SCANTECH™

Composite 3D Scanner KSCAN-Magic/MagicII

User Manual

V1.02

2021.03

Introduction

Please read user manual before start.

After reading, keep it safely for next time review.

Notice

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Basic label

This manual will use the following labels to describe different significance, so please red carefully and make sure understand all of labels.

Danger	Fail to obey the announcement will cause dangerous situation or injuries and deaths
Warning	Fail to obey the announcement may cause dangerous situation or injuries and deaths
Caution	Fail to obey the announcement may cause minor injury
Attention	Fail to obey the announcement may damage product or surrounding

Safety Announcement

Notice	During scanning process, must obey announcement and use product correctly

Please use it correctly

To avoid malfunction of the KSCAN series and to ensure proper use, please observe the following precautions.

Normal Announcement

Caution	➢ Before starting work, please confirm the function and performance of this product, and the equipment can operate normally. ➢ If the product malfunction, please turn off the power immediately for preventing other damage. ➢ Please don't change temperature suddenly during product use, otherwise condensation will cause equipment failure.

Attention	➢ For out of the working range, and modified products, the company does not guarantee its function and performance. ➢ When this product is combined with other equipment, it may not be able to satisfy the function and performance depending on the conditions of use and the environment. Therefore, please pay attention to it before use.

Operation Announcement

Warnings	➢ Please choose the correct power supply voltage. Otherwise malfunction will cause failure or fire. ➢ Please do not disassemble or modify the unit. Otherwise malfunction will cause failure or fire.

Attention	➢ In order to use this product properly and safely, please try to avoid the following places, otherwise it may cause malfunction. ● high humidity or dust; ● Corrosive or flammable gas; ● Splashes of water, oil, chemicals; ● static electricity. ➢ Dirty dirt, water or oil stains may affect the use of the product and cause measurement deviations; ● When it is attached to the surface of the product glass: blow off the dirt with clean air. When the soil is dirty, wipe it off with a soft cloth dampened with alcohol. ● When it is attached to the surface of the object: please blow off the dirt with clean air or wipe off the dirt with a clean soft cloth. ➢ If the measuring object vibrates, it may cause a deviation in the measured value. ➢ After turning on the power, wait about 5-10 minutes before use. Since the circuit will not stabilize immediately after the power is turned on, the measured value may be deviated.

Accident Announcement

Attention	➢ Turn off the power immediately when the following phenomenon occurs. If you continue to use it, it may cause equipment failure. ● Water or foreign matter inside the device; ● The device is dropped, or the casing is damaged;

	● The device emits smoke or an unusual smell.

Storage Announcement

Attention	➢ Do not wipe the product with a damp cloth, volatile oil, thinner, etc. Otherwise, the product may be discolored or deformed. When the soil is dirty, use a cotton cloth to remove the diluted neutral detergent, wring it out, wipe it, and then wipe it off with a soft cloth. ➢ Please try to avoid the following places for storage; ● high humidity or dust; ● Corrosive or flammable gas.

Laser Safety

The laser wavelengths of the KSCAN-Magic/Magic II are as follows:

Type	KSCAN-Magic/Magic II
Blue wavelength	450nm Laser Output, Pavg: <1mW
Infrared wavelength	850nm/940nm Laser Output, Pavg: <1mW
Green wavelength	520nm Laser Output, Pavg: <1mW

This product is classified as Class 2M Laser Product according to IEC 60825-1.

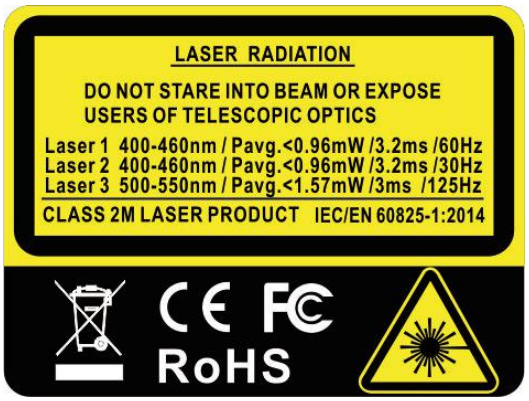
Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

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

Warnings	➢ If you do not control and adjust according to the procedures specified here, you may injure the human body (eyes, skin, etc.). Therefore, please be sure to observe the following items. ➢ About Class 2M laser products： ● Please don't stare at laser and specular light； ● Please do not intentionally point the laser towards people, especially the eyes； ● Please pay attention to the reflected light path of the laser. The laser will be specular and diffuse. If there is danger of being reflected by the reflected light, please cover the reflected light with a baffle； ● Do not use a concentrator, magnifying glass or microscope to observe the laser output within 100mm. ➢ This product does not have a mechanism to turn off the laser irradiation when disassembling. Please do not disassemble it.

Warning Label

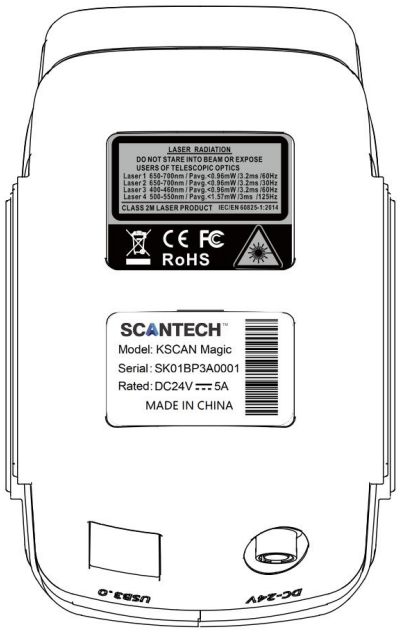
All bottom of products come with **IEC** warning label like this:



Identifier Label

An ID label is affixed on the product as below.

Label placement



Contents

1 Introduction to Handheld 3D Scanner

1.1 Product Overview

Handheld 3D scanners typically include a light source (laser or white light, etc.), a structured light projector, two (or more) industrial cameras, a computing unit for 3D digital image processing,and a calibration plate for calibrating the above-described devices and attachments such as mark points. The industrial camera obtains the 3D data of the object based on the principle of machine vision, and uses the point information to automatically splicing the data to realize the basic 3D scanning and measuring functions. The handheld 3D scanner is easy to carry, free to use, and has great practicality.

The handheld 3D scanner produced by Hangzhou Sikan Technology uses multiple wire lasers to acquire the 3D point cloud on the surface of the object. The operator holds the scanner and adjusts the distance and angle between the scanner and the measured object in real time. The system automatically acquires the image. Measuring the 3D surface information of the object. The scanner can be easily carried to an industrial site or a production floor, and efficiently and accurately scanned according to the size and shape of the object being scanned and the working environment of the scan.

1.2 Product Series

The HSCAN series of handheld 3D scanners are the basic products. When scanning large objects, they can be used with the global photogrammetry system to eliminate accumulated errors.

Based on the above, the PRINCE series handheld 3D scanner has a red and blue two-color laser. It also has two modes: red light fast scanning and blue light fine scanning. The two modes can be quickly switched, scanning efficiency and local details can be obtained.

AXE series of handheld 3D scanners use a multiplexed lens and a built-in photogrammetric module to complete high-precision scanning of medium and large objects without any equipment.

KSCAN series 3D scanner with built-in red and blue two-color laser and photogrammetry system module, with global photogrammetry, red light fast scan and blue light fine scan mode, greatly optimized the maximum scan size and scanning accuracy, providing a full-size solution from 0.02m to 10m industrial measurement. The scanner supports contact measurement, which can acquire high-precision 3D data of key parts such as hole position, plane and boundary. The supporting ScanViewer software is equipped with measurement and analysis functions such as tube measurement and deformation detection, providing efficient, reliable and comprehensive 3D measurement technology support for product design and inspection professionals.

This manual mainly introduces the use of KSCAN series 3D scanner (hereinafter referred to as KSCAN scanner, KSCAN or scanner).

1.3 Working principle

The KSCAN scanner is an instrument that uses the binocular vision principle to obtain a spatial 3D point cloud. The working position is obtained by using the mark points to obtain the spatial position of the scanner and the measured object, and the laser light is emitted by the laser emitter to illuminate the surface of the

workpiece to be scanned, and then the industrially calibrated industrial camera captures the reflected light, and is calculated. Shape data of the workpiece.

KSCAN includes infrared band and blue band. One of the infrared band is adopted by the photogrammetry mode, the other and the blue light band are used by infrared and the blue laser modes respectively. There is a certain angle between the two cameras of the scanner. The fields of view of the two cameras intersect to form a common field of view, and also it's called the reference distance, while the common focal range is called the depth of field. In general, the reference distance and depth of field of the scanner are related to the instrument, and the specific values are subject to the actual test data of the equipment. And the laser band and the resolution also related to them. The common reference values are as shown in Table 1-1.

Table1- 1 Common reference values

Resolution	Reference distance	Depth of field
1.0	500mm	620mm
0.01	180mm	200mm

2 Precautions before using

This chapter provides a brief description of the product configuration,product structure, and device connections of the scanner.

2.1 Product Configuration

Remove the scanner from the outer packaging and verify that the following standard items are included in the safety enclosure.

Standard configuration:

■KSCAN 3D Scanner: The appearance is shown in Figure 2-1.

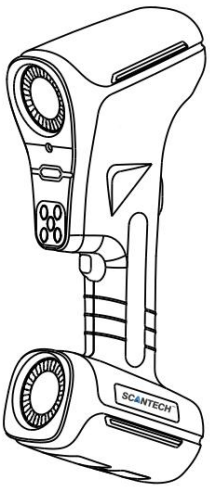


Figure2- 1 Composite 3D scanner

■Calibration plate: mainly used to calibrate camera parameters. To ensure good data quality, the camera needs to be calibrated before the scanner starts to use or when temperature changes or scan data quality is poor. The shape of the calibration plate is shown in Figure 2-2.

