

EinScan HX



User Manual September 2020



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INTRODUCTION

Thank you for purchasing the EinScan H series 3D Scanner.

EinScan HX is new developed handheld 3d scanner by Shining 3D. Based on combined structure light technology of LED and laser. EinScan HX is with unique performance of scanning common objects as most hand held structure light 3d scanners can at a fast scanning speed with color texture, and also capable of scanning black and shiny objects that only laser 3d scanning are good at for a better accuracy.



If you need any support for your 3d scanner, please contact your local reseller or the EinScan support team <u>einscan_support@shining3d.com</u>

Information in this document is subject to change without notice.

CAUTION NOTES

This manual provide important information of the proper operation of the product. Please read before use.



1. SPECIFICATION AND SYSTEM

REQUIREMEN

1.1. SYSTEM REQUIREMENTS

Preparing a suitable computer will improve your scanning experience.

One important notice for PC configuration is the **graphic card**. It has to be **Nvidia card** since certain function from Nvidia is needed for scanning. **GTX series card** is the best for scanning while Quadro series CAD card also works but you need a more expensive model comparing to the GTX series to get a good scan experience.

Handhald madal	Eins	Scan HX		
Handheid model	required	recommended		
Graphics card	Nvidia GeForce GTX 660 / Nvidia Quadro P1000	NVIDIA GTX serial cards higher than GTX1080		
USB port	1 of	3.0 port		
OS	win1	win10 64bits		
Video memory	> 4G	> 8G		
RAM	8 GB	32 GB		
CPU	i5 3th Gen	i7-8700 or higher		
Screen resolution	1920*1080 3840*2106	DPI: 100%; 125% DPI: 100%; 200%		

RECOMMENDED PC MODEL

Dell G3 laptops, Core i7-9750H, NVIDIA GeForce RTX 2060 6GB GDDR6, 2x8GB, DDR4, 2666MHz

Asus ZenBook Flip, Core i7, Nvidia MX250 with 2Gb memory, solid state hard rive, 16gb ram

Lenovo Y520 15IKBM i7-7700hq, 16GB, gtx1060 Acer Predator PH317 i7, GTX1060, 16G RAM MSI – GS63VR 7RF stealth pro RAM 32G Alien ALW15M-R2726R ASUS ROG STRIX

1.2. SCANNER SET UP

Unpack and set up your scanner and software before getting started with scanning.

1.3.1. WHAT'S IN THE BOX?



Package (This hard case is optional, please contact your supplier if you want to buy this case)



Packing list

The items listed in the packing list refer to the components and material that should be included in the package. The components may be different as listed when you purchase other accessories or change any item with your supplier. Please check carefully when opening the package.

Note: Each scanner has its own serial number, label is placed at the bottom of the scanner. It will be required for maintenance. Do not remove it.



Serial number

1.3.2. SCANNER BODY



1.3.3. CONNECTION



Hardware set-up

Take out the connection cable

- 1. Insert the pin plug into the scanner's circular connector port
- 2. Plug the other one to scanner's USB port
- 3. Plug the power adaptor into the connection cable DC in port
- 4. Plug the power cable another end into a power outlet
- 5. Connect the other end of the connection cable to a USB 3.0 port on your computer

2. SOFTWARE SET UP

2.1. DOWNLOAD THE SOFTWARE

Step 1: Go to https://www.einscan.com/support/download/

- Step 2: Select your scanner model
- Step 3: download the software to your operating computer

Note: You are required to register before downloading.

2.2. INSTALL THE SOFTWARE

Note before installation: Administrator rights are required for the installation of the software only.

- 1. Double click installation package, accept the modification on your computer
- 2. Follow the instructions to complete the software installation.



After the software is installed, a shortcut will be created on your desktop. Double click to open the software.

2.3. SOFTWARE UPDATE

When a new version is available, a pop-up will show when you start the software to remind you update your software to the latest version.

Click Yes to update



Update Reminder

2.4. FIRMWARE UPDATE

When the scanner firmware is incompatible, a message will appear when software is open.

- Click Upgrade and follow the instruction to update the device firmware. •
- Firmware updating will take around 6 mins.
- Power off the device after upgrading successfully.
- Reconnect the device, and open the software again, the device is running under the latest firmware.

Warning					
Firmware and software don't match. It is needed to upgrade the hardware to ensure the scan stability.Click "Upgrade": Software will be closed automatically to start upgrading.Click "Next time": Upgrade will not be excuted, and scanning will be unstable.					
Upgrade Next Time					
When firmware doesn't match					





Firmware Upgrading

Note:

- 1. Do not disconnect the scanner, or unplug the power during the upgrade.
- 2. Recovery will start from a failed upgrade. You can restart the firmware update after successful recovery.
- 3. If recovery fails, turn off the power of the scanner and reconnect the scanner to restart the software for upgrading.

2.5. DEVICE ACTIVATION

Device activation is required in your initial use. There are 2 ways:

- 1. Online activation is recommended if your computer is connected to the internet.
- 2. If there is an issue with network connection, choose **Local activation** to save the .ple license file on your computer, under the activation menu. (.ple file can be found in the USB drive.)

