on the right; the project file window will pop up. Then select a project file, click "Open" at the bottom right to import the project. This facilitates the subsequent editing and processing on the scanned data.

 Notes:

After importing, the system directly enters the scanning task, and scanning will be performed according to the resolution and alignment mode of the imported project.

Project Management

Users can create, import, remove and/or delete projects. After creating multiple projects, projects can be created or opened under project group, and the projects will be displayed in the project list.

In the scanning interface, click "Project Group" in the upper left corner and the operation area for project management will be seen.

Icons	Names	Descriptions
	New project	After clicking, a project file will be created automatically. The last project in the project list is the current project, and only the current project can resume scanning. Reopening another project in the list, that project will become current project.

↖	Open project	After clicking, a project file will be imported. Select a project in the project list and right-click on it, select "Rename" to rename the project.	
⊡	Remove project	After clicking, the project will be removed from the list. This operation does not delete the project. It remains under the plans folder and can be restored by opening the project.	
🗑	Delete project	After clicking, the data will be deleted permanently from the project folder and cannot be recovered.	
⌄	Dropdown button	After creating a new project group, users can choose to scan point cloud or scan markers	
👁/⦸	Visible/invisible	After clicking, the point cloud or markers can be displayed; click it again to hide the point cloud or markers.	

📑 **Notes**:

- If the last project in the list (i.e., the current project) is deleted or removed, the last project in the current list will become the current project, which can perform scanning.
- If the project under another path is opened and it has the same as the existing project in the list, "_1" will be added to the name of the opened project and such added numbers will be given in a numerical order to other projects sharing the same name.
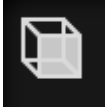
3.4.9 Edit Data

A variety of tools are provided to process the 3D data. Users are allowed to manually delete noise points and isolated points outside the model to reduce noise and obtain accurate 3D point cloud data. Users are also able to edit and adjust the perspectives to the model. The model can be directly rotated by using the mouse. Preview under various perspectives can be realized through the perspective selecting button on the software's interface.

Adjust View

- Hold down the left button and move the mouse to rotate the model.

- Alternatively, select the perspective selecting button, click ⬚ located at the bottom of the interface, and select different previews under various perspectives.

Introduction to perspective adjustment

| Icon	Description
	Front view, viewing the object to be scanned from the front perspective.
	Top view, viewing the object to be scanned from the top perspective.
	Left view, viewing the object to be scanned from the left side perspective.
	Back view, viewing the object to be scanned from the back perspective.
	Bottom view, viewing the object to be scanned from the bottom perspective.
	Right view, viewing the object to be scanned from the right-side perspective.

Create a Cutting Plane

After setting the cutting plane, the cutting plane above the direction of the arrow is valid (displayed in blue). The us er can choose whether to save the data in the reverse direction (displayed in red) or delete it. Although the data in the reverse direction of the arrow can also be saved, the newly scanned data cannnot be added to it.

Step 1   Click ⬚ and the cutting plane window pops out.

Step 2   Choose how to create the cutting plane.

- Fitting Point Cloud: the plane formed by the selected point cloud data is deemed as the cutting plane.
- Creating straight line: draw a straight line on the object to be scanned, and the plane formed by such a straight line is deemed as a cutting plane.
- By Markers: at least 3 markers shall be chosen and the plane formed by these 3 or more markers shall be deemed as the cutting plane.

Step 3   Hold down Shift + LMB or select at least 3 markers to create a cutting plane.
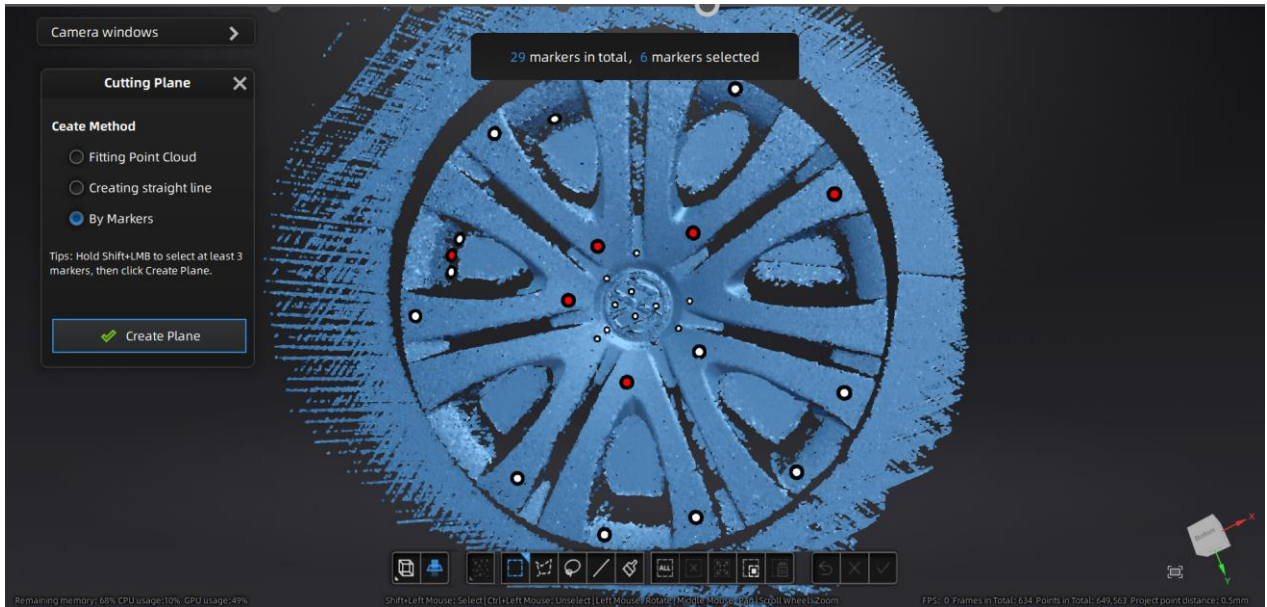
Step 4   Click "Create Plane" to generate the cutting plane.
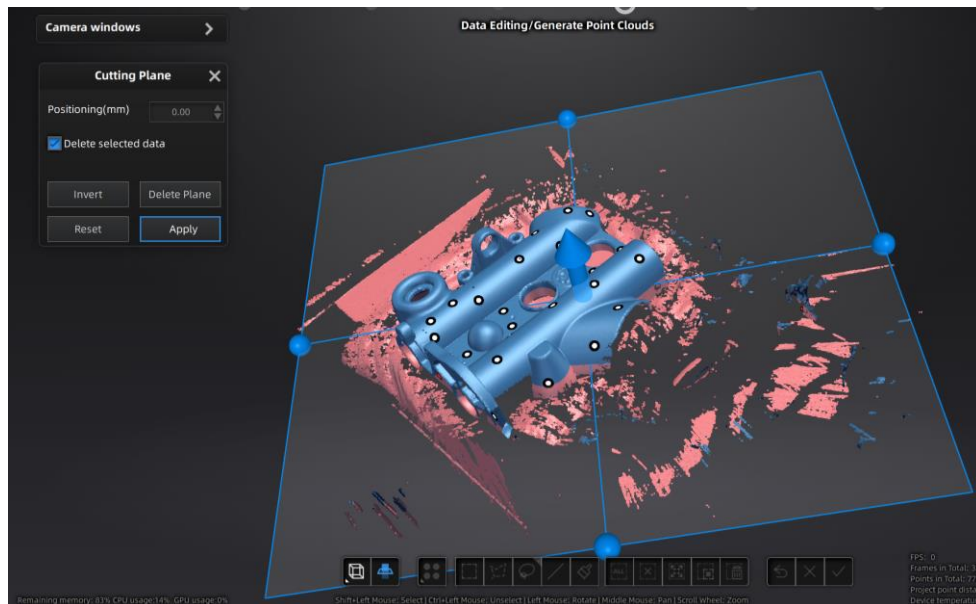
Step 5 Drag the blue ball to adjust the X, Y, Z axis or translation increment to determine the direction and angle of the plane.

● Delete a plane: After clicking, the scanned data below the plane will be deleted.

● Invert: After clicking, the scanned data above the plane will be deleted.

● Delete selected data: check the box to delete the red area.

● Reset: cancel previous operation.

Step 6   Click "Apply" to save the edit and exit the cutting plane setting.

Edit Model

Users can select data to edit the model at their own discretion.

