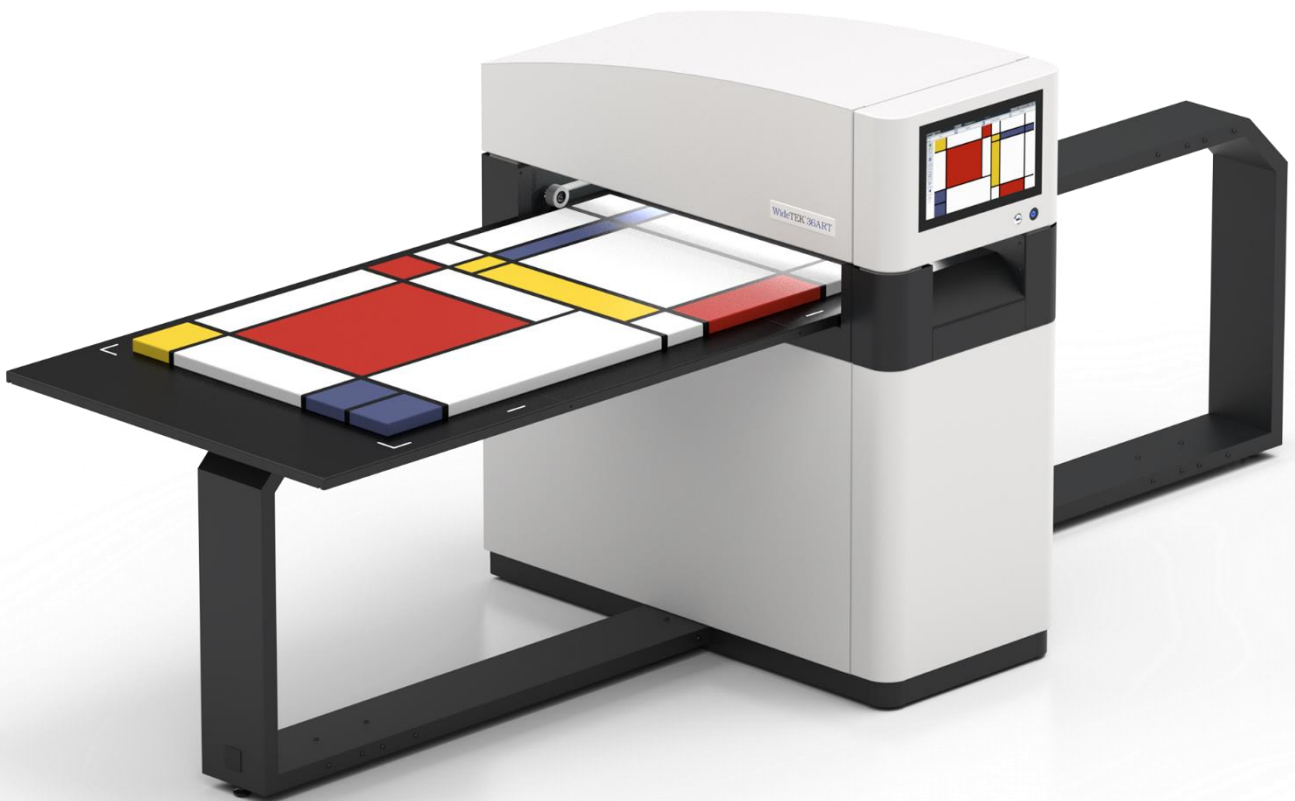


# Best Practices

WideTEK<sup>®</sup>  
*Art*



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## 2. Revision History

Date	Rev.	Name	Description of Change	Reason of Change
29.03.2018	1.0	TI,JCA,ESA	First draft	First published version

## 3. About this Manual

### 3.1. Purpose

This manual has been written by Image Access for operators of WideTEK ART scanners. It contains a description of the functional principles of the scanner family which is helpful in understanding its behavior and the scanning results. The manual also describes the limits of the technology. Many examples illustrate how to get the best scan of a certain object using the scanner controls.

### 3.2. Corrections

This manual may contain typographical errors and/or technical inaccuracies due to improvements or changes in products. When numerous changes have occurred in applicable products or in the content of this manual over a longer period of time, Image Access will issue a new version of this manual. The reader should always check [www.imageaccess.de](http://www.imageaccess.de) for the latest version of this document.

### 3.3. Warranty

The information contained in this document is subject to change without further notice. Image Access makes no warranty of any kind regarding this material; including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Image Access shall not be liable for any errors contained herein or for any incidental or consequential damages in connection with the furnishing, performance or use of this material.

### 3.4. Safety

In this manual, the following safety information can be found:


 <b>CAUTION</b>	
	Notices with the word CAUTION warn about a situation that could lead to minor or more serious injuries.


The Caution symbol calls attention to an operating procedure, practice, or the like which, if not correctly performed or adhered to, could lead to minor or more serious injuries. Do not proceed beyond a Caution symbol until the indicated conditions are fully understood and met.

<b>ATTENTION!</b>	
	This note warns of situations that can lead to scanner or other property damage. Other property includes the objects to be scanned.

The Attention symbol calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the scanner or other property. Do not proceed beyond an Attention symbol until the indicated conditions are fully understood and met.

<b>BEST PRACTICE</b>	
	This note gives hints about the best ways to achieve good results. Information in this note should be understood as an advice, there may be other ways of operating that may result in similar or even better results.

	This symbol indicates the <b>correct</b> way of handling an object or a situation.
---	--

	This symbol indicates the <b>wrong</b> way of handling an object or a situation.
---	--

## 4. Concept of the WideTEK 36ART

The unique concept of a WideTEK 36ART is formed around three major elements.

### 4.1. Scanner Main Body

The WideTEK 36ART's main body controls a lightweight scanner table which is moved through the scanner's body via a set of rubber wheels, placing the camera position at the stable part of the scanner. In contrast to other designs which consist of a massively immobile scanning bed with a rather fragile line camera mounted above the scanning bed, the WideTEK 36ART moves the material to be scanned through the scanner to the camera position. In the conventional designs, the camera and the lights must move across the scanning bed. This requires a high amount of precision and many complex physical and mechanical adjustments to ensure the necessary stability to achieve this precision.

### 4.2. Scanner Head with Cameras

The WideTEK 36ART cameras are located in the upper part of the scanner body. The three cameras are side by side and form a scanning line of 22.500 pixels, which allows scanning at 600dpi over the full depth of the scanner. The head is elevated above the scanning table, effectively creating a clearance of 100mm (4"). The camera head can be raised by up to 100mm (4") to accommodate thicker objects while remaining in focus.

There are two lasers located exactly between the cameras. They are used to measure the distance to the object and are also used to stitch the scans together.

### 4.3. Scanning Table

Transporting the scanning table through the scanner is done using a runway, which is located directly in the middle. The runway still needs room to the left and right as other designs do, but is also very slim and does not overrun a minimum footprint.

The scanning table is moved with limited force. It cannot injure a person or damage objects (unless they are pushed off the runway). Whenever the scanner is not driving the table, it can be moved freely by the operator. The benefit of this is that the table can be pulled out of the scanner without requiring any tools.

## 5. Scan Table Position

The scanning table is a unique design and is very different from conventional designs. This makes it necessary to explain its features and the logic behind the scan table design.

### 5.1. Rubber Wheel Transport

The scanner moves the table using a set of rubber wheels. The lower set of wheels, the drive wheels, are driven by two motors, one for the left side and one for the right side. Both of these wheels have contact to the table in the front and in the back.

To improve friction, there are four pressure wheels holding the table down against the transport wheels. Occasionally, the pressure needs to be adjusted. The four pressure wheels can be adjusted by unscrewing the center bolt with the SW4 Allen wrench. The pressure wheels should apply a fair amount of pressure to insure friction and should not be freewheeling in any position. If you can move the wheel and it moves the table without freewheeling, the pressure is correct.

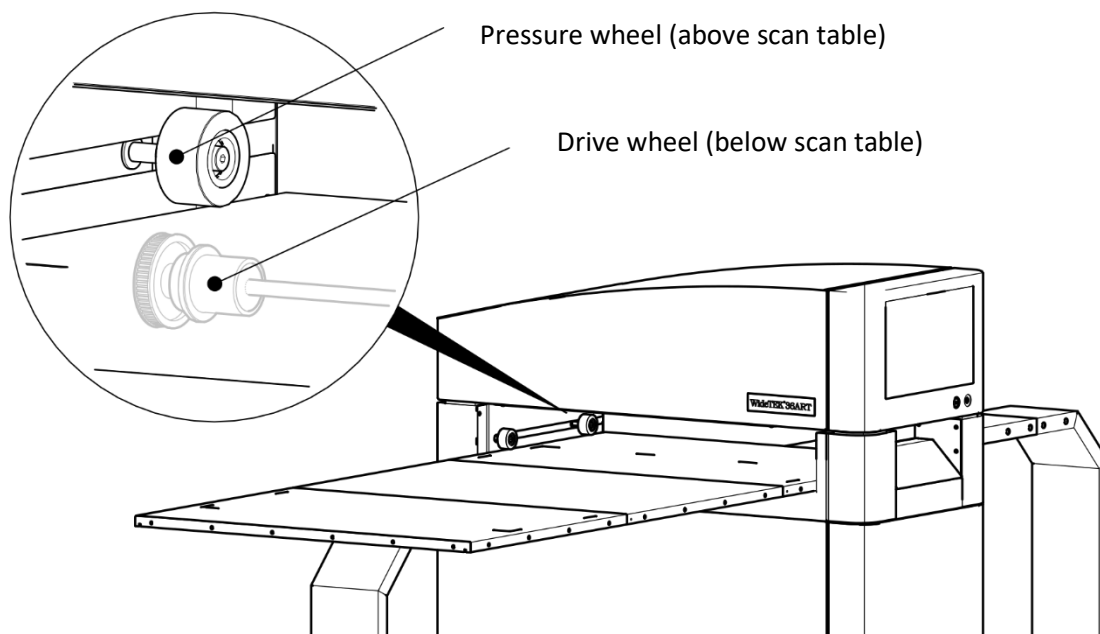


Fig. 1 Rubber wheel transport

### 5.2. Cleaning the Rubber Wheel Transport

Clean the pressure rollers, the drive wheels and the paper path with a damp cloth. Wet the cloth and wring it out as much as possible. The best results are obtained with a microfiber cloth.