Note: If the activation fails, send a request for activation file to einscan_support@shining3d.com with your serial number.

🌞 einscan-tool		- 0	×	🔞 einscan-tool	_		×
	EinScan HX Online Activation	€	•		Information License file download Success!		
		Online	e Act	ivation			
🎄 einscan-tool		- C	י ב	×			
	EinScan HX						
	Online Activation		6		the Local Activat	to revion	veal
	Local Activation						

Local activation

2.6. Interface and Parameters

2.6.1. Navigate



Interface navigation

Left mouse: rotate Middle mouse: move the data Scroll up and down: zoom in or out Keyboard:

Spacebar to scan again or restart the scan & validate Delete key to delete selected data Esc key to exit current pop-up

Navigate between different menu by click on the circle.



2.6.2. Device reconnect

When the device is offline, meaning the scanner is not connected to PC, please check the connection and click on the refresh connection button to reconnect.



Device offline or connection loose



Refresh the connection on the status bar

2.6.3. Settings



Click the settings logo from the upper right to open the drop down menu.



Drop down menu

Feedback

If you have any questions or suggestions, please share with us by clicking "Feedback". Please leave your email in "My E-mail".

User Feedback					
Do you have any questions or suggestions for us ?					
* My email:					
* Industry:	Unselected		-		
* Content:					
Attachments: (<50M)				+	
	(300)				
Evaluation:	Evaluation: 🕁 🕁 🥁 🕁 🕁				
🗹 User expe	User experience enhancement program <u>Learn more</u>				
Technical Support: einscan_support@shining3d.com					
Submit Cancel					

Feedback window

User Experience Enhancement Program

To help us improve the quality and user experience of EinScan, we hope to be allowed to collect usage experience information. This information will not contain your personal information or scanned data, and will not be accessible to any third party. This checkbox is selected by default, and we strongly recommend you keep it checked. As a reward, the User Experience Enhancement Program will continuously keep you informed with the newest software update information, to assure you get free software updates and enjoy the latest improvements based on your collective feedback. If you close the User Experience Enhancement Program, you might not be informed with software updates automatically.

Factory Default

All settings modifications will go back to the original settings.

Language

Select the language for the interface, click apply to change, restarting the software is not needed

About

For version information and support, email <u>einscan_support@shining3d.com</u>.

2.6.4. EinScan community



- **Official Website** (http://www.einscan.com/) refers to SHINING3D's official website for Einscan product and information.
- **Facebook** (EinScan) refers to facebook "EinScan Expert" for EinScan users to discuss and share the ideas, achievements and experience.
- **Support Platform** refers to the platform for EinScan users to validate the warranty and submit support ticket when necessary. Service live software updates, manual, video download can be accessed in support platform. Register your EinScan at support.shining3d.com

2.6.5. Help Mode

Open Help Mode

Click the question mark in the upper right bar, and open the help mode from the drop-down menu.



Drop down menu

Display the help tool related to the current interface.



Teamviewer

It opens S3D_teamviewer.exe, for online customer support access or display to other screen or portable screen. Share your ID and password to allow our technicians to remote control of your computer during online technical support



Share the Your ID and password to allow access

2.6.6. Alerts

A pop-up alert will notify the user of a hardware or configuration issue. Check and restart the software. If the error persists, please contact support by emailing einscan_support@shining3d.com.

Fail to activate

For activation failure, make sure the scanner is well connected. Redo the activation.

WARNING: The license file doesn't match the scanner. Activate

Device fails to activate

Incorrect configuration

try another USB port and update your graphics card drivers and restart the software.



USB not 3.0

If the computer has multiple graphic card, access to the NVIDIA Control Panel (right click on the desktop). In Manage 3D Settings > Program Settings, Add EXScan software. Then change the preferred graphic processor for this program. Select NVIDIA processor. Click Apply to save the settings.



Multiple graphic card detected



Change graphic card preferences for EinScan HX

3. SOFTWARE SCAN WORK FLOW



4. CALIBRATION

4.1. Precautions and Use

Calibration is the process to ensure the device will scan with the optimal accuracy and scan quality. Each EinScan 3d scanner was factory-tested and achieved, at least, the listed accuracy from the technical specification according to VDI/VDE 2634 standards.

Besides factory tested guarantee of accuracy, to assure high scanning accuracy, each EinScan is also coming with a calibration board for customer calibration. This customer calibration is not required daily often. Only when the first time after scanner and software are installed. Or, when you are in the following situations, you should calibrate the device:

- Device change
- After device enduring bumpy transportation
- After device accuracy decreases
- When data misaligned very often

Note:

- 1. Customer calibration is recommended to do twice a week for daily use.
- Make sure to protect the calibration board and keep it clean, no scratches or stains on the black 2. surface with white circles.
- 3. The Calibration board is matched to the Device with same Serial Number. Doing the calibration with an incorrect calibration board will fail to generate good scan data or optimum accuracy.
- 4 Clean with clear water only, do not use alcohol or chemical liquid to clean the calibration board

4.2. PREPARATION FOR CALIBRATION

Take out the calibration board, and the position paper.