Introduction to editing icons

| Icons	Name	Description
	Point cloud Edit	Edit the selected data area in Point cloud Edit mode.
	Markers Edit	Click Point cloud Edit again to switch to Mark Edit. Select the data area and the mark points in this area will in red. The red mark points can be deleted at this time.
	Rectangular	After clicking, hold down "Shift and LMB" to select a rectangular area for editing. Press and hold the left button of the mouse to select an area to be edited. The selected area will be displayed in red.
	Polygon	After clicking, hold down Shift and click to select a polygon area. When editing area selection is completed, release the Shift or double-click the left mouse button. The selected area will be displayed in red.
	Lasso	After clicking, hold down both "Shift and LMB" and the lasso will appear. At this time, move the cursor to select the area to be edited. The selected area will be displayed in red.
	Straight line	After clicking, hold down both "Shift and LMB" and move the cursor to draw a straight line. The selected area will be displayed in red.
	Paint Brush	After clicking, hold down both "Shift and LMB" and a red circle will appear. At this time, roll the mouse wheel will zoom in and out of the circle. Move the red circle to select the area to be edited. The selected area will be displayed in red.
	Select all	After clicking, all scanned data is selected.
	Unselect	After clicking, the selected area for editing is cancelled.

	Connected Domain	To enable domain connecting function, selecting a patch of data and click this button, model area associated with such data will be automatically selected.
	Invert	After clicking, areas other than the selected editing areas will be selected.
	Delete selected data	After clicking, the selected editing area will be deleted.
	Undo	After clicking, the last deletion will be undone.
	Cancel Edit	After clicking, all edits are cancelled, and the edit mode is quitted.
	Apply Edit	Clicking this button or press the space bar to quit the edit mode.

⚠ **Attention:**

After applying of data editing, the data's initial state cannot be restored, unless by reloading the initial file.

Shortcut Keys

The objects to be scanned can be edited through shortcut keys.

Shortcut keys	Instruction
Hold down the left mouse button and move the cursor	Rotate the model
Hold down the middle mouse button and move the cursor	Translate the model
Roll the mouse wheel up and down	Zoom in and zoom out the model
Space bar	Confirm editing when editing data
Delete	Delete selected data

3.4.10 Align

Since the scanning technology is unable to obtain the point cloud data of the entire model at one time, multiple and multi-angle scanning is required. While scanning, usually the point cloud data for multiple

individual scanned area may overlap. Therefore, alignment is done to obtain identical surface features based on the repeatedly scanned areas, connecting such point cloud data obtained through multiple scans into one complete set of data. Through alignment, multiple scan data are combined into a whole set of point cloud data, thereby effectively solving the problem of incomplete data collection.

When more than two project files are present in the project list, and scanned point cloud data exist in those project files, the project can be aligned.

Click on the right side of the interface to enter the project alignment interface.
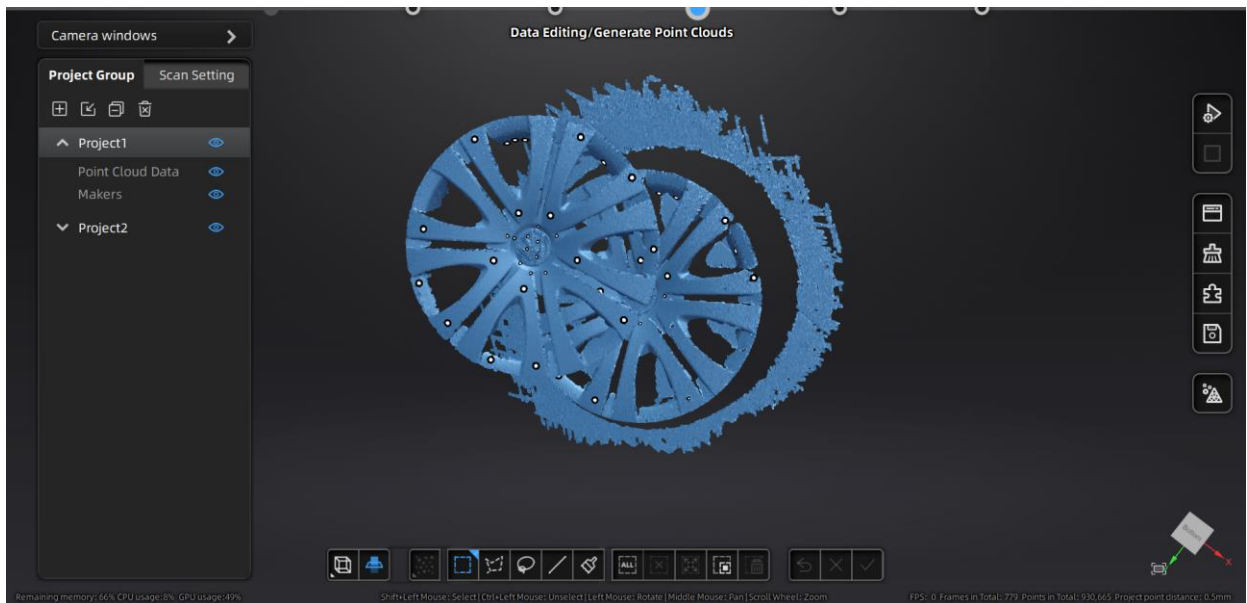
📖 **Notes**:

> If there is a project that has not generated a point cloud, click "Align" and the following prompt box will pop up. If "Continue" is clicked, the point cloud will be automatically generated and then aligned; if "Cancel" is clicked, alignment interface will appear and the project that has not generated point cloud will not be displayed on the alignment interface.

Warning

Manual alignment requires all projects to be generated into point cloud.

| Continue | Cancel |
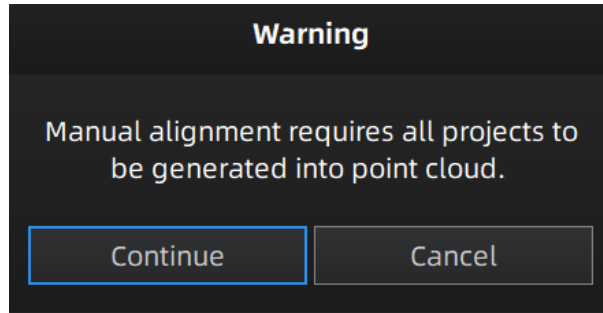
Feature Alignment

When the scanned point cloud files share common features, feature alignment can be chosen, which is the most effective way to solve the alignment problem. This method can adjust the manual alignment to minimize the error between the model and the original data.

Select "By Feature" and click "Apply", the software will automatically conduct alignment according to the features of the data.

Manual Alignment

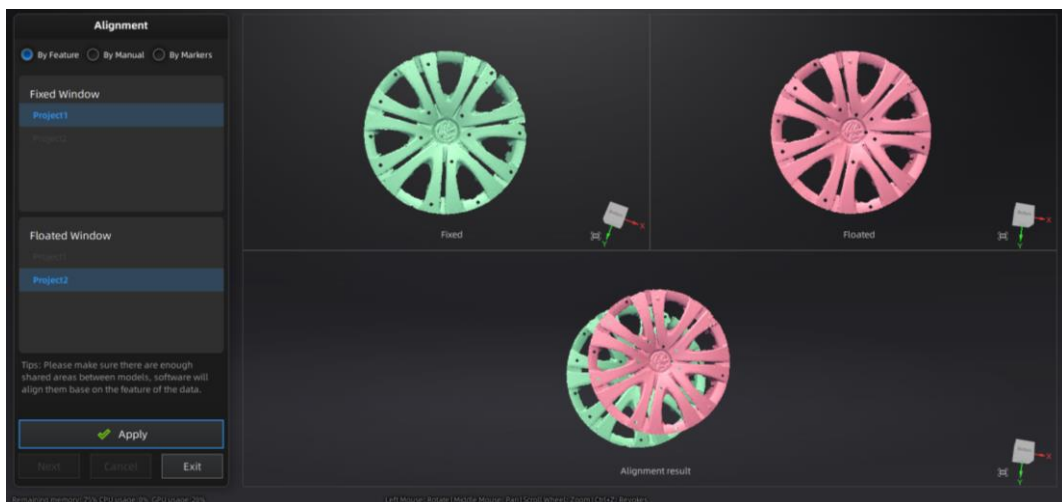Manual alignment refers to obtaining the initial position of the point cloud through three points. For large-scale point clouds, the less precise manual alignment method can be selected. The best matches of the selected points are calculated and, alignment is realized through the best fitting of all the points from the floating viewport to the fixed viewport.

After selecting "By Manual", press Shift + left mouse button to select no less than 3 non-collinear points in each of the fixed and floating viewports respectively; click "Apply" and the software will automatically conduct alignment.