Use a mild soap and water solution only if necessary. Do not use abrasive cleaners.

#### **ATTENTION!**

The pressure wheels can be removed from the scanner. Be careful not to lose the nut inside the aluminum beam. Before you put the wheels back in place, adjust the position of the nut with a small tool.

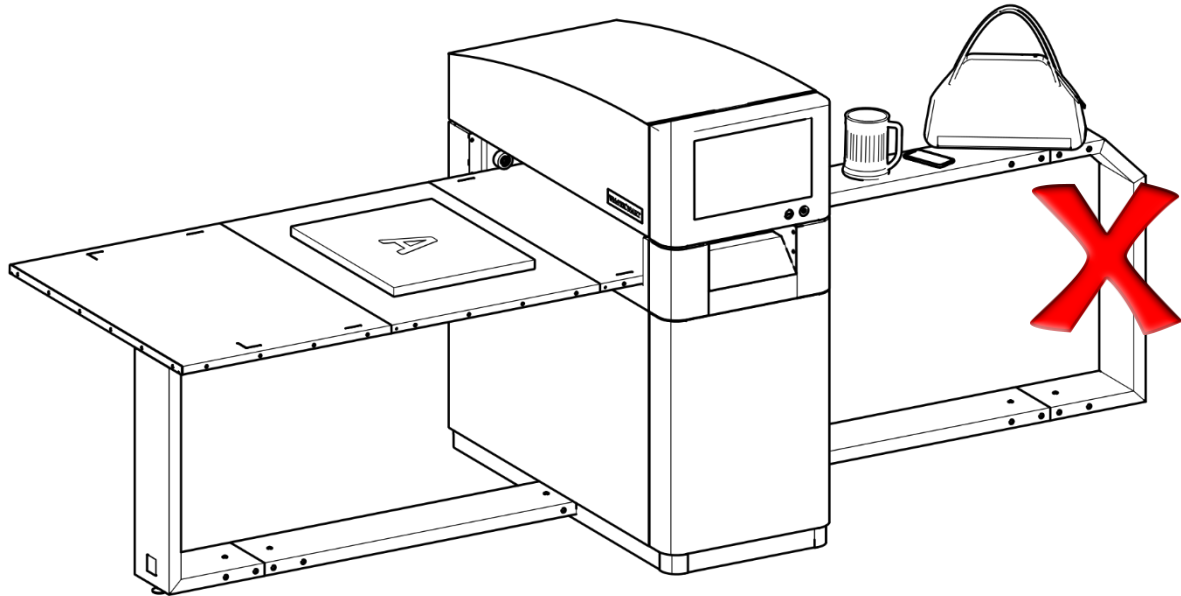


Fig. 2 Never place objects on the runway

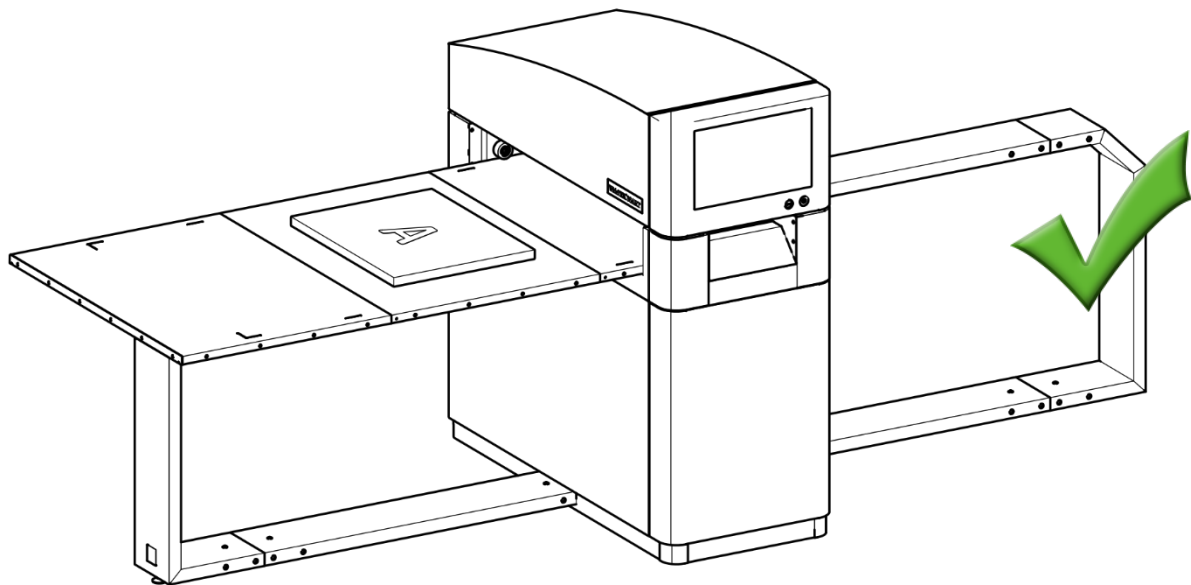


Fig. 3 Correct placement of object

**ATTENTION!**

Never put any objects on the runway. Although the motors are torque limited to avoid harm to persons, the table will have enough force to push anything (cups, bottles, phones, tablets and scanning objects) over the edge of the runway.

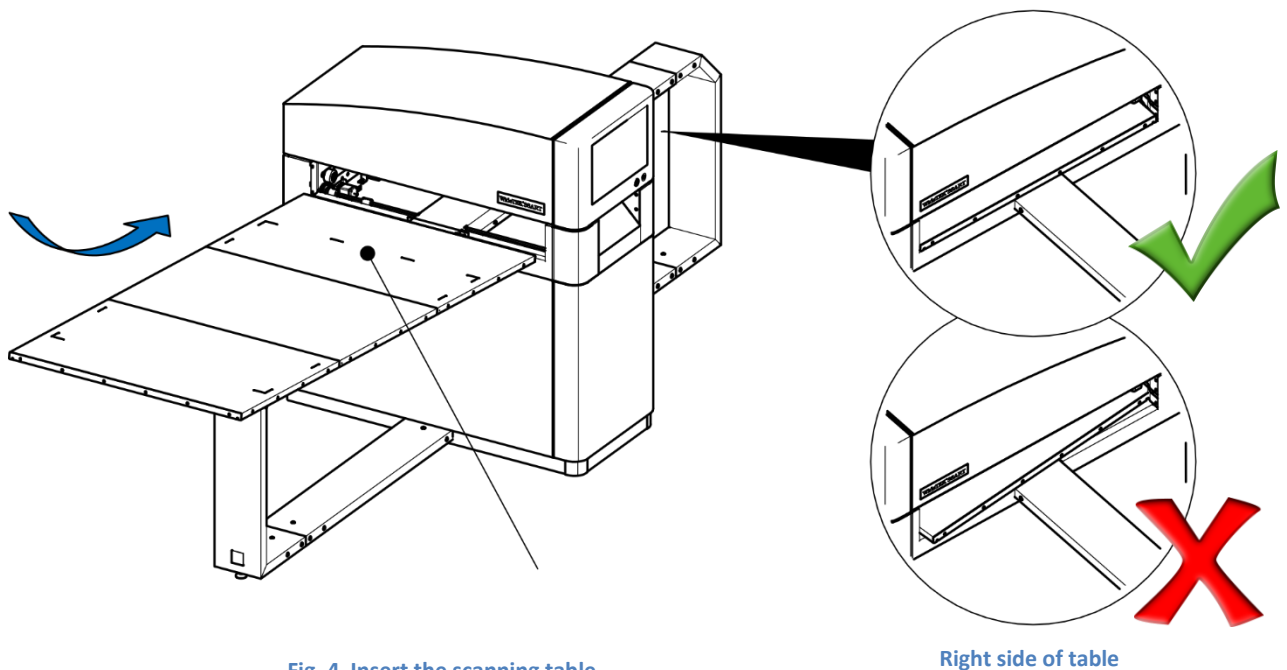


### 5.3. Insert/Remove Scanning Table without Tools

The scan table for the scanning objects can be inserted and moved on the scanner by hand.

The right side of the scan table must be inserted first. The right side can be identified via the two additional white lines across the shorter edge of the table.

- Put the scan table on the runway.
- When the scan table has been placed on the runway, make sure that it is flush with the right side of the scanner stand.
- To check if it is straight, stand in front of the scanner at the right side. Examine the top edge of the scan table to ensure it runs alongside the right side of the scanner and is flush.




The only physical connections between the table and the scanner are the transport wheels. They have four pressure wheels. They move the table with limited friction, which is a security feature. The four pressure wheels can be adjusted by unscrewing the center bolt with the SW4 Allen wrench. The pressure wheels should apply a fair amount of pressure to insure friction and should not be freewheeling in any position.

There is no position or end switch which tells the scanner where the start position is. The start position is the position the scanner table is in when a scan command is invoked. If the scan table reaches its end, or if the scan is interrupted, press the **START POSITION** button to return the table to the start position.