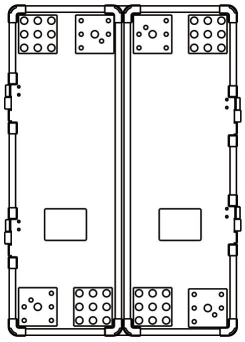


Figure2- 2 Calibration plate

■ USB cable: The DC interface is connected to the power adapter to supply power to the scanner;the Type A interface is connected to the computer and the scan data is transmitted to the computer; and the Type B interface is connected to the scanner. The shape is shown in Figure 2-3.

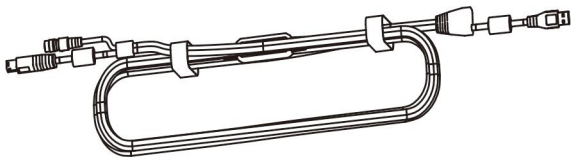


Figure2- 3 USB cable

■ Power adapter: Connect to the device via a USB cable to provide external power. The outline of the power adapter is shown in Figure 2-4.

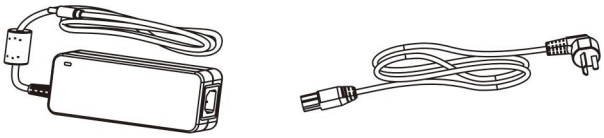


Figure2- 4 Power Adapter

■ Mark point box: There are several circular mark points in the box. The mark points are used for pasting on the scanned workpiece for scanner positioning, wherein the ϕ6mm mark point is used in the red light fast scan mode, and the ϕ3mm mark point is used in the blue light fine scan mode. The shape of the

marker box is shown in Figure 2-4.

Figure2- 5 point box

■12mm mark points: there are several Φ 12mm mark points in the waterproof box, which are used in the infrared remote scanning mode. The outline of it is shown in Figure 2-6.

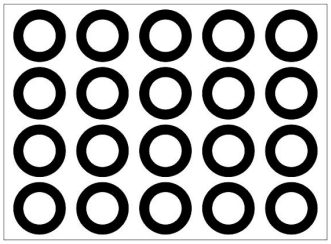


Figure2- 6 Φ 12mm mark points

■Coded mark points: refers to a set of points with certain alignment rules and coding information. In the global photogrammetry mode, the coded mark points are randomly placed on the workpiece to be measured, and the photogrammetry work is performed with the scale bar. Each coded mark point is a black-and-white point and consists of 7 reflective white circles. The software recognizes these coded points and displays their number. The outline of the coded mark is shown in Figure 2-7.

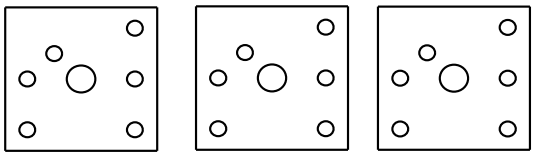


Figure2- 7 Coded mark points

■U disk and dongle box: used for device U disk and dongle. The shape is shown in Figure 2-8.

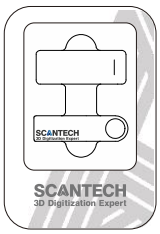


Figure2- 8 U disk and dongle box

■Paper documents: including packing list and product warranty card. According to the customer's request, a paper user manual can be attached (the default is electronic version, stored in the USB flash drive). The paper file is shown in Figure 2-9.

Figure2- 9 Paper documents

Notice	The specific model and quantity of optional accessories are subject to customer orders.

2.2 Product Structure

■The structure of the scanner product is shown in Figure 2-10.

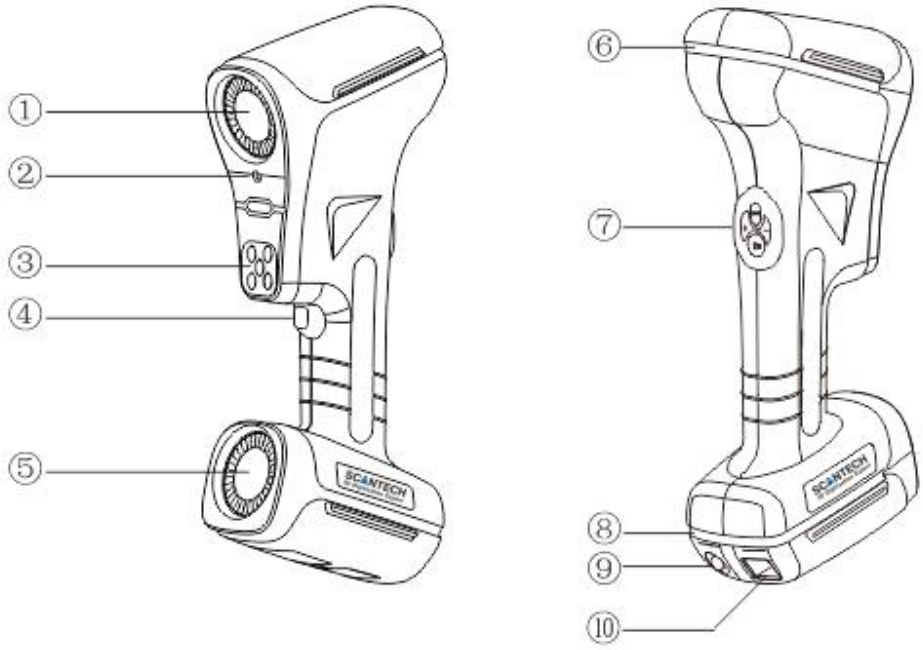


Figure2- 10 Product structure

①-camera A； ②-Indicating laser； ③-Laser transmitter； ④-Front button

⑤-camera B； ⑦-Rear button； ⑥、⑧-Indicator strip；

⑨-USB Cable power interface； ⑩-USB cable Type B interface；

■ The names and functions of some structural components are shown in Table 2-1.

Table 2- 1 Some component names and descriptions

Component name	Functions	
④Front button	Shooting buttons in the global photography system	
⑥ 、 ⑧ Indicator strip	Bright red: The scanner software is disconnected; bright green: the scanner is scanning at a normal distance; bright blue: the scanner software is connected; marquee: the distance is too large or too small when scanning.	
⑦Rear button	▷||	①Click—turn on/off scanning； ②Double-click - you can switch the laser line in multiple blue, single blue and infrared.
	M	①Click to switch the menu key function in order to adjust the zoom ratio, adjust the laser exposure parameters, and operate the view; ② After scanning the mark points, press the buttom M, then mark points will be optimized. After this step finished, then can do some scanning.
	+	①Under the adjust zoom function: zoom in view； ②Under the function of adjusting the laser exposure parameters: 0.5ms increase per exposure parameter； ③Under the action view function: adjust to the best view.
	-	①Under the adjust zoom function: zoom out view； ②Under the adjustment of laser exposure parameters: reduce the exposure parameter by 0.5ms per exposure； ③Under the action view function: press once to adjust to lock view, press twice to follow view.
⑨ USB cable power interface	Power connector for accessing the USB cable.	
⑩ USB cable Type B interface	Connect the USB cable Type B interface.	

Attention	⑦The function of all the buttons in the rear button works only under the condition that the scanning software is running.

2.3 Device connection

The device's connection includes two steps, such as connecting the power supply to the scanner and connecting the scanner to the computer. The cable includes a power adapter cable and a USB cable. The power adapter supplies power to the scanner. The USB cable has four interfaces, which are connected to the computer, power adapter and scanner. The connection is as follows (refer to Figure 2-10):

Step 1: Connect the USB cable Type A interface to the USB 3.0 port on the computer;

Step 2: Connect the USB cable power interface and Type B interface to the corresponding interfaces of the device. (When connecting, pay attention to the direction indicated by the arrow at the cable interface, otherwise the interface may be damaged);

Step 3: Connect the power adapter port to the DC interface of the USB cable.

Step 4: After checking the above steps, connect the power adapter to the power connector.

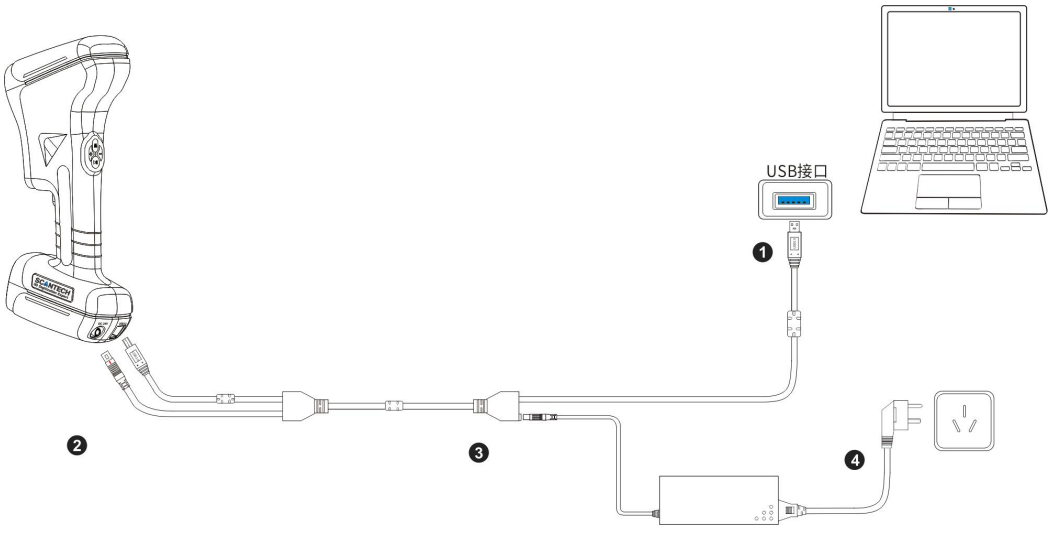


Figure2- 11 Device connection

3 Software installation

This product needs to install the scanning software ScanViewer. The following mainly explains the operating environment and installation steps required by the software.

