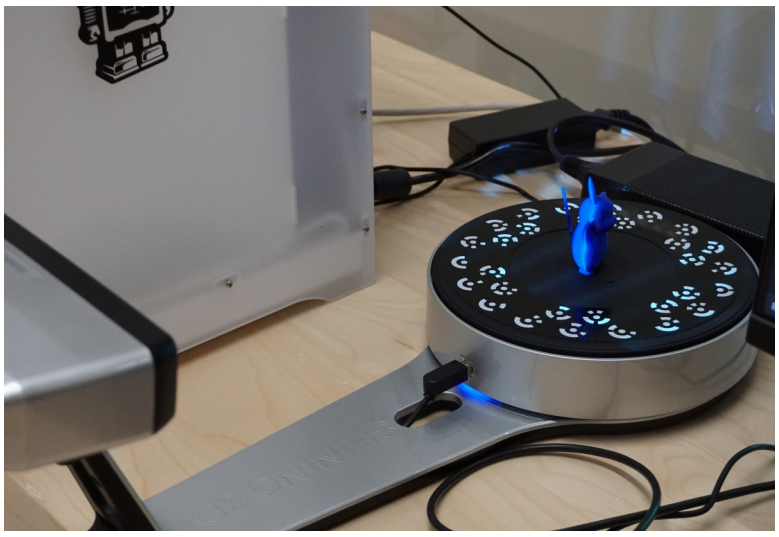
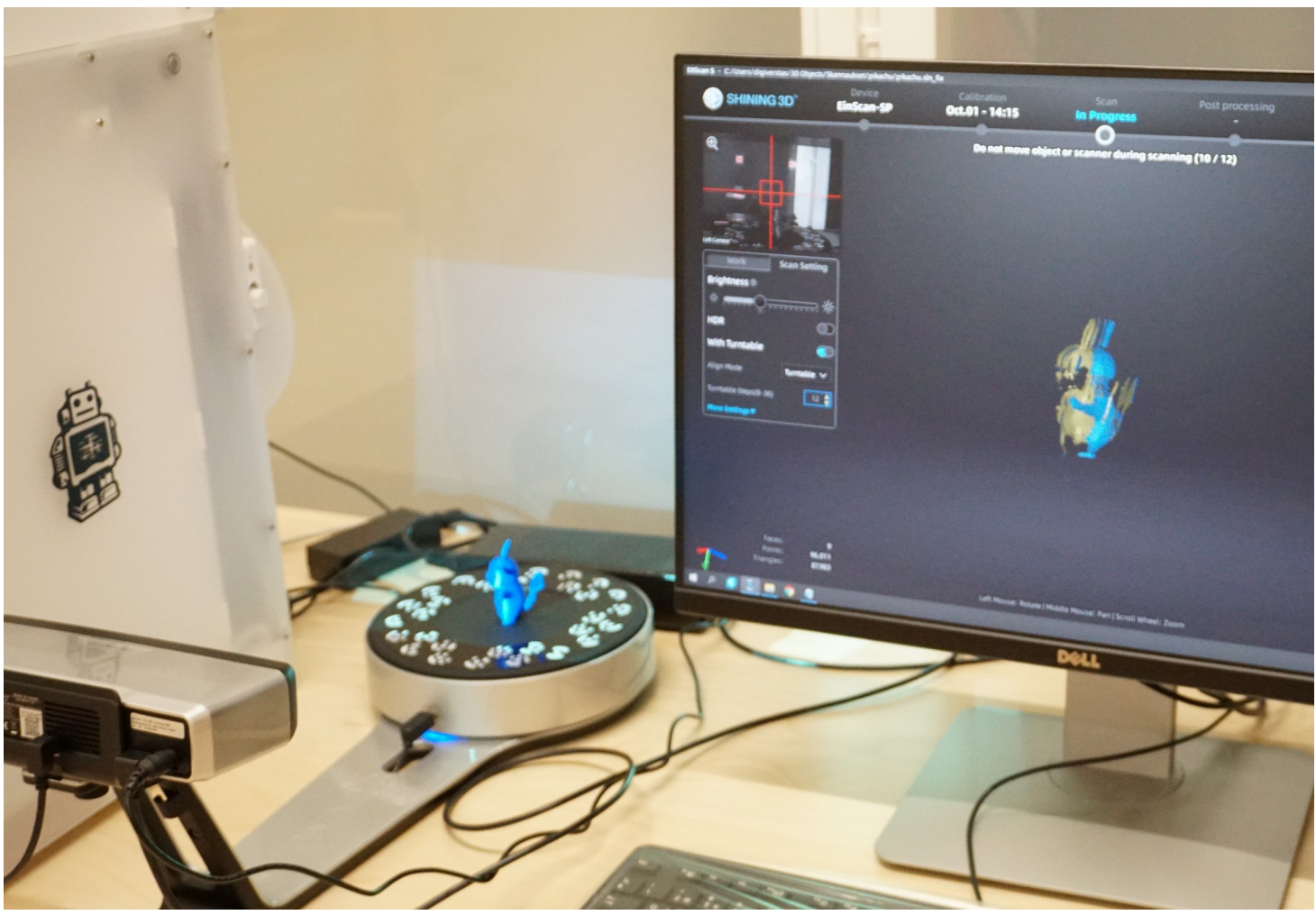




