

# Instructions for Mark Point Positioning System

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# Versions

Version No.	Revision Record
V1.0	Initial.
V1.1	1. Add multi-line column positioning cutting. 2. Fixed picture.



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**Thank you for using our vision system!**

**This manual describes the camera installation, accessory installation, Mark point cutting, and software debugging methods.**

**Please read this manual carefully before using this software, which will help you to use it better.**

## 1.1 System Fittings

Name	Specification and model	Qty.	Picture introduction
Industrial camera	TOP-MCCD-130	1	
Industrial lens	VKH0612M	1	
Ring light source	RG-LED	1	
Camera power cord	GF12-120100/3Meter	1	
Ethernet cable	CAT6A-SFTP/10Meter	1	
Camera support	Type Z Type L Type O	1	

## 1.2 Technical Parameters

### 1.2.1 Camera Parameters

CCD camera	Black and white color, effective pixel 130 w with maximum supported resolution of 1280*1024
	Gigabit Ethernet port is adopted for transmission, which can meet the backwards compatibility 100 M network standard
	External independent DC 12 V/1 A power supply system with power not exceeding 2.5W
	Support hard trigger, soft trigger, continuous trigger and other acquisition modes
	Support soft trigger input and flash output
	Sensitivity: 2. IV/lux-s 550 nm. Pixel bit depth: 10bit
	Support contrast, saturation, white balance, ISP image processing acceleration, 3D noise reduction, frame rate adjustment, etc.
	Lens interface: Machine body CS interface, factory-installed detachable 5 mm/CS adapter ring, and compatible with c interface
	Storage temperature: -30-60 degrees. Storage humidity: 20-95% (no condensation)
	Operating temperature: 0-50 degrees. Operating temperature: 20-80% (no condensation)

### 1.2.2 Lens Parameters

Industrial lens	Focal Length: 6-12mm; Distortion: <0.1%
	Sensor: CCD/CMOS; Resolution: 3 million pixels
	Image Size: 1/2" Aperture: F=1:1.6
	F. 0. V: 1/2" 53 °X 28 °
	Mount: Type C; Nearest object distance M. 0. D: 0.2 M
	Zoom Focus Iris: Manual with Lock
	Operation Temperature: -20°C-+ 60°C

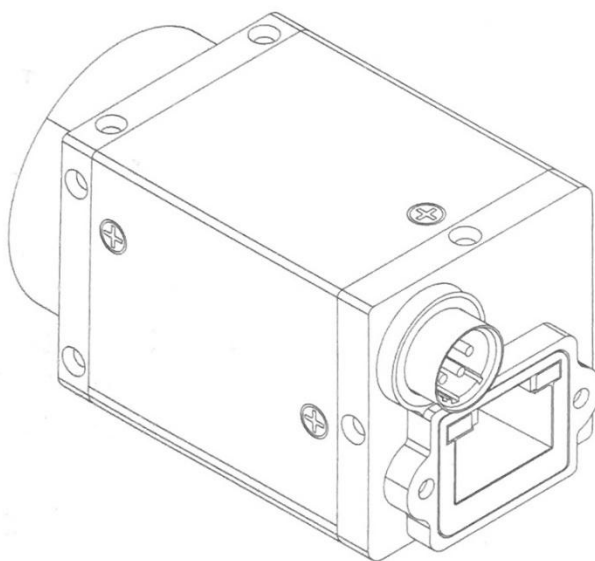
## 1.2.3 LED Light Source

Red and white LED light source	Power supply demand: DC 24 V/2 A
	Can be compatible with all kinds of dark environment with high-definition lighting shooting.
	Different light sources can be selected according to different application scenarios.
	Operating temperature: 0-50 degrees. Operating temperature: 20-80% (no condensation)
	Storage temperature: -30-60 degrees. Storage humidity: 20-95% (no condensation)

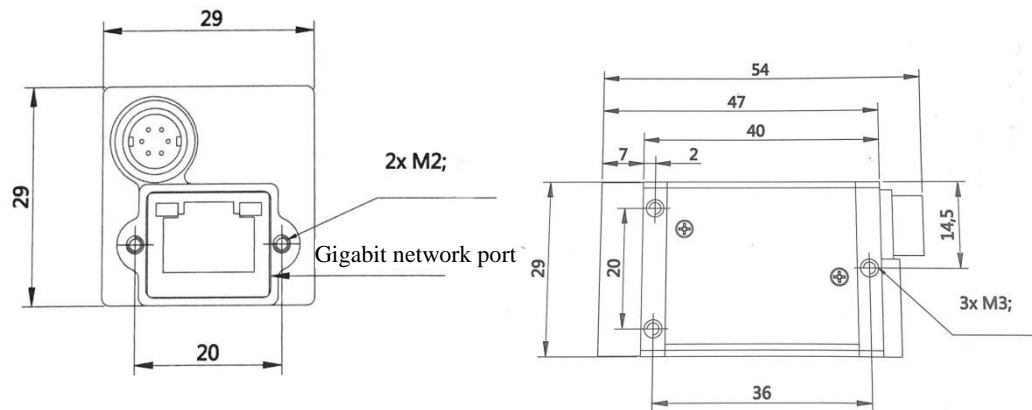
## 1.3 Fittings Installation

### 1.3.1 Fittings Dimensions

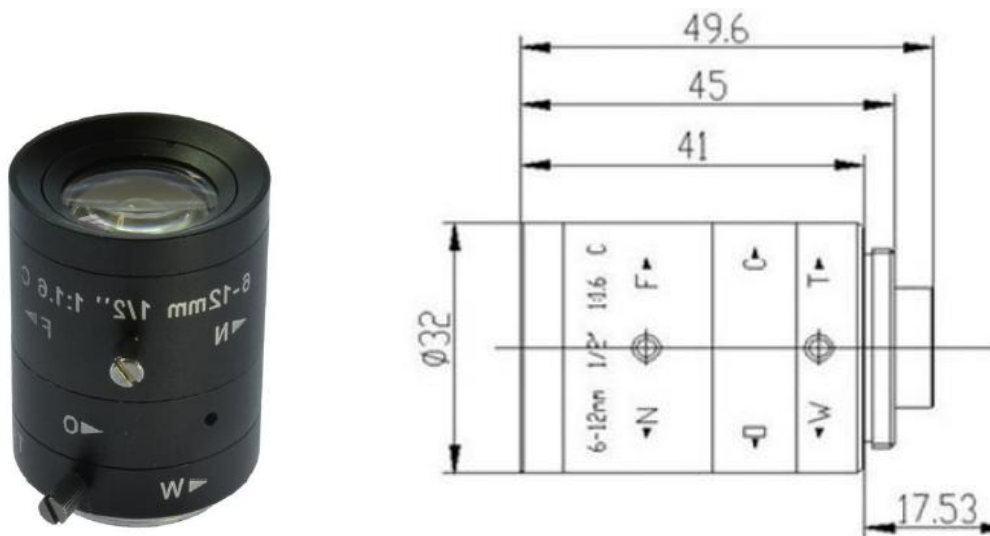
Camera size: Unit: Millimeter (mm)



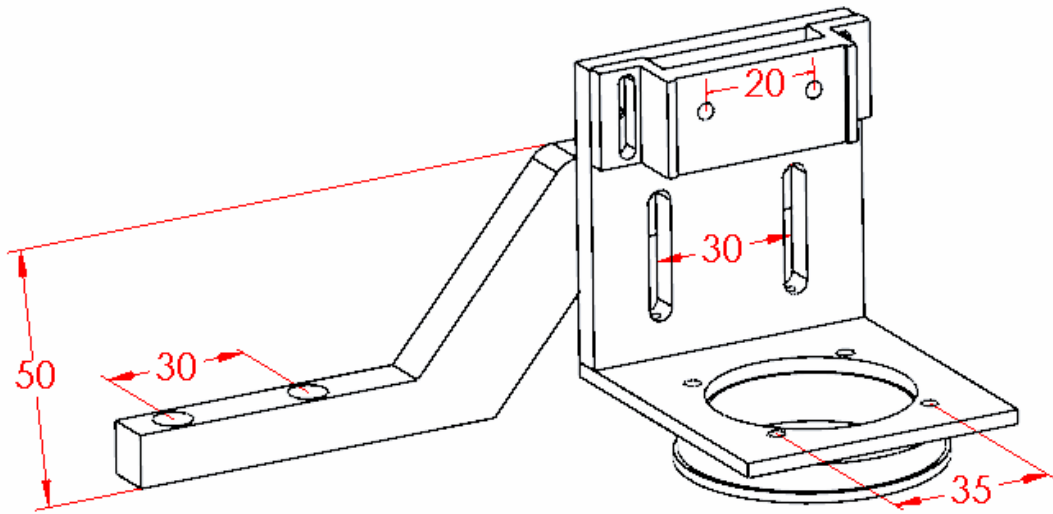




Lens size:



The installation size of camera bracket is shown in the Figure: Millimeter (mm)

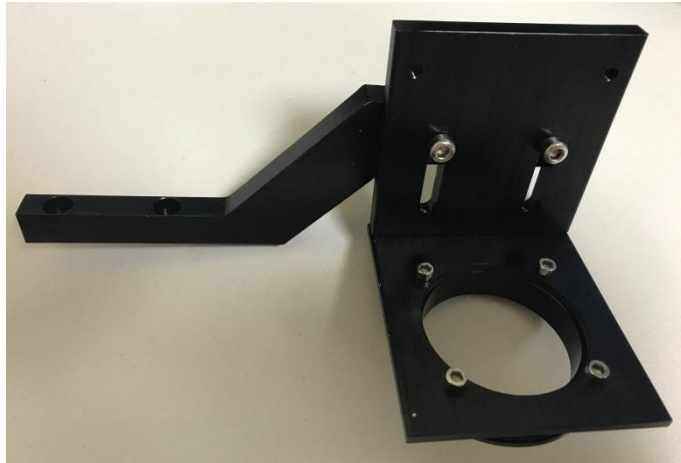


### 1.3.2 Installation Steps

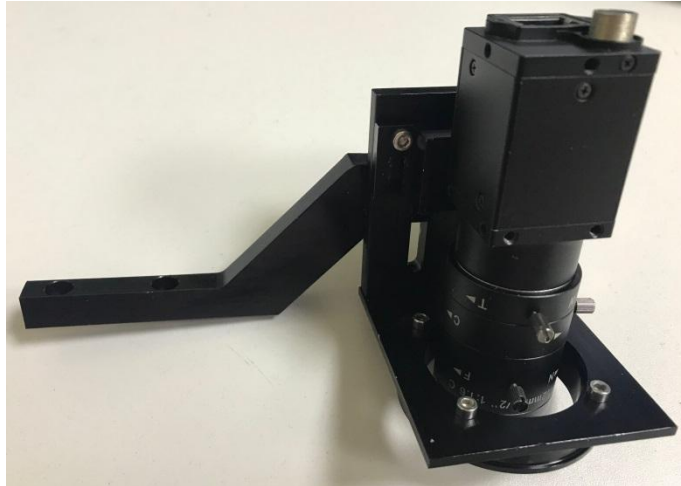
1. Connect the lens with the lens interface below the camera, and use M3 hexagonal screw to fix the camera on the camera mounting seat after connection.



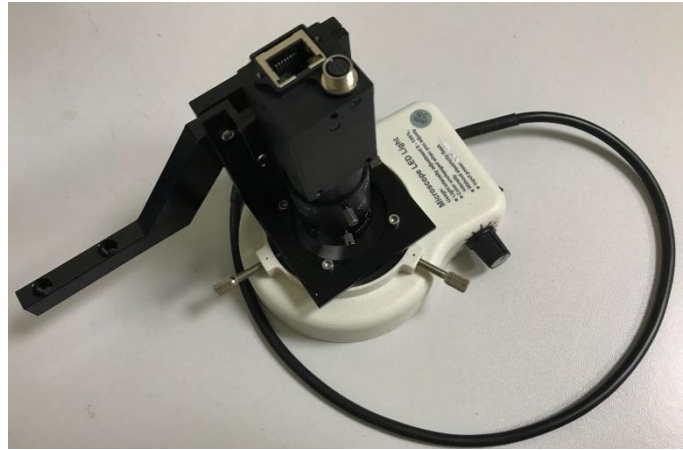
2. Use inner hexagonal screws to connect Z, L and O brackets.