Position paper

4.3. HOW TO DO CALIBRATION

Calibration includes:

STANDARD CALIBRATION

- LASER CALIBRATION
- WHITE BALANCE
- QUICK CALIBRATION

In the initial use, you will be guided to **STANDARD CALIBRATION** directly.

- 1. Put the calibration board vertically onto the paper position
- 2. Follow the instructions from the software to finish 5 positions
- 3. While holding the scanner, make sure it is upright to the center of the board. Bring the scanner closer or farther to the board till all the required distance captured.







Standard calibration (Point the scanner at the center of the board)



Calibration succeeded

A pop-up of Calibration succeeded will appear. Click Next on the pop-up, software will take you to the next step: WHITE BALANCE. Put the back side of the board on a stable and level table, and point the scanner upright to the board. Move the scanner up and down till all the required distance captured in green.



Laser calibration



Laser calibration succeeded

A pop-up of Calibration succeeded will appear. Click Next on the pop-up, software will take you to the next step: WHITE BALANCE. Put the back side of the board on a stable and level table, and point the scanner upright to the board. Move the scanner up and down till a photo taken at a right distance.

A pop-up of White balance calibration succeeded will appear. Click Next on the pop-up, you will enter to scan mode.





White Balance calibration succeeded

QUICK CALIBRATION is recommended when recalibration is required. Only one position is required. A pop-up of Calibration succeeded will appear. And then go to next step to finish **LASER CALIBRATION** and **WHITE BALANCE**



Quick Calibration (Point the scanner at the center of the board)

Quick calibration				
Quick calibration succeeded				
Quick calibration deviation:0.029478 mm				
Next				

Quick calibration succeeded

Note:

- 1. Customer calibration is recommended to do twice a week for daily use.
- 2. Move the scanner at a steady and slow speed.
- 3. Make sure to protect the calibration board and keep it clean, no scratches or stains on the black

surface with white circles.

- 4. The Calibration board is matched to the Device with same Serial Number. Doing the calibration with an incorrect calibration board will fail to generate good scan data or optimum accuracy.
- 5. Clean with clear water only, do not use alcohol or chemical liquid to clean the calibration board

If the calibration failed, please check:

- If there are any reflective object or strong light nearby, recalibrate to avoid the reflective and strong light
- If the positions were followed as suggested, recalibrate according to the suggested steps.
- If the board is clear and clean without scratches or stains

5. BEFORE SCAN

5.1. SCANNER BUTTONS



5.2. SCAN MODES

Now you can start to scan. Use EinScan HX, you can use Rapid Scan by structure light scanning for a fast scan, or use Laser scan by laser triangulation to scan some difficult.



	Laser Scan	Rapid Scan
What to scan?	300mm - 4m objects	

Light source	Laser	LED
Accuracy	0.04mm	0.05mm
Resolution	0.05mm-3mm	0.25-3mm
Alignment	Markers	Markers/features/ hybrid/texture
Scanning speed	55FPS	15fps (non-texture); 10fps (texture)
Texture Scan	No	Yes

5.3. PREPARATION

5.3.1. Rapid Scan

We do not recommend scanning:

- moving or vibrating objects, which cause the shape of object changed during scanning process.
- Soft material object
- lattice structures with many small deep holes

The objects, which has good geometry or texture features will get scanned very easily and fast with good quality.

If you have to scan the items like below, there are some preparation to be prepared before scanning and notes during scanning

	Preparation	Notes while scanning
Black, transparent, shiny,	Use washable or vanishing	Scan as normal
reflective surface objects	scanning spray	
Objects with less features	Place markers on the objects	Select marker alignment
or repetitive features	Mark/draw on the surface to add	Select texture alignment
	features	
Thin wall objects	Place markers on and around the objects	Choose global marker alignment

5.3.2. Laser Scan

When you stick markers on the surface of the object, you need to follow the following rules:

- Make sure sticking at least 3 markers in each frame (one scanning field of view).
- Control the number of markers seen on the camera view.
- Stick markers in a random, non-linear pattern.
- Markers should be stuck on the flat surface area and keep the marker surface flat.
- Use the markers provided with the device only. Other markers can result in bad
- accuracy or not to be seen.
- Spraying powder is not necessary for scanning black, transparent or shiny surface.

Note: Laser line will be projected when markers are not recognized.



Object with markers

 EinScan HX uses a class II laser when using laser scan mode, which is eye and skin safe under all conditions of normal use, but long time staring at the laser beam directly is not suggested. Please avoid direct eye contact with the laser beam. Keep the laser beam away from Child.

6. PROJECT

You can start with a new project or open an existing project to continue the scanning.

6.1. New project group

to create a new project. Select the File, and name the project. The default project is saved to the desktop. You can change the saving path, and then the newly created Work will be saved to the new location you chose.

6.2. Open project group

to open an existing project, Select the file, and choose the project has been saved.

