SCANTECH™

Scanning Software

TViewer

User Manual

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1 Software Installation

This product requires the installation of the scanning software TViewer, the following is a description of the required operating environment and installation steps for the software.

1.1 Computer configuration requirements

Scanning software for real-time processing of scanning data transmitted in real time during the scanning process, the selection of the appropriate hardware configuration can effectively improve the efficiency of the entire scanning system. About the configuration requirements of the computer parameters for the installation of scanning software.

1- 1 Computer Configuration Requirements

Name	Recommended configuration	Minimum Configuration
CPU	I7 8cores 16threads	I7，6cores 12threads
Ram	32G	
Graphics Memory	4G	
Interface	USB3.0	
Operation System	Win10	

Software installation package TrackScanVX.XX.exe that needs to be installed before using the device.

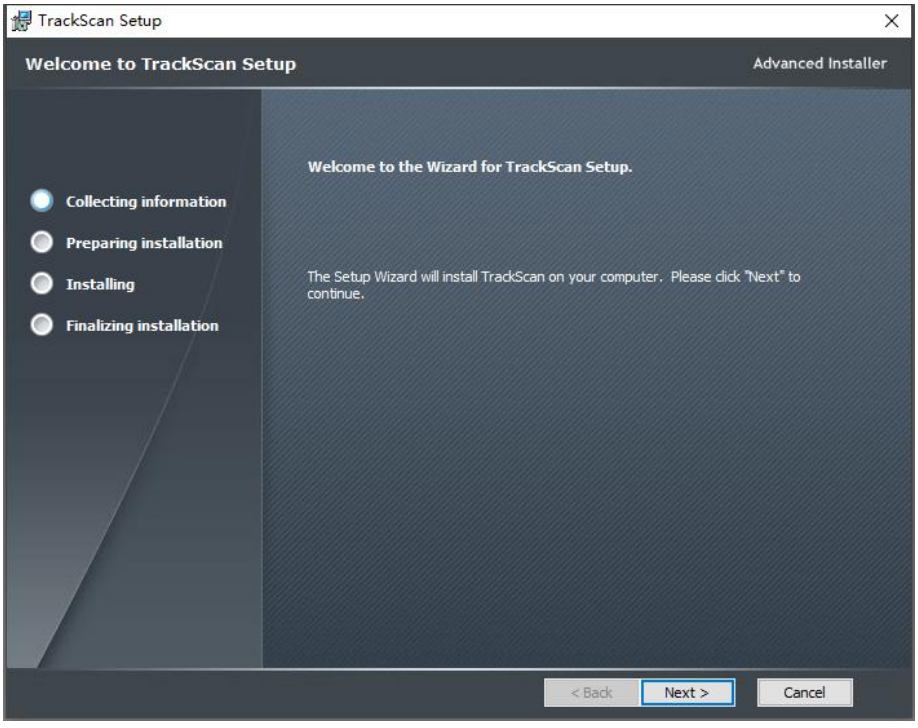
Notice	TrackScanVX.XX.exe in VX.XX for the software installation package version number, later may be due to software upgrades and version number changes, such as changes, without notice. EN is the language version corresponding to the installation package (English).

Attention	①Please close all anti-virus software before software installation; ②All software installations require administrator privileges.

1.2 Scanning software installation

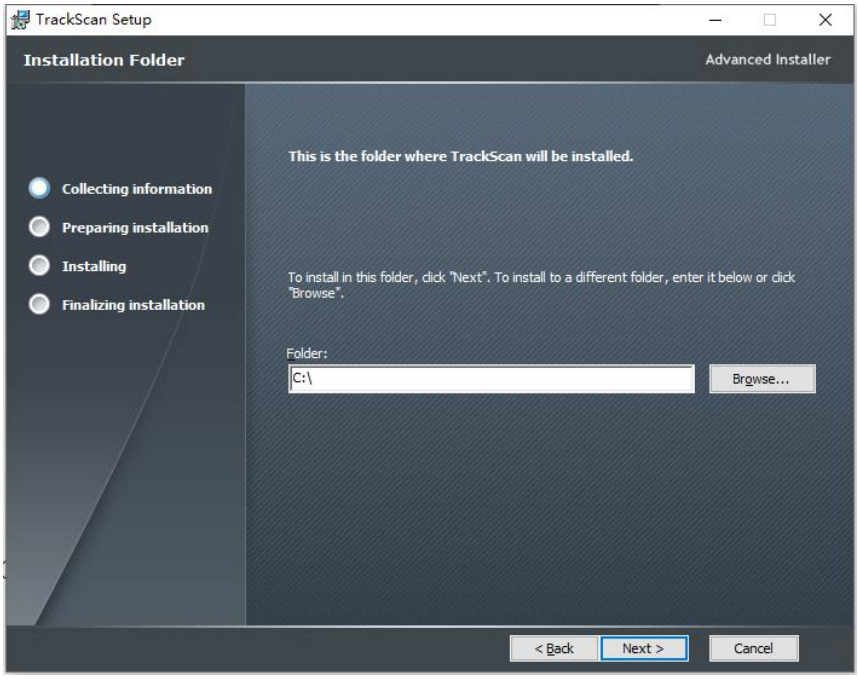
This section will scan the software TrackScanVX.XX.exe.installation package to install the computer steps to explain, here mainly to install to the Windows 10 system as an example to explain.

(1) Right-click on the TrackScanVX.XX.exe. installation package, select Run as administrator, click on "Next". As shown in Figure 1-1.



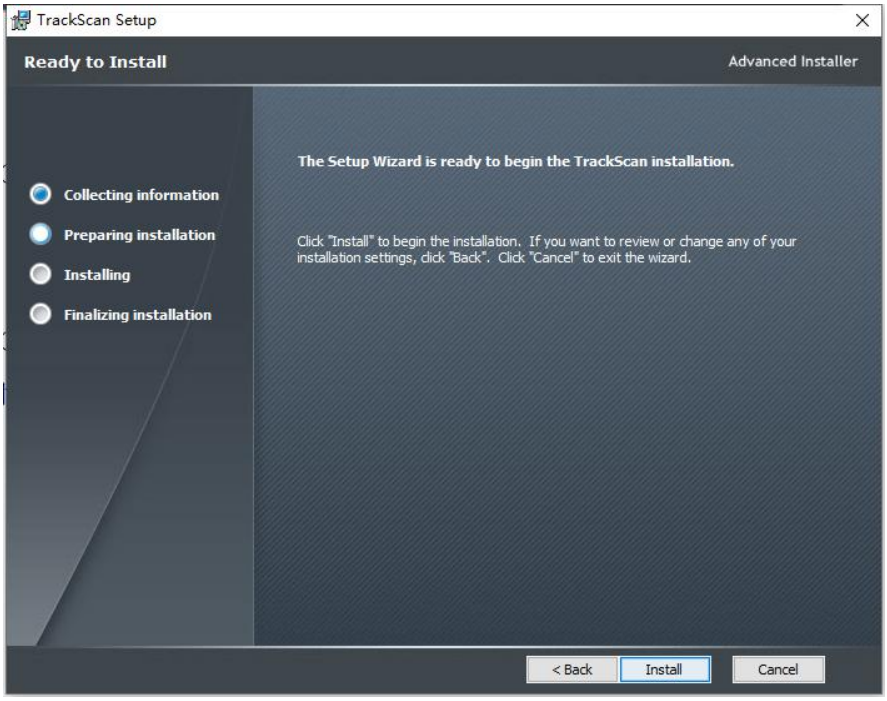
1- 1 TrackScanVX.XX Installation Steps

(2) Select the installation directory and click "Next". As shown in Figure 1-2.



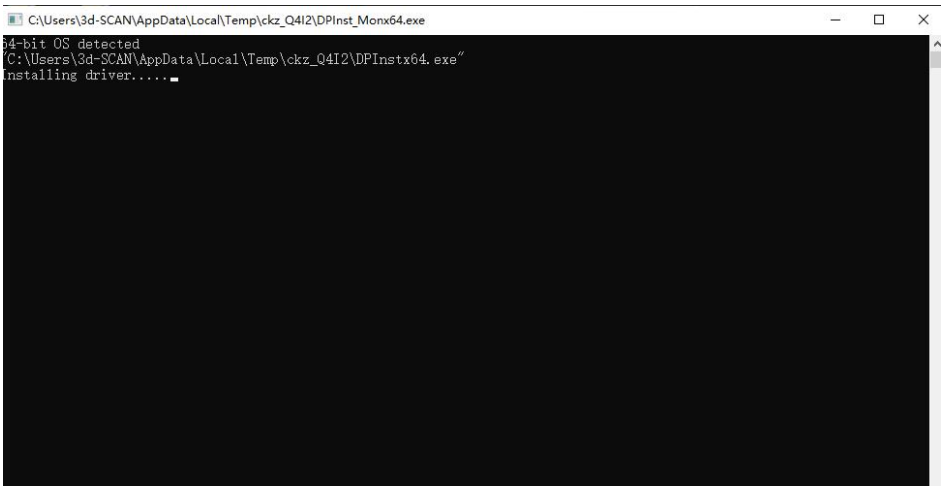
1- 2 TrackScanVX.XX Installation Steps

(3) Click "Install". As shown in Figure 1-3.



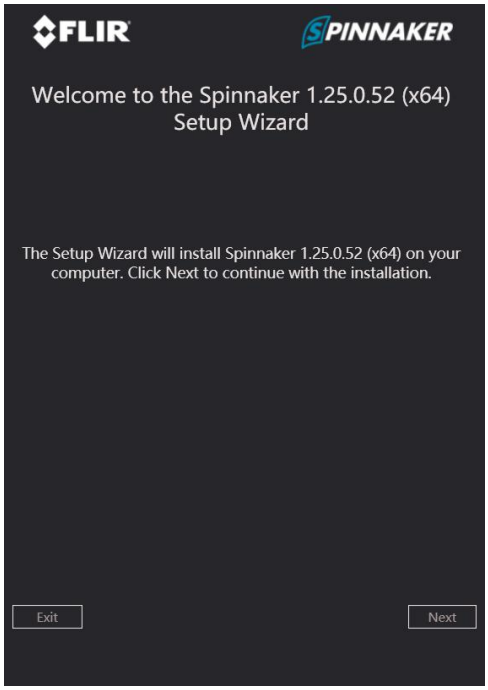
1- 3 TrackScanVX.XX Installation Steps

(4) During the installation process, a pop-up box will appear, when the box shows "Please press any key to continue", press any key on the keyboard to complete the installation. As shown in Figure 1-4.



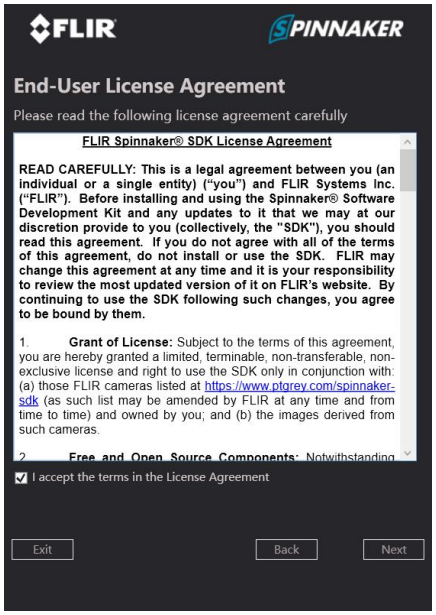
1- 4 TrackScanVX.XX Installation Steps

(5) The dialog box for installing the camera driver will pop up, click "Next". As shown in Figure 1-5.



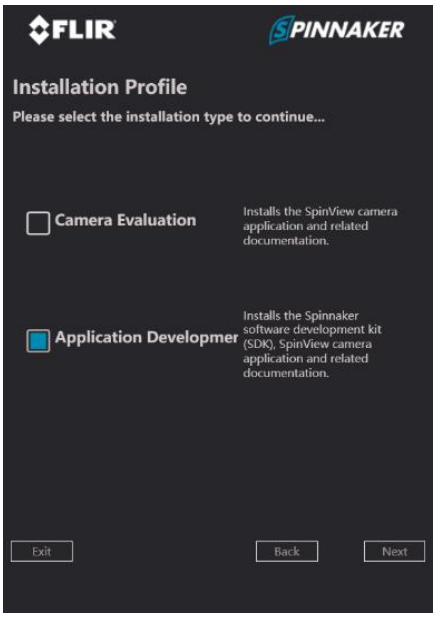
1- 5 Camera driver installation

(6) Click "I accept the terms in the License Agreement", and click "Next". As shown in Figure 1-6.



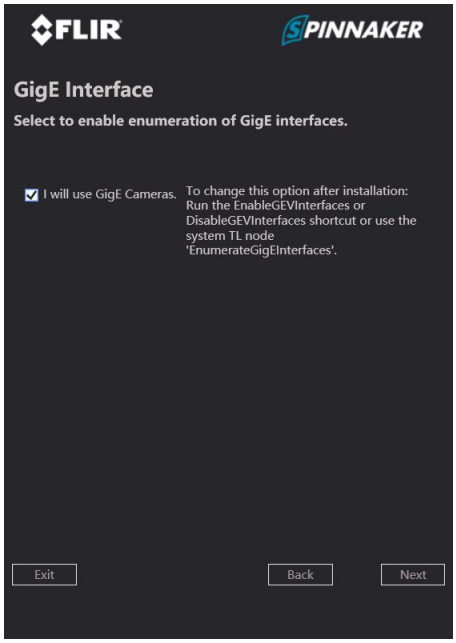
1- 6 Camera driver installation

(7) Then click "Next", select "Application Developmer" and click "Next". As shown in Figure 1-7.



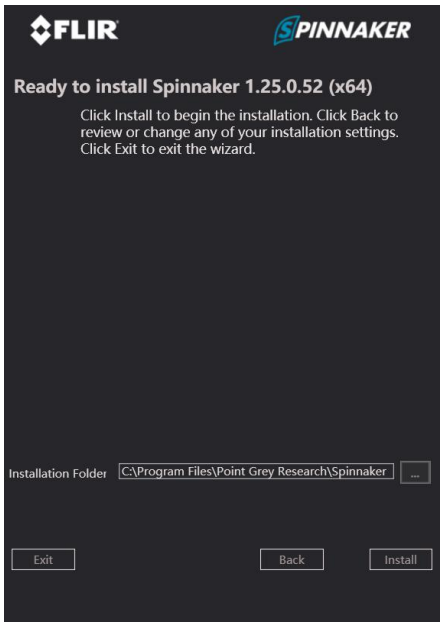
1- 7 Camera driver installation

(8) After clicking "Next", check the box "I will use GigE Cameras" and click "Next". As shown in Figure 1-8.



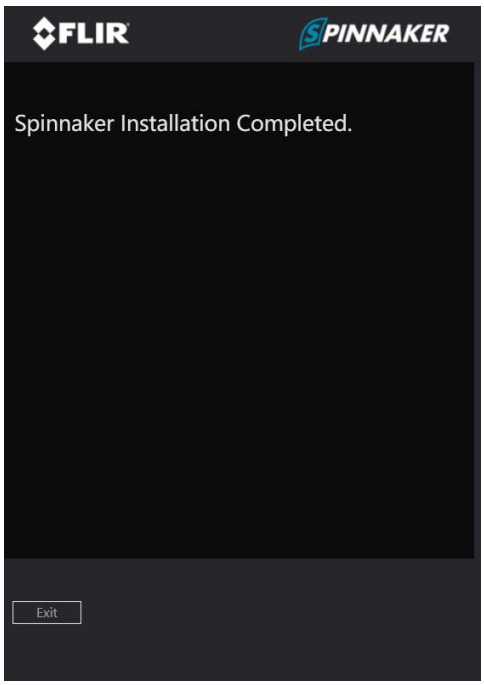
1- 8 Camera driver installation

(9) Click "Install" and wait for the installation to finish. As shown in Figure 1-9.



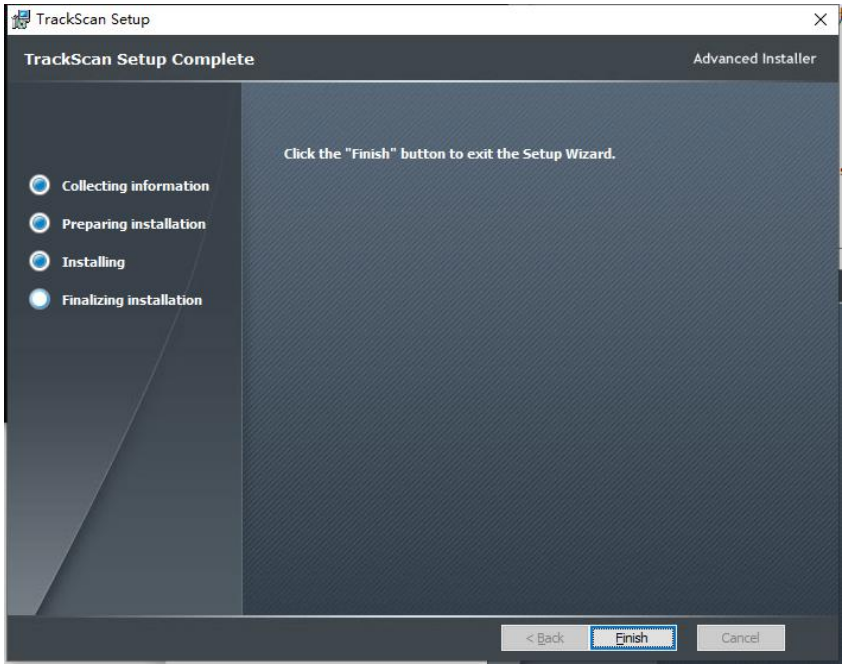
1- 9 Camera driver installation

(10) Camera driver installation completed. As shown in Figure 1-10.



1- 10 Camera driver installation

(11) After the installation of the camera driver, click "Finish" to complete the installation of TrackScanVX.XX.exe. As shown in Figure 1-11.



1- 11 TrackScanVX.XX Installation Steps

(12)After clicking "Finish", a shortcut will be automatically created on the desktop.

1.3 Software Uninstallation

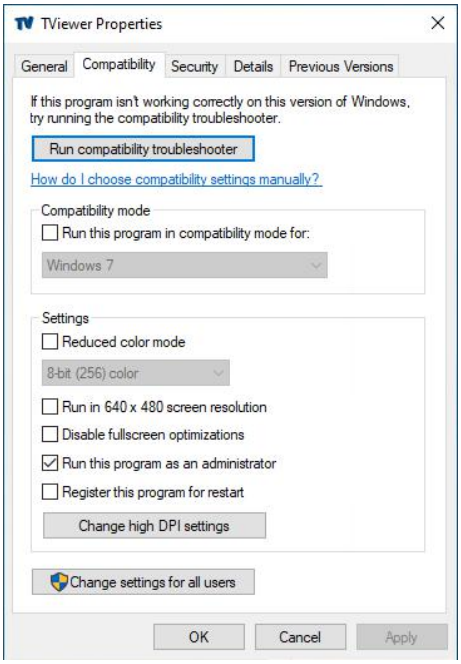
If you want to uninstall or re-install the software, you can enter the software name in the Start menu to enter the uninstall procedure; go to "Control Panel - Uninstall a Program" on your computer and select the appropriate software to uninstall. As shown in Figure 1-12.

1- 12 Software Uninstallation

1.4 Software operating environment settings

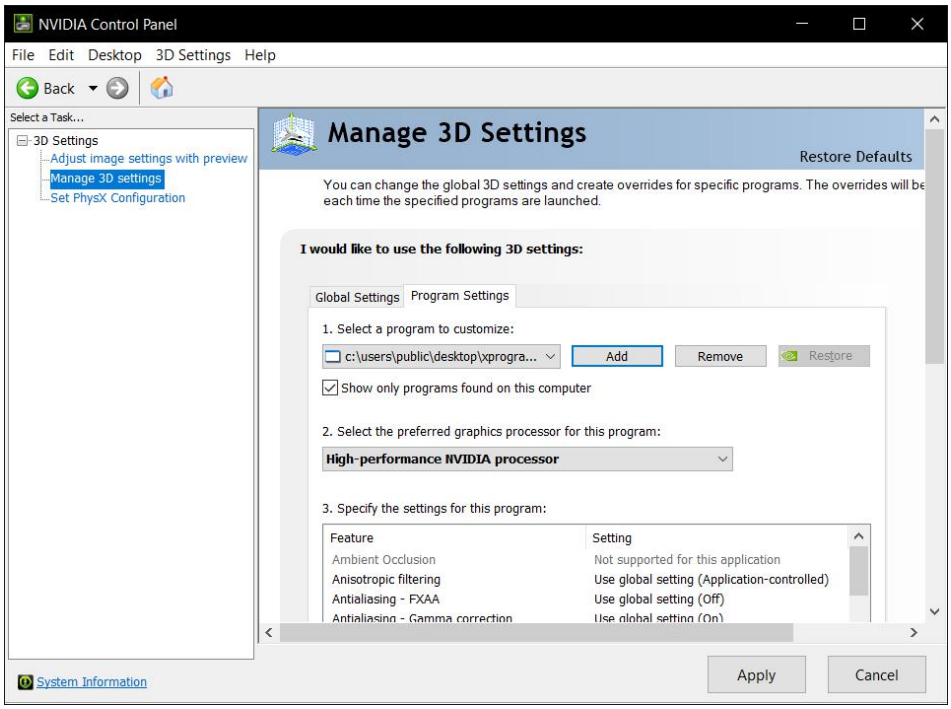
After the installation, in order to ensure the use for software, you need to set the permissions for the software: run the scanning software with administrator privileges, set the scanning software to run with the graphics card.

To grant administrator privileges: right-click the software icon, click "Properties", select the "Compatibility" tab in the properties window, check the "Run this program as administrator", and then click the "Change all user settings" button. Click "Change all user settings", check "Run this program as administrator" again in the pop-up dialog window, and then click "OK" (Picture 3-13). Do the same for the "Scanner/LowPartSW/scansense_console.exe" program in the software directory to give administrator privileges.



1- 13 Give administrator privileges to run the setup

Select the graphics card to run: Right click on the desktop, select "NVIDIA Control Panel" in the menu, in the NVIDIA Control Panel, select "Manage 3D Settings" - " Program Settings" - "Preferred Graphics Processor for this Program" - select "High Performance NVIDIA Processor" (if this option is not available, just skip it) - "Add" - "TViewer.exe" - "Apply ". As shown in Figure 1- 14.



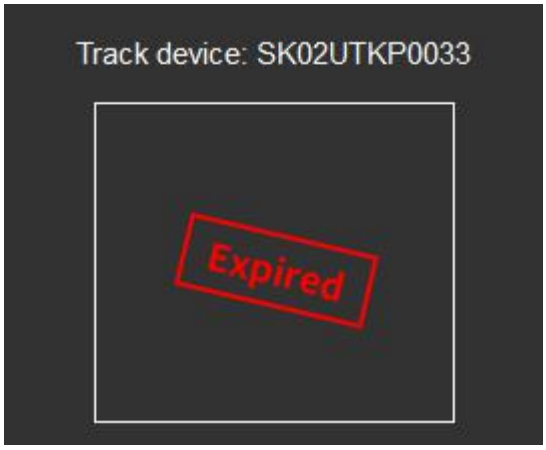
1- 14 Software graphics card runs

1.5 Manage configurations file

Configure TViewer before first time use: right click on the TViewer icon, click on "Open file location", inside the "LowPartSW" folder, replace it with the “SET” folder inside the USB stick.

(1)Configuration file

Open the TViewer scanning software, click "Menu bar - Other - Device Management - Configure License", and replace the RGF file with the one provided with the device on the USB flash drive. When the device license is about to expire or is about to expire, the software will pop up a prompt box to replace the license, click "Configure License" to replace the valid RGF file.As shown in Figure 1-15.



1-15 Prompt Box

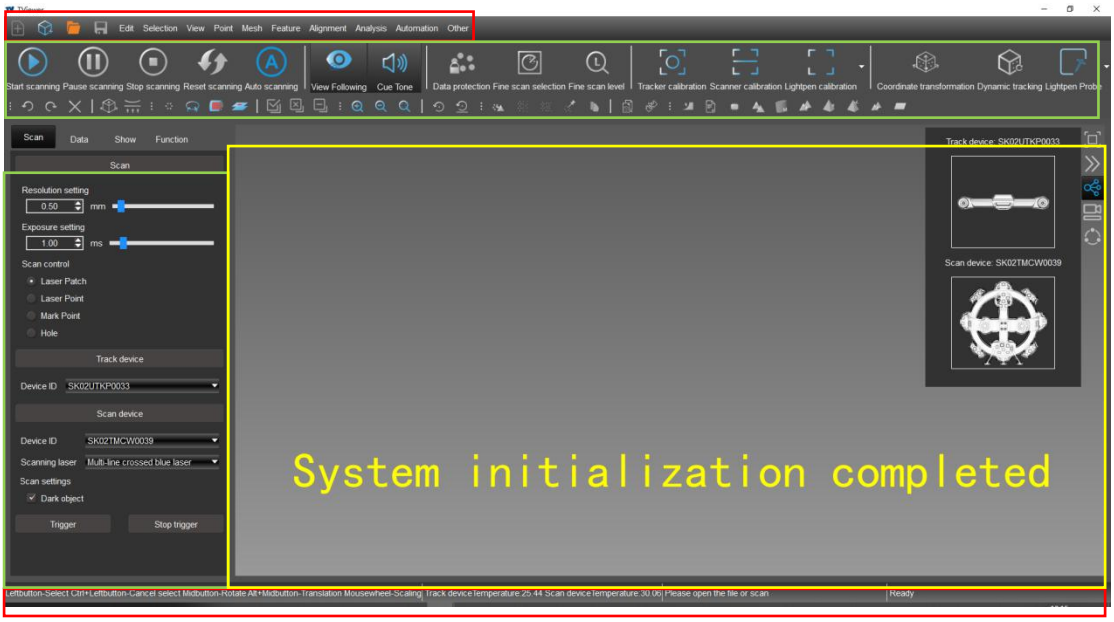
(2)Update configuration folder

Open the TViewer scanning software, click on "Menu bar - Other - Device Management - Update Configuration Folder" and replace it with "Backup-LowPartSW-SETXXXX (product model)" in the USB flash drive provided with the scanner.

2 Scanning Software

2.1 Scan software introduction

This section introduces the scanning software interface and its icons, where the interface mainly consists of five parts: menu bar, tool bar, screen area, function panel and status bar. As shown in Figure 2-1.



2- 1 introduction of Software

2.2 Scan software icon function

2.2.1 Menu Bar

The menu bar mainly includes 4 quick menu bars such as New, Add, Open, Save and 10 application menu bars such as Edit, Selection, View, Point, Mesh, Feature, Alignment, Analysis, Automation and Other.

(1) Quick menu bar mainly for file open, new, save and other operations.

2- 1 Quick Menu Bar

Name	Icon	Function and Description
New		“New” function will clear all data in screen area.
Add		“Add” function will add a new scan project.
Open		Project file: .pj3; Mark point file：.mk2, .umk, .asc, .igs, .txt； Point cloud file：.asc, .igs, .txt； Mesh file：.stl； Model file：.stp, .step
Save		Save the corresponding file in the same file format as above. Alternatively, the grid file can be saved in .ply, .obj format.

(2) See 2- 2 for descriptions of toolbar icons and their functions.

2- 2 Toolbar

Icon	Function and Description
	Start scanning
	Pause scanning
	Stop scanning
	Reset: Clear laser point data only without resetting scan parameters.
	View Following: Turn on view following, the 3D display area shows the current scanning area in real time.
	Data Protection: When data protection is on, the user selects a part of the project data to protect it, and all subsequent deletion and selection operations are ineffective for the protected data.
	Fine Scan Selection: Allows users to fine scan detailed features during scanning. Normal scan mode is used when scanning flat or non-detailed areas, and fine scan mode is used when scanning detailed features. Fine scan mode can effectively reduce the amount of data scanned while maintaining the detailed features of large work pieces.
	Fine Scan Level: There are four types of fine scan levels: none, low, medium and high. The higher the level, the higher the data granularity.
	Tracker Calibration: Calibration of the tracker parameters. See the product user manual for details of the calibration.
	Scanner Calibration：Calibration of the tracker parameters. See the product user manual for details of the calibration.
	Detector Calibration: Calibrate the T-Probe.
	Coordinate Transformation: Track the marker on the object, when the marker is attached to the surface of the object, you can turn the object and click "start scanning" to scan the back of the object (you can not move the tracking head and the object being scanned after the start).
	Dynamic Tracking: Track the marker points on the object, click "Start Scan" to track the object in real time during the scanning process (you can move the tracking head and the scanned object after the start).

	Probe Detection: Selectable detection features, including circles, elliptical grooves, points, planes, cylinders, spheres.

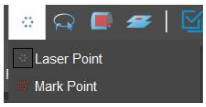
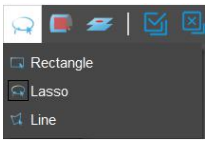
(3) See 2- 3 for a description of the "Edit" application menu bar icons and their functions.

2- 3 "Edit" application menu bar icons and their functions

Name	Icon	Function and Description
Edit		Delete: Delete the currently selected data. Undo: you can go back to the state before the last operation, only valid for "Delete". Redo: you can restore the most recent "undo" operation.
		The coordinate system can be adjusted at different distances. Can be panned or rotated. Rotation is in angular units, it is recommended to pan first and then rotate.

(4) See 2-4 for descriptions and functions of the "Select" application menu bar icons.

2- 4 "Select" application menu bar icons

Name	Icon	Function and Description
Selection		Indicates the object that can be operated at this time. The blue icon indicates that the operation object is a laser point, and the red icon indicates that the operation object is a mark point.
		The selection tool includes four tools: rectangle, lasso, polyline, and brush. Users can choose according to actual needs. Note: Press and hold Alt+Mouse Wheel to zoom in and out on the brush diameter.
		When the user selects data, the data in the back direction of the current view cannot be selected.
		The user can only select the data of the visible part when selecting the data.
		Select all: select all data; Clear all: cancel all data selection; Reverse selection: reverse selection of data.

(5) See 2-5 for descriptions and functions of the "View" application menu bar icons.

2- 5 "View" application menu bar icons

Name	Icon	Function and Description
View		The view can be zoomed in, zoomed out, and optimally viewed, and can only be used during the scan.
		After clicking the icon, click the data location where the point to be set as the rotation center, or right-click the location of the model to be set as the rotation center, then select “set rotation center”. Note: the point on the model must be selected for setting

(6) See 2-6 for descriptions and functions of the "Point" application menu bar icons.

2- 6 "Point" application menu bar icons

Name	Icon	Function and Description
Point		Wrap: Encapsulate the point cloud data to turn it into surface so that the file can be used for 3D printing and reverse engineering.
		Isolated Point: Some points whose distance from most other point clouds exceeds a certain threshold.
		Disconnected Components: The part that is not connected to the data. It can evaluate the proximity of point cloud, divide the point cloud blocks, and select the block with less adjacent points.
		Curvature Sample: Dilution point cloud data. Reduce the amount of data by reducing non feature points and retaining feature points, so that the details can be retained as much as possible.
		Connection Item: No separate data. It can evaluate the proximity of the point cloud to obtain the adjacent blocks of the selected points. Left mouse button: select data; CTRL + left mouse button: deselect data.
		Laser point Splicing: Select common laser points for splicing.
		Merge: Merge two laser point data.