Press Ctrl + Z or ESC to undo the selected points in sequential order.
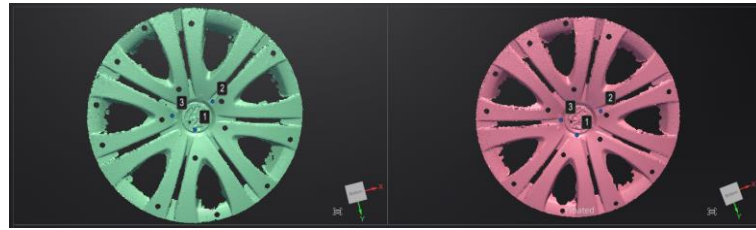
Markers Alignment

If the currently selected project is a Markers project, the markers can be aligned. It is necessary to ensure that the number of shared markers in the two projects is not less than 3. Otherwise, the alignment will fail. The software will automatically align according to the markers.

Select "By Markers", click "Apply", and the software will automatically align.

Button names	Description
Apply	Perform the alignment operation.
Next step	The aligned projects will be merged into a group, which can be further aligned.
Cancel	Undo the completed alignment.
Exit	Exit the project alignment interface.

3.4.11 Mesh

Meshing is to convert the point cloud into a triangular mesh surface. After meshing, the model can be enlarged, and any triangle surface can be manually selected for observation. The data after mesh can be directly used for rendering or measurement.

Step 1   When scanning and generation of point clouds are completed, click to create mesh.

Step 2   Through the mesh optimization on the left, you can set the mesh parameters (Filter, remove small floating parts, remove spike, max triangles, fill small hole and fill marker hole).
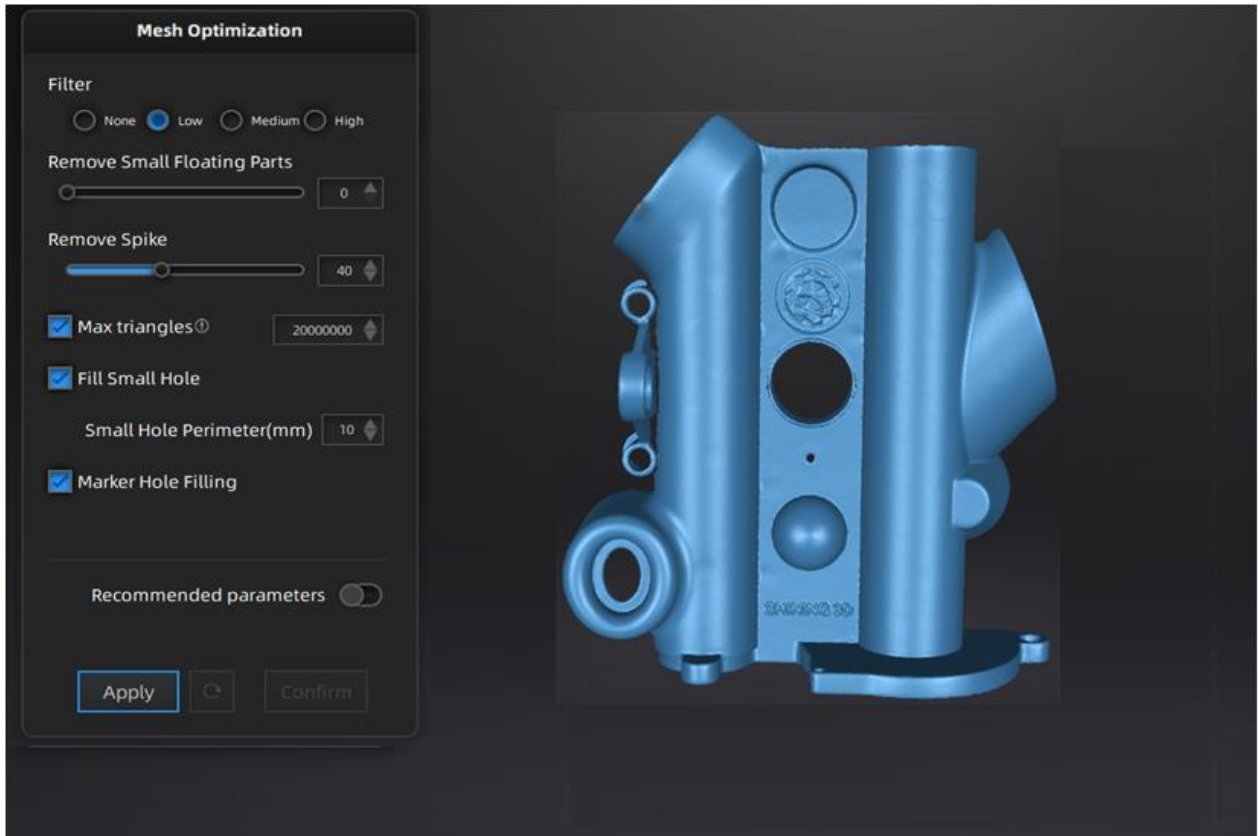
Use recommended parameters: Turn on the function, software helps you to optimize a specific model. To customize parameters, turn off the function.

Filter: Optimize data.

Filter Low	Filter Med
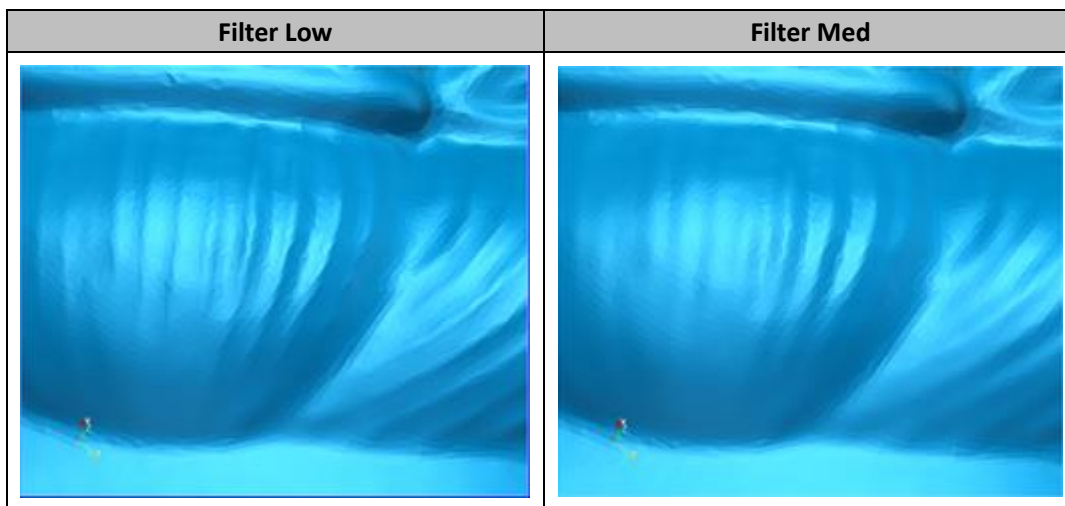
Remove small floating parts: Remove small floating parts on the model.

Remove spikes: Remove spike-like data on the image edge.

Max triangles: Set max. plate number to get mesh model's triangle plate number is within configured plate number.