3.1 Computer configuration requirements

The scanning software performs real-time processing on the scan data transmitted in real time during the scanning process, and selecting the appropriate hardware configuration can effectively improve the working efficiency of the entire scanning system. Refer to Table 3-1 for the computer parameter configuration requirements for installing the scanning software.

Table 3- 1 Computer parameter configuration requirements

Project	Recommended configuration
CPU	Intel Xeon W-10885M @ 2.40GHz
RAM	32G DDR4 3200MHz
Memory	Nvidia Quadro RTX 3000，Independent 6G
Interface mode	USB3.0
Operating system	Win10 Pro

The software installation packages to be installed before the device is used is Scanner X.X.X - MagicXX.exe.

Notice	X.XX in 3D Scanner X.XX.exe is the software installation package version number. The version number may be changed later due to software upgrade. It is subject to change without notice.

3.2 Scanning Software Installation

3.2.1 Install 3D Scanner

This section describes the steps for installing the scanning software 3D Scanner X.XX.exe. Here, the installation to the Windows 10 system is used as an example.

■Right click on the 3D Scanner X.XX.exe installation package, select Run as administrator, and click “Next”, as shown in Figure 3-1.

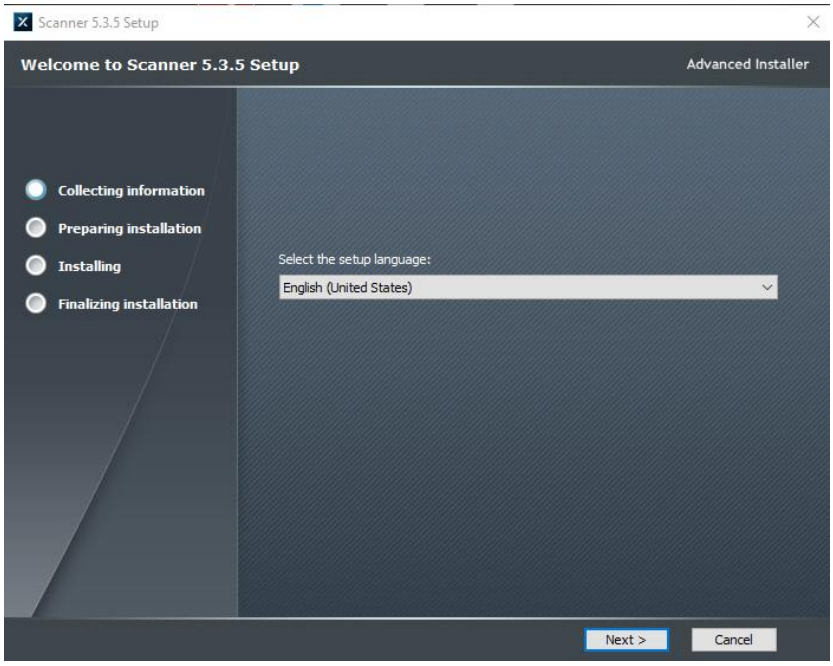


Figure3- 1 Install 3D Scanner

■Select the installation directory and click “Next”, as shown in Figure 3-2.

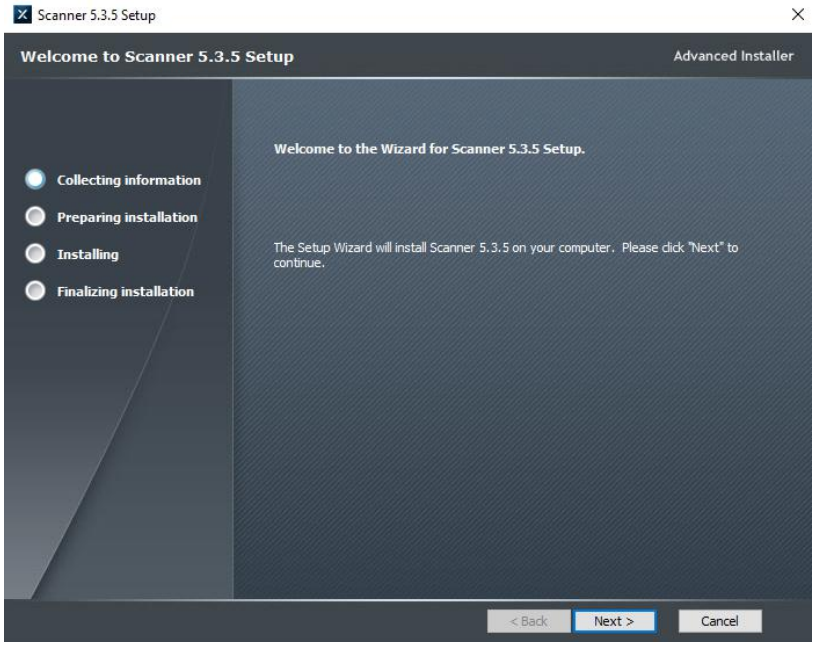


Figure3- 2 Install 3D Scanner

■Choose a directory for installation and click “Next”, as shown in Figure 3-3.

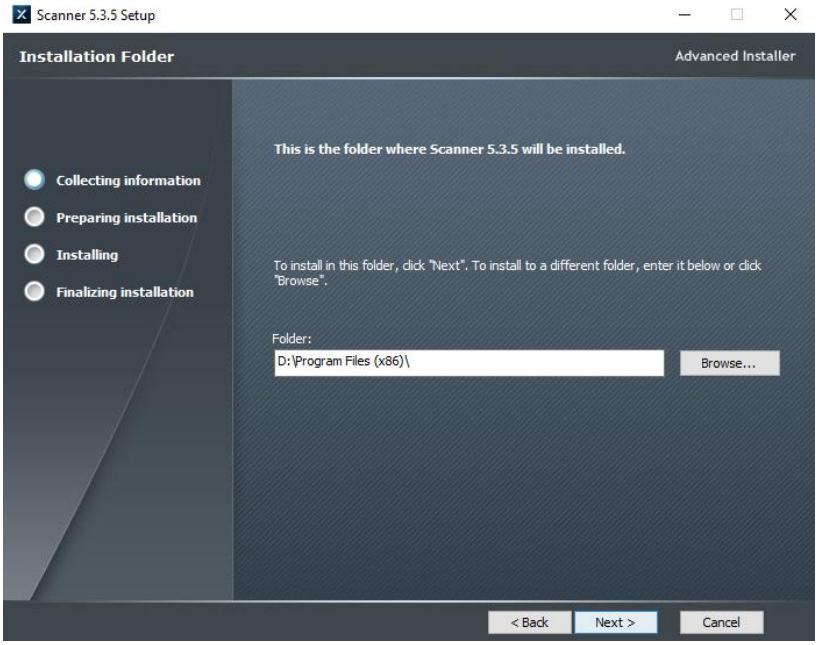


Figure3- 3 Install 3D Scanner

Attention	The 3D Scanner scanning software cannot be installed in the Program Files folder of the C drive.

■Click “Install”, as shown in Figure 3-4.

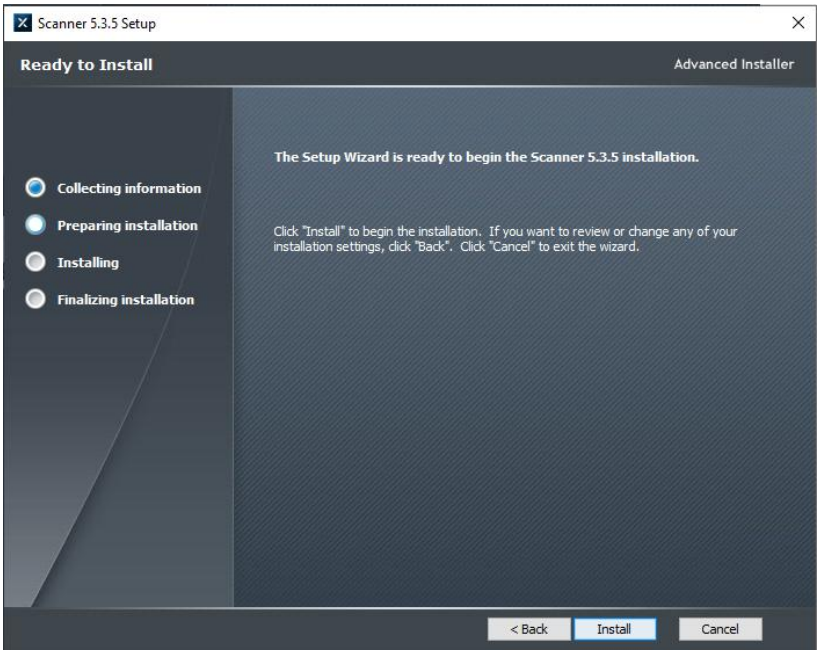


Figure3- 4 Install 3D Scanner

■The installation process as shown in Figure as shown in Figure 3-5.

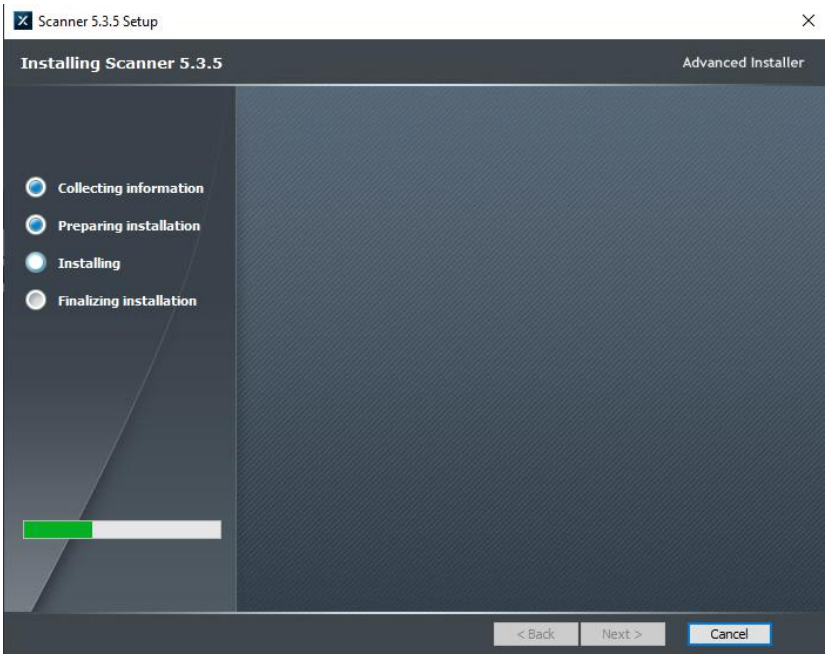


Figure3- 5 Install 3D Scanner

■After the camera driver is installed, click “Finish” to complete the installation of Scanner X.XX.exe. After clicking “Finish”, as shown in Figure 3-6.