**5.4. Location and Weight of Objects**

The maximum weight you can put on the scanning table is 10Kg or 22lbs. Proper operation of the scanning table is guaranteed if the weight is spread out to the sides so that the center of the weight is over the runway, which supports the middle of the table. The runway itself supports up to 30Kg or 66lbs but it is not recommended to place objects this heavy on the table. If the user is very careful, this can be done if the weight is centered over the runway. The motors are strong enough to pull even 30Kg but placing objects above 10Kg/22lbs on the table is done at the user’s own risk and any damage done to the scanner or the scanning material is not the responsibility of the manufacturer.

<b>⚠ CAUTION</b>	
	Maximum table load is 10kg, 22lbs. Always make sure that the total weight is centered on the table and that the center of the weight is on the runway.

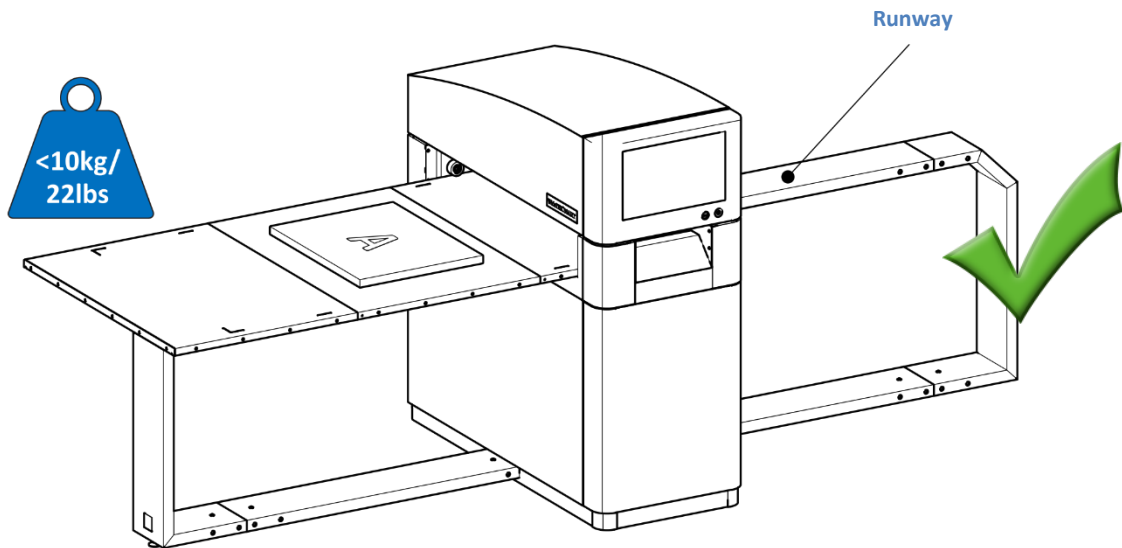


Fig. 5 Correct positioning and weight

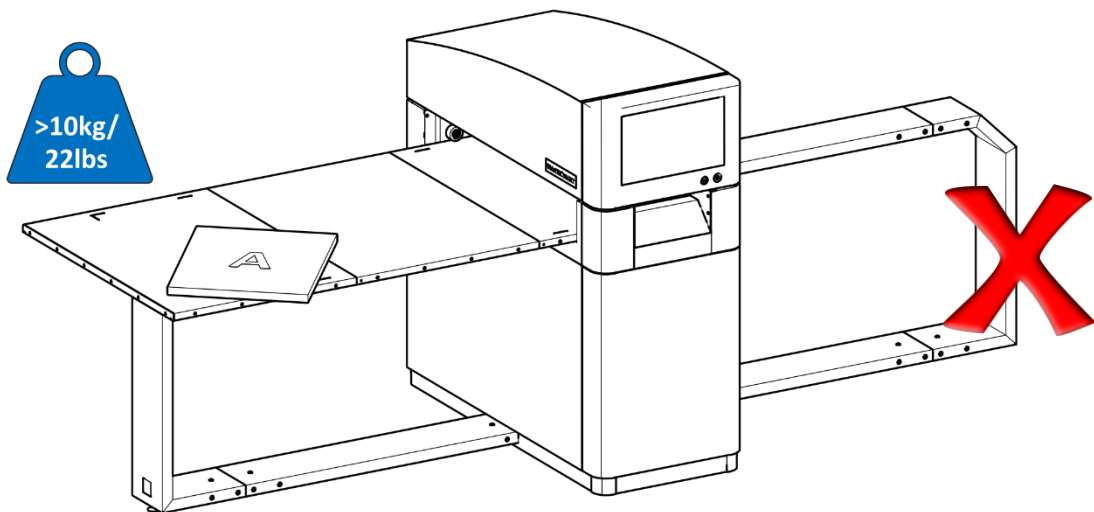


Fig. 6 Incorrect positioning and weight

## 6. The Control Panel

The scanner features full user control of the scan table position, the scanner's height and the focus methods used.

The control panel can be invoked from the main screen here. As long as the control panel is active, the line lasers are switched on and measurements are performed.

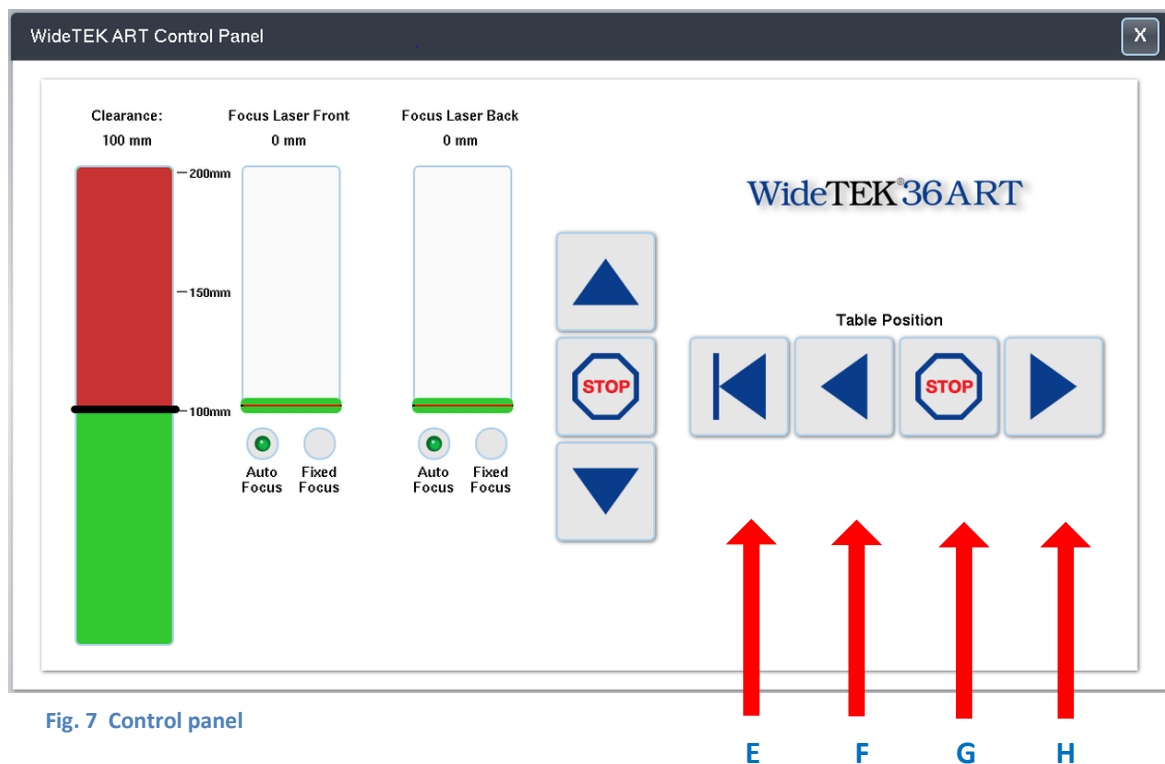
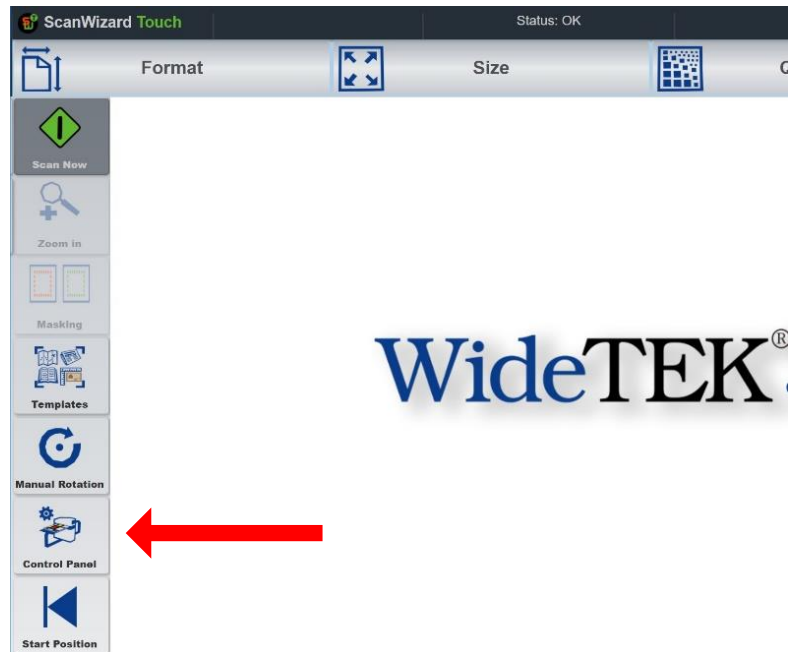


Fig. 7 Control panel

### 6.1. Table Movement Control

The button **F** moves the table to the left, the button **H** moves the table to the right. The button **E** moves the table back to the previous scanning position. Every time a scan is initiated, this position is stored as the starting position. The stop button **G** stops the table at any time immediately. During scanning, this button will also end a scan when pressed, eliminating the need to measure the necessary scan length.