Note: The projects should be scanned under the same scan mode.



Create/Open a project group

6.3. PRE-SETTING

6.3.1. SELECT TEXTURE

TEXTURE SCAN: the scan will be with color, and it also allows texture alignment. It is only available in <u>Rapid Scan</u> mode.

NON-TEXTURE SCAN: the scan will be without color.

Note: Texture scan requires the objects to have colorful texture surface, and it takes longer time for data processing when meshing.



6.3.2. ALIGHMENTS

NOTES:

RAPID SCAN allows 4 alignments by markers/features/ hybrid/texture. While **LASER SCAN** is default setting of marker alignment, no other options of alignments, so markers on objects need to be prepared in advanced.

FEATURE ALIGNMENT uses object geometric features for auto aligning during scanning. Rich features on the object are required for this mode.

MARKER ALIGNMENT uses markers to align the scans. It will help tracking for some object with non-feature regions like flat, spherical surface or objects with repetitive features. Preparation of marker on the object is required before scanning.

HYBRID ALIGNMENT uses features and markers to align the scans. By this alignment, we don't need to place the markers all over the part, but only on the region where has less geometry.

TEXTURE ALIGNMENT uses objects surface texture to align the scans. Texture Scan is required to select if you want to use texture align.



Marker alignment: 1. place on flat regions avoid the geometric regions 2. 3. stick the markers in a random, non-linear pattern 4. some cases like small objects, we suggest to distribute the markers on a black surface around the object. 5. use the markers coming with your device. Other markers can result bad accuracy or not be able to detected for scanning 6. while scanning, make sure at least 4 markers in each frame can be taken. · Feature alignment when scanning surface with enough geometry. Markers alignment when scanning surface with less geometry. Example of use of hybrid alignment not colorful Rich-colored High color contrast Solid color Texture align result: Texture align result: ??? ?

When selecting texture alignment, hold the scanner to move evenly steady.



6.3.3. RESOLUTION

Select a resolution for the project. The higher the resolution, the better the details, but this may lead to larger files and processing times.

Choose High, Medium or Low or drag the cursor to choose another point-distance setting from the bar.

RESOLUTION	LASER SCAN	RAPID SCAN
Scope	0.05~3.0mm	0.25~3.0mm
High Detail	0.2mm	0.7mm
Medium Detail	0.5mm	1.0mm
Low Detail	1.0mm	1.5mm



Select Resolution

6.3.4. GLOBAL MARKER FILE

When selecting marker alignment in Rapid Scan, you will find an option of **"open global markers file"**. It allows you to import .asc, .p3 marker files by using a combination of marker frame or photogrammetry measurements. By this method, we can scan large scale objects for a better accuracy. It will also help scan thin-wall objects to merge the front and the back side more accurately.

- 1. Follow your photogrammetry system operation; you can also set up a marker frame on the object, scan it by marker alignment
- 2. Save the point model in .asc or .p3 file
- 3. Open new project group and marker alignment
- 4. Import the saved .asc or .p3 file
- 5. Scan the object
- 6. The scans will all aligned according to the global marker file



Note:

- 1. Under rapid scan mode, global marker file is only available when selecting marker or hybrid alignment.
- 2. Under laser scan mode, global marker file is always available.

6.4. SCAN SETTING

Entering to SCAN interface, there are some settings to be noticed before scanning:

6.4.1. BRIGHTNESS ADJUSTMENT

You can adjust the brightness by clicking " ror " ron the scanner, or drag the cursor under the camera preview to left (-) or right (+).

Rapid scan	Too bright (X)	Good (v)	Too dark (X)
Camera window	Determent Scan Setting Brightness © Comparison Plane detection ©	€ bottom converse Scan Setting Brightness © ♦ Plane detection ©	€ Bettom carries Scan Setting Brightness © ☆
Preview display	Preview	Preview	Preview
Laser scan	Too bright or too Dark (X)	Good (√)	Brightness setting



Note: Brightness setting will be selected after object selected. When the laser traces and markers are not detected, the data will not captured much. The distance and brightness is required to be adjusted manually. Laser and LED brightness will change correspondingly when Brightness is adjusted.

6.4.2. OPTIMAL DISTANCE RANGE

When the scanner is too close or too far from the object, it will lose tracking. An optimal distance is important. You can observe the distance color on the scanner or color bar on the software. If tracking is lost, reposition the scanner to the scanned area at a proper distance.



Distance color on scanner			
	Ţ		
Red	Green	Blue	
Too close	Optimal	Too Far	

Scan mode	Resolution	Minimum distance	Optimal distance	Maximum distance
	0.25~0.5mm	200mm	300mm	400mm
Rapid scan	0.5~0.7mm	200mm	325mm	450mm
	0.7~3.0mm	200mm	470mm	600mm
Laser scan	0.05~3.0mm	370mm	470mm	570mm

6.4.3. OTHER SETTINGS IN RAPID SCAN

TEXTURE FLASHING: LED on/off. Suggest to always on for texture uniformity. When OFF must be chosen, make sure your ambient light is well distributed Only available when selecting scanning with <u>texture</u>.

