
Friendess ,Inc.

UltraCut Laser Cutting Control System

User Manual

Version 1.6

[Remark]



welcome

Thank you for using UltraCut Laser Cutting Control System!

"UltraCut Laser Cutting Control Software" (hereinafter referred to as "UltraCut") is a software suite designed for flat laser cutting. It includes laser cutting process handling, commonly used nesting functions, and laser processing control. The main functionalities comprise graphic processing, parameter configuration, custom cutting process editing, path planning, simulation, and cutting processing control.

Only when used with encryption dog and control card can UltraCut realize machining control.

When UltraCut runs on a computer without the encryption dog, it will enter the demo mode, and you can use all functions except for machining control. Therefore, UltraCut can be installed on a standalone laptop for design purposes before processing.

Please note that this user manual serves as the operational guide for the main program of UltraCut software. For other software tools installed alongside UltraCut, such as platform configuration tools, please refer to separate manuals or contact us for further assistance.

This document is written based on UltraCut version 7.8. Due to the continuous updates and improvements in the software's functionalities, there may be discrepancies between the UltraCut software you are using and the statements in this manual. We apologize for any inconvenience this may cause.

If you have any questions or suggestions during your usage, please feel free to contact us at any time. We are here to assist you!



The working and cutting performance of the machine are directly related to the material, laser, cutting gas, gas pressure and the parameters setup. Please be cautious in setting the parameters!

Improper parameter setting and operation may reduce the cutting performance, or even cause damage to machine parts and human body. UltraCut system has already provided multiple protections, meanwhile manufactures and users must follow the safety operation rules in case of any accidents and injuries.

Shanghai Friendess Electronic Technology Corporation Limited does not bear any direct, indirect, incidental or corresponding losses and liabilities arising from the improper use of this manual or this product.



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一、 Platform Configuration Tool

1.1 bus scan



Open the platform configuration tool and click the "总线扫描" button to enter the bus scanning interface.

Click to start scanning, it will display the success or failure of the scanning result, as well as the number of scanned drives and expansion boards.

1.2 axis configuration

The axis configuration includes motor parameters, encoder parameters, motion parameters, travel switches, etc. The specific motor parameters and encoder parameters should be configured and written according to the actual mechanical structure, and the travel switch should be configured according to the I O port connected to the expansion board .

轴配置

☐ 开软件自动使能伺服 编码器滞后补偿: 0us

X轴 Y轴 Z轴

主轴: 1

电机参数

传动结构: 直线电机 减速比: 1

极距: 40mm 单圈脉冲数: 360000

编码器参数

编码器类型: 增量式

主轴编码器方向: CCW 模拟编码器方向: 同向

运动参数

最大速度: 2000mm/s 最大加速度: 15000mm/s²

行程范围: 1000mm

行程开关

正限位: A1 常开 负限位: A2 常开

原点开关: A3 常开

垂直度矫正

☐ 启用垂直度矫正

☐ 以X轴为基准矫正Y轴 ☒ 以Y轴为基准矫正X轴 夹角: 90°

螺距补偿

☒ 不补偿 ☐ 仅补偿反向间隙 ☐ 完整螺距补偿

X: 0mm Y: 0mm

查看补偿数据

Figure 1 axis configuration page

The table below briefly describes some of the parameters in the axis configuration.

**Logical axis configuration**

In the X Y Z axis structure, you only need to configure the X Y Z axis parameters; if it is a dual Y axis structure, you need to enable dual Y axes and additionally configure Y2 axes; if it is a dual Z axis structure, you need to enable dual Z axes and additionally configure Z2 axes

Motor parameters

Transmission structure	Including linear motor, rack and pinion, screw, and other four structural types, configured according to the actual mechanical conditions of the machine tool
Transmission lead	This parameter will only appear when setting the linear motor, set according to the complete magnetic pitch of the linear motor
Pitch circle diameter	This parameter will only appear when setting the rack and pinion, set according to the diameter of the pitch circle of the gear
Screw lead	This parameter will only appear when the screw is set, set according to the lead of the screw
Reduction ratio	This parameter needs to be changed only after the reducer is installed. Enter the corresponding parameter according to the reduction ratio of the reducer
Number of pulses per revolution	According to the actual motor parameter setting, you can view the corresponding input of the driver parameters, and the driver suitable for linear motors is generally checked in the electronic gear ratio

Encoder parameters

Spindle encoder direction	It is used to set the direction of the encoder. This parameter can be used for reverse correction without modifying the control direction of the driver, and finally ensure the correct direction of the axis movement.
encoder type	Including multi-turn absolute encoder, incremental encoder, single-turn absolute encoder, configured according to the actual type of motor encoder
Analog Encoder Direction	It is used to set the direction of the output signal of the equivalent encoder of the drive, and is used in conjunction with the detection of the direction of the analog encoder in the software to ensure that the direction of the analog encoder is correct

motion parameters

Maximum speed	It is used to limit the maximum speed of the machine tool, and all speed
---------------	--



	settings in the software cannot exceed this upper limit
maximum acceleration	It is used to limit the maximum acceleration of the machine tool, and all acceleration settings in the software cannot exceed this upper limit
travel range	The actual travel range of the machine tool is generally slightly smaller than the range of the positive and negative hard limits, and this travel range is the soft limit of the software.
Limit switch	
X YZ limit, origin logic	Normally open and normally closed logic is configured according to the logic of the actual limit switch
limit port	configure each limit port according to the connected I O port
Other parameters	
Open the software to automatically enable the servo	According to the specific scene of debugging or production, confirm whether it is necessary to enable the XYZ axis automatically after the software is turned on, or to manually enable each axis after entering the software. It is recommended to enable it manually during debugging, and to enable it automatically during normal operation.
Z- axis brake output port	the IO board is connected to the brake port of the Z axis, configure the corresponding output port
Z-axis stops	Set the stop height for the Z axis
Z axis is in demo mode	Check when the z-axis is not enabled
Encoder lag compensation	It is used in the case of using a sincos analog encoder, etc., where there is a large equivalent analog encoder delay. The specific value needs to refer to the drive parameters. A BZ encoder is generally set to 0us and does not enable compensation.
Verticality correction	It is used to correct the verticality error existing in the xy axis, and you can choose to use the x axis or y axis as the reference
pitch compensation	Support for importing interferometer data for each axis. The method of importing the pitch compensation data: select the pitch compensation type as "full pitch compensation", see Figure 2 for details

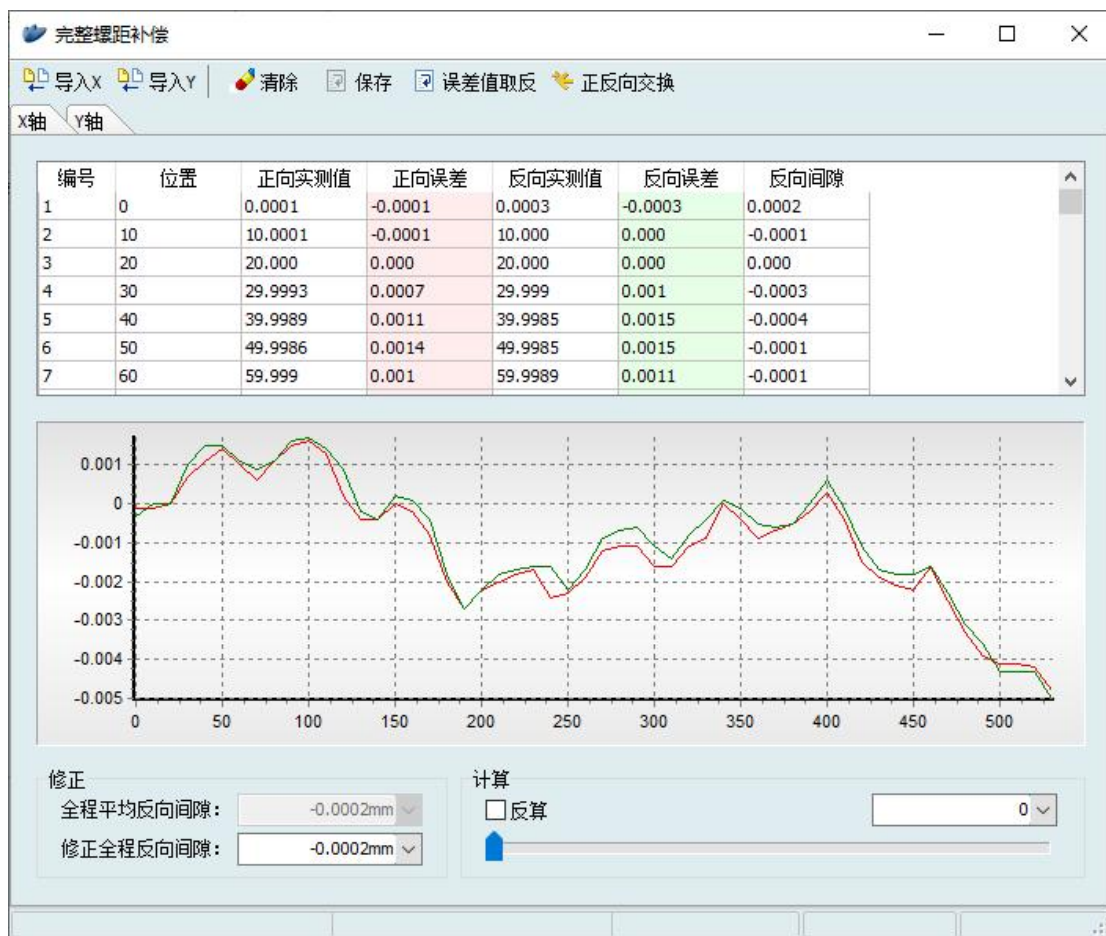


Figure 2 Complete pitch compensation page

Click "Import X" to import the error data of the X axis, and click "Import Y" to import the error data of the Y axis. After the data import is completed, the import results will be displayed in two ways: list and graph.

If the position coordinates displayed in the table are inconsistent with the direction of homing, the compensation result will be invalid. Under normal circumstances, when importing data, UltraCut will automatically judge the sign of the position. In case of inconsistency, please contact us to solve it, or adjust the measurement range to be consistent with the travel range of the machine tool by modifying the measurement parameters of the interferometer software before importing data.

1.3 Universal axis

There are mechanical parameters, limit switch configuration, and return-to-origin configuration in the general axis. The specific mechanical parameters should be configured and written according to the actual mechanical structure; the limit switch needs to be configured according to the I O port connected to the expansion board ; the return-to-origin configuration includes speed, sampling signal, return-to-origin mode, etc.



通用轴配置

通用轴1 通用轴2 通用轴3 通用轴4 通用轴5 通用轴6

主轴: 5

电机参数

传动结构: 直线电机 减速比: 1

极距: 40mm 单圈脉冲数: 360000

编码器参数

编码器类型: 增量式

主轴编码器方向: CCW

运动参数

最大速度: 2000mm/s 最大加速度: 15000mm/s²

行程范围: 1000mm 停靠点坐标值: 0mm

行程开关

正限位: A4 常开 负限位: A5 常开

原点开关: A6 常开

回原点参数

回原点方向: ☒ 负向 ☐ 正向 回退距离: 5mm

回原点采样信号: ☐ 原点 ☒ 限位

回原点方式: ☐ 使用Z相信号

粗定位速度: 50mm/s 精定位速度: 5mm/s

Figure 3 General axis configuration interface

See 1.2 Axis Configuration and 1.4 Return to Origin Configuration for the general axis configuration parameter description.

1.4 Back to origin configuration

The back-to-origin configuration interface involves the basic configuration of each axis' s back-to-origin, including speed, sampling signal, and back-to-origin methods.



回原点

☐ 强制启用软限位 ☐ 开机后提示用户回原点 ☐ 以报警方式提示回原点

X轴 **Y轴** **Z轴**

回原点方向: ☒ 负向 ☐ 正向 回退距离:

回原点采样信号: ☐ 原点 ☒ 限位

回原点方式: ☐ 使用Z相信号

粗定位速度: 精定位速度:

使用限位开关回原点 (不使用Z相信号)

限位 粗定位过程 精定位过程 减速过程 返回距离

Figure 4 back to origin configuration page

Home option	
Force soft limit	After opening, the soft limit is forced to be enabled in the software, and the soft limit option in the software will be hidden
Prompt the user to return to the origin after booting	After turning it on, if it is detected that it needs to return to the origin, a prompt to return to the origin will pop up.
Prompt to return to the origin by alarm	The reminder of returning to the origin will be prompted in the form of an alarm
Each axis homing option	
Home direction	Set the direction of returning to the origin of each axis. According to the Cartesian two-dimensional coordinate system, the lower left is negative, and the upper right is positive.
Back to origin sampling signal	You can choose to use the origin signal or the limit signal as the sampling signal. When the sampling signal is valid, it will start to perform the homing action
Use Z-phase signal	Z- phase signal when performing the return-to-origin action . The current supported driver brands are Sakatronic and Panasonic
Coarse positioning speed	Velocity used during coarse positioning



Fine positioning speed	Velocity used during fine positioning
Backoff distance	The distance parameter used when performing the rollback when returning to the origin
Back to origin	Ordinary homing is the normal homing action. Absolute homing requires the use of an absolute encoder, and the homing is performed according to the zero recorded by the absolute encoder.

1.5 Laser configuration

Laser configuration includes laser configuration and PSO configuration, etc.

激光器

类型: 总线PSO 激光器功率: 50W

PSO配置

分辨率: 0.1um 此数值与实际编码器分辨率数值有关, 请谨慎修改!

☐ 启用双路 PSO PWM

连接测试

192 168 0 11

写入IP

☐ 裂片

类型: CO2激光器

Figure 5 laser configuration page

Laser configuration	
type	Select the corresponding laser
Laser power	Fill in according to the actual power of the laser
Prompt to return to the origin by alarm	The reminder of returning to the origin will be prompted in the form of an alarm
PSO configuration	
resolution	Fill in the resolution of the PSO encoder according to the



	resolution of the reading head
Dual PSO PWM	After the dual-channel PSO PWM is enabled, both the PWM and CLK ports of the PSO board will output signals
connection test	Test whether the PSO board and the machine can communicate
write to IP	Set the IP address of the PSO board
other	
lobes	Enable shards

1.6 Call the police

Alarm configuration can set emergency stop alarm input and user-defined input port alarm and warning. When the alarm input is valid, the UltraCut software will display red to indicate that the alarm is valid; when the warning input is valid, the UltraCut software will display yellow to indicate that the warning is valid.



Figure 6 Alarm configuration page

Each user-defined input alarm can set the corresponding limit operation of the system after the alarm, which can realize restrictions such as stopping processing and stopping motion after the alarm is generated:

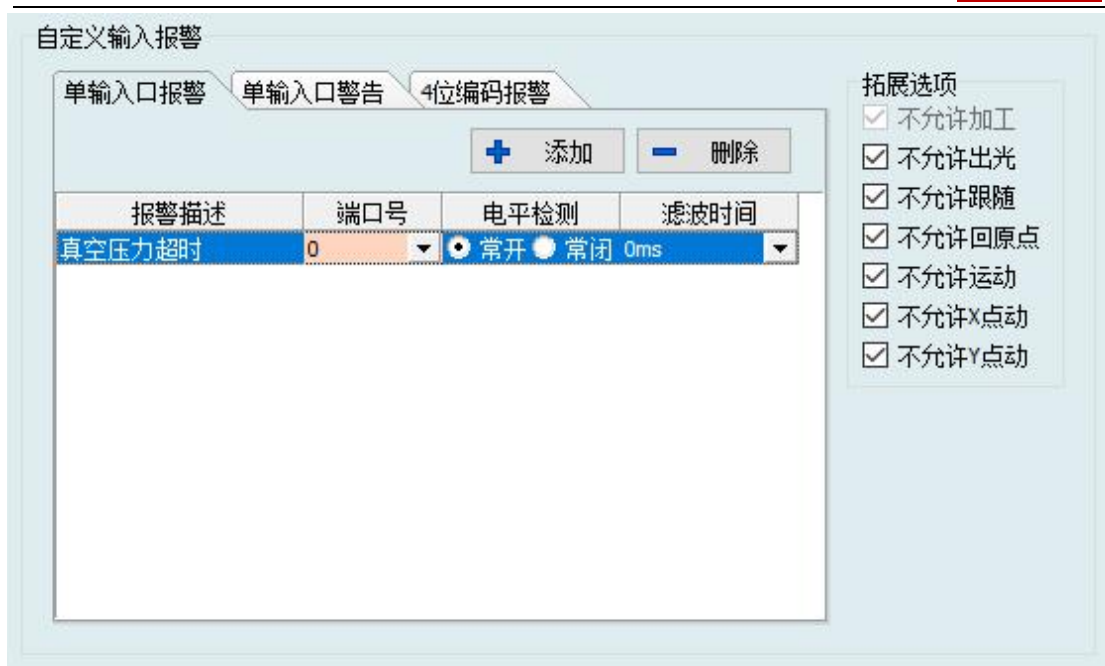


Figure 7 Limiting actions of the system after an alarm

1.7 IO list

The IO list configuration page displays the input port and output port information provided by all connected expansion IO expansion boards. Each input port and output port can be customized to name. If the input port is a dedicated input port bound to a system-specific function, its system name will be displayed.



IO列表

扩展卡选择: Demo

☐ 合并显示系统命名和用户自定义命名

输入口

输入口	系统命名	自定义命名
-----	------	-------

输出口

输出口	系统命名	自定义命名
-----	------	-------

黑色显示的是系统命名

蓝色显示的是用户自定义命名

Figure 8 IO list configuration page

1.8 Universal input

The general input port page can configure the selected input port as the trigger port of the system's predefined functions.

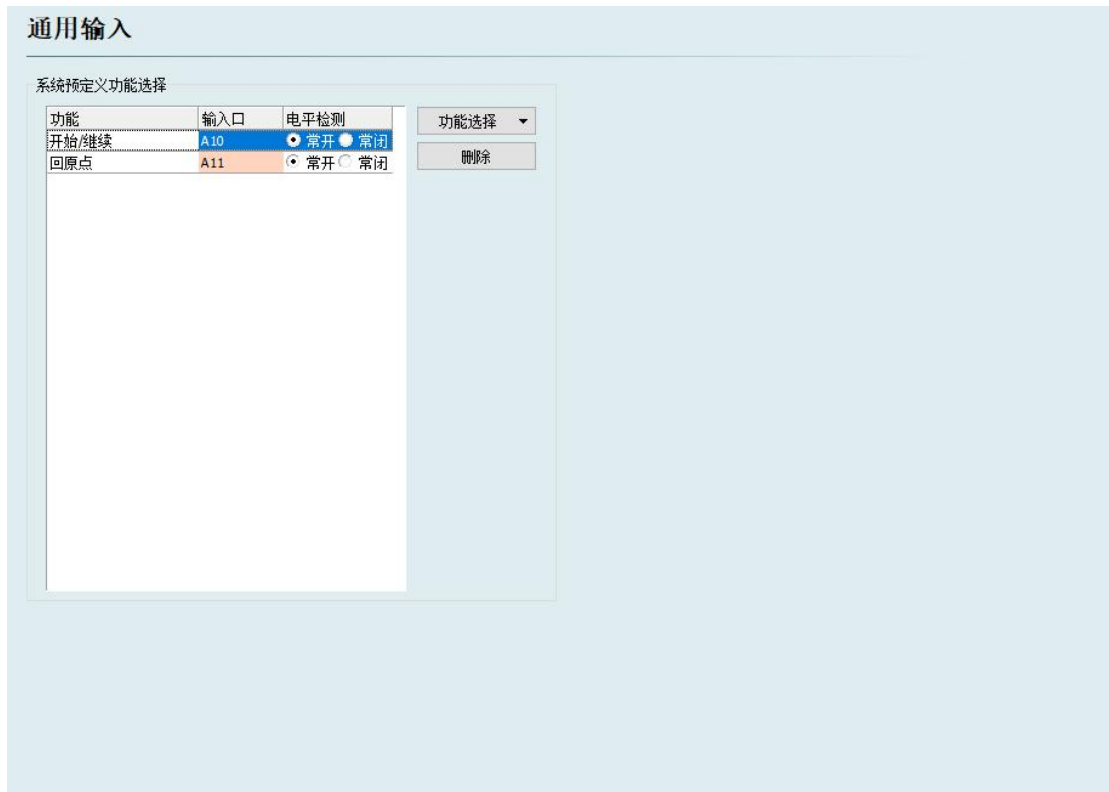


Figure 9 General input port configuration page

The input ports configured with predefined functions will display the corresponding predefined function names on the "Extended IO Monitoring Board" page of the UltraCut software.

1.9 General output port

The general output port can be configured with an output port corresponding to the system function.



通用输出

通用输出口

指示光: 0 出光指示: 0

Ready信号: 0 报警灯光: 10

加工指示: 0 报警铃声: 0

吸附1: 0 吸附2: 0

☐ 只要有运动就输出加工指示

☐ 产生警告也触发报警灯光和报警铃声

自定义输出口配置

添加 删除

名称	输出口	自锁
----	-----	----

报警灯光闪烁		
加工指示灯闪烁		
出光指示灯光闪烁		
报警铃声断续		

Figure 10 General output port configuration page

General output port	
indicator light	The output port corresponding to the "Indicating light" button of the software console
light indicator	Status output signal during consecration and cutting
Ready signal	The output signal when the system is in an idle and processable state
Processing instructions	The status output signal that the system is in processing
alarm light	The output signal of the system exists alarm state
alarm bell	The output signal of the system exists alarm state
Adsorption 1, Adsorption 2	The output signal corresponding to the "Adsorption" button of the handheld box

Alarm lights, alarm bells, processing indicator lights and light output indicators can all be set to enable intermittent output, that is, flashing or intermittent effects. And can set the time of lighting and extinguishing respectively.

1.10 wireless handheld box

The wireless handheld box supports the configuration of 4 custom buttons, which can be configured as processing control, return to mark, return to origin and other extended functions. And one button can be configured into two functions. If the function needs to be used in conjunction with the F N key combination, it should be configured in the blue area.