3. Fix the camera mounting pedestal on the L-type bracket with M3 screw.



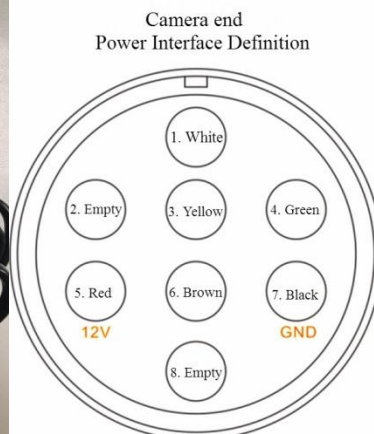
4. It is suggested that the camera bracket installed can have a height adjustment range of  $\pm 5$  mm.
5. The annular light source is directly fixed at the lowermost end of the camera lens, and the M4 side top screw provided by the light source is fixed on the lens protection seat (O-bracket).



6. Using M4 internal hexagonal screw to fix the Z-bracket at the appropriate position of the laser head.
7. Adjust the camera height, lens focal length, light source, exposure, gain, etc. until the image in the whole field of view is clear and the edge is sharp. After the adjustment is completed, lock the lens magnification adjustment knob.
8. The lowermost end of the lens must be within 100-150 mm from the plate.

## 1.4 Wiring Instructions

In order to reduce interference and make the camera shoot more stably, we equip the camera with a 2 meter long power cord (excluding the length of the power adapter). This power cord is a shielded wire for a 6-core aviation plug and has three groups of wires: Power supply, trigger input and trigger output. At present, we only use a DC 12V/1 power supply group. The red 3 m wire is 12 V and the black one is GND.



## 1.5 Illustration of Light Source

Red and white LED light sources can be switched at will. The power supply voltage of the light source is DC 24 V/2 A, which is compatible with various cutting materials. According to different scenes, appropriate light source brightness and light source color can be adjusted, so that high-definition lighting shooting can be carried out under the moving state.

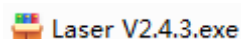


## 1.6 Software Description

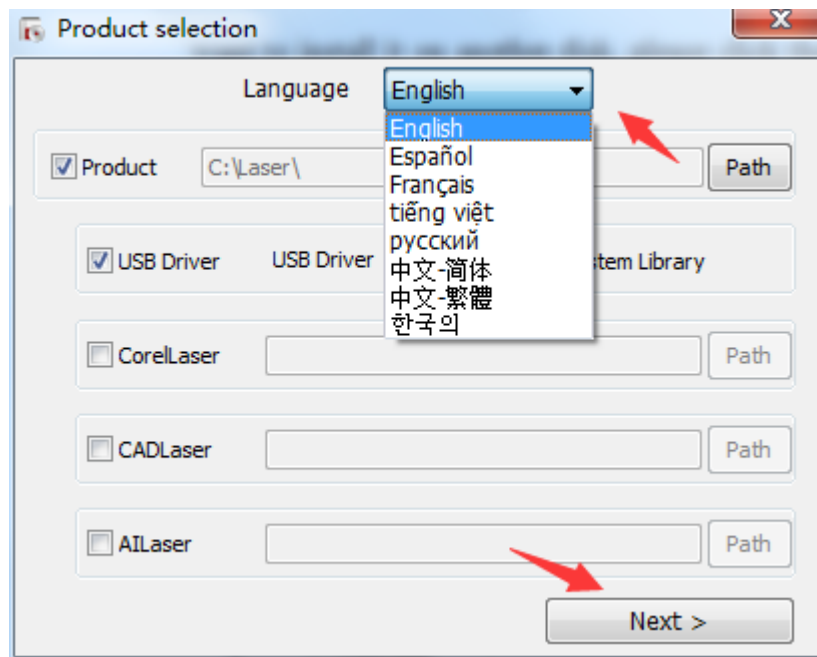
### 1.6.1 Software Installation

a) First installation:

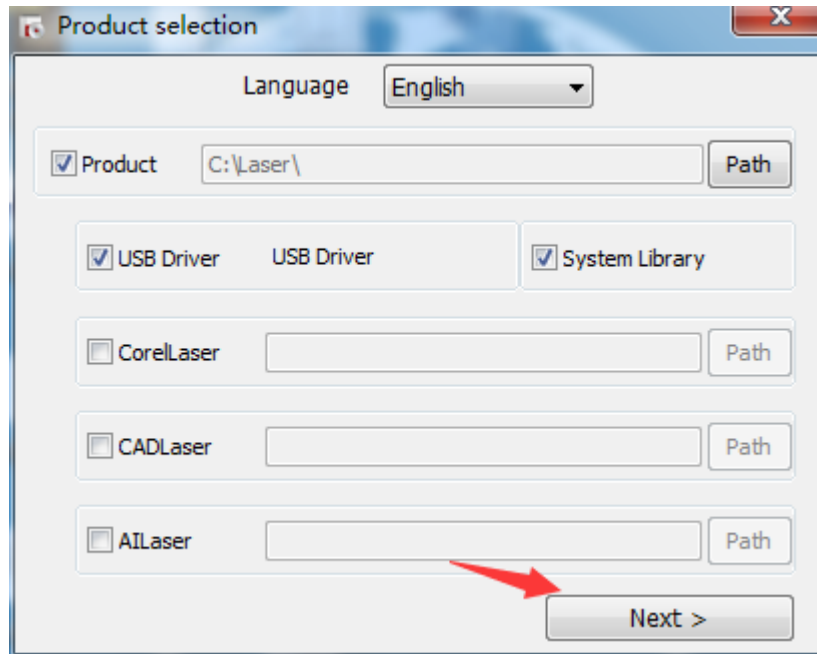
- 1) When installing directly on the hard disk, please click the right mouse button "Run as Administrator" first [Laser V X.X.X.exe]. (X.X.X is the version number) such as:



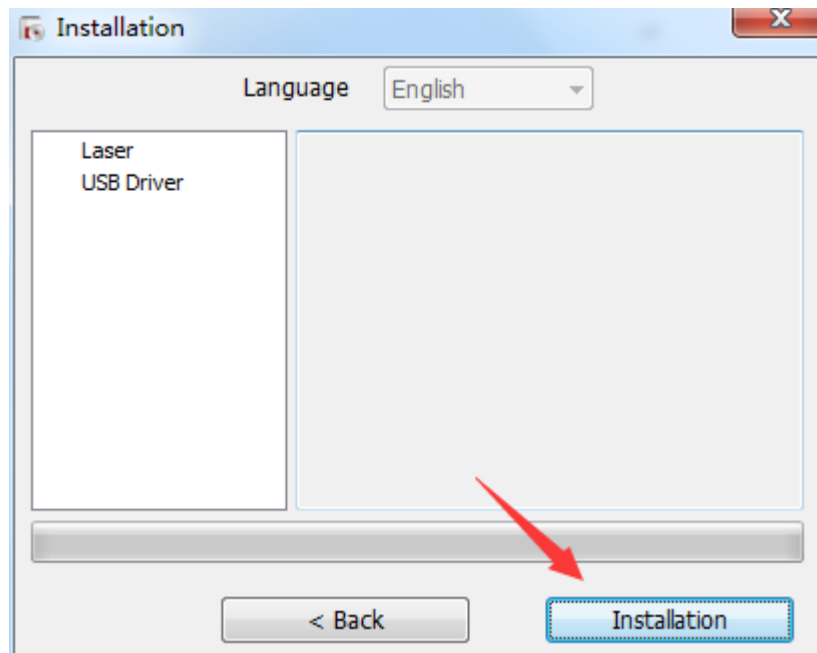
- 2) Automatically decompress files, start installation, and select the language.  
The software will choose a default language based on the language of the operating system itself, Chinese-simplified, or English, etc.
- 3) The product installation path is installed on the C:\ disk by default. If you want to install it on another disk, please click the "path" option at the back of the product catalog and select the drive letter point you need to install to confirm.



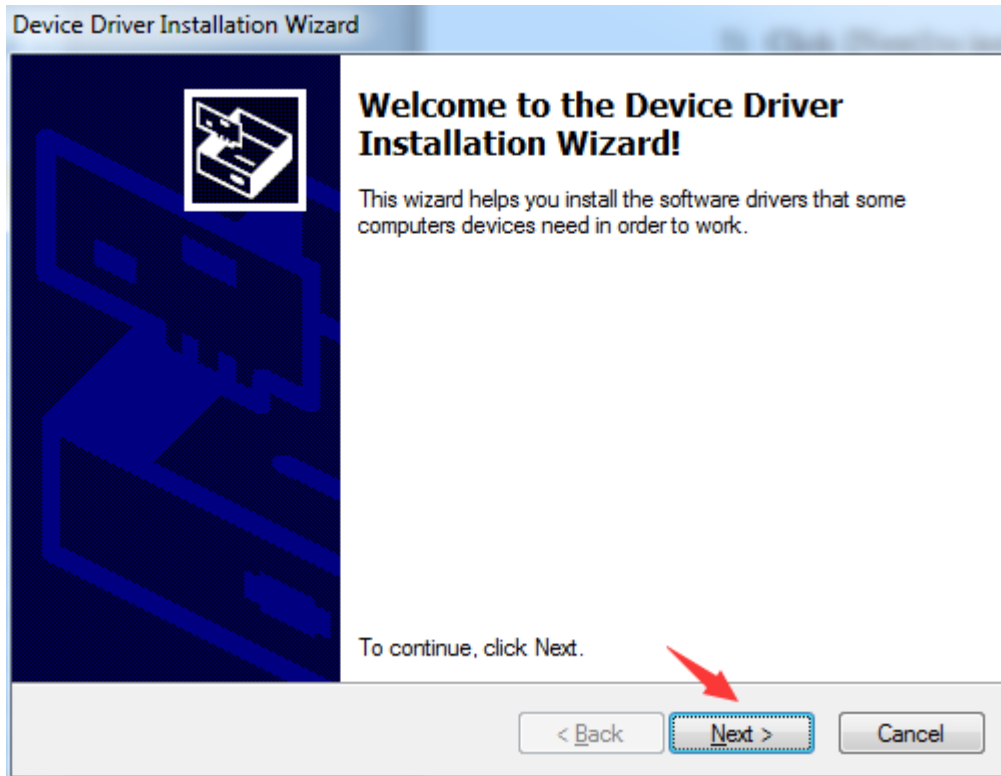
- 4) The default for the first installation is to check some program functions that users must use. For example: (Product, USB driver, and system library) So users only need to click the "Next" button to install it directly.



- 5) Click [Next] to install.
- 6) Click [Install] to install Laser and USB drivers.