PLANE DETECTION: Enable to detect the surface flatness. Suggest ON when selecting <u>feature or hybrid</u> <u>alignment</u>. When there is less geometry, software will remind "not enough features to align". If you do not choose the plane detection, you could still scan flat surface, but the misalignment will happen.



Plane detection ON when not enough features to align



6.4.4. OTHER SETTINGS IN LASER SCAN

Object: choose the object surface material accordingly: Reflective, Normal, Black.

Data setting: Scanning some black glossy object, when brightness is already set to its limits, but still

very less data is captured. Please turn the data setting cursor from left 🔟 to right 🥌 . It will help scanning, but with noise.

Scan Setting
Object ①
🔵 Reflective 🔵 Normal 🔵 Black
Brightness
*
Laser brightness
Q Ö
LED brightness
0 O Ö
Data setting 🖲

Scan Otherstting

7. SCAN

7.1. PREVIEW

Click the trigger on the scanner or in the software, you will enter the Preview mode. In this mode, it will start to show data for preview, but not record this data. In this mode, you can:

- Adjust the brightness sensitivity, refer to **<u>BRIGHTNESS</u>** ADJUSTMENT
- Check the working distance, refer to OPTIMAL DISTANCE
- Inspect markers recognition, refer to MARKER ALIGNMENT



Rapid Scan Preview



Laser Scan Preview

7.2. START/PAUSE/CONTINUE/STOP SCAN

Click the trigger again, scan will start, and data is recorded. During scanning make sure to keep the scanner perpendicular to the surface, keep a proper distance from the object, and adjust the brightness depending on the ambient light and texture of the object.

Click Start in software or press the Play button to exit the preview mode and start the scan

NOTES:

- 1. Preview mode will start every time a new project is built or an existing project is imported, or continue scanning after each pause.
- 2. Click Start in software or press the Play button to exit the preview mode and start the scan

7.3. RESUME SCANNING AFTER TRACKING LOST

If the scanner can't capture common features (when feature alignment is selected), miss enough markers (when marker alignment is selected or under laser scan), or with unclear texture(when

texture alignment is selected), it will stop data capturing. The software will remind tracking lost on the interface with sound. You can point the scanner at any scanned regions, and the scanning will be resumed.

Besides of the above alignment requirements, moving too fast, scanning distance, and the object surface too dark or shiny will also cause the tracking lost. Refer to <u>PREPARATION</u>, <u>DISTANCE</u>, <u>BRIGHTNESS ADJUSTMENT</u> for more tips.



The green color on the data shows the current captured region.



7.4. GENERATE POINT CLOUD(Only in Rapid Scan)

Click to generate point cloud: an optimized 3d point clouds will be generated. The optimization includes a realignment of the data by recalculation.

Generate P	oint Clouds
Quality Priority	Speed Priority
Apply	Cancel

generate point cloud

When scanning by feature, hybrid, texture alignment, Quality and Speed priority for the point-cloud optimization can be selected.

Quality Priority The misaligned data of the rigid object can be optimized automatically. Scanning non-rigid body such as a human, the degree of optimization depends on the degree of misalignment. Quality Priority consumes memory and takes a long time.



Speed Priority If the scanned data is aligned pretty good during the scan, you can select this option for a faster processing of point cloud data.



Then you can select, delete data to use the edit tools.

7.5. CLOUDS EDITING

CLOUDS SELECT/DELETE

SHIFT + Left mouse: Select unwanted data, the selected section will be displayed in red, as shown below.

CTRL+ Left mouse: Deselect an selected region

C		Edit buttons:	Edit Data
1			
	[1]	① <u>Connected region selection</u>	
	123	② Deselect	ADDED
3		③ Revert	
		④ Delete	
4		⑤ Undo	The Second
6	3	$^{\textcircled{6}}$ Show/Hide texture (when installed with a color pack)	
6	\odot		

	Connected region selection Click the button after select the data, all connected region to the selected data will be picked.
通	Delete selected data Click the button or "DELETE" on the keyboard to delete selected data.
	Undo You can only undo the most recently deleted data.
\bigcirc	Show/Hide texture (when Color Pack is attached) Click the button to switch between displaying and hiding the texture.
	End the editing
×	Revoke all and exit editing

7.6. CUTTING PLANE(only applied under Laser scan mode)

Cutting plane is very useful when a base need to be removed during scanning. You can orient the plane around X,Y, Z axes. The plane can be rotated, zoom, move.

	Cu t Clic	tting Plane Ik this button to enter cutting plane	
6	Sho	ow cutting plane	
ھے	Hic	le cutting plane	
		 ① Create cutting plane ② Remove cutting plane ③ Reverse normal ④ Deselect ⑤ Redo Other mouse operation Shift+Left select Ctrl+left Deselect Left click to rotate	
	Cre Clic the	e ate a cutting plane ok the button, a plane will be created to divide the scan int e plane will be remained when scanning.	o two parts. Only one side off
	Re Clic be	verse normal ok the button, the plane normal will be reversed. The sele also reversed.	cted data to be remained will
觉	De Clio	lete ok the button, the selected data from the cutting plane will	be deleted.
5	Re Car	do ncel the recent operation	

SHIFT+Left: Select data to create cutting plane. The selected part will show in red.