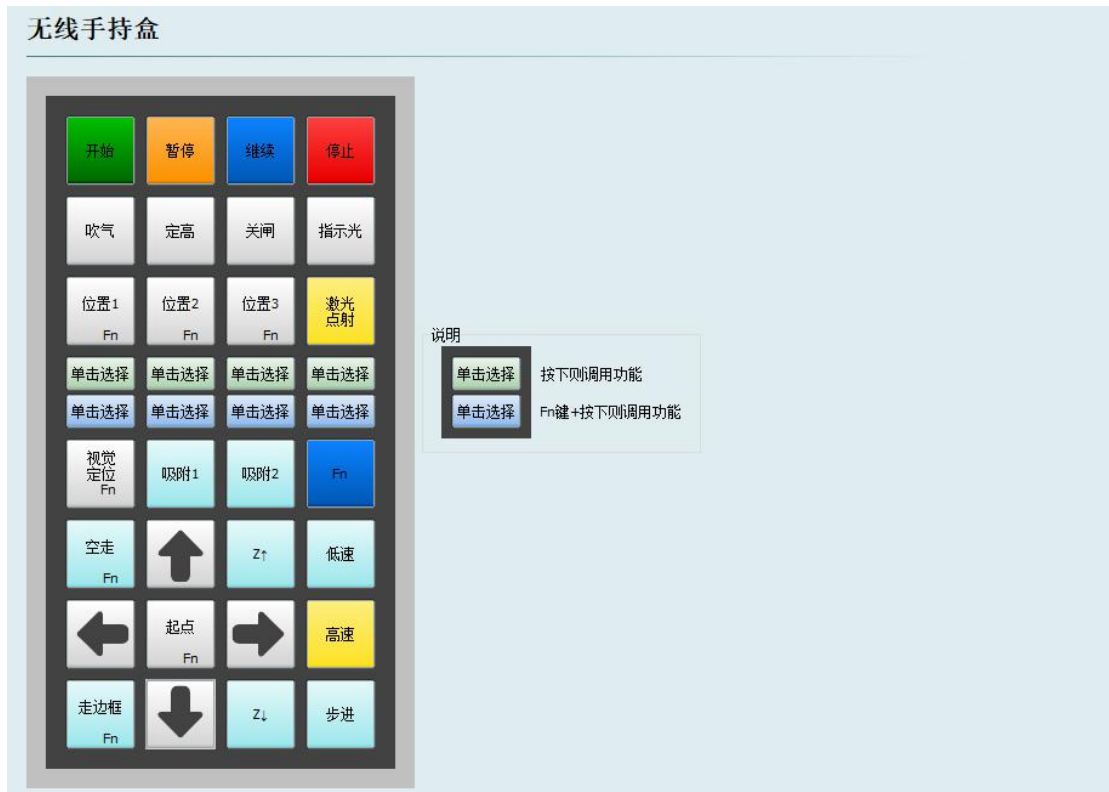


Figure 11 Wireless handheld box page

1.11 Y-axis automation

Please refer to "General PLC Manual V1.3" for detailed description of the Y-axis automation function.

1.12 other configuration

Other configuration pages can adjust some functions of the software to adapt to the use in different scenarios.



其他配置

视觉配置

☒ 启用第一方视觉软件

☐ 启用正反切补偿

相机个数:

拓展功能

☐ 启用操作员界面

☐ 启用手机玻璃切割

☐ 启用关键步骤提示

其他配置

☐ 使用Modbus Rtu监听 端口号:

☐ 使用Modbus Tcp监听 端口号:

报警复位:

自动模式:

使用习惯

☐ 启用「使用材料厚度切割」功能

Figure 12 Other configuration pages

visual configuration	
Enable vision software	Turn on the visual positioning function
Number of cameras	Number of cameras used for visual localization
Tangent compensation	It is used to adjust the coincidence accuracy of the front and back tracks in the scene of front and back cutting
Camera IP configuration tool	Open the camera IP configuration tool
Extended function	
operator interface	Enable to open the operator interface
Tips for key steps	After enabling, open the drawing with Mark points, it will prompt to open the visual software
Mobile phone glass cutting	After checking, the software can use the mobile phone screen frame editing function



二、 graphic manipulation

2.1 automatic optimization

importing external files such as DXF and PLT , UltraCut will automatically optimize the drawing, and the specific automatic optimization parameters can be viewed and modified in the file-user setting-user parameter interface.

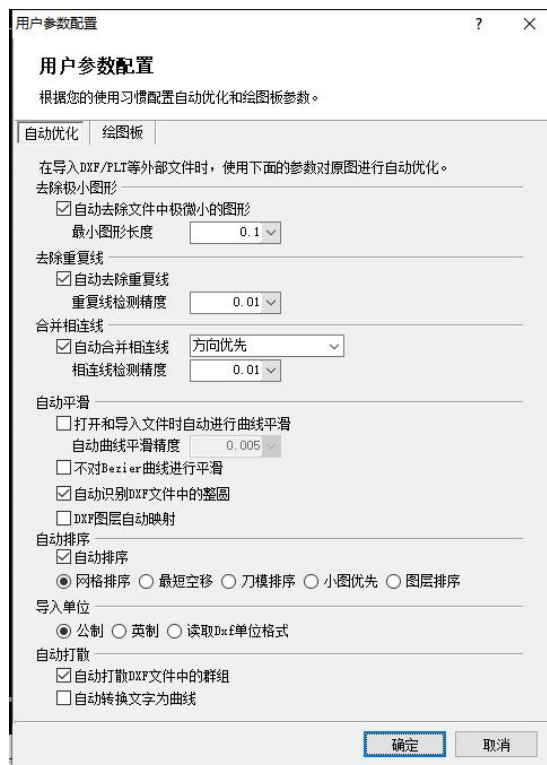


Figure 13 User parameter configuration page

The following table briefly describes some of the automatic optimization parameters

remove tiny graphics	
Automatically remove extremely tiny graphics in files	After checking, the tiny graphics in the file will be automatically removed, and the threshold for removing graphics size is the minimum graphics length parameter
Minimum graphic length	Tiny graphics threshold parameter, graphics smaller than this parameter will be judged as tiny graphics and cleared
remove duplicate lines	
Automatically remove duplicate lines	After checking, duplicate lines will be automatically removed, and the threshold for judging whether duplicate lines overlap is the duplicate line detection accuracy
Repeated line detection	The threshold parameter for judging whether it is a duplicate line, if



accuracy	the distance between two straight lines is less than this parameter, it will be judged as a duplicate line
merge connected lines	
Automatically Merge Connected Lines	If checked, the connected lines will be merged automatically. Direction, length, and distance priority are the filter items for choosing which two points to merge among multiple points.
Connected line detection accuracy	Judging the threshold value of connecting lines, if the distance between two points is less than this parameter, automatic connecting lines will be executed
automatic smoothing	
Automatic curve smoothing when opening and importing files	Checking it will automatically perform curve smoothing, and the smoothing effect is determined by the automatic curve smoothing precision parameter
Automatic Curve Smoothing Precision	When performing curve smoothing, the distance between two nodes is less than this precision parameter will be smoothed by the curve
No smoothing of Bezier curves	After checking, the Bezier curve type will not be smoothed, only other graphic properties will be smoothed
Automatic recognition of full circles in D XF files	It can recognize the full circle in the D XF file, and correctly recognize the circle attribute
D XF layer auto-mapping	the DXF file , the corresponding layer process will be automatically mapped, and the mapping rule corresponds to the process 1~10 according to the number of the DXF layer name
automatic sorting	
automatic sorting	Automatically sort files after checking
sort by	Choose a different sorting method to sort the graph
import unit	
import unit	All units in UltraCut are metric units, and the import of metric units remains unchanged; the import of imperial units will enlarge the corresponding proportion of the graphic size; when reading the dxf unit format, it will judge according to the unit format of the dxf file, and decide whether to convert the graphic size
Automatically disperse	
Automatically break up groups in DXF files	After checking, it will automatically disperse the group graphics in the D XF file
Automatically convert text to curves	After checking, the text in the drawing will be automatically converted into a curve



2.2 Graphic display effect

The first "View" column **"Display" under the common menu bar** provides a number of buttons to help control the display effect, as shown in the figure below:



Figure 14 Drawing Tablet Display Editing

Click the button in the above picture, the display effect will take effect immediately, and you can see the change of the display effect in the drawing board. Please pay attention to the display changes of the button itself. When the light blue background color is on, it means that the corresponding effect has been turned on. If there is no light blue background color, it means that the corresponding display effect has not been turned on. For example, if the state is on " , the graphics processing path will be displayed with arrows on the drawing board, and if the state is " , the arrows on the graphics will disappear.

When you click the " " button while selecting a graphic , the selected graphic will be displayed in the center of the page, if you click directly without selecting any graphic, the overall graphic will be displayed in the center of the page.  图形居中

Click " " in the lower right corner of the "View" column  to open a dialog box for more detailed control of the drawing board, including **enabling and disabling key point automatic snapping** , **enabling and disabling rulers** , and controlling mouse picking accuracy, etc.

Scroll the mouse wheel on the drawing board to zoom the view, press F3 to display all the graphics in the center on the screen, and press F4 to display the machine format range in the center on the screen. Click the right button of the mouse on the drawing board -> Zoom to select the above operations.

2.3 select graphics

UltraCut provides rich graphics selection methods. The most basic operation is " **click** ", and the graphic can be selected by clicking the mouse on the graphic. Another more common operation is " **frame selection** ", drag the mouse to form a semi-transparent marquee on the



screen to select graphics. There are two types of "frame selection". When dragging the mouse *from left to right*, a blue semi-transparent rectangle with a solid line frame will be displayed, and only the graphics completely covered in the rectangle frame will be selected; when the mouse is dragged from right to left, a cyan translucent rectangle with a dotted line frame will be displayed, as long as any part of the graphic is within the rectangle frame, the graphic will be selected.

A schematic diagram of the two options is shown below. The left picture is for selection from left to right, BC will be selected, the right picture is for selection from right to left, ABCD will be selected. Using these two methods flexibly can select the graphics you need more conveniently.

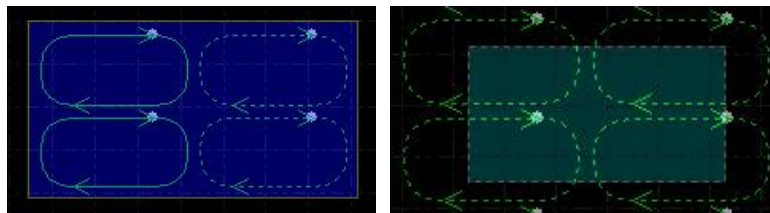


Figure 15 Select Graphical Schematic

you press the Shift key while selecting, you can add or deselect graphics without clearing the original selection.

Click the "Select" button, a drop-down menu will appear, through which you can perform advanced selection operations, including:

- ❏ Basic operations: select all (Ctrl+A), reverse selection, copy (ctrl+c), paste (ctrl+v), cut (ctrl+x), deselect (you can click on the blank area), copy with base point (select a point, the position relationship between the graphic and the mouse when pasting is the same as the position relationship between the base point and the original graphic)
- ❏ Graphics operation: select unclosed graphics, select similar graphics, select all external or internal molds, select all graphics smaller than the specified size (you need to enter the specified size in the drawing information bar below the software)
- ❏ Layer operation: select layer (used to select all graphics in a layer), lock the background.
- ❏ After the "Prohibit fast dragging and copying" is selected, the user will no longer be allowed to drag, copy, and rotate graphics, so as to avoid misalignment of already arranged graphics due to misoperation.

Among them, " **select similar figures** " allows you to select all figures that look similar on the drawing board, for example, first select a 5mm circle, and then click "select similar figures" to select all 5mm circles;



2.4 geometric transformation

The "Geometric Transformation" column under the common menu bar provides a wealth of geometric transformation functions. Before using it, select the graphics you want to transform.

Most common geometric transformations can be completed by clicking the "Geometric Transformation" drop-down triangle, such as mirroring, rotation, alignment, scaling, etc.

2.4.1 size modification

UltraCut provides 7 fast size transformations, which can be completed through the drop-down menu under the "Size" button. Click the small triangle under the "Size" button to open a drop-down menu, which provides an operation to change the size of the selected graphic. As shown on the right:

For example, "100mm" scales the graphic proportionally to a width of 100mm, and "2x" scales the graphic proportionally by 2 times.

If you want to input the exact size, please click the "Size" button directly, the following dialog box will appear, input the new size, click "OK" to complete the size transformation.

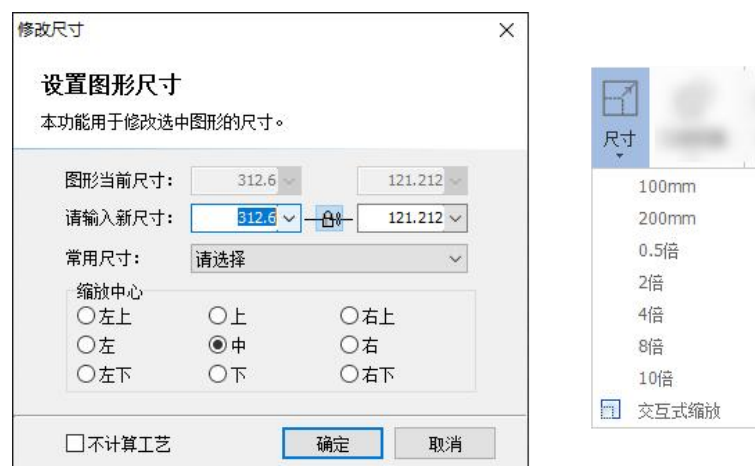


Figure 16 Schematic diagram of graphic size editing

When the lock state in the interface is , the length and width are locked according to the size of the original image. If you want to input the length and width separately, click the "   " button to unlock the state, and the button will change to the "  " state.

"Zoom Center" can specify the positional relationship between the new graphics and the original graphics after zooming. For example, if you select "Upper Left", it means that the new graphics and the original graphics will be aligned according to the upper left corner after transformation, and other parts will be scaled based on the upper left corner.

Please note: **The lead-in and lead-in lines and kerf compensation set for the graphics will not be transformed at the same time, and the values of lead-in and lead-in lines and kerf compensation will remain unchanged after the size is modified .**



2.4.2 Interactive geometric transformation

UltraCut provides 3 interactive geometric transformations, including interactive scaling, rotation at any angle and mirroring at any angle, through which more detailed geometric transformations can be achieved. Before performing these operations, first select the graphic to be operated, then click the corresponding menu or button, and then operate according to the prompts at the bottom of the screen.

For example, if a rectangle is rotated 45° based on its lower left corner, the following steps can be followed:

- 1) First select the rectangle to be operated.
- 2) Then click the small triangle under "Geometric Transformation" to open the drop-down menu, select "Any Angle Rotation", and the bottom of the screen will prompt "Please specify the base point:".
- 3) Move the mouse to the lower left corner of the rectangle, and the mouse will automatically snap to the lower left corner, as shown in the figure below:

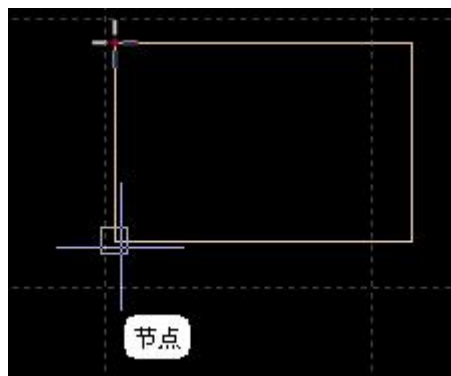


Figure 17 node adsorption schematic

- 4) Click the mouse, the bottom of the screen prompts "Please specify the rotation start point or rotation angle:"
- 5) At this time, directly enter 45 and press Enter to complete the operation.

If you do not know the rotation angle in advance, but want to rotate the rectangle to align with another figure, then the first 4 steps are the same as above, and start from step 5 as follows:

- 6) Move the mouse to the lower right corner of the rectangle, click the mouse, and a horizontal line will be formed as the starting line of the rotation.
- 7) The screen prompts "Please specify the rotation destination point". At this time, move the mouse, and the graph will rotate with the mouse. Click the mouse at the desired rotation destination to complete the operation. As shown below:

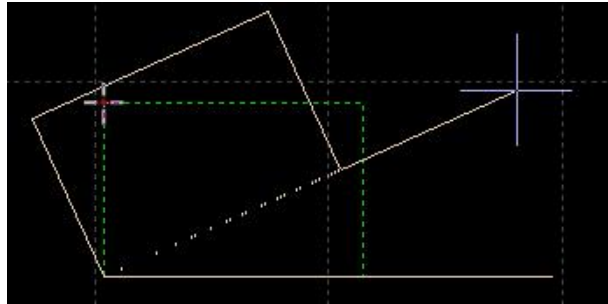
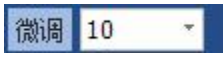


Figure 18 Graphical Rotation Schematic

The operations of interactive zooming and mirroring at any angle are similar and will not be repeated here.

2.4.3 Quick pan and copy

The UltraCut software allows you to use the direction keys to quickly pan the graphics. To use this function, you need to click the "fine-tuning" button in the lower right corner of the software interface to  change from state to  state. Only in the lighted state can the number box on the right be edited. After lighting up the "Fine Tuning" button, select the graph and press any direction key, the graph will translate a distance in the corresponding direction, and the distance parameter is input in the number box on the right side of the "Fine Tuning" button. This function can help you temporarily move a certain graphic quickly, and then focus on the design of other graphics, and then quickly move back to the original place. Since the fine-tuning distance parameters can be precisely controlled, you don't have to worry about the deviation of the graphic position. Press the arrow key while pressing the Ctrl key, the selected graphics will be copied. For example, pressing "Ctrl+Right →" will copy the selected graphic at 100mm from the right.

2.5 Coordinate and parameter input

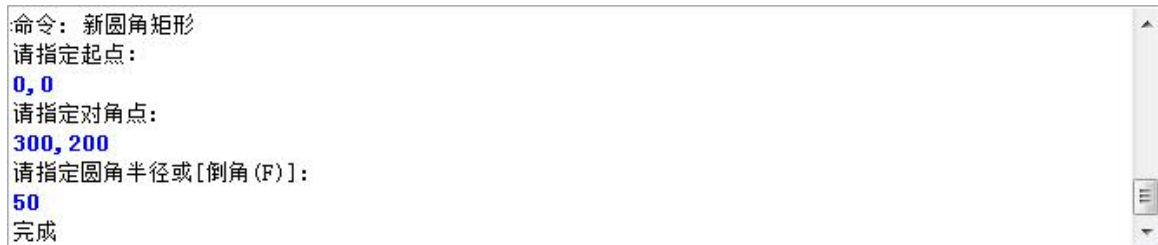
In some cases, we want to draw with precise coordinates. UltraCut allows you to directly input coordinates. The format of coordinate input is <X coordinate><comma,><Y coordinate>. For example, to input coordinates (100, 100), just enter "100, 100". The entered coordinates and parameters are shown in blue.

Most drawing operations allow both mouse manipulation and direct input of coordinates. The following demonstrates drawing a rounded rectangle with a length of 300mm, a width of 200mm, and rounded corners of 25mm.

- 1) Click the “ ” icon in the left toolbar , and the screen prompts “Please specify the starting point”



- 2) Enter the coordinates "0,0" and press Enter, and the screen will display "Please specify the diagonal point"
- 3) Enter the coordinates "300,200 " and press Enter, the screen displays " Please specify the fillet radius or [chamfer (F)]: "
- 4) Enter 50 and press Enter. All operations are completed. As shown below.



```
命令: 新圆角矩形  
请指定起点:  
0, 0  
请指定对角点:  
300, 200  
请指定圆角半径或[倒角 (F)]:  
50  
完成
```

Figure 19 Coordinate and parameter input schematic

2.6 Automatic adsorption

During the drawing process, UltraCut will provide automatic adsorption function as needed, including automatic adsorption to the grid, adsorption to the key points of the graph, adsorption to the border of the graph, etc.

You can turn off the automatic adsorption function. The operation steps are to click the "File" menu - "User Settings" - "User Parameters", select the "Drawing Tablet" tab in the opened dialog box, and cancel the " " option  关键点自动吸附. The precision of automatic snapping is also set in the above dialog box.

2.7 graphics drawing

UltraCut provides graphics drawing functions, in the middle part of the left toolbar, from top to bottom: isolated point, straight line, polyline, circle, arc, rectangle, polygon, text, standard parts, and this part is also available in the drawing module of the upper menu bar. Among them, the last 2 are removed, and the first 7 functions are standard graphics drawing, which are similar to CAD functions.

2.7.1 standard drawing

The operations of isolated point, straight line, polyline, circle, and rectangle are simple and clear, and will not be described in detail here. It is worth mentioning that there are two functions in the drop-down menu of "Circle" in the "Drawing" column: **"Replace circular positioning holes with isolated points"** and **"Replace with circles"**. The former can turn smaller circles into isolated points, and the latter can convert graphics similar to circles into circles, which is convenient for subsequent flying cutting.



请指定起点: (819.4494, 2483.6085)
请指定测量终点: (1081.5374, 2424.4496)
长度: **268.6817**, X方向: **262.0879**, Y方向: **-59.1590**

Figure 21 shows the measurement results

2.8.2 Measuring ruler



Click Common - 测量尺 (or shortcut toolbar on the left - "Measurement Ruler"), the mouse will turn into a ring-shaped measurement value, which is convenient for measuring the small distance between two graphics, such as the distance between the control track and the feedback track after error measurement. The measuring ruler function can be exited via the right mouse button.

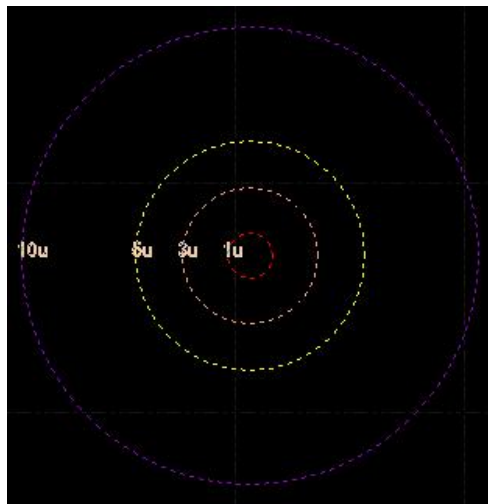


Figure 22 Measuring ruler

2.9 graphics optimization

When importing external graphics, UltraCut will automatically optimize the graphics. If you need to manually optimize the graphics, you can use the function of the "Optimize" button under the common menu bar, as shown in the figure below:



Figure 23 Graphics optimization menu

Select the graphics to be processed, click the corresponding button, and then operate according to the prompts.

2.9.1 smooth curve

Select the polyline to be optimized, then click the "  Curve Smoothing" button, a dialog box will display a prompt to enter the curve smoothing accuracy, directly enter the desired fitting accuracy and press Enter.

The figure below shows the comparison between the original curve and the smoothed curve. In order to facilitate the observation of the effect, the fitting accuracy value entered here is relatively large. In actual use, users are required to perform fitting according to the processing accuracy they need.



Figure 24 Curve smoothing

2.9.2 Curve Split

Curve splitting is to break the closed graph into two graphs, and the user can edit the two graphs separately. Click the "  曲线分割" button, and click the mouse at the position that needs to be divided. The curve splitting process can be carried out continuously until the ESC cancels the command or switches to other commands.

2.9.3 remove duplicate lines

This function is used to eliminate visually overlapping graphics to only one, and click "Remove Duplicate Lines", all graphics will be searched and cleaned.



2.9.6 merge connected lines

Graphics drawn with AutoCAD often contain visually connected, but not actually connected graphics, which can be merged by merging connected lines. Select the graphics to be merged, then click "合并相连线", enter the merge precision, and confirm.