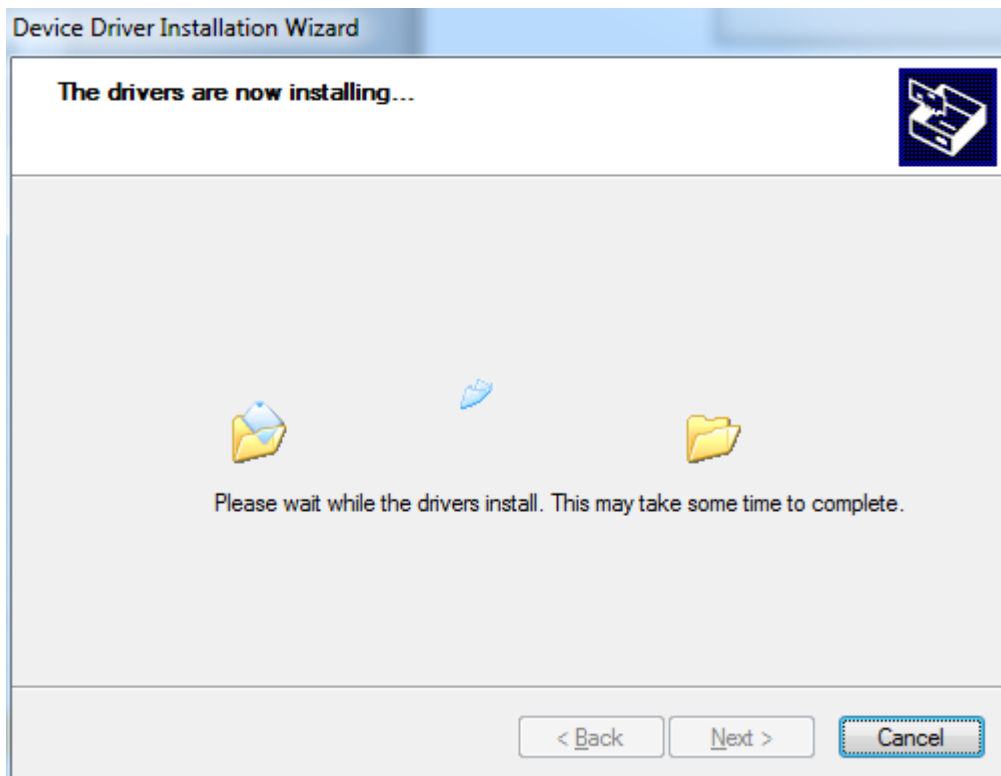


Install USB driver



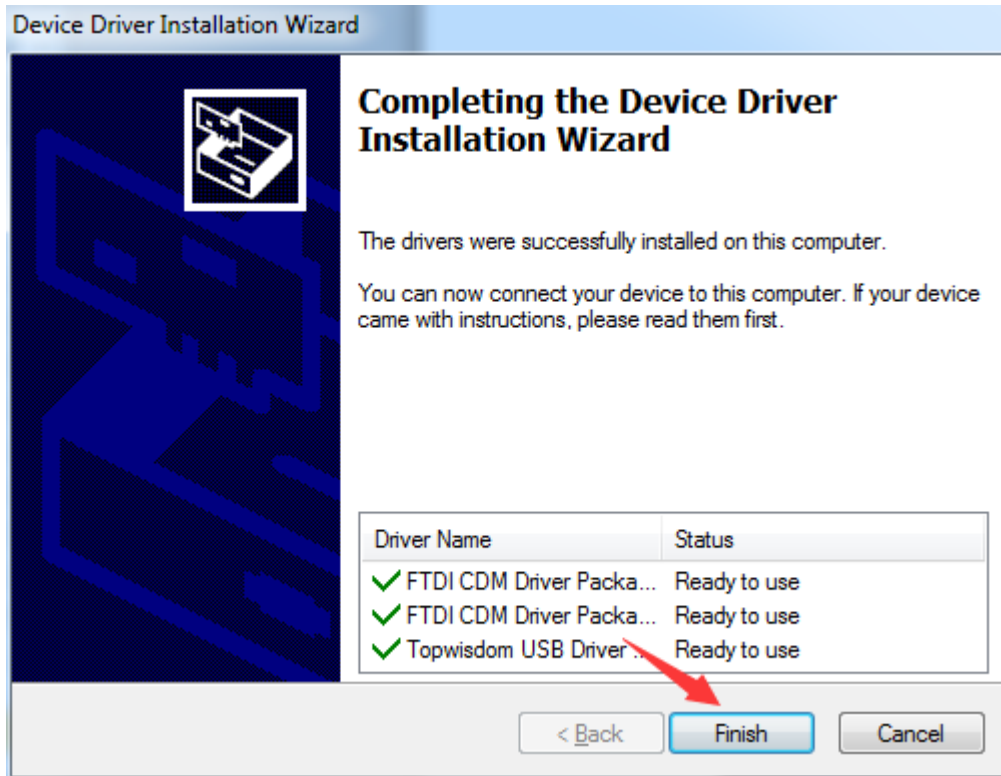
7) Click [Next].

8) Installing USB driver

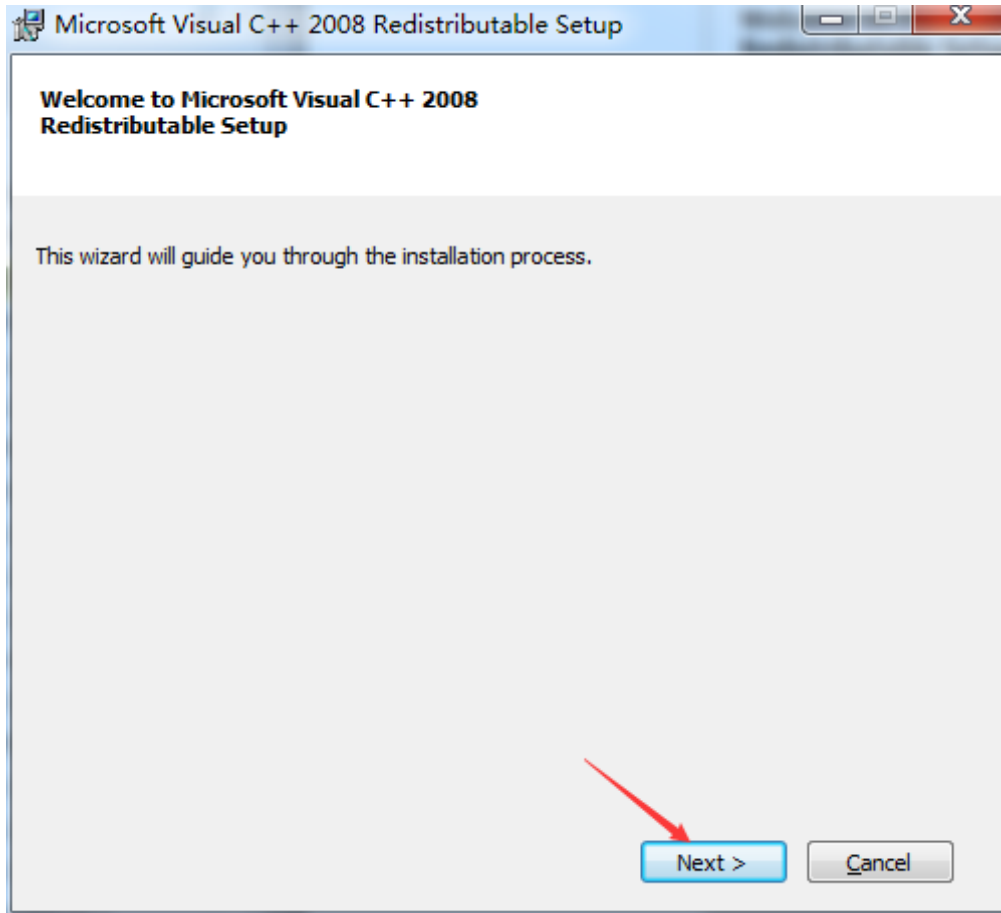


9) Click [Finish] to complete the USB driver installation.



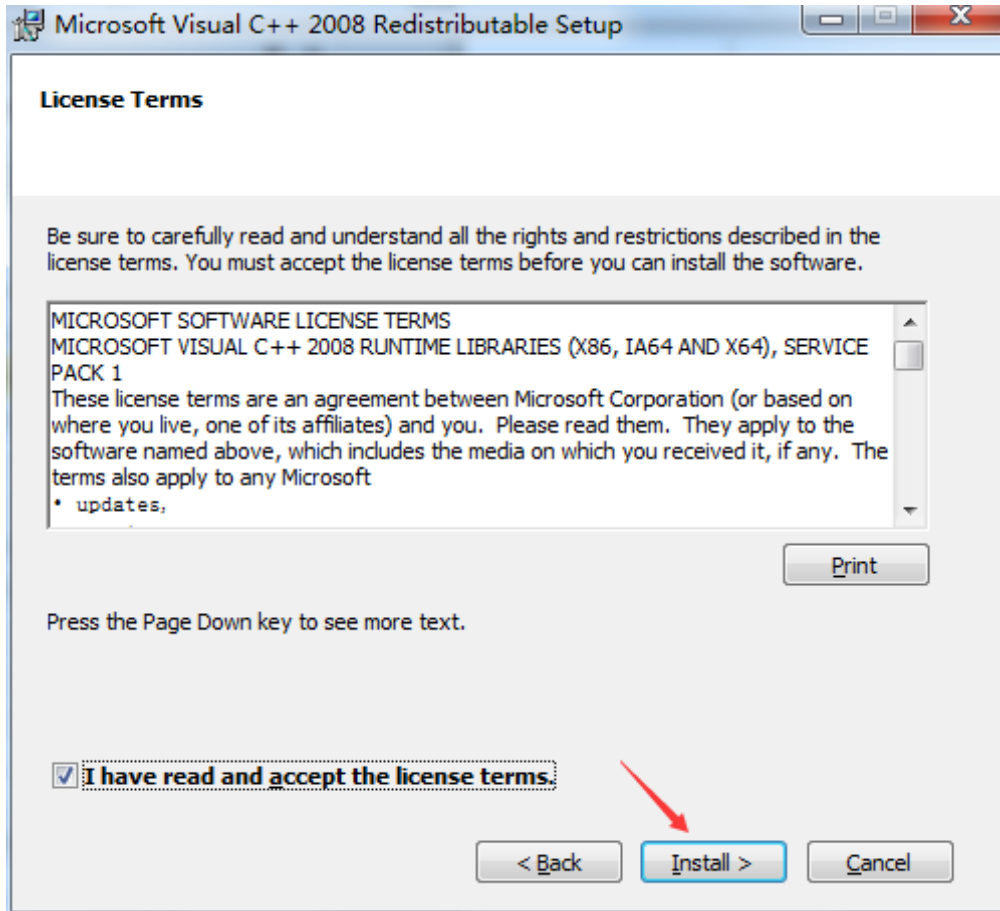


10) Perform system library installation. The installation interface is shown in the following figure:

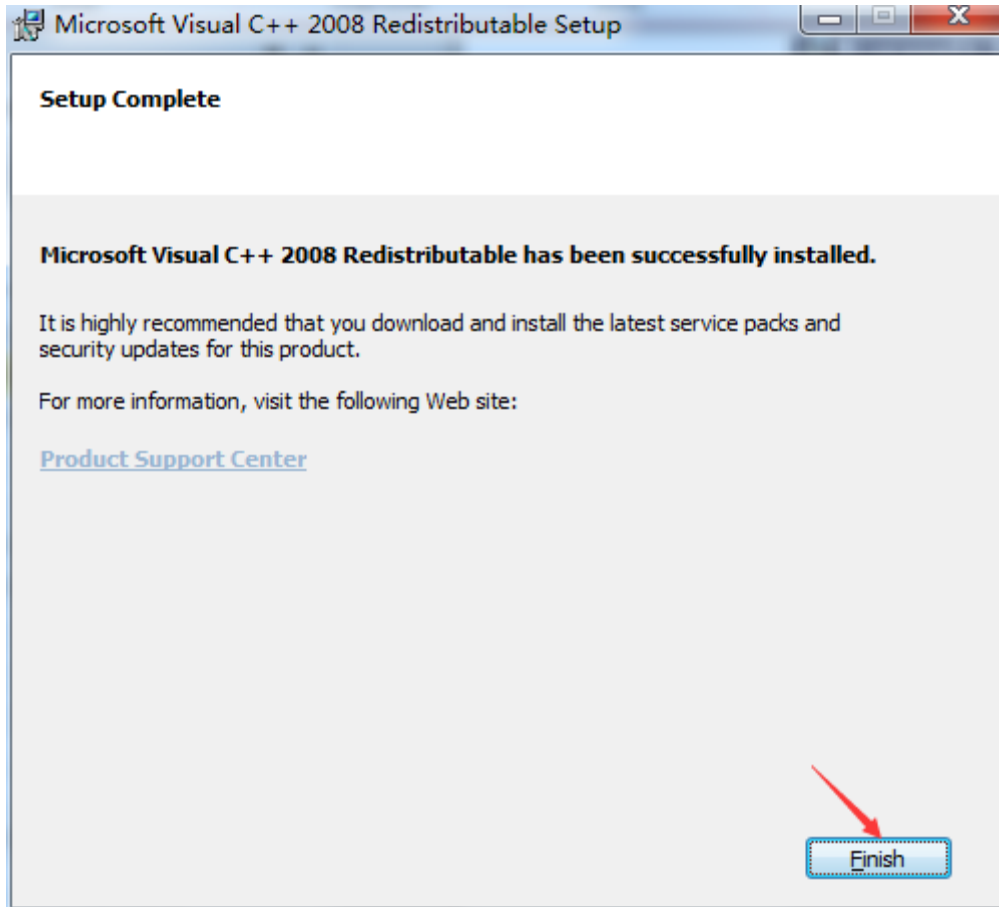


11) Click [NEXT].