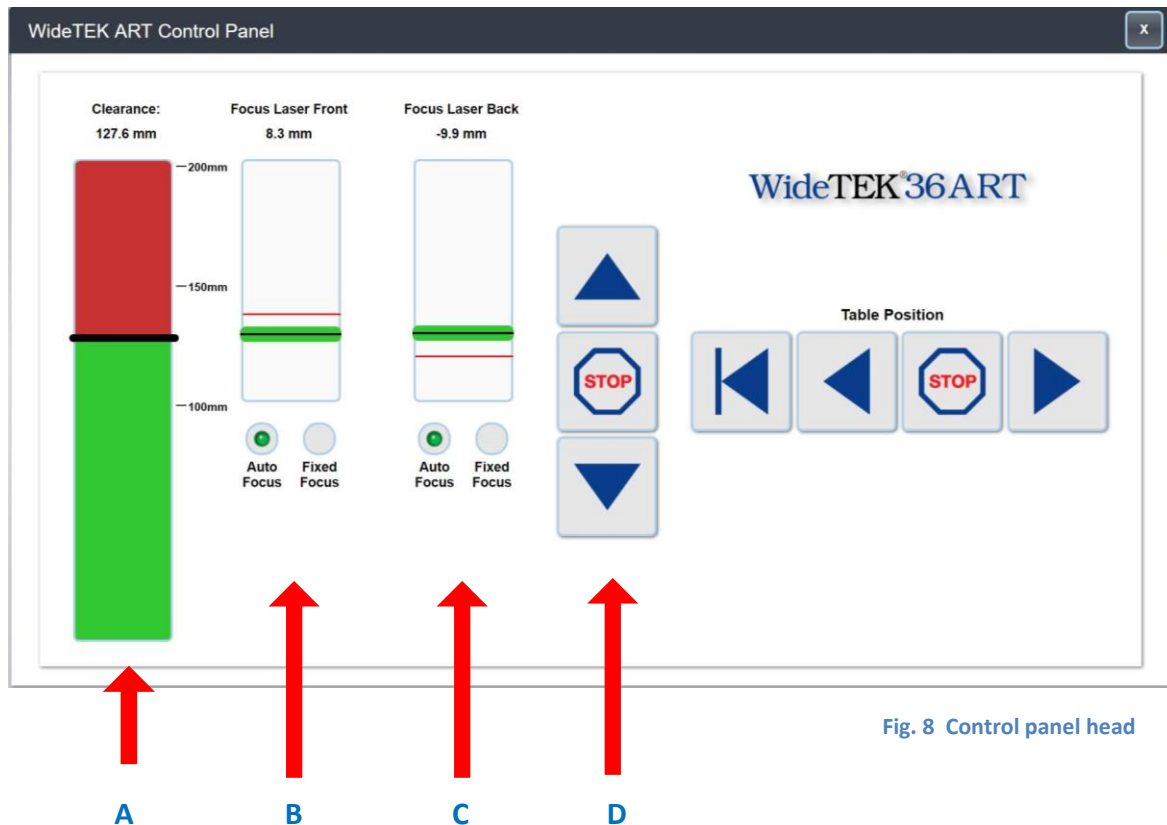
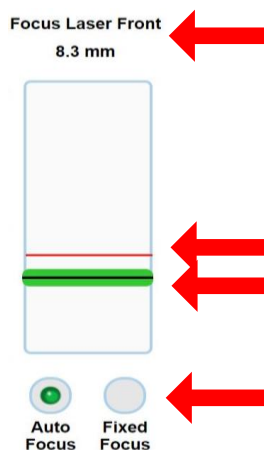


Fig. 8 Control panel head

## 6.2. Head Movement Control

The head of the WT36ART can be raised by 100mm (appr. 4") to accommodate for objects that are thicker. In the lowest position, clearance is already 100mm which means that objects whose scanning surface is at the table level can have a frame or other obstructing parts up to 100mm. When you drive the head up, that scanning surface and the clearance move up in sync. The indicator **A** represents the heights of the head. The black bar at the 100mm line is the lowest position and it can be raised to 200mm.

The buttons at **D** move the head up and down. The movement starts slowly but will accelerate if the button is kept activated. The controls **B** and **C** show the laser assisted height measurements as well as the actual position of the head. They are the same with the exception that the **Focus Laser Front** represents the first laser from the operator's view and the **Focus Laser Back** represents the second laser from the operator's view.



The value **Focus Laser Back 8,3mm** is the distance between the measured heights (red line) and the current position of the head (bold green line). In this example, the optimal focal plane is 8,3mm (red line) above the current position of the head.

The red line represents the result of the laser measurement. Laser measurement may fail if the head is too low because at some point the laser becomes invisible. This is the case if an "out of range" message appears.

The **Auto Focus** and **Fixed Focus** buttons will be explained on the following pages.

### 6.3. Auto Focus Control

The **Auto Focus** function uses a laser assisted distance measurement of the object relative to the focal plane of the camera, which moves up and down with the head position.

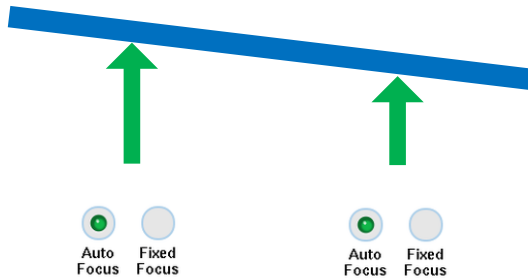


Fig. 9 Auto Focus using both lasers

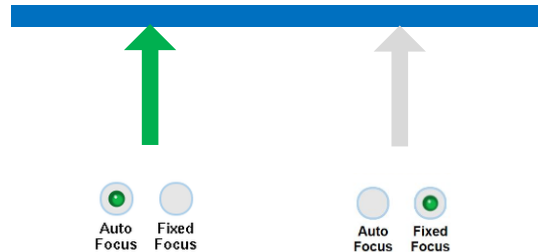


Fig. 10 Auto Focus using one laser

If both lasers detect a distance between the object scanned and the focal plane, the scanner assumes a straight line between the two points (Fig. 9). The image taken is assumed to be taken from an object which has a position like the blue bar in the above Fig. 9. The scanner will then correct all geometric distortions (mainly due to shifting resolution because of the varying distance). This process is repeated for each scanning line, effectively following any bow or angle of the object.

If only one laser is set to **Auto Focus**, the distance is only taken from this laser. Since only one measurement exists, the object is assumed to be perfectly horizontal, illustrated in Fig. 10.

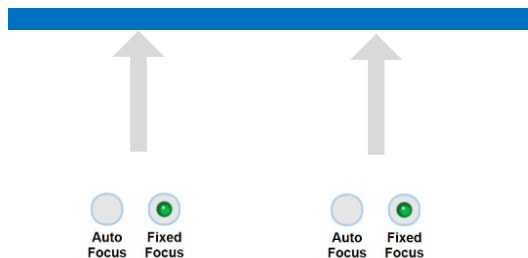


Fig. 11 No Auto Focus used

If both lasers are set to **Fixed Focus** no geometric correction is done. The object is assumed to be exactly in the focal plane and also perfectly horizontal.

This is useful if scanning very irregular objects. Since no correction is done, the scanner will behave like an ordinary camera taking an image from a fixed position.

There is one trade-off to having multiple cameras. Each camera has an angle of view at the outer edges of its view and the next camera has the same angle of view but from the other side. This may produce artifacts on very irregular objects if the area of irregularity is in the vicinity of the lasers, where the cameras join.

### 6.4. Correct Positioning for Auto Focus

The scanner has two lasers which are located between the three cameras. The laser lines are visible by both cameras, which allows measuring the heights of the object. These lasers are used by the Autofocus function. The laser lines also assist in the stitching process. The lasers are on during the scanning process but also when the control panel is active. The scanning area is marked by the white corners and a dotted line. Scanning starts at the white dotted line on the right. It is not necessary to perfectly align the object with the start line, since the scan has to be cropped later anyway.

Place the object to be scanned on the table below the red laser lines. It will be seen by the cameras and the focal point will be set. Depending on the size of the scanning material, both laser lines should be fully on the object. If the object is smaller, one laser line should be fully on the object. The other laser line should be outside of the object. The laser lines should not be partially on an edge of the object but rather either **fully on** or **fully off** the object.