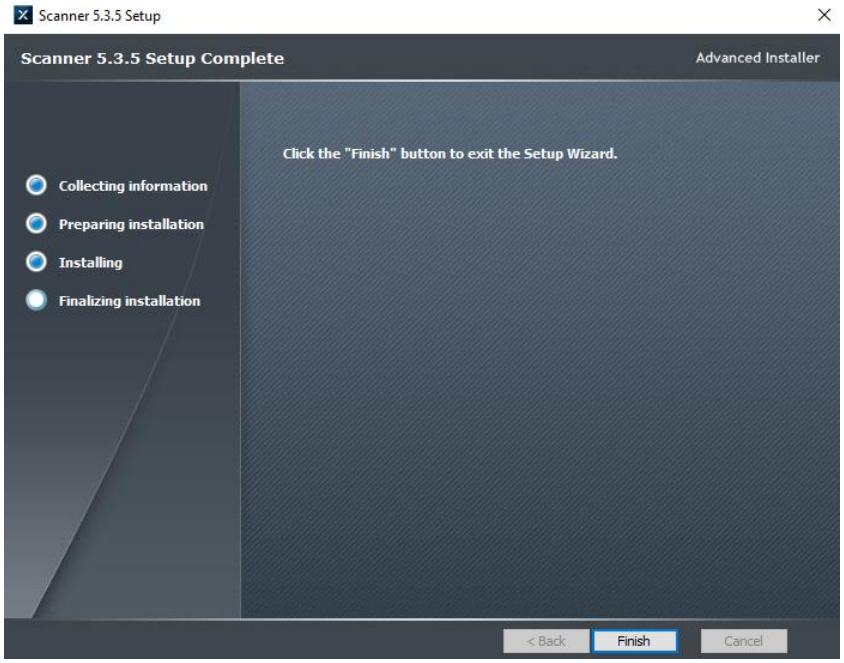


Figure3- 6 Install 3D Scanner

3.3 Software Uninstallation

To uninstall the software or reinstall the software, you can enter the software name to start uninstalling; enter the computer "Control Panel - Uninstall Program", select the corresponding software and uninstall (Figure 3-7).

Figure3- 7 Uninstallation

3.4 Software Running Environment Settings

After the installation of the scanning software is completed, in order to ensure the smoothness of the software usage, it is necessary to set the running permission of the software:give the scanning software administrator permission to run, and put the scanning software into the graphics card to run.

Give administrator permission to run: Right-click the scan software shortcut icon, click "Properties", select the "Compatibility" tab in the pop-up properties window, check the "Run this program as an administrator" option, click "Change Settings for all users", after checking "Run this program as an administrator" in the pop-up dialog box, click the "OK" button. As shown in Figure 3-8.

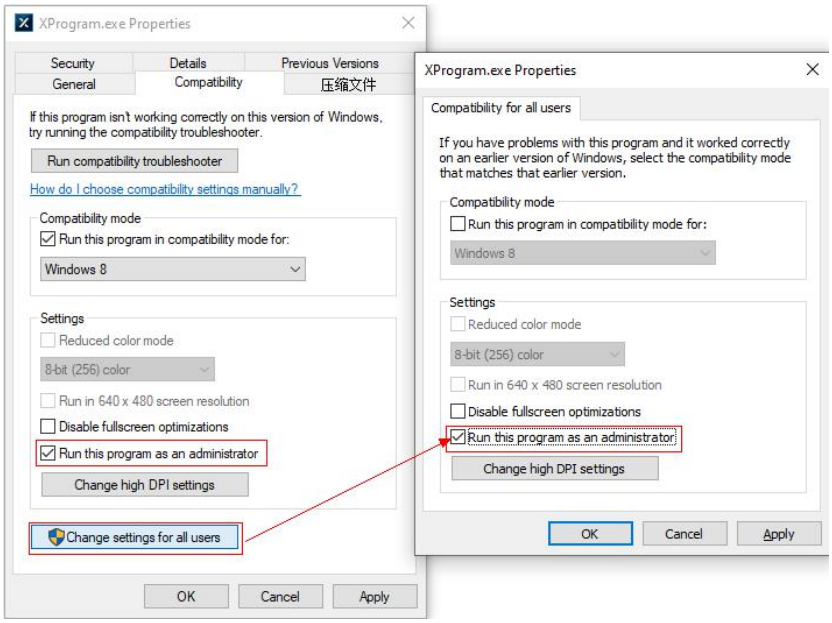


Figure3- 8 Give administrator permission to run

Put into the graphics card to operate (take NVIDIA graphics card as an example):Right-click the mouse in the blank space of the desktop, select "NVIDIA Control Panel" in the pop-up menu, in the NVIDIA Control Panel that opens, select "Manage 3D Settings" - "Programs" Settings - "The preferred

graphics processor for this program" option - select "High Performance NVIDIA Processor" (if you don't have this option, just skip it.) - "Add" - "Scanviewer.exe" - "Apply". As shown in Figure 3-9.

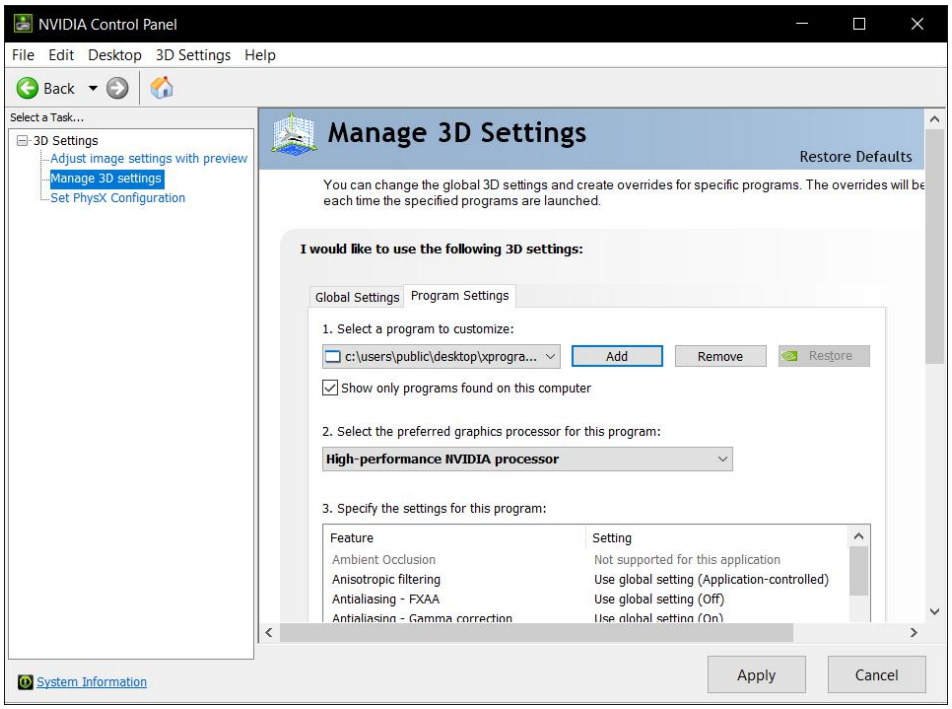


Figure3- 9 Put into the graphics card to operate

Follow the steps above to put the "Glopho.exe" installer into the graphics card (Figure 3-10).

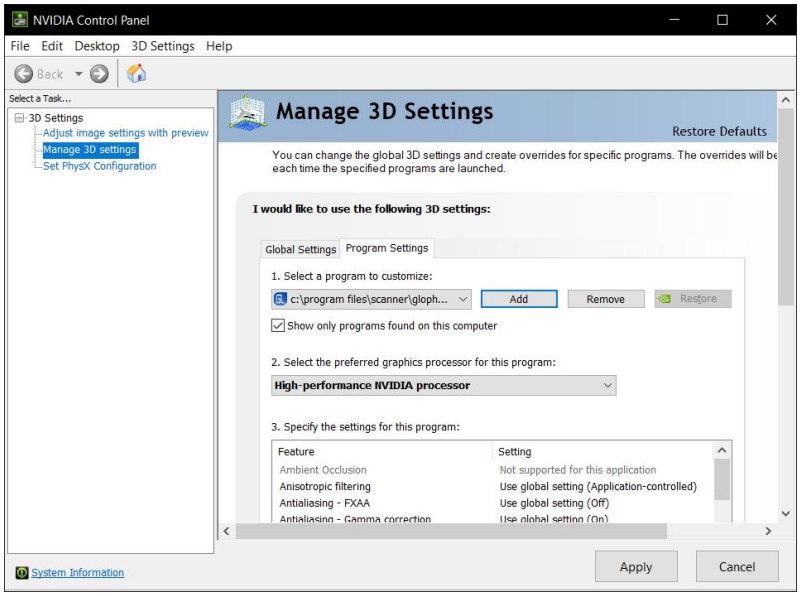


Figure3- 10 Put into the graphics card to operate

At this point, the scan software installation settings are all completed. Restart the computer and plug in the dongle to start the software. The software startup interface (Figure 3-11), select “SV” to enter the laser scanning work, and select “GL” to enter the photogrammetry work.