(7) See 2-7 for descriptions and functions of the "Mesh" application menu bar icons.

2- 7 "Mesh" application menu bar icons

Name	Icon	Function and Description
Mesh		Quick Select: Quickly select patches with similar curvature and adjacency.
		Select Area Information: Forming a mesh state(Perimeter and area).
		Fill Hole: Fill hole function.
		Simplify: Reduce the amount of mesh data while maintaining the detailed features of the mesh.
		Manifold: Delete broken faces in mesh data.
		Refine: Encrypted mesh data.
		Defeature: Optimize mesh surface quality.
		Remove Spikes: Remove sharps from mesh data.
		Sharpening: Optimize sharp edges.
		Sand Paper: Optimize mesh surface quality.

(8) See 2-8 for descriptions and functions of the "Features" application menu bar icons.

2- 8 "Features" application menu bar icons

Name	Icon	Function and Description
Features		Create a circle feature.
		Create elliptical groove features.
		Create rectangular groove features.
		Create circular groove features.
		Create polylines features.

		Create point features.
		Create line features.
		Create plane features.
		Create sphere features.
		Create cylindrical features.
		Create cone features.

(9) See 2-9 for toolbar descriptions and functions in the "Alignment" application menu bar interface.

2- 9 "Alignment" application menu bar

Name	Icon	Function and Description
Alignment		Best fit. For details, refer to 3.8.1 Best Fit Alignment.
		Align data to the global coordinate system. For details, refer to 3.8.2 Aligning to the Global.
		Features alignment. For details, refer to 3.8.3 Feature Alignment.
		Point-to-point alignment. For details, refer to 3.8.4 N-point Alignment.
		Point-line-plane alignment. For details, refer to 3.8.5 PLP Alignment.
		RPS alignment. For details, refer to 3.8.6 RPS Alignment.

(10) See 2-10 for descriptions and functions of the "Other" application menu bar icons.

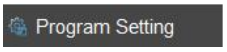
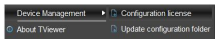
2- 10 "Other" application menu bar icons

Name	Icon	Function and Description
Measure		Distance: Measure the distance between features. For details, refer to3.9.1 Measure.
		Angle: Measure the angle between features. For details, refer to 3.9.2 Angle.
Comparison		Section: Create a section. For details, refer to Section 3.9.3.
		3D Comparison: 3D view comparison. For details, refer to 3.9.4.
		Create Annotation: View the annotation. For details, refer to 3.9.5.
		Create Report: Create a report page. For details, refer to 3.9.6.
Pipe		Pipe Inspection: Detection of tube defects by scanning data.For details, refer to 3.9.8
GD&T		Roundness: Deviation of the actual measured circumference from the nominal circumference.
		Straightness: Deviation of the actual measured line from the nominal line, divided into plane line and space line.
		Flatness: Deviation of the actual measured plane from the nominal plane.
		Cylindricity: Deviation of the actual measured cylinder from the nominal cylindrical surface.
		Sphericity: The deviation of the actual measured sphere from the nominal sphere, sphericity is similar to circularity and can be seen as an extension of circularity in three dimensions.
		Parallelism: When a plane is used as a datum, the parallelism tolerance zone is the area between two parallel planes at a distance of the parallelism tolerance value and parallel to the datum plane.
		Verticality: When using a straight line as a reference, the verticality tolerance zone is the area between two parallel planes at a distance of the verticality tolerance value and perpendicular to the reference straight line.

		Concentricity: The coaxiality tolerance zone is the area within the cylindrical surface where the axis of the diameter coaxiality tolerance value coincides with the reference axis.

(11) The description and function of the toolbar in the “Other” application menu bar interface。

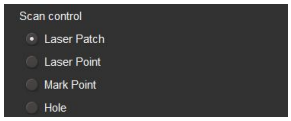
2- 11 “Other” application menu bar

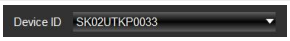
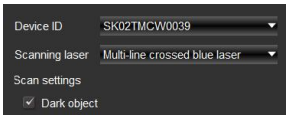
Name	Icon	Function and Description
Other		Software and hardware information.If shows “N/A”, it means the device is not connected.
		Switching of software languages.
		Some settings of the software: Update Configuration files

2.2.2 Function panel

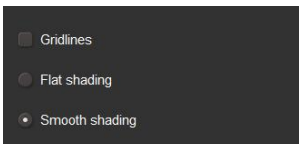
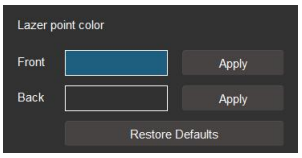
The function panel mainly includes four parts: Scan, Data, Display, Window.

2- 12 Scan

Name	Icon	Function and Description
Scan		The parameters of the collected point cloud data can be set, and different device models have different setting ranges. The smaller the resolution value, the denser the point cloud, the larger the amount of data, the slower the scanning speed and the better the details of the object. The higher the resolution value, the more sparse the point cloud, the smaller the amount of data, the faster the scanning speed, and the poor object details.
		Adjust the parameters of the laser line light and dark. The higher the value, the brighter the laser.
		The laser patch displays the scanned in the form of a patch; The laser point displays the scanned in the form of point; Mark Point: Scan Markers Information;

Name	Icon	Function and Description
		Hole: Scan holes information.
		Display the ID of the current tracker.
		Device ID: Display the ID of the current scanner; Scanning laser: Displays the type of laser mode currently being scanned by the scanner; Dark object: When scanning the surface material is darker or more reflective, you can check the "black object" to get better scanning results.

2- 13 Show

Name	Icon	Function and Description
Show		When the "mesh line" is checked, the mesh line of the grid data is displayed; When "Plane Shading" is checked, the triangle mesh is displayed more realistically; When "Smooth Shading" is checked, the triangle mesh is displayed more smoothly.
		The user can change the color of the point cloud and the front and back of the laser points.

2.2.3 Status Bar

The status bar mainly describes the software shortcut operation in the 3D display area and the data status and data volume during the scanning process. In the 3D display area, the shortcuts are as follows:

(1) Left mouse button: select data;

(2) Ctrl + left mouse button: uncheck the data;

(3) Middle mouse button: rotate the scan data;

(4) Alt+ mouse middle button: pan scan data;

(5) Mouse wheel: Data scaling.

Data Status: The amount of laser point and marker data scanned in the file. If selected, the amount of data at the selected point is displayed.

2.2.4 3D Display Area

In the 3D display area, click on the following icons to display the status respectively as follows:

(1) Click“  ”， Software interface can be displayed in full screen.Click“  ”Full screen display can be exited.

(2) Click“  ”to tuck away the status bar display, status bar become“  ”,click“  ”to expand the status bar display again.

(3) Click“  ”to display the device connection status, display the ID and connection status of the tracker and scanner, the connection status includes: device not online, device camera connection failure, camera connected to the USB2.0 interface, the current device license has expired, the device is normally connected these five status.

(4) Click“  ”to enter the "Tracking" function, which shows the tracking field of view and the current scanner position in the field of view in real time. Click“ 

”to switch whether to display the tracking field of view in the 3D display area, then you can click "New" function to restore the initial state.

Notice	The "Tracking" function does not work properly during scanning.

2.2.5 Shortcuts

See 2-14 for the shortcuts of the scanning software keyboard.

2-14 Shortcuts

No.	Shortcuts	Function	Info
1	Space	Start/Stop scanning	
2	Ctrl+P	Pause scanning	
3	Ctrl+E	Call up batch export function	
4	Left Mouse	Select	
5	Ctrl+Left Mouse	Reverse Selection	
6	Middle Mouse	Rotate	Press and hold the scroll wheel to rotate the view
7	Alt+Middle Mouse	Move	
8	Mouse Wheel	Zoom in/out	
9	Del	Delete	
10	Tab	Option switching	
11	F11	Full screen / cancel full screen	

3 Scanning software operation

It is introduced in order by toolbar and contains several modules such as Scan, Edit, Selection, View, Point, Mesh, Feature, Alignment, Analysis, and Other.

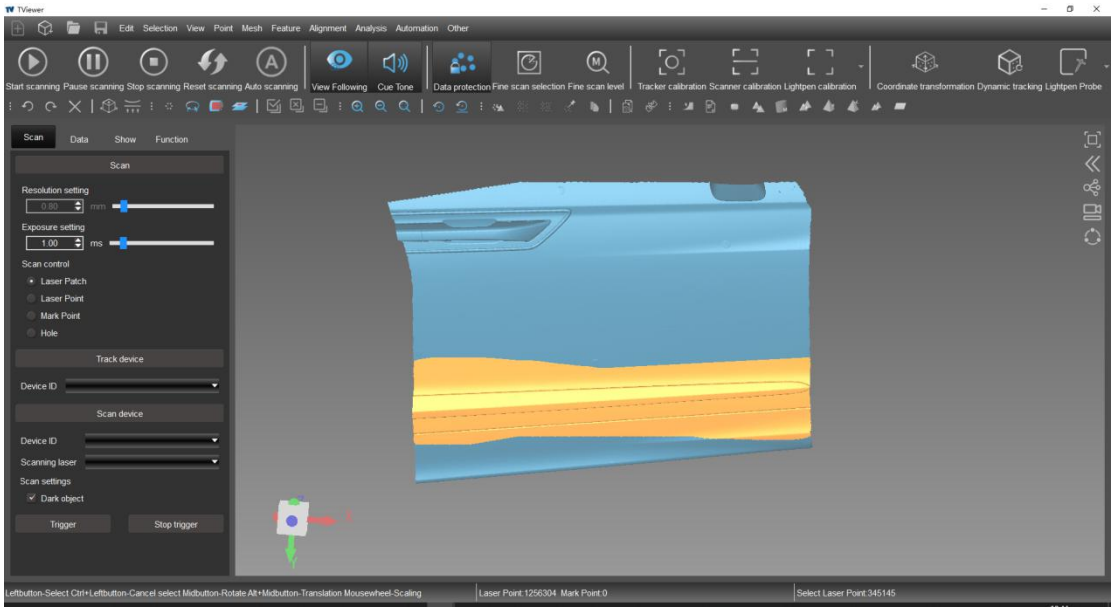
3.1 Scanning

The "Scanning" section mainly introduces four application parts of the software such as data protection、fine scan，fast calibration，Probe，coordinate transformation and so on.

3.1.1 Data Protection

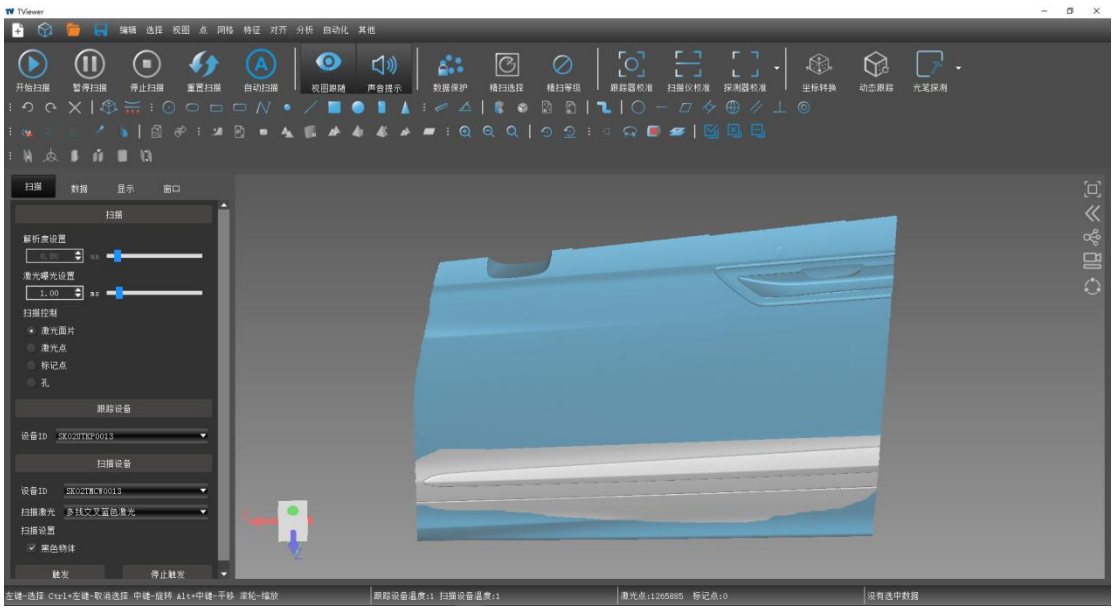
The data protection feature allows the user to select a portion of the project data for data protection. During the subsequent operations, all delete and select operations are invalid for the protected data. The specific operations are as follows:

(1)After the scan is completed, click “Stop” (or pause)—select some data—click “Data Protection” (data protection mode, other functions are temporarily unavailable), and the selected data color turns yellow. As shown in Figure 3-1.



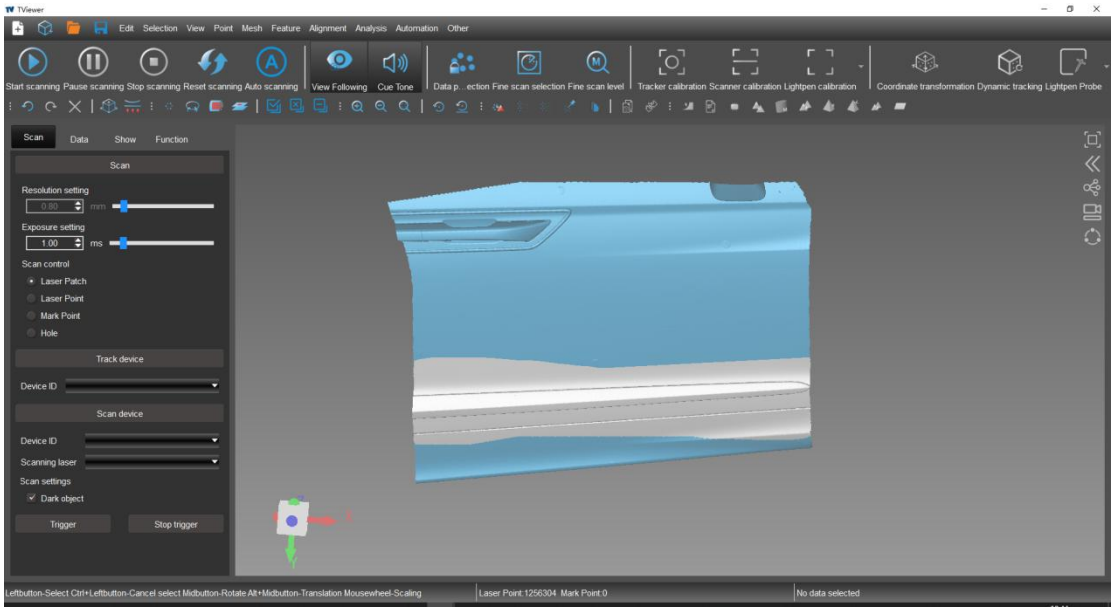
3- 1 Select protect data

(2) Select “Data Protection”, the data color will be grayed out, and all the selection and deletion operations after selection will not affect the gray (protected) part of the data. As shown in Figure 3-2.



3- 2 Data protected

(3) Click “Data Protection” again, the data color changes from gray to yellow, indicating that the data protection function has been withdrawn. As shown in Figure 3-3.



3- 3 Withdraw data protection

(4) In the 3D display area, click the right mouse button and select “Clear all” to exit the data protection function.

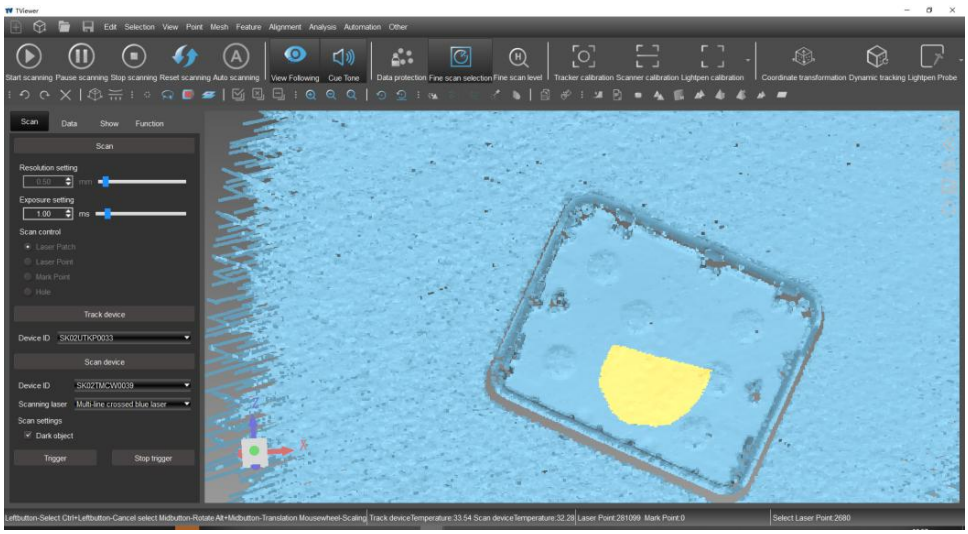
3.1.2 Fine Scan

The fine scan feature allows the user to scan for finer data at the same project. This feature can only be used in a pause or stop state. The specific operation is as follows.

(1) In the case of existing scan data, click “fine scan” to select the fine level (none, low, medium, high, the higher the level, the higher the data fineness).

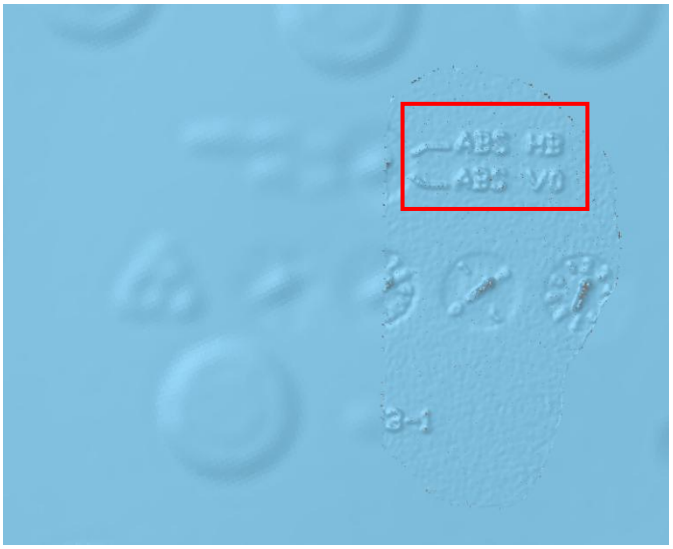
3- 4 Select fine scan level

(2) Click “Select” to select the fine data area. The color of the data in the selected area becomes golden yellow, as shown in Figure 3-5.



3- 5 Select fine scan area

(3) The data after fine scan is shown in Figure 3-6. Click "Select" again to exit the fine sweep mode and enter the normal scan mode.



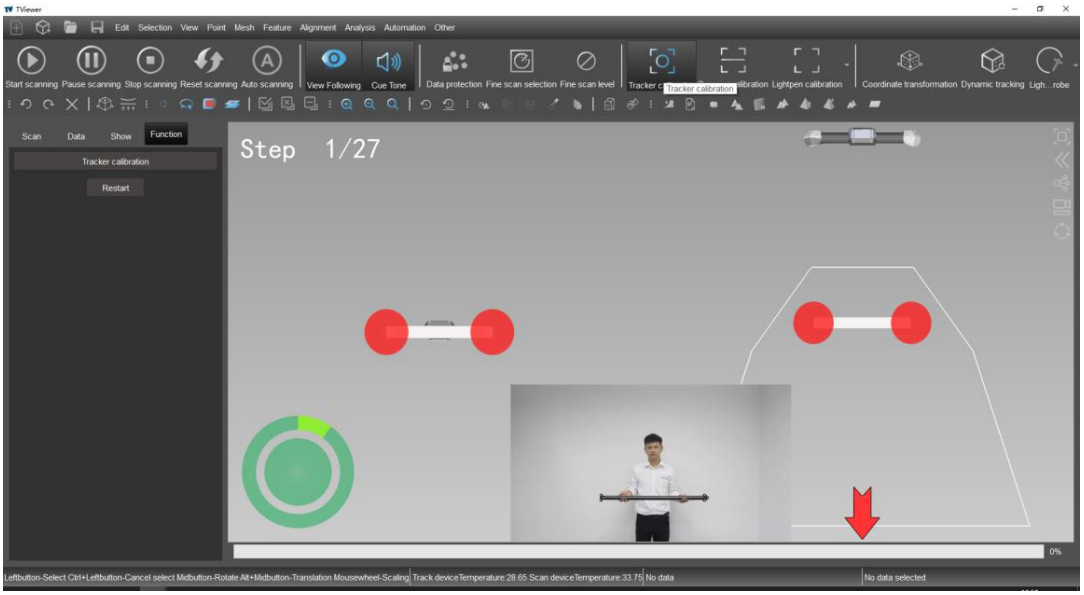
3- 6 Fine scan data

3.1.3 Calibration

The calibration module contains tracker calibration, scanner calibration, and detector calibration.

(1) Tracker Calibration

Click “Tracker Calibration” and start calibrating the tracker. As shown in Figure 3-7.

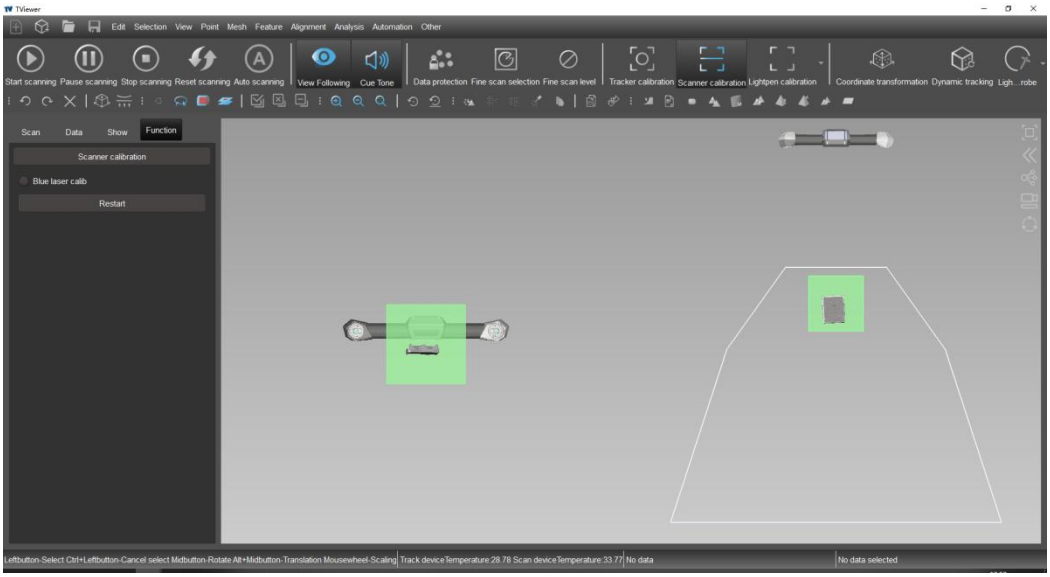


3- 7 Tracker calibration

Move according to the red area and gradually perform the calibration until the calibration is completed.

(2) Scanner Calibration

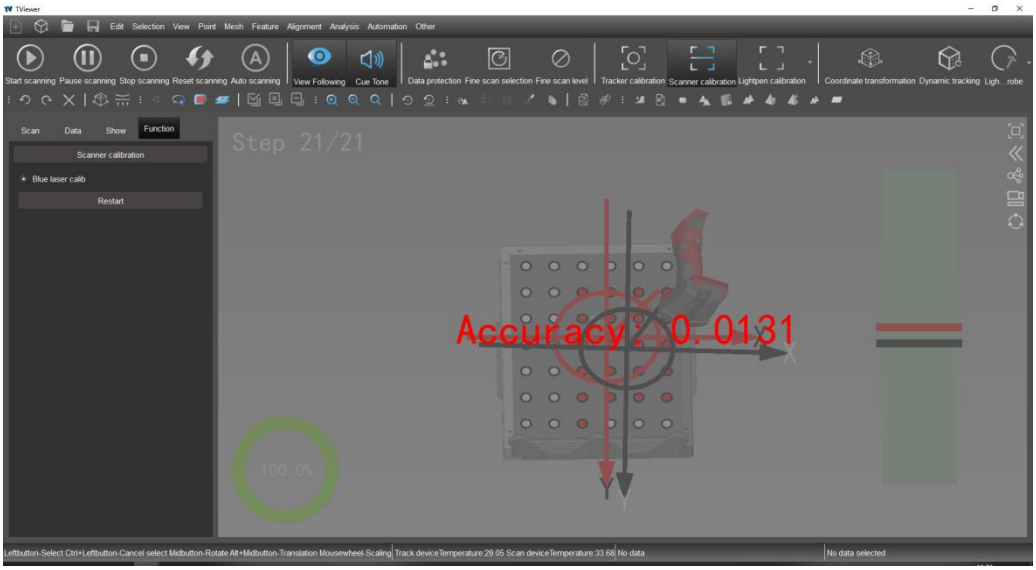
Click “Scanner Calibration” and start calibrating the scanner. As shown in Figure 3-8.



3- 8 Scanner Calibration

Place the calibration plate in the field of view of the tracker, let the tracker see the calibration plate, move the calibration plate to the boxed area in the figure so that the square area turns green, and press the scanner button. As shown in Figure 3-8.

Move the scanner according to the specified gray area and gradually perform the calibration until the calibration is complete. As shown in Figure 3-9.



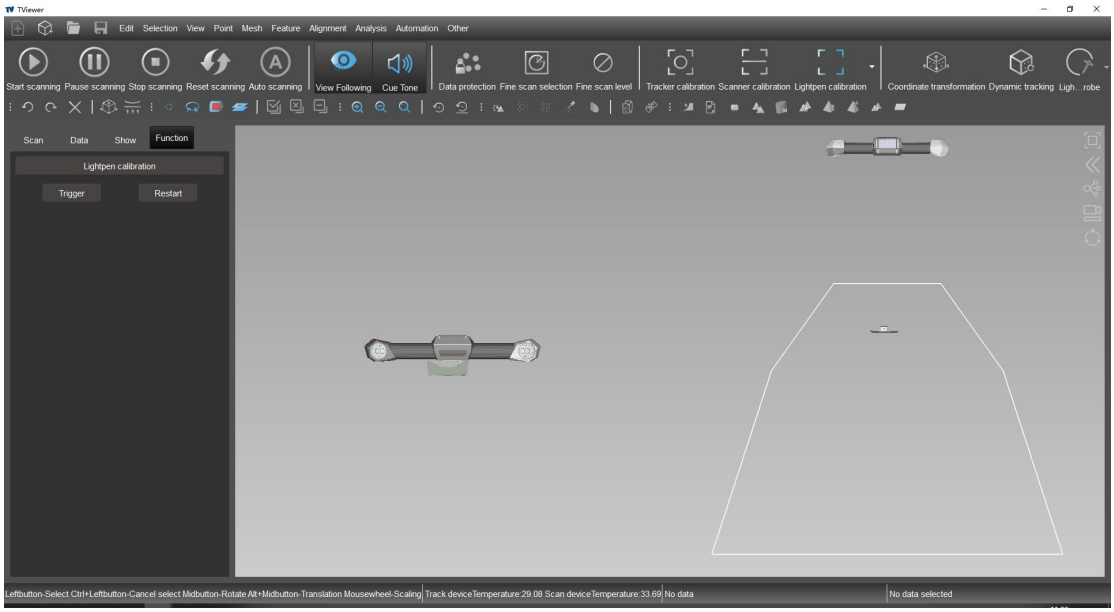
3-9 The result of scanner calibration

(3) detector calibration

Detector calibration is mainly for probe to do calibration; detector calibration is divided into two modes.