Fill small hole: For objects with tiny holes (larger than 10 mm), use the function to fill tiny hole to make the scanned image look better. For objects with holes (smaller than 10 mm), you are not recommended to use the function or you can set the function parameter value to a smaller one.
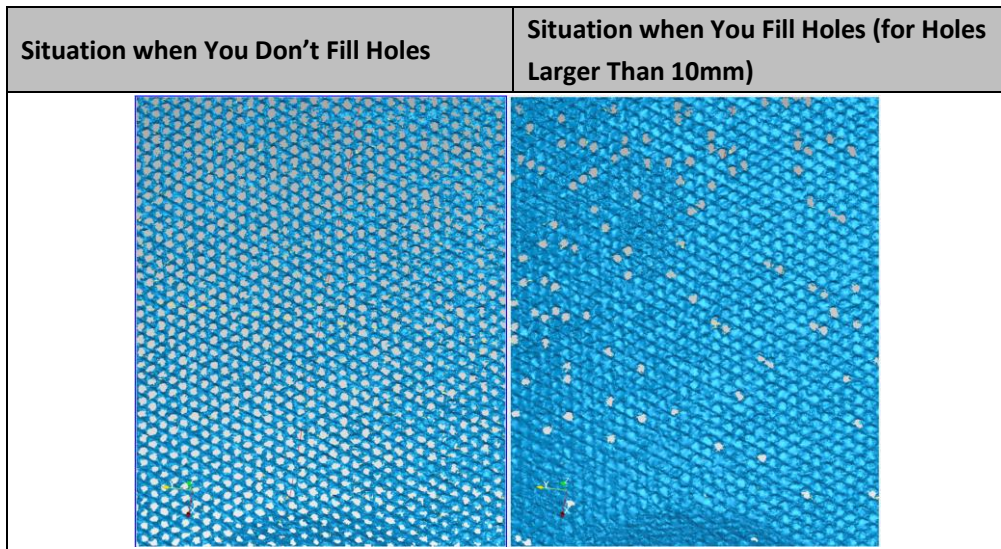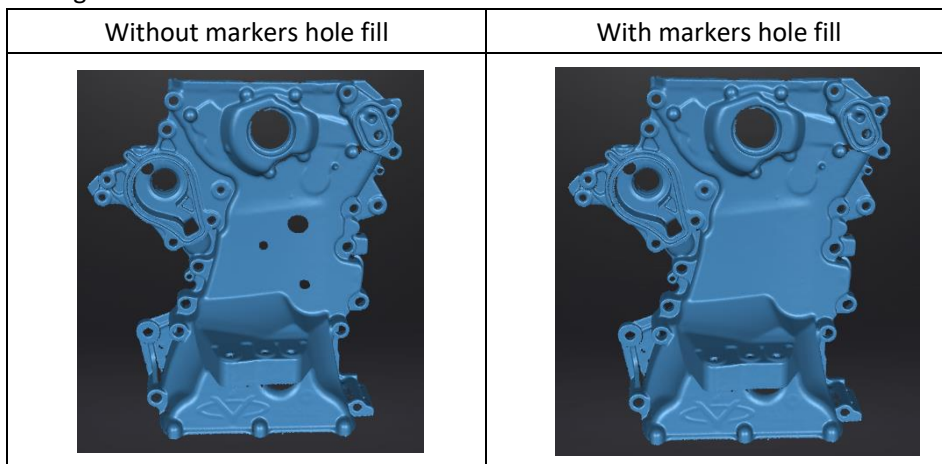
Situation when You Don't Fill Holes	Situation when You Fill Holes (for Holes Larger Than 10mm)

Marker hole filling:

Without markers hole fill	With markers hole fill

Step 3 Click "Apply" to mesh the data.

3.5 Post-processing

After the model data is meshed, the software automatically switches to the post-processing interface. Alternatively, users can directly click on the navigation bar to enter the post-processing interface and import data. Post-processing can then be performed on the data, including simplification, mesh optimization, smooth, remove small floating parts, auto hole filling, manual hole filling and cutting plane tool.

Click to select the file for post-processing; or directly drag the file in STL, OBJ, PLY formats into the measurement interface.

Shift+ Left Button of the mouse: Select the redundant part of data, and the selected data will be displayed in red.

Ctrl+ Left Button of the mouse: Deselect part of the selected data.

Icon	Name	Description
	Select visible	When selecting the model processing area, only one side is selected, that is, visible data is selected.
	Select thorough	After selecting, the front and back sides of the model will be simultaneously selected.

3.5.1 Simplification

After simplification, the polygon numbers, file size and level of detail of data will be reduced accordingly. Set the ratio from 1 to 100, the default is 0.

The comparison of detail between before simplification and after simplification (at 70% simplify proportion).

Simplification menu
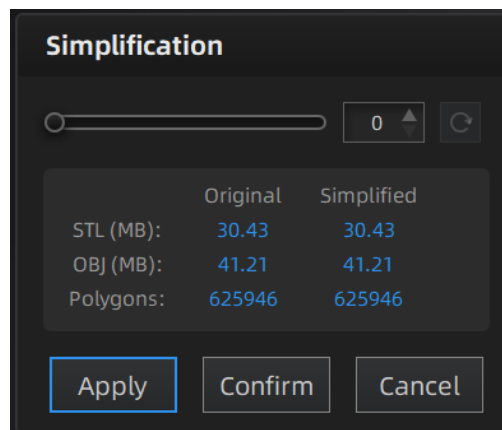
Click **Apply** to simplify data, preview the result of current setting.

Click **Confirm** to apply the "Simplification" setting.

Click **Cancel** to quit, and go back to the original data.

Multiple operations on "Simplification", the result will not be added. It will always operate on the original data.

Before simplification	After simplification

3.5.2 Mesh Optimization

Mesh optimization can optimize the quality of the data. There are 3 ratio options of mesh optimization. Processing time will be different. Below shows the result of 3 different ratios.

Original

Mesh optimization 10	Mesh optimization 50	Mesh optimization 100

Click **Apply** to optimize data, preview the result of current setting.

Click **Confirm** to apply the "Mesh Optimization" setting.

Click **Cancel** to quit and go back to the original data.

Multiple operations on "Mesh Optimization", the result will not be added. It will always operate on the original data.

3.5.3 Smooth

Smooth the possible noise on the surface of the scan data. It might remove some small details or smooth some sharp edges at the same time. The example of before and after smoothing is shown below. Run 2 times, data will be smoothed twice.

Smooth menu

Original
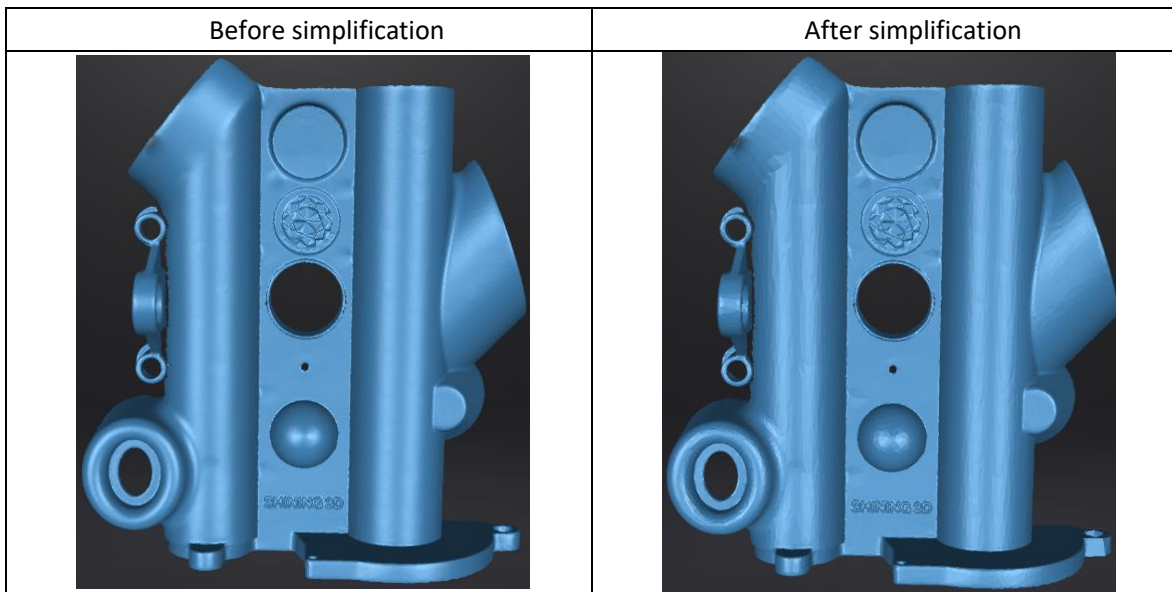

Smooth 10	Smooth 50	Smooth 100
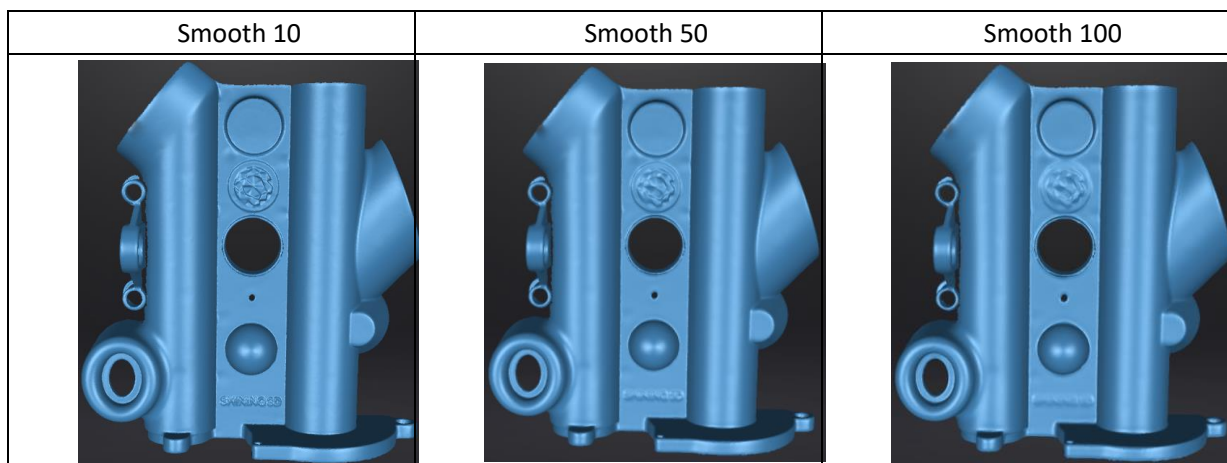
Click **Apply** to smooth data, preview the result of current setting.