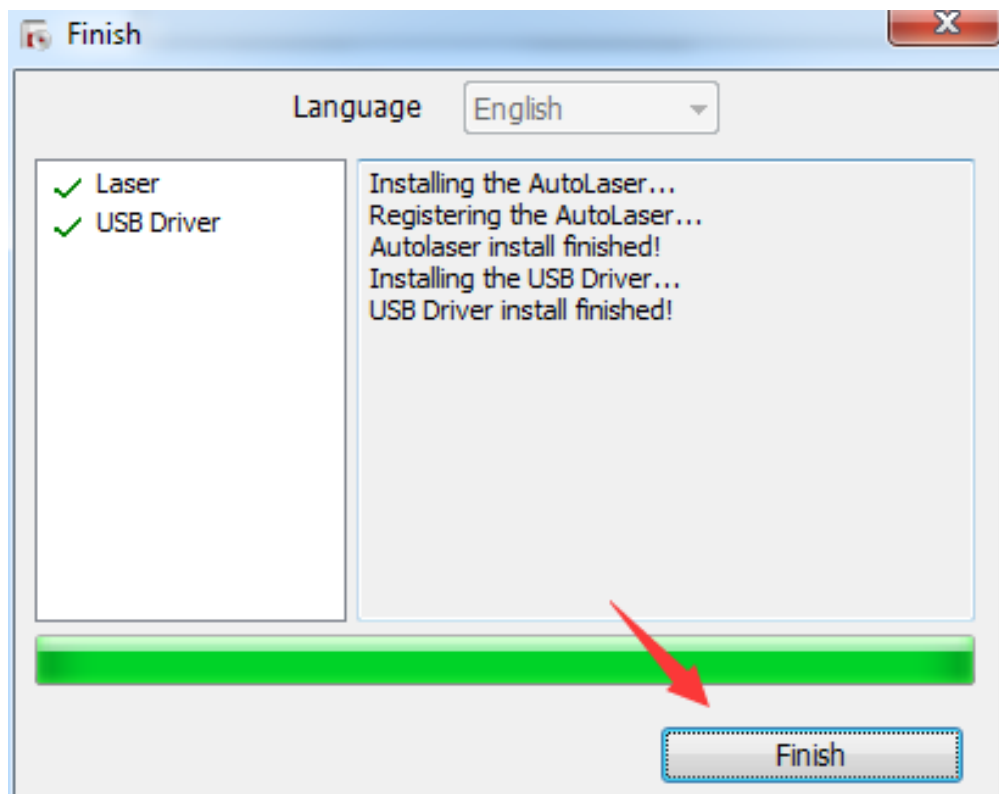
12) Check "I have read and accept the license terms" and click Install.



- 13) Installation is complete. The following interface appears. Click [Finish] to install the system library.

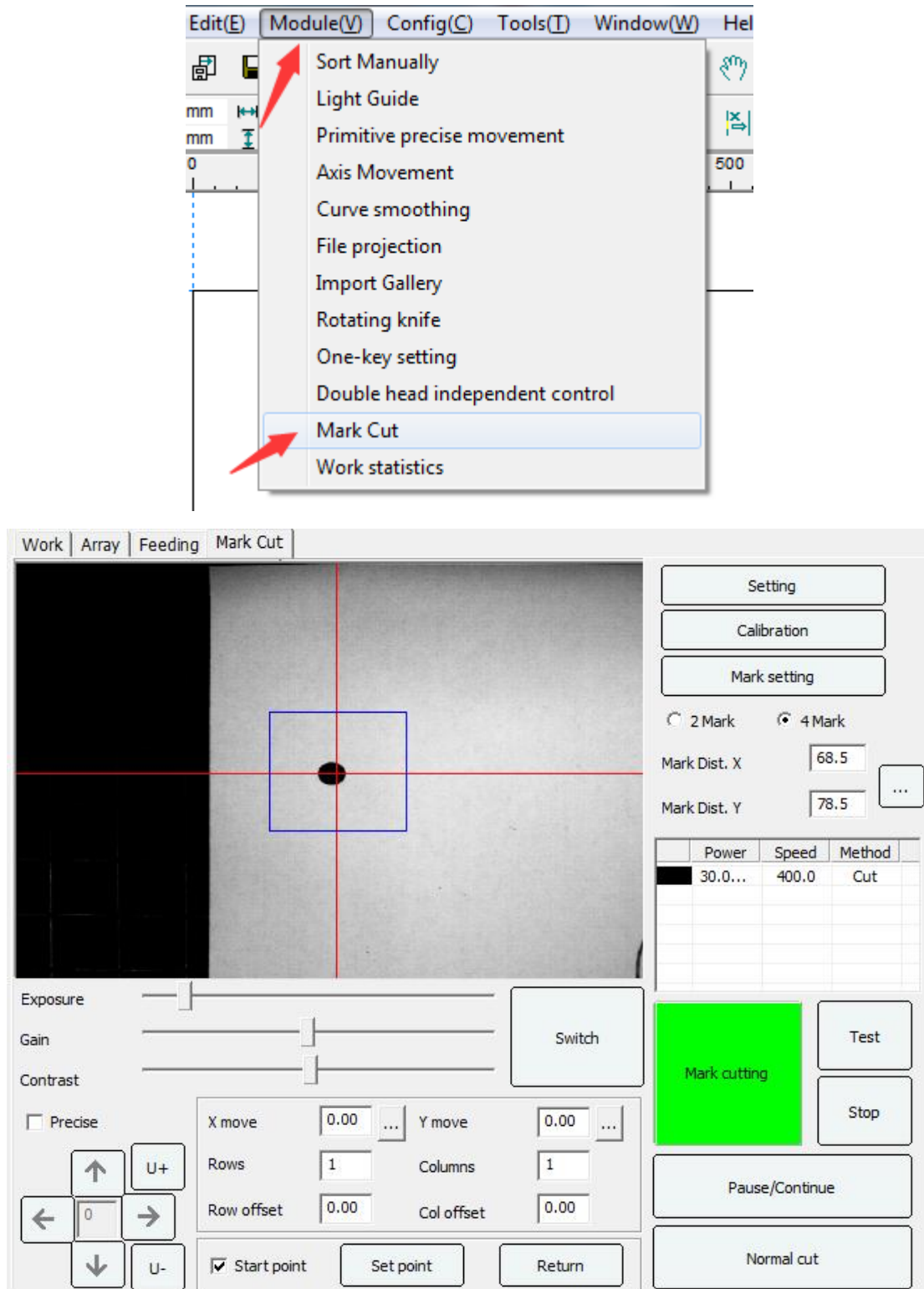


14) Click the [Finish] button, and the entire software is installed.



## 1.7 Mark Cutting Instructions

Open the "Mark" point cutting function: open the software, and select "Mark Cut" in the menu bar "Module" option. As shown in the figure:

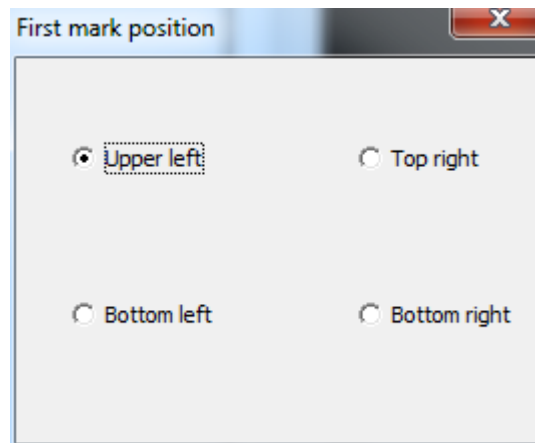


**Number of "Mark" Points:** 2 "Mark" points or 4 "Mark" points can be selected to match according to the requirements.

**"Mark" lateral distance (Mark Dist. X):** The distance between two "Mark" points in the X direction should be filled in according to the actual distance.

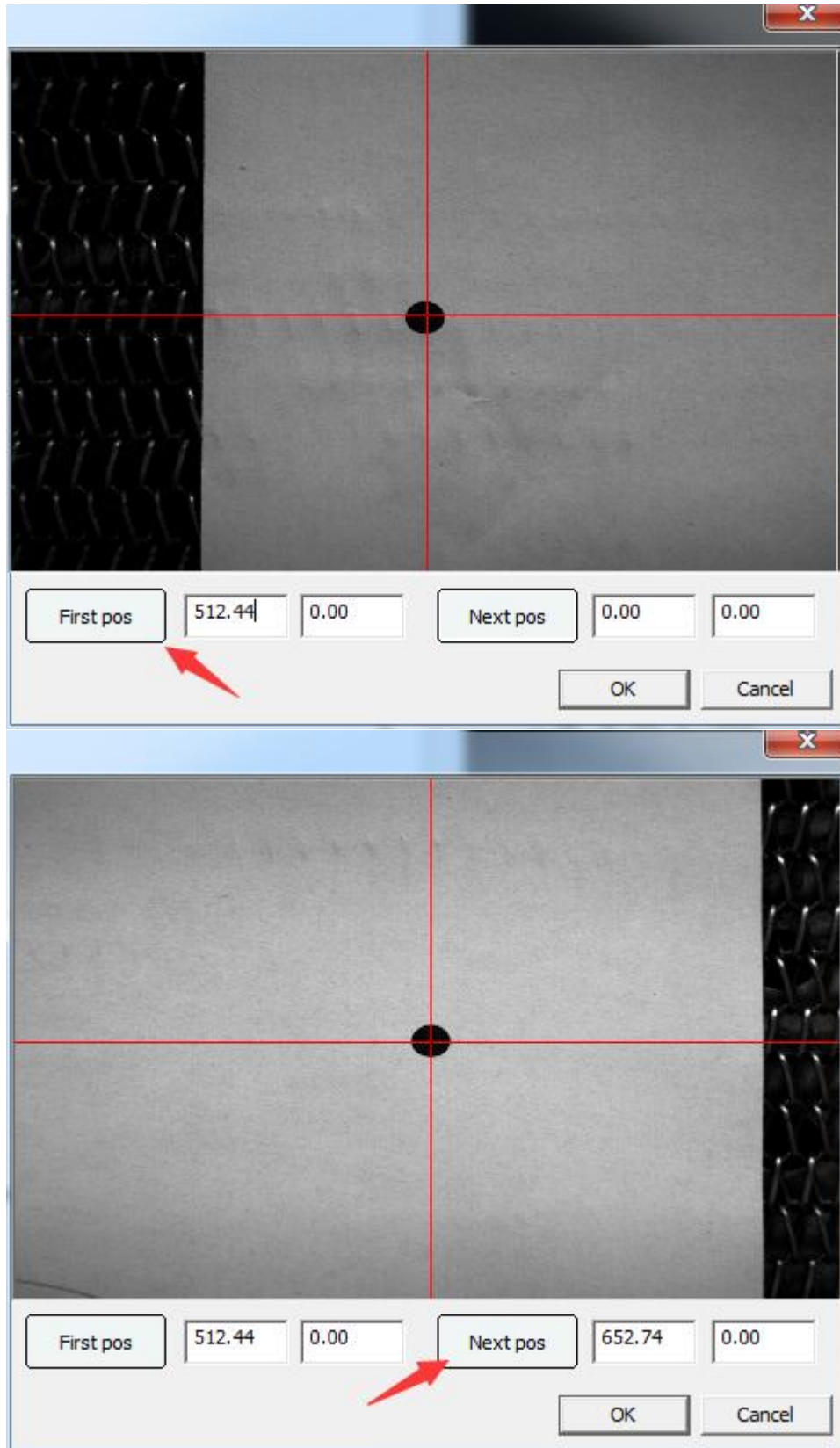
**"Mark" vertical distance (Mark Dist. Y)** The distance between two "Mark" points in the Y direction should be filled in according to the actual distance.

**"Mark" point location:** Click the extension button to select the position of the first "Mark" point, which is generally selected according to the mechanical origin.



**Accurate movement (Precise):** Move an axis accurately, fill in the distance to be moved after checking, and then click the direction key to move the axis.

**Lateral movement (X move):** Move the camera to the center of the first "Mark" point and click "Set point". Then open the extension button to pop up the measurement moving window, and click "First Pos". Then click the right mouse button in the camera display area, move the camera to the center of the next "Mark" point, and click the "Next pos" button. Click "OK" after completion, and the software will calculate the distance between the two "Mark" points by itself. The same applies to vertical movement (Y move). As shown in the Figure:





The screenshot shows a control interface with the following elements:

- Three horizontal sliders for **Exposure**, **Gain**, and **Contrast**.
- A **Switch** button on the right.
- A **Precise** checkbox.
- A set of movement controls: four arrow buttons (up, down, left, right) and two buttons labeled **U+** and **U-**.
- A grid of input fields:
  - X move**: 140
  - Y move**: 0.00
  - Rows**: 1
  - Columns**: 1
  - Row offset**: 0.00
  - Col offset**: 0.00
- Three buttons at the bottom: **Start point** (with a checked checkbox), **Set point**, and **Return**.

**Starting point (Start point):** After checking, you can turn on the function of setting the starting point and returning to the origin.

**Set starting point (Set point):** Set the starting point of the camera photography and the return position of the laser head after cutting.

**Back to starting point (Return):** No matter where the laser head is clicked, the laser head will return to the previously set starting position.

**Numbers of rows and columns:** The template is used to set the number of cutting primitives when cutting.

**Row/Column offset:** It can be positive or negative used for multi-row offset cutting. When the laser head cuts the first row, it will automatically offset the corresponding distance according to the offset value set by the user before cutting the second row. The same applies to column shifting.

**Exposure:** Adjust the brightness of the picture, increase the exposure compensation if you want the picture to be brighter, and reduce the exposure compensation if you want the picture to be darker.