Figure 25 merge connection lines

Please note that the visual end point of the graphic is not necessarily the geometric end point of the graphic, there may be redundant backtracking lines at the end point, these graphics need to be split by "curve splitting", the redundant graphics are deleted, and then merged.

2.9.4 remove small graphics

Sometimes the imported graphics may contain visually imperceptible graphics, resulting in a small display size, or moving to an abnormal position during processing. You can use the "remove small graphics" function to delete such graphics, click the "remove small graphics" button on the toolbar, set the graphics size range, and then confirm. Graphics smaller than this size will be deleted, and other graphics will be kept.

2.10 view

The view module can adjust the zoom, display position and order of the graphics, and can also edit the graphics. The function entry is located above the left toolbar, and from top to bottom are selection, node editing, manual sorting, panning view and zooming.



2.10.1 node edit

UltraCut provides a node editing mode for fine-tuning graphics. Select "Edit Node"  and then select the graph to see the distribution of graph nodes. Drag a node (yellow and blue rectangle points as shown in the figure below) to adjust the graph. Click the "Select"  button again to exit node editing mode.

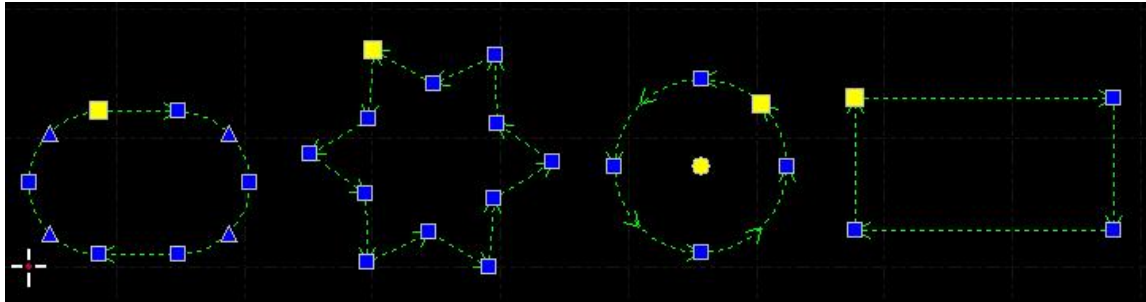


Figure 26 Node editing. Yellow is the node and the starting point, blue is the node, both can be dragged

2.10.2 Node fine-tuning and additions and deletions

After entering the node editing mode, click the fine-tuning button "  " in the lower right corner, the fine-tuning distance can be set freely, up to three decimal places can be set, and the fine-tuning distance unit is mm. The fine-tuning button is yellow when it is turned on. At this time, you can click the node to be fine-tuned, and use the up, down, left, and right keys on the keyboard to move. The distance the node moves is the fine-tuning distance.

After entering the node editing mode, it also supports the addition and deletion of nodes. In the node editing mode, double-click directly on the track to add nodes. After selecting a node, click the delete key on the keyboard to delete the node directly.

2.11 Mobile screen frame editing

UltraCut provides mobile screen frame editing function. This function needs to take effect after the platform configuration tool - other settings - check "Mobile glass cutting".

On the common page of the main menu, you can create a new mobile screen and set the selected graphics as the mobile screen. When a graphic is a mobile phone screen frame type, it can be operated with a tic-tac-toe box, a split line, an array, and a sort. These functions cover the CAD editing operation of the mobile phone screen frame, and generate the mobile phone screen to be processed into drawings that can be actually processed.

There are currently two mobile phone screen frame templates for creating a new mobile phone screen frame: notch screen and mobile phone front screen. By setting different parameters, mobile phone screens of different sizes and styles can be generated. Set as mobile phone screen can set the selected ordinary graphics as the mobile phone screen frame type. Only the mobile phone screen frame type graphics can edit the screen frame.

The tic-tac-toe box, splitting line, and array and sort operations in the screen frame of the mobile phone will be described in detail below. After the mouse selects the type of mobile phone screen frame, the screen design menu page will appear in the main menu. All screen frame editing operations are carried out in this menu page.



2.11.1 Tic Tac Toe Editing

The tic-tac-toe box is used as a cutting line around the screen frame of the mobile phone, and the upper and lower margins, left and right margins, and the extension length of the intersection can be adjusted. After selecting the screen frame of the mobile phone, you can edit the parameters of the tic-tac-toe frame.



Figure 27 Tic Tac Toe Editing

Tic Tac Toe Parameters	
top and bottom margins	The distance between the tic-tac-toe box and the upper and lower sides of the screen
left and right margins	The distance between the tic-tac-toe box and the left and right sides of the screen
Extended parameters	The distance extended at the intersection of the horizontal and vertical lines of the tic-tac-toe box

2.11.2 Trigger LineEdit

Screen frame editing supports adding a split line between the phone screen and the tic-tac-toe frame. Includes automatic, one-point, and two-point additions. You can set different ways of adding symmetry and set the angle of the cracking line to add various types of cracking lines. After the mouse selects the screen frame of the mobile phone, the cracking line editing menu will appear.



Figure 28 Trigger LineEdit

Trigger Line Parameters



automatically added	Automatically add trigger lines according to the set parameters
single point add	According to the set parameters, click the position on the screen to add the trigger line
add two points	According to the set parameters, use the mouse to specify the on-screen and off-screen positions to add cracking lines
delete	Delete: enter the delete trigger line mode, click the trigger line and delete it; Clear: delete all trigger lines
keep gap	The gap between the cracking line and the screen, effective for all cracking lines
Extension distance	The distance length of the trigger line beyond the tic-tac-toe box is valid for all crack trigger lines
Processing direction	The processing direction of the cracking line is valid for all cracking lines

2.11.3 Automatically add trigger lines

Using the function of automatically adding trigger lines, it can be automatically generated according to the set parameters. Click the Auto Add button on the menu bar to open the Auto Add Trigger Line dialog box. After setting reasonable parameters, click Edit, and the corresponding trigger line will be automatically added on the screen of the mobile phone.

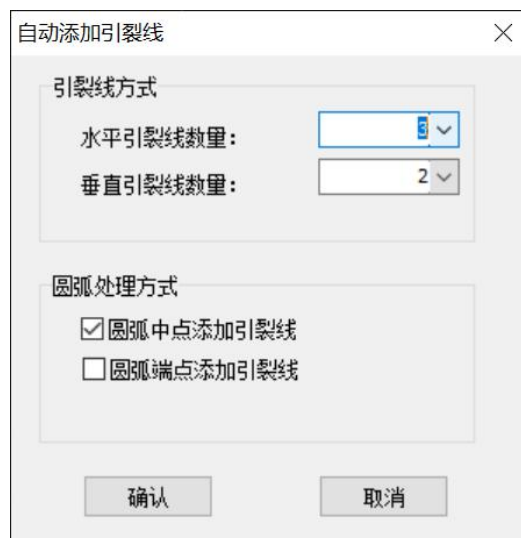


Figure 29 Automatically add trigger lines

Trigger Line Parameters	
Number of horizontal cracking lines	Number of horizontal cracking lines
The number of vertical cracking lines	The number of vertical cracking lines
Add a cracking line at the midpoint of the arc	Add a cracking line at the midpoint of the arc



Add a cracking line to the end of the arc

Add a cracking line to the end of the arc

2.11.4 Manually add trigger lines

In the edit menu bar of the screen frame of the mobile phone, there are two ways to manually add the trigger line: one-point addition and two-point addition. In the drop-down menu of manually adding cracking lines, you can choose different symmetrical adding methods, which is convenient for symmetrically adding cracking lines at the same time on the left and right or up and down of the mobile phone screen frame. At the same time, you can also specify the angle of the cracking line when adding a cracking line at a single point.

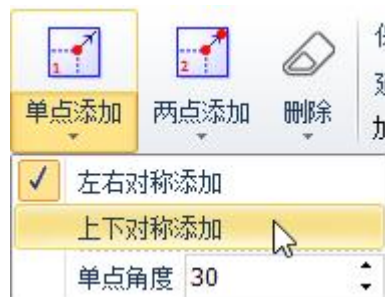


Figure 30 Edit trigger line

Manually add trigger line parameters	
Add symmetrically	Add a symmetrical cracking line at the mirror position of the screen along the vertical axis of symmetry
Add up and down symmetrically	Add a symmetrical cracking line at the mirror position of the screen along the horizontal axis of symmetry
single point angle	The angle between the cracking line and the normal of the screen frame. 0° means perpendicular to the border, counterclockwise is positive

2.11.5 screen frame array

Usually, after editing the tic-tac-toe frame and the cracking line, it is necessary to perform an array operation on this single screen frame to meet the drawing requirements for batch processing. After arraying, the well-tac-toe frames of all screen frames are merged into horizontal and vertical line arrays, and the extension relationship between the cracking lines and the array screen frames is automatically adjusted to avoid overlapping.

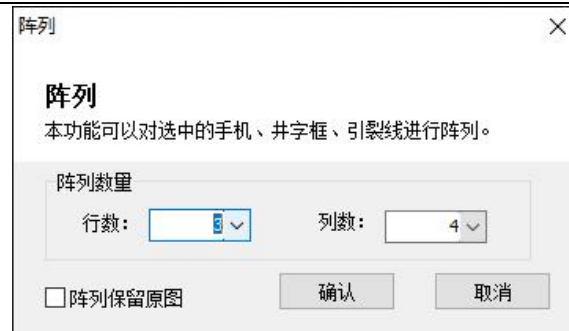


Figure 31 screen frame array

Mobile phone screen array parameters	
Rows	The number of rows of the array phone screen
Number of columns	The number of columns of the array phone screen
Array retains the original image	After the mobile phone screen is arrayed according to the number of rows and columns, the frame of the mobile phone screen before the array will be retained. Usually used in occasions that need to adjust the process of the mobile phone screen frame

2.11.6 Toolpath sorting

Tool path sorting is used to adjust the processing sequence after the array of mobile phone screen frames is completed, so as to improve the processing efficiency of mobile phone screen frames. Currently, two toolpath sorting methods are provided: intelligent sorting and single-screen priority sorting. Click the tool path sort drop-down menu to select.



Figure 32 Screen frame tool path sorting

Mobile screen sorting parameters	
Smart Sort	Sort in the order of all mobile phone inner holes-screen-leading lines-tic-tac-toe boxes in the array
Single screen priority	Sorting in the order of the inner hole-screen-leading line-tic-tac-toe frame of a single mobile phone, and process each mobile phone screen frame in turn



三、 Process Settings and Tools

This chapter introduces the process setting related functions provided by UltraCut. Since most of the process parameters are directly related to the material to be cut, the laser used, the air pressure, etc., please set it according to the actual process requirements. All parameters mentioned here, including those in the pictures, are examples only and should not be considered as guidance parameters.

warn! **Inappropriate or wrong parameters may lead to poor cutting effect or even damage the machine tool**, please set carefully.

3.1 running line

The run-up function (lead-in and lead-out line) can achieve uniform dots at the beginning and end of the graph by adding a section of unlit lead at the beginning and end of the graph.

After selecting the graph, click the "Running" button on the "Common" menu page - Process Settings to enter the setting page of the running line.

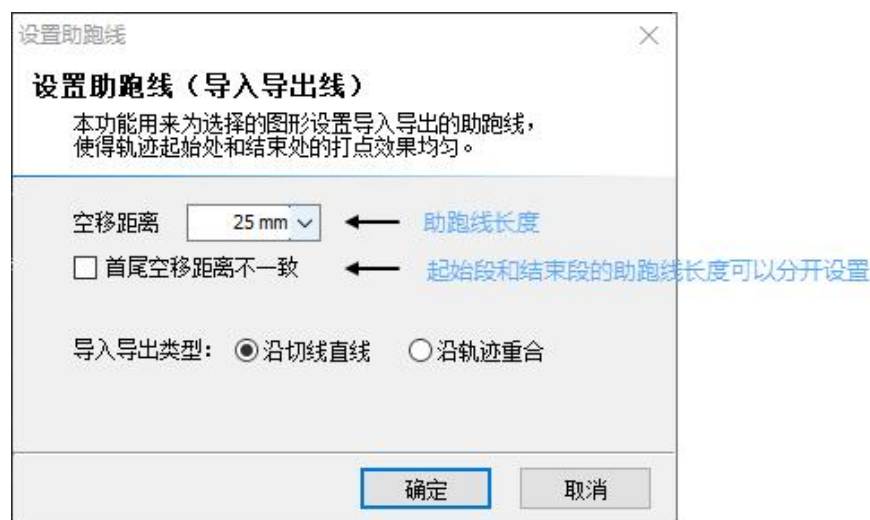


Figure 33 Run-up line setting page

3.2 Lead-in and lead-out lines

3.1.1 Distinguish between inner and outer molds and positive cutting/undercutting

When opening external files such as DXF, UltraCut will automatically distinguish between inner and outer molds. If the graphic is changed during the editing process, resulting in a change in the relationship between the inner and outer dies, and you need to distinguish the inner and



outer dies again, click the "Sort" button, and any sorting method can distinguish the inner and outer dies (you need to check the "Distinguish inner and outer dies when sorting", this option is located in the drop-down menu of the sort button, and it is checked by default), or directly click the "Leader" button to drop the triangle and select "Distinguish inner and outer dies".

UltraCut distinguishes inner and outer molds according to the enclosing relationship. The outermost layer is always regarded as the outer mold, the next layer of the outer mold is the inner mold, the next layer of the inner mold is the outer mold, and so on. Unclosed graphics cannot form a layer. If you want to start yang cutting from a certain layer, you can select all graphics starting from this layer and inside, group them, and then distinguish the inner and outer molds by "sorting within the group".

When adding leads, the outer mold is positive cut and introduced from the outside, and the inner mold is negative cut and introduced from the inside. To manually set the yin and yang cuts, please select the graph to be set, and then click the " " button under the common menu bar



3.1.2 Automatic lead-in and lead-out lines

Select the graphics that need to set lead-in and lead-out lines, then click the icon " " under



the common menu bar , and set the parameters of lead-in and lead-out lines in the pop-up window, as shown in the figure below:

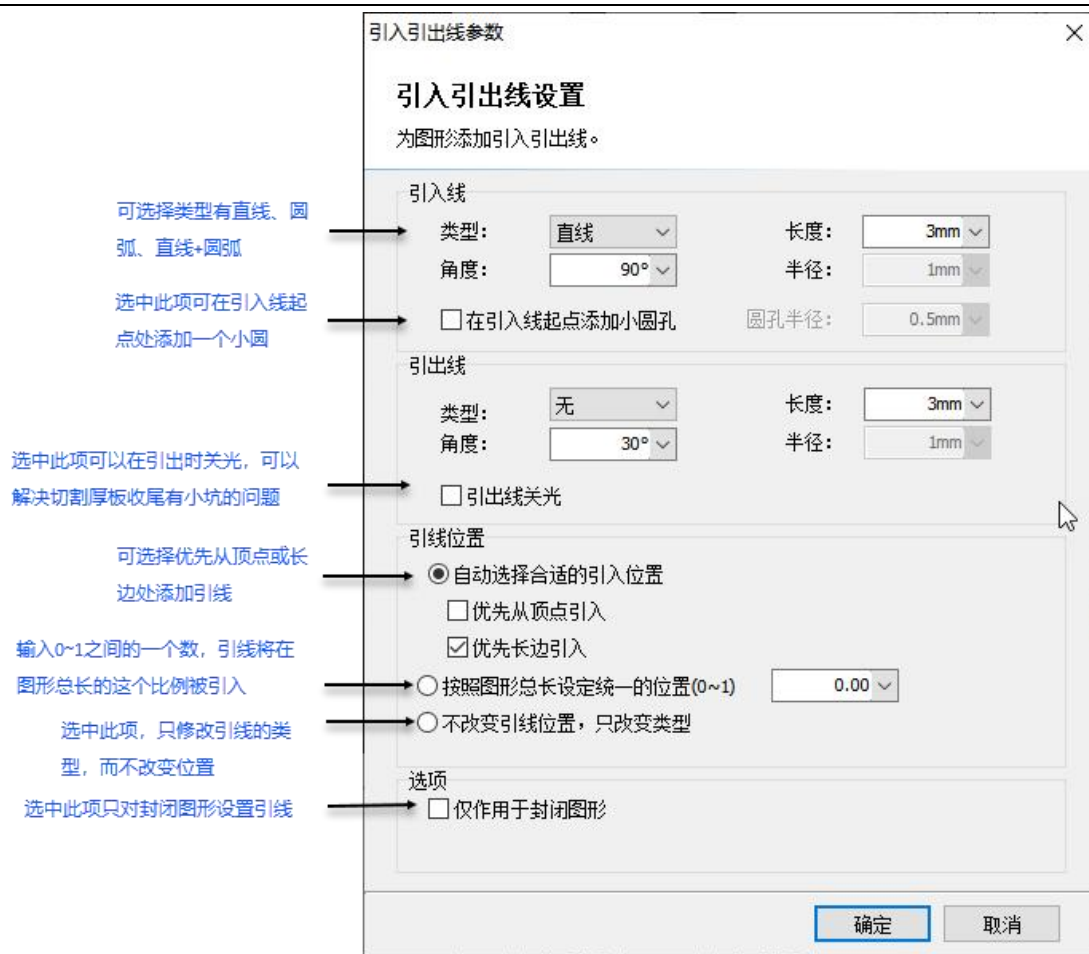


Figure 34 Lead-in and lead-out line settings

Supported leader types include arc and line, and line and arc, and supported parameters include leader type, angle, length, and radius. You can also choose whether to add a small round hole at the start point of the lead-in line.

When the arc introduction is selected, no matter how large the set angle is, the end of the arc will remain tangent to the figure to be cut, as shown in the right figure. The angle set at this time is actually the angle between the line connecting the start point and end point of the lead line and the graphics to be cut. Pinouts are similar.

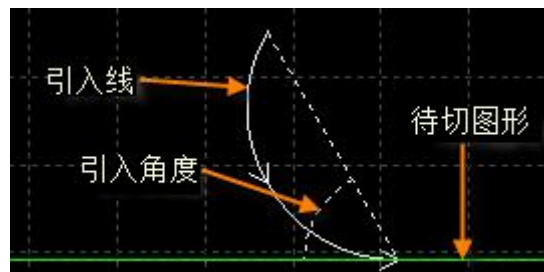


Figure 35 lead-in schematic

Please note that the automatic selection of the appropriate import position will determine the import position of the graph according to the preset priority vertex or priority long edge, so the previous parameters such as the import position and type of the graph will be overwritten. If



you have fixed requirements for the position of the lead, you can choose to set a uniform position according to the total length of the graphic or not change the position of the lead, but only change the type option.

3.1.3 Manually set the lead-in line

Click the " " button on the tool bar  起点 to modify the lead-in line manually. Clicking on the graph means to modify the position of the lead-in line, but not to modify the angle and length.

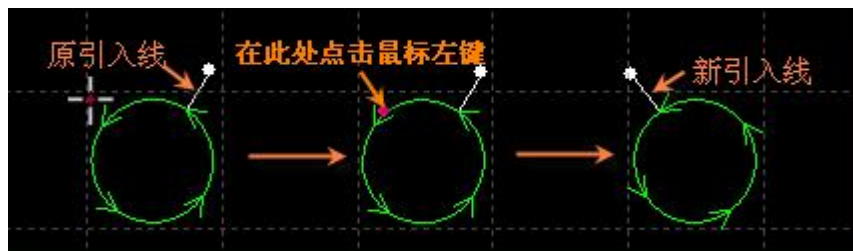


Figure 36 Manually edit the position of the lead-in line

First click (point A, yellow point) outside the graph, and then click (point B, red point) on the graph, which means drawing a straight line from outside the graph to the graph.



Figure 37 Manually add an incoming line

3.1.4 Check the lead-in and lead-out lines

Click the small triangle under the "Leader" button, and then select "Check Lead-In" to check the legality of the lead-in and lead-out lines that have been set. This function will shorten the lead-lines that are too long to avoid intersecting with other graphics . Click "Distinguish inner and outer molds" to determine the specific position of the lead according to the set inner and outer molds.

3.3 Kerf Compensation

Select the graphics to be compensated, and then click the "  补偿 " button on the tool bar to perform slot compensation.

The width of the kerf should be measured according to the actual cutting results. The compensated trajectory is displayed in white on the drawing board, and the compensated



trajectory will be run during processing; the compensated original image will not be processed, and it will only be displayed on the drawing board for easy operation.

The direction of slotting compensation can be selected manually, or can be automatically judged according to positive cutting and negative cutting, the inner mold shrinks inward, and the outer mold expands outward.

During kerf compensation, you can choose whether to round the corner or make a right-angle transition, as shown in the figure below:

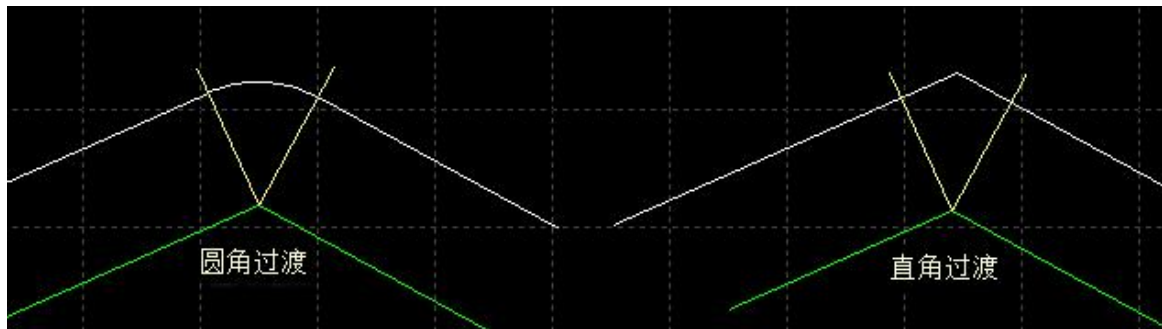


Figure 38 Corner transition type in slot compensation

The green in the figure is the original image, the white is the track after compensation, and the light yellow is the vertical line drawn from the corner of the original image. It can be seen from the figure that after the compensation on both sides of the vertical line, the edge of the kerf can be guaranteed to coincide with the original image, but a transition is required at the corner. Usually, the fillet transition can ensure that the edge of the kerf still coincides with the original image during the transition process, and the operation is smoother.

For the convenience of selection, common compensation values can be edited under common configuration.

To cancel the compensation, please select the graphic that needs to be canceled, then click the "Clear" button, select "Cancel Compensation" or directly select the "Cancel Compensation" button under Kerf Compensation.

3.4 round corner

Click the " " button on the toolbar  to convert sharp corners into rounded corners.



Figure 39 Rounding

3.5 group

The "group" in UltraCut refers to the combination of multiple graphics, or even multiple "groups" to form a "group". The entire "group" will be viewed as a whole. The internal order of the "group", the positional relationship between graphics, and the layers are all fixed, and the interior will not be affected during operations such as sorting and dragging.



Select the graphics that need to be grouped, and then click the " 群组 " button to combine the selected graphics into a group. If you need to break up the group, please select the group



graphic, and the original "Group" button will become a " 打散 " button. To break up all groups on the drawing board, click the small triangle under "Groups" and select "Split All Groups".