Digiverstas

3D-scanner

A 3D scanner can be used to create 3D model files, which can then be modifed with a suitable 3D modeling program or even print the library with a 3D printer. The scanning program creates an STL file when only the surface of the piece is needed, and an OBJ file when textures are needed.

There are free software for further processing of the created model files (Blender, Meshmixer, Designspark Mechanical).

Scans can be large in file size. For saving files, you should bring your own portable USB storage.

You can use the 3D scanner by asking the library staff.

EinScan SP -scanner and ExScan SP –program QUICK GUIDE

A 3D scanner produces digital model files of physical objects. The scan saves the model files in STL format. With the EinScan SP scanner, you can also create template files that contain the surface texture of the object to be scanned, in addition to just template files containing shape information.

About the properties of the object to be scanned

A **shiny surface** of the item or a **completely black** item can cause scanning errors. Likewise, **transparent** and **hairy pieces** can be challenging for the scanner. The **deep cavities** and **hidden shapes** of the part to be scanned are mostly scanned in a tree-like manner or they can be completely omitted from the created model.

With the help of scanning spray, black, shiny and transparent pieces can be scanned if they otherwise do not scan correctly. For hairy parts, a light moistening with water sometimes helps. Scanning of deep cavities can be done by pouring silicone (or something else) there and measuring the shape of the inner surface from the final result.

Parts with **rotational symmetry** and **repetitive patterning** are also challenging for the scanner. It would be good to have shapes in the piece that break the rotational symmetry. **The piece must also be large enough in size** to be able to scan, i.e. at least a few centimeters in diameter in practice.

To begin place the object to be scanned on the turntable.

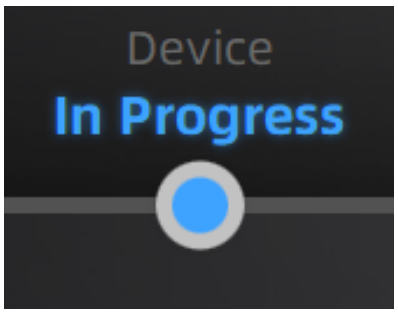
If necessary, to stop any movement, it can be fixed in place using blutack or adhesive putty.

Instructions for preparing the scan in the ExScan S – program

Start the 3D scanner from the power button. The scanner is on when the blue light on the power button is on.

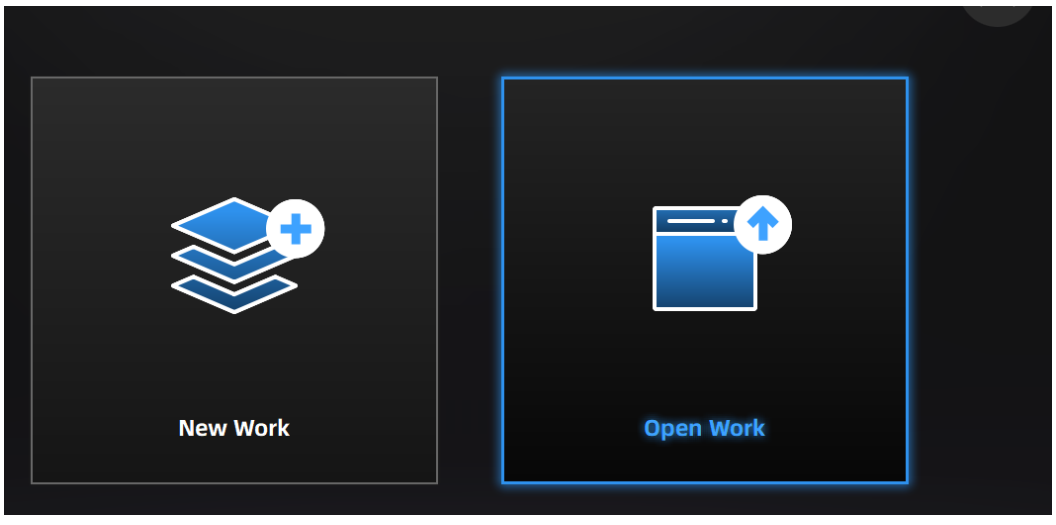
Open the **ExScan S** program from the icon on the desktop.