**Gain:** The brightness of the camera is improved, so that the camera can still display better images in a relatively dark environment.

**Contrast:** The degree of contrast between the bright and dark parts of the picture increases the contrast, the bright parts of the picture will be brighter, the dark parts will be darker, and the contrast between light and dark will be enhanced.



**Switch:** When the camera shoots a plurality of picture primitives, it is convenient for the user to compare and check whether the shot picture elements are correct.

**Mark cutting:** Take photos to identify the "Mark" point, and then locate the cut.

**Normal cutting:** Common processing does not recognize the "Mark" point.

**Test:** Before cutting, the "Mark" point is simulated and photographed for testing.

**Pause/Continue:** Pause work and click again to continue working.

**Stop:** Stop the current work and return the laser head to the starting position.

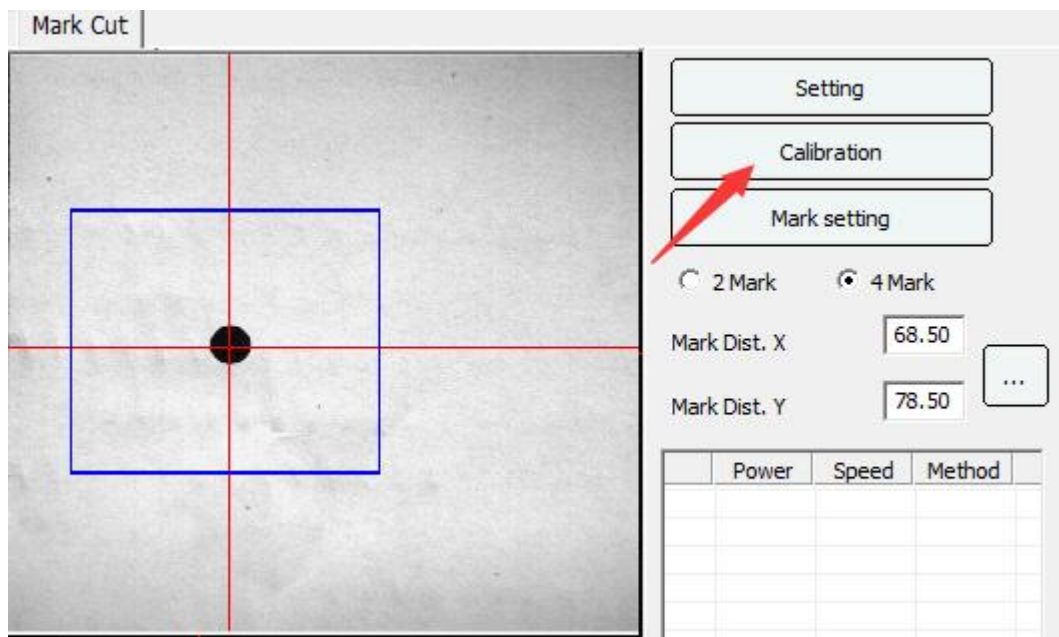
## 1.7.1 Camera Calibration

**Note:** Before calibrating the camera, please check whether the X-Y axis resolution is correct and whether the X-Y beam is vertical. Firmly install the camera and lens to ensure normal communication between the software and the system, and then enter the camera calibration process.

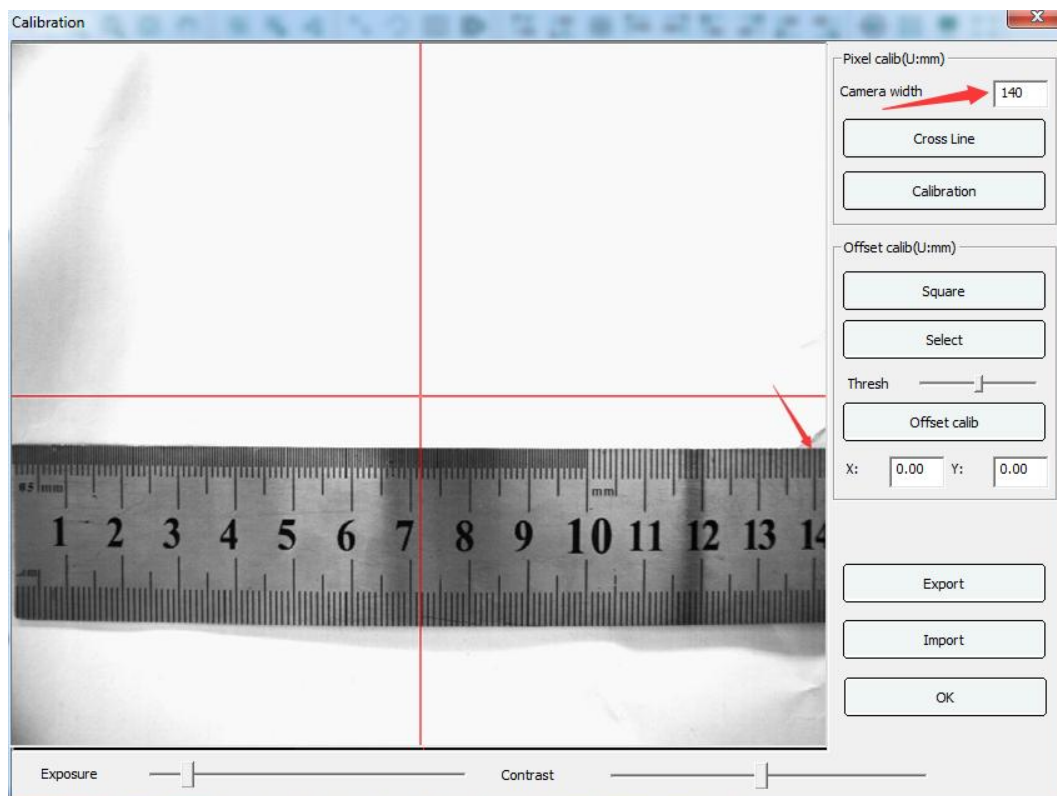
### 1.7.1.1 Pixel calibration

When using the "Mark" point cutting function for the first time, calibrate the camera first, otherwise accurate cutting will not be possible. Adjust the magnification of the lens and the brightness of the light source before calibration to ensure that the edges of the collected images are clear and the background is less noisy.

1. Connect the computer and the machine with USB cable or network cable, and check whether effective communication is possible.
2. Click "Calibration" to open the calibration management interface.

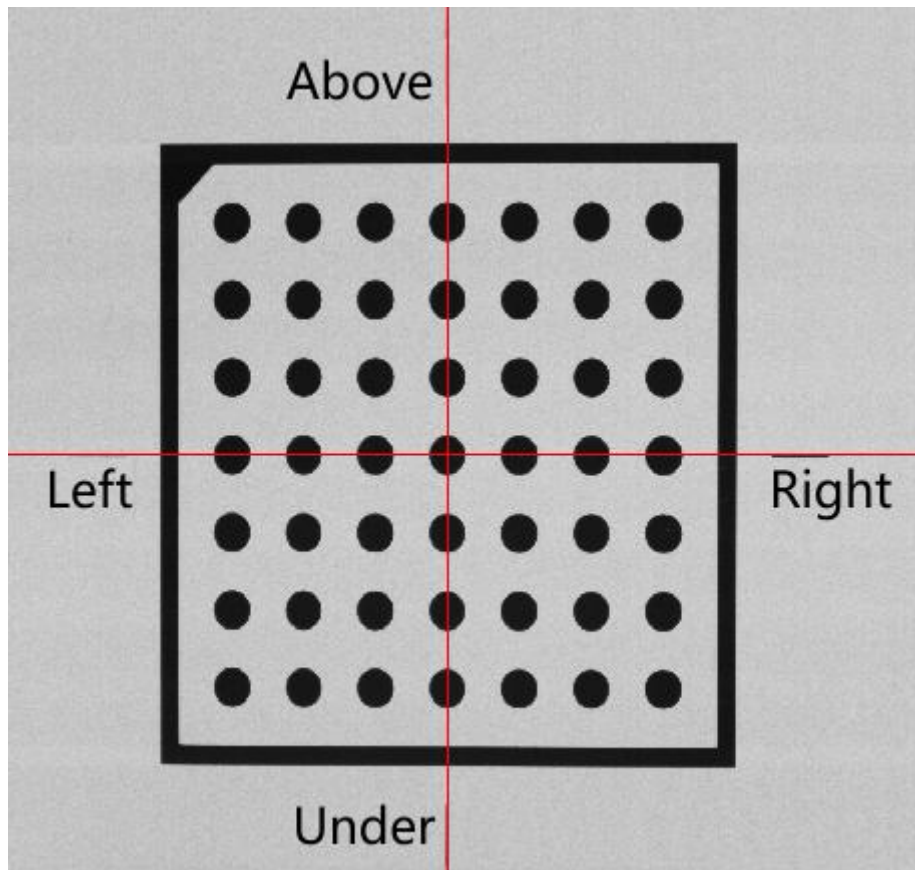


3. Use a steel ruler to measure the width of the camera's field of view and fill in the camera width.

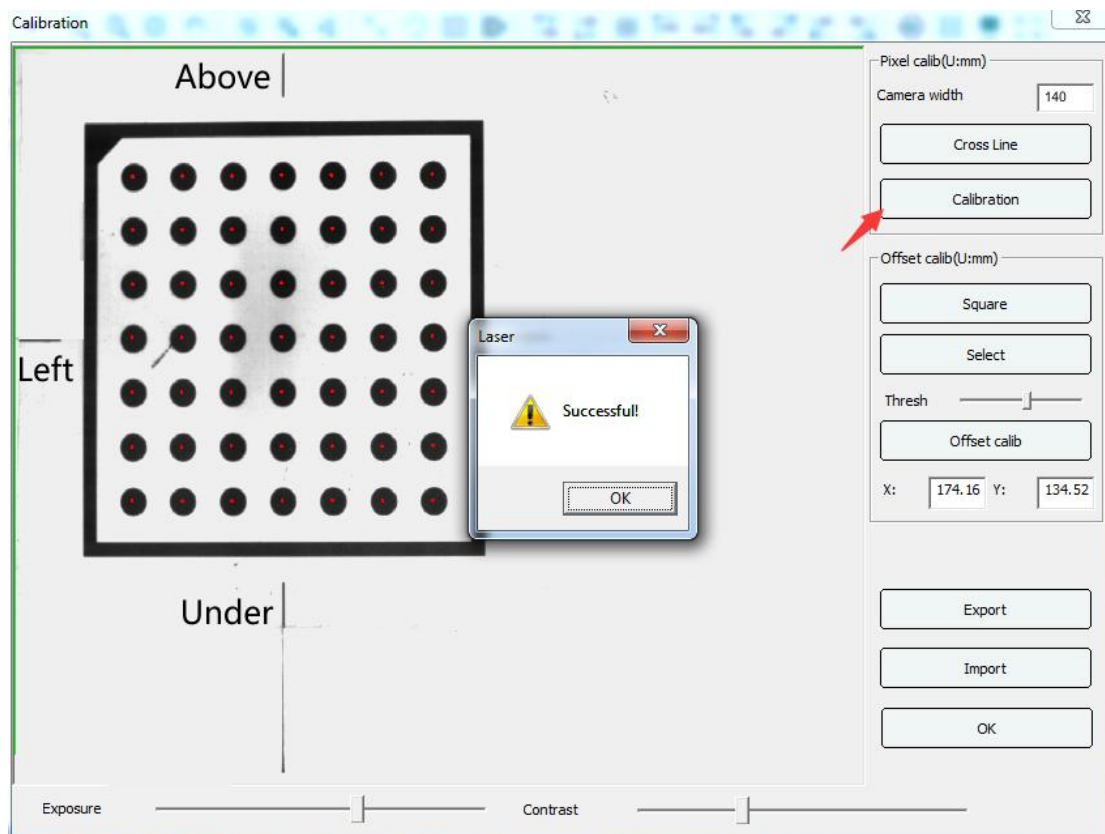


4. Place a piece of white paper on the machine table and fix it. Move the laser head to the white paper range and click "Cross Line". At this time, the laser head starts to work and cuts the corresponding cross lines. Then place the calibration plate

on the cut cross line, and slightly adjust the calibration plate so that the middle line of the upper, lower, left and right sides of the calibration plate completely coincides with the previously cut cross line.