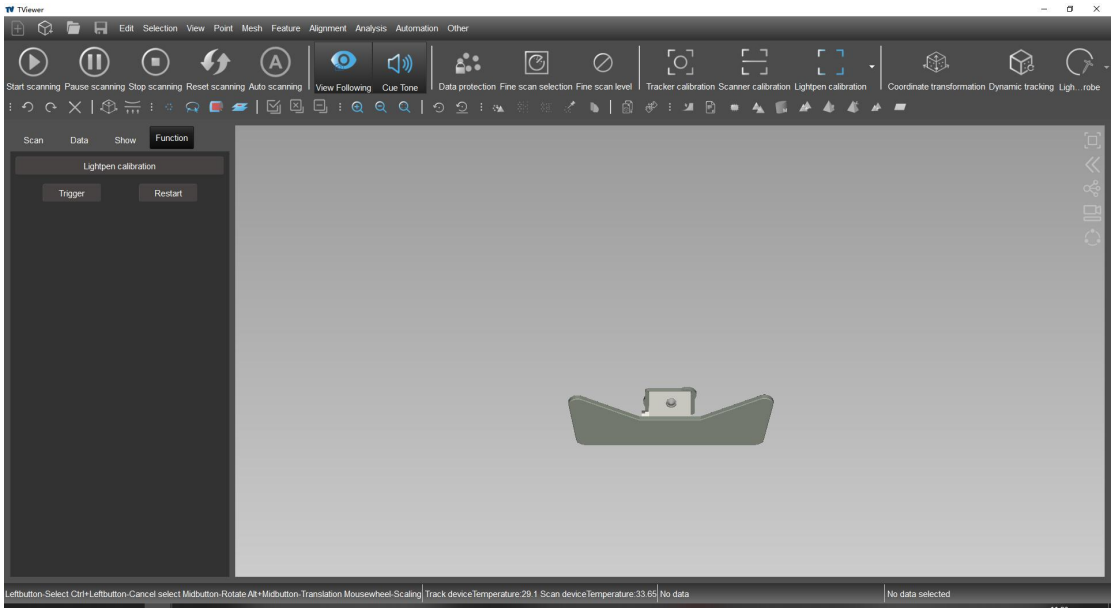
(a) Using fixed calibration

Place the probe base fixed in the area where the tracker can be seen in space, as follows:



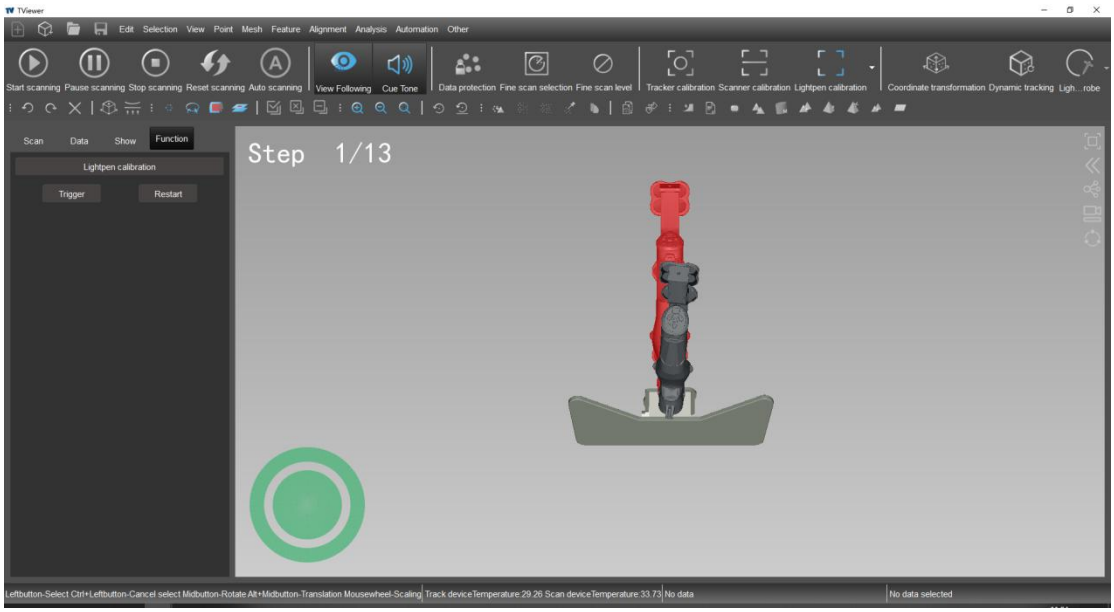
3-10 Detector calibration

Click the OK button on the Probe or the trigger button on the software to enter the probe fixed calibration mode, as follows:



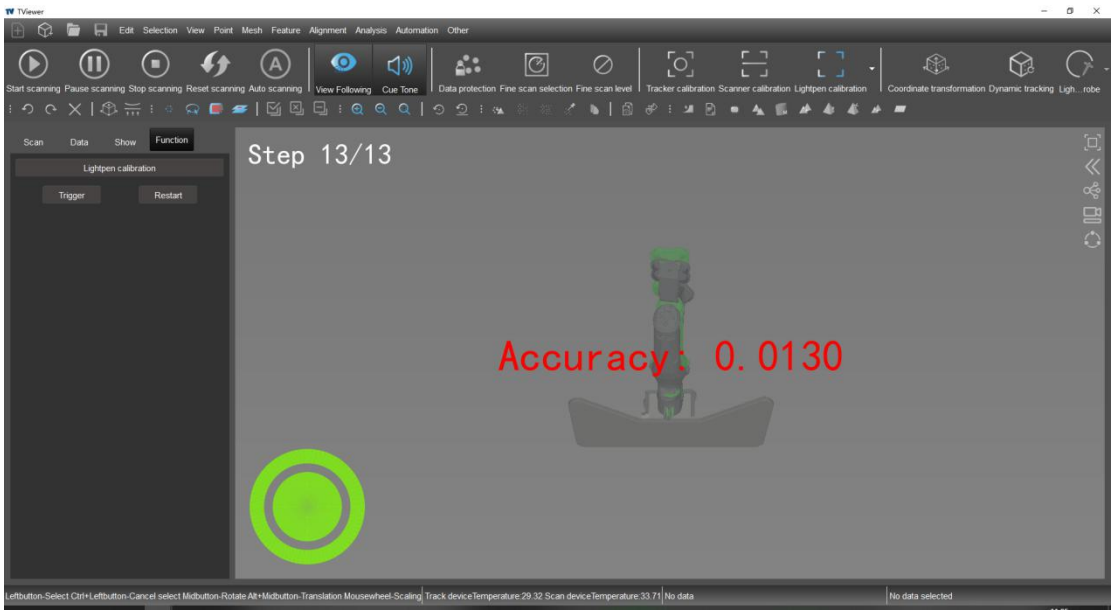
3-11 Detector calibration

Place the probe on the fixed base, the following interface appears:



3-12 Detector calibration

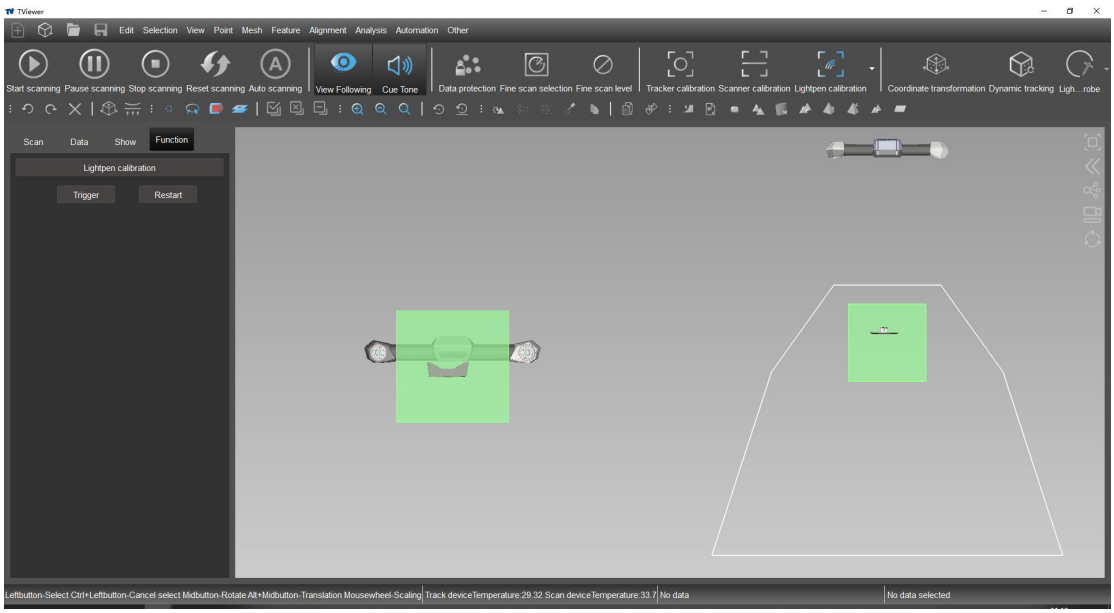
Gradually align the current position of the probe (gray probe legend) to the legend of the red position, and display the corresponding accuracy after the calibration is completed:



3-13 Detector calibration

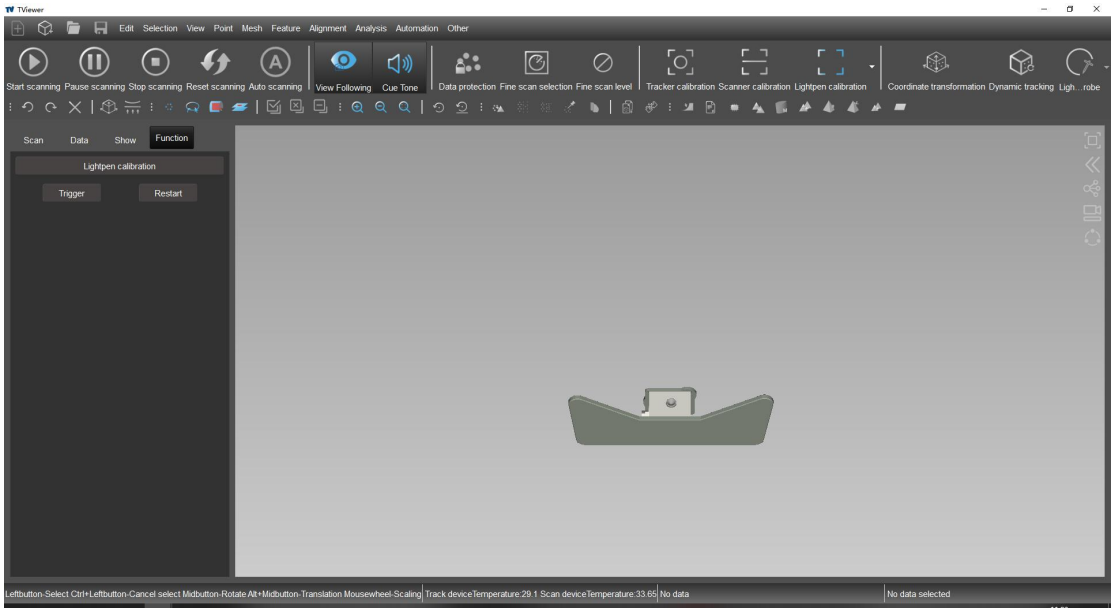
（b）Using tracking calibration:

Place the probe base in the green area (do not cover the marker points on the base), as follows:



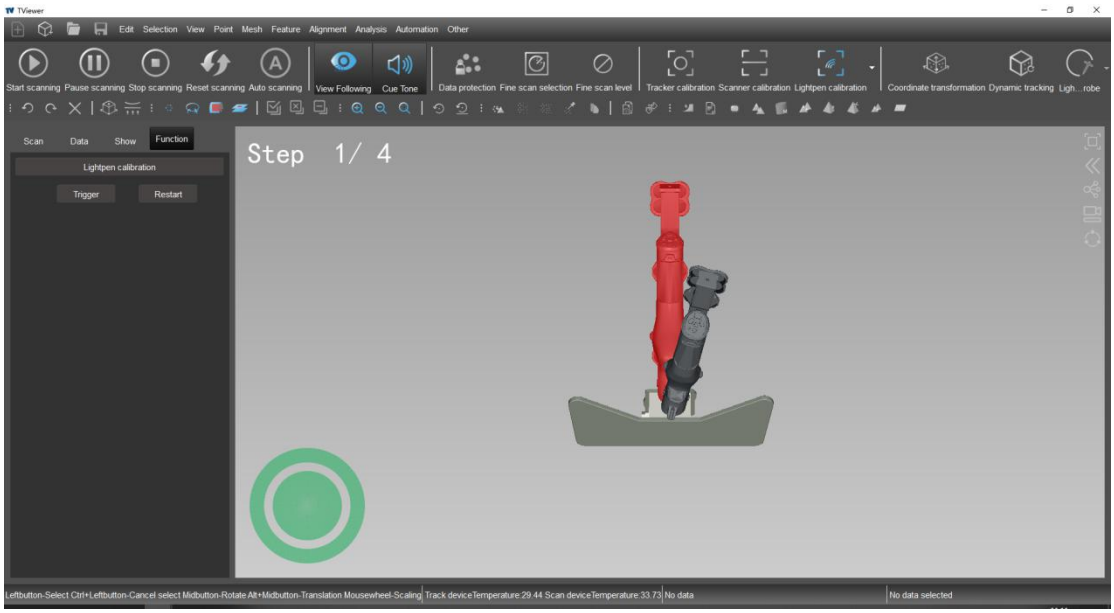
3-14 Using tracking calibration

Click the OK button on the probe or the trigger button on the software to enter the probe fixed calibration mode, as follows:



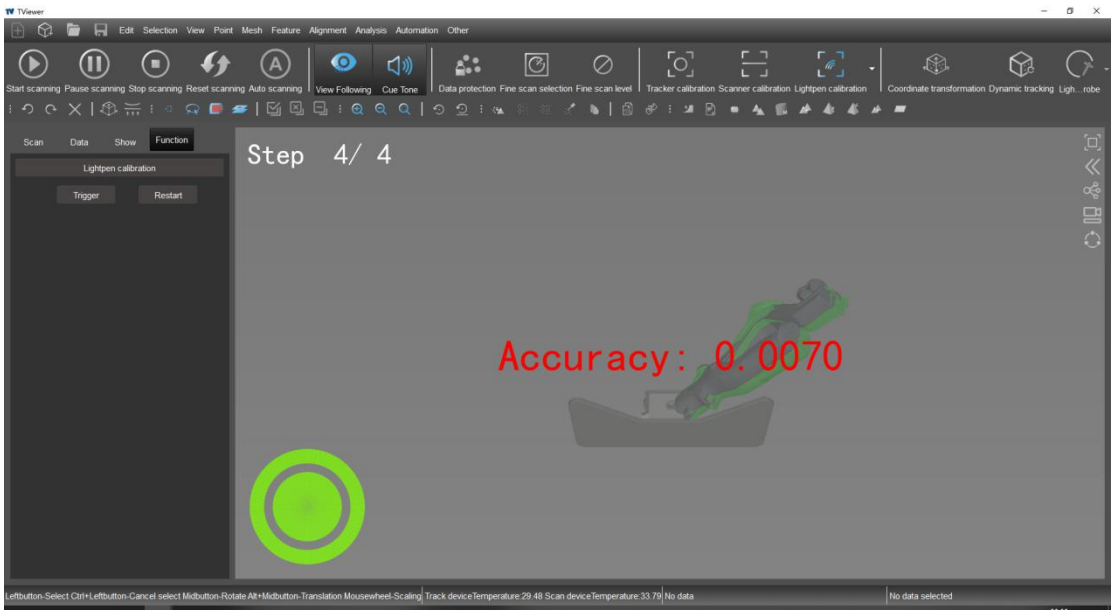
3-15 Using tracking calibration

Place the probe on the fixed base, the following interface appears:



3-16 Using tracking calibration

Gradually align the current position of the probe (gray probe legend) to the legend of the red position, and display the corresponding accuracy after the calibration is completed:



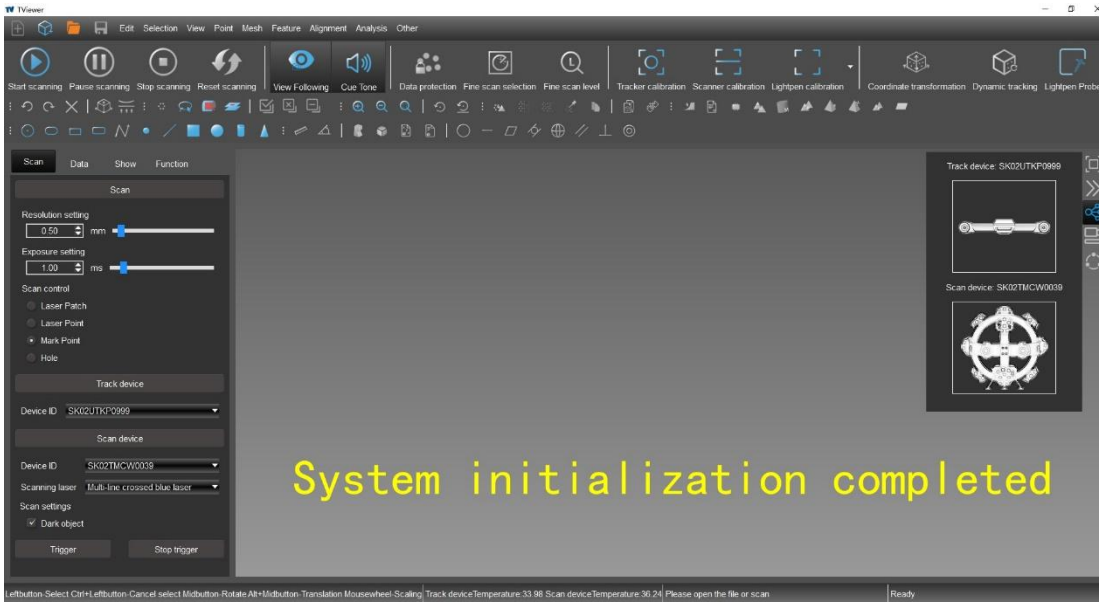
3-17 Using tracking calibration

3.1.4 Coordinate Transformation

In order to scan the entire work piece position, you can move the work piece when paused and automatically stitch the data to the specified position when you start scanning again (e.g., if you scan the bottom of the work piece, you can paste the rotating station in the front section of the work piece, scan all the mark points, click "Pause Scan", rotate the work piece, move the bottom side of the work piece to the side or (For example, you can scan the bottom of the work piece, click "pause scanning", rotate the work piece, move the bottom of the work piece to the side or fixed surface, click "continue scanning", and scan the complete work piece).

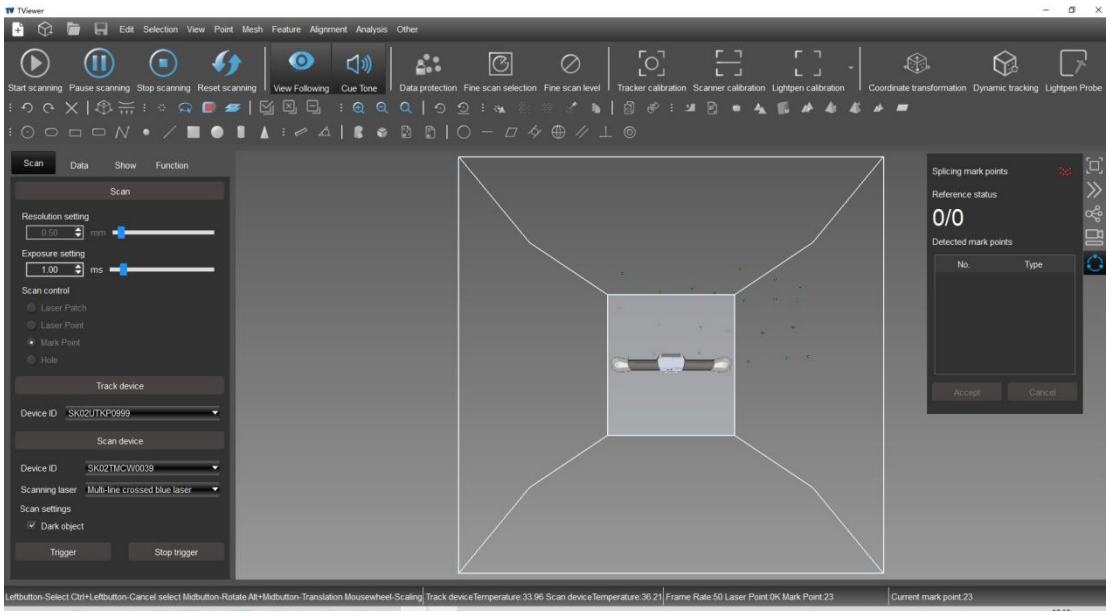
Below shows how the “rotating mode”:

(1) Before enter the “rotating mode”, need to scan the marks first. Choosing the mark point mode on left panel, then click “start scan”, such as pic 3-18.



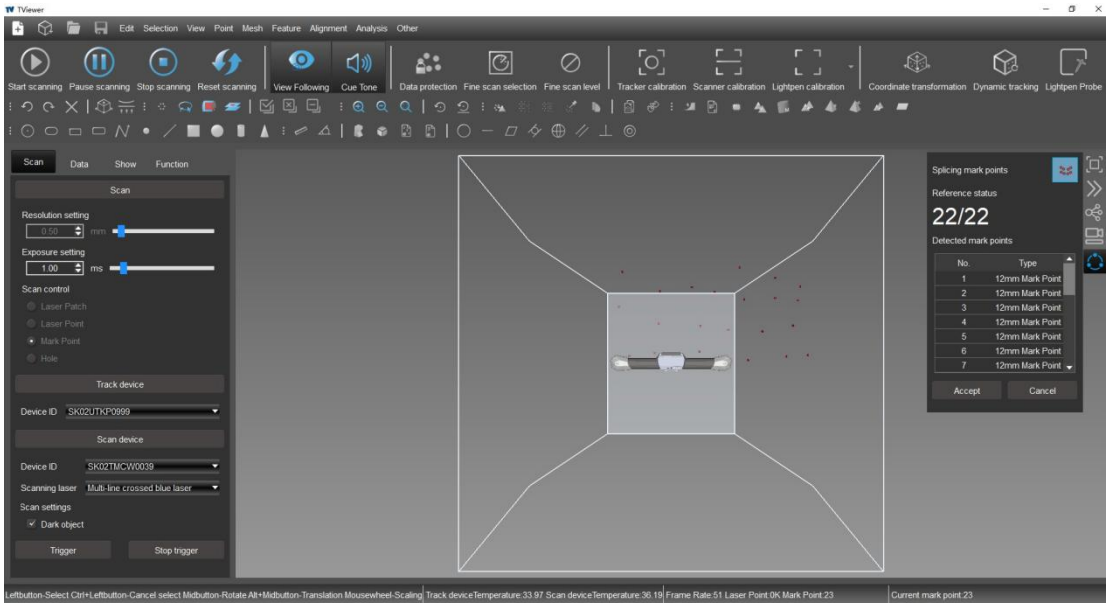
3-18 Mark point scanning

(2) Click the “Splice marker”，circle select all the mark points on the screen. Such as the pic-3.19



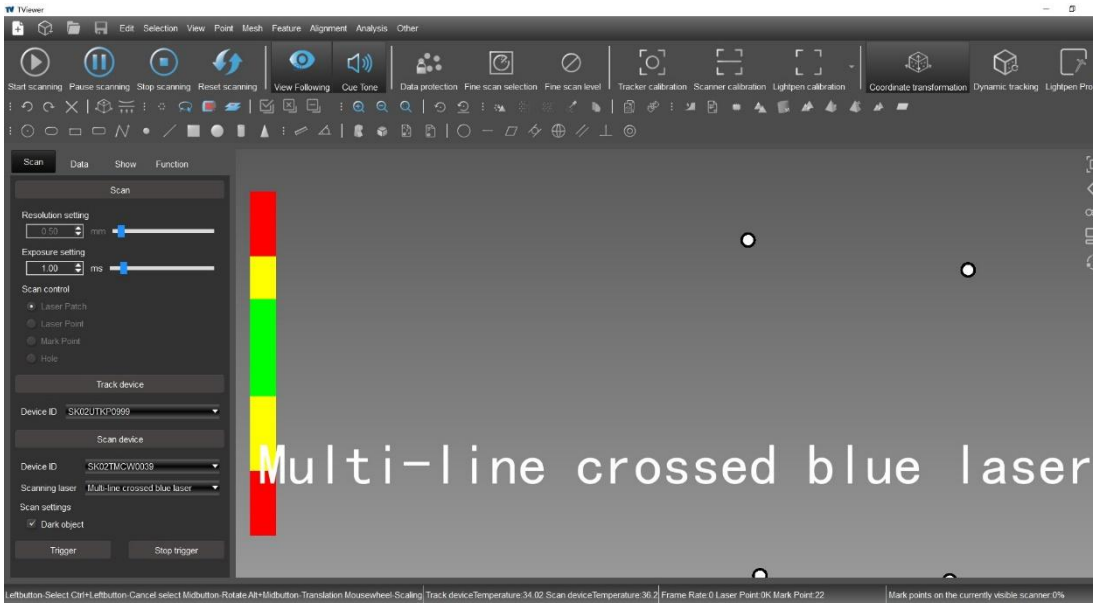
3-19 Select mark point

(3) click “accept “on the right panel, then click the “stop scan”, such as pic 3-20.



3-20 Select mark point

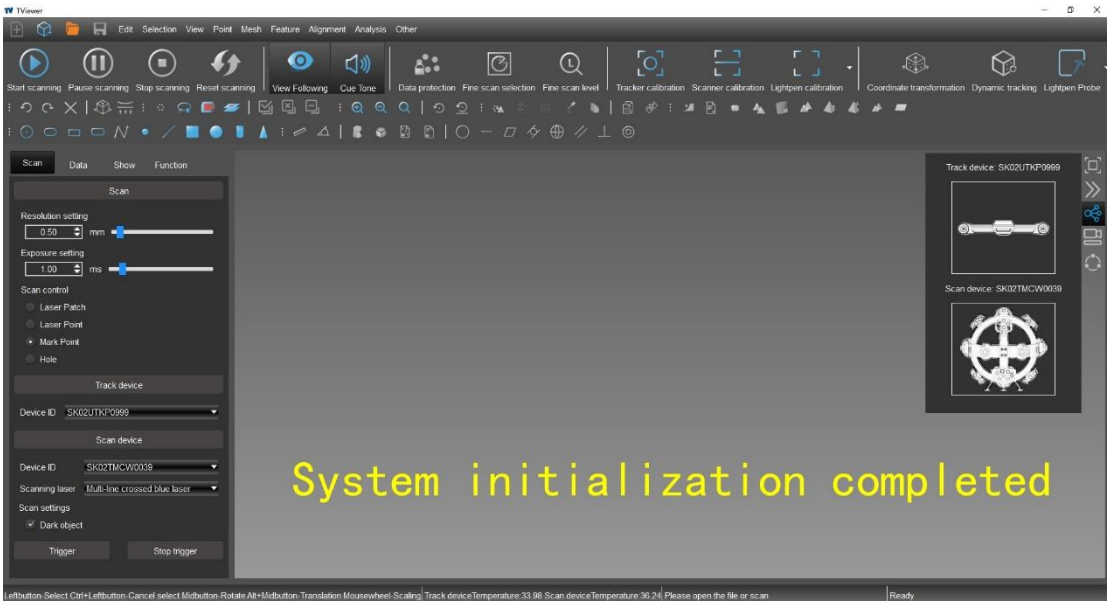
(4) click the rotate, then click “start scan”, can process the scanning as usual. Such as the pic 3-21.



3-21 Rotate

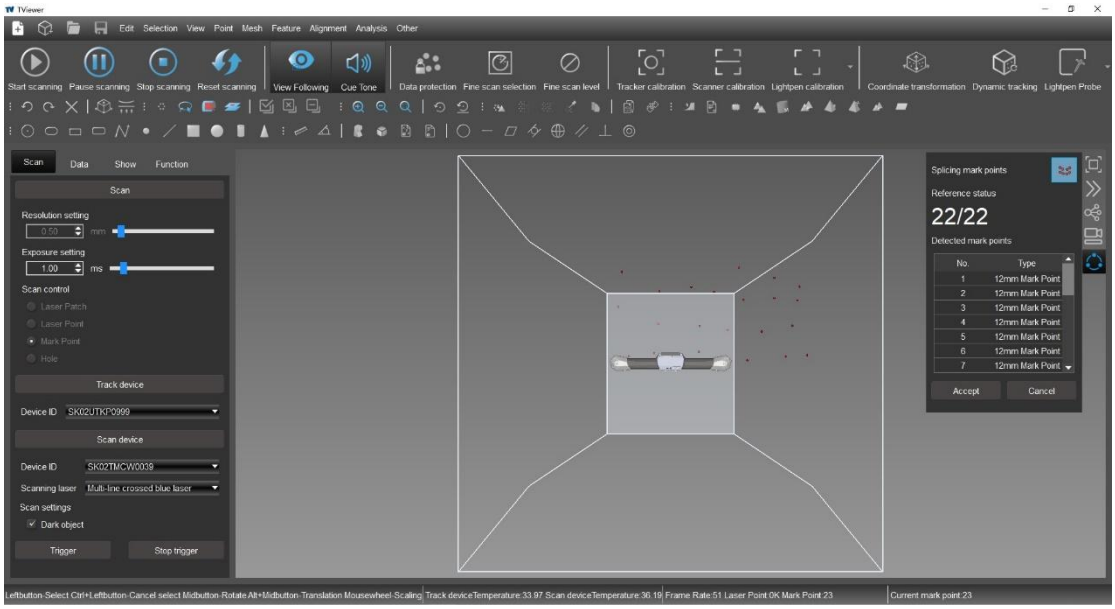
Below shows how the “dynamic tracking”:

(1) Before enter the “dynamic tracking mode”, should scan the mark points first. Choose the mark point mode in left panel, then click the “start scanning”.



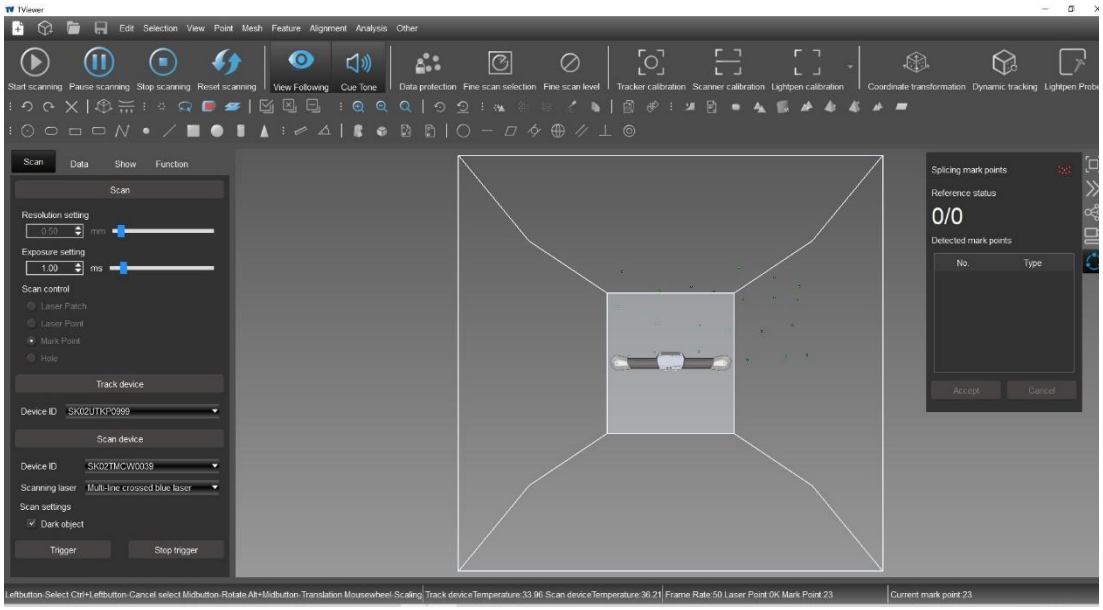
3-22 Mark point scanning

(2) Click the “Splice marker”,circle selcet all the mark points on the screen. Such as the pic 3-23.



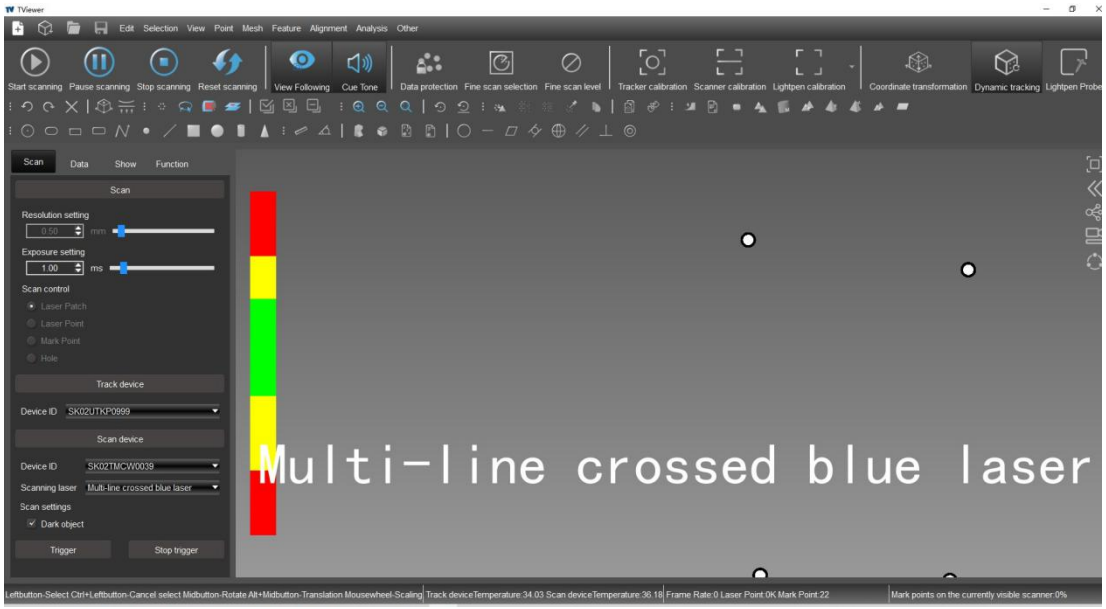
3-23 Mark point select

(3) Click” accept “on the right panel, repeat circle select the mark points process, until all mark points are scanned. Then click “stop scanning”. Such as pic 3-24.