The program has recognized the device when it says **Device: In progress** at the top of the program



In the window that opens select **EinScan-SP**.

Select **New Work** to start a new scan. Select **Open Work** if you want to continue a previously started and saved work.

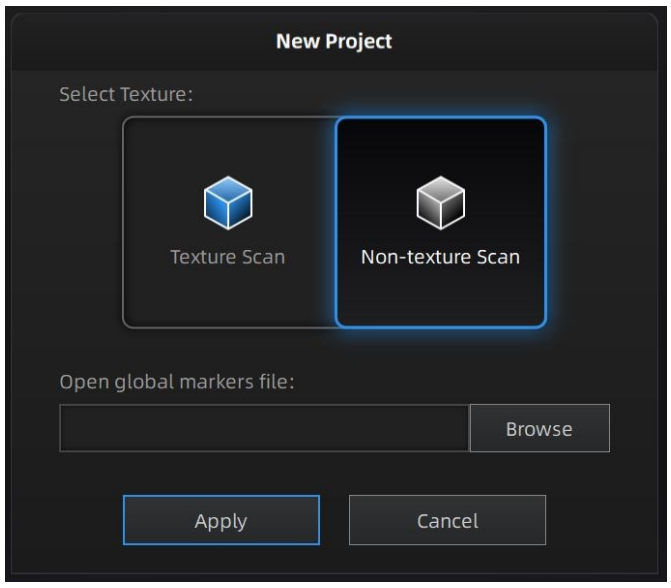


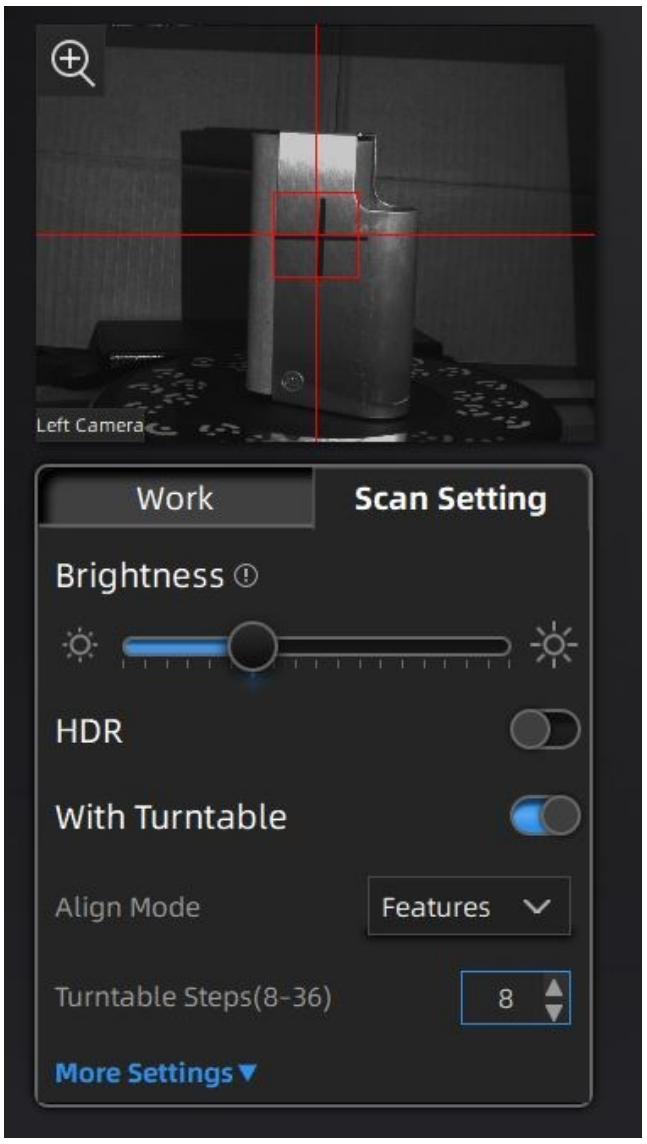
New scan

Enter a name for the job in **Project** name. You can change the destination folder using the drop-down menu and the directory tree on the left.