"Break" does not break up any curves, only the part that has been grouped. And "Explode Graphics" will explode the graphics into line segments one by one.

If there is a figure in the "group" that can contain all other figures, it is called the outline. A "group" with an outer contour can be considered a "part".

Although UltraCut software allows arbitrary graphics to be grouped and operated as a whole, it is still recommended that users use the group function "logically" and try to only group graphics that meet the logical conditions of "parts". In the future we may use the terms "group" and "part" indiscriminately.

3.5.1 Sorting of groups

The parts are sorted as a whole, based on the outer contour or the first graphic, and the order of the graphics inside the part will not change during the sorting.

If you need to sort the graphics inside the group without breaking the group, you can select the group, right-click, and select "Sort Inside the Group".

The "Sort Inside Group" operation will not change the order of graphics in subgroups within a group. The order of "group internal sorting" is only related to the geometric characteristics of



the graphics, and has nothing to do with the layer to which it belongs. The sorting process automatically distinguishes the inner and outer molds according to the geometric inclusion relationship.

3.5.2 Processing of groups

The group (part) is processed as a whole, and the processing is completed continuously. No other graphics will be inserted during the processing. Even if the group (part) contains graphics of multiple layers, they are processed continuously. Group pre-punching also follows this rule.

Please note that regardless of the graphics order inside the part, the outer contour of the part is always processed last, please sort it before processing.

3.6 scan/fly cut

When the graphics to be cut are regular graphics (such as rectangles, full circles, polygons) and are arranged regularly, connecting the line segments in the same direction through scanning and cutting for flying cutting will greatly increase the cutting speed and save cutting time.

Before scanning and cutting, it is recommended that users sort the graphics that need to be scanned. This operation can optimize the path of scanning and cutting and save time for moving.



Click the " " button under the common menu bar  or the "Precise Scan" option in the drop-down menu to enter the precise scan parameter setting interface.

3.6.1 Interface and entry

1. Entrance

generate:

Main interface - Common - Tools - Scan (-/Precise Scan)

Main interface - common - process settings - run-up

Main interface-common-tools-optimization-transition line

Clear:

Main interface - common - process settings - clear - clear the new version of the scan line

2. interface



Figure 40 Precision scan interface

3. show

The scan line display is the same as the old version, and the dotted line indicates the scan line.

Select the graph with the mouse and hover over the graph, and the currently used scanning parameters will be displayed.

3.6.2 Usage _

1. generate

Select the graphic you want to set, click the corresponding button (scan, etc.), set the parameters, and click OK.

Allows the user to reorder, adjust the starting position, set compensation, reverse, move graphics, proportional zoom, etc. (but not common with the lead) after the setting is completed, and the scanning path will be updated in real time after these operations.

It is allowed to reset the parameters locally in the fly-cutting. You can select one/some graphics in the scanning graphics and reset the parameters. These graphics will use new parameters and can form a scanning whole with the old parameter graphics.



It is allowed to add a new graphic into the overall scan, only need to set the scan parameters of the graphic, and then adjust the cutting order of this graphic to the overall range of the scan.

2. to clear

Select the graphic you want to clear, and click the Clear New Scan Line button.

3. undo restore

Right-click drop-down menu, Undo/Redo.

Shortcut key, Ctrl+Z/Ctrl+Y.

4. Detailed parameters

Common parameters	
general-sort	After checking, you can choose the sorting method, and the selected graphics will be reordered before generating scan lines
General - read selected graphics parameters	If you select the graph, you have set scan, run-up, and transition before, and if you check this function, you can directly read the parameters of the first set graph
Transition Line - Maximum Radius	Default radius of curvature to use when generating transition lines
Transition Line - Allows automatic reduction of radius	After enabling this function, if the maximum radius cannot generate a reasonable transition line, it is allowed to automatically reduce the curvature radius limit until a reasonable transition line is generated or the set minimum radius is reached
Transition Line - Minimum Radius	If it is enabled to allow automatic radius reduction, you need to set the minimum radius of the search to prevent the cutting from being stuck due to too small a curvature
Run-up line - along the original shape/tangent direction	The run-up line coincides with the figure or extends along the tangent direction of the starting point
Run-up line - lead-in length	Run-up line length before processing graphics
Run-up line - lead-out end length	Run-up line length after graphics processing
advanced parameters	
General - break up the group	The selected group can be broken up, and the graphics in the group can be scanned
General - Expand Graphics	The selected graphics can be exploded into multiple segments, and the exploded graphics can be scanned
General - Automatically plan the direction and starting point of the	The algorithm will automatically modify the starting point and direction of the graphics to generate a more reasonable scanning path



graph	It is recommended to check
Transition line - maximum deflection angle of single-ended transition line	The cumulative deflection angle in a transition line, if it exceeds the set value, it will be judged that the planning is unreasonable and no transition line will be generated; it is used to prevent the generation of transition lines that go around multiple turns
Run-Up Line - Use Length Limits	After checking, you can set the maximum length/total length of a single graphic to ensure that the running line of each graphic does not exceed the total length of the graphic multiplied by this ratio
*Running line - additional extension of the first and last running line	After checking, it is allowed to extend the run-up line at the lead-in end without a transition line in front and the run-up line at the lead-out end without a transition line in the back, which is used for acceleration and deceleration to ensure the stability of the speed of the non-extended part of the run-up line, thereby improving the processing quality
*running line - lead-in length	Extra extended length of run-up line before processing graphics
* run-up line - export segment length	Extra extended length of run-up line after graphics processing

Note: *The function is not compatible with cross-group fly-cutting, and software versions 7.7.4 and earlier do not support it

5. Precautions

(1) The structure of the new scan line is completely different from that of the old scan line

The new version of scan lines is no longer a group, and cannot be cleared by using the clear of the old version of the scan lines, nor can it be cleared by breaking up, and it is also impossible to select all the scan graphics by selecting a certain scan graphic.

Newer version scan files cannot be opened correctly by older versions.

(2) Support across groups

The scanning lines between different groups will be regenerated according to the visual positioning results after visual positioning.

(3) Reordering will affect the cutting path

If the sorting rearranges the processing order of graphics, it will affect the effect of scan line generation, so after re-sorting, it is necessary to check whether the effect of scan line generation is reasonable.

3.6.3 New version scan example image

1. Array Circle Fly Cut

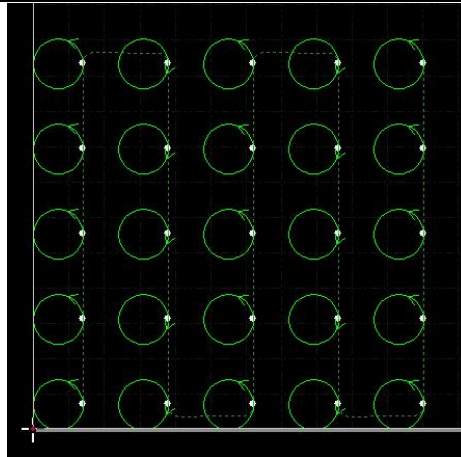


Figure 41 Effect drawing of array circle flying cut

Parameter setting:



Figure 42 Array circle flying cutting parameter setting

2. Array Runway Fly Cut

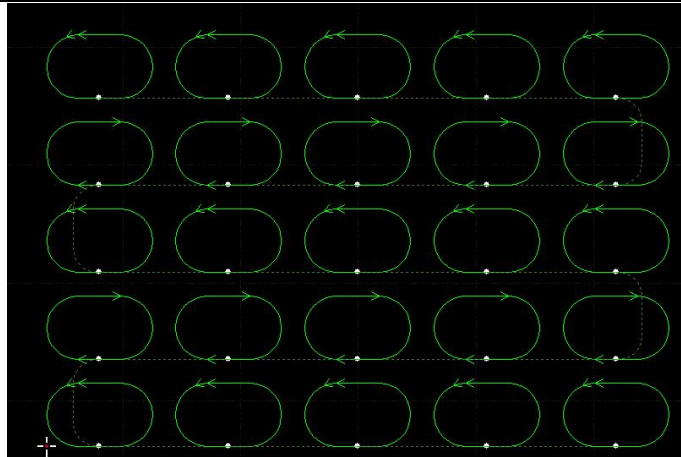


Figure 43 Effect drawing of array runway flying cut

Parameter setting:



Figure 44 Array runway flying cut parameter setting

3. running line

There are transition lines in the following figure, in order to facilitate viewing the position of the run-up line

Along the original graph:

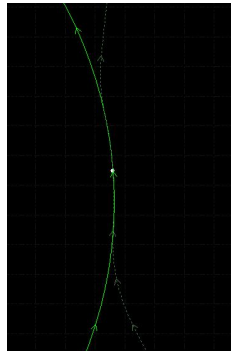


Figure 45 Run-up line along the original graph

Tangent direction:

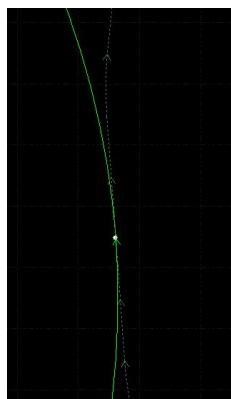


Figure 46 Run-up line along tangential direction

4. auto shrink radius

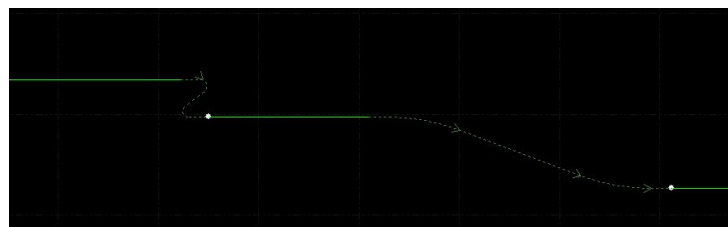


Figure 47 Automatic radius reduction effect diagram

The scan line on the left is the transition line generated after the radius is automatically reduced.

5. Failed to generate eligible transition lines



Figure 48 cannot generate transition line renderings

The section on the left cannot generate a transition line that meets the conditions, leaving only the run-up lines of the front and back graphics.



3.6.2 Linear scanning

the “Linear Scan” option in the drop-down menu of the “ ” button under the common



menu bar to enter the linear scan parameter setting interface. 扫描

直线扫描

直线扫描

本功能实现对规则的阵列图形进行直线扫描切割。

起刀位置

☒ 左上

☐ 右上

☐ 左下

☐ 右下

允许距离偏差:

10

光滑连接最大距离:

30

☐ 跑道形飞切

最大飞行线长度:

30

确定

取消

Figure 49 Line scan parameter setting page

Linear Sweep Parameters	
Starting position	Set the start position of sweep cutting
Smooth connection maximum distance	Steering pitches smaller than this value can use smooth connections
Maximum scan line length	Takes effect when runway scanning is enabled. Indicates the maximum distance two graphs can be connected. If the distance between two graphics in the drawing is greater than the set value, the linear scan cannot be set

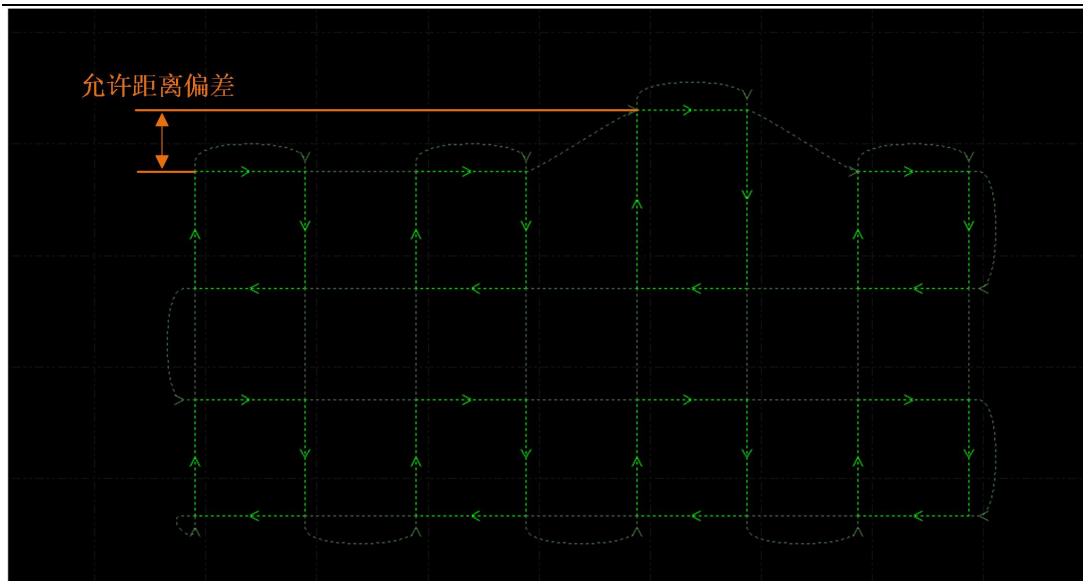


Figure 50 shows the effect of linear scanning

3.6.3 Arc scanning

the “Arc Scan” option in the drop-down menu of the “ ” button under the common



menu bar to enter the arc scan parameter setting interface. 扫描

圆弧扫描

圆弧扫描

本功能实现对圆按顺序进行扫描切割。

连接两圆最大间距: 50

☒ 圆弧先排序再扫描 从上到下

☒ 按零件扫描

确定 取消

Figure 51 Arc scan parameter setting page

Arc Sweep Parameters	
Maximum distance connecting two circles	The maximum distance two circles can be connected. If the distance between two circles in the drawing is greater than the set value, the arc sweep cannot be set
Arcs are sorted first and	When enabled, the selected graphics will be sorted according to the



then scanned

sorting method on the right before scanning

The scan cutting overcut distance can be set in the global parameters, so that the parts can fall off better.

3.7 array

"Array" command can be used to quickly and accurately copy an object, and UltraCut provides two array methods.

3.7.1 rectangular array



Click the " 阵列 " button or "Rectangular Array" in the "Array" drop-down menu, and the parameter interface will appear as shown in the figure below:

Figure 52 Rectangular Array Setup

After setting the number of rows, columns, offset and direction, the selected graphics can be quickly copied, as shown in the figure below:

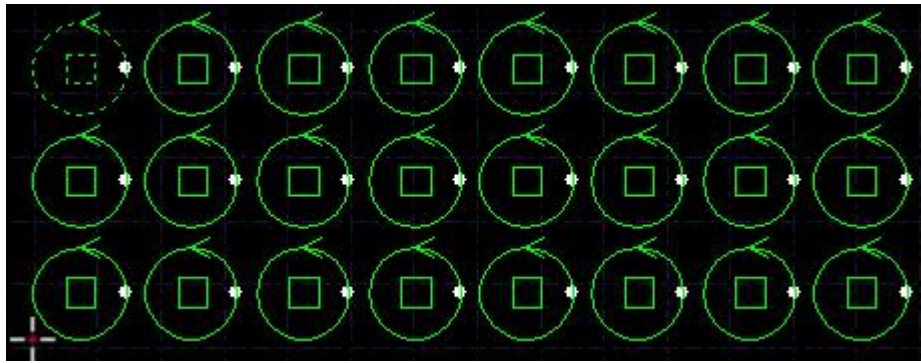


Figure 53 Schematic diagram of the effect of a rectangular array

3.7.2 interactive array

Click "Interactive Array", set the row spacing and column spacing, and then drag the mouse to delineate the area and quickly copy the selected graphics in an array. As shown below:

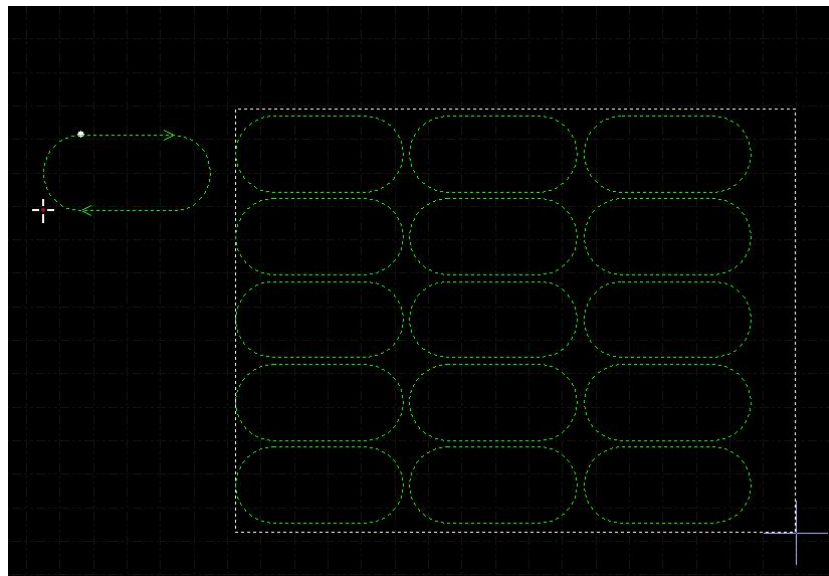


Figure 54 Schematic diagram of interactive array effect

3.8 Bulk edit

For the process modification of similar graphics, you can use the "batch modification" function to improve the drawing efficiency. The following figure is an example: after selecting



the graphics, enter the batch modification interface, and after setting the lead , it will take effect



for multiple similar graphics at the same time .

Figure 55 Batch modify function location

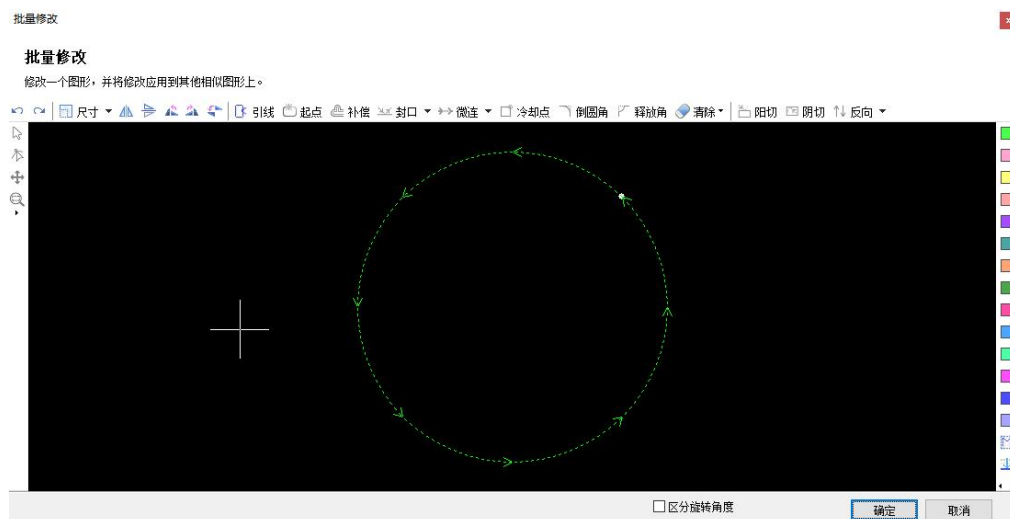


Figure 56 batch modification interface

3.9 Sorting and Path Planning

You can find the column shown in the figure below in the "Drawing" tab of the toolbar, which lists all the functions of sorting, and there are tools for graphic alignment in the upper part, as shown in the figure below:

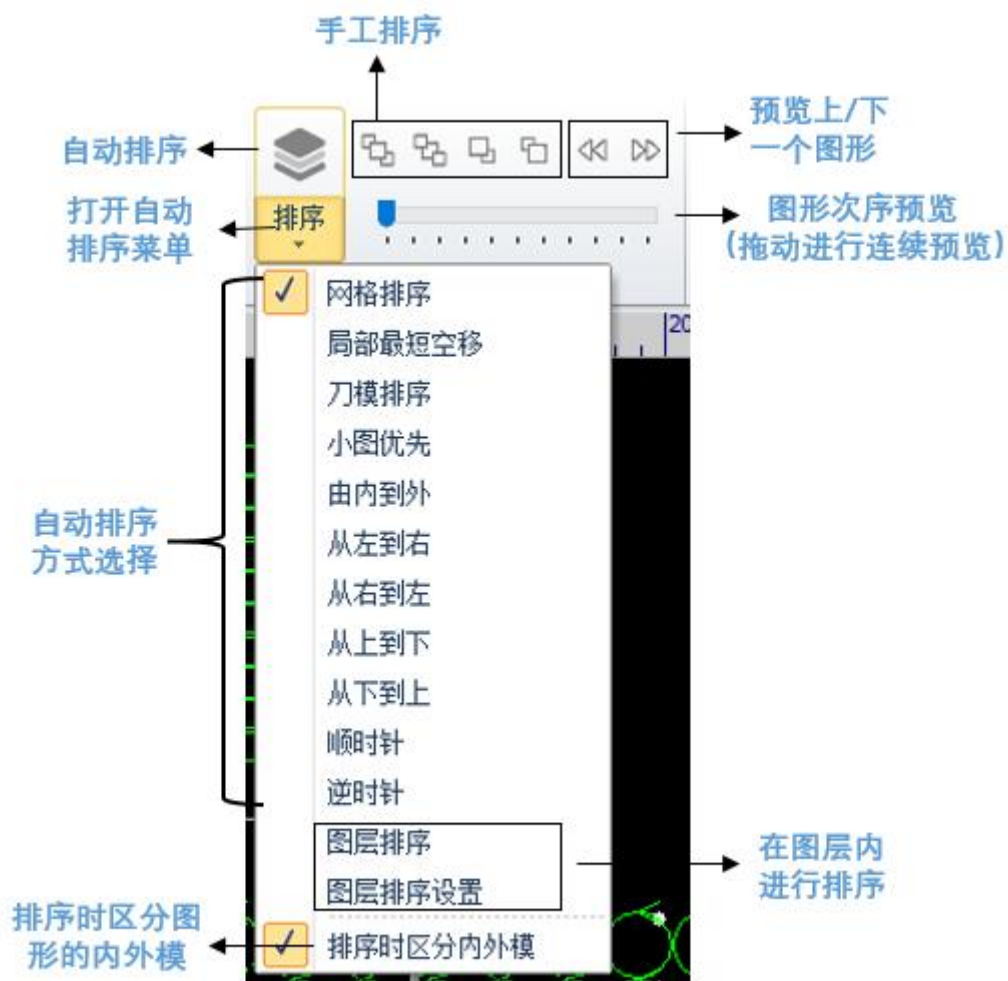


Figure 57 Sorting

For the rules of group sorting, please refer to the "Group" section. If there are no special requirements, it is recommended to choose the "Grid Sorting" method.