Figure3- 11 Select work

3.5 Managing File Configuration

After starting the ScanViewer scanning software, you need to manage file configuration. There are two main ways to manage file configuration:

■ Replace the RGF file

Open the ScanViewer scanning software and click "Menu Bar - Other - Device Management - Replace Authorization File" to replace the RGF file in the U disk provided with the KSCAN scanner. When the device license is about to expire, the software will pop up a prompt box to replace the valid RGF file by clicking "configuration license". As shown in Figure 3-12.

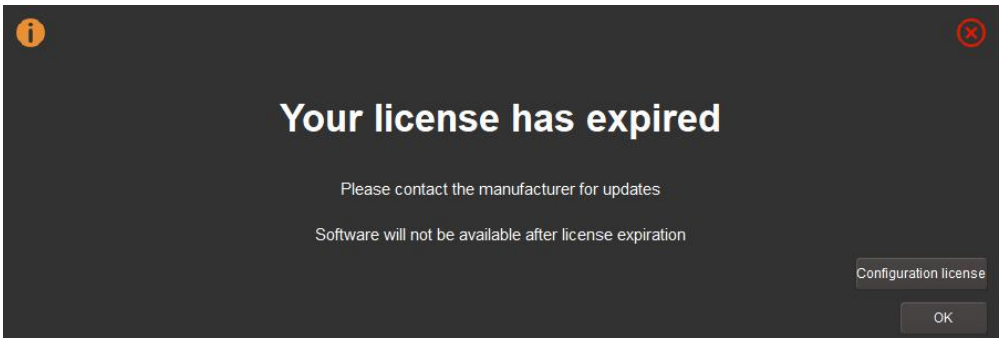


Figure3- 12 Authorization prompt box

■Replace the authorization folder

Open ScanViewer scanning software, click "Menu Bar - Other - Device Management - Replace Authorization Folder", and replace it with "Backup - LowPartSW-SETXXXX (Product Model)" in the U disk provided with the KSCAN scanner.

Notice	When photogrammetry software needs to change the configuration of management files, right-click the software shortcut "Open the configuration of files", open the Glopho folder, and replace the authorized folder.

4 Basic Operation Process

This chapter focuses on the mode selection of the KSCAN series, the photogrammetry operation flow and the scanning operation flow.

4.1 Mode Selection

The KSCAN series of composite 3D scanners are equipped with red and blue two-color laser and photogrammetry system modules, including global photogrammetry, red light fast scanning and blue light fine scanning. Please select the appropriate working mode according to the measured object (refer to Table 4-1).

Table4- 1

Name	Mode	Object Size	Resolution	Accuracy
Glopho(GL)	Photogrammetry	Medium and large workpiece measurement	/	0.02mm+0.025mm/m
ScanViewer(SV)	Blue light fast scan	Medium and large workpiece scanning	0.050mm	0.02mm+0.035mm/m
ScanViewer(SV)	Blue light fine scan	Large workpiece with small features	0.010mm	0.01mm+0.035mm/m
ScanViewer(SV)	Infrared scan	Medium and large workpiece scanning	> 1.0mm	0.02mm+0.035mm/m
ScanViewer(SV)	Deep hole	workpiece with special features	/	0.02mm+0.035mm/m

4.2 Photogrammetry Operation Process

4.2.1 Targets

Targets in photogrammetry operation refers to put coded markers and uncoded markers on the object which would be measured.

The requirements for pasting uncoded markers are as follows:

The spacing between each two mark points is 30mm to 250mm, which is determined according to the actual situation of the workpiece. If the surface curvature changes little, the distance can be appropriately larger, and the maximum distance is 250 mm. If the workpiece features more curvature changes, the distance can be appropriately reduced, and the minimum distance is 30 mm. As shown in Figure 4-1.

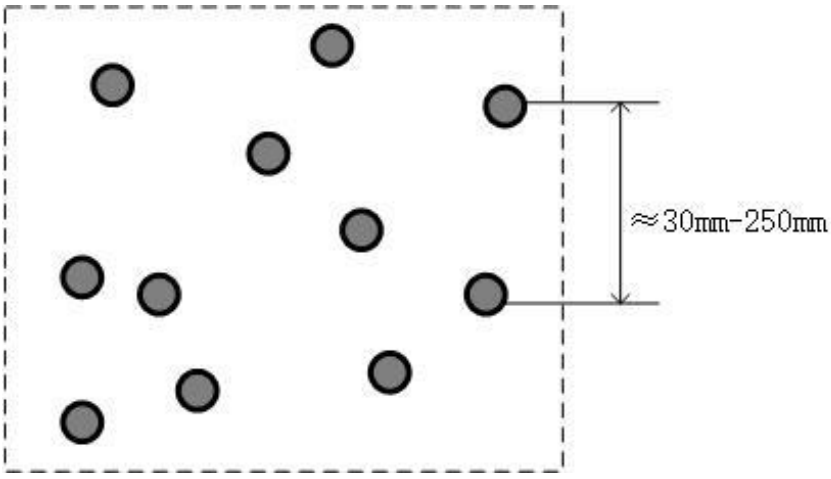


Figure4- 1 Pasting uncoded markers

Note that the mark points should be randomly distributed to avoid regular arrangement (Figure 4-2). Because the scanner is relatively positioned by identifying the position structure composed of the marker points, if the marker points are arranged regularly, the probability of reading errors at the marker point position is increased, thereby causing data acquisition errors.

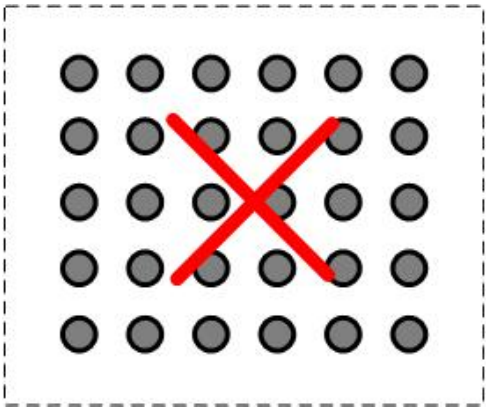


Figure4- 2 Error tipping

Mark points should not be pasted to the edge of the workpiece. In order to ensure the accuracy of the data quality, the position of the mark points on the workpiece will be deleted when the last point cloud data is output, forming a hole. Therefore, when affixing, the mark points must be more than 2mm away from the edge, which is convenient for later data repair processing.

In addition, the mark points should not be soiled, hidden or damaged. If it is necessary to spray powder (see 4.3.1 Workpiece Pretreatment for details), first spray the powder and then paste it.

The requirements for pasting coded points are as follows:

■ The coded points are randomly distributed to avoid alignment into regular lines.

■ At least 6 clear coded points can appear in each picture when shooting. Appropriate code points must be placed in a suitable, easy to shoot position. But it is not as much as possible. Too much will reduce the calculation accuracy.

■ The coded mark points cannot be placed overlapping with the reflective mark points, and different coded mark points cannot be overlapped.

4.2.2 Ruler placement

The ruler is a device that determines the overall accuracy of the photogrammetry, similar to the scale of the map. The KSCAN series of rulers are divided into two types: a short ruler on the left and right sides of the standard configuration quick-adjustment plate and an optional 1m ruler.

Short ruler: The length of the ruler is short, suitable for medium and large workpieces, and the accuracy is slightly worse than the long scale. Its shape is shown in Figure 4-3.

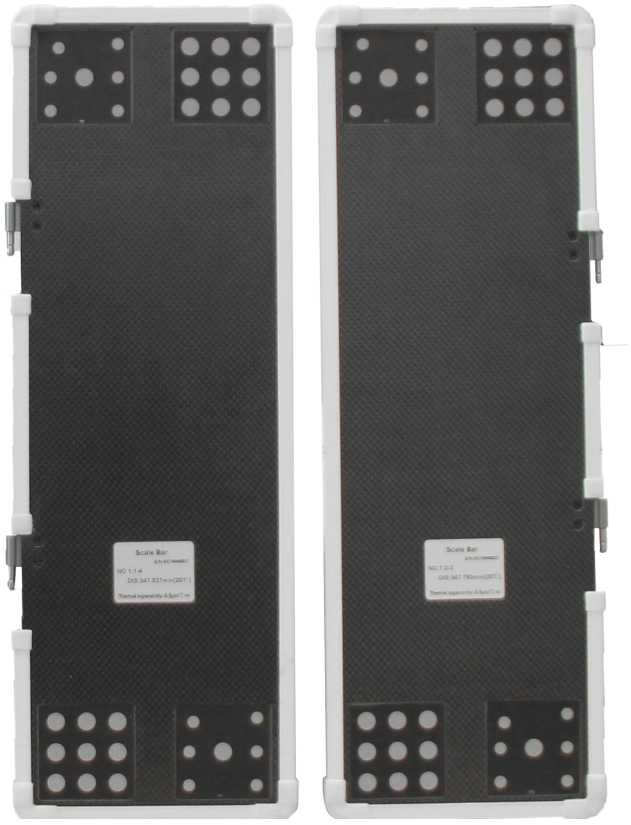


Figure4- 3 Short ruler

1m ruler: The length of the scale is 1m, which is suitable for medium and large workpiece shooting with high precision. Its shape is shown in Figure 4-4.

Figure4- 4 1m ruler

The placement of the ruler has an effect on the shooting result, so it is important to position the scale correctly. Pay attention to the following points when placing:

■ The position where the ruler is placed must be easy to shoot, and the placed ruler cannot be deformed.

■ The time for placing the ruler should be after pasting the reflective marker point and pasting the coded marker point.

Example of placement and the placement of 1m ruler is shown in Figure 4-5.

Figure4- 5 1m ruler

An example of coded points placement and standard ruler placement is shown in Figure 4-6.

Figure4- 6 standard ruler

Attention	When shooting large workpieces, the scale must be placed around the workpiece.

Attention	The reasons for the deformation of the scale are: the ends of the scale are squeezed, the weight is placed on the scale rod, and only the sides of the scale are fixed so that the middle portion of the scale is suspended.