In the **New Project** window, select **Texture Scan** if you want the texture of the piece to be scanned, and select **Non-texture Scan** if you want only the shape of the piece to be scanned.

Finally, select **Apply.**





Scan settings

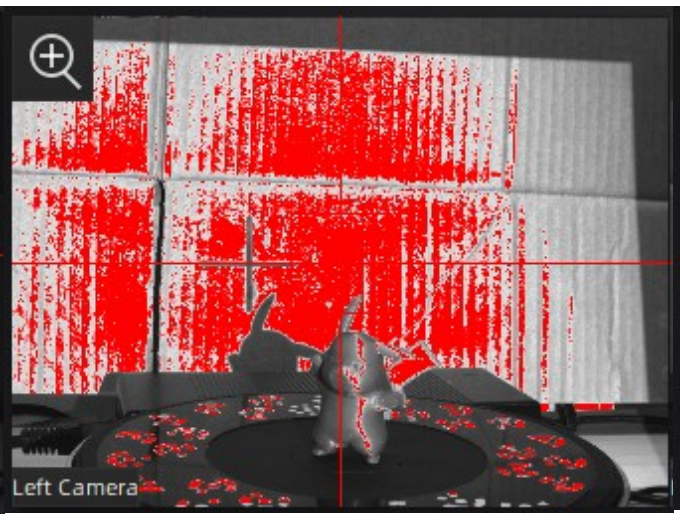
On the left side of the scan window is the settings window, where you can find the **Scan Setting** tab. Brightness adjustments are made with the slider under Brightness. **Use the slider to adjust the object to be scanned in the camera screen so that only a little red or red spots are visible in the image** (see images below).

The HDR setting is for texture scans. It is useful if the texture has high contrasts, eg black and white.

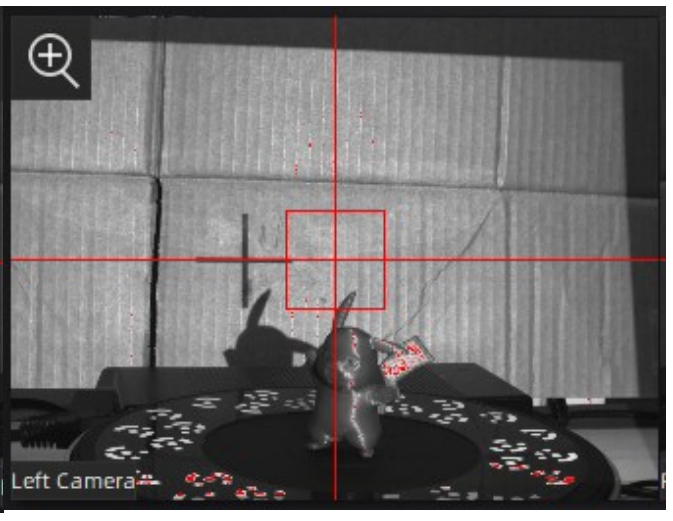
Examples ofBrightness settings:

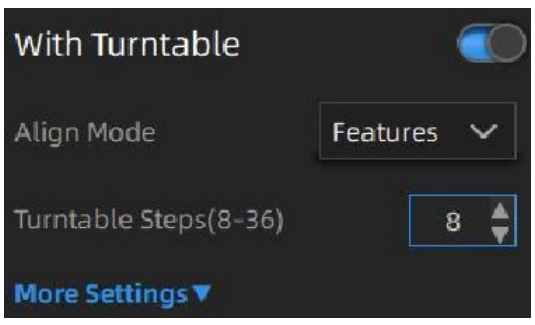
Too little brightness

Too much brightness



Appropriate brightness

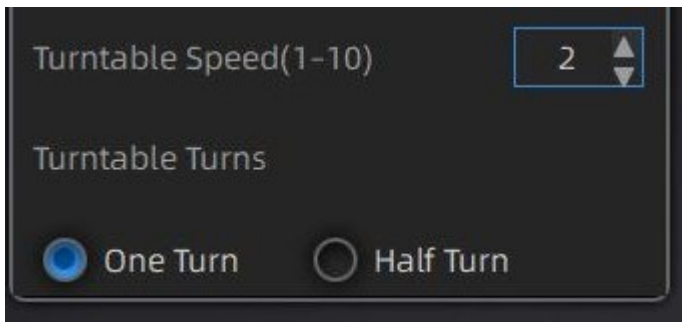




From the same settings window, turn on **With Turntable** to use the rotating scanning platform. During the scan, the platform rotates between complete revolutions, stopping, with the cameras taking a scan from this angle. You can choose the number of stops under Turntable Steps. **If the scans become inaccurate, you can try increasing the number of stops.**

The **Align Mode** section determines how the scanner tries to combine scans taken from different image angles into a single entity. **Features** combines scans according to the features of the object. This is a good solution for objects whose shape is clearly different from different viewing angles.

Otherwise select **Turntable Align.**



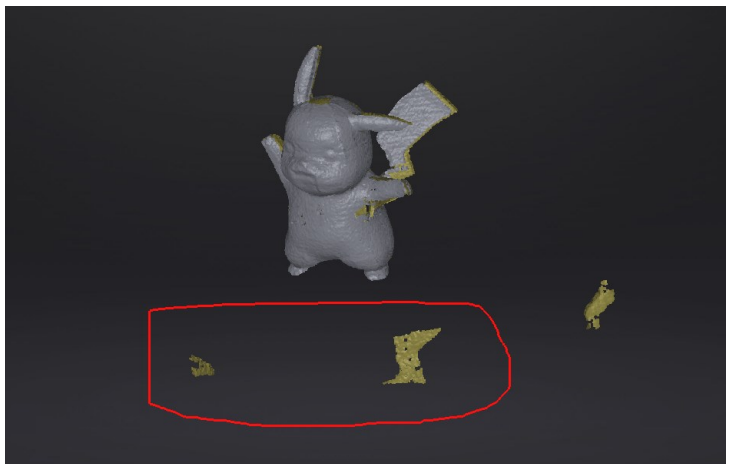
The object should remain in place during the scan. If the object moves as the platform rotates, alignment can be difficult. From **More Settings** you can adjust the turntable speed.

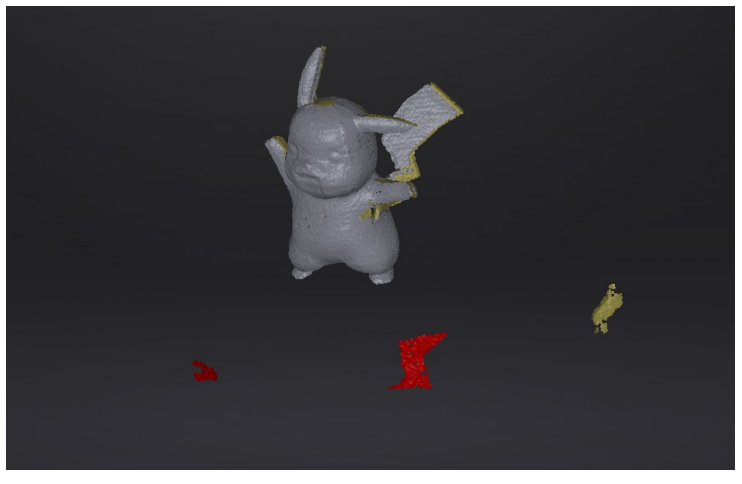
(Turntable Speed). The object can be attached to the base with blutack, for example, so that it does not move during the scan.

Scanning

When the settings are complete, you can start scanning. On the right side of the screen is the **Start Scan** button, where the scan starts. When the scan is finished, the result of the scan opens in editing mode.

You can remove parts, e.g. extra debris around the object. Press **Shift + left mouse button** at the bottom to select parts and select **Delete selected data** on the right side or the **Delete** key to delete the selected part.



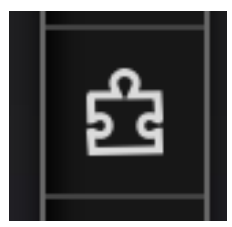


When editing is complete, press **Apply Edit** on the right, and the scan will be added to the project with edits.

Select the items you want to remove. Points to be deleted are shown in red. After editing, the **Global Optimization tool** (square image) can be found on the right side, which can be used for neat scanning.