3.9.1 sequence preview

Drag the progress bar of "Graphic Sequence Preview" or click   the button " " to preview the processing sequence. The figure below demonstrates the screen when a part is previewed:

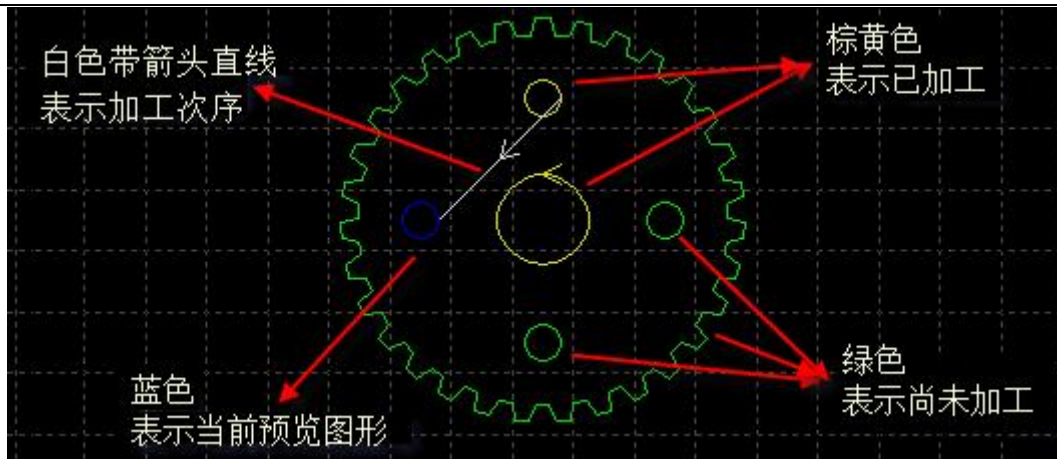


Figure 58 Sequence preview when sorting

Sequential preview is fully interactive and easier to control than analog processing. You can also zoom in on the position you want to observe carefully and preview forward and backward repeatedly. Open the “ ” button in the drop-down triangle of the “Display” button under the common tool bar  to display all the moving paths and help to view the overall processing sequence.

3.9.2 manual sorting

If you want to fine-tune the results of automatic sorting, you can use manual sorting, first select the graphics to be adjusted, and then click the



button in “ ”, the functions of the four buttons from left to right are as follows:

move to the front		Move the selected graphics to the first processing
move to the end		Move the selected graphic to the last processing
forward one		Move the processing order of the selected graphics forward by one
backward one		Move the processing order of the selected graphics backward by one

Please note that no matter how you move it, the order of the graphics can only be changed within the layer it belongs to. The overall order between layers can be adjusted in the “Layer Parameter Settings” dialog box, see the section “Process Parameters ”.

After the sorting is completed, click the “  ” button to view the previous/next graph under this sorting.



In addition to manual sorting in fine-tuning mode, manual sorting can also be performed more intuitively through the "manual sorting mode". Click the " " button on the left tool bar of the main interface to enter the "manual sorting mode", and the empty moving path and graphic sequence number display will be automatically opened on the screen. According to the order you want, you can set the graphics processing order by clicking with the mouse one by one. If you accidentally make a mistake, just click again or right-click to cancel from the wrong place. If you just want to adjust the order between two graphics, you can hold down the mouse and draw a straight line from one picture to another to set the order between the two pictures. As shown below.

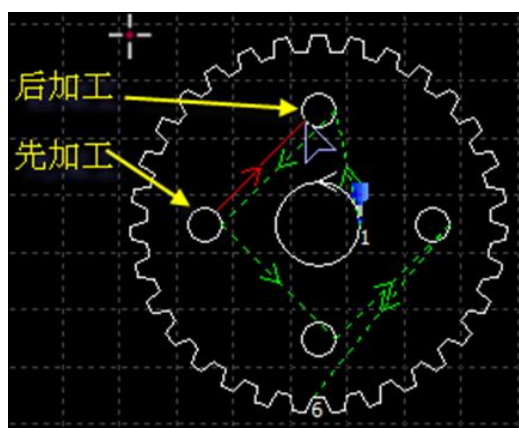


Figure 59 Manual sorting

3.9.3 partition sort

If you want to fix the order of a certain part, you can select the graphics that need to be fixed in order, and then click "Group", then the order between them will remain unchanged, and subsequent manual sorting and automatic sorting will not affect the interior of the group. Please note that after grouping, all graphics in the group will be processed continuously from the first to the last, and graphics not in the group will not be processed during this period.

If you want to automatically sort only a certain part of the graphics without affecting other parts, you can also complete it through groups. Select the graphics that need to be automatically sorted, click "Group", then right-click the group, and select "Sort within the group".

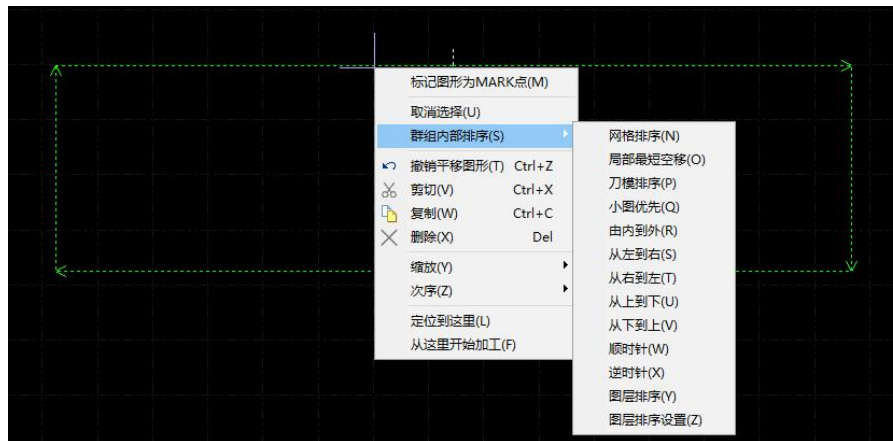


Figure 60 Sorting within groups

3.10 PSO process parameters

UltraCut provides PSO process parameter settings during processing , and presets 4 layer processes, including mobile phone frame process, well-shaped frame process, cracking line process, and inner hole process. The process layer also supports setting parameters such as speed, altitude, and P SO mode. The process also includes a cutting process and a cutting sub-process, which can be freely enabled according to different usage scenarios.



图层参数设置

全局参数 工艺1

从文件读取 保存到文件

☐ 裂片 ☐ 不关气 ☐ 不加工 ☐ Z轴保持

切割 切割子工艺

运动参数

切割速度: 100 毫米/秒

切割高度: 32.8 毫米

精密切割参数

☒ 启用精密切割

☐ 圆弧匀速

☐ 圆弧处自动降速

☒ 样条拟合精度 0.005 毫米

☐ PSO进阶参数

PSO和激光器参数

出光模式: 4 TRIG

出光间距: 4 微米

重频频率: 100 kHz

峰值功率: 50 %

Burst个数: 10

☒ 图层独立运动参数

加速度: 999 毫米/秒²

低通滤波: 5 Hz

拐角控制精度: 0.01 毫米

圆弧控制精度: 0.005 毫米

推荐切割速度(毫米/秒): 400 / 200 / 133.333 / 100 / 80 / 66.667 / 57.143 / 50 / 44.444 / 40 / 36.364 / 33.333 / 30.769 / 28.571 / ...

用户备注

确定(O)

Figure 61 layer process parameter setting page

3.10.1 Parameter Description

motion parameters	
cutting speed	Set the actual processing target speed, it is recommended to use the parameters in the recommended cutting speed group for setting
cutting height	Set the Z-axis coordinates during processing
PSO parameters	
light mode	Commonly used patterns are 3/4/13/14/5 ; _ 3 TRIG+ means that the repetition frequency synchronization signal of the laser is connected, and the output trig signal with a pulse width of 1us is used for light control; 4 TRIG represents the repetition frequency synchronization signal that is not connected to the laser, and the output trig signal with a pulse width of 1us is used for light control; 1 3 GATE+ means that the repetition frequency synchronization signal of the laser is connected, and the output pulse width



	is the signal corresponding to the cycle time of the current repetition frequency for light control; 1 4 GATE represents the repetition frequency synchronization signal that is not connected to the laser, and outputs a signal with a pulse width corresponding to the cycle time of the current repetition frequency for light control; 5 CO2 compares points at each position, and outputs a signal whose high level time is "pulse width" to emit light , which is generally applicable to CO2 lasers; If you need to adjust the pulse width of the signal in T RIG mode, you can modify it on the platform configuration tool-laser page
Light spacing	Control the point spacing of the actual light output, and note that the best point spacing is an integer multiple of the resolution of the grating ruler reading head
Repeat frequency	This parameter needs to be consistent with the repetition frequency set by the laser. In the current version, the software supports writing the parameters of Han' s Draco, Huari, Zhuo Lei, and Inno lasers (you need to select the corresponding laser in the platform configuration and confirm that the communication with the laser is normal)
Pulse Width	The high level time of the optical signal. Mode 2 and Mode 5 support this parameter
Precision Cutting Parameters	
Enable precision cutting	The instruction accuracy of speed planning can be increased to the order of um
Arc constant speed	Machining straight line to arc, and arc to line graphics, so that the acceleration and deceleration process does not occur on the arc, which will affect the overall processing efficiency
Automatic deceleration at arcs	Improve the accuracy of the arc dot spacing, reduce the speed on the arc to the closest recommended speed, and perform arc processing at a uniform speed, which will affect the overall processing efficiency
Spline Fitting Accuracy	Enabling the NURBS spline interpolation method can improve the processing speed and smoothness of graphics . After enabling, you can set the accuracy of spline fitting, it is recommended to enable, the default value is 0.005 mm
scan line speed	Set the motion speed at the scan line



Layer Independent Motion Parameters		
Layer Independent Motion Parameters		Independent motion control parameters for each layer, use global settings when unchecked
PSO Advanced Parameters		
octave		Use octave frequency sampling for the encoder signal, only check to enable this function when sincos simulates the encoder
P SO clock		It can only be turned on when the laser supports external control of the repetition frequency signal. After turning on, the control frequency and pulse width time can be set.
Laser parameters		
peak power		The software sets the peak power of the laser. In the current version, the software supports writing the parameters of the Han' s Draco, Huari, Zhuo Lei, Inno, and Guoshen lasers (you need to select the corresponding laser in the platform configuration and confirm that the communication with the laser is normal)
Number of Bursts		Special parameters of some lasers
other		
Recommended Cutting Speed		Multiple sets of recommended cutting speeds; if the current cutting speed is not the recommended cutting speed, it will be marked with a red prompt, click "... " to view more recommended speeds

3.10.2 cutting sub-process

UltraCut provides the cutting sub-process function, which supports the process of processing different heights on the same track, so as to adapt to the processing of thicker materials. It supports up to 4 levels of sub-processes. After setting, different processes can be used on the same track to process multiple times.



Figure 62 sub-process parameter editing page

3.10.3 Fragmentation

The slitting function is applicable to the scene where the system calls the slitting head to perform slitting after cutting, and the system will perform slitting along the cutting track according to the slitting process.

After the "split" function is enabled on the platform configuration tool-laser configuration page (see 1.5 laser configuration for details), the relevant parameters of the split head will be displayed in the global parameters (see 4.9 global parameters for details), and the "split" switch as shown in the figure below will also be displayed on each layer process page. Check "Split", and additional slivers will be performed after the graphics of this process are cut.

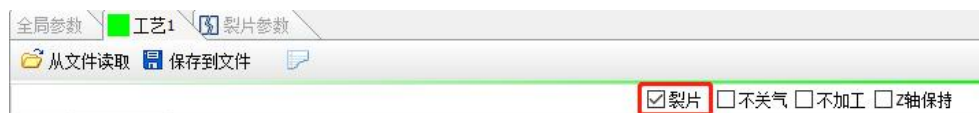


Figure 63 Open the split process

Any layer process that enables the "split" process will open the sliver parameter setting page. The light output mode of the split craft is fixed at mode 5.

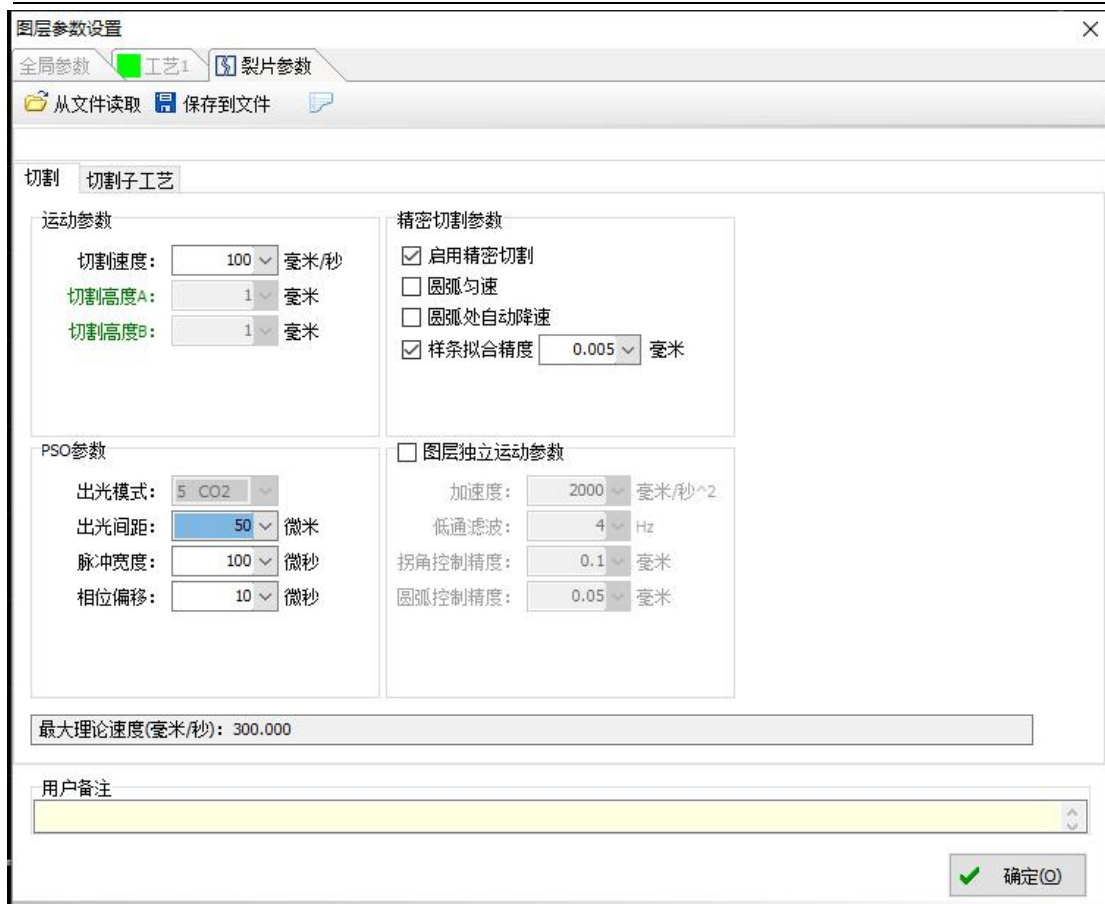


Figure 64 Fragment parameter setting page

3.11 programmable point

Programmable dots plan the entire trajectory in segments, and can independently plan the cutting speed and dot spacing of different areas in a single graphic.

Click the shortcut key “” on the left to enter the programmable point function. At this time, the upper operation bar will add a menu bar of "Variable Speed Change Point Spacing Edit".



Figure 65 Programmable point parameters

Click "Start Setting" to enter the edit programmable point mode. In this mode, programmable points can be added, deleted, moved, and regression points can also be added.



Figure 66 Edit programmable point mode (the shape of the mouse is a dotted cross)

Add programmable points: click a certain point in the graph. If there is no programmable point at the clicked position, add a programmable point; if there is a programmable point at the clicked position, modify the setting of the point according to the current speed and point spacing.



Figure 67 Effect diagram of adding programmable points

Delete programmable point: hold down the Shift key and click a certain programmable point in the graph.

Move a programmable point: Hold down the Ctrl key, click on a programmable point and drag.

Add a regression point: hold down the Shift key and click a point in the graph. If there is no programmable point at the click position, add regression points (velocity and point spacing are both regression layer parameters).



Figure 68 Effect diagram of adding regression points

Exit the programmable point function: click the shortcut key "  " on the left; or click the "exit edit programmable point" mode in the right-click menu of the mouse.

1.3 Parameter description

Programmable Point Parameters	
programmable point	You can set the starting point of the area line segment with independent speed and point spacing parameters
regression point	The starting point of the line segment of the area where the speed, point spacing parameters and layer parameters are consistent
speed	Cutting speed from the current programmable point to the next programmable point
dot pitch	Dot spacing from the current programmable point to the next programmable point
start setting	Enter the programmable point editing mode. In this mode, you can add, delete, move programmable points, and add regression points
apply to similar shapes	It can be set after selecting a graphic. After clicking, the process (including programmable points) of the selected figure will be applied to similar figures in the drawing

display rules	
line color	The color of the line ranges from green to red, with the faster the speed (the greater the distance between points), the darker the red.
line bold	Line segments that are consistent with the layer parameters will be displayed in bold
text color	White indicates speed; yellow indicates dot spacing
font size	If the speed is currently being set, the speed text will be enlarged; if the point spacing is currently being set, the point spacing text will be enlarged
prefix letter	"S" indicates the starting point; "R" indicates the return point



四、 Process control

UltraCut is a set of software that integrates design and processing control. All the graphics and parameter preparation mentioned above can be carried out without the machine tool. After all the design is completed, the file can be saved, and then opened on the machine tool for processing.

4.1 Coordinate System

The "model coordinate system" used in the graphic design process has nothing to do with the machine tool, and its zero point is marked by " " on the screen . The coordinate system used in the machining process is associated with the running state of the machine tool. The correspondence between the two coordinate systems is as follows:

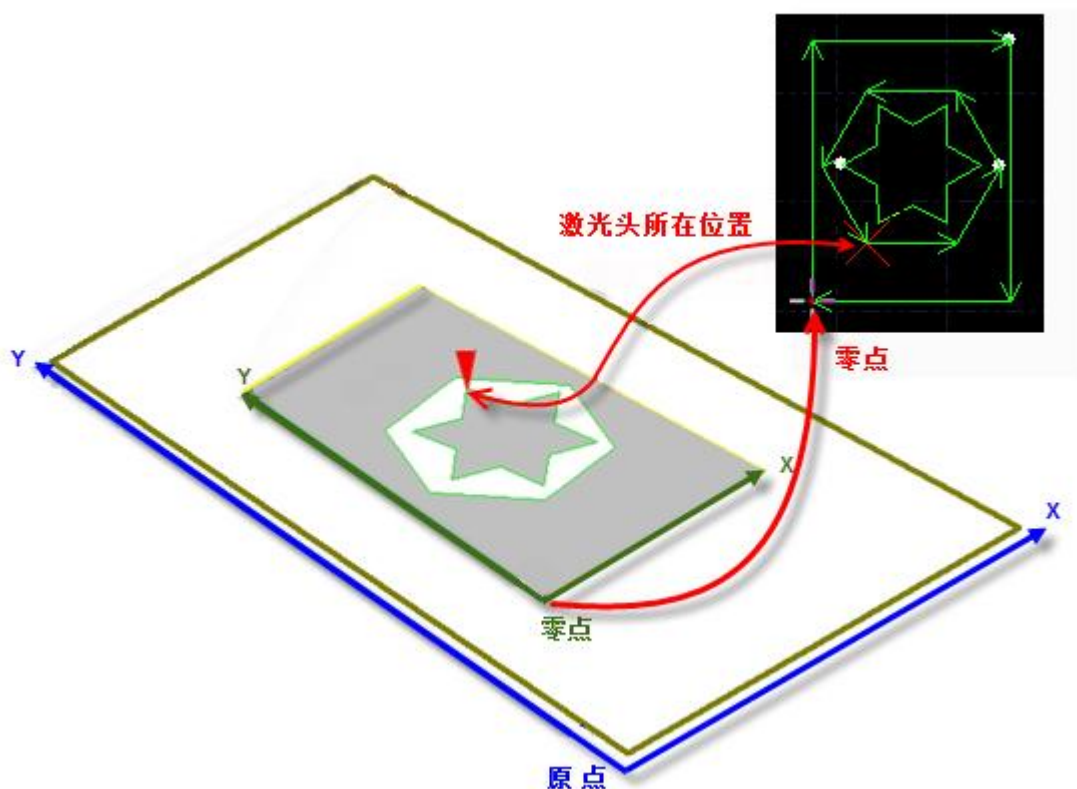


Figure 69 Coordinate System Mapping Relationship

Click the " " button on the console  to display the positional relationship between the graphics and the machine format on the screen.



4.1.1 Mechanical coordinate system

The machine tool coordinate system is uniquely determined by the machine tool structure and machine parameters. The coordinate system established by clicking "Back to origin" is consistent at any time. After the first installation or when the machine coordinate system deviates due to abnormal reasons, you can click the button " " on the "CNC" page to reset the

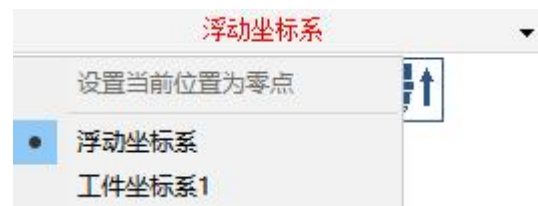


machine coordinate system 回原点 .

No matter what mechanical structure is used, the definition of the coordinate system in UltraCut is consistent. All the movement is the movement of the laser head relative to the workpiece. The right direction of the laser head is the positive X direction, and the backward direction of the laser head is the positive direction of Y. That is, the lower left corner of the workpiece is the minimum coordinate, and the upper right corner is the maximum coordinate.

4.1.2 Program coordinate system

Since the machine tool coordinate system is fixed, it is necessary to introduce the workpiece coordinate system for the convenience of use. All program coordinate systems in UltraCut have the same coordinate axis direction as the machine tool coordinate system, only the zero point of the coordinate system is different, which is called the **program zero point** . The program coordinate system is divided into floating coordinate system and workpiece coordinate system.

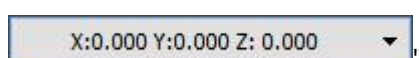


The button at the top of the console is used to select the program coordinate system, and you can choose "floating coordinate system", 9 "workpiece coordinate systems" and one "external coordinate system".

The floating coordinate system is generally used for informal processing. It can be considered as "wherever the laser head moves to start processing".

workpiece coordinate system 1~9 is selected , the zero point is manually set by the user through "Set the current point as zero point". Once set, it will be permanently saved until the next time. Therefore, the workpiece coordinate system is suitable for mass product production, and its position is generally determined by the fixed fixture. Using workpiece coordinate system 1~9 can keep each processing at the same position of the machine tool.

Click the bottom status bar "



You can choose to display the mechanical or program coordinates, and you can also set the zero





points of the two coordinate systems here. Selecting "Coordinate Positioning" will position the cutting head to the specified coordinate position.

4.1.3 Find the zero point after an exception occurs

case one

For example, only the peripheral equipment such as laser or auxiliary gas is abnormal, which causes the processing to be interrupted, and does not cause the coordinate system to shift.



You can directly click " " to return to zero.

case two

Such as sudden power failure, servo alarm and other abnormalities that will cause the mechanical coordinate system to shift, it is recommended that the user execute "return



Origin", reset the mechanical coordinate system. Then click " " to find the zero point.