Ctrl+left: Deselect the data

Move: Click the middle of cutting plane by left mouse to move along the normal direction of cutting plane

Rotate: Click the edge of cutting plane by left mouse to rotate the cutting plane

NOTES:

- 1. Cutting Plane Operations: Create a new cutting plane, remove cutting plane, reverse normal, delete data (Markers can't be deleted)
- 2. Cutting plane operation is only workable under the current project.
- 3. Scan with Cutting plane: Only one side from the cutting plane can be scanned. Cutting plane is

very useful when a base need to be removed during scanning.



Click this button to exit cutting plane, saving all the edition under cutting plane

Click this button to exit cutting plane, cancel all the edition under cutting plane

8. PROJECT GROUP

8.1. CREATE/IMPORT PROJECTS

When the scan data is saved, you can create new projects with more scans, or import the saved projects and manage all projects on the project tree.

ŧ	Create a new project
Ŀ	Import the saved projects.

Note: Only projects from the same scan mode and with the same resolution can be imported.



Right click menu

8.2. REMOVE/DELET PROJECTS

Ð	Remove the project
Ń	Delete the selected project(s)

Select one or multiple projects by click remove to remove the project(s) from the project tree, but not from the local folder. It can be imported when it is needed.

Click Delete or right click and delete to delete the selected project(s) from the project tree and the local folder.

8.3. ALIGN PROJECTS



Click to open the Manual Alignment interface. There are two ways to align:

4 Auto align

Drag the data into the fixed and floated viewport, click the feature align button on the right, the software will align based on the features automatically.

4 Manual align

SHIFT + click left mouse button to select at least 3 non-collinear corresponding points in the 3D preview windows for Manual Alignment, as shown below. Ctrl+Z: cancel last point picked

Click Complete to validate and leave the Alignment interface Click Reset to cancel all alignments done in this session Click Next to validate the alignment and continue to use the alignment interface



Aligned result



Drag and drop a project to the float and fixed window

9. MESHING

9.1. CREATE MESH(watertight/unwatertight)



to create mesh. 2 types of mesh are

When scanning and editing are completed, click available: Watertight and Unwatertight.

If there are non-texture projects, there will be a data optimization option. After clicking it, the number of triangles will be optimized as below:

Original numbers of Polygons	Optimized Polygons
15 million triangles	6 million triangles
12~15 million triangles	5 million triangles
8~12 million triangles	4 million triangles
5~8 million triangles	3 million triangles
2.5~5 million triangles	2.5 million triangles
2.5 million triangles	No optimization

If the projects are all with texture, the data optimization option will be unavailable. The software will simply the data by default.



Mesh Mode



can directly be 3D printed.	Processing time is quicker than Watertight.
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TEXTURE WATERTIGHT

The texture capture is separate from the 3d data capture. If the texture has been captured, it will still be displayed on areas where holes are filled in the mesh processing. If the texture is missing, the corresponding mesh data will be in black.



9.2. MESH EDITING

The mesh can be edited: Select/delete, Hole filling, Sharpen, Smooth, Simplification, Multiview.

MESH SELECT/DELETE

Press **Shift + Left mouse** to select data and enter the selection menu **CTRL+ Left mouse**: Deselect an selected region

1	[x]	Edit buttons:
2	6	①Connected region selection
3	高	②Deselect
		③Revert
4		④Delete
5	\otimes	⑤ Undo
	~	6 Select Trough
6	8	⑦Select Visible
		⑧Hide/Show color
7	\odot	



Select **Visible** to select data on the front view only Select **Through** to select data all though

 \checkmark

Click End button to return to the Post-processing menu



Click Revoke, to cancel and return to the Post processing menu

9.3. HOLE FILLING

When selecting meshing in unwatertight, the 3d model will keep the missing scanned regions as holes.



use the hole filling tools.

Click for **Manual hole filling**. The hole edges are displayed green, and get red after picking. Click the edge of the hole to fill it



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

The hole edges are displayed green.

Choose Curvature, Tangent or Flat before picking a hole

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



Effect of Curvature, Tangent or Flat

9.4. SHARPEN

Click Smooth button to display the sharpen menu, click again to close the menu.



Sharpen men



Original



9.5. SMOOTH

Click Smooth button to display the smooth menu, click again to close the menu.

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



smooth menu



Original



9.6. MESH OPTIMIZATION

Click Mesh optimization button to display the mesh optimization menu, click again to close the menu.

There are 3 ratio options of mesh optimization. Processing time will be different. Below shows the result of 3 different ratios.

Mes	sh optimization	1
Mesh optimizatio	n	
1	0=====	100 50
Apply		Close

mesh optimization menu





9.7. SIMPLIFICATION



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

The comparison of detail between before simplification and after simplification (at 30% simplify proportion).