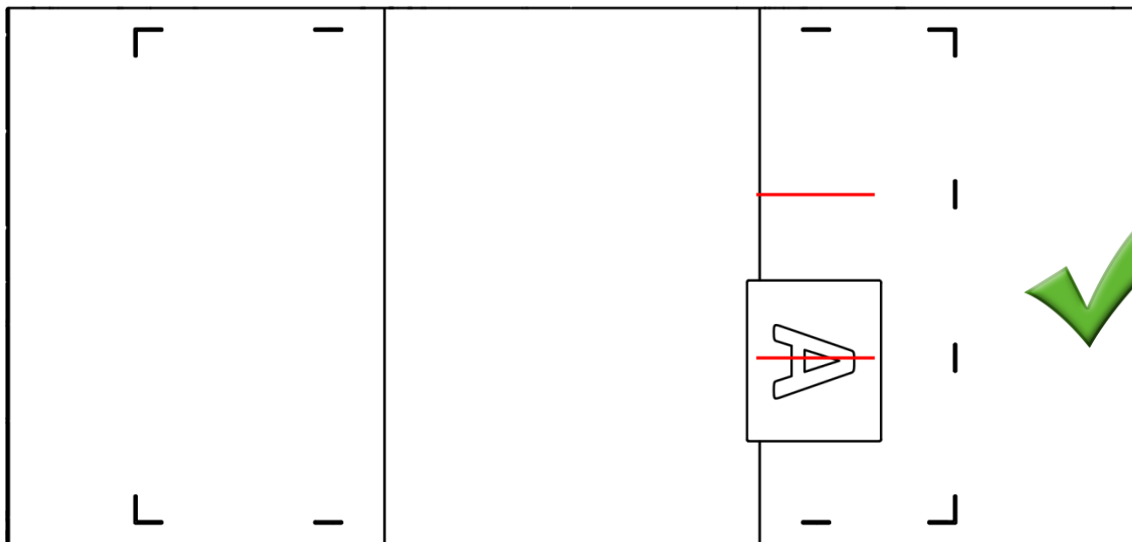


Fig. 12 Correct positioning under laser

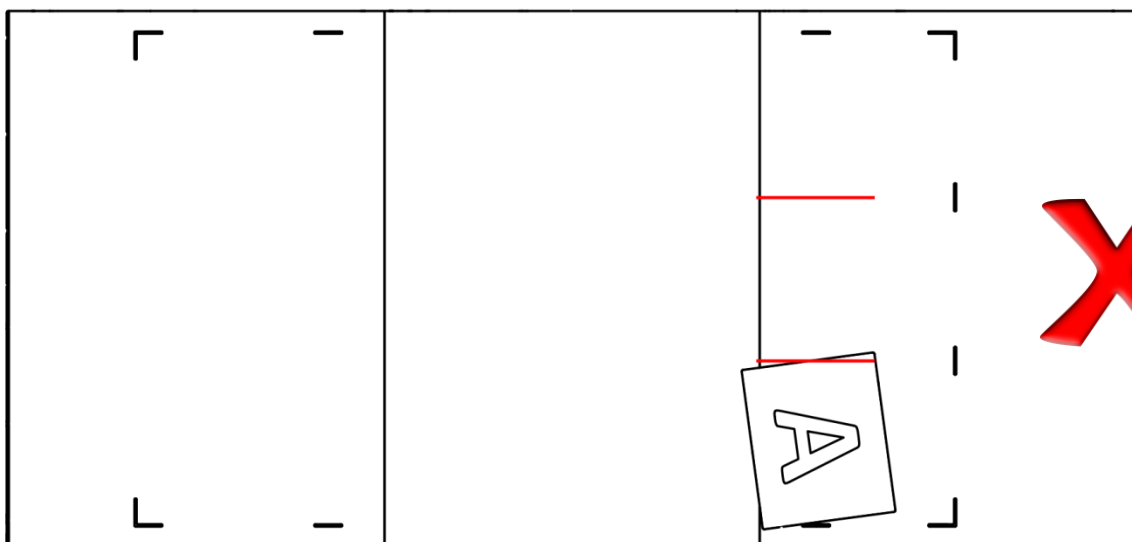


Fig. 13 Incorrect positioning under laser

### 6.5. Scan Start and Length Control

When the scanner has been powered up and the scanning table is in the start position, the scanner is ready to scan. The object must be put under the camera and moved close to the white alignment edges which define the start and the width of the scan. You may also pull out the table for this operation by hand. Do not forget to push the table back to the start position (Aligned to the right side of the scanner).

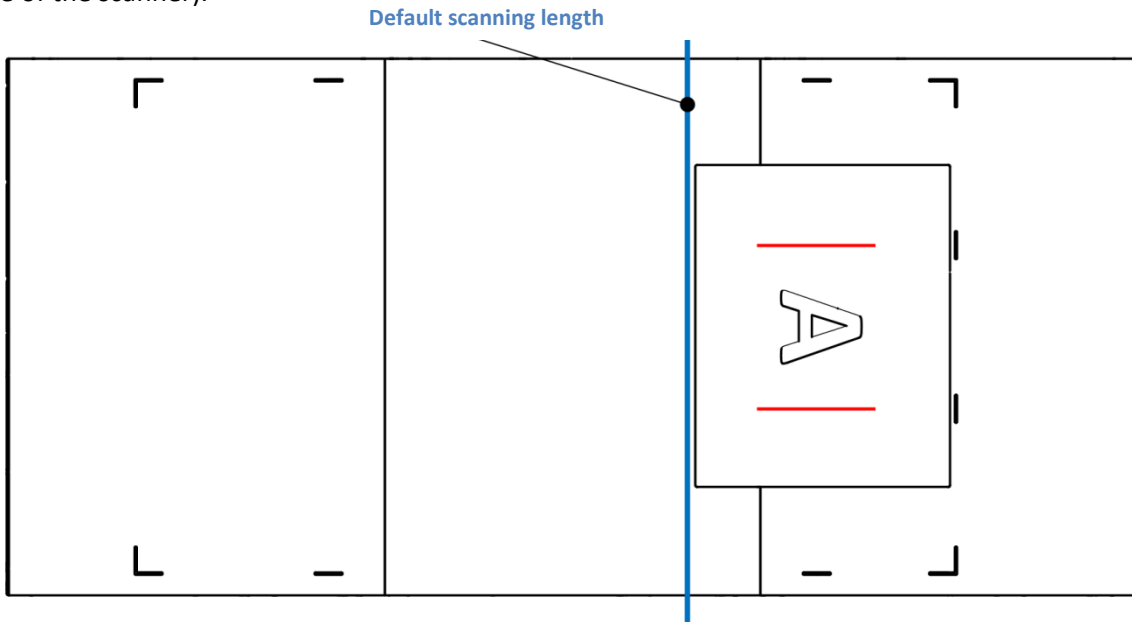


Fig. 14 Default scanning length

### 6.6. Operator Defined Scanning Length

The preset and automatic scan length is 20" (508mm) from the start line. This can be changed in the software in increments of 10" (254mm) up to 60" (1.524mm). Set the scanning length to a value higher than the object's length and press the start button. The default scanning length is 20" therefore, if your object is shorter you do not have to do anything. At any time during the scan, you can press the stop button and end the scan. Typically, this is done after the object has passed the scanning position, which is clearly visible through the front window located below the touch screen.

### 6.7. Start Scan

Tap the start button and wait until the scanner stops. Alternatively, you can tap the stop button any time. At the end, tap the **Last Scan Start Position** which will move the scanning table back to the start position. For convenience, you may also exchange the object now and then go back to the start position.

<b>ATTENTION!</b>	
	Whenever a new scan is started the scanner assumes the table is at the start position. If you did not use the <b>Last Scan Start Position</b> the table will advance with every scan until it disconnects from the wheels.

## 7. Software Stitching

The laser lines projected on the scanning object are seen by two cameras at any given time. Each laser line's actual position is proportional to the distance of the object relative to its ideal position. The result is shown in the control panel for both lasers, back and front.

Stitching might appear to be easy because it would only be necessary to put the left and right image together exactly at the laser line. Unfortunately, the laser line is not one pixel wide but rather covers five or more pixels. Also, the object itself presents to the laser a surface with varying reflectivity, diffusion and other properties, making it hard to exactly detect its position precisely for the cameras.



Because a stitching error of more than one pixel is visible to the human viewer, more has to be done to correct stitching artifacts.

All Image Access scanners which have two or more cameras feature an **Adaptive 2D** stitching function. This function will identify the optimal crossover point for the stitching process, based on advanced algorithms. The algorithms are content based, to determine the x and y offset which needs to be applied for an optimal result.

If this control is set to **Fixed** these algorithms are switched off. The image is stitched together using the values determined in the factory at the time of manufacturing or newer values measured by a technician with the help of the stitching adjustment glass plate. Using the fixed values only makes sense for diagnostics purposes.

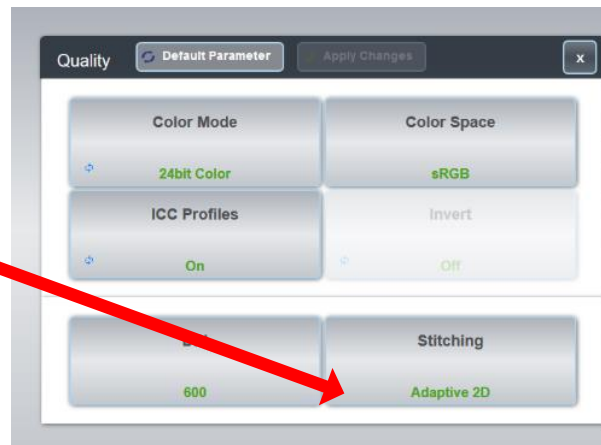


Fig. 15 Quality tab

**Example:** If a scan with fixed stitching at head position zero and using a flat document (like the stitching adjustment target shipped with the scanner) does not result in an almost perfect stitch (less than 5 pixels @ 600dpi), a camera adjustment by an authorized service technician may be necessary.

<b>BEST PRACTICE</b>	
	<b>Adaptive 2D</b> Stitching is the setting of choice. In almost all scenarios it produces very predictable and the best possible results. Only use <b>Fixed</b> if you fully understand the way it works.



## 8. Various Scanning Scenarios

### 8.1. Scanning Thin Objects

#### Thin Object Examples

Examples of thin objects are paper based objects, plastic foils, fabric etc. with a thickness of not more than 1mm (40mils). All necessary settings can be made in the control panel.

#### Position

Position the object as described in the previous chapter. If the object is small, it should be located directly under the front laser only. Although not necessary in most cases, the Focus Laser Back can be set to Fixed Focus. In this case, the laser information is not used for any corrections.

#### Focal Plane and Stitching

The focal plane is assumed to be on top of the scan table. The scanner head is at its lowest position which can be controlled in the Control Panel via the **Clearance** reading at **100mm**. The **Focus Laser Front** and **Focus Laser Back** both read close to **0mm**. Both focus lasers should be left at **Auto Focus**.