4.2 Call the police

UltraCut will monitor all parts during the operation of the machine tool. Once an alarm is detected, it will be displayed in a red title bar immediately, and measures such as stopping the movement will be taken. Before the software alarm is eliminated, a large number of operations will be prohibited. Please check the machine tool until the alarm is eliminated before operating. An example of an alarm is shown in the figure below:



Figure 70 Alarm message indication

In addition to the title bar, the "Alarm" window at the bottom left of the interface will also display alarm information. After the alarm is eliminated, the red display on the title bar will disappear, and the information in the "Alarm" window will be retained. Double-click the "System" window to open and view all historical records, so as to understand the events that occurred during the running of the software .

In addition to alarms, if UltraCut detects other abnormalities, it will be displayed in the "System" window in different colors according to the abnormality level, including warnings, reminders, messages, etc. These messages will not cause the machine tool to stop moving, but it is still recommended that you pay attention to various messages displayed by the software in time, so as to take necessary measures as soon as possible.



The alarm can be canceled automatically or manually. You can check all the alarms need to be manually canceled at the bottom right of "Process-Global Parameters" .

4.3 manual console

Some functions of console manual control are shown in the figure below:

4.3.1 Jog console

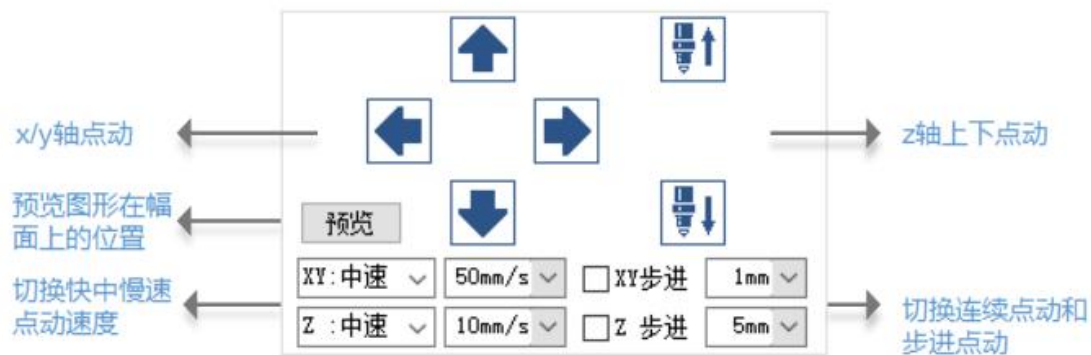


Figure 71 Jog console

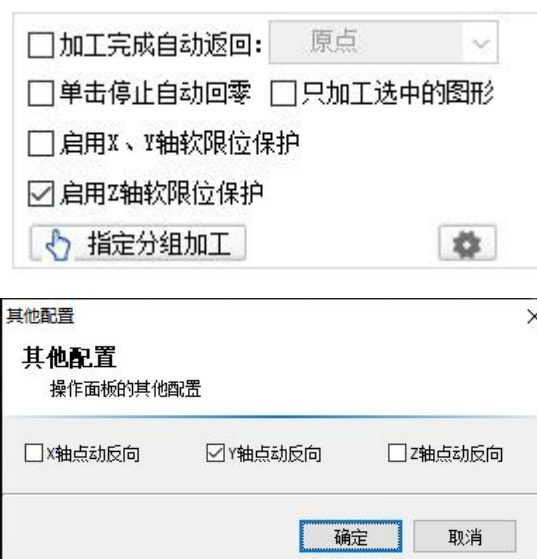


Figure 72 jog reverse setting

Through the " " button in the lower right corner of the console  , you can enter other configuration pages to set the x / y / z axis jog direction.



4.3.2 Customize console



Figure 73 Custom Console

with a " " icon will change to a " " style after the corresponding device is turned on " " .

Among them, the " " button is to press to turn on the laser, release to turn off the laser, and form a burst; the other buttons are to press to switch, and to release no action, such as

" ", press to turn on the " " indicator light, and press it again to turn off the indicator

light. Depending on the laser, " " may change to " " after a period of time after being pressed, and this state is read from the laser.

Click the " " button to configure the functions of all the buttons on the custom console.



Figure 74 Control panel custom configuration

Among them, "digital input monitoring" means that the state of the input port can be displayed on the console, " " indicates that the input port is in a state of shelving, and " " indicates that the input port is in an activated state. "Digital output control" means that every time the button is pressed on the console, the state of the output port can be switched, " "



 means that the output port is in the closed state, and "" means that the input port is in the open state.

Please note that all button actions require the support of corresponding parts on the machine tool. If the machine tool is not equipped with these parts, or the platform parameters are configured incorrectly, some buttons may be invalid.

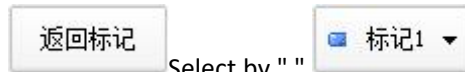
4.3.3 Marking the Console



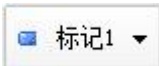
Figure 75 Marking Console

Click “ ” to record the current position of the machine tool, and then click

“ 标记坐标 ” to return to the previously recorded position when needed .



Select by " ”.

Click  the "Edit" button after " ” to enter the secondary interface of mark point editing;

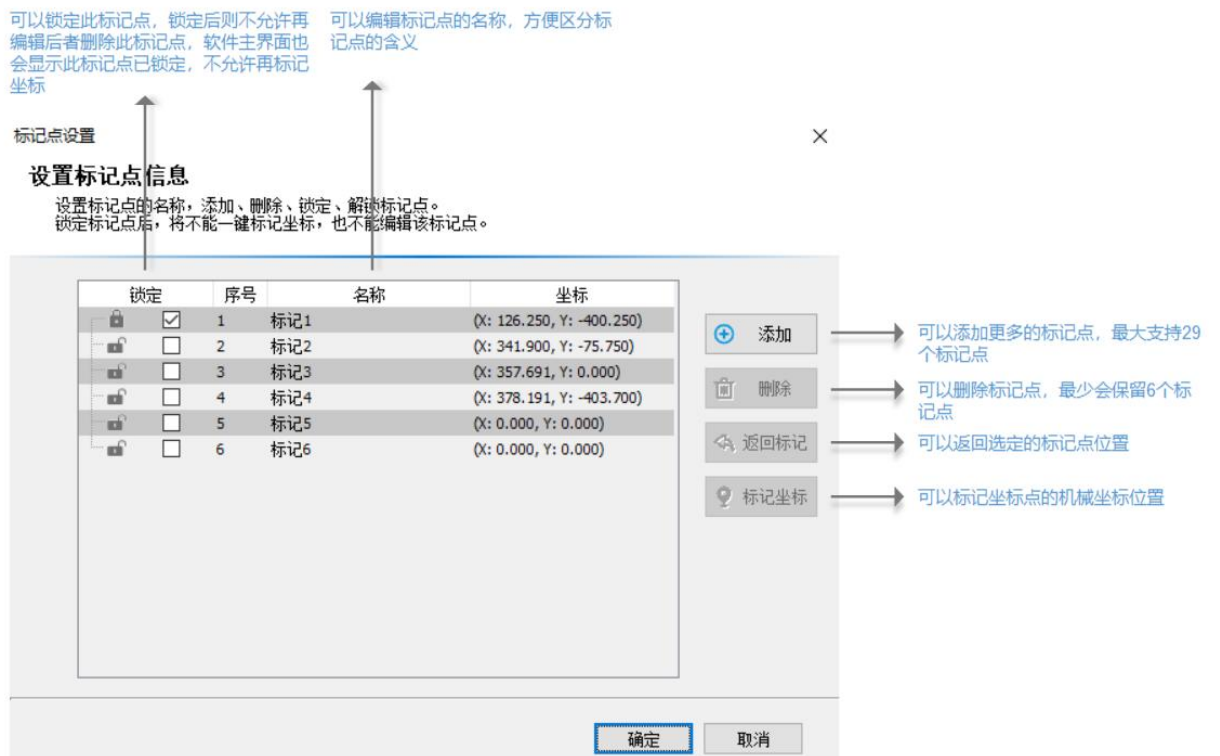


Figure 76 Marker point secondary editing interface



4.3.4 Burst console

出光模式: 2 NTRIG
重频频率: 100 KHz
脉冲宽度: 1us
出光时间: 10ms
峰值功率: 50W
PSO 选通: ☒ PWM ☐ CLK
☐ 点射

Figure 77 Point-and-shoot console

Burst Control Parameters	
light mode	There are three modes to choose: 1 HIGH / 2 NTRIG/12 NGATE ; mode 1 is a constant high level signal, mode 2 is a TRIG signal whose output frequency is "repeat frequency" , the pulse width of mode 2 can be edited, and mode 1 is a GATE signal with a 2 -bit output frequency of "repeat frequency" and a duty cycle of 100 % .
Repeat frequency	The repetition frequency of the output signal. If a laser supported by a communication protocol is connected, the frequency control command will be sent and applied to the laser
Pulse Width	The pulse width of the output signal, only mode 2 NTRIG can be set
Lighting time	The time at which the light signal is emitted from the spot
peak power	If a laser supported by a communication protocol is connected, the power control command will be sent and applied to the laser
P SO strobe	selecting the dual-channel P SO PWM or split function in the platform configuration tool-laser, you can select PWM OUT/CLK OUT to realize point emission of light
shoot	After "Spot Shot" is checked, click "Laser On" and the light will be emitted at regular intervals according to the "Light Time"; if "Spot Shot" is not checked, the light will always be emitted after clicking "Laser On", until the light signal is turned off after clicking "Laser Off"



4.4 Soft limit protection

be turned on and off through the " " option on the console , and it is turned on by default.

☒ 启用软限位保护 Z-axis soft limit protection soft limit " ☒ 启用Z轴软限位保护 " , closed by default.

After the soft limit protection is enabled, if the software detects that the movement may exceed the travel range, it will prompt "movement has exceeded the travel range", and will not issue any movement commands to prevent possible impacts. At this time, please check the graphics and the position of the machine tool, and operate after confirming that they are correct.

the software will also monitor the coordinates of the machine tool in real time during the movement of the machine tool . Once the soft limit is exceeded, it will immediately alarm and stop all movement.

Please note: the soft limit protection depends on the coordinate system of the machine tool, if the coordinate system is incorrect, the protection will also be incorrect. Therefore, when the software is closed abnormally, machine parameters are modified, etc., the correct machine coordinate system should be established through the "return to origin" operation!

4.5 walk the border

Click the " " button on the console  , and the laser head will walk a rectangle along the outline of the graphics to be processed, so that you can determine the approximate size and position required for processing the plate. The speed of running the frame is set in "Layer Parameter Settings" – "Global Parameters" – "Border Inspection Speed".

Please note: If you have performed an edge-finding operation before walking the border, the software will record the result of the edge-finding. When walking the border, it will move along the inclined rectangle, that is, the actual frame movement after correction by "Edge Finding". For details, refer to the "Edge Finding" section.

4.6 Processing and emptying

Click the " " button on the console  to start processing, and the monitoring screen shown in the figure below will be displayed during the processing, including coordinates, speed, processing timing and other information.

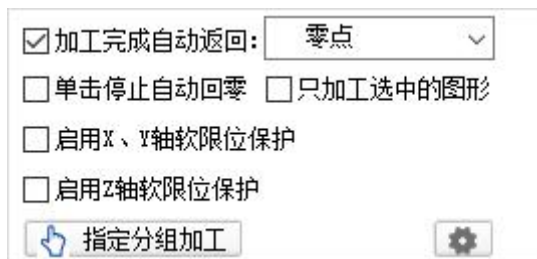


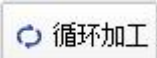
Figure 78 Status monitoring during processing

When the picture above is displayed, you cannot switch to other tabs of the toolbar, this is to prevent graphics from being modified during processing, but the "File" menu can still be used.

Click the “ ” button on the console  to perform idle walking. The difference between idle walking and actual processing is that the laser and gas are not turned on, and you can choose whether to enable follow. All running tracks, including the “pre-piercing” air movement, speed, acceleration and deceleration process, etc., are completely consistent with the actual machining process, and you can also pause, continue, forward, and backward, including the breakpoint memory after stopping. Therefore, the dry walk can be used for a comprehensive inspection and simulation of the overall machining process without cutting.

By default, it will automatically return to the zero point after processing. If you want to return to other positions after processing, please select the desired position on the console. The supported positions include zero point, start point, end point, origin point and mark point . If canceling "  加工完成自动返回 " is equivalent to returning to the "end point", that is, it will stay in place after the processing is completed. If you are using the "floating coordinate system", it is recommended to choose to return to zero after processing. If you want to return to the marked point after processing, please select Automatically return to the corresponding marked point after processing and confirm.



If cycle processing is required, please click the "  " button and make corresponding settings.

4.7 stop, pause and continue

" on the tool bar or " " button on the console  during processing . After stopping, the machine tool will return to the zero point. If you do not want to return to the zero point, please cancel  the selection of the " " item on the console.



If processing is paused, please click the " " button on the tool bar  or the " " button on

the console



during processing. After pausing, you can click the "Process" button

on the right toolbar to modify parameters, or operate the functions of the manual control part on the console, including laser spotting, gas switching, switching follow, etc.

" button on the console



during processing , and the processing will continue

from the paused point.



4.8 Start machining from any position

UltraCut supports to start processing from any specified position, right-click on the position you want to start, and then select "Start processing from here". As shown on the right:

For the sake of safety, after selecting "Start processing from here", the software will pop up a dialog box asking for reconfirmation. After confirmation, the cutting head will first move to the position you specify, and then start processing from there. The trajectory before the specified position will not be processed.

If you want to locate to the specified position first, but do not start processing, please select "Position here", the cutting head will move to the position you specify, and then enter the pause state.

4.9 global parameters

In the "Global Parameters" tab of the "Layer Parameter Adjustment" dialog box, some motion control parameters are available for adjustment. Adjusting these parameters will affect the smoothness of mechanical operation, processing effect and efficiency.

The following table lists some parameters of the "Global Parameters" tab.

Motion Control Parameters	
Air speed	Speed of idle movement (not processing speed)
Space acceleration	When moving in space, the maximum acceleration of each axis is used in conjunction with the speed of space moving
Space Shift Low Pass Frequency	The jerk during air movement, used in conjunction with the air movement acceleration
Edge inspection speed	The speed of walking the border
Processing acceleration	During trajectory processing, the maximum acceleration of each axis is used in conjunction with the processing speed
Processing Low Pass Frequency	The jerk during processing , used in conjunction with the processing acceleration



follow control parameters	
Enable follow when idling	By default, the Z axis will not move when idling. If it needs to follow when idling, the user can choose this option
Disable following while processing	It is necessary to follow the cutting during normal processing, if it is not necessary to follow during processing, this option is optional
Whether to return to dock after processing	axis will return to the docking point only after the option is checked.
Z axis stop position	Set the stop point of the Z axis, and return the Z axis coordinates after processing is completed
unit selection	Select the unit of the parameter according to the usage habits
advanced	
Precision Cutting Algorithm 6 .5	For adaptation and precision machining occasions, the motion trajectory is smoother It is recommended to open
All alarms need to be cleared manually	an alarm , a manual reset is required to clear the alarm
Enable machine protection	Hide the parameters that affect the service life of the machine tool
pause by track	After pressing the pause button on the interface, it does not pause immediately, but pauses after processing the current track
Delay before error determination	Time to wait before error determination starts trajectory movement
Delay after error determination	After the error measurement ends the trajectory movement, the waiting
Slit Compensation Accuracy	When performing slot compensation, the selection accuracy of compensation curve nodes
Flying cutting gouging distance	to ensure that the flying cut graphics can be cut smoothly
lobes	
X direction offset	The X-direction offset of the split head relative to the cutting head
Y direction offset	Y-direction offset of split head relative to cutting head
enable preionization	C lk The out port will output the pre-ionization signal, the frequency and pulse width can be set



五、CNC auxiliary function

5.1 Simulation processing

After all the sorting of graphics is completed, the processing process of the entire file can be completely simulated through simulated processing. This process can be performed off the machine tool. During the simulation process, not only the sequence between graphics can be seen, but also the processing process within the graphics can be seen.

Click the “ ” button on the console  to start the simulation, and the toolbar will automatically jump to the “Numerical Control” page. In the first column of the “Numerical Control” page, you can adjust the speed of the simulation process, as shown in the figure below.



Figure 79 Simulation Processing

5.2 PLC process



Click the “  PLC过程 ” button under the “Numerical Control” page, you can customize the PLC process and execute them.

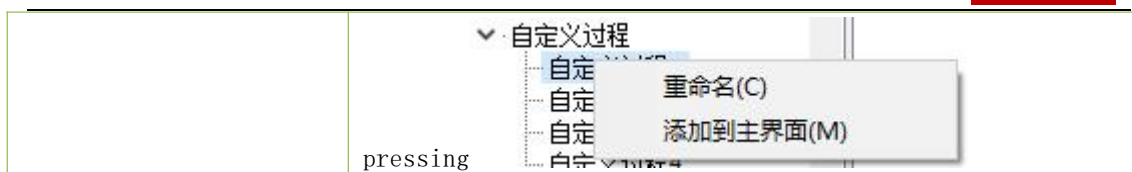
Attention: Improper modifications may lead to serious consequences! If necessary, please contact our technical staff.

The table below gives a brief description of some of the main processes in the PLC process

Preset standard cutting process	
direct cut	Direct cutting performs this PLC process
Turn off the laser process	PLC process when the laser is turned off during the processing action
Manufacturing processes	
visual positioning begins	PLC process is executed when the vision positioning starts



visual positioning end	PLC process is executed at the end of vision positioning
start of file	PLC process will be executed when starting to process a file , it can be considered that this PLC will be executed at the beginning
end of file (before zero return)	PLC process will be executed before the processing of a file is completed and before the zero return action
After end of file and zeroing	PLC process will not be executed until the processing of a file is completed and the zero return action is completed.
layer start	PLC process is executed when each layer starts machining
end of layer	PLC process will be executed at the end of each layer processing , and when a file has multiple layers, the layer start and end will be executed multiple times
cycle starts	PLC process at the beginning of cycle processing
end of loop	Execute this PLC process at the end of cycle processing
when the program starts	PLC process will be executed when the program is opened
when the program exits	This PLC process is executed when the program is closed
stop	PLC process is executed when stop is clicked
pause	PLC process is executed when Pause is clicked
continue	PLC process is executed when you click continue
Pause + PLC + continue	To use this PLC , you need to configure the corresponding pause + PLC + continue function in the input port function in the platform configuration tool or the hand-held box. When processing, first pause and then enable the corresponding input port function or hand-held box function, and this PLC process will be executed.
Alarm processing flow	
public process	All alarms will execute this PLC process
emergency stop	PLC process will be executed when emergency stop alarm
Servo alarm	This PLC process will be executed when the servo alarms
Limit alarm	This PLC process will be executed when the limit alarm
laser alarm	This PLC process will be executed when the laser alarms
License alarm	This PLC process will be executed when the license alarm
custom process	PLC process can be freely configured . After the configuration is completed, you can right-click the custom process button to rename it and add it to the main interface. After adding to the main interface, the corresponding custom process button will appear on the CNC interface, and the corresponding custom PLC process will be executed after



provides a brief description of some of the PLC steps that can be added

PS0	
Set up PS0 laser form	Laser mode for setting PS0
PS0 laser dot spacing	Used to set the dot pitch of the PS0 laser
Set PS0 frequency	Used to set the PS0 laser frequency value
Set PS0 PWM on/off	Used to set the enable signal of PS0 PWM to control the opening and closing of PS0
Set PS0 FeedBackOn/Off	Used to control the collection of PS0 dot data, generally added at the beginning and end of the file, used to collect dot data
Z axis	
back to dock	Z axis returns to the set docking height
Move to specified coordinates	The Z axis moves to the specified coordinate, and the coordinate value can be manually input
Z-axis stop	This PLC process will be executed at the end of each layer processing. If a file has multiple layers, the layer start and end will be executed multiple times.
digital input	
Waiting for input port, timeout to continue	When this step is executed, it will start to wait for the corresponding input port. If the corresponding input port is valid within the time limit, it will continue to execute PLC. If it times out, it will print a prompt message and continue to execute PLC .
Waiting for input port, timeout alarm	When this step is executed, it will start to wait for the corresponding input port. If the corresponding input port is valid within the time limit, it will continue to execute PLC . If it times out, it will directly alarm
digital output	
close all outlets	When this step is executed, the output port will be closed, including all expansion boards
open outlet	Can be configured to open the corresponding output port
close output port	Can be configured to close the corresponding output port
analog output	
D A output	the specified voltage value of D A port output, and the power supply value range is 0~10 V



time delay	
time delay	Execute this step and wait for the corresponding delay time before executing PLC
Start time measurement, time measurement result	The two can be used together to measure the execution time of PLC

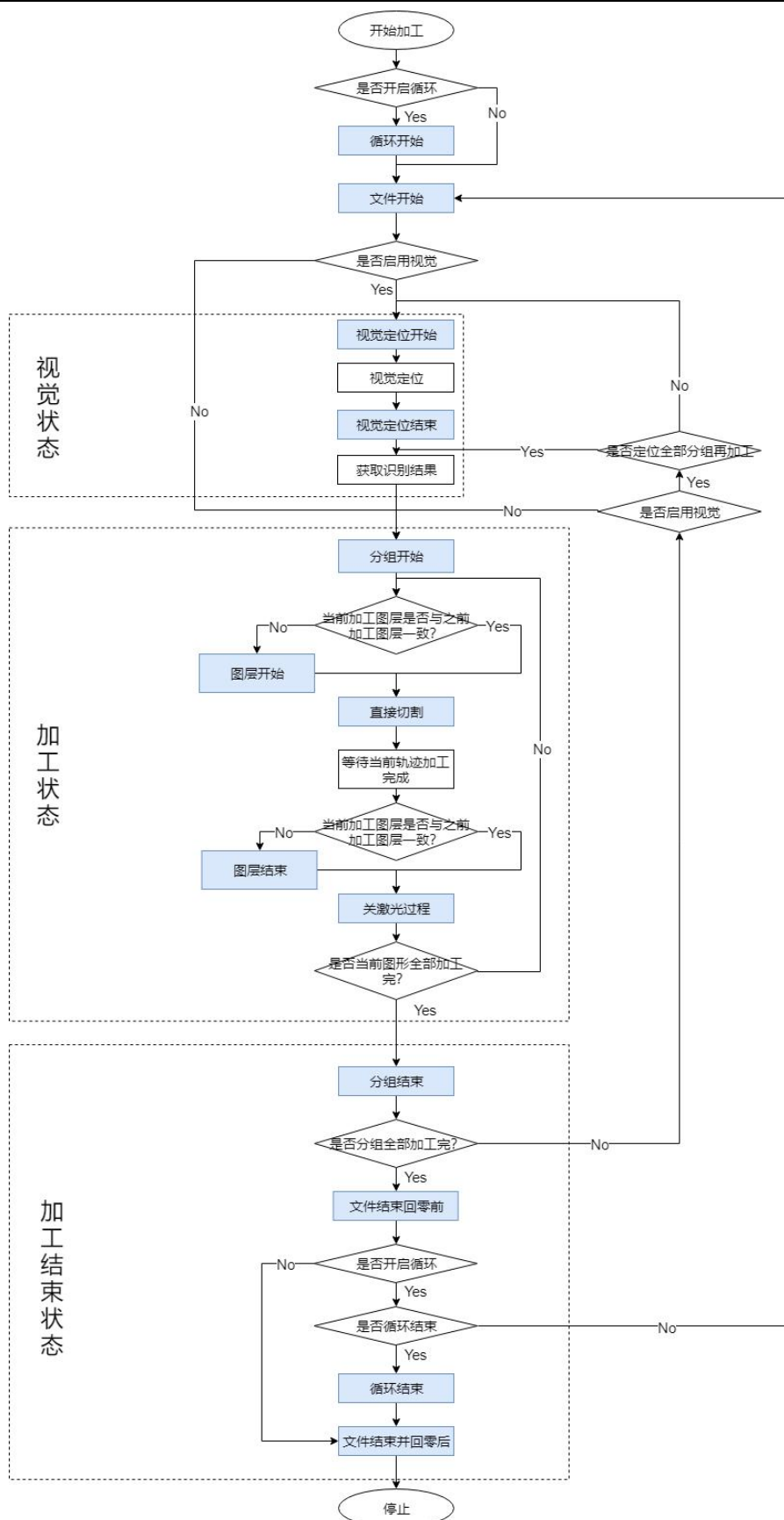


Figure 80 PLC execution flow chart



*Among them, the status node with blue background can customize the action in the software PLC editor.