Click **Confirm** to apply the "Smooth" setting.

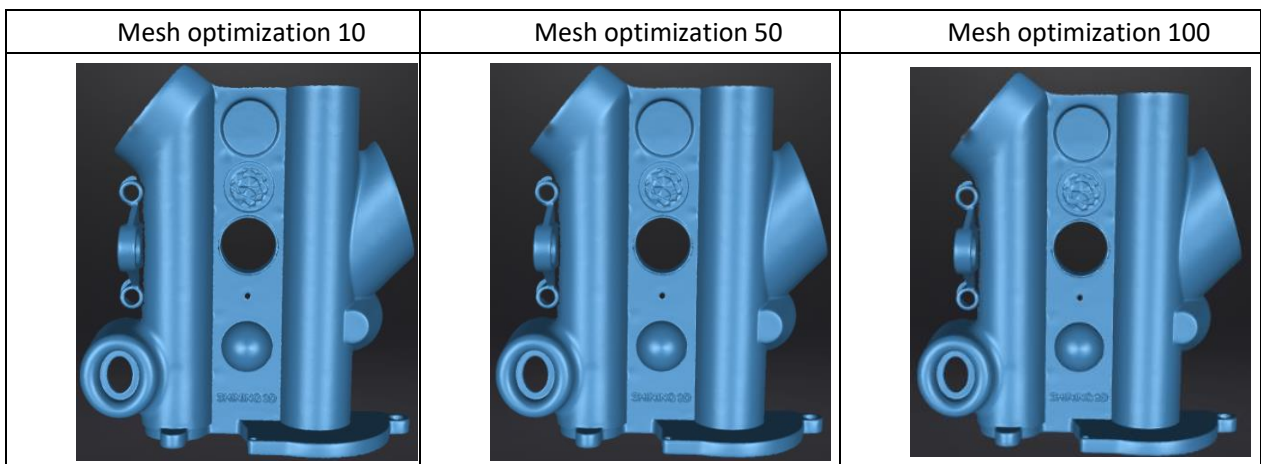Click **Cancel** to quit, and go back to the original data.

Multiple operations on "Smooth", the result will not be added. It will always operate on the original data.

3.5.4 Remove Small Floating Parts

Remove small floating parts in the scan data.

0 means no operation, 100 is the maximum. The maximum value is the square of the diagonal length of the floating part/10, MAX=$(L/10)^2$.

Diagram of removing floating parts shows as below:

Original data
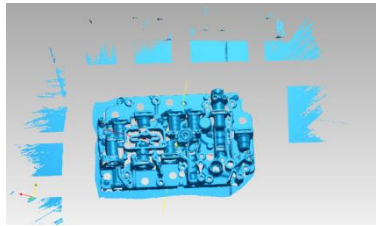
Remove floating part-10	Remove floating part-50	Remove floating part-100

Click **Apply** to remove floating part, preview the result of current settings.

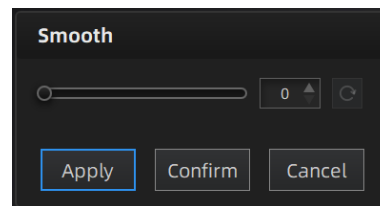Click **Confirm** to apply the "remove floating part" setting.

Click **Cancel** to quit and go back to the original data.

Multiple operations on "Remove floating part", the result will not be added. It will always operate on the original data.
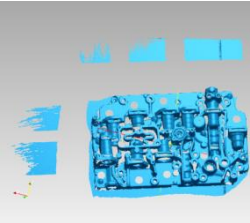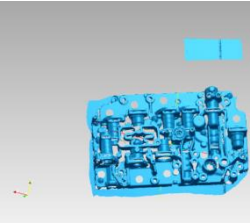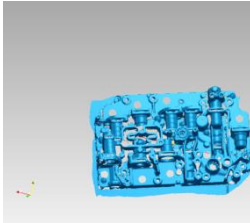
3.5.5 Fill Holes

Due to the loss of point cloud data in some areas, holes may occur after the 3D scanned model is meshed, resulting in incomplete models. The model can be made complete through the hole mending operation. Holes can be mended either automatically or manually. Each method realizing hole mending according to the changes of the curvature of the area around the hole. Types of tangent and plane are also available to be chosen for hole filling. When there are multiple holes to be mended, automatic hole mending method is recommended.

Auto Hole Filling

Input the perimeter of the biggest hole to be filled. Less than 100mm is recommended. This function will fill every hole with a smaller perimeter than the number input.

Auto hole filling

Auto Hole Filling

Filling type   Curvature   ∨

Perimeter(mm)   80   ↻

Hole-filling: Choose 10 - 100 mm perimeter to fill the hole.

Apply   Confirm   Cancel
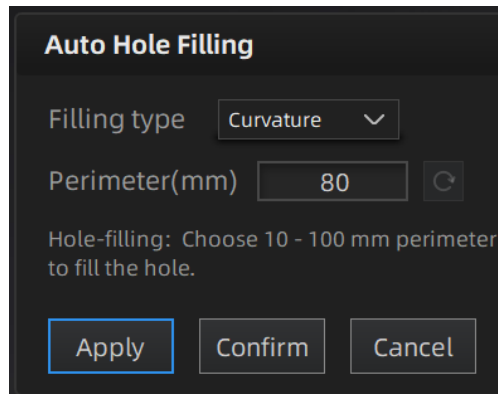
Choose Curvature, Tangent or Flat before filling hole.

- **FLAT** calculates the solution for the hole filling considering the point position on the boundary.
- **TANGENT** calculates the solution considering the point position and the normal of the last row of triangles forming the boundary.
- **CURVATURE** calculates the solution considering the point position and the normal of the 2 last rows of triangles forming the boundary.

Effect of Curvature, Tangent or Flat
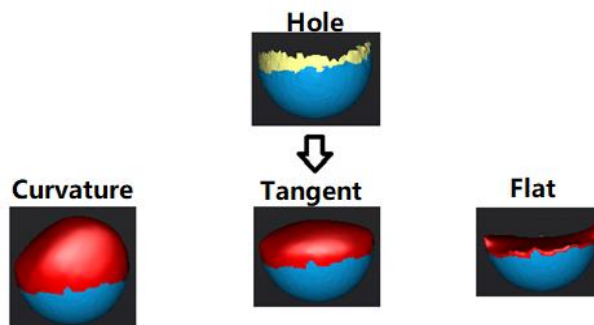
Click **Apply** to auto fill hole, preview the result of current setting.

Click **Confirm** to apply the "Auto hole filling" setting.

Click **Cancel** to quit, and go back to the original data.

Manual Hole Filling

The hole edges are displayed green and get red after picking. The number of the holes and the number of holes filled will be displayed on the interface. Choose Curvature, Tangent or Flat before picking a hole.

Manual hole filling

Click the edge of the hole to fill it.
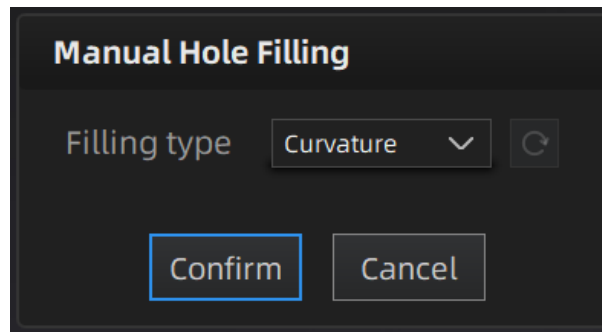
Click , according to the order of filling holes, from the last hole to cancel hole filling. Ctrl + Z can also cancel hole filling.