	Simplifica	ation
	Original size	After simplification
STL (MB):	118.58	58.11
OBJ (MB):	95.11	46.61
Polygons:	2461123	1205950
Simplificat	ion ratio:	
1 💳	-0	⊃ 100 49 %
Apply		t Close

simplification menu



9.8. TEXTURE REMAPPING



Click **I**Texture Remapping to display the Texture menu

Mesh edition of simplification, hole filling on texture scanned data will affect the texture render. By doing the texture remapping, the texture information will be reapplied on the mesh.

Texture remapping is accessible before saving the data.

Choose **"Texture Layout Optimization**" (TLO) to create an optimized arrangement for the texture file. It will make the texture manual editing much more convenient if you are going to process the texture in a 3rd party software.

This option has no effect on the texture itself.



Texture Layout Optimization



Notes:

- 1. TLO requires a longer time to compute
- 2. TLO is used only with OBJ output
- 3. TLO result is more convenient for texture manual editing

10. Export Data

10.1. DATA FORMATS

6

Click **Click** to export the data. Navigate to choose a save folder. And input the file name. Select one of the formats below. By default, the saving path is the project folder, the file name is "Scan data", and the format is .stl.

File name:	Scan data			Save
Files of type	e: All Files (*)		- Cancel
	.asc(whole)	🗹.stl 🗌.pl	y 🗌.obj 🗌.	p3 .3mf
		Si	ave folder	
Format	Texture	Data type	Saves as	Recommended for
ASC (separated) (fixed mode	No	Separated point-clouds, with	scan_0.asc scan_1.asc scan_2.asc	 Inspection Fast export (no post-processing needed)
only)		calculated alignment	etc	 Complex data to post process in another software
ASC (whole)	No	optimized point-cloud	scan.asc	 Inspection Fast export (no post-processing needed in hand-held mode) Large data to post process in another software Complex data to post process in another software
STL	No	Mesh	scan.stl	 3D printing (watertight mesh data) Reverse Engineering Compatibility with most mesh editing software
OBJ	Yes (separated)	Mesh, Texture & Matching file	scan.obj scan.jpg scan.mtl	 Artistic applications 3D rendering Compatibility with most mesh editing software
PLY	Yes	Mesh	scan.ply	 Low storage Easy texture editing
3MF	Yes	Mesh	scan.3mf	 Low storage Compatibility with Microsoft paint3d
Ρ3	No	Marker position	scan.p3	 <u>Global Marker File</u> in EinScan software Measurement of the marker position

10.2. SCALE DATA

Scaling the volume of scanned data, while the number of triangles, the level of detail of the scan and size of data will not be actually changed.

By default, the scale is 100% and will be exported with millimeters for reference.

The value display represents the dimensions of the smallest box containing the data oriented to the reference axis.



Scale window

Scale result

10.3. MEASUREMENT

After meshing, the Measurement menu will be available on the top. Or click Measurement on the navigation bar, and import a data.

Post processing	Measurement In Progress	Go to Measurement
Open file		

Click **Open file**, a STL or OBJ file can be import to edit.

10.3.1. CREATE FEATURE



Click the Feature button to display the menu, click again to close the menu



Feature menu

Display of Features

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

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

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

Feature	Creation method	Requirement	Description
	Selected Points		 Click on the data to select a point Click create to create a point
Point	Line-Plane Interface	Line and Plane should be created in advanced	 Click on the created line, or select it on the dropdown Click on the created plane, or select it on the dropdown The point generated is the intersection between the non-parallel line and plane Feature creation failed! Error code 9: the line is parallel to the plane
Line	Point-Point		 Pick 2 points. Click on the data to select a point or click on a feature point previously created In the Choice list select one of the point to redo it The line generated is define as point From to point to point
	Plane-Plane Intersection	2 Planes should be created in advanced	 Click on the plane previously created, or select it on the dropdown, repeat for the second plane. The created line is the intersection between the 2 non-parallel planes Feature creation failed! Error code 1: the planes are parallel
	3 Points Fit		 The plane is generated by 3 points not co-linear. Click on the data to select one point or click on a previous created feature point; In the Choice list select one of the point to reselect it Feature creation failed! Error code 6= the points selected are co-linear
Plane	Point-Line Fit	Line should be created in advanced	 The plane generated includes the point and the line (The line should be created in advanced) Click on the line previously created, or select it from the drop-down Click on the data to select a point or click on a feature point previously created In the Choice list select one of the element to reselect it Feature creation failed! Error code 6= the point selected belongs to the line
	Best Fit		 Press Shift+ LMB to select an area, press ctrl+ LMB to unselect The plane generated is the position with the smallest deviation from the selected area Recommend method to create plane

10.3.2. MOVEMENT

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

The transformations do not affect the shape and size.