4.2.3 Shooting process

After the targets and the rulers are placed, the workpiece can be photographed:

■ Open the KSCAN software, select “GL”photogrammetry, perform photogrammetry work, click “Toolbar-shooting”, enter the shooting interface, press the “front button” of the scanner (See 2.2 Product Structure for details of button position) Shooting, the color of the coded points will change between red-yellow-green, and the green represents best.

■Close the shooting interface and click Run，as shown in Figure 4-7.

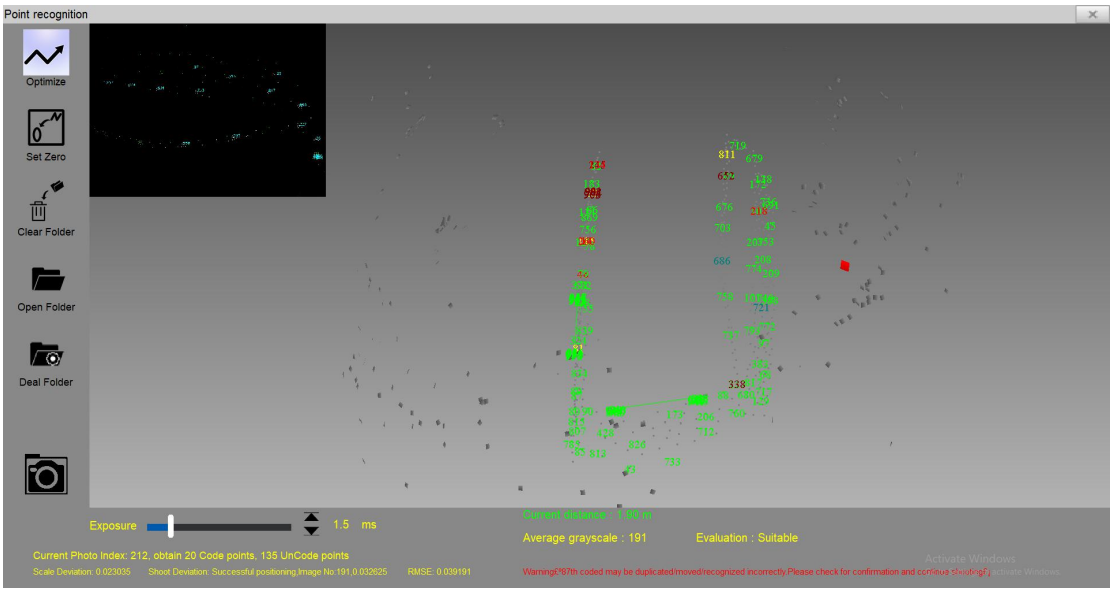


Figure4- 7 Shooting interface

■ In the 3D display interface, right click on the mouse and select “Export non-coded point” and save it, as shown in Figure 4-8. At this point, you can directly do some scanning with the targets from “File—Open ScanViewer Software”.

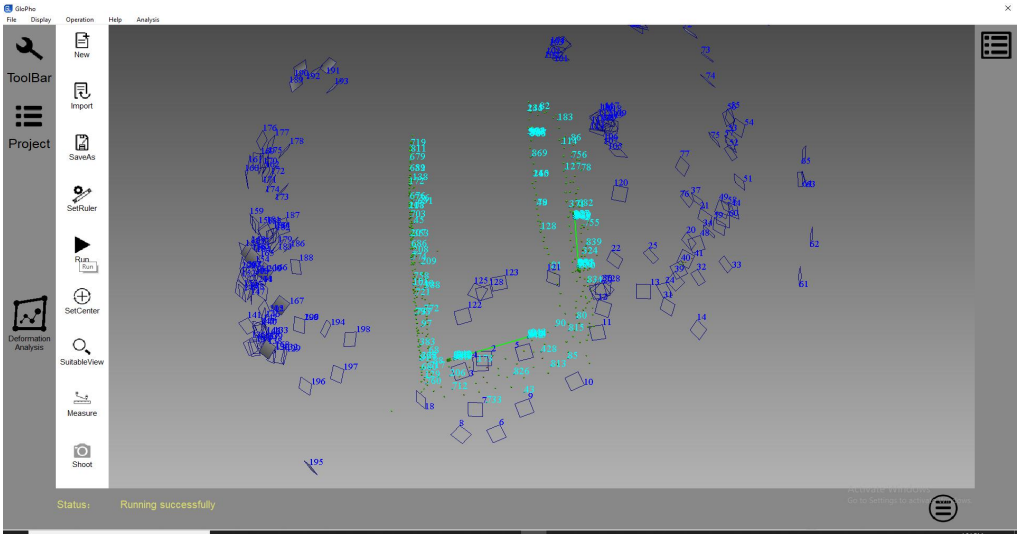


Figure4- 8 Operation results

■ Select the “File” menu and click “Open ScanViewer Software” to enter the ScanViewer scanning software. In addition to viewing the point file, you can also perform the next step of scanning the laser patch (dot). As shown in Figure 4-9.

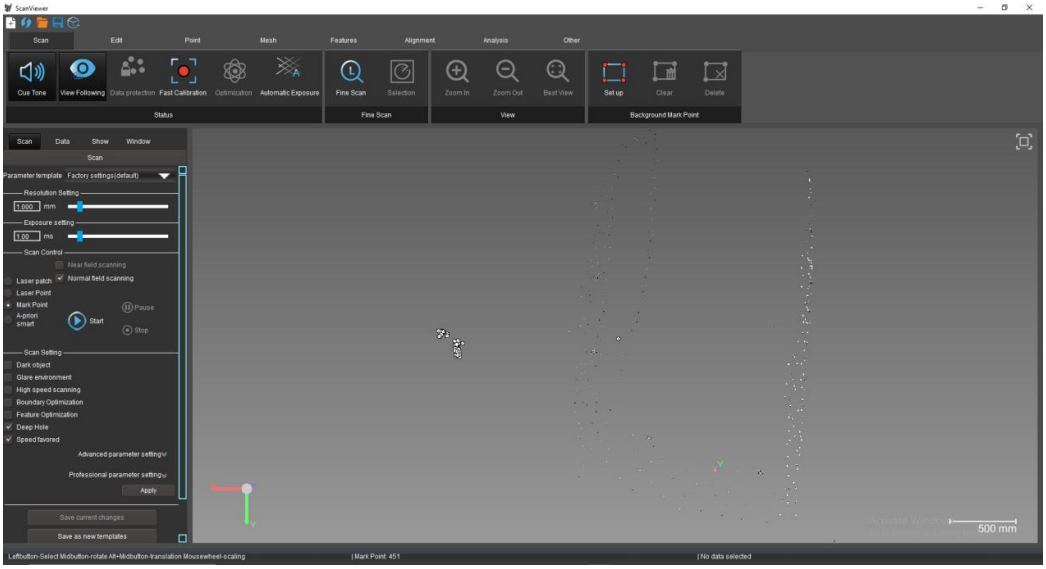


Figure4- 9 Export non coding points

The above is the basic operation flow of the photogrammetry. For the use of photogrammetry software, please refer to its user manual. The scanning operation flow is described below.

4.3 Scanning process

The scanning operation process includes: pre-processing of workpieces (see 4.2.1 points for details), quick calibration, pre-scanning points, and scanning laser patches (dots).

4.3.1 Workpiece pretreatment (optional)

The principle of the scanner is based on laser detection. Therefore, when the material or surface color of the scanned object is as follows, the scan result will be affected.

Transparent material: for example, glass. If the workpiece to be scanned is made of glass, the laser will penetrate the glass, so that the camera cannot accurately capture the position where the glass is located, so it cannot be scanned.

Osmotic material: for example, jade, ceramics, etc. For workpieces such as jade and ceramics, the laser line will penetrate into the object when it is projected onto the surface of the object, causing the position of the laser line captured by the camera not to be the surface contour of the object, thus affecting the accuracy of the scanned data.

Highly reflective materials: for example, mirrors, metal-processed high-reflective surfaces, etc., mirrors and other high-reflective materials produce specular reflections on light, which causes the camera to be unable to capture its reflected light at certain angles, so scanning data under these illumination conditions cannot be obtained.

Other materials or colors that affect the diffuse reflection of the laser: for example, dark objects, because the dark object absorbs light, the light information reflected to the camera is reduced, which affects the scanning effect. (Tip: The “dark object”scanning mode unique to Hangzhou Sikan Technology can effectively handle such scanning scenarios. For details, please refer to 5.2.2 Function Panel).

To scan the workpiece of the above materials, it is necessary to spray a contrast enhancer on the surface of the workpiece before scanning, so that the workpiece can diffusely reflect the laser light irradiated on the surface.

4.3.2 Quick calibration

After the scanner is connected, the device needs to be quickly calibrated using the quick calibration plate. During operation, the label on both sides of the calibration plate is oriented to the user. The user pushes slightly in the direction of the red arrow to open the quick-dead plates on the left and right sides, as shown in Figure 4-10.

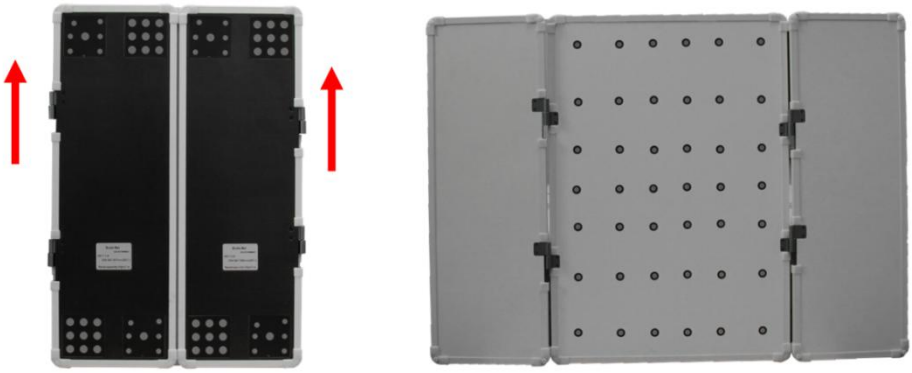


Figure4- 10 Open rule

Click “Fast Calibration” in ScanViewer (refer to 5.1 Introduction to Scanning Software Interface), and the “Fast Calibration” interface will pop up, as shown in Figure 4-11.