Click **Confirm** to apply current setting and exit the manual hole filling.

Click **Cancel** to quit and go back to the original data.

3.5.6 Cutting Plane Tool

Readjust the front direction of the scanned data if the data is not aligned or the front direction needs to be redefined.

Steps

1. Hold down the **Shift+ LMB** and drag the cursor to draw a straight line.

2. Click **Intersect Plane** to create a plane. The front is above the plane. The scanned data in the reverse direction of the plane is displayed in red (the data to be deleted)

3. Select the area to be deleted.

● Reverse Selection: After clicking **Reverse Selection**, the scanned data in the forward direction of the plane is in red.

● Delete the selection and close the intersection: Delete the selection and close the intersection: delete the red area and fill in the scan data that coincides with the created plane.

● Delete selection: Delete the red area.

4. Click **Apply** to delete the red area.

5. Click **Orient Based On Plane**, the scanning model will be readjusted according to the direction of the plane arrow.

6. Click **Confirm** to save the edit and close the Cutting plane tool window.

3.6 Measurement

After Meshing, the software can switch to the measurement interface, or directly enter the measurement interface to import data, and perform operations such as measurement and alignment on the data.

The measurement interface and the post-processing interface share the same data.

On the operation progress bar, click to enter the measurement interface.

Click to select the file to be measured; or directly drag the file in STL, OBJ, PLY format to the measurement interface.

3.6.1 Create Feature

Click the feature button ![icon] to display the menu, click again ![icon] or "Close" to close the menu.

Feature menu	Display of Features

Click on the corresponding icon to create points, lines, planes.

Then select the creation method and follow the instructions, click "Create" to generate, or "Close" to cancel and close the window.

The features created displaying in gray, the selected feature is in Red. In the feature list, click "delete button" to remove (Delete action cannot undo).

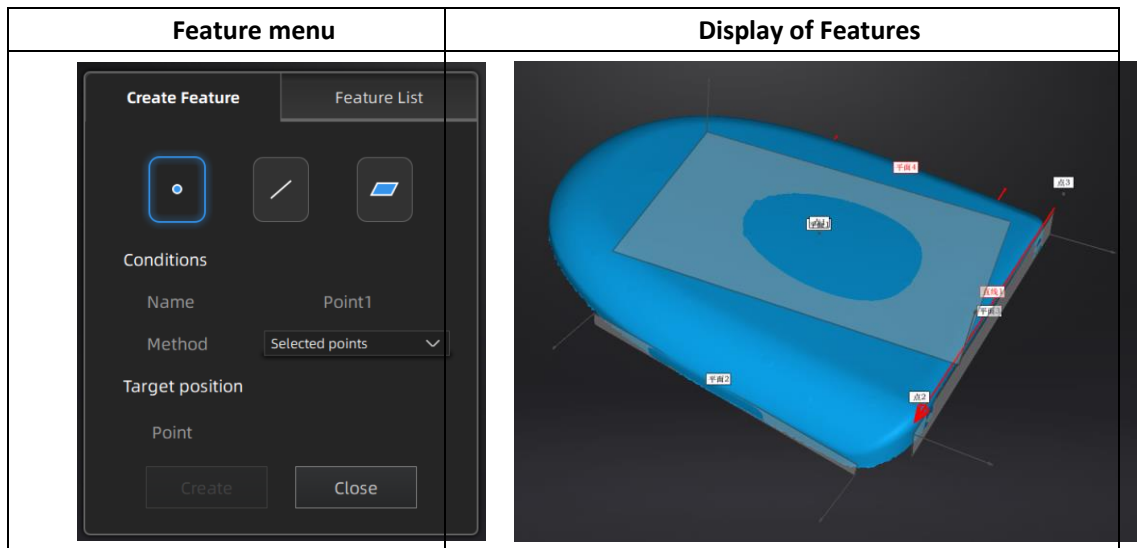| Feature	Creation Method	Requirement	Description
Point	Selected Points	—	• Click on the data to select a point. • Click create to create a point.
	Line-Plane Interface	Line and Plane should be created in advanced	• Click on the created line, or select it on the dropdown. • Click on the created plane, or select it on the dropdown. The point generated is the intersection between the non-parallel line and plane. **Feature creation failed! Error code 9**: The line is parallel to the plane.
Line	Point-Point	—	• Pick 2 points. • Click on the data to select a point or click on a feature point previously created. In the Choice list select one of the points to redo it. The line generated is define as point from to point to point.
	Plane-Plane Intersection	2 planes should be created in advanced	• Click on the plane previously created, or select it on the dropdown, repeat for the second plane. • The created line is the intersection between the 2 non-parallel planes.

|			Feature creation failed! Error code 1: the planes are parallel.
Plane 	3 Points Fit	—	● The plane is generated by 3 points not co-linear. ● Click on the data to select one point or click on a previous created feature point. ● In the Choice list select one of the points to reselect it. **Feature creation failed! Error code 6=** the points selected are co-linear.
	Point-Line Fit	Line should be created in advanced	● The plane generated includes the point and the line (The line should be created in advanced). ● Click on the line previously created, or select it from the drop-down. ● Click on the data to select a point or click on a feature point previously created. ● In the Choice list select one of the elements to reselect it. **Feature creation failed! Error code 6=** the point selected belongs to the line
	Best Fit	—	● Press Shift+ LMB to select an area, press ctrl+ LMB to unselect. ● The plane generated is the position with the smallest deviation from the selected area.

3.6.2 Align

Use this mode to modify the alignment of the data to the global coordinate. This action is useful for post processing or reverse engineering.

The transformations do not affect the shape and size.

	Enter/Exit the Movement menu.

Click the Movement button to display the menu, click again to close the menu.

✚ Exact movement

Exact movement menu
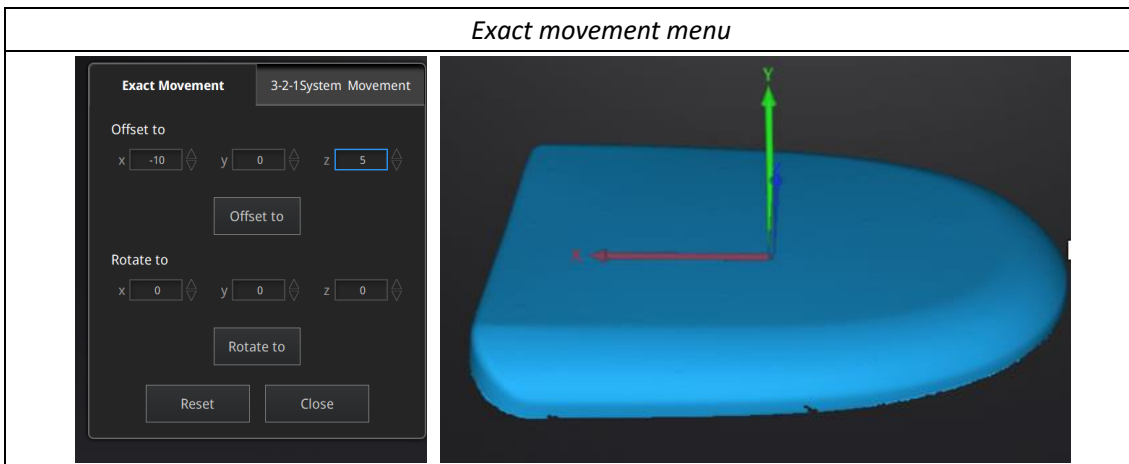
Enter the value in mm and degrees, click **Apply** to match the data origin to the input coordinate and orientation.

The arrows represent the global coordinate system, Red=X+, Green=Y+, Blue=Z+.

Click **Reset** to cancel the transformation to original position.

Click **OK** to confirm the transformation.

Tips:

- Start from data reposition (offset to 0,0,0).
- Edit rotations prior to transformation.
- Change the view normal to a reference plane to change the corresponding angle.
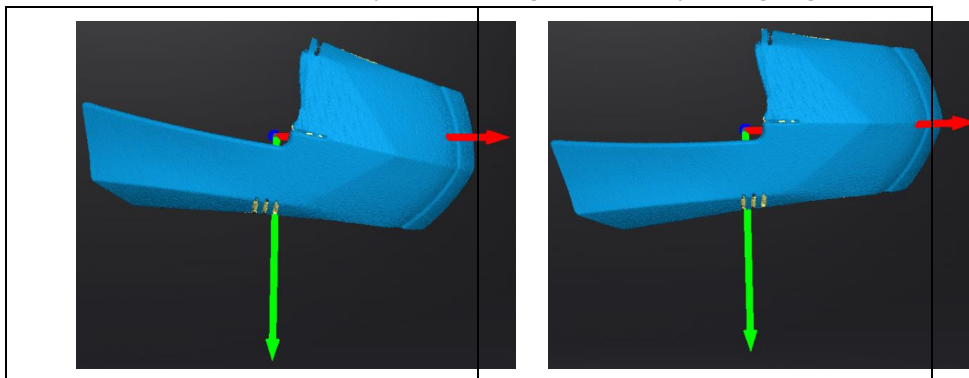
✚ 3-2-1 Movement

Prior to 3-2-1 movement, the creation of a plane, line not normal to the plane and point are required.