5.3 back to origin

You can return the laser head to the mechanical origin and reset the mechanical coordinate system by clicking " " on the "Numerical Control" tab or selecting "All Return to Origin" in its drop-down option. For details, see the "Coordinate System"



section. 回原点 You can also select "X axis return to origin", "Y axis return to origin" or "Z axis return to origin" in the drop-down options to make a single axis return to origin independently. When returning to the origin, if the "Z axis returns to the origin first" is checked, the corresponding return to the origin will also be executed.

5.4 Light path debugging

5.4.1 Function introduction

Error measurement by interferometer, commonly known as "interferometer". Generally speaking, the CNC system controls the machine tool to stay at intervals for a period of time, and then the laser interferometer measures the actual position of each point. After all the position measurements are completed, a correspondence table between the theoretical position and the actual position is obtained.

The software can use the interferometer data to compensate the positioning action and machining trajectory within the range of the machine tool to improve the accuracy of the overall machining. It is recommended that all equipment with high precision requirements should be corrected by interferometer compensation.

5.4.2 Operation steps

(1) back to origin

Before hitting the interferometer, it is necessary to return to the origin to ensure that the origin of the machine tool is aligned with the zero point of the interferometer.

(2) Interferometer

Most laser interferometers, such as Renishaw, need to set the travel range, test interval and dwell time of each point before starting the test, such as 1 second for every 30 mm. The laser interferometer decides whether to measure by judging the separation distance and dwell time.

First determine a few parameters:



travel range. The total stroke range to be measured is generally set slightly smaller than the design stroke of the machine tool.

Measurement interval. Theoretically, the smaller the measurement interval, the more accurate the result after compensation; but the smaller the measurement interval, the more points need to be measured and the longer it takes. The interval value is recommended to be between 10 mm and 100 mm.

dwel time. Renishaw's default minimum dwell time is 2 seconds.



Please make sure that the zero point of the laser interferometer is the same as the zero point of the machine tool.

When measuring the error, please ensure that the pitch compensation function in the platform configuration tool is turned off, that is, "no compensation".

The following takes Renishaw interferometer as an example to introduce how to use UltraCut for error measurement. Other interferometers are set according to reference.



Open the Renishaw linear length measurement software, click "  " to start setting parameters.

Figure 81 Renishall parameter setting 1

The first positioning point is always 0, and the final positioning point is the travel range. The spacing value is the aforementioned measurement interval.

Click "  " to enter the next step.



Figure 82 Renishall parameter setting 2

Click " >> " to enter the next step. Enter information as required, and click " >> " to enter step 4.

Figure 83 Renishall parameter setting 3

Among them, please set and record the value of the minimum stop cycle, and use it when setting parameters in UltraCut. After completion, the laser interferometer begins to collect data.

At this point, open the UltraCut-"CNC"- "Optical Path Adjustment" interface, and find the following window:

Figure 84 Optical path adjustment parameter setting

The stroke range here is automatically read in, please set it to the same value as the value set in the interferometer, but pay attention to the sign. Input a negative value in the forward direction, and a positive value in the opposite direction. If the input is wrong, the system will prompt when saving.



Please set the interval value to be the same as that of the interferometer, otherwise the data may not be measured.

Please set the dwell time to be slightly larger than the "minimum stop period" of the interferometer to ensure that the interferometer can correctly identify each point that needs to be measured.

The number of cycles should be the same as the "measurement times" set in the interferometer. Since UltraCut only reads the measurement results back and forth once, when the data of multiple measurements is imported into UltraCut, only the first data will be read.

Gap adjustment means that when moving in reverse, it will first continue to move 5mm along the original direction, and then return to 5mm, thereby eliminating the mechanical backlash. This value should not be greater than the spacing value minus the tolerance window, otherwise the interferometer will mistake this as a point to be measured.

Unidirectional means that only one unidirectional measurement is performed. Ticking this option can save measurement time when there is no or almost no backlash on the machine.

Click "Generate Interferometer Positioning Program", and the positioning program will be generated on the right side of the window. After the check is correct and the following conditions are met, click "Execute" to start the measurement.

The axis being measured has returned to the origin correctly. Be sure to measure from the origin

The interferometer is ready and the parameters match those set by UltraCut.

The measurement results are saved from the interferometer software after the test is complete, for Renishaw the results are in RTL format. Copy this file to the computer where UltraCut runs.

In specific processing, if you need to locate the cutting head to a certain



point, you can click the " " 光路调试 button on the "CNC" page, and input the specific

X:	0mm
Y:	0mm
定位	

coordinates you want to locate at the position shown on the right.

You can also set up the laser interferometer in the optical path adjustment interface to test the error between the movement position given by the software and the actual mechanical movement position, so as to perform mechanical error compensation, also known as pitch compensation.

(3) Import compensation data

Once the pitch compensation data file is obtained, it can be imported into Ultra Cut . Ultra Cut can directly read files saved by Renishaw , API , Agilent , OptoDyne and other laser interferometers.



If the interferometer file you are using cannot be read by Ultra Cut , please contact our company and we will try our best to solve it for you . The method of importing error data is as follows:

Open the platform configuration tool, and select "Complete pitch compensation" in the "Pitch compensation" item of the " Axis configuration " interface, as shown in the figure below:



Figure 85 Schematic diagram of importing interferometer data

Then click "View Compensation Data", and the following window will pop up :

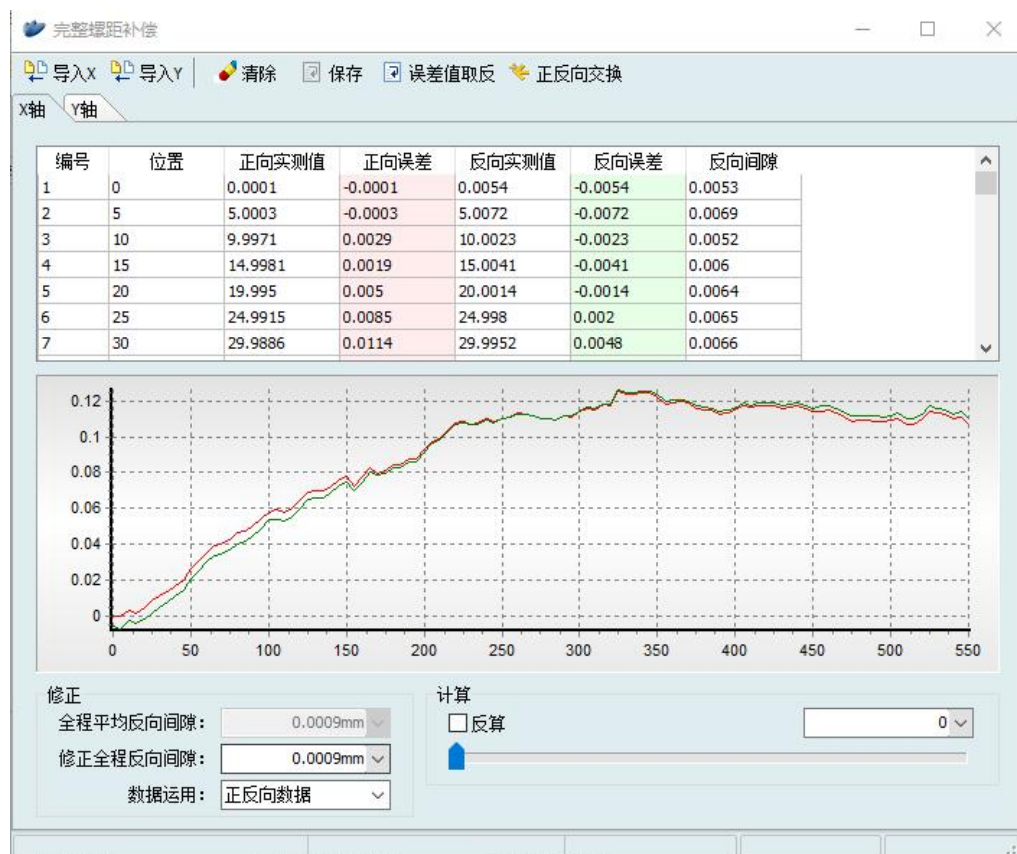


Figure 86 Import interferometer compensation data

Click "Import X " to import the error data of the X axis, and click "Import Y " to import the error data of the Y axis. After the data import is completed, the import results will be displayed in two ways: list and graph. If the position coordinates displayed in the table are inconsistent with the direction of homing, the compensation result will be invalid. Under normal circumstances, the software will automatically judge the symbol of the position when importing data. If it is inconsistent, please check the parameter settings in the back-to-origin setting



and optical path debugging, and adjust the measurement range to be consistent with the travel range of the machine tool by modifying the measurement parameters of the interferometer software before importing data.

After this window and the platform configuration tool are saved, the software will apply the compensation data to perform precision compensation on the machine tool.

(4) Verify Compensation Accuracy

Open the software, perform the step of returning to the origin, and perform the optical path debugging again, and use the interferometer to verify the data after compensation.

5.5 error measurement



Click " 误差测定 ", the cutting head will move once according to the graphics to be processed. After the completion, a blue solid line will be displayed to show the track of the servo motor feedback , and an orange solid line will be used to show the track of the command. You can adjust the process parameters required for actual cutting through the blue track.

After the error measurement, zooming in on the traces reveals an orange trace and a blue trace. The two trajectories are command feedback and actual motion feedback. You can use the measuring ruler button " " in the leftmost toolbar to  measure the deviation between the blue trajectory and the original drawn trajectory, as shown in the figure below.

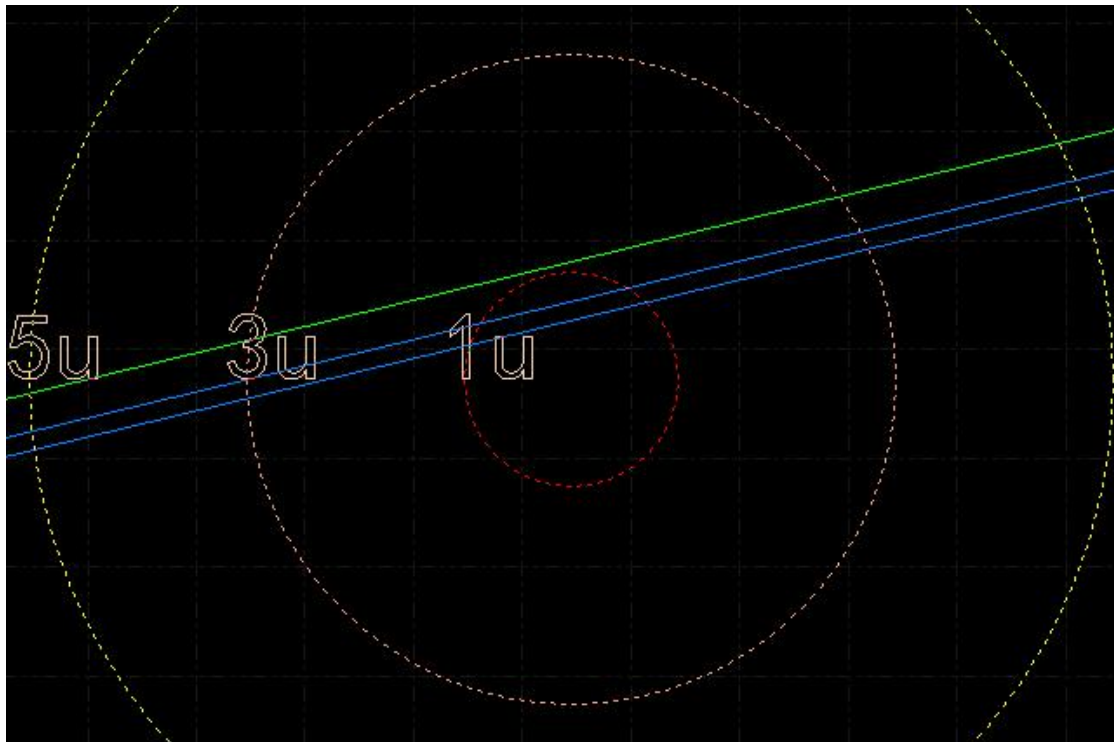


Figure 87 Measuring ruler tool



After the error measurement is finished, an interface will pop up, displaying the result of the error measurement. as the picture shows:

Roundness test	
select circle	Select to view error measurement results for a circle
mean radius	The average radius of the circle fed back by the motor
maximum radius	The maximum radius of the circle fed back by the motor
minimum radius	The minimum radius of the circle fed back by the motor
maximum error	The maximum error of this circle fed back by the motor
minimum error	The minimum error of this circle fed back by the motor

5.6 Diagnostic tools

There are some monitoring windows in the diagnostic tool menu of the file drop-down menu for monitoring processing, P SO , I O port and other information, which can be used for diagnosis and viewing of abnormalities in specific processing.



Figure 88 Diagnostic tool location



5.6.1 Axis information monitoring

Open the control card monitoring to enter the axis information monitoring window. In the axis information, you can check the status of each axis and control the basic movement of each axis.

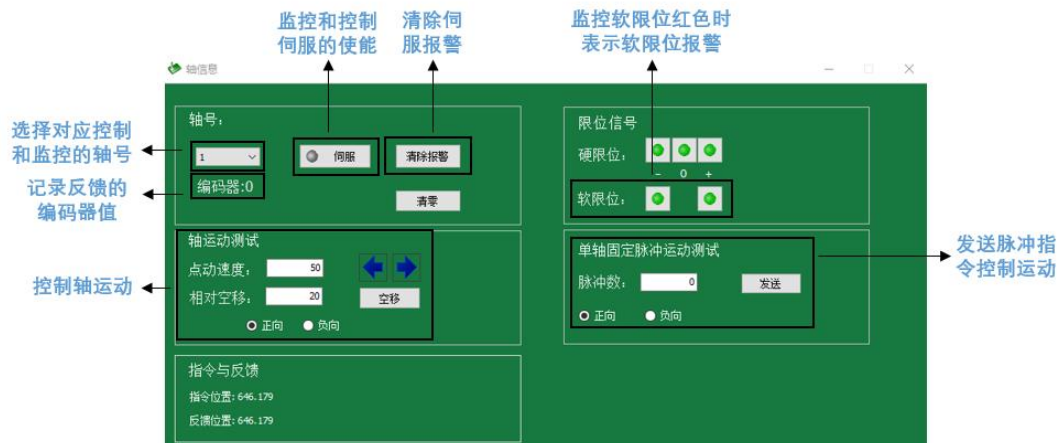


Figure 89 axis information monitoring window

5.6.2 PSO monitoring

The role of PSO monitoring tools:

1. Manually send PSO motion parameters and related enable signals;
2. Monitor PSO motion-related parameters, status and command data for abnormalities, and help operators troubleshoot some hardware and software errors;
3. upgrade firmware;



Figure 90 PSO monitoring interface

This interface also supports the firmware upgrade of the BPC 6203 E board card. You can click the " **选择升级文件** " button to select the corresponding PSO firmware . Then click the "



升级

" button, wait for the upgrade process, the slave station will restart the alarm, and restart the software at this time to complete the upgrade.

5.6.3 Extended IO monitoring

O port can be monitored in the extended I O monitoring

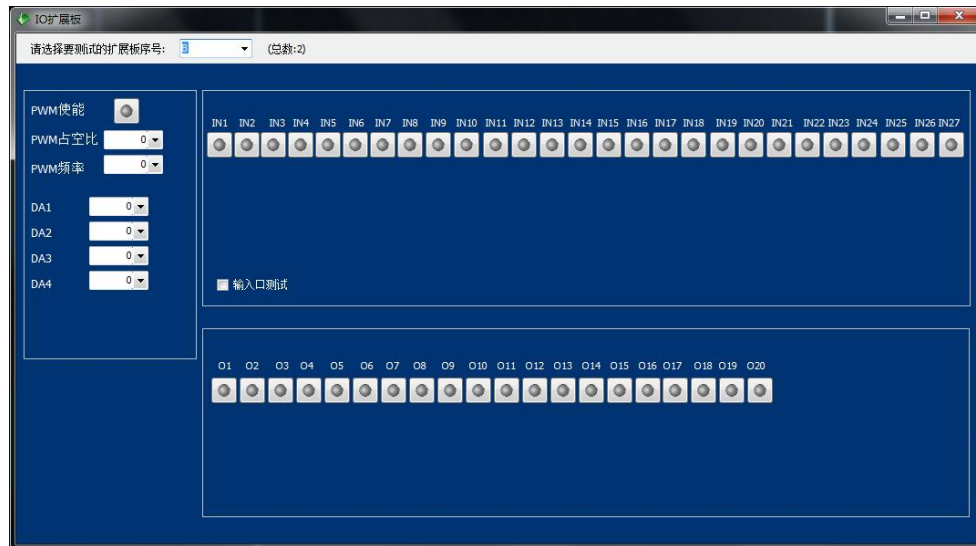


Figure 91 Extended IO monitoring page

5.6.4 PSO analysis tool

collected P SO control light signal can be statistically displayed, which is convenient for process debugging and troubleshooting of light effect problems;

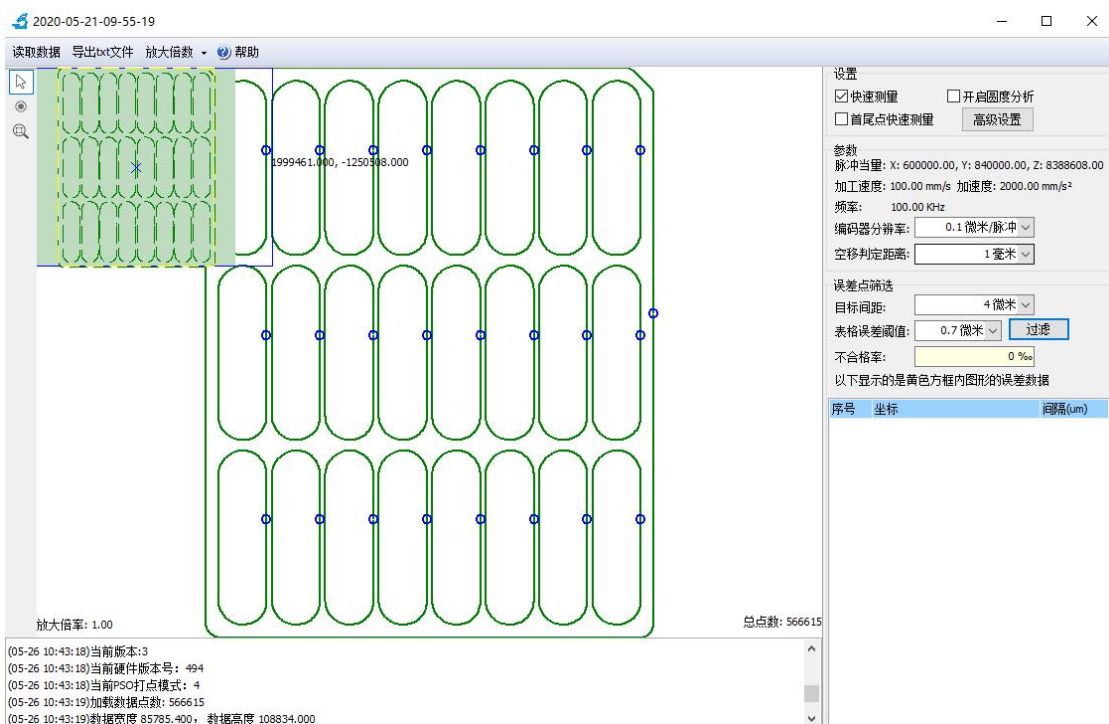




Figure 92 RBI Analysis Tool

5.6.5 PSO speed planning analysis tool

The speed planning statistics of the processing graphics can be displayed on the control end, which is convenient for process debugging and adjustment, as well as processing accuracy and efficiency;

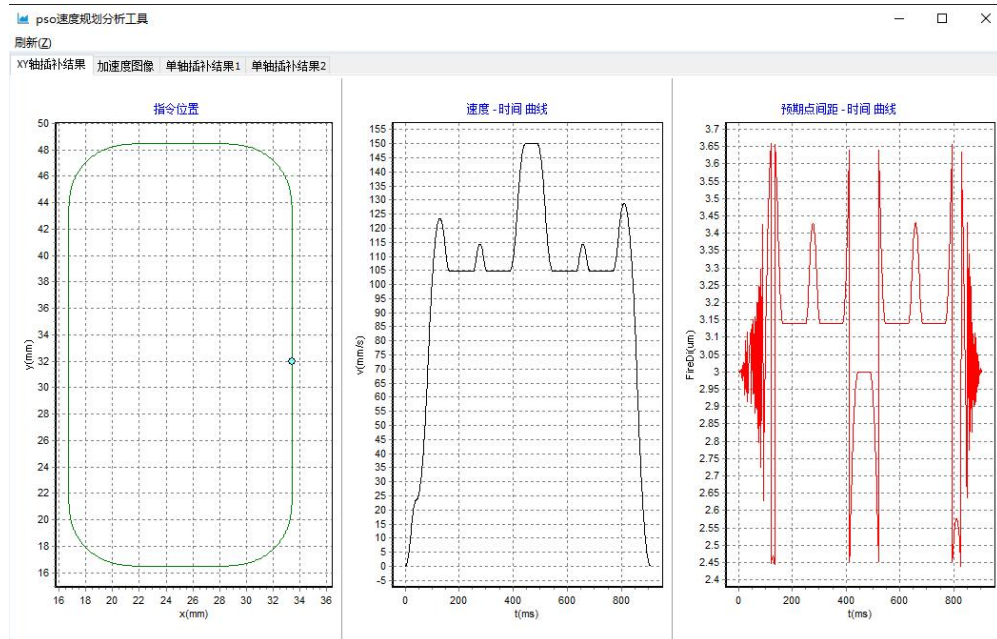


Figure 93 PSO Speed Planning Analysis Tool

5.7 manual positioning



UltraCut provides precise mechanical coordinate positioning. Click " 坐标定位 ", you can freely input XYZ coordinates, and locate the corresponding coordinate position. The coordinates support the input of three digits after the decimal point.