3-24 Select mark point

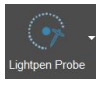
(4) Click the “dynamic tracking” to enter the mode, then click “start scanning”,can process the scanning as usual,the work piece can be moved during the mode.



3-25 Dynamic tracking

Notice	After scanning the marker point, the targets is prohibited to move.

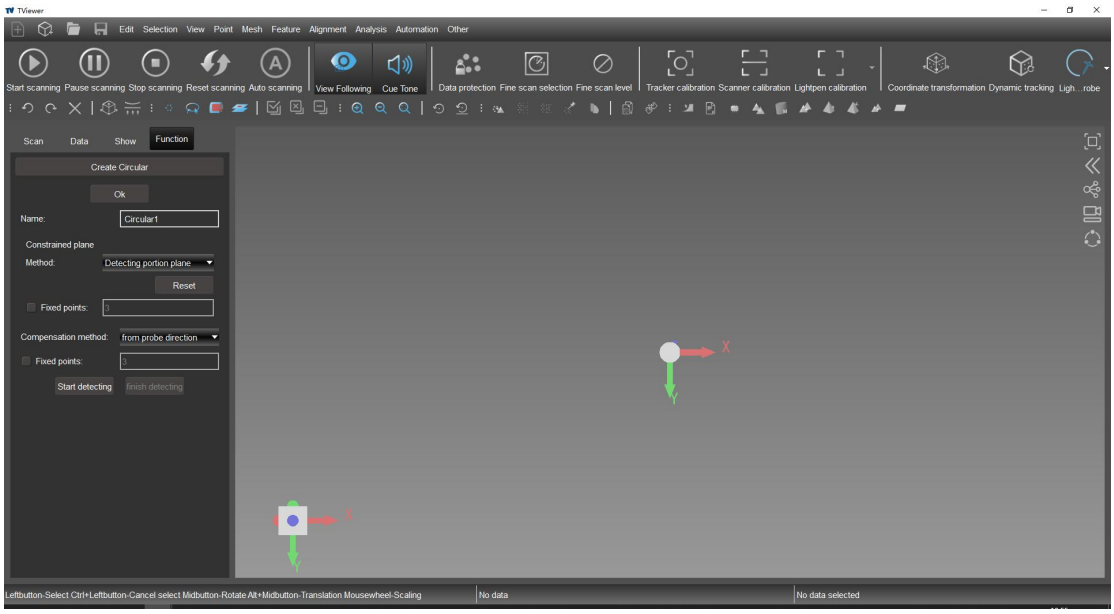
3.1.5 Light probe Module

Icons	Detecting type
	This entry is a planimetric probe detection
	This entry is a circle probe detection
	This entry is for elliptical slot detection
	This entry is a point detection
	This entry is for ball detection
	This entry is a cylindrical probe

Enter into the related type, will open a new window,we will show one of them for example.

(1) Circle detection by the probe

Choose the circle detection, shows following window.



3-26 Circle detection of probe

Before detecting a circle should probe the plane first on which the circle is located; currently there are two ways to detect a constraint plane: detecting a local plane and using plane features (there are 2 functions under this function: detecting a new and using an already created plane).

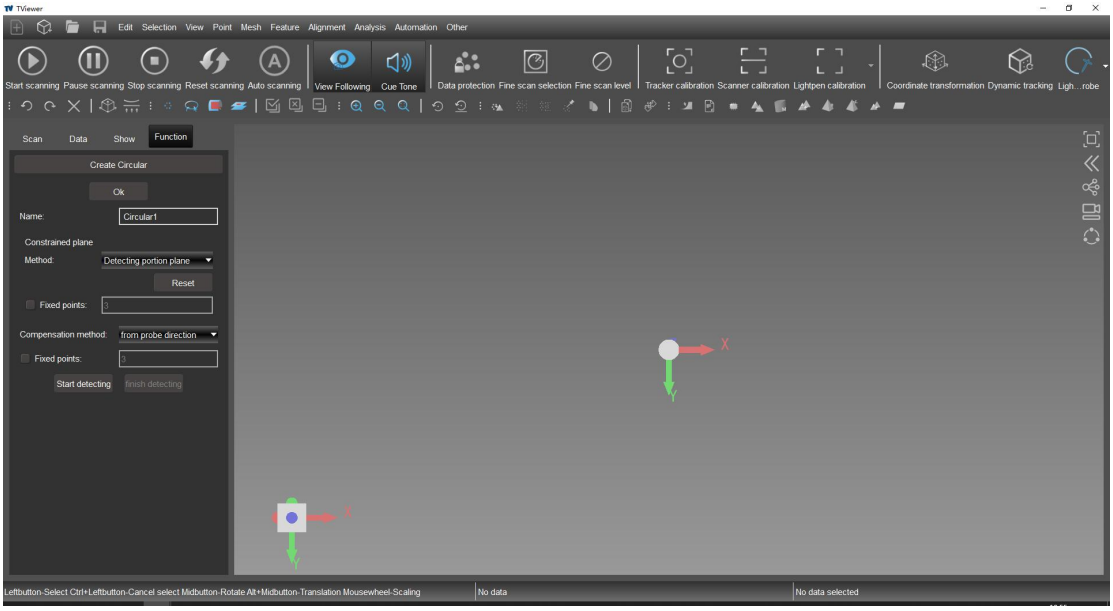
when probing a local plane first detect the points on the constraint plane, click on the OK button to fit the plane after the points on the plane have been detected, then detect the points on the circle and click on the OK button when the detection is complete.
When using a new plane for probing features, also probe the new plane first and then continue to probe the points on the circle after the probing is complete;

When using existing plane features, you can increase the number of probing circles

(automatic fitting when the number of points is fixed to a specified number of points)

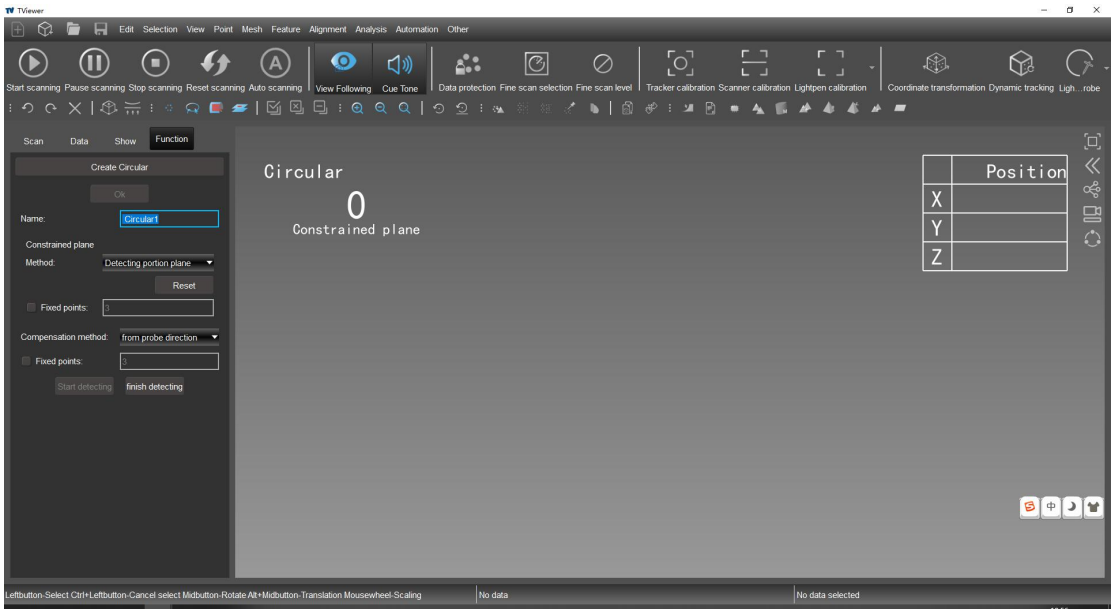
Shows how it process as below:

1.Open the software and choose the circle feature detection, as shown below.



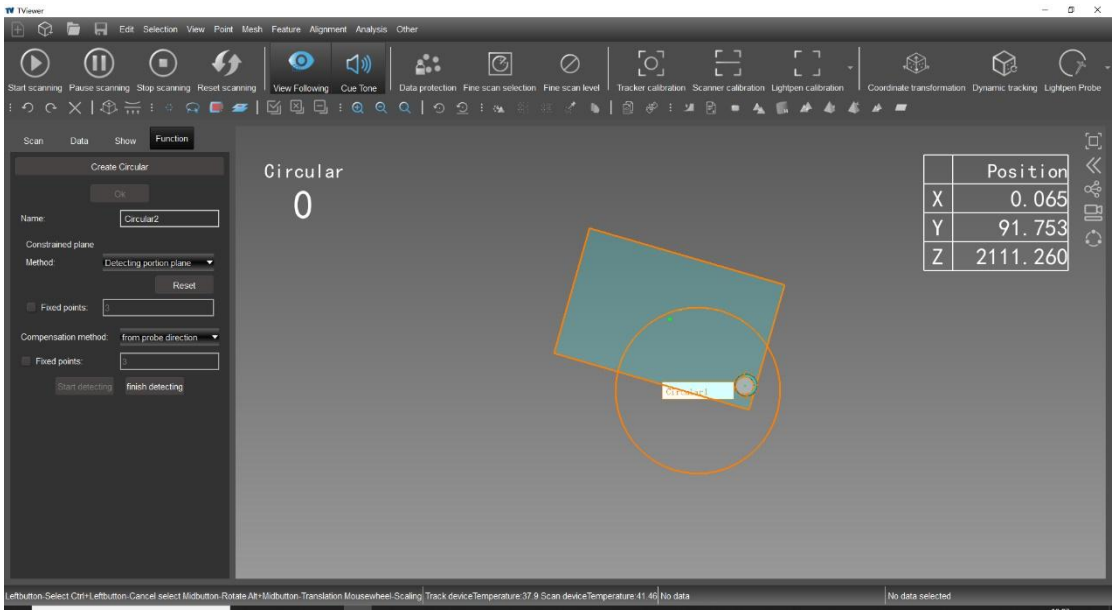
3-27 Circle detection of probe

2.Click “start detection”.



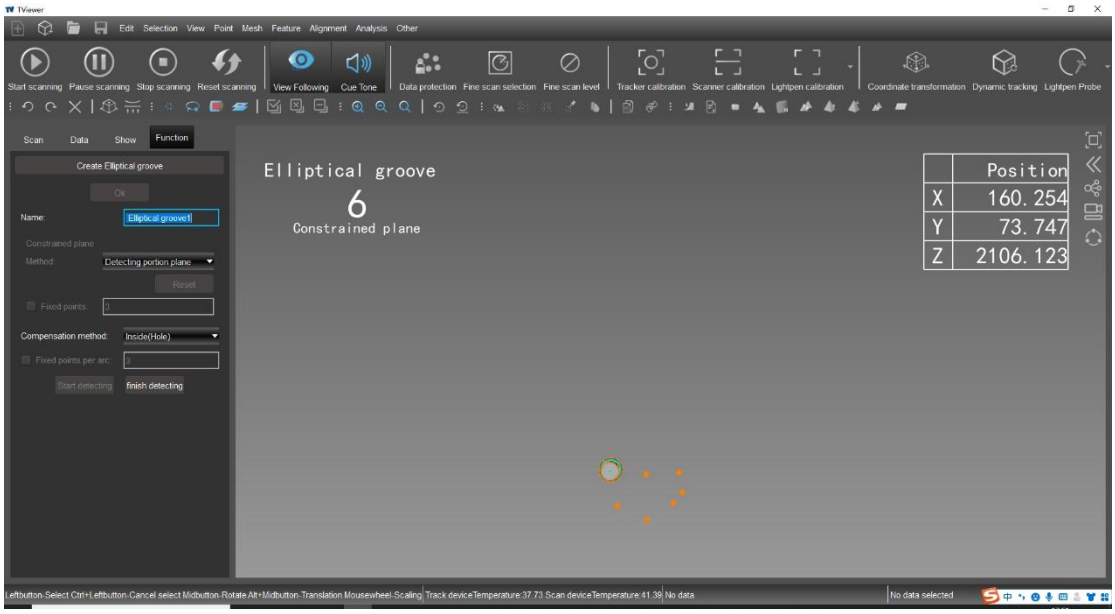
3-28 Detect“circle”function

3.First detect flat features, detect a set number of points or more, click the OK button of the light pen, as follows (flat features of 3 points or more)



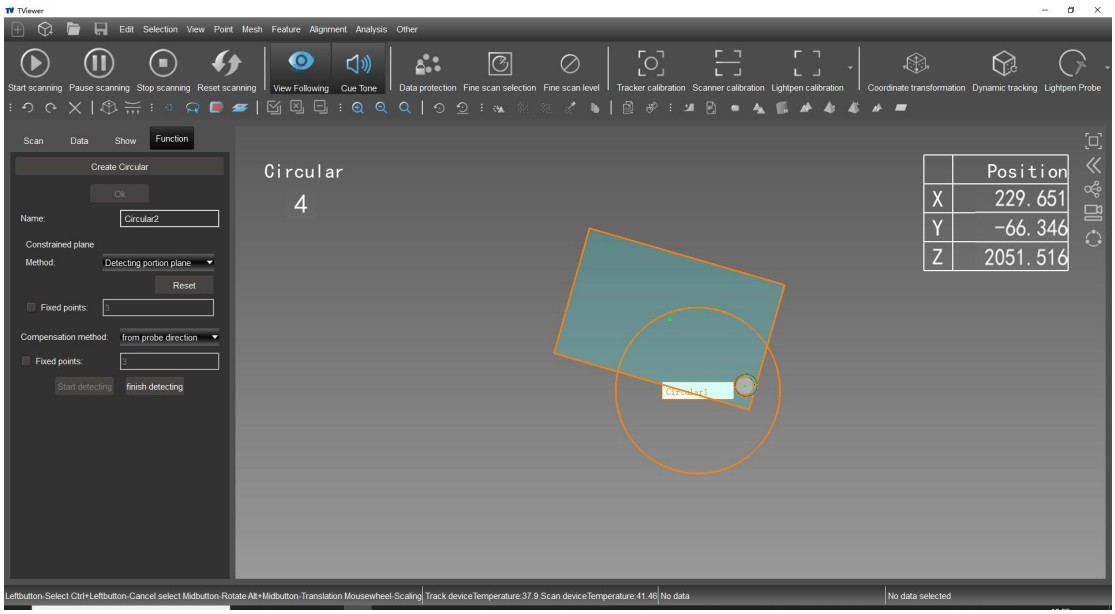
3-29 Detect“circle”function

4.After completion, the interface of the detection circle is automatically entered as follows.



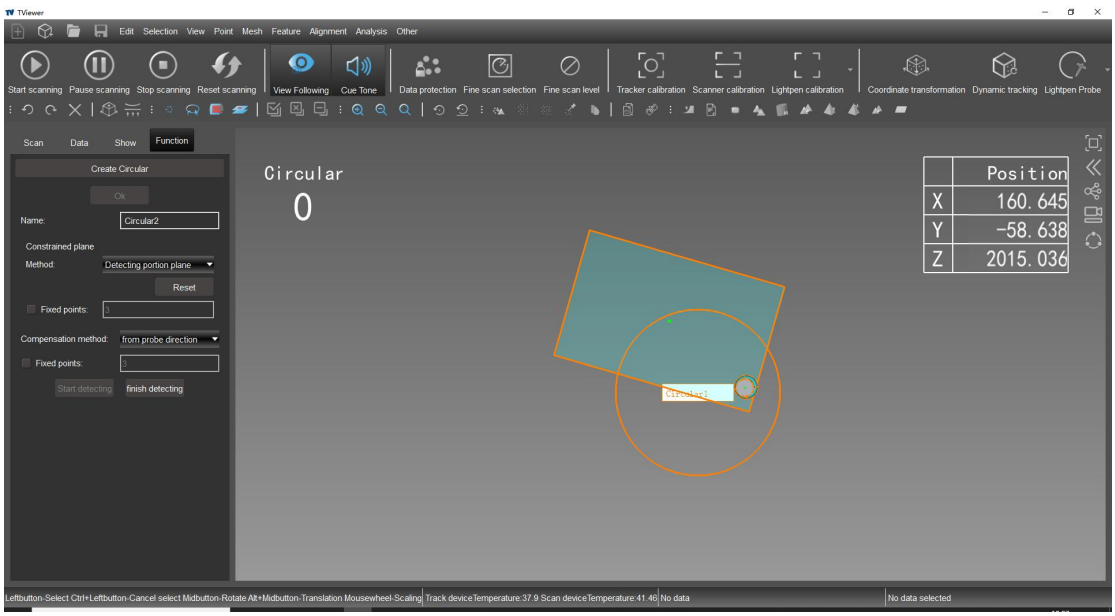
3-30 Detect“circle”function

5.Then, hitting the point on the round feature.



3-31 Detect“circle”function

6.Once you have detected the points, click on the "OK" button to fit the corresponding features.



3-32 Detect“circle”function

3.2 Edit

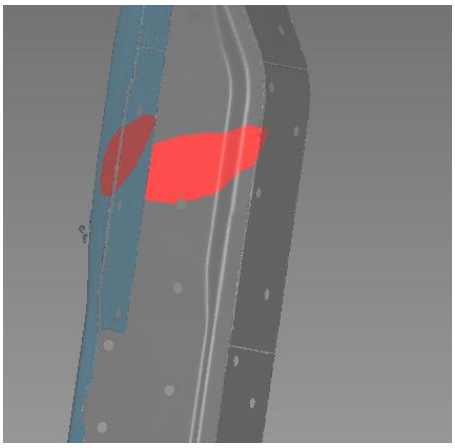
Under the Edit module, operations are performed on a particular piece of data, including modules for undoing, redoing, deleting, calibrating the origin, temperature compensation, etc., as shown in the figure

3.2.1 Select mode

3.2.1.1 Select Single laye

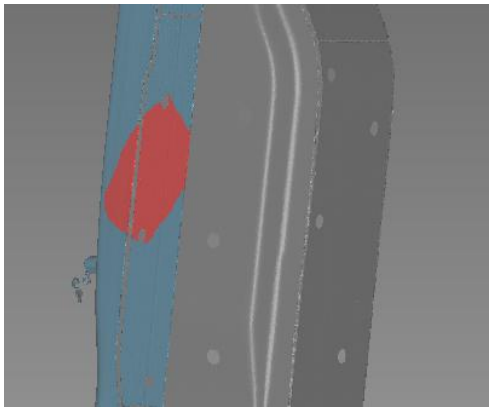
Click “Select single layer”, the user will not be able to select the data of the current back side when selecting the data (Note: “Front” refers to the outer surface of the object, and “Back” refers to the inner surface of the object).

(1) When "Select single layer" is not clicked, the back of the selected data is also selected, as shown in Figure 3-33.



3- 33 Disable select single layer function”

(2) When you click “Select single layer”, the back side of the selected data is not selected, as shown in Figure 3-34.



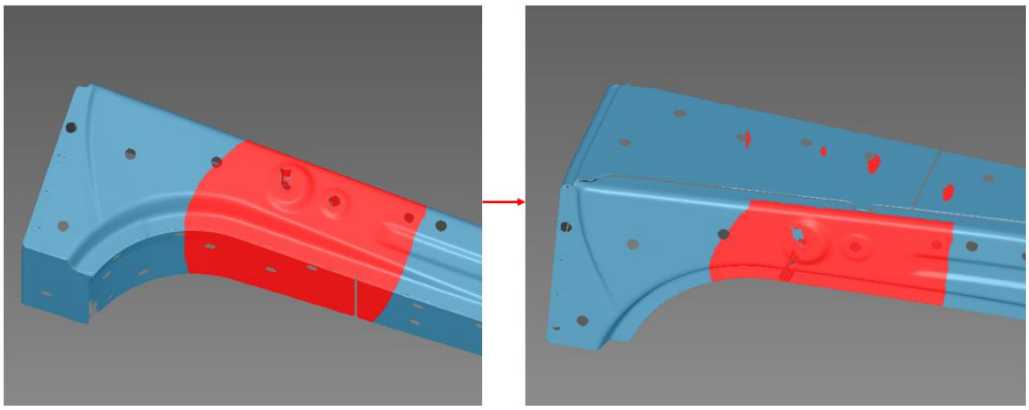
3- 34 Select Single Layer

Attention	The "Select single layer" function is only valid for data from laser point files and project files

3.2.1.2 Select through

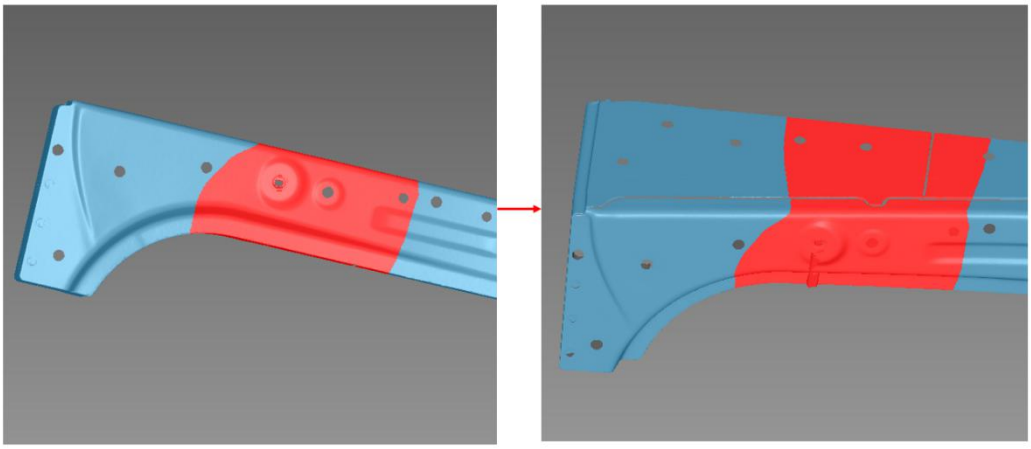
Click "Select Through", the user will only select the data of the visible part when selecting the data.

(1) When “Select Through” is not clicked, the front and back of the selected data are as shown in Figure 3-35.



3- 35 Select through

(2) When you click “Select Through”, the front and back of the selected data are shown in Figure 3-36



3- 36 Enable select through

Attention	The Select Through function is only valid for grid file data.

3.3 Point

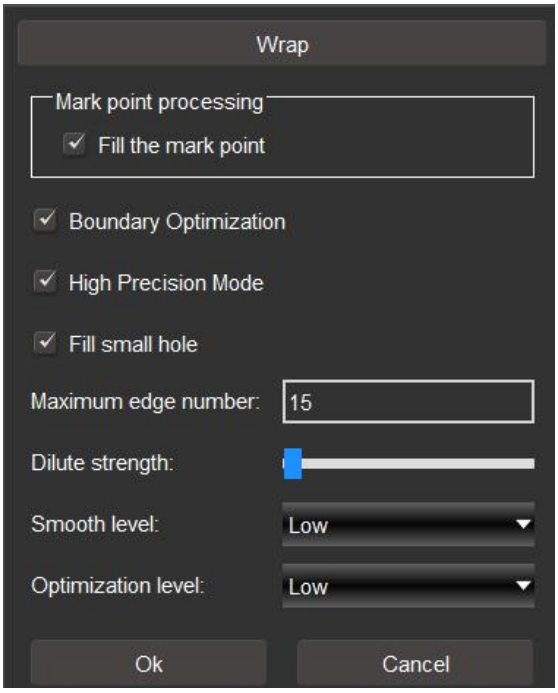
The "Points" section mainly explains five application methods: Wrap, Isolated points, Disconnected Components, Curvature sampling, and Register. The specific icon function is detailed in the 2.2.1 menu bar.

3.3.1 Wrap

The main function of wrap is to generate the point cloud data into a form of mesh. The mesh data can be saved in .stl or .ply format, and the file can be used for 3D printing and reverse engineering operations

The options in the meshing process include fill mark point hole, Boundary optimization, high-precision mode, fill small holes, maximum edge number, dilute strength, smooth level, and optimization level:

(1) Boundary optimization: rearrange the edges of the encapsulated mesh data to obtain smoother mesh edge data.
(2) High-precision mode: Maintaining higher detail while smoothing.
(3) Fill small hole, the maximum number of edges: fill the hole with the number of edges less than the threshold (the default value of the software is 15 sides, the user can also customize) when encapsulating the grid to obtain more complete mesh data.
(4) Dilute strength: In the wrap process, according to the dilute intensity, the number of different mesh is reduced in the flat area and the feature area to obtain the package grid data with less data volume.
(5) Smooth level: adjust the position of the mesh vertex to obtain smoother mesh data; the parameters are low, medium and high, and the smoothing grid strength is increased in turn to obtain smoother and smoother grid data.
(6) Optimization level: Continuously optimize the mesh data to make the mesh surface smoother, while reducing the number of meshes while retaining features. The parameters are low, medium and high, and the optimized mesh strength is increased in turn, and the obtained mesh data is smoother and smoother under the premise of ensuring a certain precision.
After the scan is completed, click "Stop" - "Wrap", pop up the parameter window in the function panel, you can set the parameters (generally select the default settings). As shown in Figure 3-37.

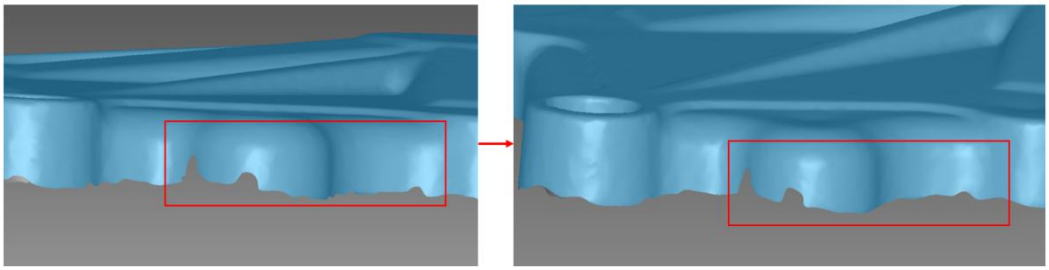


3- 37 Wrap setting interface

The following mainly describes the differences between the various parameters disable and enable during the "Wrap" process.

(1) Edge optimization

In the interface enable "Boundary Optimization", select the edge, click "OK", wait for the data to process and complete the "edge optimization", as shown in Figure 3-38.

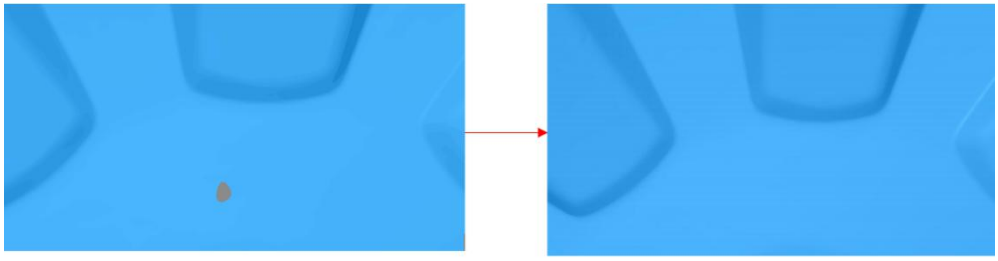


3- 38 Fill mark point process

(2) Fill small hole

In the interface enable "fill small hole", you can fill the hole with the edge number less than the threshold (the default value of the software is 15 sides, the user can

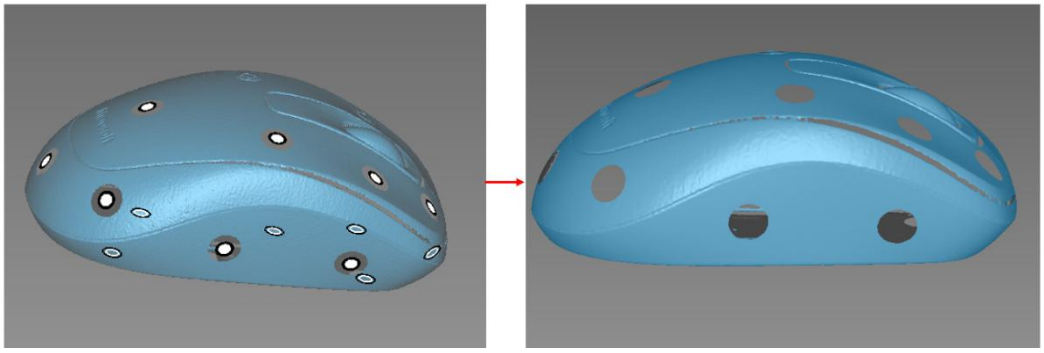
customize), click "OK", wait for the data to process and complete The “fill hole” operation is shown in Figure 3-39.



3- 39 Fill small hole effect

(3) Smooth level

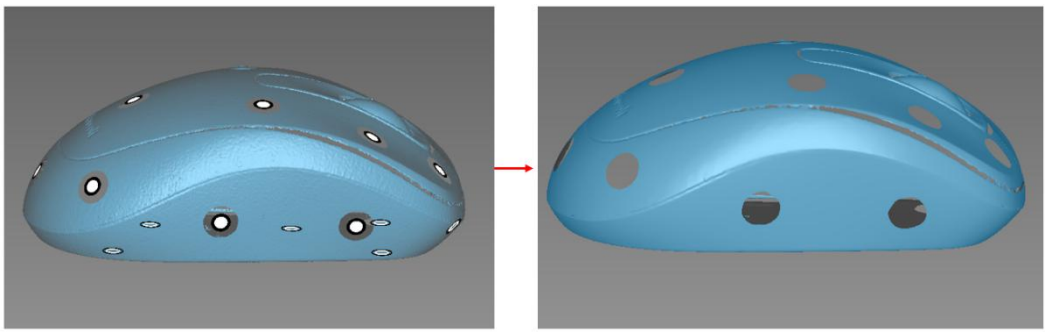
In the interface, the “smooth level” has four levels: no, low, medium and high. Select the desired “smooth level” and click “OK” to wait for the data to process and complete the “smooth level” operation.



3- 40 Smooth level effect

(4) Optimization level

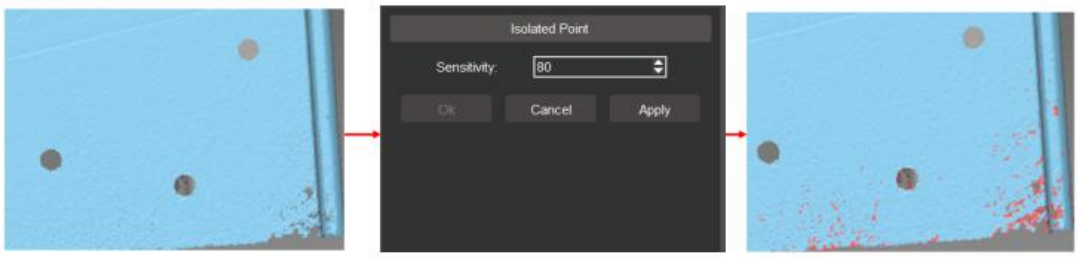
In the "optimization level", there are 4 levels of presence, none, low, medium and high. Select the desired "optimization level", click "OK", wait for the data to process and complete the "optimization level" operation, such as Figure 3-41.