It may be necessary to take several scans of the object. **Place the object in a new position so that the empty spots are now visible to the camera**. You can also use the blue tack/adhesive here, if the object does not stay in the new position.

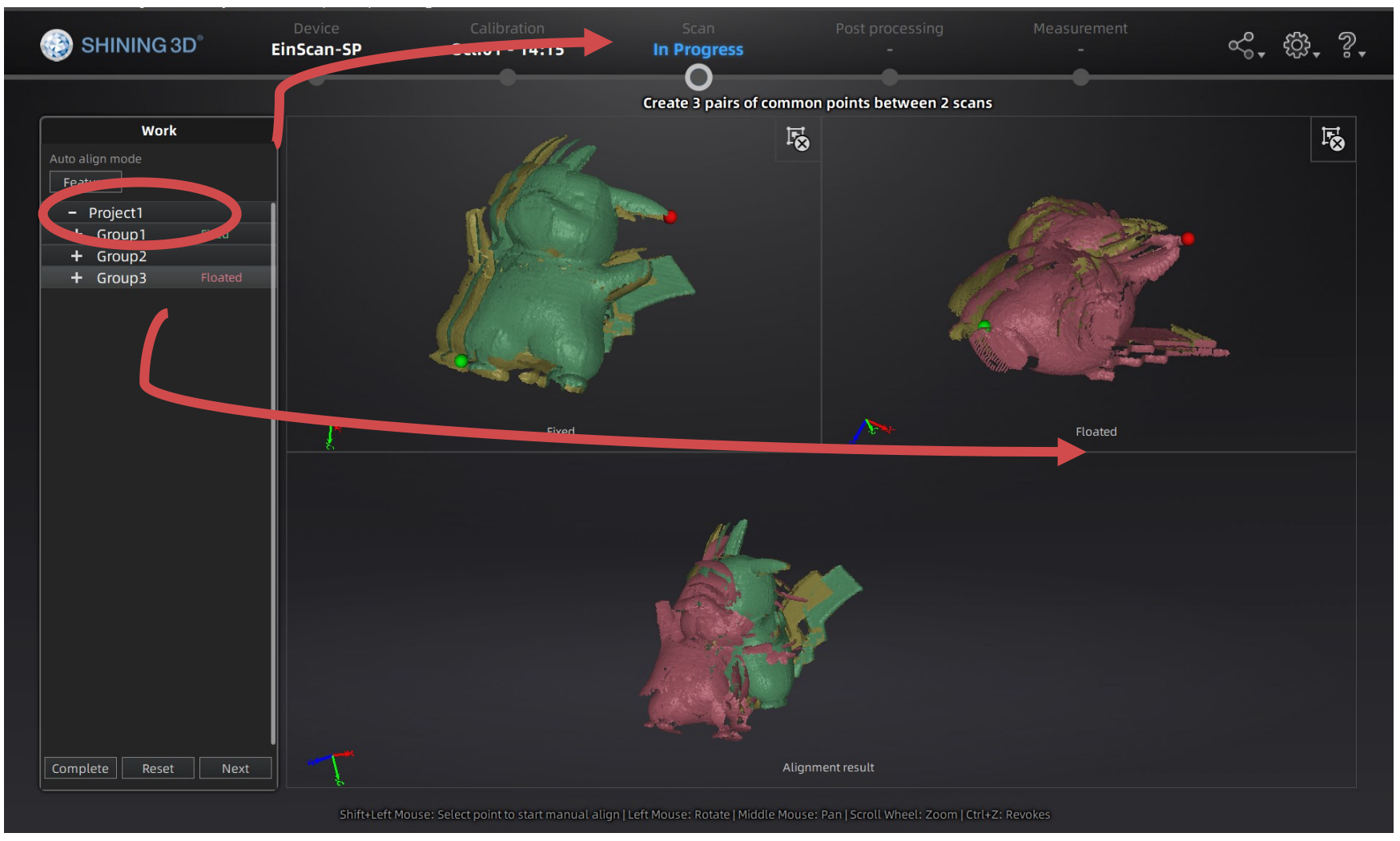
If you want a new scan for its own project, you can create a new project in the **Work tab**. Otherwise, each new scan becomes its own group (**Group**) in the same project. Take the scan and make the necessary edits in the same way as the first time. You can edit the scans again by opening the group from the **Work** tab.