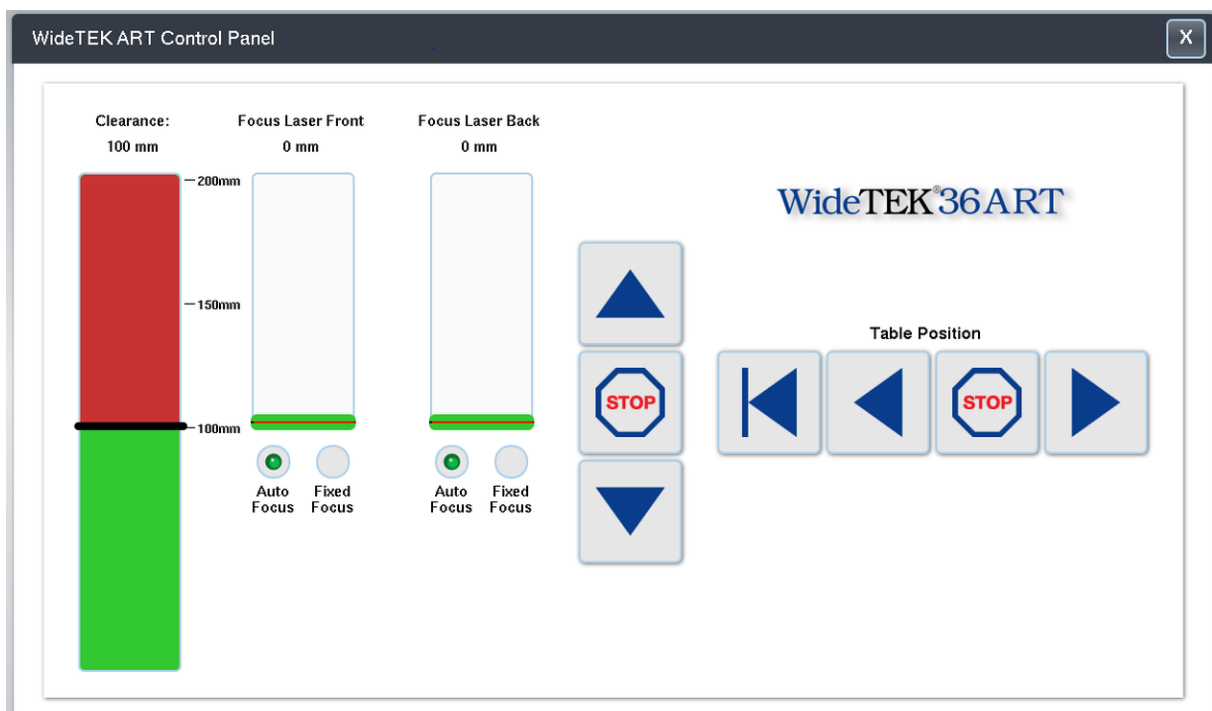


Fig. 16 Default setting, Auto Focus on and clearance at 100mm

#### Scan

The lasers will measure the distance to the object surface while the object is moved through the scanner. If the distance changes, the software will correct the resolution and stitch all camera images together at the correct position.

## 8.2. Artifacts Scanning Thin Objects

As long as the surface of the object in the vicinity of the lasers is smooth, there will be no artifacts. If another object is laying on top of the object to be scanned and caught by a laser set to **Auto Focus**, the laser will assume that the surface is closer and will correct the resolution causing a distortion.

### Thicker Object under Laser

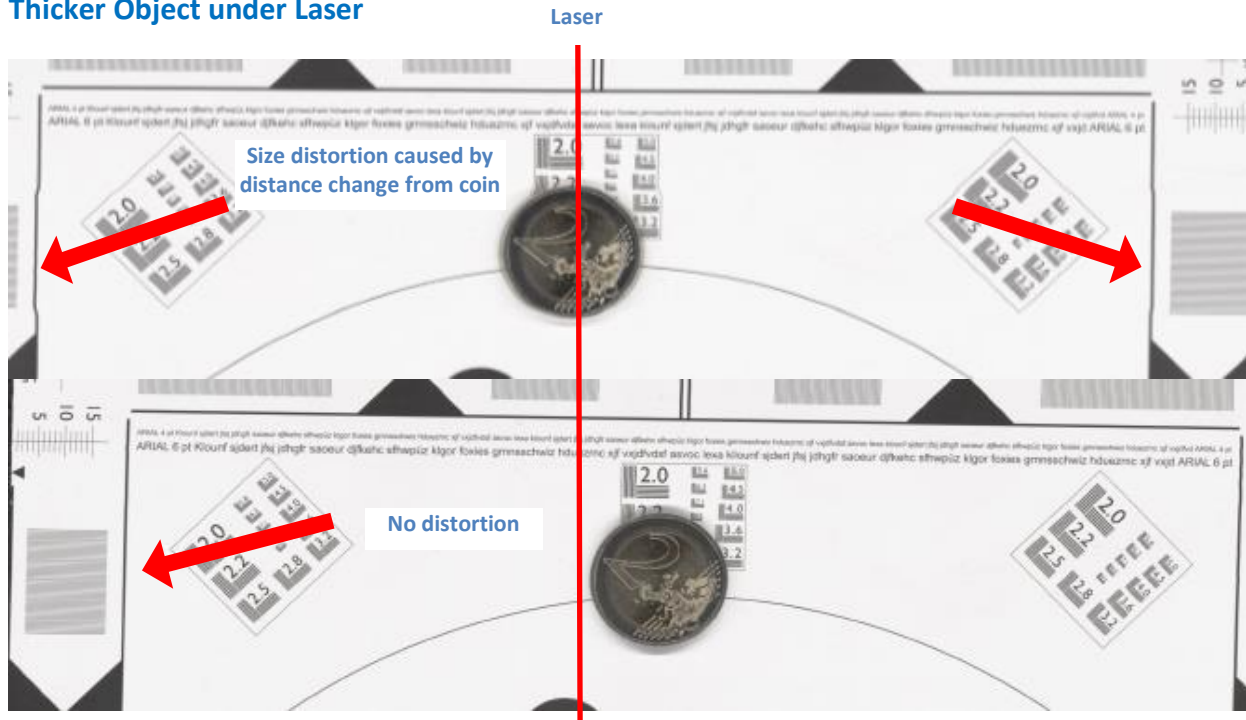


Fig. 17 Artifact caused by an object under the laser

### Wavy Objects

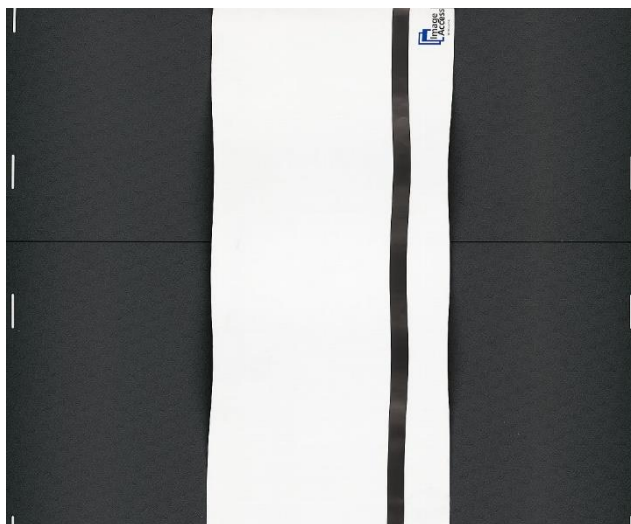


Fig. 18 Wavy target scanned with Fixed Focus



Fig. 19 Wavy target scanned with Auto Focus

The White Reference Target had been laid on the scanner bed in waves. This is to illustrate the difference between fixed and auto focus. In **Fixed Focus** the waves are visible and the marks on the edges of the scanning area are straight because no focus and geometric adjustment is done. In **Auto Focus** the geometric adjustment is performed which straightens out the target but leaves the edge markers at an angle.

### 8.3. Scanning Thick Objects

#### Thick Object Examples

Examples of thick objects are fine art on canvas, plastic foils, hardwoods, tiles, etc. All necessary settings can be made in the control panel.

#### Position

Position the object as described in the previous chapter. If the object is small, it should be located directly under the front laser only. If the thick object is only seen by the front laser, the back laser should be set to **Fixed Focus**. In this case, the laser information is not used for any corrections.

#### Focal Plane and Stitching

The focal plane is indicated by the two horizontal green bars. If the object is large enough, both lasers are on Auto Focus and will measure the distance to the object. If the object is very uneven in height between the lasers, try to make both distances close as in the following example.