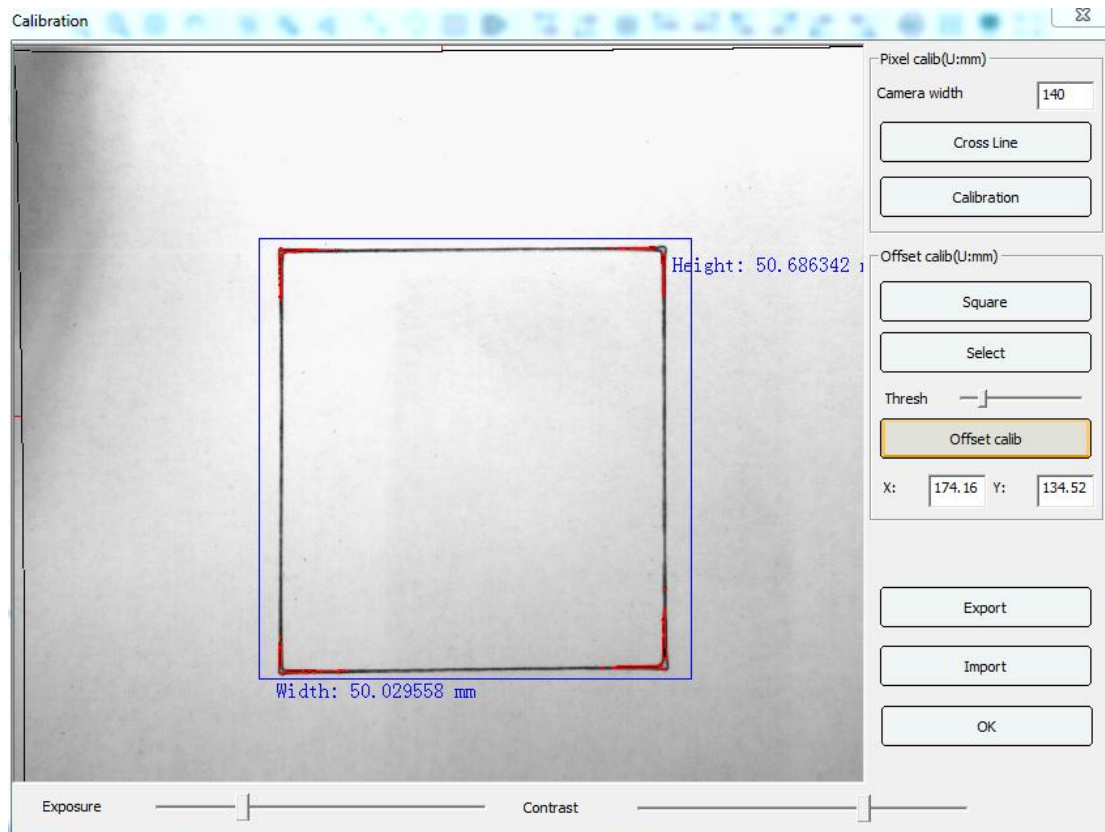
5. Move the laser head to make the red cross line displayed in the video window coincide with the cross line of the calibration plate. Then click the "Calibration" button, and the laser head will move for calibration until "Successful" appears on the screen. Click OK, and pixel calibration is completed.



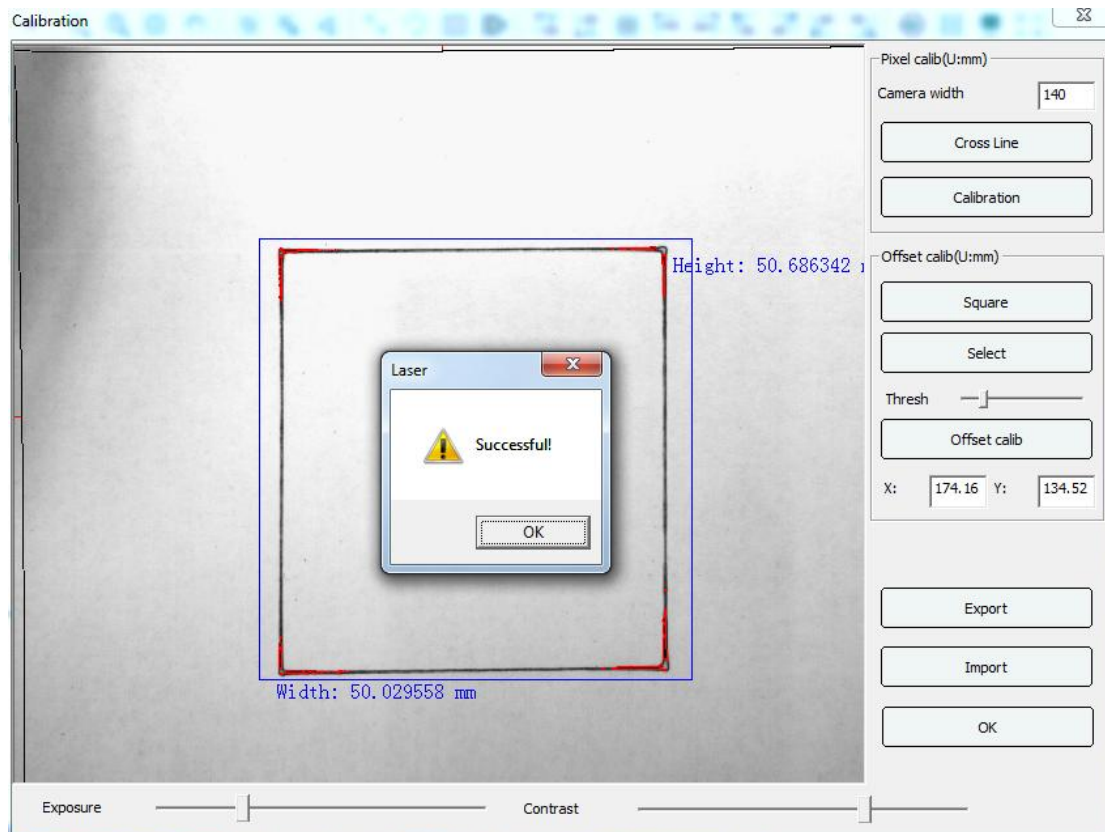
6. If the calibration fails, please adjust the camera exposure, contrast and other parameters under the calibration interface and try calibration again. Or check whether the visual field width is correct and calibrate it again.

### 1.7.1.2 Offset calibration

1. Open the calibration management, click the "Square" button, and the machine will execute the action of cutting calibration side. After cutting is completed, move the camera directly above the calibration party, click "Select" button and select the calibration party square just cut. At this time, the cut calibration square line turns red.
2. If the red line shows too thin or too thick or has some miscellaneous points, it can be adjusted by using the "Threshold" function on the right side of the software. Generally, the lines can be adjusted to be sharp and smooth.



3. Click the “Offset calib” button to prompt the success of the offset calibration. If the calibration fails, please readjust the exposure parameter and contrast parameter below the calibration and try the calibration again.

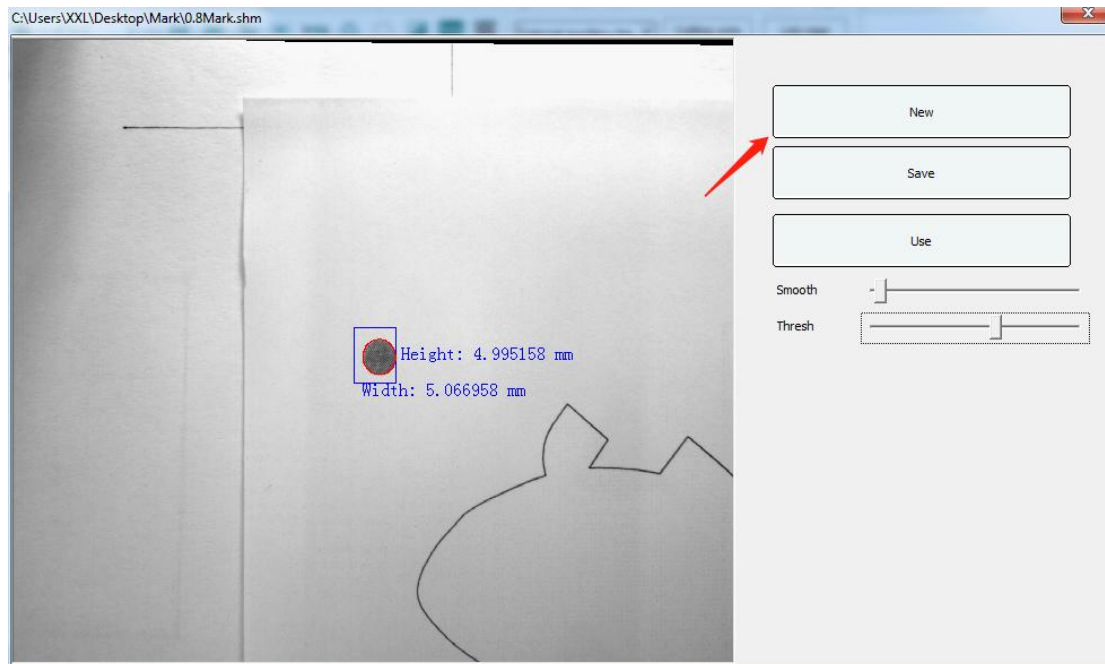


**Note: If the camera shifts, the focal length of the lens changes, or the software is uninstalled and reinstalled during use, the camera needs to be recalibrated.**

## 1.7.2 Create "Mark" Points

1. Move the camera directly above the "Mark" point, click "Set point" and then open "Mark setting"-“New”.
2. Box the "Mark" point and adjust the "Smooth" and "Threshold" parameters to make the red circle the same size as the "Mark" point. The closer the height and width of the red circle are to the actual "Mark" point size, the better. Then click "Save" and the user can set the location for saving. After finishing, you can just turn off the "Mark" point management interface.





**New:** Create a new "Mark" point.

**Save:** After the "Mark" point is created, it is used to save the created "Mark" point.

**Use:** Select the "Mark" points that have been saved before and use them.

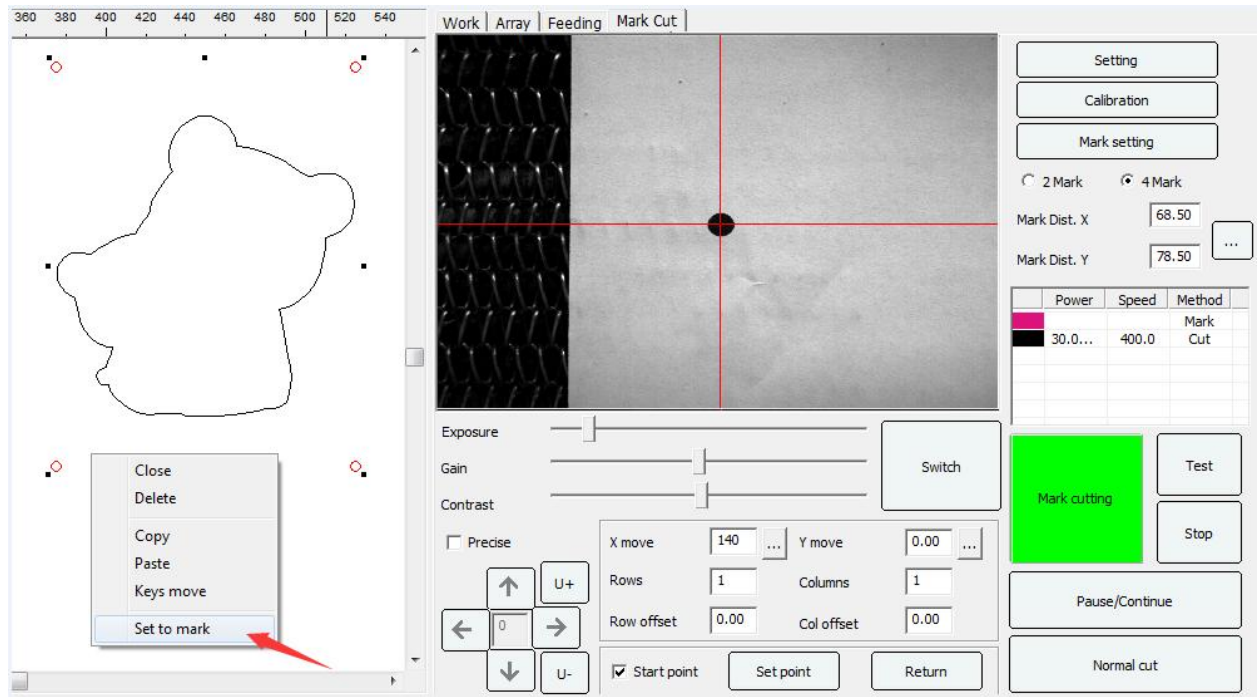
**Smooth:** Used to adjust the smoothness of the red line edge of the "Mark" point.