3- 41 Optimization level effect

3.3.2 Isolated point

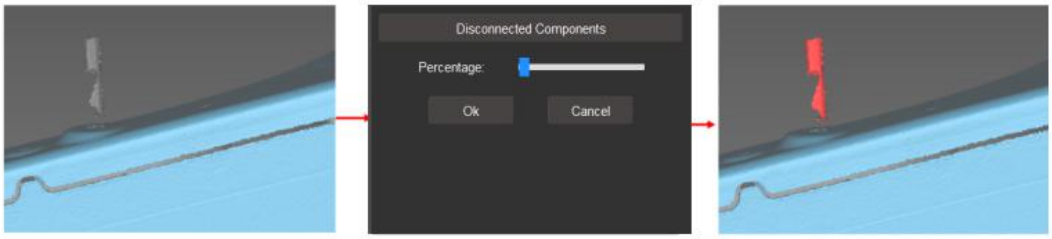
For the scanned data, click “Isolated Point” and select the“Sensitivity”value in the function panel. (Sensitivity 0-100 value. The larger the value, the stricter the condition of the isolated point is determined). Click "OK", after the process is complete, you can see the red "isolated point" in the data. As shown in Figure 3-42.



3- 42 Select isolated point

3.3.3 Disconnected component

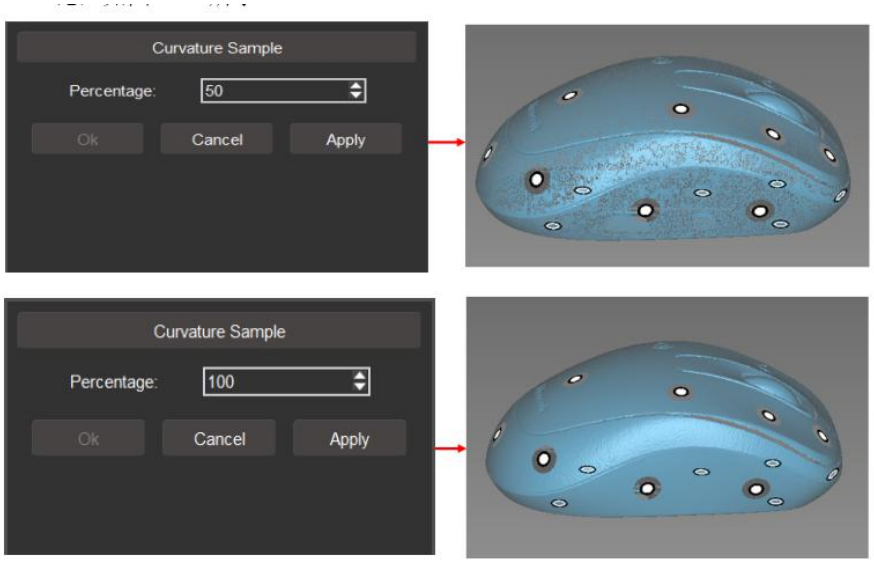
For the scanned data, click “disconnect component”, select the “separation” level, and the separation level is divided into three categories: low, medium and high. The lower the level, the more the disconnected point cloud data is selected.



3- 43 Select disconnect component

3.3.4 Curvature sampling

For the scanned data, click “Curve Sampling”, select “Percentage”, enter the percentage value, and click “Apply”. The curvature sampling effect is 50% and 100% in the case of curvature sampling, as shown in Figure 3-44.

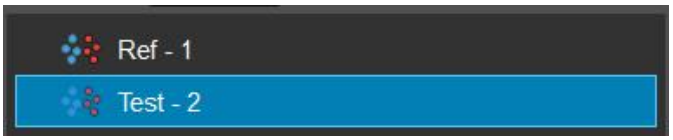


3- 44 Curve Sampling

3.3.5 Register

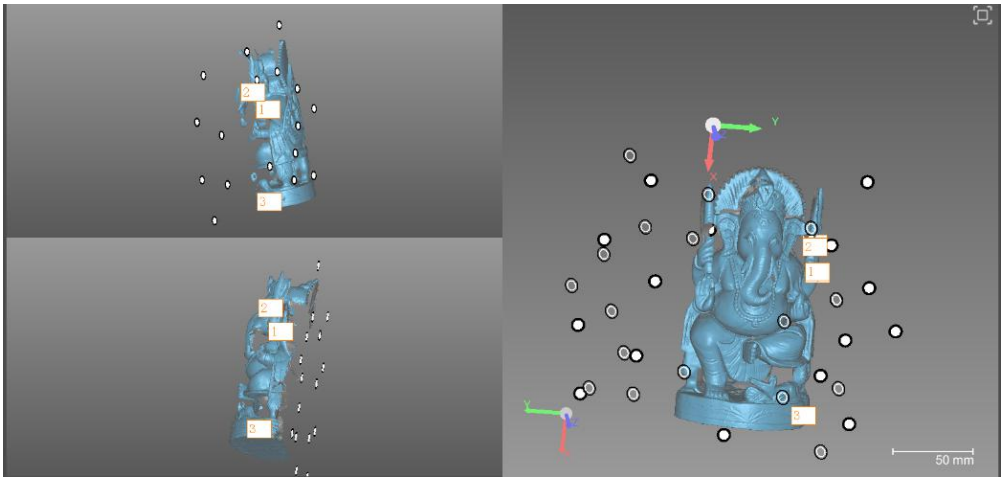
(1) Laser point stitching

The first step: open two sets of laser point files that need to be spliced (the following is an example of "Buddha, Buddha 2"), right click on the data "Buddha 1", select "Set Test", right click on the data "Buddha 2" , select "Set Reference". As shown in Figure 3-45.



3- 45 Set property before splicing

(2) Click on the laser spot stitching, select the three reference points in the left picture 1 and the three test points in the left picture 2, and click “Apply” to complete the laser point stitching. As shown in Figure 3-46.



3- 46 Laser point splicing process

The third step: the laser spot stitching result is shown in Figure 3-47.

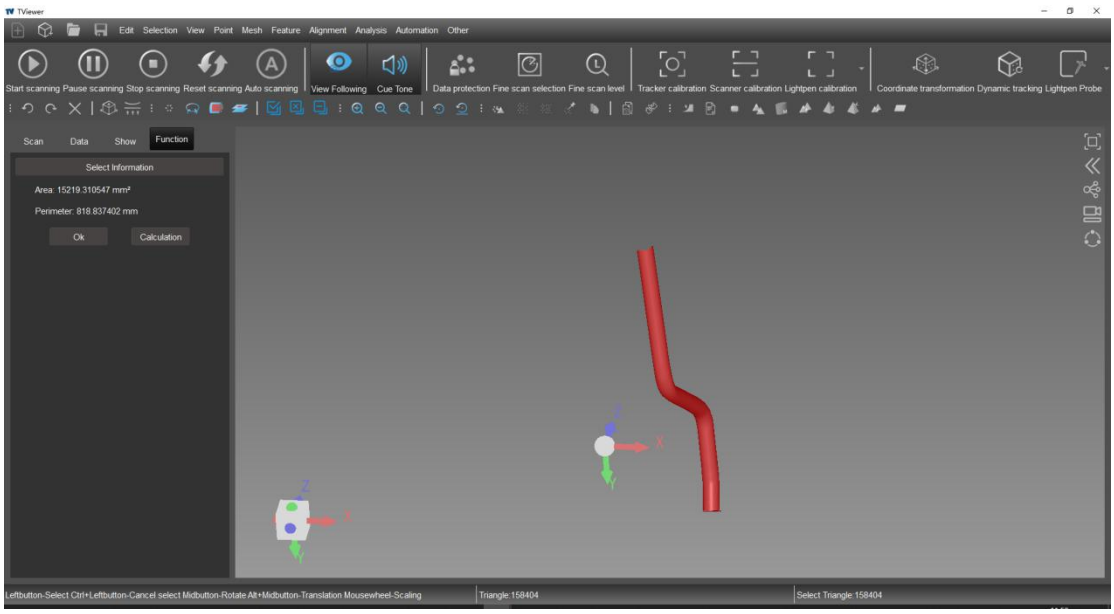
3- 47 Laser point splicing data

3.4 Mesh

The "Mesh" tab mainly explains five application methods such as quick selection and selection information, hole filling, simplify, refine, and defeature.

3.4.1 Quick select & select information

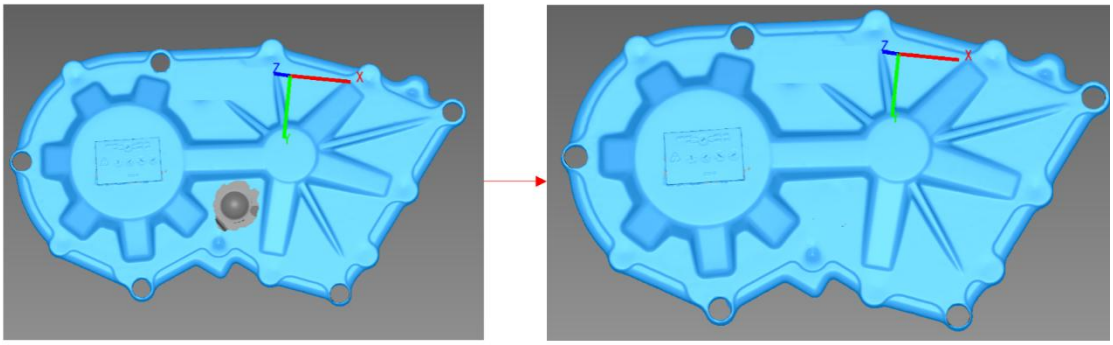
After scanning, click “Quick Select” for the data. After quick selection, click “Select Information” to display the area and perimeter of the selected area. As shown in Figure3-48.



3-48 Select information interface

3.4.2 Fill hole

Select the scan data that will be filled in the hole, click " Fill Hole" (the data boundary turns green and other functions are locked). Select the area to be filled and click the edge". The comparison before and after filling holes is shown in Figure3-49.

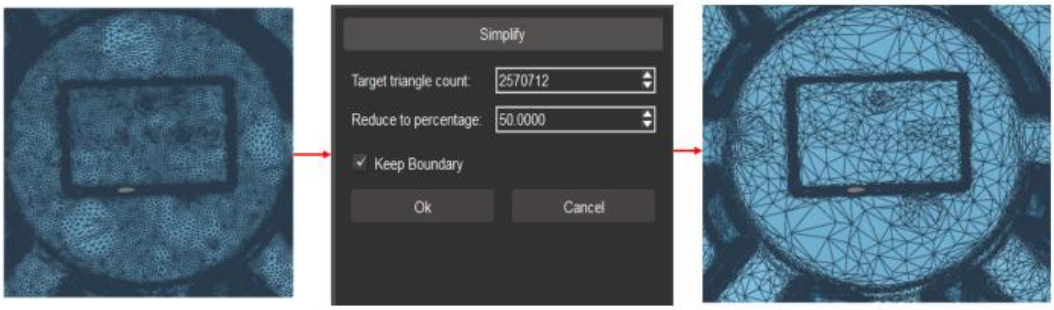


3-49 Fill hole process

3.4.3 Simplify

Select the mesh data to be simplified, click on “Simplify”, select the parameters (retain the number or percentage of triangles) – click “OK” to complete the data simplification. The comparison before and after simplification is shown in

Figure3-50.

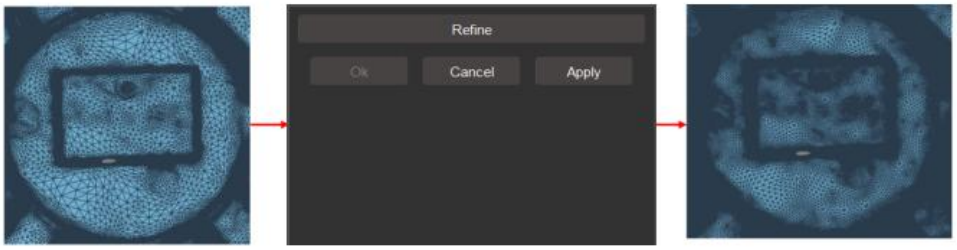


3-50 “Simplify” prcess

Notice	Select the function panel "Display" - check the "Grid Line" to see the simplified effect more intuitively.

3.4.4 Refine

Select the mesh data to be refined, and click “Refine” - “Apply” to complete the data refinement. The comparison before and after refinement is shown in Figure 3-51.

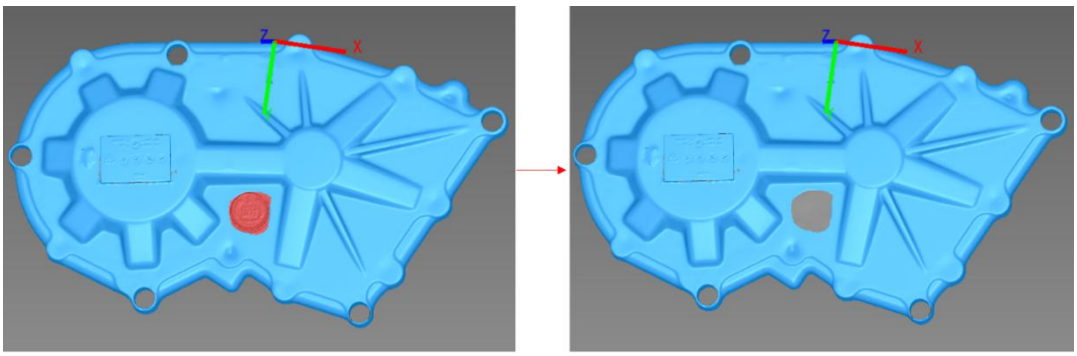


3-51 Refine process

Notice	Select the function panel "Display" - check the "Grid Line" to see the refinement effect more intuitively

3.4.5 Defeature

Open the mesh data file whose features need to be removed, select the features to be removed, and click “Defeature” to complete. The comparison before and after feature removal is shown in Figure 3-52.



3- 52 Defeature process

3.5 Feature

"Features" tab mainly explains the attributes of features such as circles, grooves, points, and lines, feature construction, feature preservation, and feature extraction. When you open the Model File, the feature construction method will increase the "CAD option".

Feature	Parameter	Construction ways
Circle	Center coordinates, direction, radius, etc.	Mode: parameters, intersections, fittings, selection points; Intersection sub-mode: plane and cylinder, plane and cone, plane and ball; Fitting sub-method: fitting; Choose the idea of the way: three points.
Elliptical grooves	Center point coordinates, direction, direction of the main vector, length, width, etc	Mode: parameters, fitting; Fit sub-mode: elliptical slot.
Rectangular groove	Center point coordinates, direction, direction of the main vector, length, width, etc.	Mode: parameters, fitting; Fit sub-mode: rectangular slot.
Circular	Center point coordinates,	Mode: parameters, fitting;

Feature	Parameter	Construction ways
groove	direction, direction of the main vector, length, width, etc.	Fitting sub-mode: circular groove
Point	Point coordinates	Mode: parameters, objects, intersections, projections, fittings; Object sub-method: center of the circle, center of the plane, center of the sphere, midpoint of the line, midpoint of the cylinder Intersection sub-mode: two straight lines, straight lines and planes, three planes, straight lines and balls; Projection sub-mode: projection of a point on a line, projection of a point on a plane, projection of a point on a sphere, projection of a point in a cylinder, projection of a point in a cone; Fitting sub-mode: spherical center, conical cone point
Line	Starting point coordinates, end point coordinates, direction, length	Mode: parameters, objects, intersections, projections, fittings, selection points; Object sub-method: round normal, cylindrical axis, elliptical groove normal, elliptical groove main vector, circular groove normal, circular groove main vector, rectangular groove normal, rectangular groove main vector; Intersection sub-mode: two planes; Projection sub-mode: the projection of a line in a plane; Fitting sub-method: straight line; Choice point: two points.
Plane	Coordinates, directions, main vectors, radii, length, width, etc.	Mode: parameters, objects, fitting, selection points; Object sub-method: circular plane, elliptical groove plane, circular groove plane, rectangular groove plane; Fitting sub-mode: plane; Choose the idea of the way: three points
Sphere	Core coordinates, radius	Mode: parameters, fitting, selection points; Fitting sub-method: sphere; Choose the idea of the way: four points.
Culinder	Base point, direction, radius, height	Mode: parameters, fitting; Fit sub-mode: cylinder.
Cone	Direction, half angle, height, base radius, top radius	Mode: parameters, fitting; Fitting sub-method: cone

Notice	The features described in this section are bounded or finite, such as the length of a line, the height of a cylinder, and the plane. Conical features include cones and truncated cones in the mathematical sense.

3.5.1 Feature construction

The feature structure includes six modes: intersection mode, fitting mode, selection point mode, CAD mode, object mode, and projection mode.

(1) Intersection mode

The intersection modes include straight lines and straight lines, straight lines and planes, straight lines and spheres, and three planes intersecting the construction points; the two planes intersect to form a straight line; the plane and the cylinder, the plane and the cone, and the plane intersect with the sphere to construct a circle.

(2) fitting mode

The fitting method includes a least squares fitting structure, a minimum onetime fitting structure, a Chebyshev best fitting structure, a maximum inscribed circle fitting structure, and the like.

The least squares method (also known as the least square method): is a mathematical optimization technique. It finds the best function match for the data by minimizing the sum of the squares of the errors. The least squares method can be used to easily obtain unknown data and minimize the sum of the squares of the errors between the obtained data and the actual data.

Least multiplication: As long as the sum of the absolute values of the errors is minimized. It does not require random errors to follow a normal distribution, and "stability" is higher than the least squares method. This method is superior to the least squares method when the random error of the data does not obey the normal distribution.

Chebyshev fit: Named according to the mathematician Chebyshev's theory, minimizing the maximum value is the MinMax problem.

Maximum inscribed circle fit: Fits the largest inscribed circle based on actual data.

(3) Selection point mode

The selection point method includes a three-point construction plane, a threepoint construction circle, a four-point construction sphere, and the like.

(4) CAD mode

That is, the feature is created by clicking on the face or line or point of the feature in the CAD data mouse.

(5) Object model

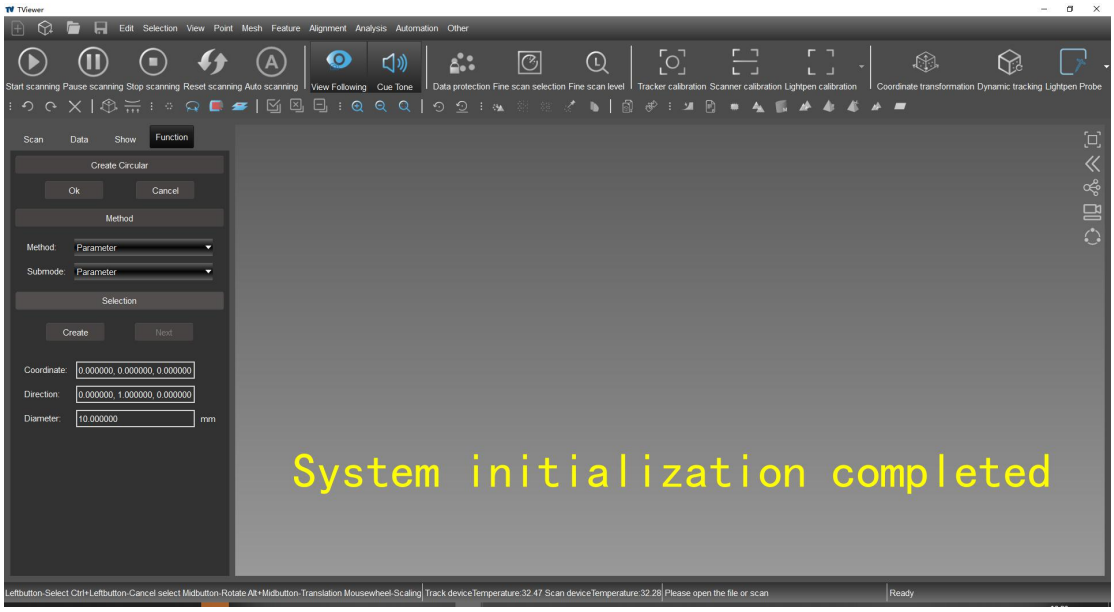
That is, points, lines and planes are obtained from the constructed features. The construction points are generally the center of the circle, the center of the sphere, the center point, etc. The structural line is generally the normal of the axis or the two-dimensional feature, and the structural plane is generally the plane of the two-dimensional feature.

(6) Projection mode

It includes a projection point whose point is on a straight line and a projection point construction point where the point is in the plane, and a straight line where the straight line projects in the plane.

3.5.1.1“Circle” construction

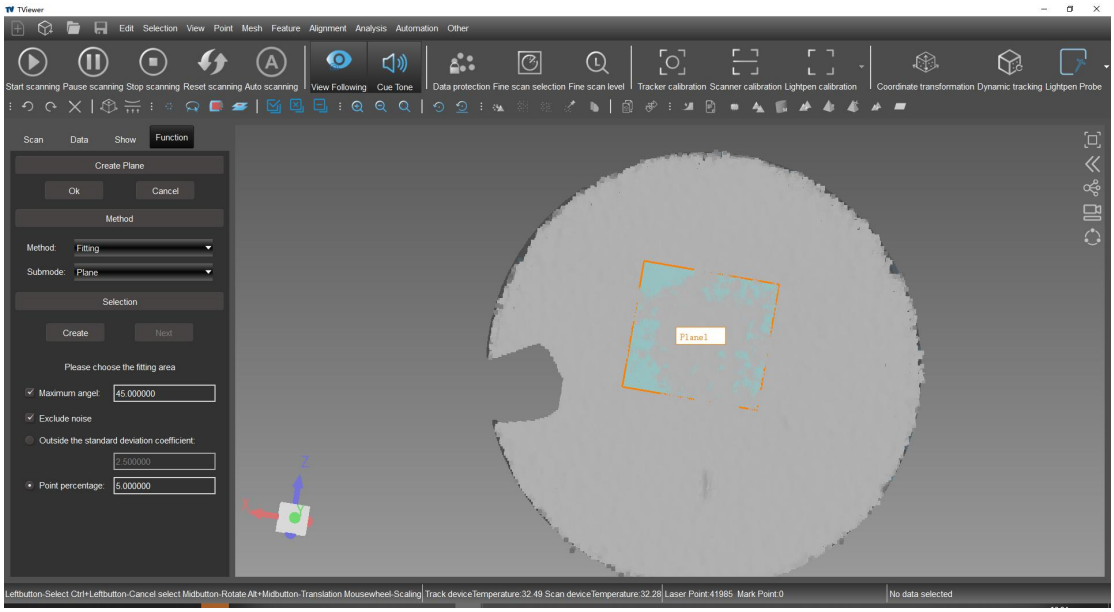
Parameters: Click “Circle”, select “Parameter”, enter the coordinates, direction, radius value, and click “Create” - “OK”.



3-53 “Circle” construction

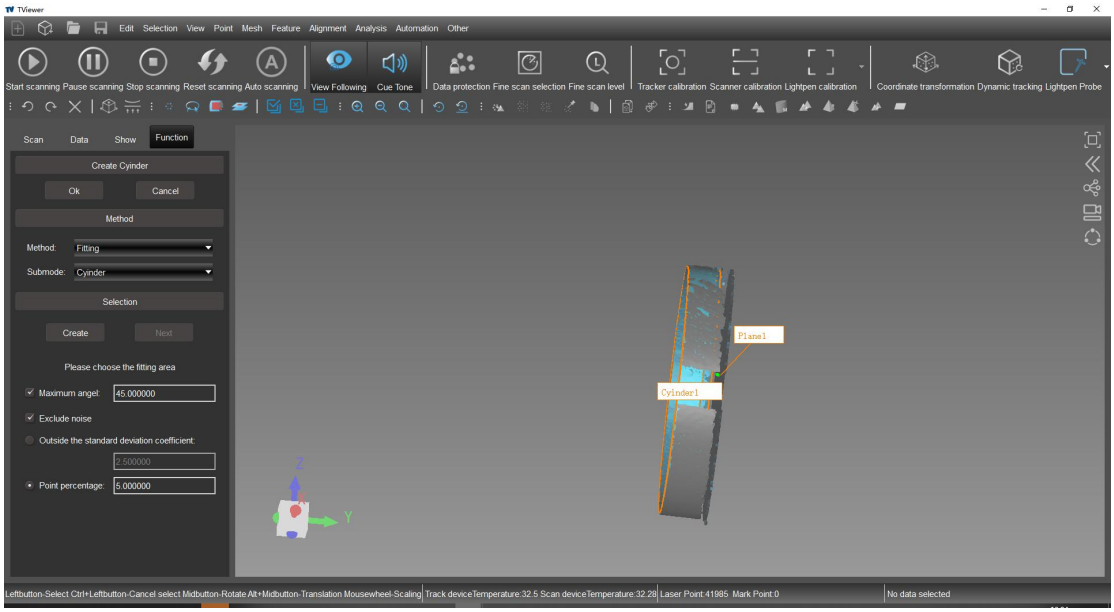
Intersection: Click “Circle” and select “Intersection”. There are 3 planes of “Plane and Cylinder”, “Plane and Cone”, “Plane and Ball”. The following mainly introduces the construction circle of “Plane and Cylinder”. Create a plane and a cylinder separately. Specific steps are as follows:

Step 1: Click on “Plane” – “Fitting” – “Create” – “OK” to create a planar feature.



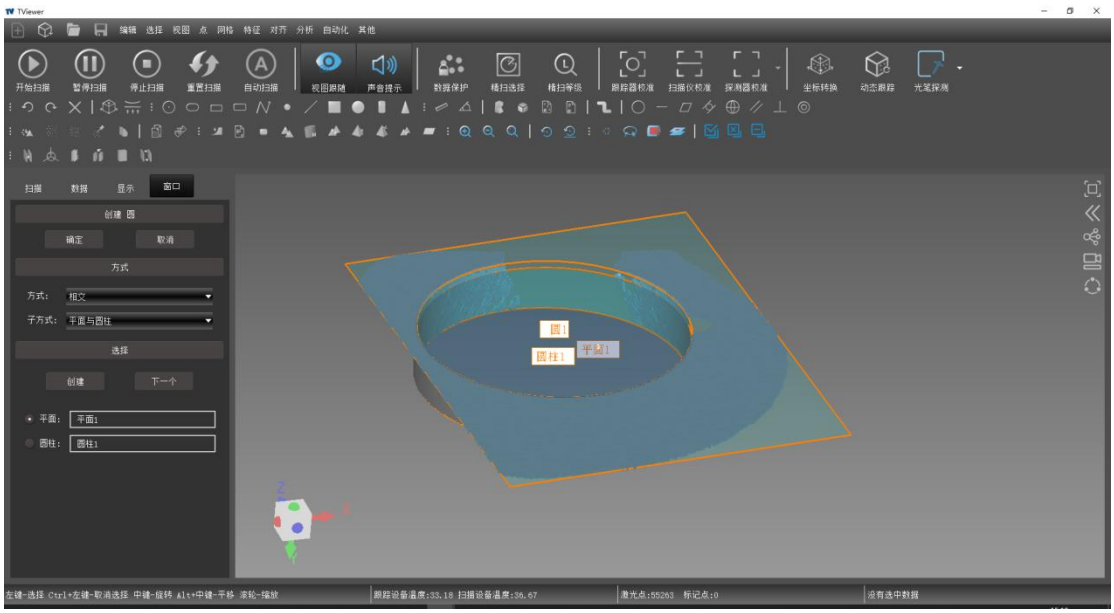
3-54 “Circle” construction

Click on "Cylinder" - Method "Fitting" - "Create" - "OK" to create a cylindrical feature.



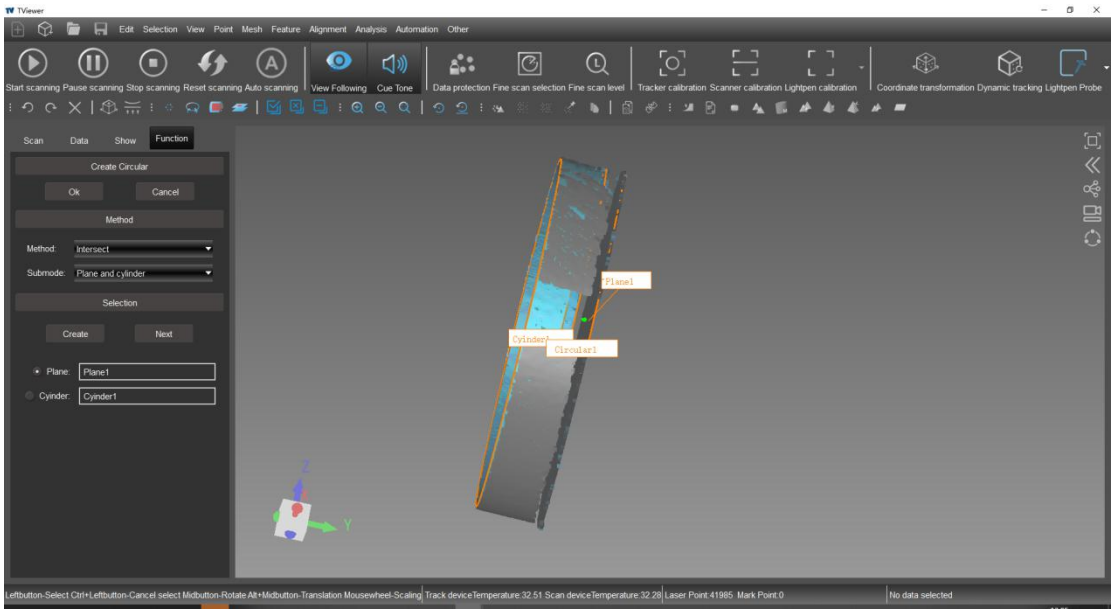
3-55 “Circle” construction

At this point, the plane and the cylindrical features are constructed. Click on the “circle”—the way “intersect”, click on the plane and the cylinder respectively, and finally click “Create—OK” to complete the feature pattern of the intersecting construction circle.