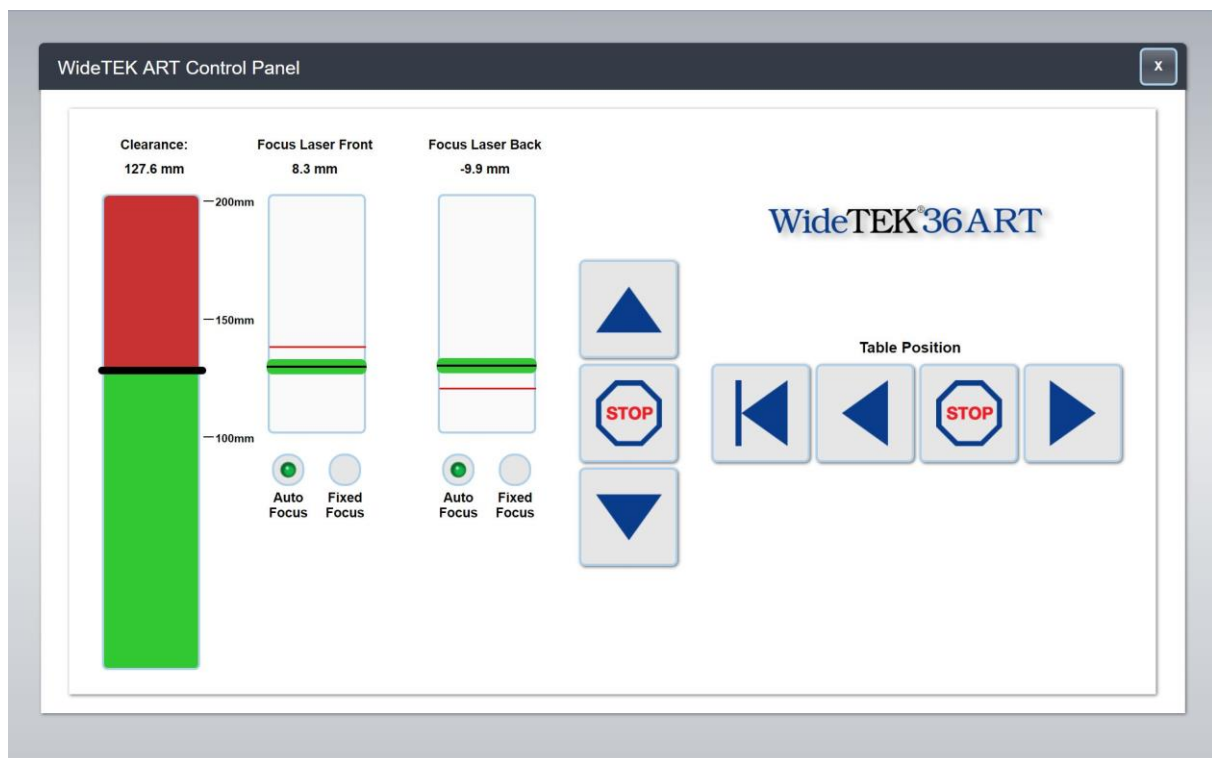


Fig. 20 Control panel showing thick object

<b>BEST PRACTICE</b>	
	Always make sure you understand where the laser measurement takes place. Since the scanner focal position of the head can only be at one position, make sure it is the optimal position with the least deviations between the two measurements.

#### 8.4. Artifacts Scanning Thick Objects

Fine art on canvas should be scanned without the frame. If there is enough clearance, it can be scanned with the frame but you will see artifacts on the frame due to the Auto Focus. When the lasers hit the frame, they measure a shorter distance to the frame and will therefore correct the size distortion so that the width of the image is slightly reduced to scale it back to 300 or 600dpi. As soon as the laser hits the canvas, it measures a slightly greater distance and does not scale anymore. This is correct for the canvas but the frame on the left and right are closer to the camera and are left untouched. This results in a slightly wider frame at a more spread out position.

If the canvas is not bowed too much, you can try scanning framed art with **Fixed Focus**. This will not produce artifacts caused by the frame.

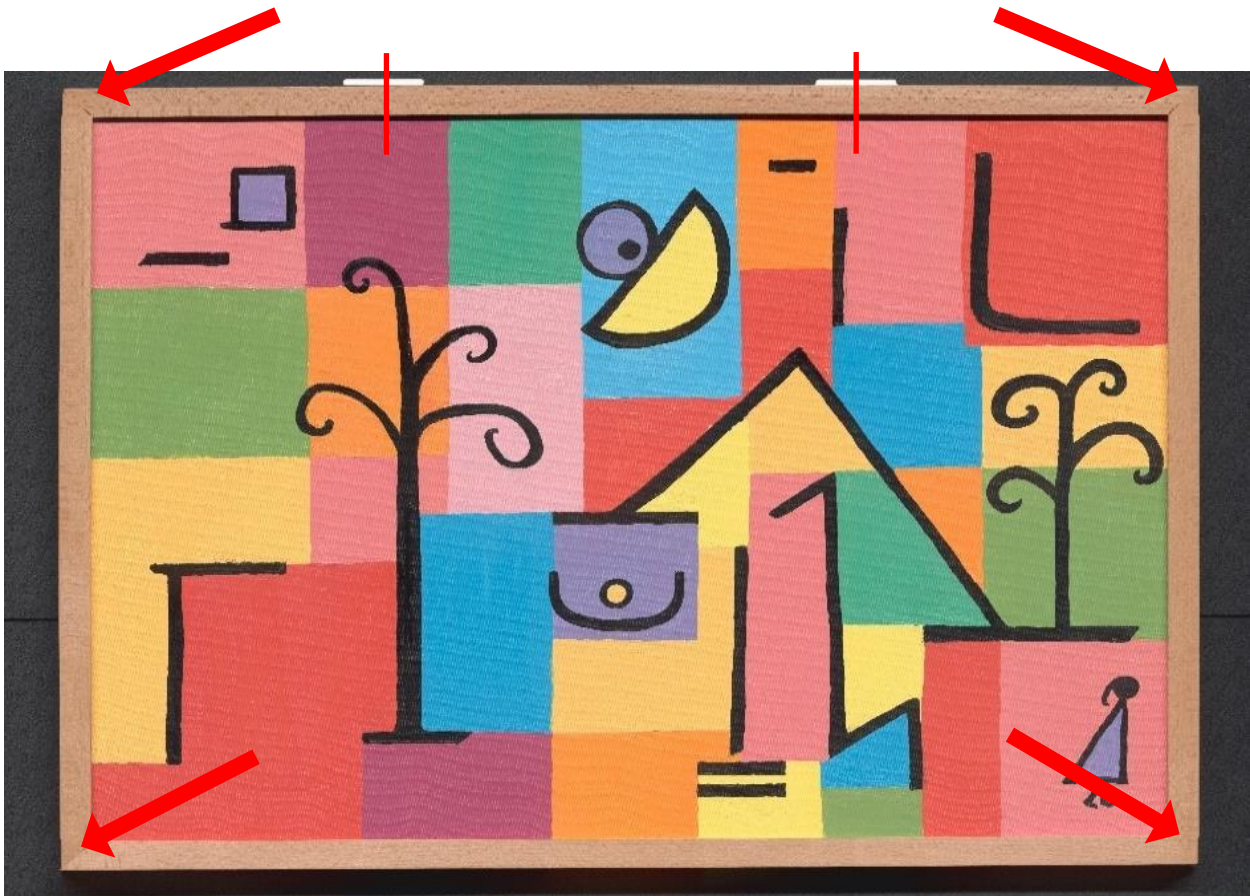


Fig. 21 Fine art scan with frame

#### **BEST PRACTICE**

Whenever possible scan fine art without a frame. There are many benefits, one of them is, that you can print it out and put it in the same frame without missing any content due to shadows, incorrect cropping and other imperfections.

## 8.5. Scanning Structured Objects

### Structured Object Examples

Examples of structured objects are tiles, woodwork and art consisting of different layers or objects on top of each other. All necessary settings can be made in the control panel.

### Position

Position the object as described in the previous chapter. If the object is small, it should be located directly under the front laser only for measurement of the distance.

### Focal Plane and Stitching

Both focus lasers should be left at **Fixed Focus**. When adjusting the scanning heights, make sure you measure at the surface of the scanning object and not on an edge or in between structures.

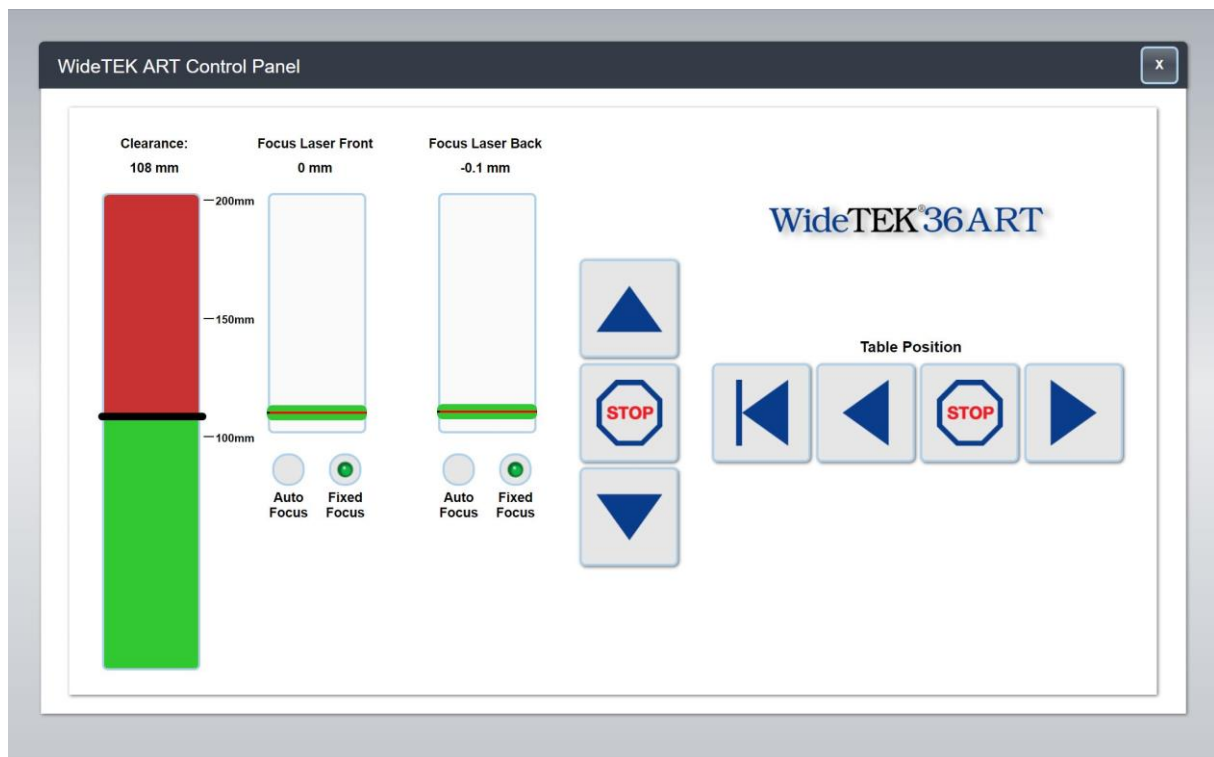


Fig. 22 Scanning at Fixed Focus

### Scan

The lasers will assume a constant distance while the object is moved through the scanner. If the distance changes, the software will stitch all camera images together at the correct heights. Outside of the correct heights, you may see stitching artifacts.