**Threshold:** Used to adjust the size and position of the red line "Mark" point.

### 1.7.3 "Mark "Point Cutting Process

1. Click on the file to import the "Mark" point graph to be cut.
2. Select the number of "Mark" points, and it is recommended to select the 4 "Mark" point mode.
3. Create the "Mark" point. Refer to 1.7.2 Summary for the creation method.
4. Then fill in the horizontal distance of the "Mark" point (Mark Dist. X) and the vertical distance of the "Mark" point (Mark Dist. Y) , which can be calculated by using the horizontal movement and vertical movement functions.
5. Select the "Mark" point in the imported drawing, right-click the "Mark" point and select the "Set to mark" function. At this time, another layer parameter with the mode of "Mark" will automatically appear in the parameter bar on the right. And

this layer is at the state of prohibited from outputting.



6. Move the camera directly above "Mark" and click to set the starting point (Set point button). Then, click Test, and if OK, click "Mark cutting".

### 1.7.4 Setting

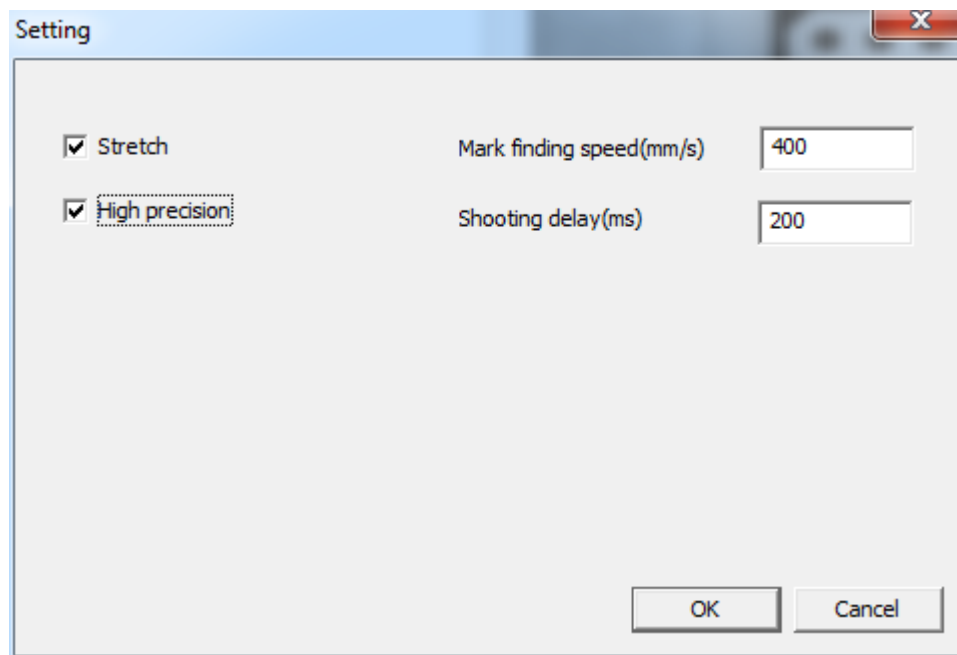
**Stretch:** Select the "Setting" button. In the pop-up dialog box, the graphics stretch compensation is checked by default. When compensation is enabled, the software automatically calculates the horizontal and vertical distances of the "Mark" point based on the working primitives. Before work, the camera will calculate the actual distance of the "Mark" point again after shooting the "Mark" point, and stretch the graph according to the actual distance of the "Mark" point shot by the camera to make the cutting more accurate. If it is unchecked, it will not stretch. (Note that the "Mark" point should be a single primitive and a circle is recommended.)

**Mark finding speed:** The moving speed of the camera when shooting the "Mark" point and the moving speed of the right button in the video window can be changed according to the user's requirements.



**High precision:** The camera is more accurate when shooting "Mark" points. After the camera captures the "Mark" point, the laser head will automatically move to the center of the "Mark" point and then take a picture.

**Shooting delay (ms):** The camera delays the waiting time before shooting the "Mark" point, so as to make the laser head stop completely before shooting and improve the accuracy of the camera shooting.



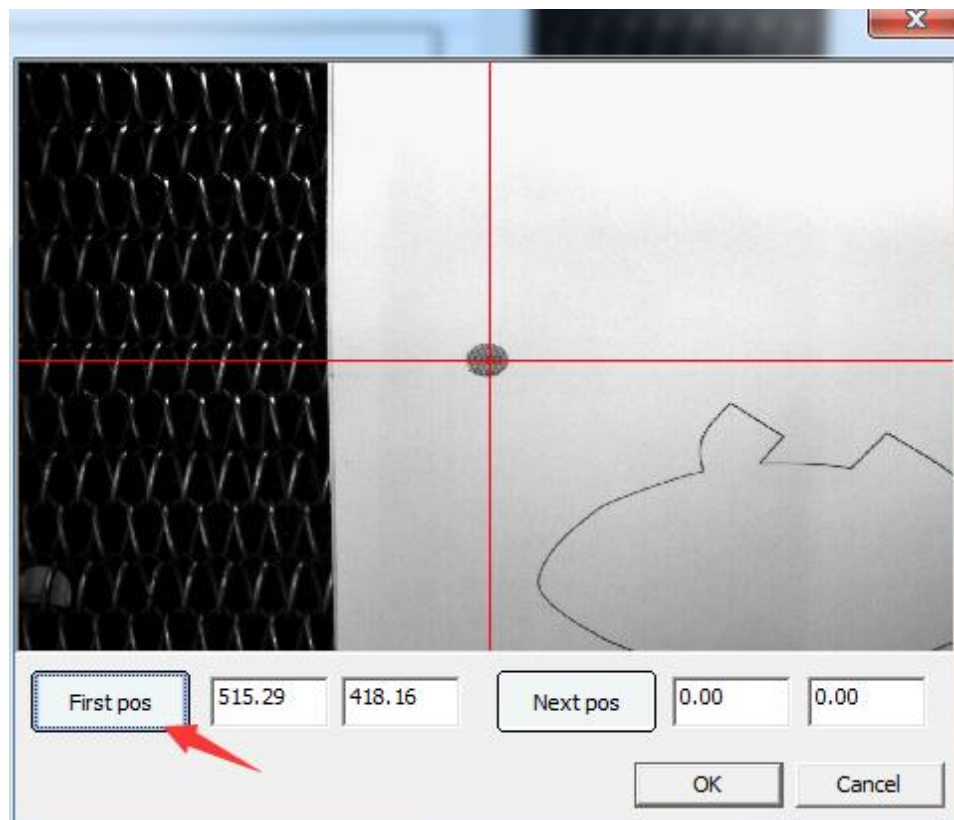
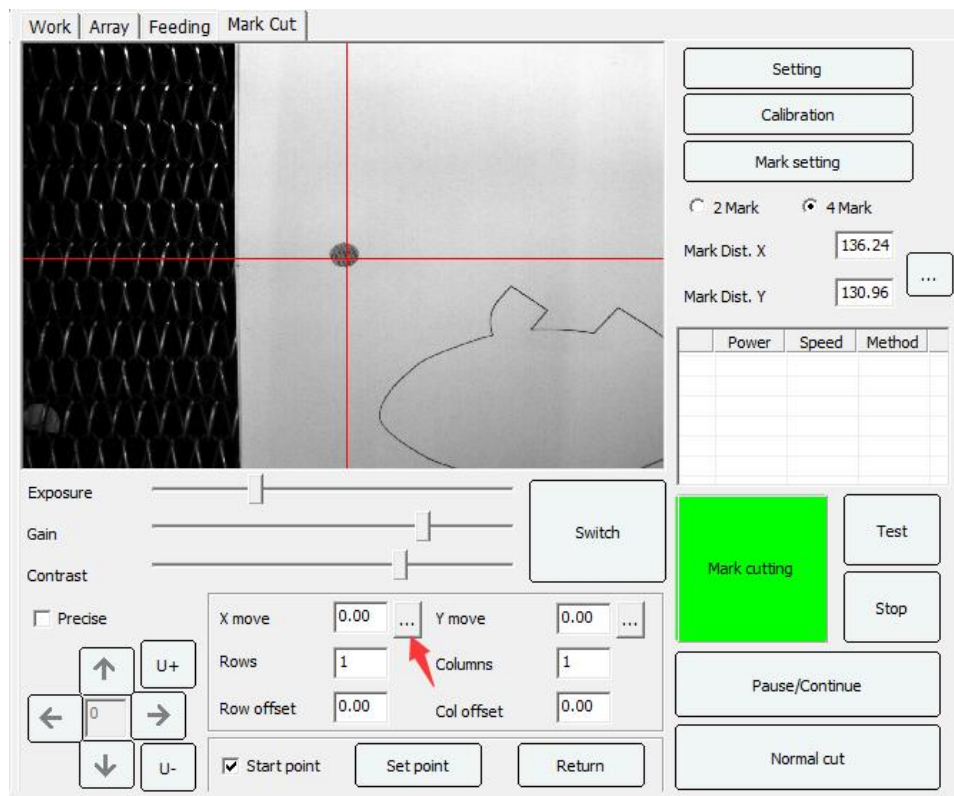
### 1.7.5 Multi-row multi-column positioning cutting

This function is used for multi-row and multi-column positioning cutting. It is necessary to set the horizontal and vertical movement distance (X Move / Y Move), the number of rows and columns. If the element has a row and column offset, you need to set the offset distance.

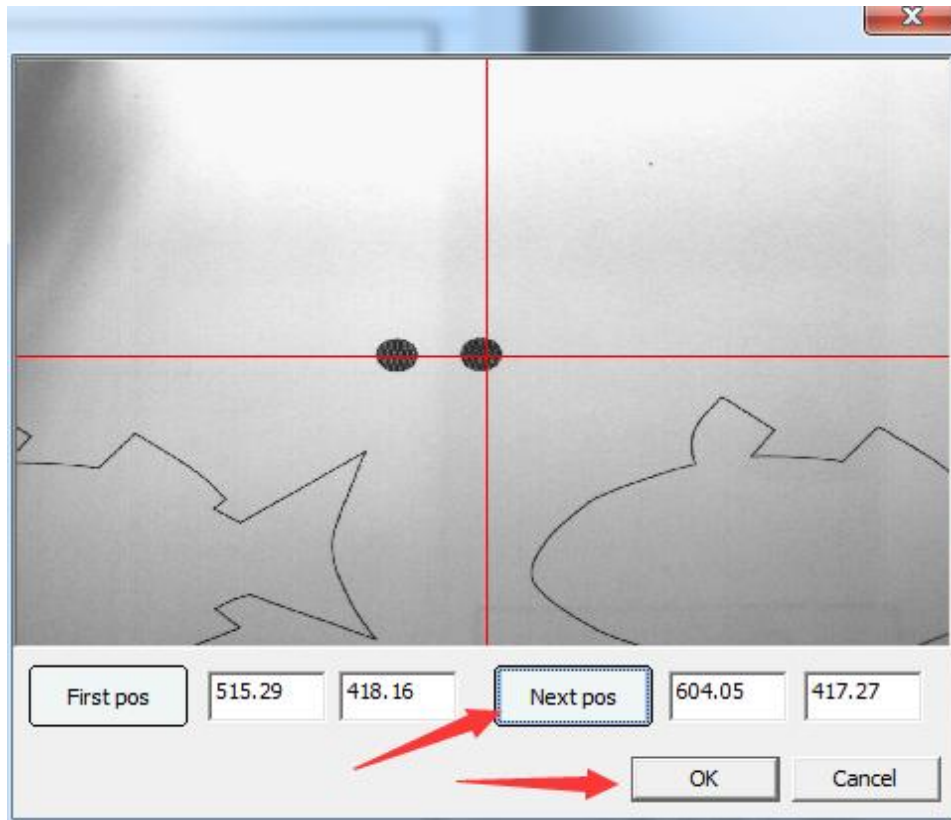
Import the Mark point cut file and set the Mark point. Set start point of the print pattern to be cut.

Horizontal movement distance (X move):

Click the expand button on the side of "X move".