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

Exact movement



Exact Movement Menu

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

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

Click **Reset** to cancel the transformation to original position Click **OK** to confirm the transformation

Tips:

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



4 3-2-1 Movement

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

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

Exac	ct Movement	3-2-1System Move	ement	
Method	d			
Plane	plane2 🗸 🗸	Method X+	\sim	
Line	Constraint Line 🗸	Method Select.	∨	/plane2
Point	Constraint Point 🗸			
A	lign Re:	et Close		

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

3-2-1 Movement menu

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

Exa	ct Movemer	nt	3-2-1System	1 Move	ment
Metho	d				
Plane	plane2	\sim	Method	X+	\sim
Line	line1	~	Method	Y-	\sim
Point	point1	~			
A	lign	Res	et	Close	

Click **Align** to perform the transformation

Data after 3-2-1 movement

Click **Reset** to cancel Click **Apply** to confirm the transformation.

10.3.3. MEASURING

Click Measurement button to display the menu, click again to close the menu

DISTANCE

This tool calculates the distance between two points belonging to the surface of the data Click on the data to pick the first and second point, select one of the two points to redo it.



Distance menu

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

🔸 SURFACE AREA

Press **Shift+ LMB** to select an area, press **ctrl+LMB** to unselect. **Ctrl+A** to select all. Click **Calculate** to display the Area value of the selected data in mm²

Redo the selection and click calculate again to update

Distance Surface Area Volume	
Surface Area	
Area: 9,022.958008 mm²	
Calculate Close	

Surface Area menu

🔶 VOLUME

This tool calculates the volume contains in a <u>watertight</u> mesh.

It returns the volume in mm³ and the coordinates of the smallest box, parallel to the global coordinates, containing all the data.

Distance	Surface Area	Volume
Volume		
Total: 5	525,260.812500 m	1m³
Bounding b	ох	
X: -44.0)437, 194.8873	
Y: 48.5	108, 247.9108	
Z: 324.	3329, 617.0605	
	Close	
	Volume menu	

votume menu

Prior to the calculation make sure the file is <u>watertight</u> (no holes).

Warning
Please make it watertight.
ОК

File not watertight alert

11. SHARE DATA



Click **Click** after mesh to share data to Sketchfab, it will show the dialog as below. A model title, username and user password are required. Register and view the shared model at

http://sketchfab.com.

Notes:

- 1. Sketchfab basic plan accounts can only upload data less than 50M, while Pro plan account can share with a maximum of 200M.
- 2. Data is saved as .STL does NOT contain texture

Sk	etchfab Upload
Share the current mode All fields marked with a <u>Click here to register a f</u>	l to Sketchfab.com. in * are mandatory. rree Sketchfab account.
Model Title: *	EinScan HX
Description:	
Tags (separated by space):	EinScan HX
Make models private:	PRO account required
Sketchfab username:*	
Sketchfab password:*	
Submit Moo	del Cancel

12. Third-party Software

Click

after mesh to import the mesh to a third-party software.



SOLID EDGE SHINING 3D EDITION can be started.

Notes:

- 1. The third party software should be installed and activated in advanced.
- 2. Solid Edge Shining 3D Edition is included in the scanner.
- 3. Geomagic Essentials is not included in the scanner. Please contact us if you are interested to buy.
- 4. Both software needs to obtain the license for an online activation.

GEOMAGIC ESSENTIALS is the essential bridge between 3d scanning and design. Once 3d scan is finished in EinScan 3d scanning software-Exscan Pro, take the 3d scan data to Geomagic essentials, extract the feature you want, and create solid models and complex profiles to your CAD design environment.

Solid Edge is a design tool from SIEMENS PLM Software. Partnered with SIEMENS PLM Software, EinScan users is able to use Solid Edge SHINING 3D Edition, which includes reverse engineering, generative design (optional modular), and simulation (optional modular) with CAD functions in one platform.

13. **MODEL PREVIEW**



Double click the short-cut on the desktop. Drag files into the window for preview. Manipulate the data with the same control as EXScan software.



Model Preview

STL, OBJ, PLY, ASC, or 3MF can be loaded, files from 3rd party software might fail to be loaded. In this case we recommend Meshlab, a free mesh software editor, or upload to sketchfab.

Notes:

To load a OBJ textured file make sure to have the MTL and JPG files with the same name and in the same folder than the OBJ

14. SUPPORT AND CONTACT

14.1. Submit a Ticket

Sign up in Shining 3D Support Platform support.shining3d.com Or send email directly to <u>einscan_support@shining3d.com</u>

Login to the support portal	or login using	Sign up
Enter the details below	G GOOGLE	SIGN UP WITH US
Your e-mail address	FACEBOOK	Once you sign up, you will have complete access to our self service portal and you
	S TWITTER	use your account to raise support tickets
Password		and track then status.
Password Remember me on this computer		מוזט נומנא נוזפון גנמנטג.
Password Remember me on this computer Forgot your password?		anu nack tren status.

Log in with your account. Click New Ticket on the tab bar to submit a ticket and check the status

How can we h	nelp you today?	
Enter your search term he	ere	Q
+ New Support Ticket	Check Ticket Status	

14.2. Contact Us

By email einscan_support@shining3d.com sales@shining3d.com

Skype: Einscan_support

Facebook Group: EinScanexpert

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