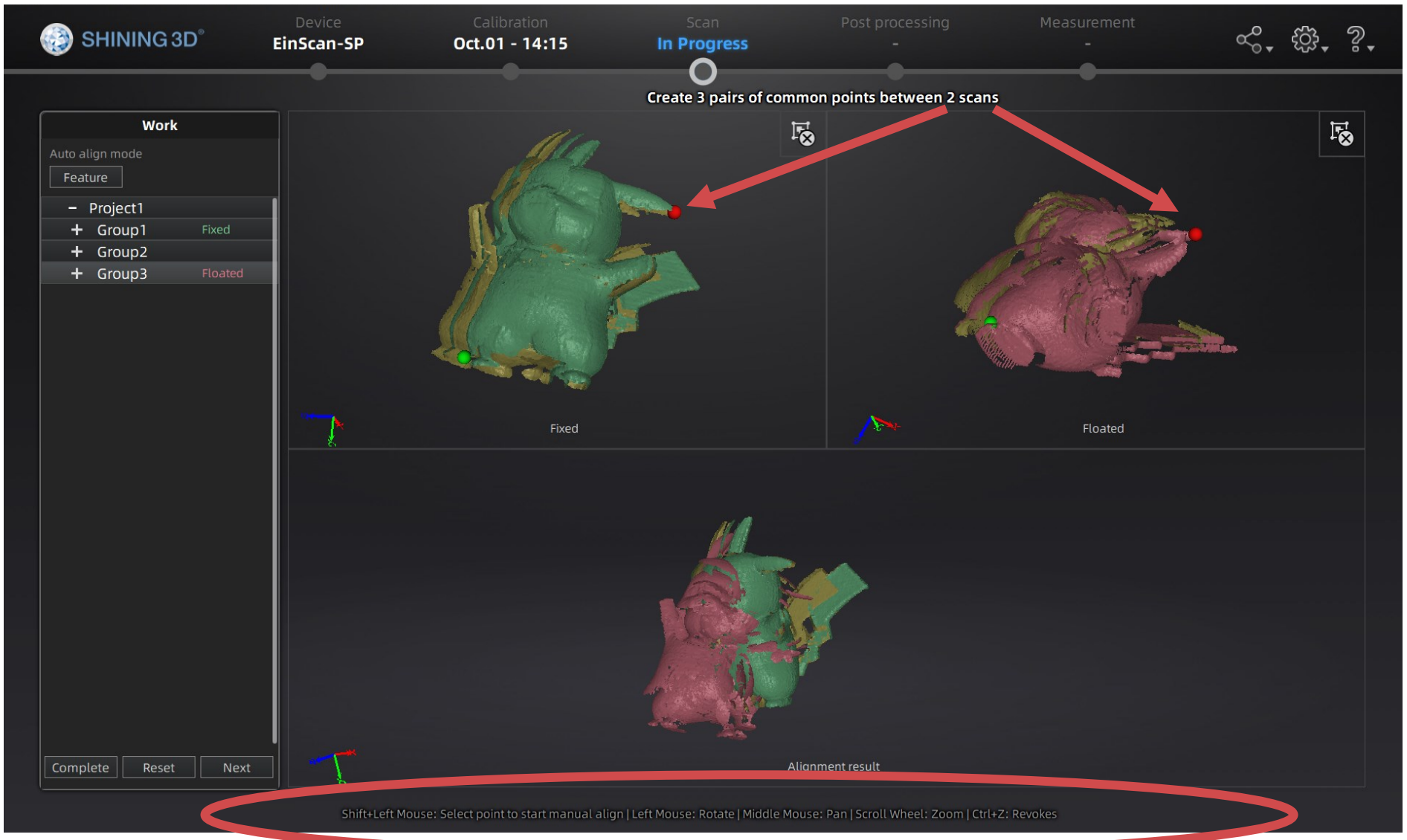


Aligning scans into one piece

When the scans are complete, they should be aligned into a single piece. On the right is the **Align tool** (puzzle piece icon), which you can use to align scans in different projects or groups. From the left, drag the project or group containing the scan into the **Fixed** window to the upper left. Drag the second scan to be aligned with the first to the top right of the **Floated** window.

First, try aligning according to the features of the object (**Feature** button on the left). If the result is good (shown at the bottom of the **Alignment result** window), accept the alignment by pressing **Complete** in the lower left. If alignment according to features is not successful, you have to align manually.