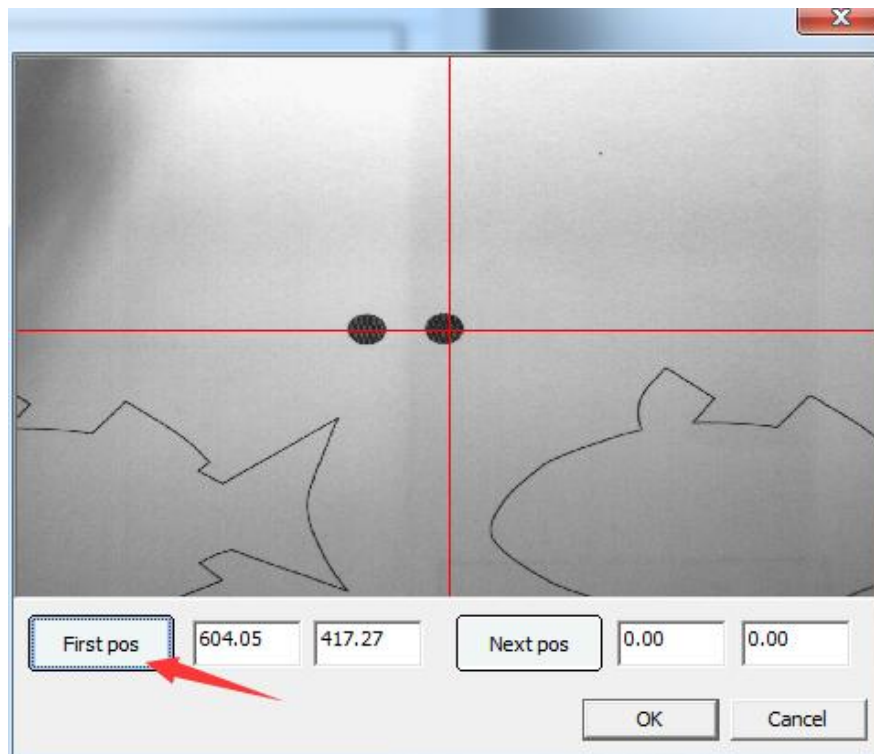
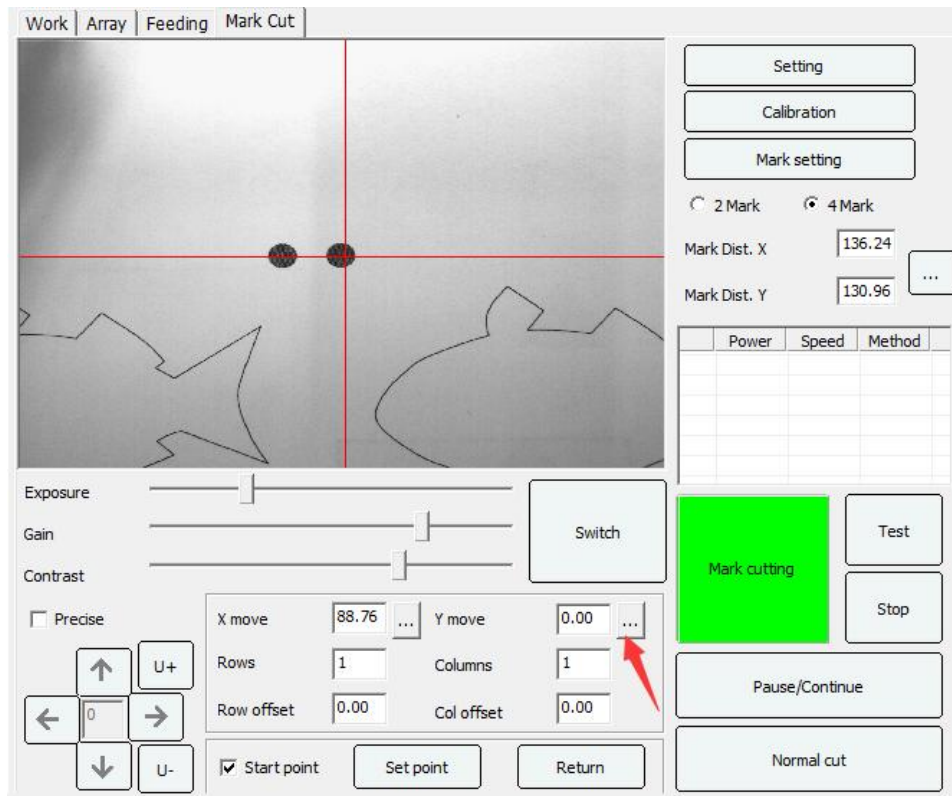


Right-click to the position of the first Mark point, then the machine move to it,click "First Position" to record the current coordinates, then move the laser head to the next Mark point to be cut, click "Next Position", and then click "OK".

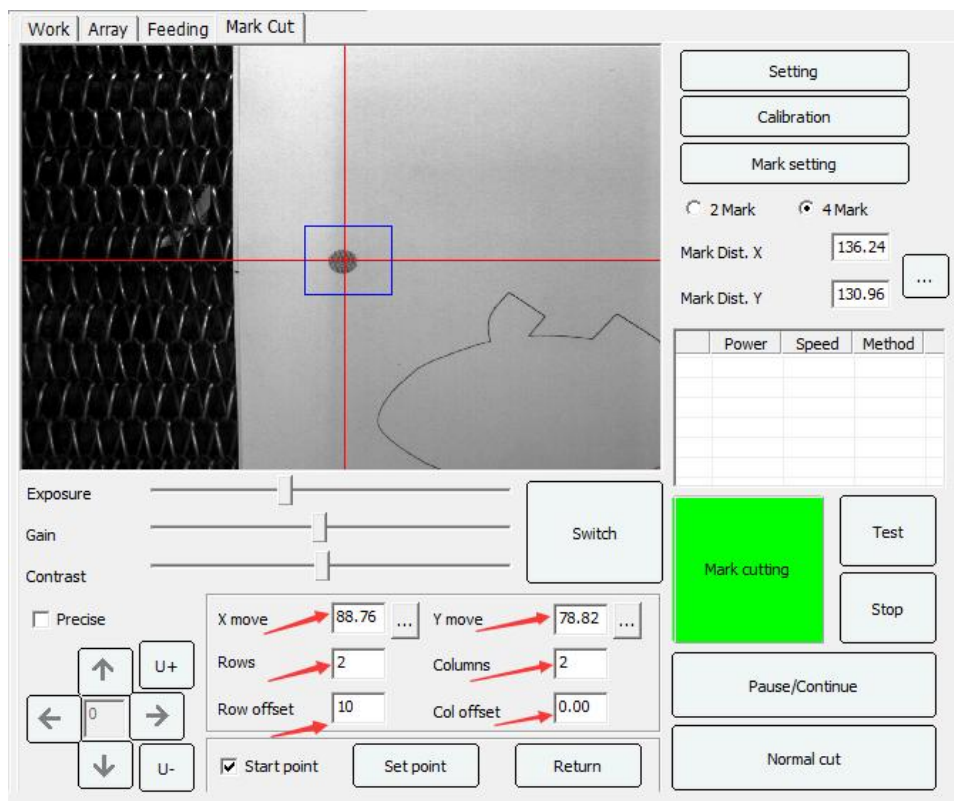
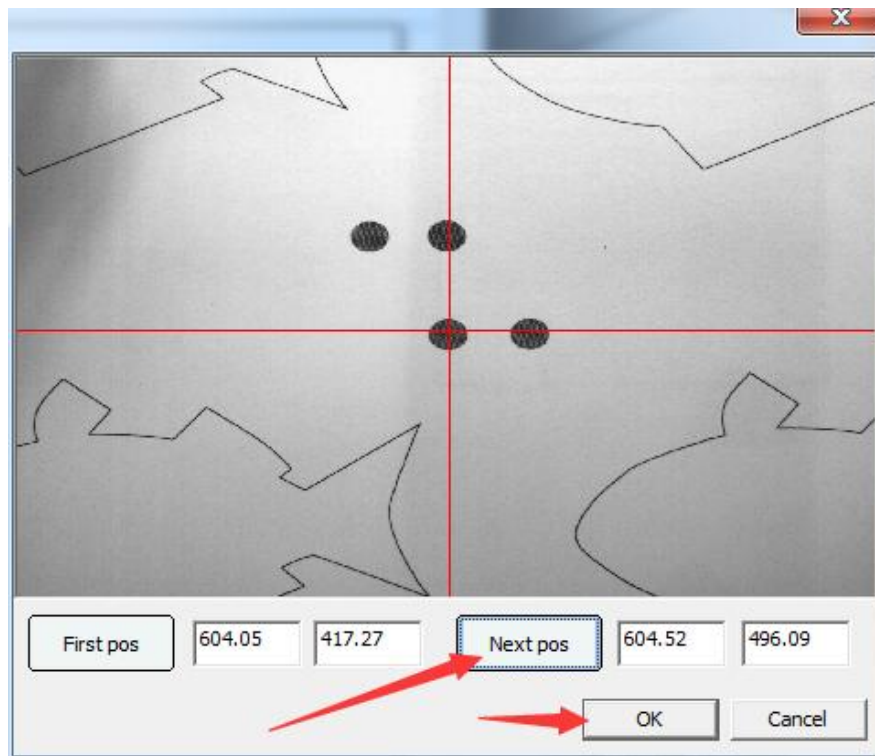


Vertical movement distance (Y move):

Click the expand button on the side of "Y move".



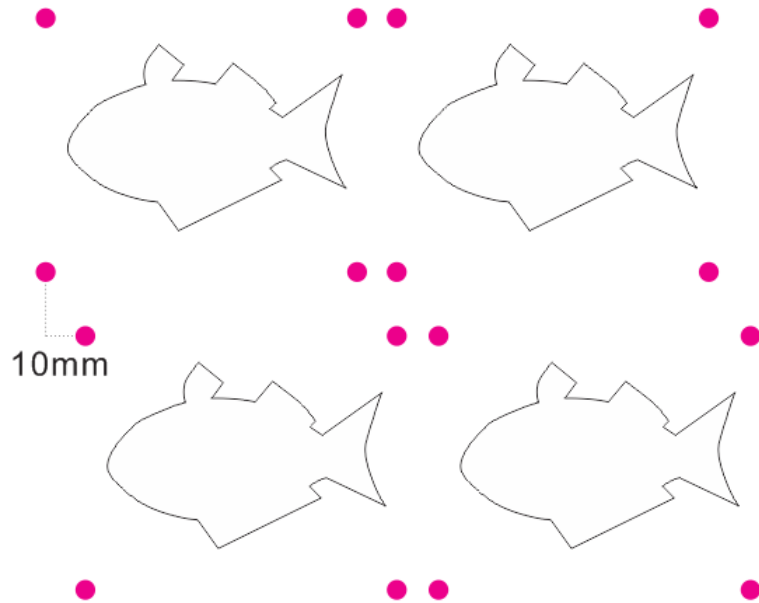
Right-click to the position of the first Mark point, then the machine move to it,click "First Position" to record the current coordinates, then move the laser head to the next Mark point to be cut, click "Next Position", and then click "OK".



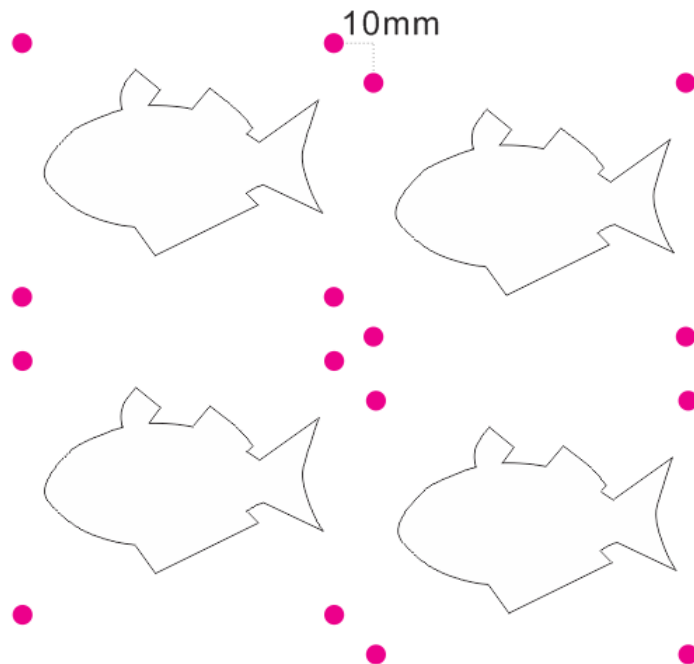
Through the above steps, the "X move" and "Y Move" distances are automatically calculated, and then set the "Rows" and "Columns" parameters. If there is a row offset and a column offset, as shown below:



**Row offset:**



**Column offset:**



The user can set the two parameters of “Row offset” and “Columns offset”, and use the measurement tool to measure the offset value. Take the upper left coordinate system as an example, offset to the right to a positive value, and offset to the left is a

negative value.

After setting the corresponding parameters, perform a “Test”. If the test is normal, click “Mark cutting”. Otherwise, check whether the Mark point horizontal and vertical distance and offset distance are correctly filled, and then perform the cutting test again.