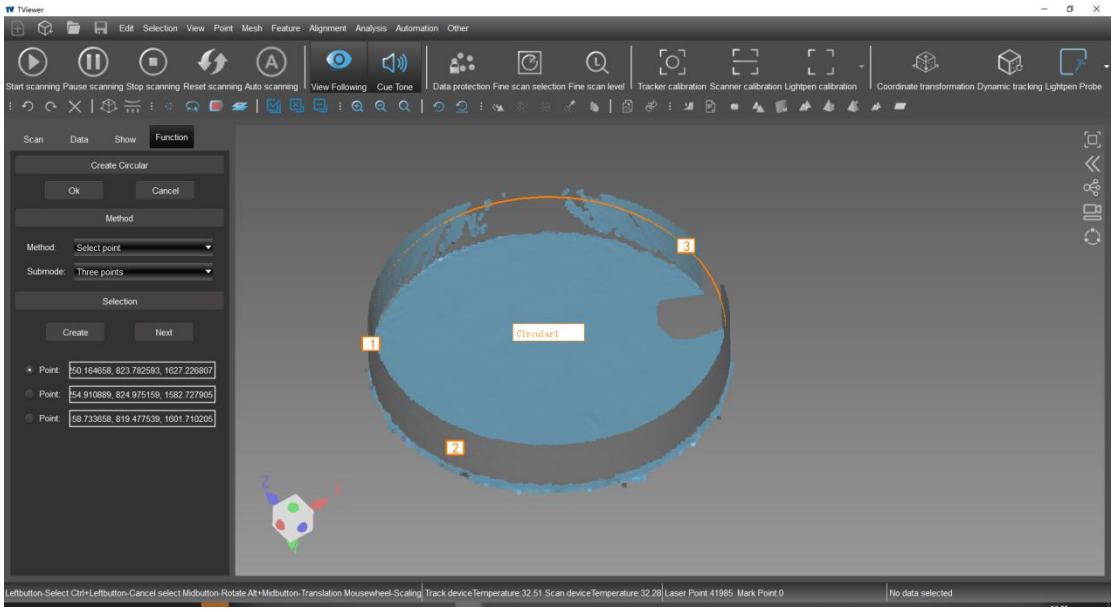
3-56 “Circle” construction

Fitting: Click “circle”—method “fit”, and divide into the least squares best fit, the least one best fit, Chebyshev best fit, The maximum inscribed circle fits four fitting methods. Among them, the "minimum one-time best fit" sub-mode has "internal, middle", "Chebyshev fit" optional sub-modes have "internal, central, external" and so on. The following uses the "least squares best fit" creation method.



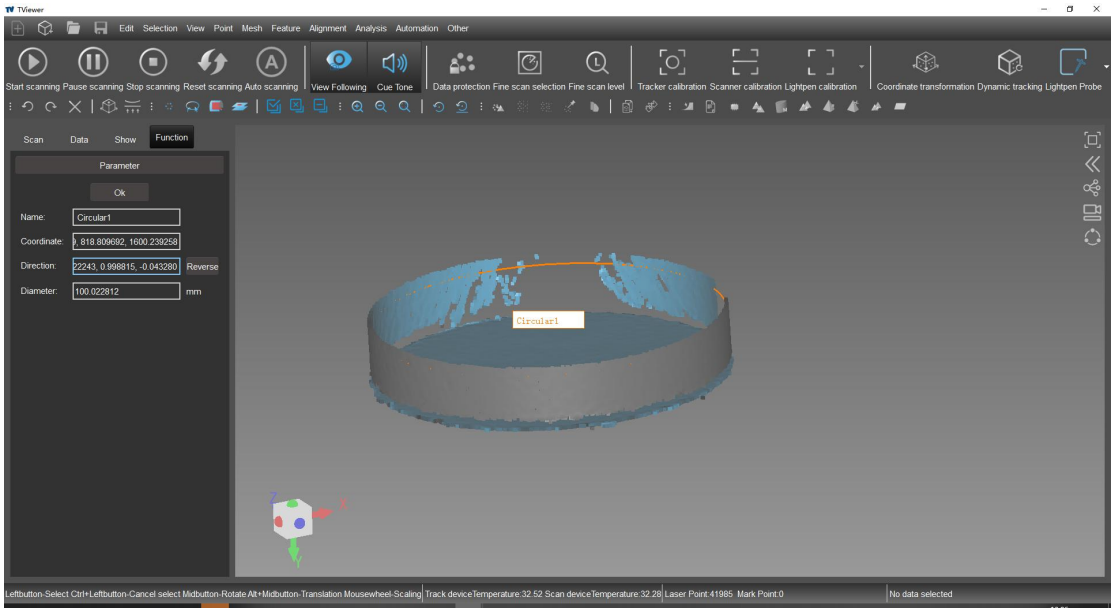
3-57 “Circle” construction

Select points: Click "circle", select the mode "select point", sub-mode "three points", click "create" - "determine" to complete the three-point mode to construct the circle feature. As shown in Figure



3-58 “Circle” construction

In some applications, the constructed features may be opposite to the actual normal. The feature extraction function sometimes needs to "reverse" the direction of the feature. Click on the data "Circle 1" - "Properties" - "Reverse" - "OK".



3-59 “Circle” construction

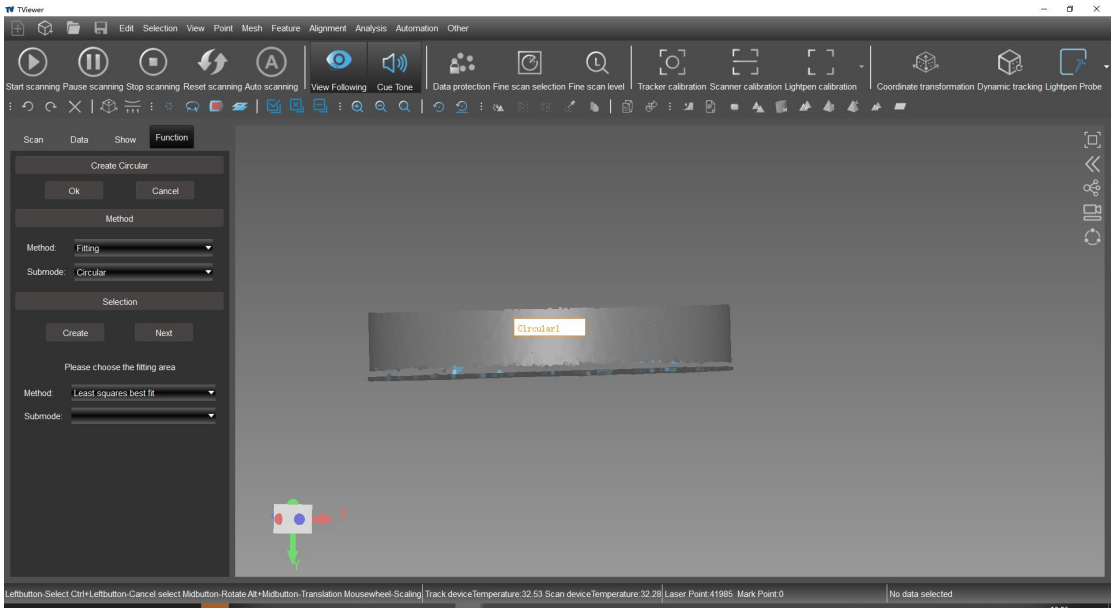
Attent	When the constructed normal directions are the same, this step may not be operated.

The features of the structure can be saved as .step or .iges format files, in which the features of the circle, the elliptical slot, the rectangular slot, the circular groove, the polyline, the point, and the straight line are saved as .iges format files, planes, balls, The features of the cylinder and cone construction are saved as .step format files.

3.5.1.2 "point" feature construction

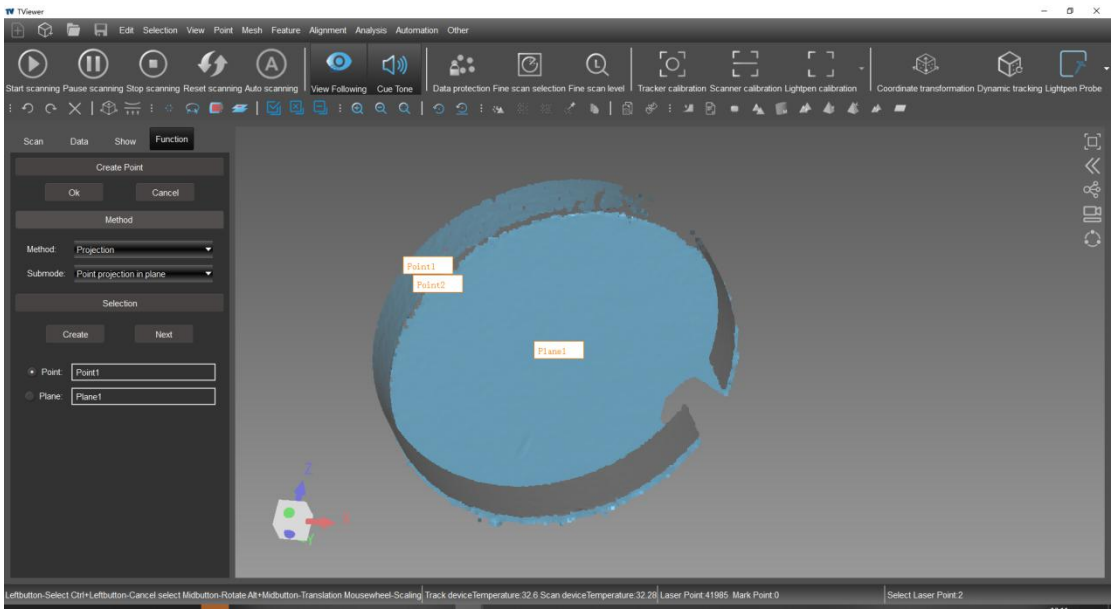
The principle of parameter, intersection and fitting structure is the same as that of the previous section 3.5.1.1 “Circle”.

Object: first construct a feature "circle", click "point" - mode "object" - sub-mode "center" (can be selected according to specific characteristics) - "create" - select "circle 1" data - click "OK "Yes.



3-60 "point" feature construction

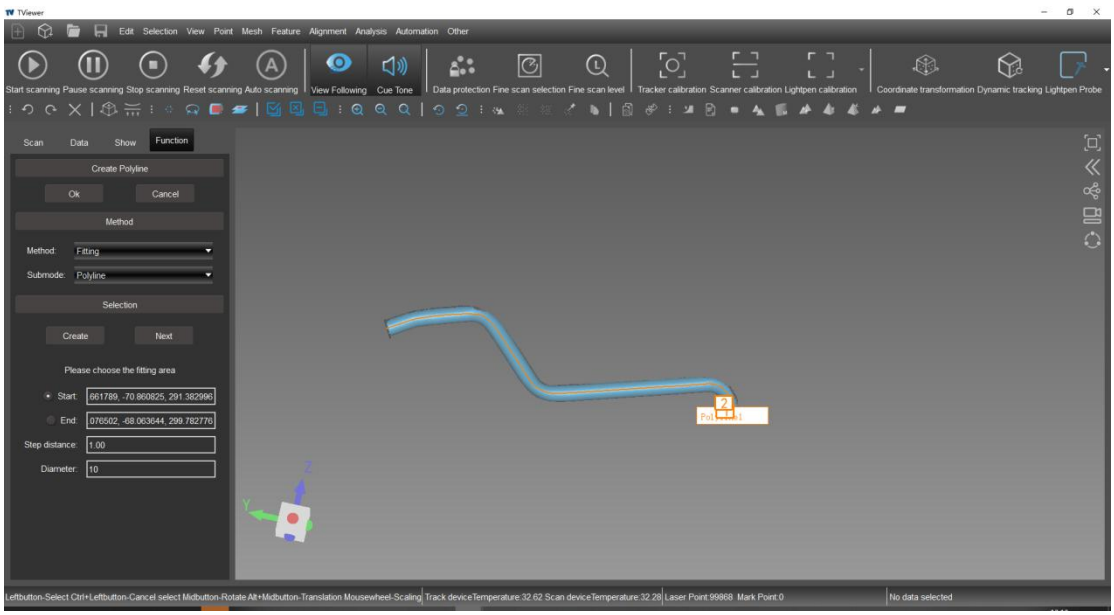
(1) Projection: first construct a feature "circle", select "point" - mode "object" - sub-mode "centre", click "circle 1" - "create" - "apply".



3-61 "point" feature construction

3.5.1.3 “Polyline” feature construction

Select the data that needs to construct the “polyline”, click “polyline”, select “starting point” and “end point”, and input the “step” and “radius” parameters. The data input by the step size is 2~5 times of the resolution, and the actual radius value of the radius input data.



3-62 “Polyline” feature construction

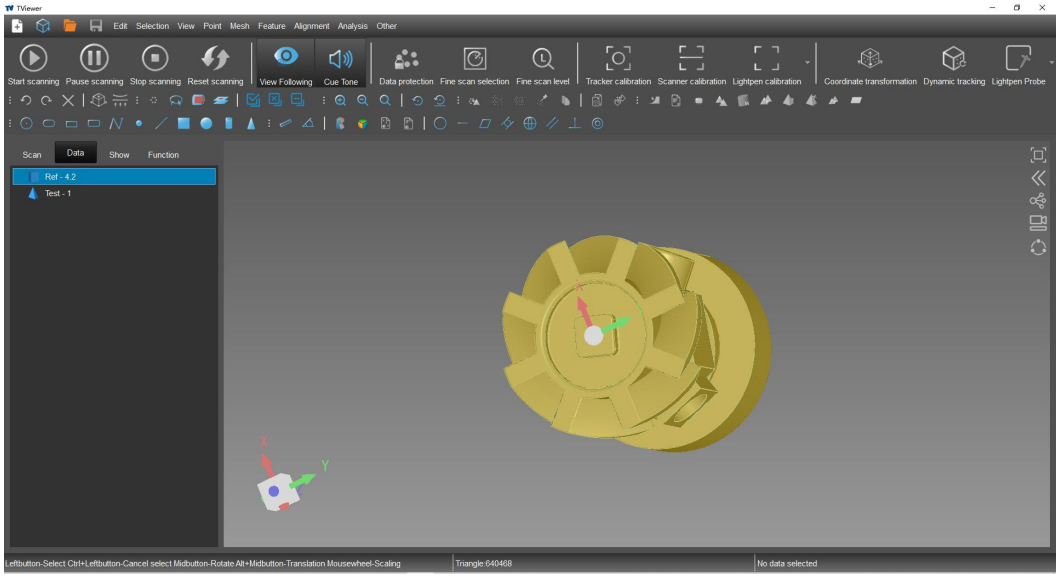
Click “Create” - “OK” to construct the polyline (Fig. 4-48), right click on “Polyline 1” to save, select the save type “polyline file (.iges)” Save it.

Attent	The data to be fitted needs to be continuous without obvious fracture, otherwise it will cause polyline cut-off

3.5.2 Feature extraction

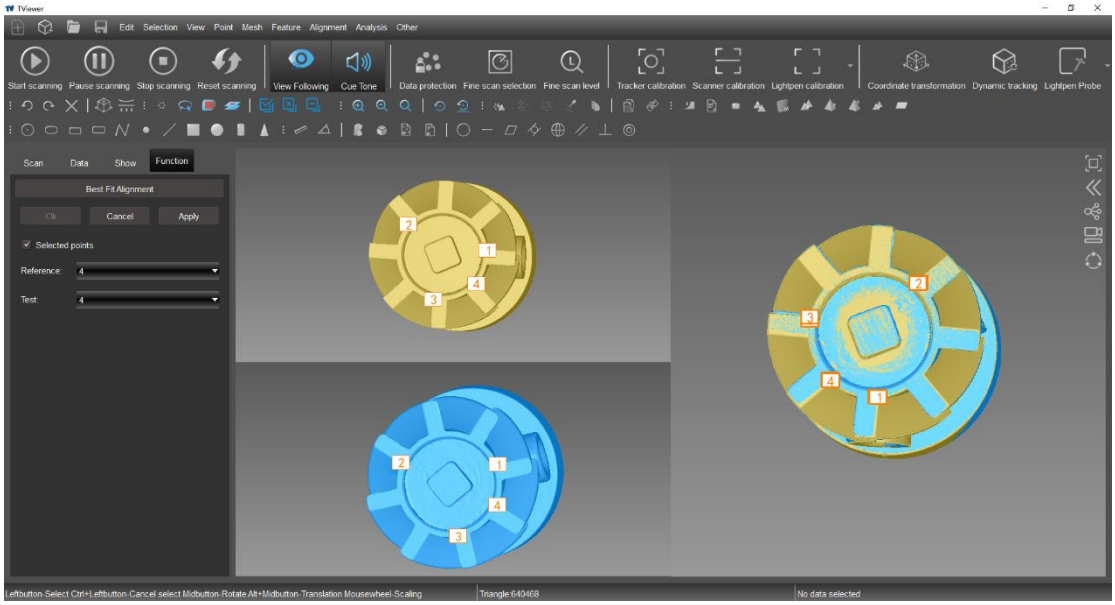
Feature extraction means that in the same coordinate system, features on the reference data are automatically fitted to similar positions on the test data to create the same type of feature operation. The reference data must be a model file, ie a CAD data file, and the features that can be extracted must be constructed in a CAD format. At this stage, the software supports the extraction of features such as planes, circles, spheres, and cylinders selected by CAD. The following mainly introduces the plane feature extraction:

Select the file that needs to extract “plane”, open the corresponding model file at the same time, right click on the file and select “Set Test”, right click on the model file and select “Set Reference”.



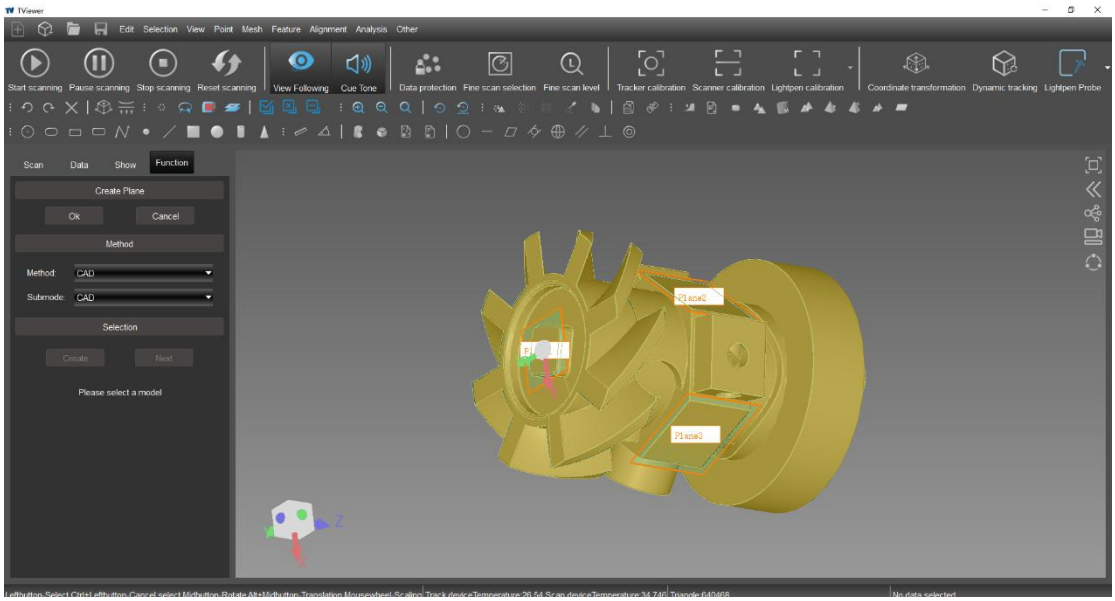
3-63 Feature extraction

Click “Best Fit Alignment”, select the corresponding N point ($3 \leq N \leq 9$) from the model file and the file position, and click “Apply”–“OK”.



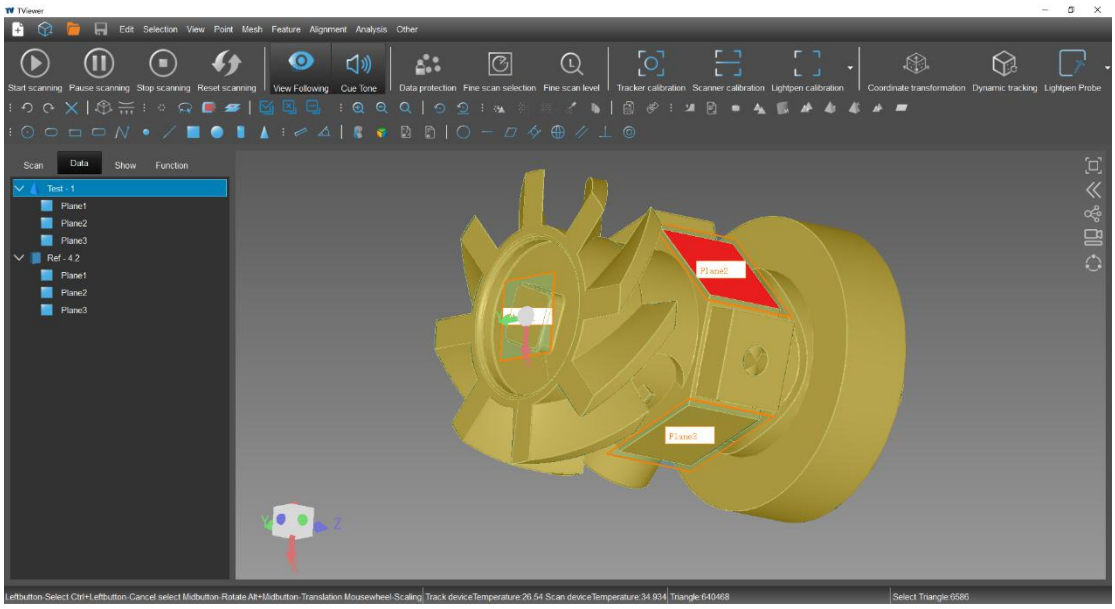
3-64 Feature extraction

Construct three plane features on the model file, select the mode “CAD”, and click “OK” after the three planes are selected.



3-66 Feature extraction

Perform the “extraction” of the planar features constructed in the previous step. In general, the default parameters (the user can customize according to the actual situation), click “OK” to extract the three planes in turn.



3-66 Feature extraction

After the feature extraction operation is completed, the following section describes the "Alignment" application.

Attention	Feature extraction is generally after the "alignment" operation. If the deviation of the data after "alignment" is too large, it may affect the extraction effect. Please adjust each parameter according to the actual situation.

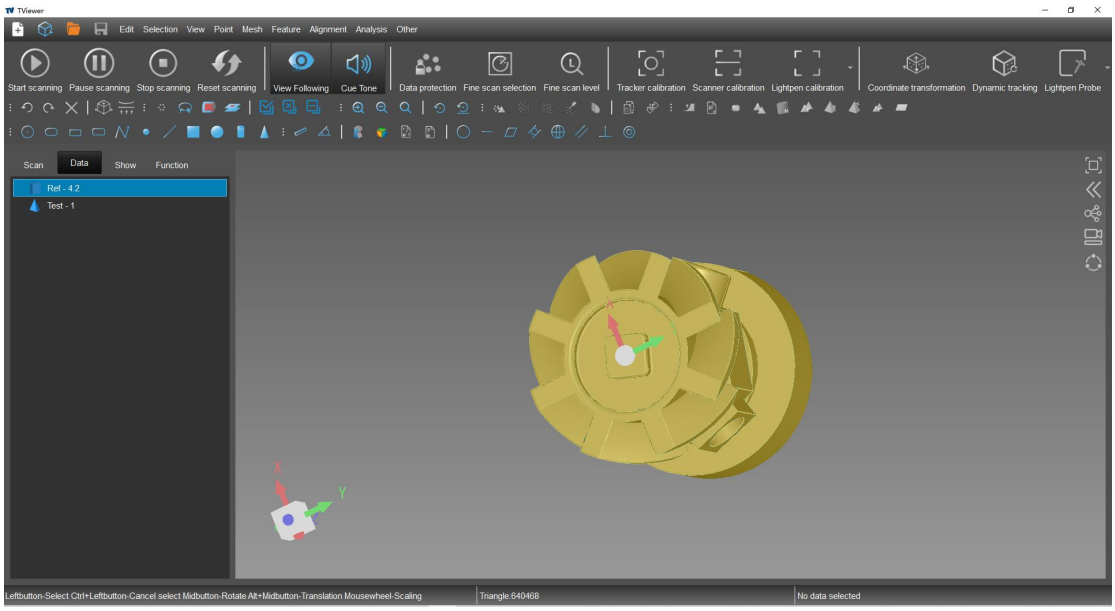
3.6 Alignment

Alignment is the process of unifying two different sets of data into the same coordinate system by rigid transformation. All of the alignments described in this section are rigid transformations, which are transformations that only change the position and orientation of the object without changing the shape and size of the object. Common alignments include: best fit alignment, alignment to global, feature

alignment, N dot alignment, PLP alignment, and RPS alignment.

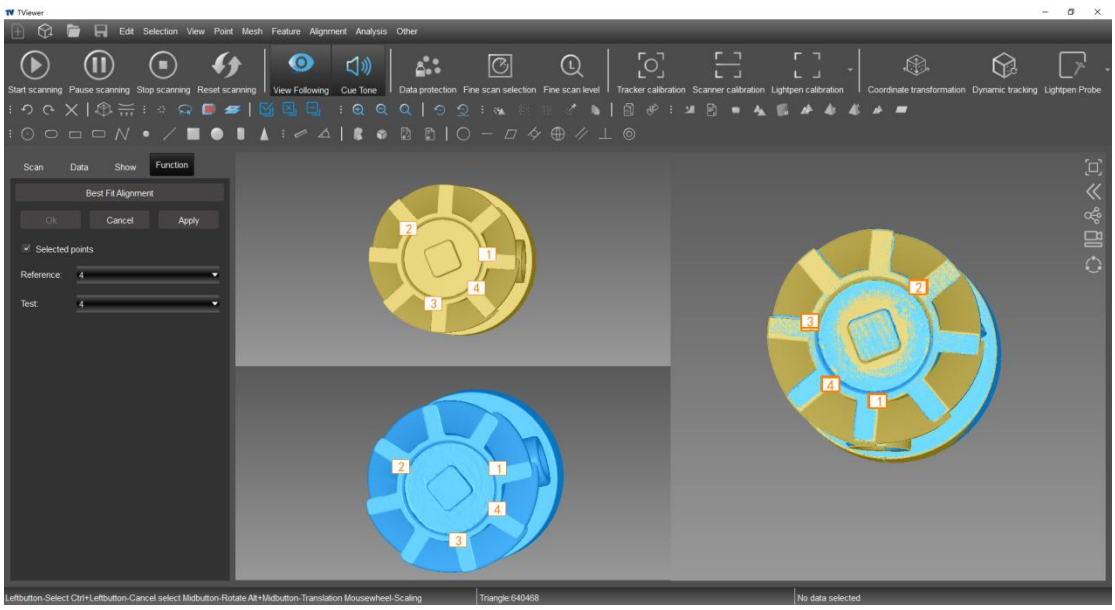
3.6.1 Best fit alignment

(1) Select the file data to be aligned, and open the corresponding model data. Right click on the file and select “Set Test”. Right click on the model file and select “Set Reference”.



3-67 Best fit alignment

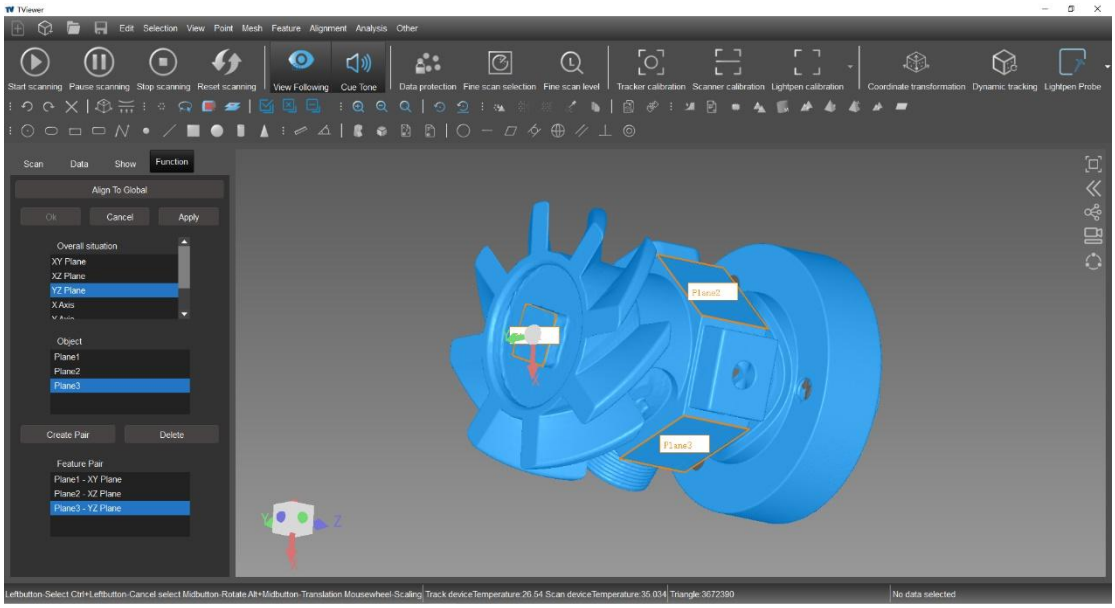
Click “Best Fit Alignment”, select the corresponding reference and test N points ($3 \leq N \leq 9$) for the model file and file position respectively, and click “Apply”-“OK”.



3-68 Best fit alignment

3.6.2 Align to global

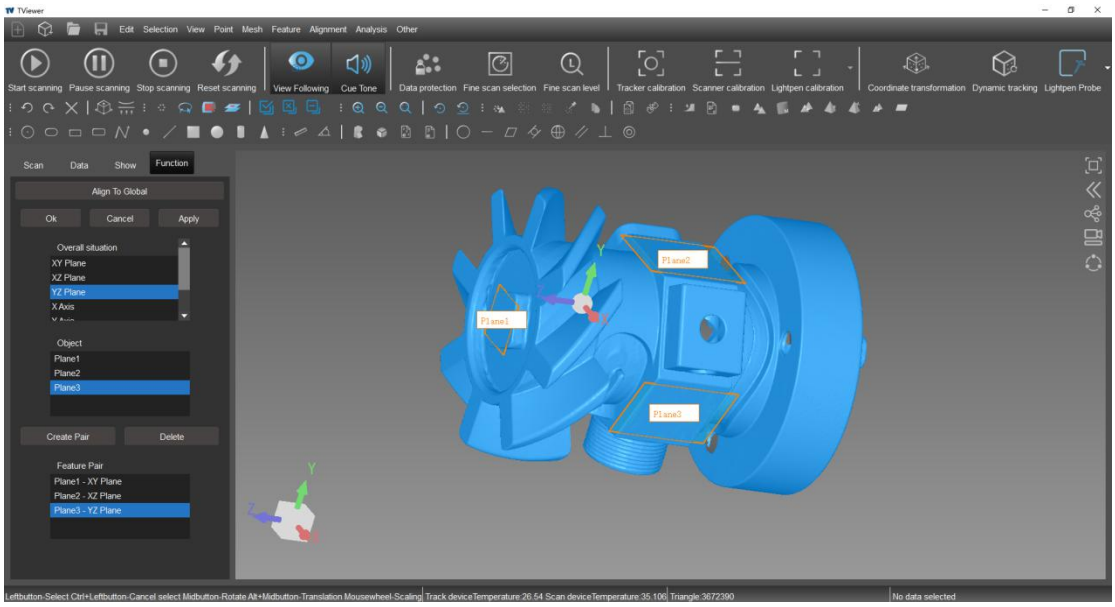
Select the data that needs to be aligned to the global, construct three plane features and after the construction is complete, click “Align to Global”.



3-69 Align to global

Attention	Alignment into the global process should avoid constructing parallel (or coincident) plane features.