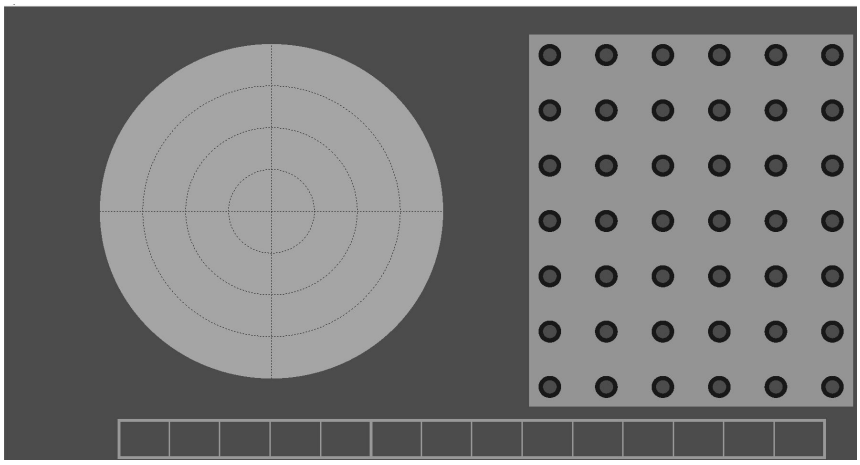


Figure4- 11 Fast Calibration

Place the calibration plate on a stable plane. The scanner is facing the calibration plate. The distance is about 400mm. Press the scanner to open the laser beam (take seven parallel lasers as an example), as shown in Figure 4-12.

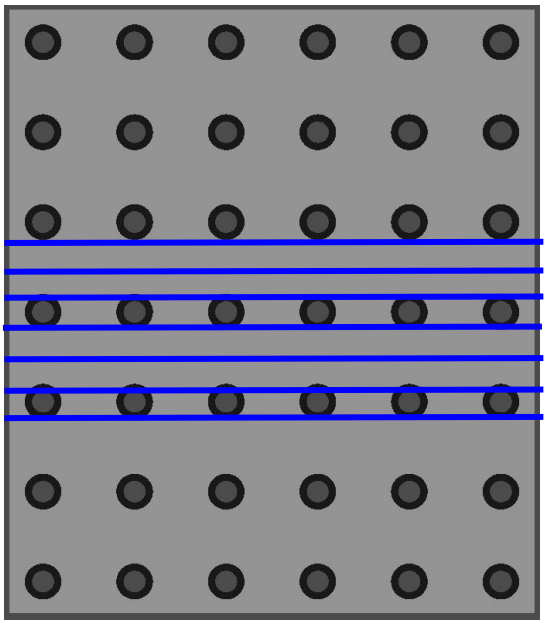


Figure4- 12 Fast Calibration

Control the angle of the scanner, adjust the distance between the scanner and the calibration plate, so that the shadow circle on the left side coincides; in the state that the left shadow circle is basically coincident, the angle is not changed, and the scanner is moved horizontally to make the right side The trapezoidal shadows coincide and then adjust the distance to match the size. As shown in Figure 4-13.

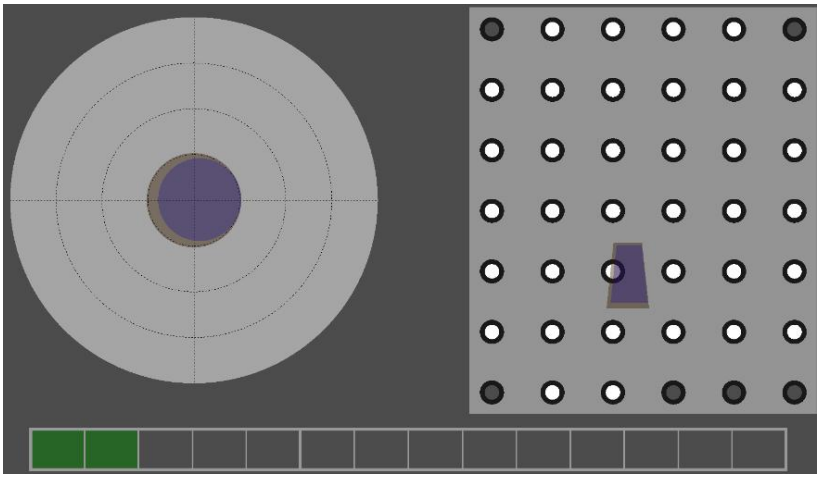


Figure4- 13 Fast Calibration

Gradually raise the device, after calibrating the vertical direction, perform 45-degree calibration on the right side, tilt the scanner to the right by about 45 degrees, and keep the laser beam between the fourth and fifth line markers to make the shadow Coincident, as shown in Figure 4-14.

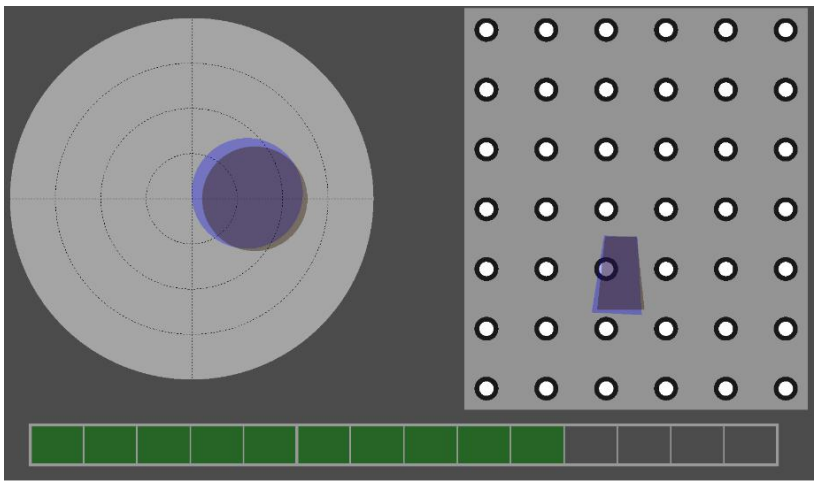


Figure4- 14 Fast Calibration

After the right side calibration, perform the left 45 degree calibration, tilt the scanner to the left by about 45 degrees, and the laser beam is kept between the fourth line and the fifth line mark point, so that the shadows coincide, as shown

in Figure 4- 15.

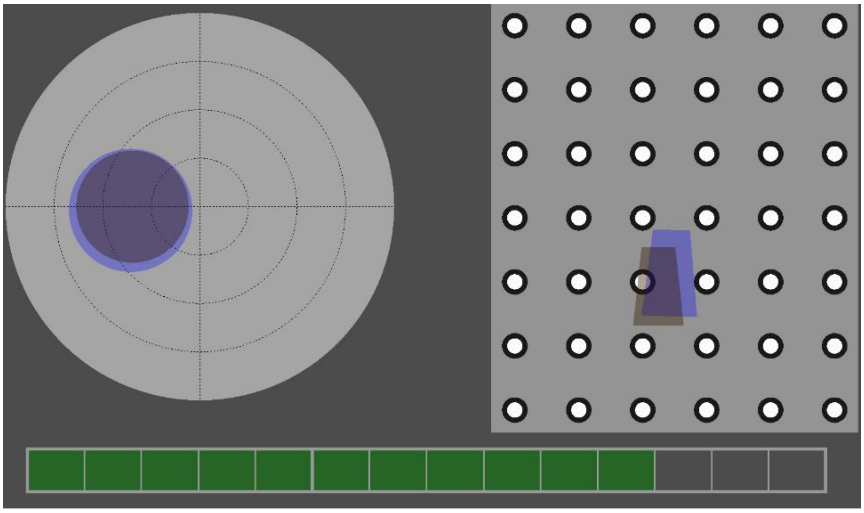


Figure4- 15 Fast Calibration

After the left side calibration, perform the upper 45 degree calibration, tilt the scanner upward by about 45 degrees, and the laser beam is kept between the fourth line and the fifth line mark point, so that the shadows coincide, as shown in Figure 4-16.

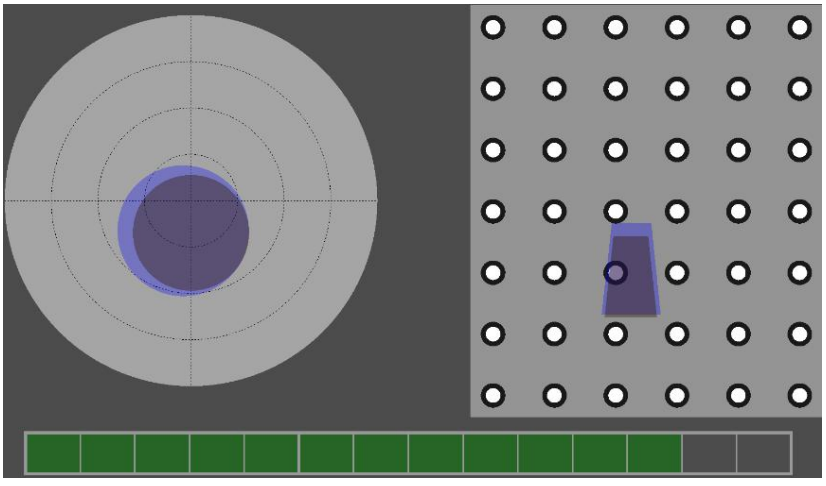


Figure4- 16 Fast Calibration

After the upper side is calibrated, the lower side 45 degree calibration is performed, and the scanner is tilted downward by about 45 degrees, and the laser

beam is kept between the fourth line and the fifth line mark point, so that the shadows coincide, as shown in Fig. 4-17.