### 8.6. Artifacts Scanning Structured Objects

As long as the surface of the object in the vicinity of the lasers is smooth, there will be no artifacts. If another object is laying on top of the object to be scanned and caught by a laser set to **Auto Focus**, the laser will assume that the surface is closer and will correct the resolution causing a distortion.



Fig. 23 Structured target scanned with Fixed Focus

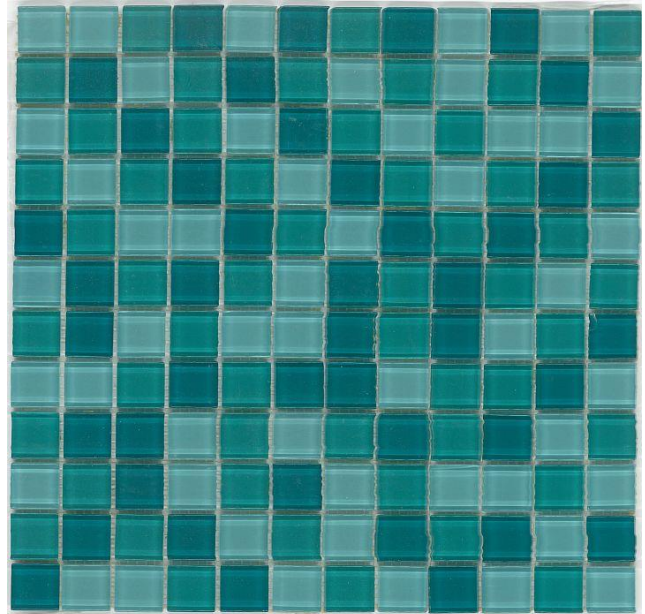


Fig. 24 Same target scanned with Auto Focus

This patch of tiles which are glued to a carrier should be scanned with **Fixed Focus**. If they are scanned with **Auto Focus** the laser will detect rapidly changing distances which would trigger geometric corrections across the scan. These corrections are most likely only adequate at the position of the laser and not across the whole scan width.

**BEST PRACTICE**

Scanning structured surfaces can confuse the laser assisted distance measurements and cause unwanted distortions. It is therefore advisable to adjust the focal plane manually and scan with **Fixed Focus**

## 9. 3D Texture Scanning

The scanner can produce many different illumination scenarios to achieve various effects. Although these techniques are well known from photography, the results from the scanner are a magnitude better, more realistic and most of all, they are reliably repeatable. One setting will produce almost identical results on any WideTEK 36ART anywhere in the world and at any time. A professional photographer can take hours to setup the illumination and since the results are affected not only by the setup but also by many ambient influences, the results will never be the same. The following examples are all derived from the same physical scan. The paper scanned in this example has a shiny finish which has reflections that can partially turn some areas into white.

To the right is a normal scan, similar to the results from any other CCD based flatbed or overhead scanner. To produce this result a good CCD based scanner is required, a CIS scanner will not work.



Fig. 25 Normal scan of crumpled gift wrap paper

The scan to the right was done with **Illumination** set to **3D Light** and the slider **3D Light** at **+2**. Positive values simulate a light source shining from the top which leaves a natural impression.



Fig. 26 3D scan at positive 3D

This scan was done with **Illumination** set to **3D Light** and the slider **3D Light** at **-2**. Negative values simulate a light source shining from the bottom which leaves a rather unnatural impression.



Fig. 27 3D scan at negative 3D

The WideTEK ART has a special setting called **Anti Reflection** which can be selected under the **3D Light** button. This is a unique feature of this scanner. It removes all reflections from the scan when scanning very glossy and uneven surfaces. Its effect can be compared to the uses of polarizers.



Fig. 28 Anti reflection scan



9.1. The Perfect Illusion



Fig. 29 Image of an oil painting



The WT36ART uses different light scenarios in a single scan and can generate many images from a single scan. Almost all parameters can be changed without the need to physically rescan the object, as long as the illumination mode was 3D. The only exceptions are a longer scan, a higher resolution scan and a 3D scan, if the scanner was set to 2D before scanning.

The upper image on the previous page was scanned the traditional way, with diffuse light from all sides. It is very good scanning quality but looks slightly flat because the viewer can see some texture but expects to see more. The second image is derived from the same scan but with 3D illumination switched on and set to a strength of +2. The viewer can now clearly see the texture of the oil painting. The magnified image below shows how many details are captured, including the structure of the canvas and the brush strokes in the oil paint areas. If this scan is printed on plain paper and framed, it will look better than the original in most locations with less than perfect illumination.



Fig. 30 Magnified area of oil painting

The 3D effect simulates total illumination from above, the natural way. It is a human expectation that the light (sun) shines from above.

The image to the right is only rotated, yet it looks completely different. It is important to ensure that the upper part of an object goes into the scanner first with 3D illumination set to positive values. If the scan unintentionally is done upside down, negative values will compensate this.

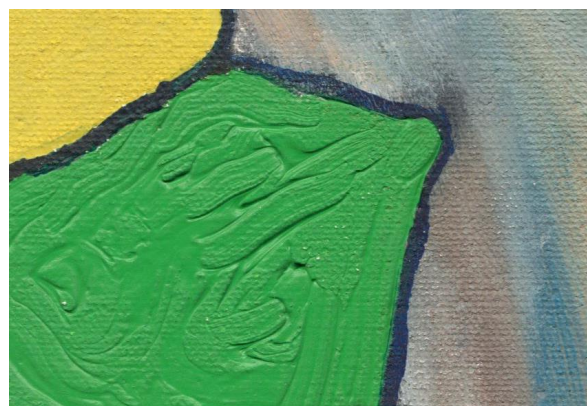


Fig. 31 Rotation of magnified area

## 10. Optional Table Extension

As an option, a table extension of 700mm (27,56") is available. The table extension kit **WT36ART-EXT1-A** contains one middle segment of the standard table as well as 4 runway extensions.

In addition to the mechanical parts, a software key is required. This is available through our customer service portal at:

<https://portal.imageaccess.de/>

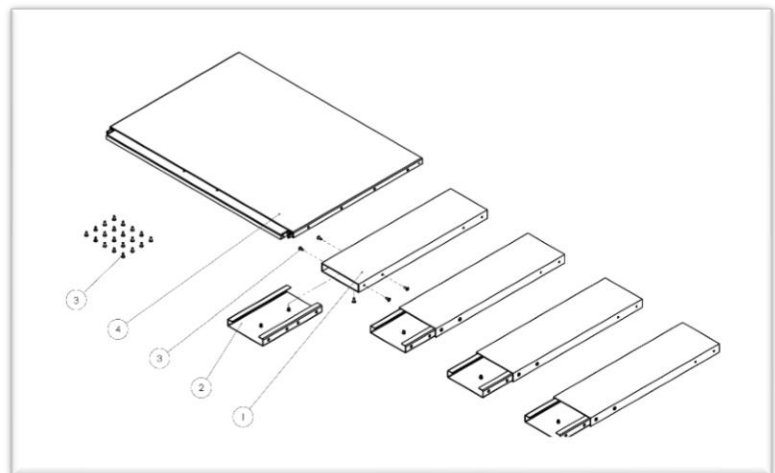


Fig. 32 Parts of WT36ART-EXT1-A

The table extension increases the scanning length from 60" (1.524mm) to 88" (2.235mm). The scan area is 22sq ft or 2.044m<sup>2</sup>.

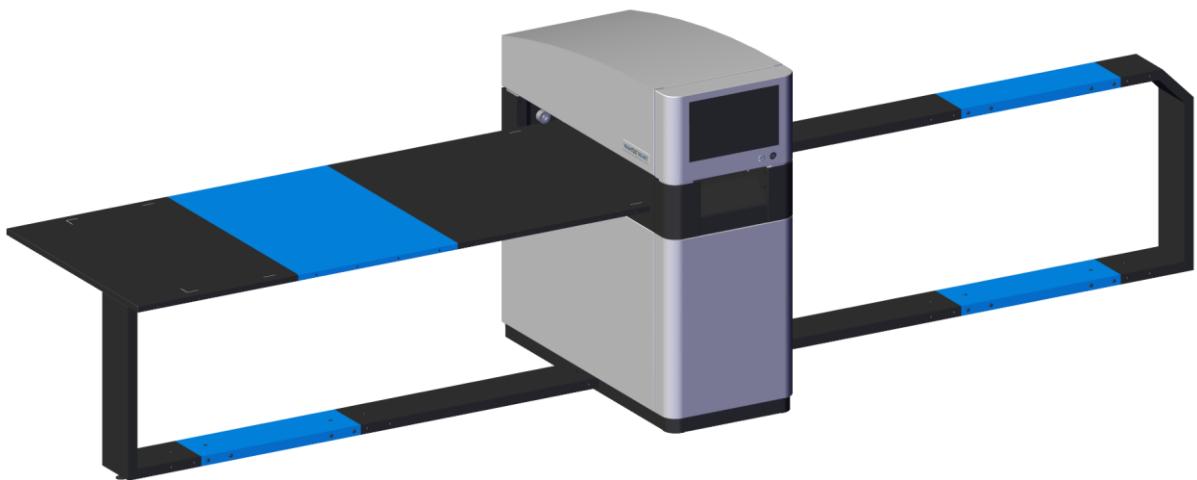


Fig. 33 Additional parts of the assembled extension kit



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