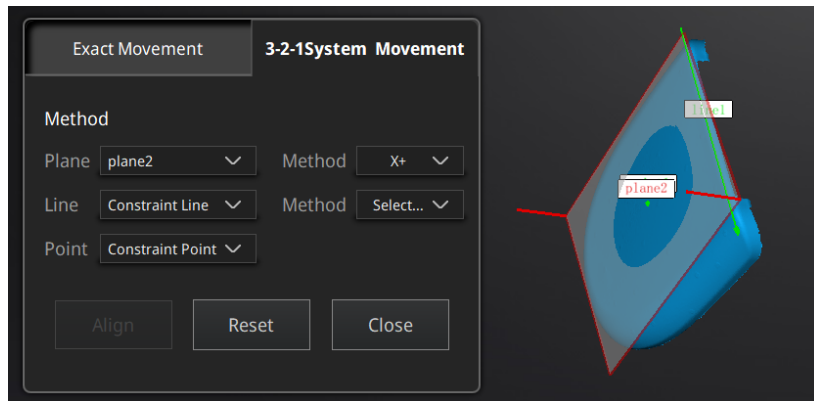3-2-1 movement (plane-line-point alignment) aligns the data by deletion of the Degrees of Freedom.

The arrows represent the global coordinate system, Red=X+, Green=Y+, Blue=Z+.

- Select a Plane in the drop-down menu, match it to the first axis in the Method drop-down. The arrows on the corners of the plane represent the plane positive direction. The normal vector of the plane will match the axis direction.
- Select a Line in the drop-down menu, match it to the first axis in the Method drop-down. Beware the direction of the line to match it to the + or - axis. The projection of the line to the first plane will be parallel to the corresponding axis.
- Select a Point in the drop-down menu. The data will be translated to match the point with the origin point (coordinate 0,0,0).

Click **Align** to perform the transformation.

Data after 3-2-1 movement
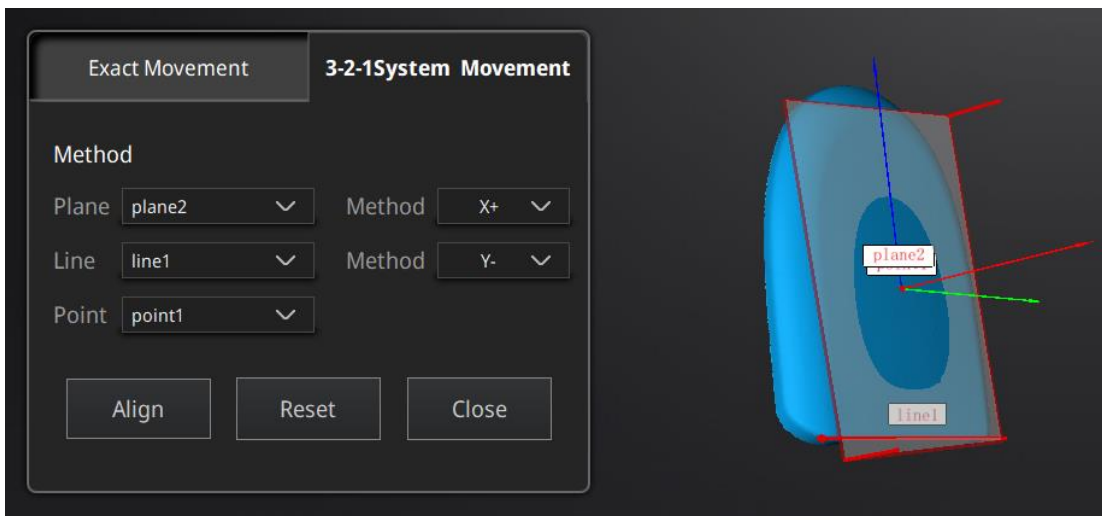
Click **Reset** to cancel.

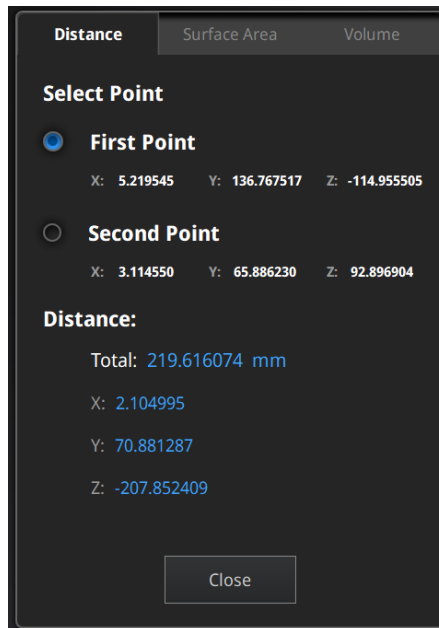Click **Apply** to confirm the transformation.

3.6.3 Measure

Click [icon] measurement button to display the menu, click again to close the menu.

DISTANCE

This tool calculates the distance between two points belonging to the surface of the data.

Click on the data to pick the first and second point, select one of the two points to redo it.

Distance menu

Total is the 3D distance, X, Y and Z are the projection of the segment to the respective planes.

➕ **SURFACE AREA**

Press **Shift+ LMB** to select an area, press **ctrl + LMB** to unselect.

Ctrl + A to select all.

Click **Calculate** to display the Area value of the selected data in mm^2

Redo the selection and click calculate again to update.

If "Select Through" is enabled, the sum of the surface area of the selected area and the surface area projected to the corresponding surface will be calculated.

Surface area menu
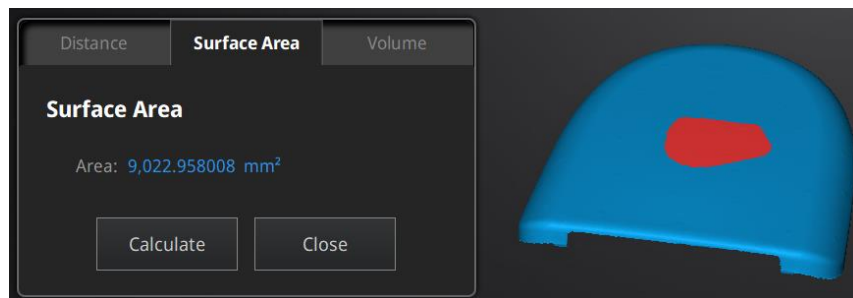
➕ **VOLUME**

This tool calculates the volume contains in a watertight mesh.

It returns the volume in mm^3 and the coordinates of the smallest box, parallel to the global coordinates, containing all the data.

Volume menu
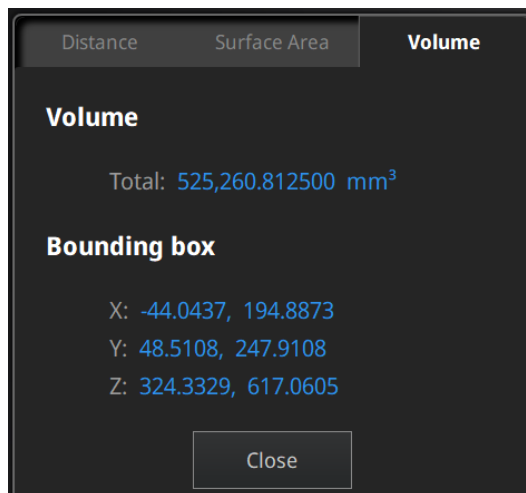
File not watertight alert
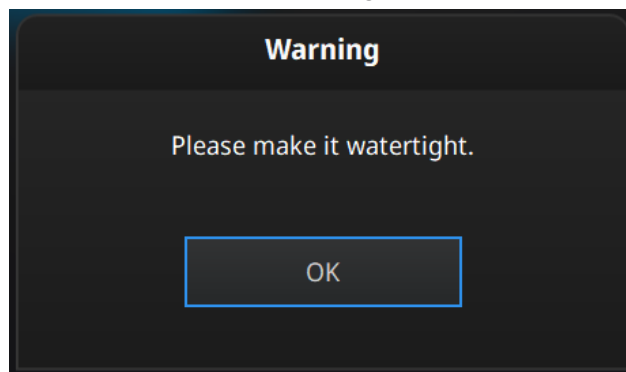
☒	Enter/exit the measurement interface

Click the "Measure" button to enter the measurement interface and display the measurement menu, click the button again to exit the measurement interface.