To align manually, **select three common points (Shift + left mouse button)** from both scans to align. You can move and rotate the scan with the mouse. **The bottom part of the screen shows instructions for different key commands.**

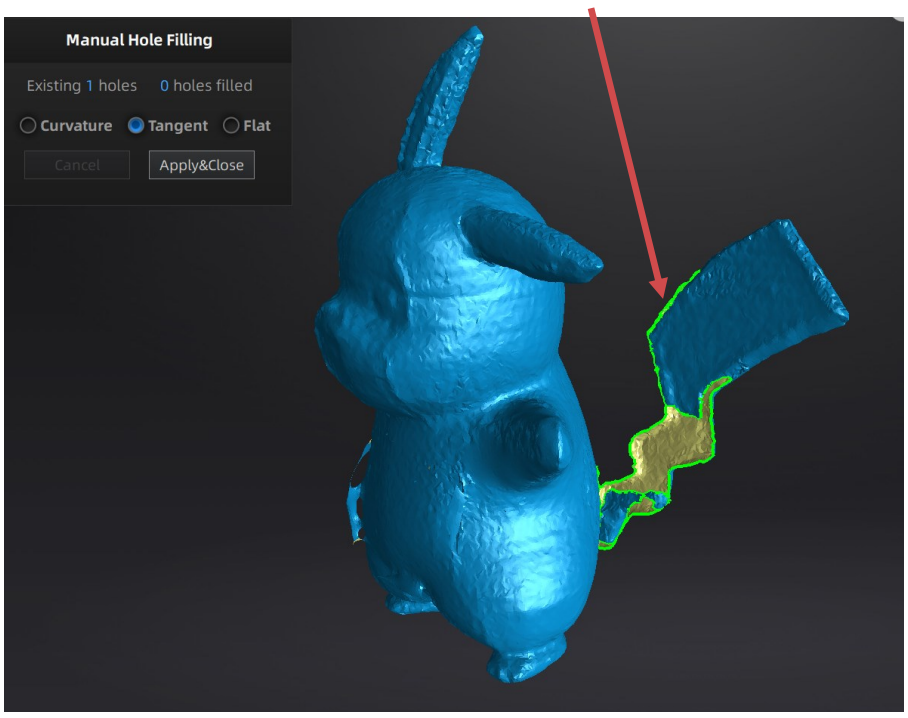
Preparing the scan for a 3D model

Once the scan is complete, a model is created from it by meshing it. This is done with the **Mesh Model** tool at the bottom on the right side, after pressing which either a waterproof model **(Watertight Model)** or a **water-permeable model (Unwatertight Model)** is selected.

The waterproof model creates a closed network, i.e. it tries to fill the holes left in the scan. It is ready for 3D printing as is. Finally, the quality of the network is selected. More complex objects need a higher quality to preserve the details. Networking takes a while depending on the amount of quality and the complexity of the shape of the scanned object.

Once the model has been created, some post-processing can be done on it. **Holes can be filled from the water-letting model with the Hole Filling function**, the button of which is in the right menu.

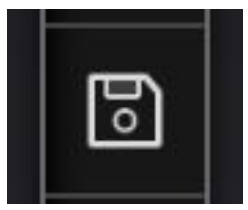
From the hole filling tool, you can choose the automatic option **(Auto Hole Filling**), which fills all the holes, or the manual option, where each hole is selected yourself. **The selection of the hole is made by pointing to the green edge of the hole**, when it turns red and clicking with the mouse, when the hole is filled according to the selected function (**Curvature, Tangent or Flat**). You can try which of the different functions of the hole filling tool looks best. Click **Apply** to save the changes.



Reset cancels the changes.

Both water-permeable and waterproof models can also be sharpened or smoothed (**Sharpen and Smooth**).

The simplification tool (**Simplification)** can be used to reduce the number of triangles in the model network and thus reduce its file size. Select the simplification ratio and click **Apply**, after which you can see how the model changes after the simplification. Press **Reset** if the model suffers too much and try a higher ratio. Simplification can be done many times with different ratios, and the model can often be simplified a lot without affecting the shape too much.



When the post-processing is complete, save the model (**Save Your Scan**).

Choose a file format. For 3D printing, you should choose the **STL file format**. Texture scans require the **OBJ file format**. After choosing the name and file format, the program still shows the dimensions of the object and gives the possibility to scale it while maintaining the dimensions before saving.