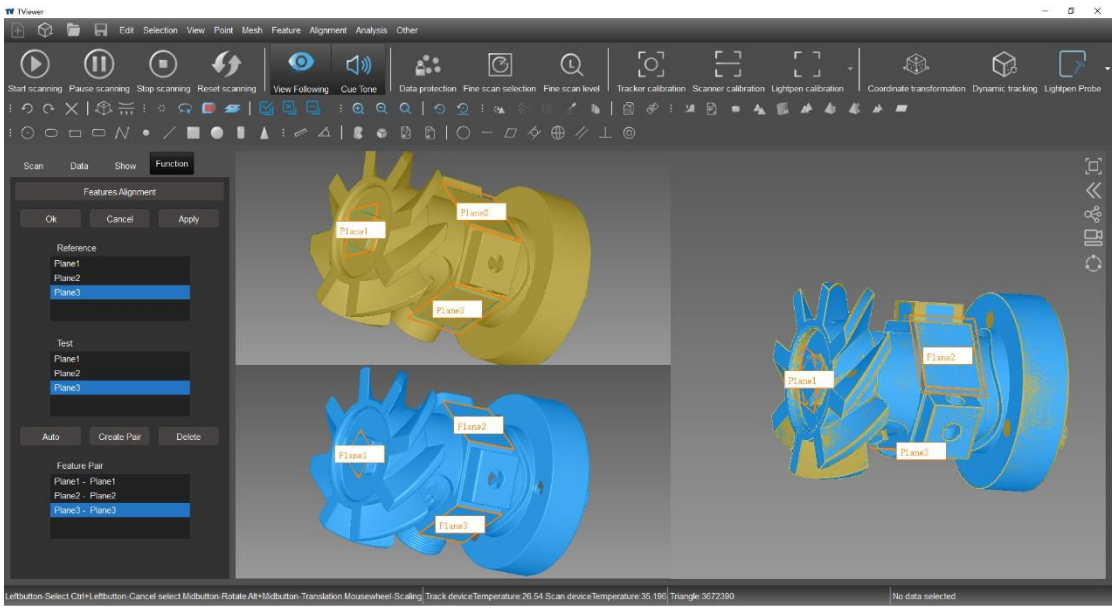
Select plane 1, plane 2, plane 3 corresponding to the XY plane, XZ plane, and YZ plane respectively, click “Create Pair”—“OK”, and finally run the data alignment to the whole.



3-70 Align to global

3.6.3 Features Alignment

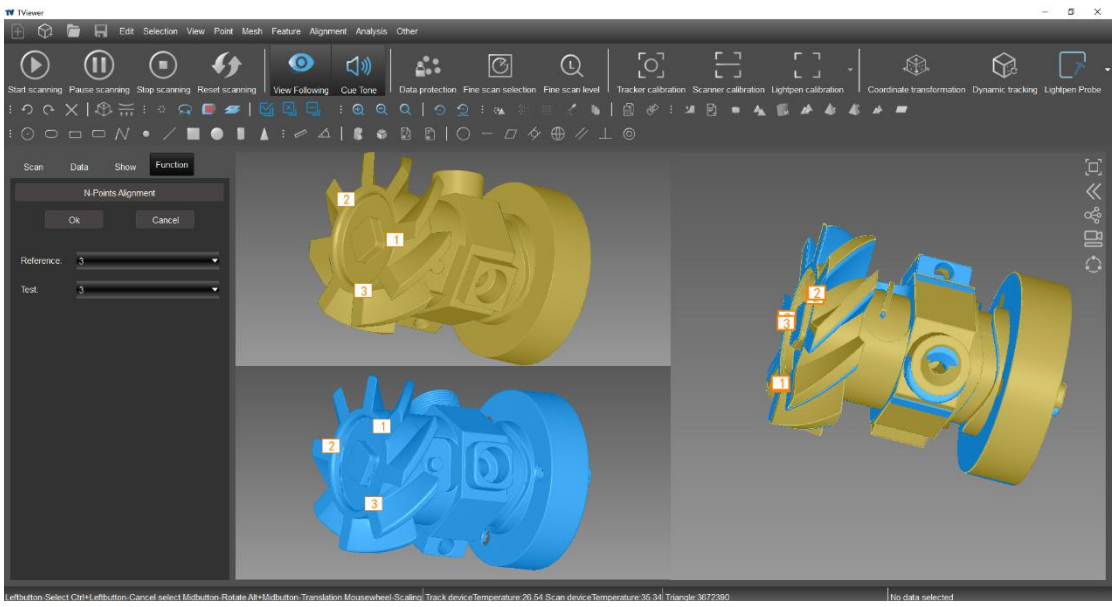
After the feature extraction, click “Align—Features Alignment” and click “Auto”—“OK” to complete the feature alignment. You can also click “Create Pair”, “Reference” and “Test” to match one by one, and select the priority of the corresponding feature to complete the feature alignment.



3-71 Features Alignment

3.6.4 N-Points Alignment

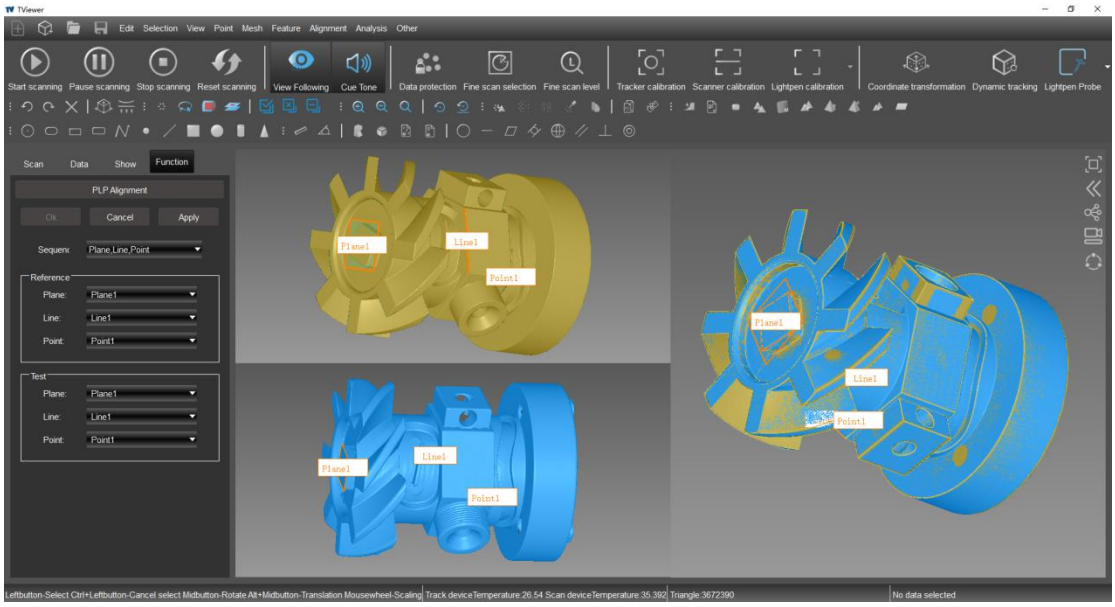
Select the data to be aligned, and open the corresponding model data. Rightclick "Set Test" and "Set Reference", click "Align - N Point Alignment", and click 3 reference points in the model file and grid file respectively. And 3 test points, click "OK".



3-72 N-Points Alignment

3.6.5 PLP Alignment

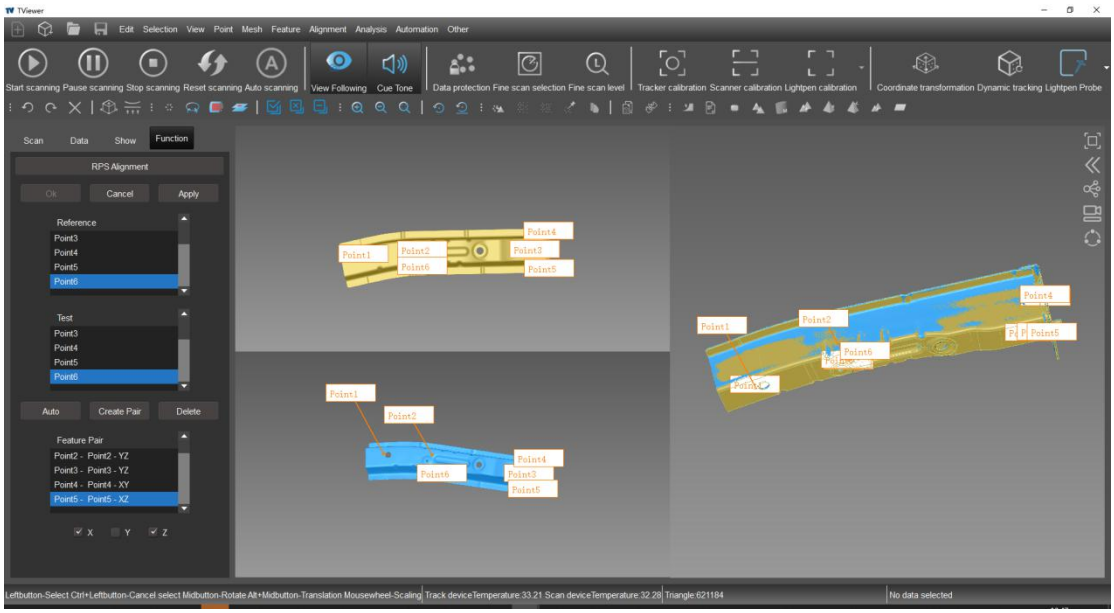
Select the data to be aligned, and open the corresponding model data. Rightclick "Set Test" and "Set Reference" respectively, and click "Align - PLP Align". PLP alignment is an alignment method that unifies two sets of data into the same coordinate system according to the feature plane, line, and point. Before using this method, the features of plane, line, and point should be constructed respectively in the corresponding positions of the two types of data. After the feature is constructed, click on "Apply" - "OK".



3-73 PLP Alignment

3.6.6 RPS alignment

Select the data to be aligned, and open the corresponding model data. Rightclick "Set Test" and "Set Reference" respectively, and click "Align - RPS Align". RPS alignment is an alignment method that unifies two sets of data according to a reference point to the same coordinate system. Before using this method, two different sets of features are constructed in corresponding positions in the two data. After the feature is constructed, click on "Automatic" - "Apply" - "OK".



3-74 RPS Alignment

3.7 Analysis

The “Analysis” tab mainly covers five application methods such as distance, angle, section, 3D comparison, and GD&T. The specific icon function is detailed shown in below picture.

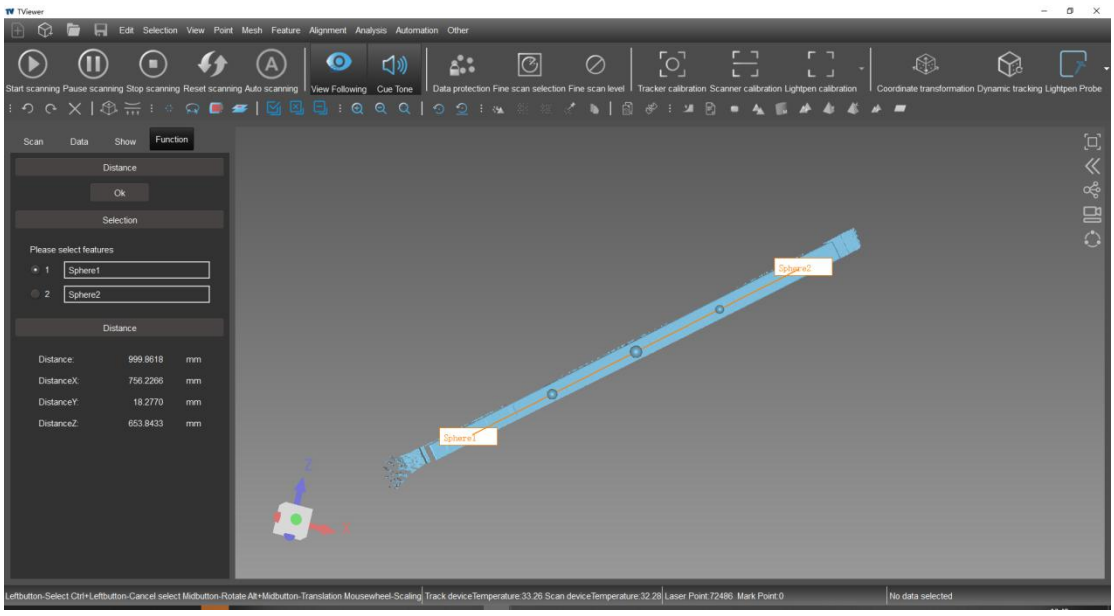
3.7.1 Distance

When measuring the distance between features, the second feature is the main feature, the circle degenerates into the center of the circle, the circular groove, the elliptical groove, the rectangular groove will degenerate into the center point, the ball

degenerates into the center of the sphere, and the cylinder and cone will degenerate into the axis. The distance will eventually be converted into one of three ways: point-to-point distance, point-to-line distance, and point-to-face distance.

Select the data to be measured and construct the characteristics of the required measurement, then measure the distance between the features. The following is an example to measure the distance from the center of the feature circle to the center of the circle.

Click “Distance” and select “Circle 1” and “Circle 2” respectively to measure the spatial distance between the two centers。



3-75 Distance

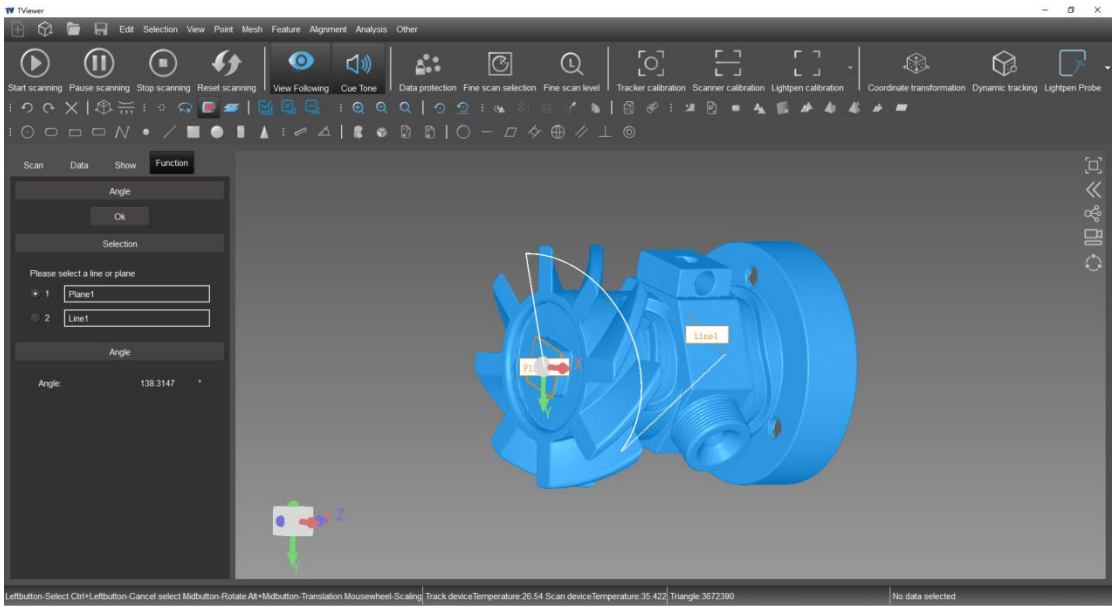
3.7.2 Angle

When measuring the angle between the feature (plane and plane), the cylinder and the cone degenerate into the axis, and the circle, the circular groove, the elliptical groove, and the rectangular groove take the corresponding plane.

After selecting the data to be measured and constructing the required features, you can measure the angle between the features. The following is an example of measuring the

angle of a feature from a straight line to a plane:

Click on "Angle" and select "Plane 1" and "Line 1" respectively to measure the angle between the plane and the line.



3-76 Angle

3.7.3 Section

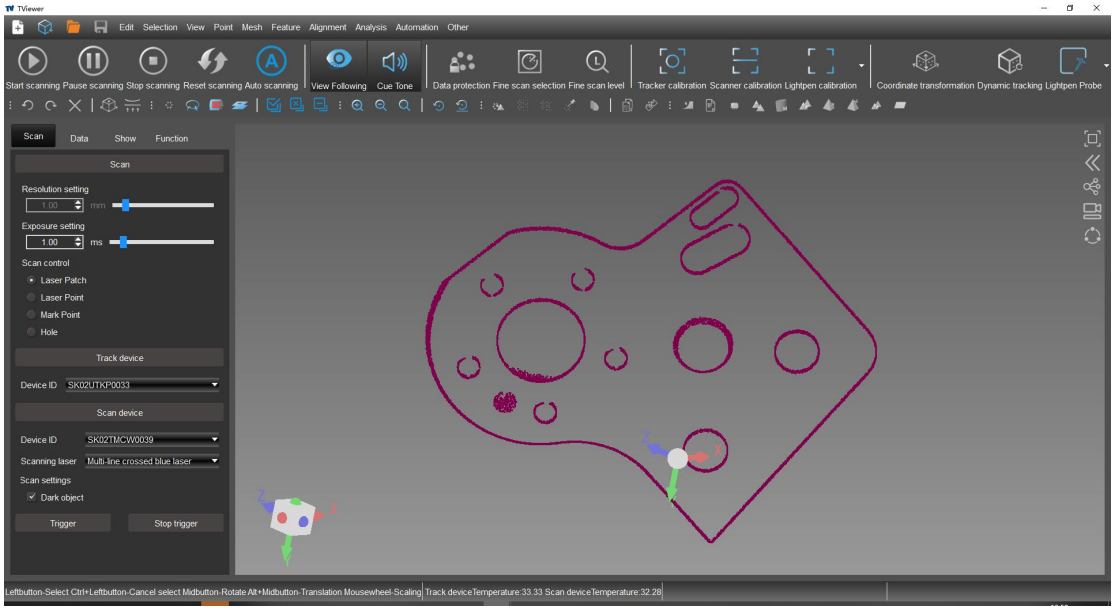
When creating the cross-section of point cloud, mesh, and CAD data, the plane intercepts the CAD data and the mesh data to obtain the section line, and the plane intercepts the scanned data to obtain the point cloud. The cross-section data, like other scan data, allows for feature fitting, feature measurement, and GD&T detection.

(1) Section mode: object and selection plane. Object: Interactive line as the intercept plane; select plane: Select the constructed plane as the intercept plane.

(2) Thickness: It is effective only when the point cloud is intercepted in the plane, that is, the point within the thickness range is considered to be on the plane and finally output.

(3) Position degree: refers to the up and down translation of the intercept plane along

the normal direction, the positive number is along the normal direction, and the negative number is along the normal direction. Open the grid file, select the required data, click on "Section", sketch the section in the 3D view, and then click "Calculate - OK" to view the section data.



3-77 Section

3.7.4 3D Comparison

The 3D comparison represents a deviation map between the Test data and the Reference data by generating a different color, and the deviation map is defined as a chromatogram (color difference diagram). The deviation is positive or negative, and the color values in the chromatogram evolve from blue to green to red. Blue indicates that the measured surface is lower than the Reference surface. If the measurement data is displayed in red, it means that the data is above the Reference surface. The calculation of the deviation uses the nearest point principle.

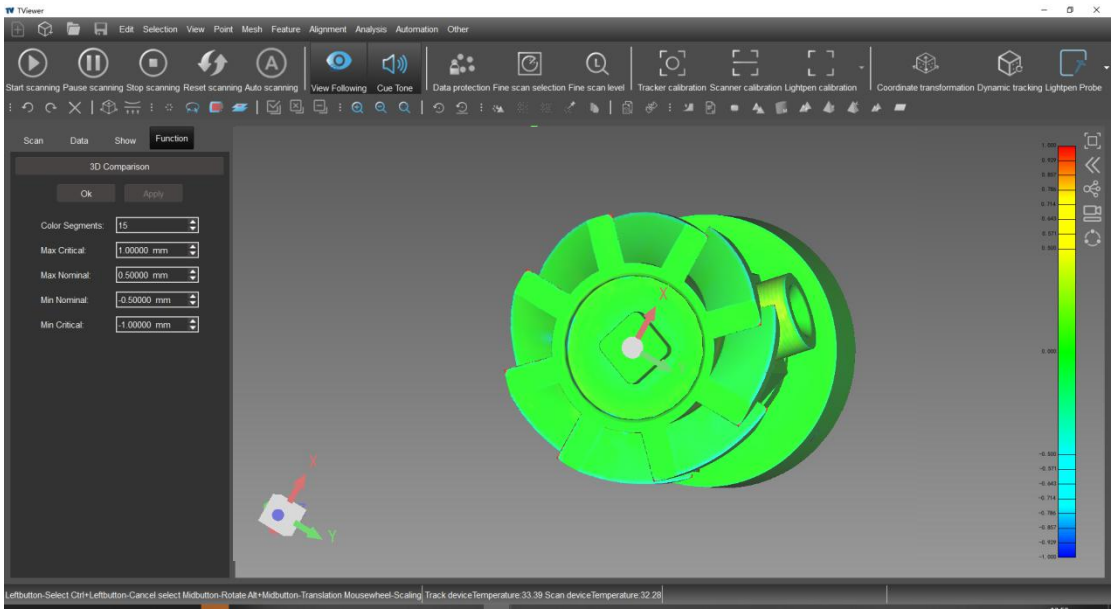
As shown in below picture, the chromatographic deviation mainly includes the color segment, the maximum deviation value, the minimum deviation value, the maximum nominal value, the minimum nominal value, and the number of decimal places.

Maximum critical value: the maximum deviation allowed, the deviation is the deviation

Minimum critical value: as opposed to the maximum deviation, generally taking the opposite of the maximum deviation.

Maximum nominal value: The maximum ideal deviation.

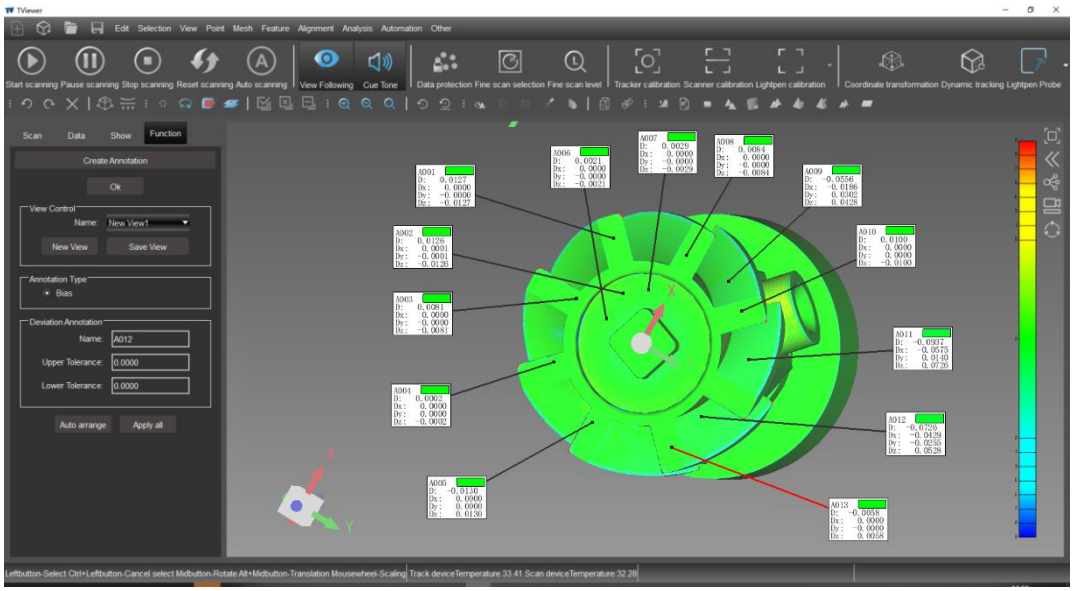
Minimum nominal value: as opposed to the maximum nominal value, generally taking the opposite of the largest nominal value.。



3-78 3D Comparison

3.7.5 Create annotation

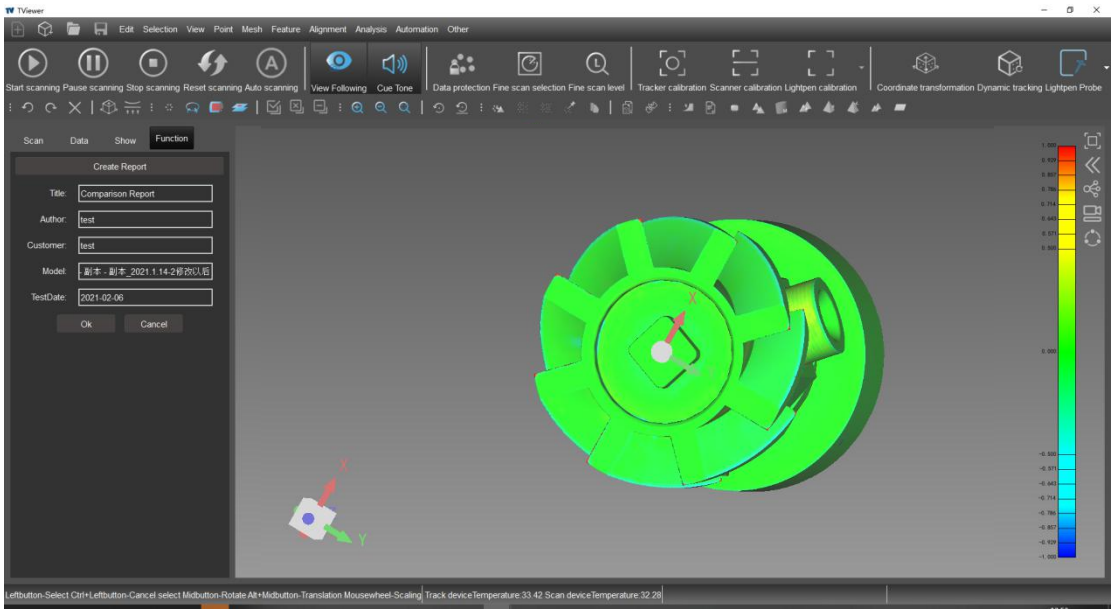
After the 3D comparison is completed, click “Create Comment” to view some “Deviation Notes” and click “OK” to see “New View 1” in the left frame.



3-79 Create annotation

3.7.6 Create report

After creating the annotation, click “Create Report”, fill in the relevant report information in the pop-up dialog box, click “Save” to save it in .pdf format file.



3-80 Create report

3.7.7 GD&T

GD&T, the geometric tolerance, including shape tolerance and position tolerance. Shape Tolerance: The amount of variation allowed for the shape of a single actual

element, such as roundness, straightness, flatness, cylindricity, sphericity, and so on.

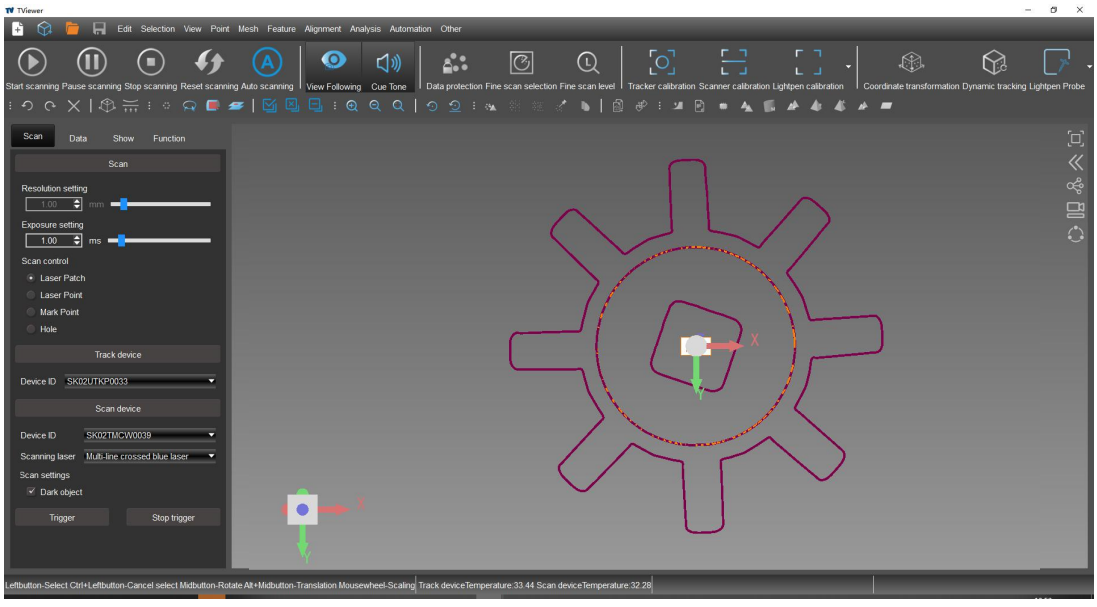
Position Tolerance: Correlate the deviation of the actual measured element from the ideal measured element with a certain direction. The position tolerance zone is an area that is allowed to change in association with the actual measured element, and has parallelism, perpendicularity, coaxiality, and the like.

The detection of GD&T is based on the fitting characteristics. Shape tolerances are only relevant to the fitted features and the fitted point cloud data. Positional tolerances require the setting of datum features, which can be constructed in any configuration.

3.7.7.1 Shape Tolerance

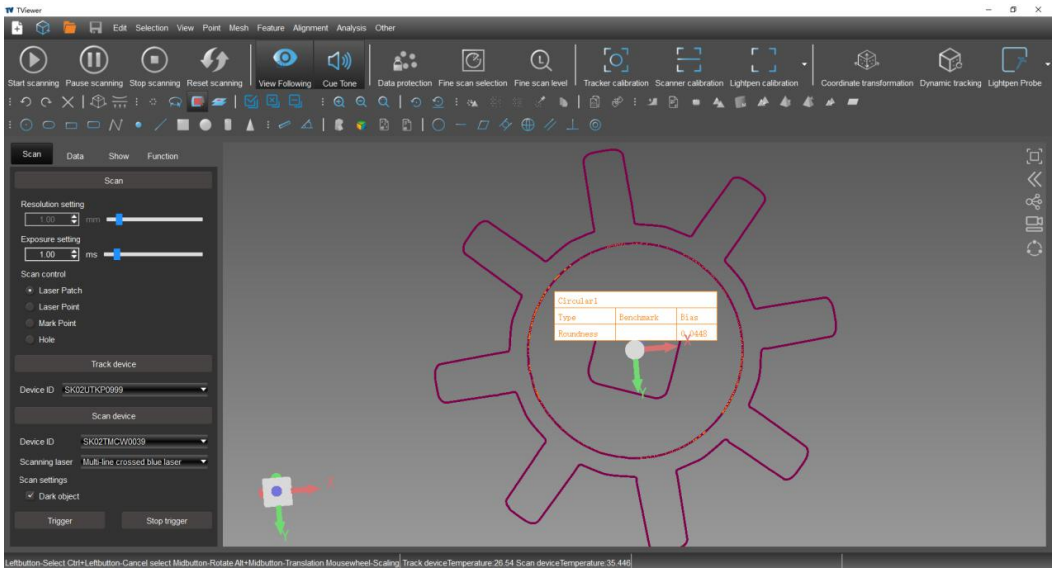
Shape tolerances include roundness, straightness, flatness, cylindricity, and sphericity. The following is an example of the shape tolerance of roundness:

(1) Taking the section data as an example, first fit a “circle” feature, and click “Create” - “OK”.