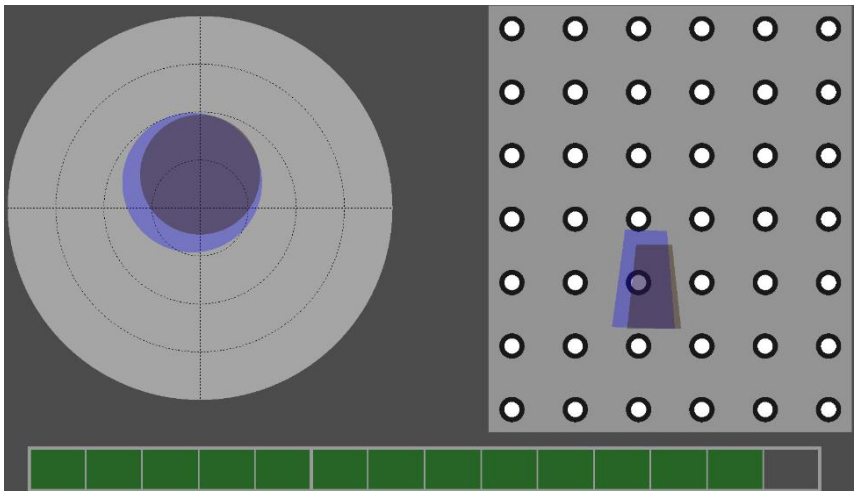


Figure4- 17 Fast Calibration

The calibration is completed, and the result is shown in Figure 4-18.

Figure4- 18 Fast Calibration

Attention	① During the rapid calibration process, there should be no other mark points near the calibration plate; ② Use the calibration plate to ensure that there are no other highly reflective objects nearby; ③ After the calibration is completed, keep the calibration plate and

	place it in the safety protection box.

4.3.3 Pre-scan points

Once the calibration is complete, you can start scanning. When scanning, first collect and scan the mark points on the surface of the workpiece to establish the coordinates and positioning of the workpiece. This step is called pre-scan points (this step can be skipped and scan laser patch (dot) directly.

The role of the pre-scan markers is to establish the positional relationship of each face of the workpiece, and to collect the positioned mark points, so that the subsequent scanning laser patch (dot) is easier to perform, and the transition from face to face is more convenient. Pre-scan points can use the software's point optimization function to increase the accuracy of the scan.

Click “Mark Point” and “Start” to start to scan the mark points. After the scanning is completed, click “Stop”-“Optimization”, as shown in Figure 4-19.

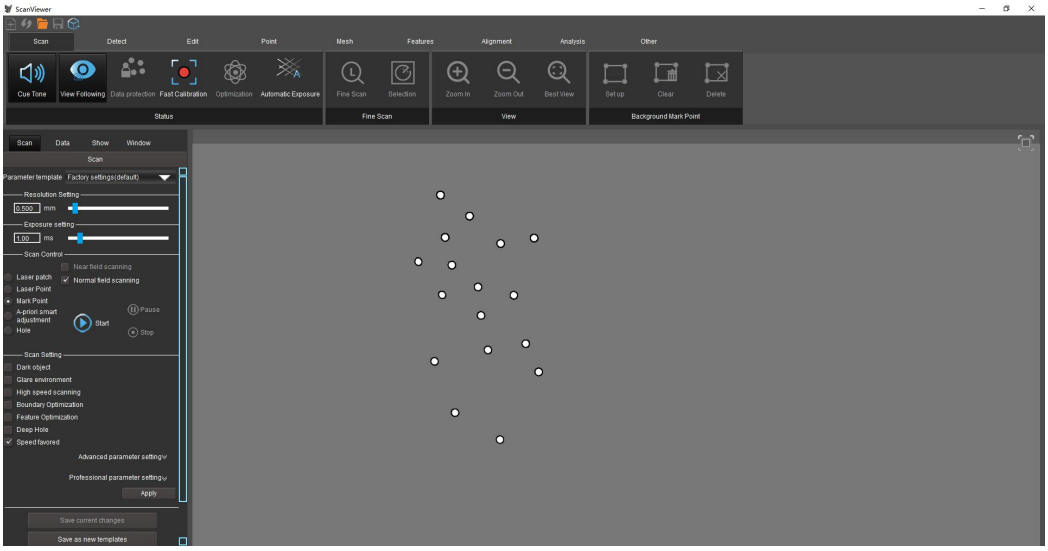


Figure4- 19 Pre-scan points

When pre-scan the mark points, you can use multiple angles to identify the mark points as much as possible, or you can directly click on the "smart mark point" to scan (the smart mark point scan does not require multiple angles). This is to provide enough calculation data for the point optimization, and the laser patch (dot) can be scanned after the point optimization is completed.

4.3.4 Scanning the laser patch (point)

Before scanning the laser patch (dot), you need to set the scan parameters (or use the default values of the parameters), such as scan resolution, exposure parameter settings, scan control, advanced parameter settings, and professional parameter settings.

When scanning the laser patch (dot), pay attention to the angle of the scanner and the distance between the scanner and the workpiece, move the scanner smoothly, and use the laser to collect the blank position data completely. After the scan is complete, click "Stop", the software starts processing the scanned data, waits for the data processing to be completed, and the laser patch (dot) scan ends. As shown in Figure 4-20.

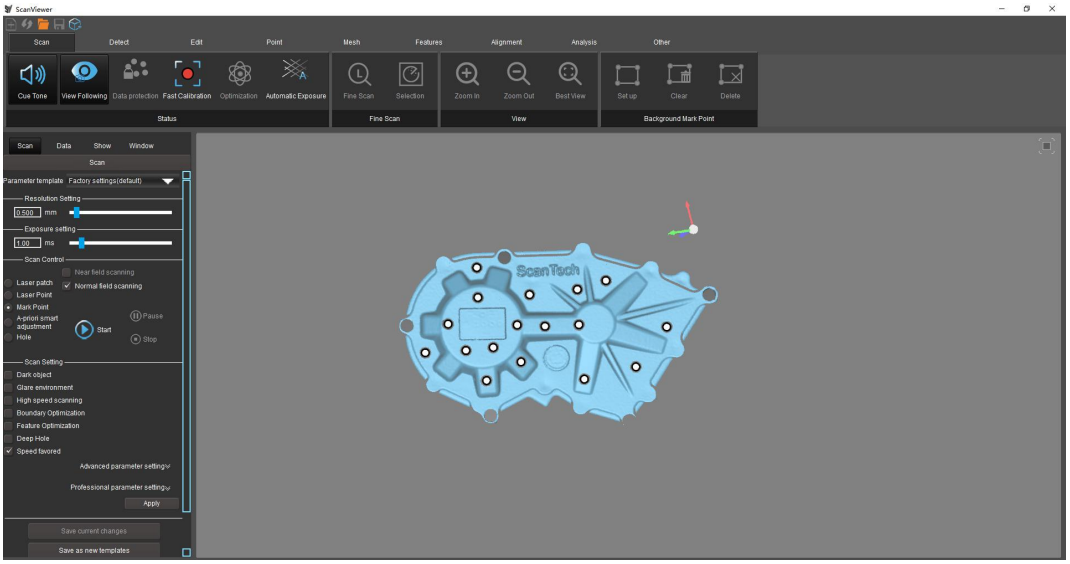


Figure4- 20 Scan data

After the scan is finished, you can save it as “project file, laser point file”, or click “dot”—“wrap” to optimize the operation. After the optimization is completed, you can mesh it . As shown in Figure 4-21.

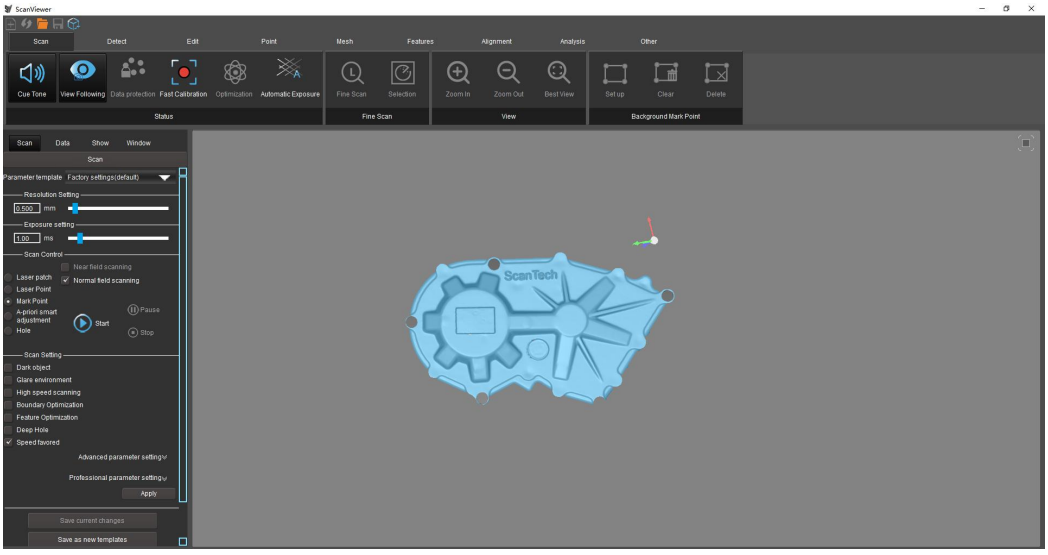


Figure4- 21 wrap

5 Cautions

The device must be connected using the USB3.0 data interface;

The device must be directly connected to the computer interface and cannot be plugged into an external USB hub;

If there is slight heat on the top and bottom of the device after prolonged use, it is a normal phenomenon and does not affect the use of the device;

If the computer is equipped with protection software (360 security guards, computer housekeeper, Windows Defender, etc.), scanning frame phenomenon may occur;

Do not remove the dongle during the use of the software.