3.7 Save

3.7.1 Save Data

💾	Save data.

Enter the file name and click the save button.

Export data

First select the saving path, enter the file name, and select the file type. The files for non-texture scanning is to be saved as stl by default and, files for texture scanning is saved as obj by default. At least one type is required to be selected.

The default saving path is the desktop.

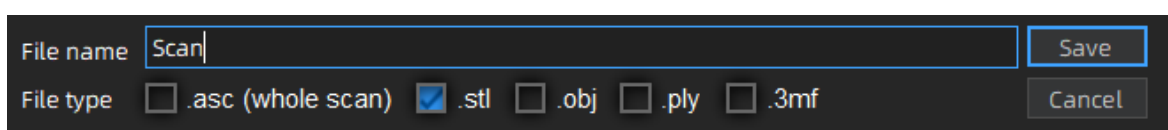| Format	Types of data	Save as	Recommendation
ASC (single piece) (suitable only for fixed scanning)	Single point cloud, alignment performed	scan_0.asc scan_1.asc scan_2.asc etc…	● Check the data; ● Quick export (post-processing not needed); ● Post-processing can be done through other software.
ASC (whole piece)	Optimized point cloud	scan.asc	● Check the data; ● Quick export (no need for post-processing for handheld scanning); ● Post-processing can be done through other software.
STL	Mesh data	scan.stl	● 3D printing; ● Reverse designing; ● Compatible with most post-processing software.
OBJ	Mesh data	scan.obj scan.jpg scan.mtl	● Used in artwork; ● 3D rendering; ● Compatible with most post-processing software.
PLY	Mesh data	scan.ply	● The file is small; ● Easy for texture editing.
3MF	Mesh data	scan.3mf	● The file is small; ● Compatible with Microsoft 3D printing software.
P3	Markers file	scan.p3	● Universal framework point file of Einscan software; ● Identifying the positional relationship between markers.

3.7.2 Share Data

 Share data.

Click the Share button to upload the mesh data to Sketchfab.

The scanned model can be shared to the Sketchfab website, where the title, username and password are required to be provided. You can register an account on the Sketchfab (http://sketchfab.com) to view the shared models.

⚠ **Attention**:

The uploaded file is in stl format without texture.

3.7.3 Third-party Software

Five third-party software, including Geomagic Control X, Verisurf, Geomagic Design X, Geomagic Essentials and Solid Edge SHINING 3D Edition are included. Users can import scanned mesh data into the third-party software with one click.

Geomagic Control X

 Export data to Geomagic Control X

Mainly used for 3D inspection. If the Geomagic Control X software has been installed, clicking this button will open the Geomagic Control X software and import the mesh data.

Verisurf

 Export data to Verisurf

Mainly used for 3D inspection. If the Design with Verisurf software has been installed, clicking this button will open the Design with Verisurf and import the mesh stl data into Design with Verisurf.

Geomagic Essentials

 Export data to Geomagic Essentials

Mainly used for reverse design of mesh data. If the Geomagic Essentials has been installed, clicking this button will open the Geomagic Essentials and import the mesh data.

Geomagic Design X

|	
Dx	Export data to Geomagic Design X

Mainly used for reverse design of mesh data. If the Geomagic Design X has been installed, clicking this button will open the Geomagic Design X and import the mesh data.

Solid Edge SHINING 3D Edition

|	
◣	Export data to Solid Edge SHINING 3D Edition
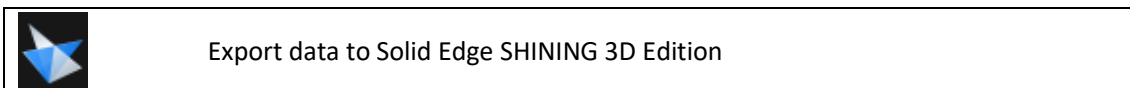
Mainly used for reverse design of mesh data. Solid Edge SHINING 3D Edition is a 3D CAD software. If Solid Edge SHINING 3D Edition has been installed, clicking this button will open the Solid Edge SHINING 3D Edition and import the mesh stl data into Solid Edge SHINING 3D Edition.

3.7.4 Preview Model

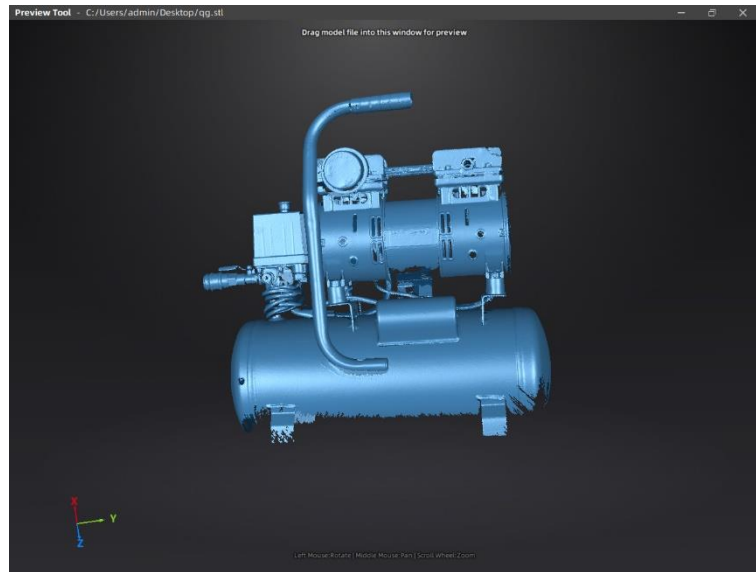|	
Preview Tool	Double-click the Preview Tool shortcut on the desktop
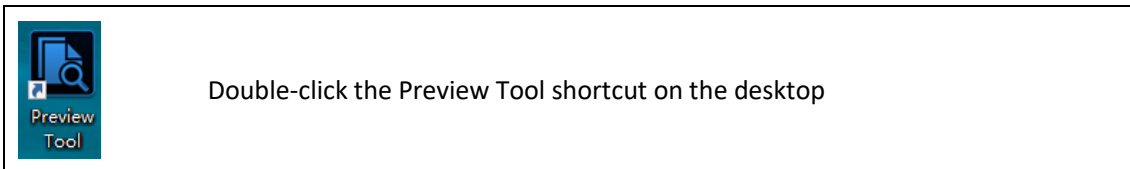
Or open the Model Preview Tool in the start menu, i.e., start menu>Shining3d_Freescan UE>Preview Tool

As shown in the figure below:
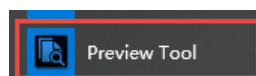
Drag the desired file into the Preview Tool to preview it:

Model Preview

STL, OBJ, PLY, ASC, and 3MF can all be previewed. However, files generated by third-party tools may fail to import, and the tool will prompt "Failed to import files".

⚠ **Attention**:

When importing Obj texture files, ensure that mtl and jpg sharing the same file name are under the same directory as obj.

3.8 Other Operations

Icons	Functions	Descriptions
	Official Website	Open the official website of Shining 3D to learn about the company's products and information.
	Facebook	Enter Shining 3D's facebook to view product introduction and other operations.
	Support Platform	Enter Shining 3D's support platform to view product introduction and other operations.
	Advanced mode	After checking this option, the point distance can be selected as 0.05 when creating a new project.
	User Experience	To help us improve the quality and user experience of device, we hope to be allowed to collect usage experience information. This information will not contain your personal

		information or scanned data, and will not be accessible to any third party. The User Experience Enhancement Program will continuously keep you informed with the newest software update information, to assure you get free software updates and enjoy the latest improvements based on your collective feedback. If you close the User Experience Enhancement Program, you might not be informed with software updates automatically.
	Factory Default	All settings can be restored to the initial settings, and the software will automatically restart.
	Language	A language selection window pops up, allowing users to choose multiple languages.
	About	View related software release information, contact information, etc.
	Open help mode	Open the real-time help file.
	TeamViewer	The quick access to remote assistance. Please send the ID and password in the pop-up window to the technical supporters for remote assistance.

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