3-81 Shape Tolerance

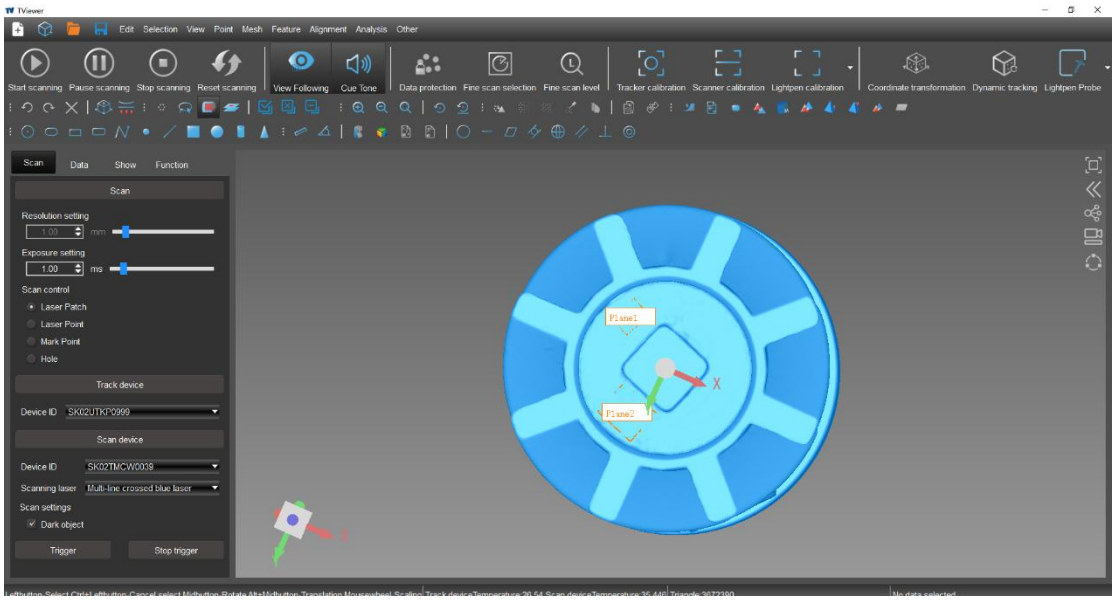
(2) Click “roundness”, click “Circle 1” – “Apply” at the object to display the roundness deviation, click “OK”, and “roundness” analysis is completed.



3-82 Shape Tolerance

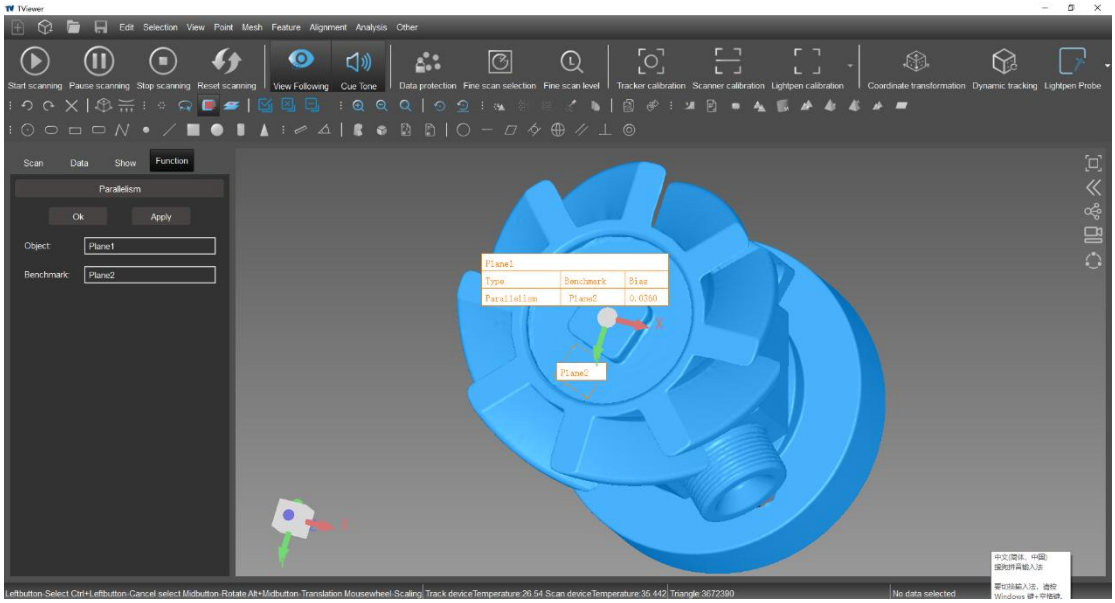
3.7.7.2 Position Tolerance

Position tolerances include parallelism, perpendicularity, concentricity, and the like. The following is an example of the parallelism tolerance of two planes: First fit two "plane" features, click "OK".



3-83 Position Tolerance

Click “flatness”, select the object “plane” and the reference “plane”, click “Apply” to display the parallelism tolerance.



3-84 Position Tolerance

3.8 Pipe inspection (optional)

The pipe fittings provided by the software are mainly used for the pipe bending machine. After the surface point cloud data is obtained by the scanner, the corresponding pipe bending parameters are input, and the relevant pipe bending parameters can be automatically calculated, which can be used for reverse engineering and detection comparison.

Intersection coordinate xyz data: including the intersection of two end points and two adjacent straight pipe segments;

Cut point coordinate xyz data: replace the intersection point in the intersection coordinate xyz data with the corresponding two tangent points;

Ybc data: also known as LRA data, the feed length of the bender, the angle of rotation (with positive and negative points), the bending angle, and the control system of the bender with Y-axis, B-axis, C-axis and X-axis as the control object To achieve digital control;

Polyline: The center line of the intersection point of the intersection coordinate XYZ is the intersection polyline (referred to as the polyline). Unless otherwise specified, the XYZ mentioned in the pipe inspection is the intersection coordinates.

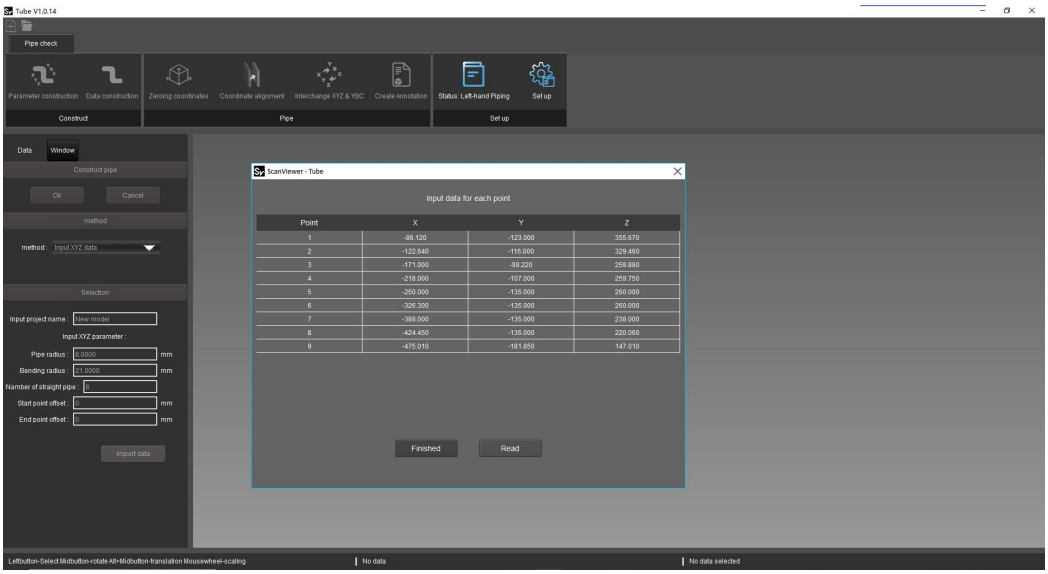
The following mainly introduces the definition and use of individual modules of "construction" and "fitting".

3.8.1 Parameter construction

The parameter construction method is mainly divided into the xyz construction method (where the xyz structure refers to the intersection coordinate xyz) and the ybc construction method.

■ xyz construction method

Select “Enter xyz data”, you can enter the new model name and the corresponding parameters of the pipe XYZ, such as pipe radius, bending radius, straight pipe number, click “input data”, in the pop-up window, double-click the active edit box to manually input the pipe fittings. Point data (use the Tab key to switch the input), you can also select "Read Data" to enter the data of each point, click "Finish" to construct the pipe model.



3-85 xyz construction method

3-86 xyz construction method

■ ybc construction method

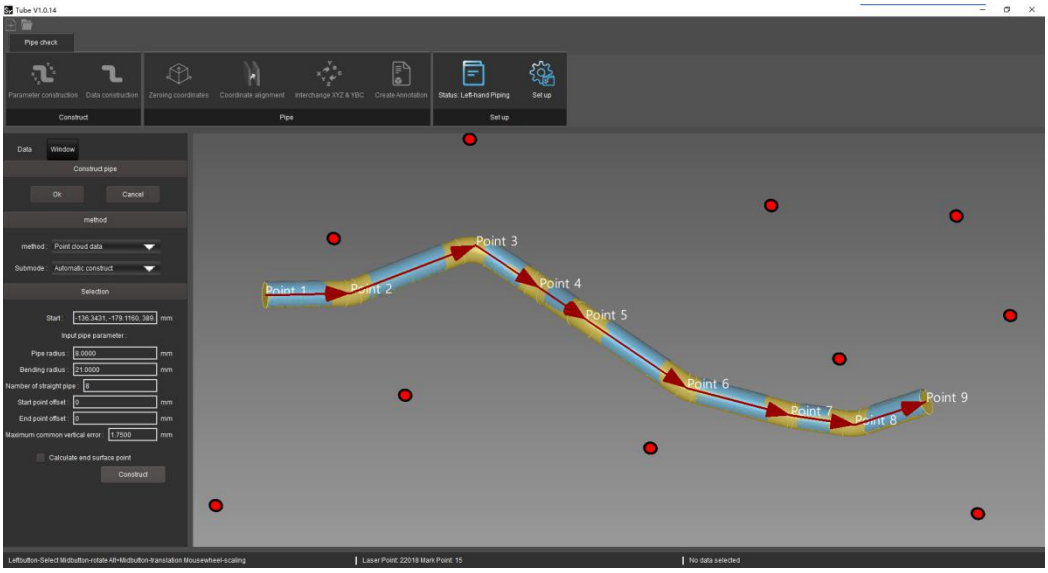
Click “cancel” to return to the main interface then select "Enter ybc data", the rest of the operations such as "xyz construction method", refer to (1) xyz construction method.

3.8.2 Data construction (reverse engineering)

Data construction (reverse) is the construction of the pipe model by data reverse. Data constructs operate differently depending on the file format. Mainly divided into laser point cloud data, engineering data, grid data and model data.

■Laser point cloud data

Select the laser point cloud data, enter the “construction pipe fittings” function area, select a point on the point cloud as the starting point of the construction pipe fittings (preferably select the edge point of the first end of the pipe fitting), and input the parameters corresponding to the pipe fittings, such as the pipe radius and bending radius. The number of straight pipe segments, the maximum common vertical line error is generally default, click "construction" to complete the laser point cloud data structure.



3-87 "laser point data" construction

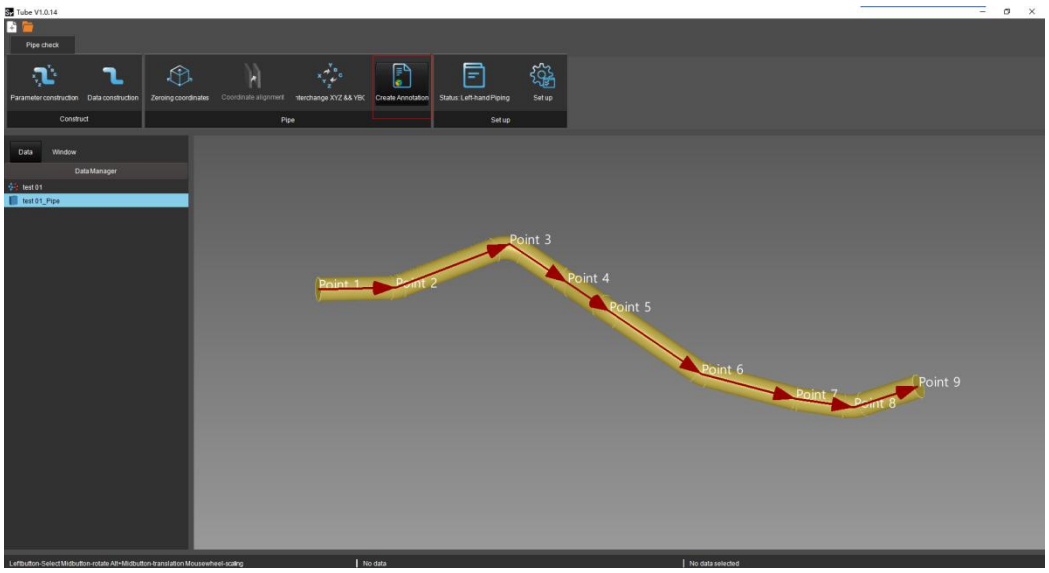
When the sub-mode is selected for automatic construction, click “Construction” to perform the best fitting construction of the pipe fittings;

When the sub-mode is manually configured, the user needs to manually group the

point cloud according to the pipe radius, the bending radius and the number of straight pipe segments, select the laser point cloud data, click "mark point cloud" - "next", select the next group in turn, when grouping When the number of point clouds reaches the number of straight pipes, click “Construction” to construct the pipe fittings best. The fitting process can check whether the end points are calculated.

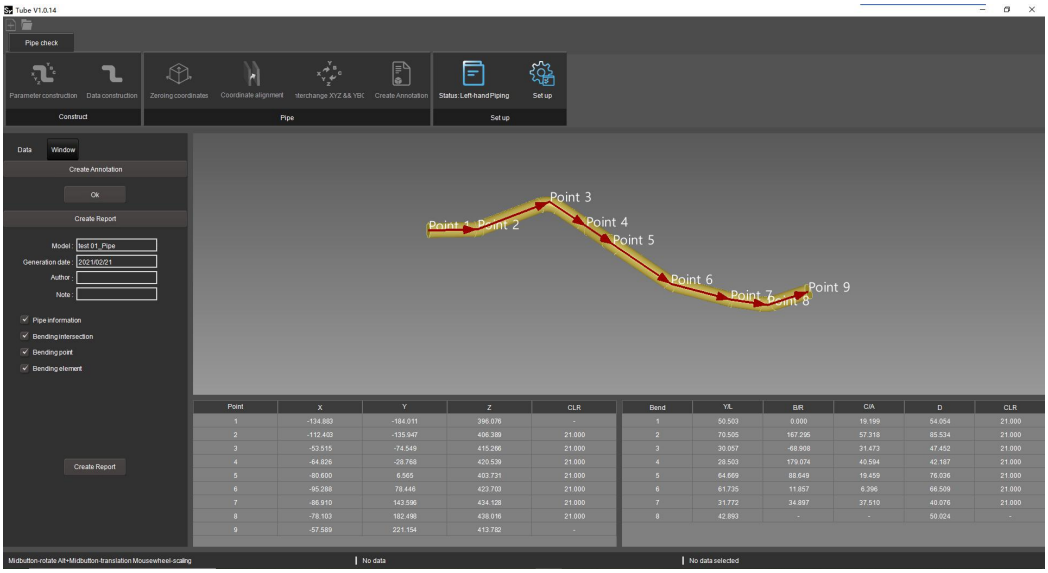
Attention	Calculating the end point requires that there must be data on the data end face, otherwise the fit fails.

After the data is constructed out of the pipe fitting model, click “ OK” and then click “Create Comment” to generate the pipe fitting parameter report.



3-88 Create a single model annotation

Under the “Create Report” function bar, you can check the contents of the pipe fitting report (such as pipe fitting information, bending intersection, bending point and Bend elements), you can enter the model name, date of creation, create author, notes and other display information, click "Create Report" to generate a pipe report.



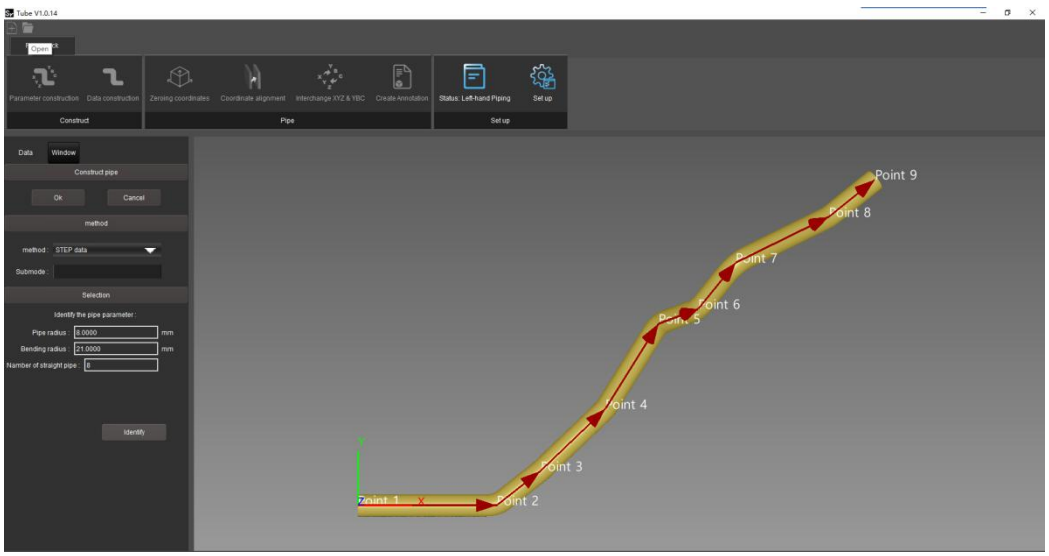
3-89 Create a single model annotation

■Engineering data and mesh data

Select mesh data, engineering data, enter the "construction pipe fittings" function, construct the flow such as laser point cloud data, refer to (1) laser point cloud data.

■Model data

Select the model data, enter the "construction pipe fittings" function, click "recognition" to automatically identify the pipe fitting parameters on the model data.

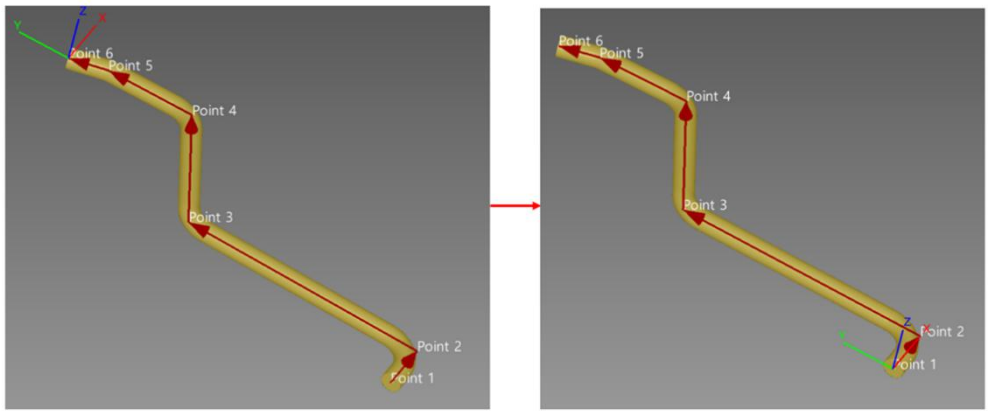


3-90 Model data "data construction"

3.8.3 Zeroing coordinates

Convert the bend data to the bender coordinate system, which is determined by the first two straight sections.

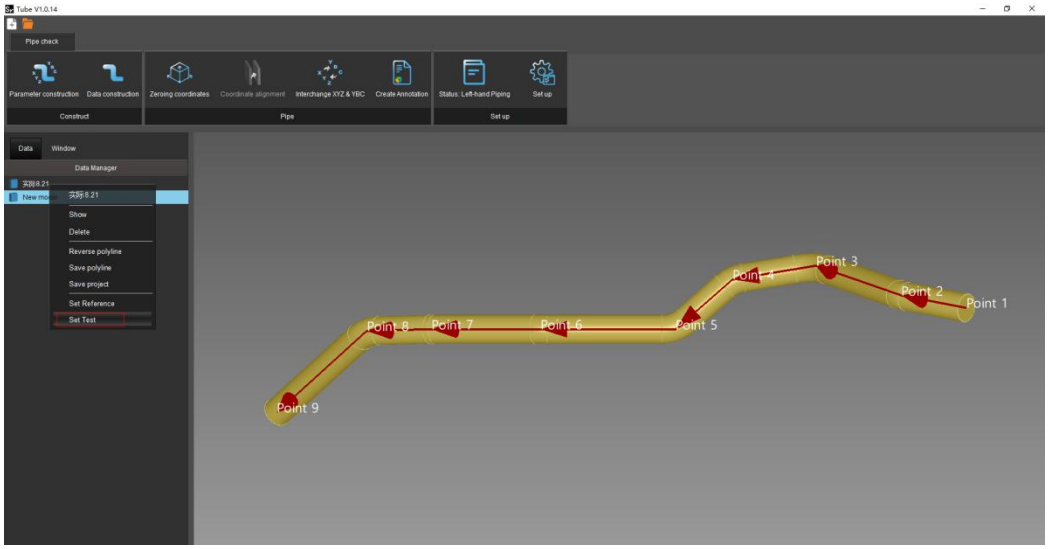
Select the pipe model data, enter the “Zeroing Coordinates” function, click “Apply—OK” to save and overwrite the alignment data, and click “Cancel” to restore the alignment operation.



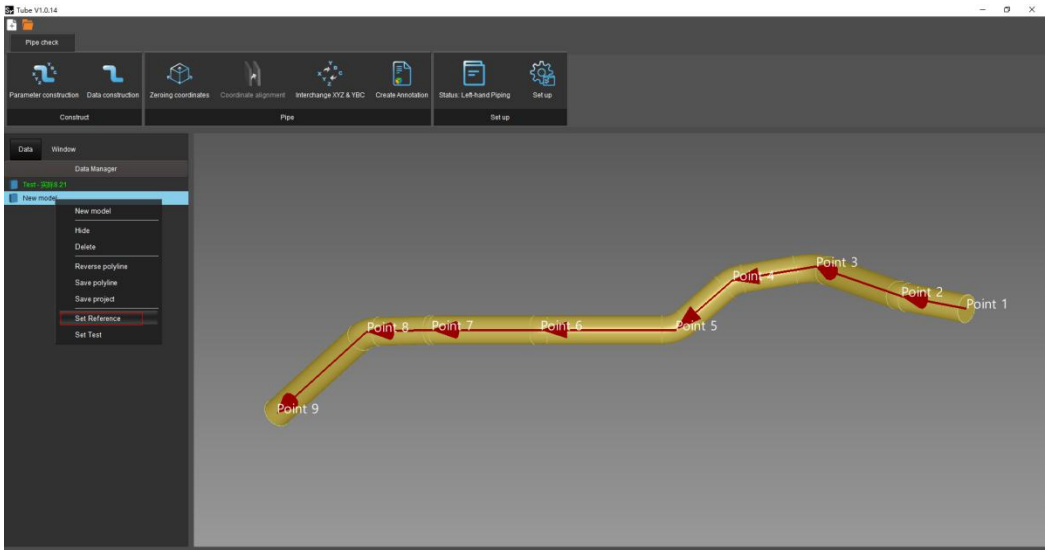
3-91 Zeroing coordinates interface

3.8.4 Coordinate alignment

The elbow data to be detected is unified into the coordinate system of the reference elbow data (general model data), and the two sets of data must be constructed with polylines, and set to "Test" and "Reference" respectively.

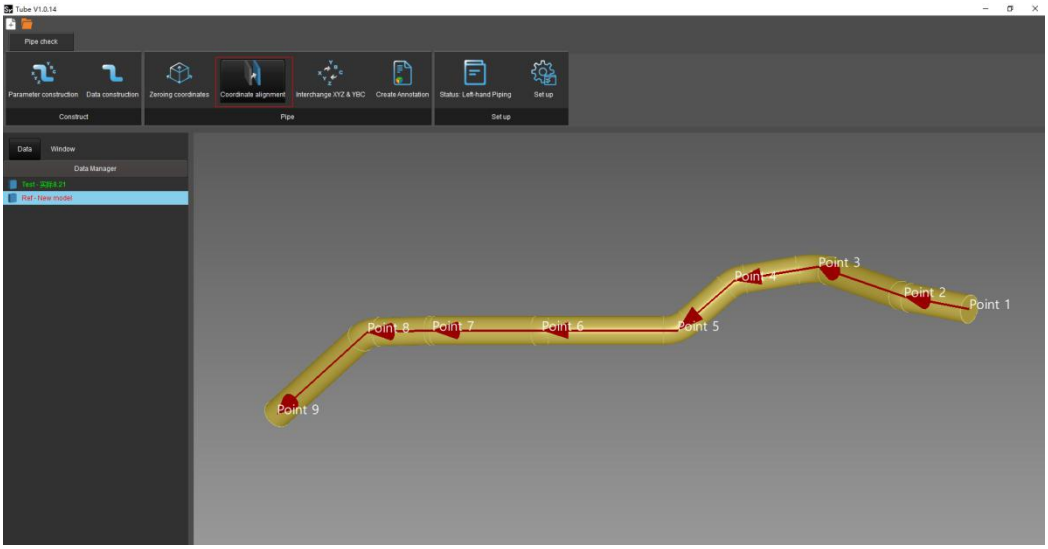


3-92 Set to test

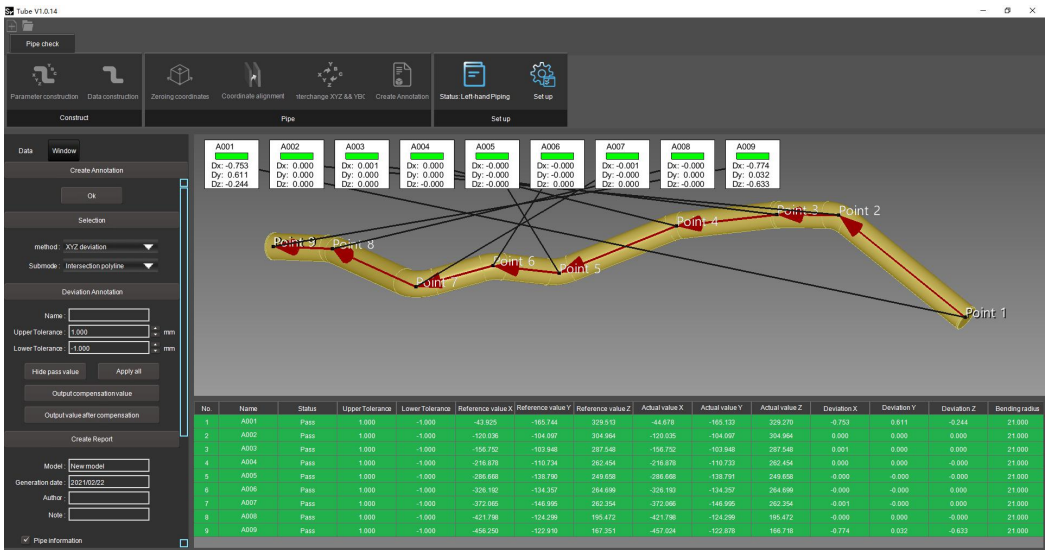


3-93 Set to reference

And then click "coordinate alignment", (check "Endpoint Participation Alignment" according to the actual situation) Click "Apply" to complete "Coordinate Alignment".



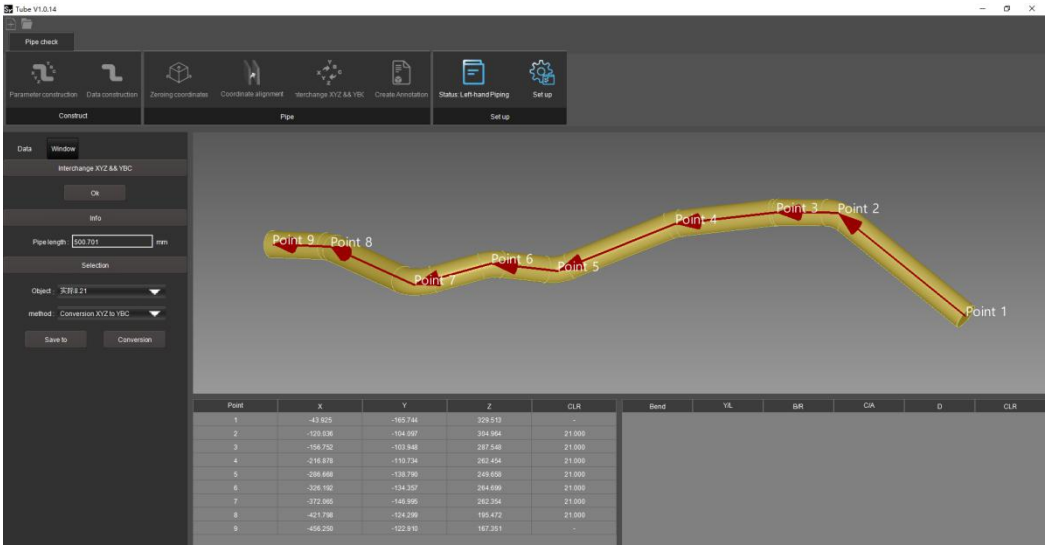
3-94 The interface of “coordinate alignment”



3-95 The interface of “create annotation”

3.8.5 Interchange XYZ/YBC

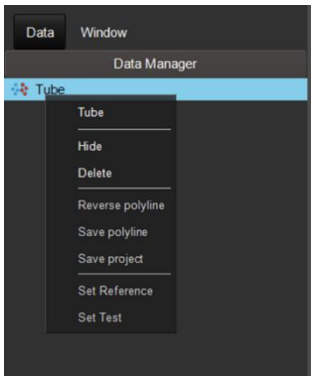
The “Object” column displays the pipe model data in all current data. The “Pipe length” column displays the length of the pipe fitting of the currently selected pipe model; the mode is divided into “XYZ to YBC” and “YBC to XYZ”, so that the pipe data is in XYZ data. Switch the display between the value and the YBC data value, and finally click "Save to File" to save the converted data to the TXT file.



3-96 Interchange XYZ/YBC

3.8.6 Pipe inspection function panel

For the description and description of the tube inspection function panel.

Pipe inspection function panel	Description and description
	"Pipe 1": the name of the current data;
	Show/Hide: Click to toggle whether the data is displayed.
	Delete: delete the data from the directory tree;
	Reverse polyline: if there is a polyline in the data, the reverse polyline direction;
	Save polyline: If there is a polyline in the data, save the polyline data, you can choose to save as a .txt file or .iges file;
	Save the model: if the data is a constructed pipe model, save the pipe model to the .step file;
	Set/Clear Reference: Set the model data as reference data or cancel the reference data identifier;
	Set/Clear Test: Set the model data to test data or cancel test data identification.

4 Cautions

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

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

(3) 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;

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

(5) Do not remove the dongle during the use of the software.

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