机械坐标定位

**机械坐标定位**

空移定位到指定的绝对机械坐标

X 646.179

Y 435.941

Z 0.000

X Y Z

定位

Figure 94 Manual positioning page

5.8 Focus and height debugging



UltraCut provides focus and height adjustment. Click " **焦点与高度调试** ", you can try to cut a straight line at different Z-axis heights, and use it to finally adjust the most suitable Z-axis height for cutting samples.

The basic operation process of focus and height debugging is as follows:

1. Set the cutting process and the starting height of the Z axis
2. The cutting straight line is generated by setting the height step, straight line length, straight line spacing, number of straight lines, and straight line type. After modifying these parameters, the schematic diagram on the right will show the cutting straight line pattern
3. Jog the XYZ axis to move to a suitable place, and then click start to start the debugging cutting process, and you can click stop at any time during the whole process
4. Check the cutting effect of the sample, choose the most suitable straight line as the focus height, you can select the corresponding straight line in the settings, the current nozzle height will display the Z-axis height used when cutting this straight

设置当前喷嘴高度为
工艺切割高度

line. And you can choose the process, click the " " button to write the current height into the corresponding selected process.

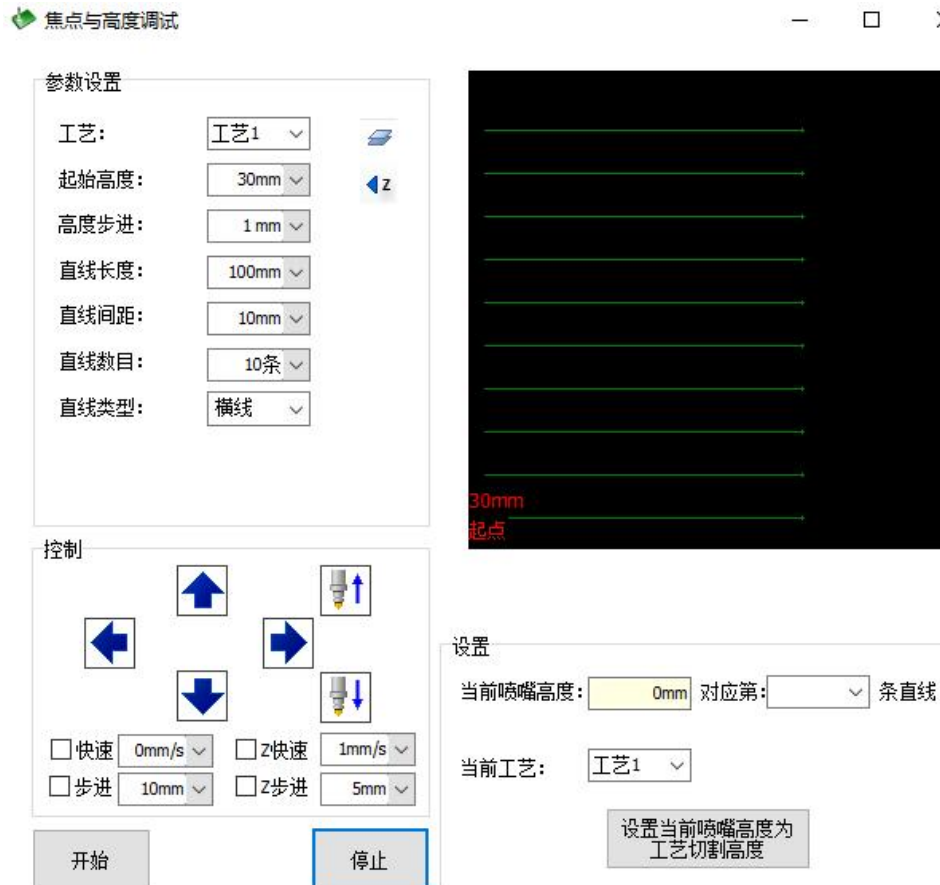


Figure 95 focus and height debugging page

parameter settings	
craft	Choose the process of processing straight lines
starting height	Set the starting height of the Z axis to start cutting the straight line
stepping height	The distance from the end of straight line cutting to the start of the next line in Z axis
straight line length	The length of the cut line
Straight line distance	distance between lines
number of lines	number of lines generated
line type	Select the type of line generated as horizontal line or vertical line
control	
start	Control the debugging to start the action, after clicking, it will directly start the light cutting
stop	The entire debugging process can be stopped immediately by clicking this button
set up	



current nozzle height	After selecting a straight line, it displays the Z-axis height when the corresponding straight line is cut
corresponding to the straight line	You can choose to process and cut the straight line, the order is the processing order
current process	Select the craft layer to write in the Z-axis height
Set the current nozzle height as the process cutting height	After clicking, the current nozzle height parameter will be written into the nozzle height of the current process



六、 **visual orientation**

See "UltraCut Vision Module Instructions" for details.





七、 new features

7.1 General PLC

For details, see "General PLC Manual "

7.2 Collimated optical path split function

7.2.1 Function description

The slitting function is applicable to the scene where the system calls the collimated optical path for slitting after cutting, and the system will perform slitting along the cutting track according to the slitting process.

At present, the split function is compatible with the dual Y-axis automation process and the single Y-axis automation process supported by the system. It does not support dual Z-axis for the time being, and is compatible with cutting with vision.

The laser for cutting is connected to the PWM output port of hardware B PC6203E , and the laser for slitting is connected to the CLK output port.

7.2.2 Use process

The following table shows the parameters involved in the split function:

parameter name	parameter position	function
enable shards	Platform Configuration Tool → Laser Page	This option must be checked for the split function to take effect
X direction offset	Main program→Process→ Global parameters	The X-direction offset of the split head relative to the cutting head
Y direction offset	Main program→Process→ Global parameters	Y-direction offset of split head relative to cutting head
Process Enabled Slivers	Main program → process → each sub-process	Whether to enable slivers in a single process determines whether slivers are required after cutting the graphic of the process
Fragment parameters	Main program→Process→ Split parameters	Set the corresponding parameters of the sliver

1. enable shards



Open the platform configuration tool, enter the laser page and check the split function.

Only when the split function is enabled in the platform configuration tool, the main program will display the split related parameters.

Note: split function and dual PSOPWM function are mutually exclusive

Figure 96 Platform Configuration Tool Enables Fragmentation

2. X and Y offsets

The X and Y offsets are manually input by the user, which means the offset of the split head relative to the cutting head in the X and Y directions. After the cutting is completed, if splitting is required, the system will enter the splitting process and move the splitting head to the position of the cutting head for splitting.



Figure 97 Process global interface setting offset

3. Process Enabled Slivers

Each process can choose whether to open the slivers, only the current process layer chooses to open the slivers, and the corresponding graphics of the process layer will be slivers after cutting.

Figure 98 Process Layer Enabled Slivers

4. Fragment parameters



The split parameters will only be displayed when there is a process layer that needs splits, and the corresponding parameters of the splits can be configured in it. Among them, the laser mode is fixed at mode 5: pure position comparison triggers an optical signal.

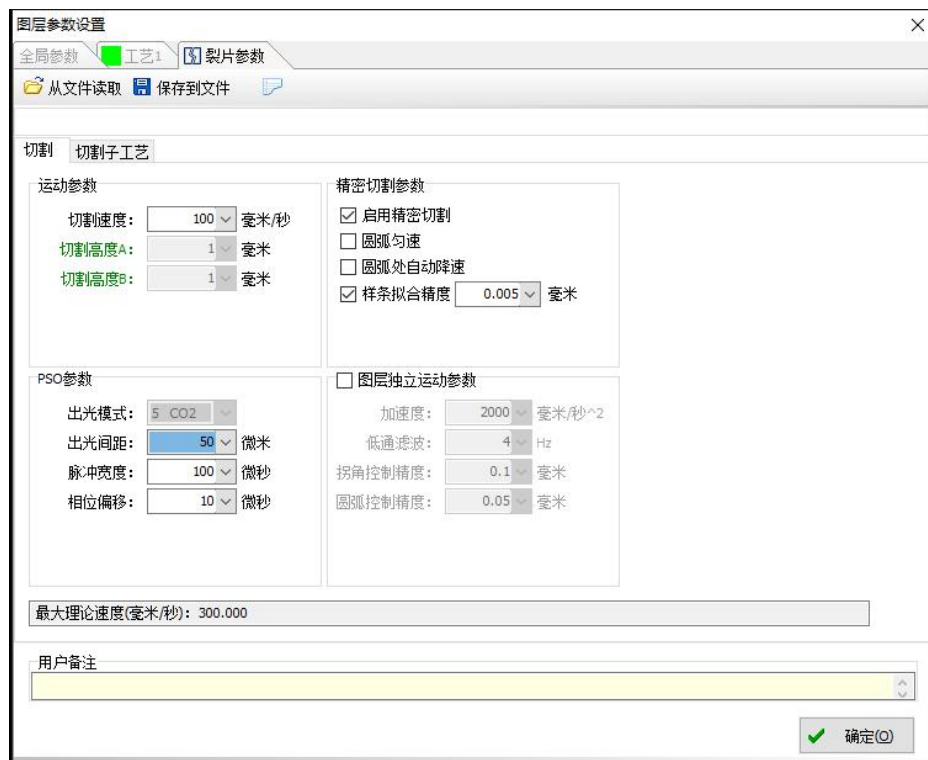


Figure 99 Set the split process

Note :

1. Only the PSO firmware version greater than 465 can use the split function, the firmware version number can be seen in the main program→file→diagnostic tools→PSO monitoring;





Figure 100 PSO monitoring position

- The split parameters are saved with the file, and the X and Y offsets are related to the machine tool and not saved with the file.

7.3 Real-time servo monitoring function

7.3.1 Function introduction

Real-time monitoring of the command position, command speed, feedback position, feedback speed and other status of the servo drive.

7.3.2 Interactive interface



Click the "NC" -> "实时曲线监控" button to enter the servo curve monitoring page.

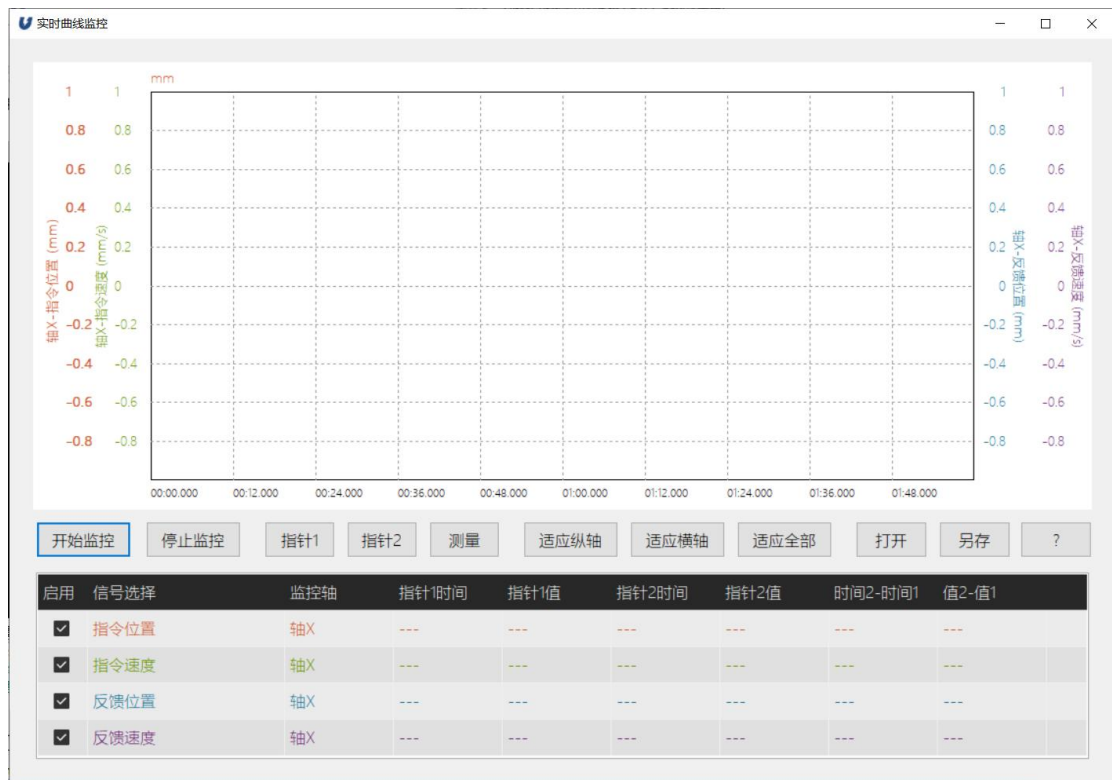


Figure 101 Real-time servo monitoring page

Real-time servo monitoring parameters	
start monitoring	Start the real-time selection to monitor the selected signal in the servo drive and display the corresponding real-time curve
stop monitoring	Stop real-time monitoring
enable	Tick to enable (disable) the corresponding monitoring curve.



	There are 4 optional curves, namely: orange, green, blue, purple curves
signal selection	Select the monitor signal corresponding to the curve of the current color. There are 10 optional signals, namely: command position, command speed, feedback position, feedback speed, feedback torque, command error, dual drive error, command buffer number, command acceleration, feedback acceleration
monitoring axis	Select the servo driver corresponding to the curve of the current color
pointer 1	Click "Pointer 1", select an abscissa, you can mark this abscissa, and display "Pointer 1 Time" and "Pointer 1 Value" in the list below
pointer 2	Click "Pointer 2 ", select an abscissa, you can mark this abscissa, and display "Pointer 2 Time" and "Pointer 2 Value" in the list below
time 2 - time 1	The absolute value of the difference between "hand 2 time" and "hand 1 time"
value 2 - value 1	The difference between "pointer 2 value" and "pointer 1 value"
Measurement	Measure the time difference and value difference between two points in a curve
fit vertical axis	Zoom in (zoom out) the curve to a multiple that can contain all values on the horizontal axis
fit horizontal axis	Zoom in (zoom out) the curve to a multiple that can contain all values on the vertical axis
adapt to all	Enlarge (shrink) the curve to a multiple that can contain all values on the horizontal axis and all values on the vertical axis
Open	Open a live curve file
save as	Save the current real-time monitoring curve
?	Help button. When the cursor stays on the help button, help information can be displayed

7.4 Graphical geometric transformation function

7.4.1 Function introduction

The graphics geometric transformation function can perform precise and quantitative translation and rotation transformations on the selected graphics.



7.4.2 Function description



Click the "几何变换" button to enter the graphic transformation interface.

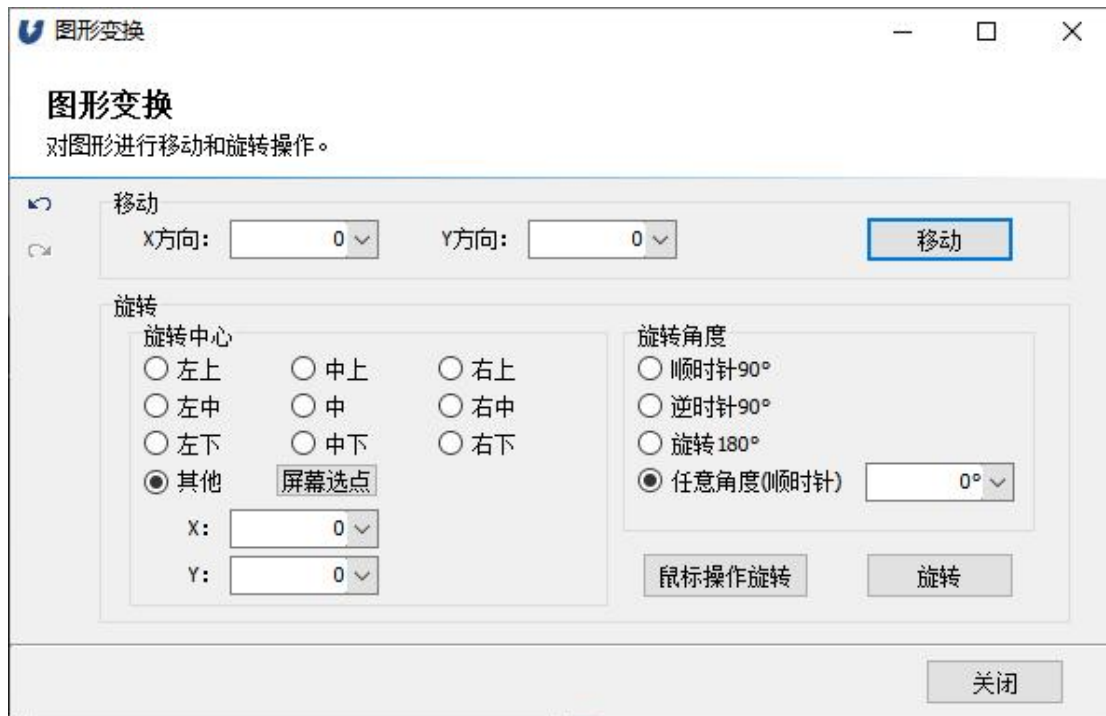


Figure 102 Graphical geometric transformation interface

Graphic Transformation Parameters	
X direction	Movement distance in X direction
Y direction	Movement distance in Y direction
center of rotation	10 options for the center point of rotation . Among them, the nine options of upper left, upper middle, upper right, middle left, middle, middle right, lower left, lower middle, and lower right all refer to the corresponding positions of the outer bounding box of the selected graphic; other options include screen selection and manual input. After clicking the screen selection point, you can click any point in the graphics as the rotation center
Rotation angle	The angle of rotation. There are 4 options in total. Among them, after selecting "Any Angle (Clockwise)", you can manually enter the rotation angle
The run-up lines on both sides of the first	The run-up line at the start point of the first graph is symmetrical to the run-up line at the end point, and the run-up



and last graphics are symmetrical

line at the end point of the last graph is symmetrical to the run-up line at the start point. Recommended only for fine scans of circles

Mobile function operation steps:

1. Select all graphics that need to be moved.
2. Set the movement distance in X direction and Y direction.
3. Click "Move".

Rotation function operation steps:

1. Select all graphics that need to be rotated.
2. Select the center of rotation and the angle of rotation.
3. Click "Rotate".

7.5 Independent Fragment Function

7.5.1 Configuration enable

1. In the laser module of the platform configuration tool, check "Enable individual lobes".

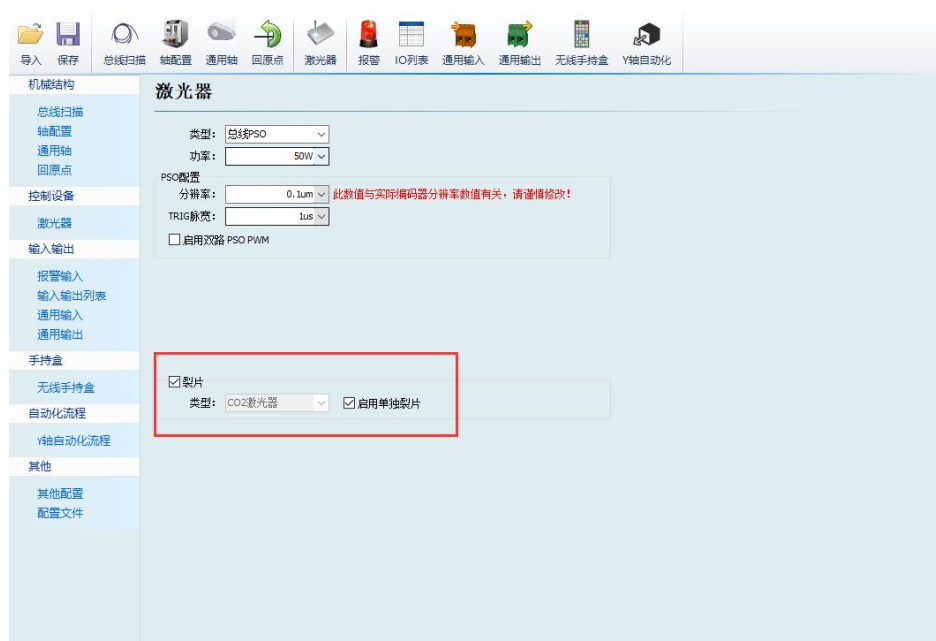


Figure 103 Enable individual shards

2. Hardware configuration: The pwm out port of 6203E needs to be connected to ultrafast laser to control the cutting process, and the clk out port of 6203E needs to be connected to CO2 laser to control the splitting process.

3. Configure the offset in global parameters. The offset needs to be manually calibrated, and the deviation between the split head and the cutting head in the X and Y directions is measured and filled in. The positive and negative values are confirmed according to the direction of the coordinate system of the machine tool.



图层参数设置

全局参数 工艺1 裂片参数

运动控制参数

检边速度: 200 毫米/秒

加工加速度: 5000 毫米/秒²

加工低通频率: 3 Hz

圆弧控制精度: 0.010 mm

拐角控制精度: 0.010 mm

空移参数

速度: 700 毫米/秒

加速度: 8000 毫米/秒²

加速低通频率: 4 Hz

减速低通频率: 4 Hz

Z轴空移参数

速度: 20 毫米/秒

加速度: 500 毫米/秒²

低通滤波: 3 Hz

XY 轴空移设置: ☒ 统一 ☐ 分开

单位选择

时间单位: 毫秒

速度单位: 毫米/秒

加速度单位: 毫米/秒²

定高控制参数

☐ 加工时禁用定高 ☐ 空走时启用定高 ☐ 加工完成后回停靠

Z轴停靠位置: 23 mm

高级

☐ 所有报警需要手动清除

误差测定前延时: 100 毫秒

误差测定后延时: 100 毫秒

☐ 按轨迹暂停

割缝补偿精度: 0.05 mm

☒ 精密切割算法6.5

飞切区域半径: 20.0 微米

PLC时序编辑

裂片

X方向偏移量: 0 mm

Y方向偏移量: 0 mm

☐ 启用预电离

确定

Figure 104 Set the offset

4. In the drawing, check the sliver in the process settings, and set the corresponding sliver processing parameters; the light emission mode is locked to 5- CO₂ , and the light emission control method is similar to the fixed point spacing of ultrafast lasers, and then adjust the laser's single light output energy by adjusting the pulse width. Generally, the phase offset is set to 0us, and the software will prompt the maximum processing speed supported by the current parameters at the bottom;

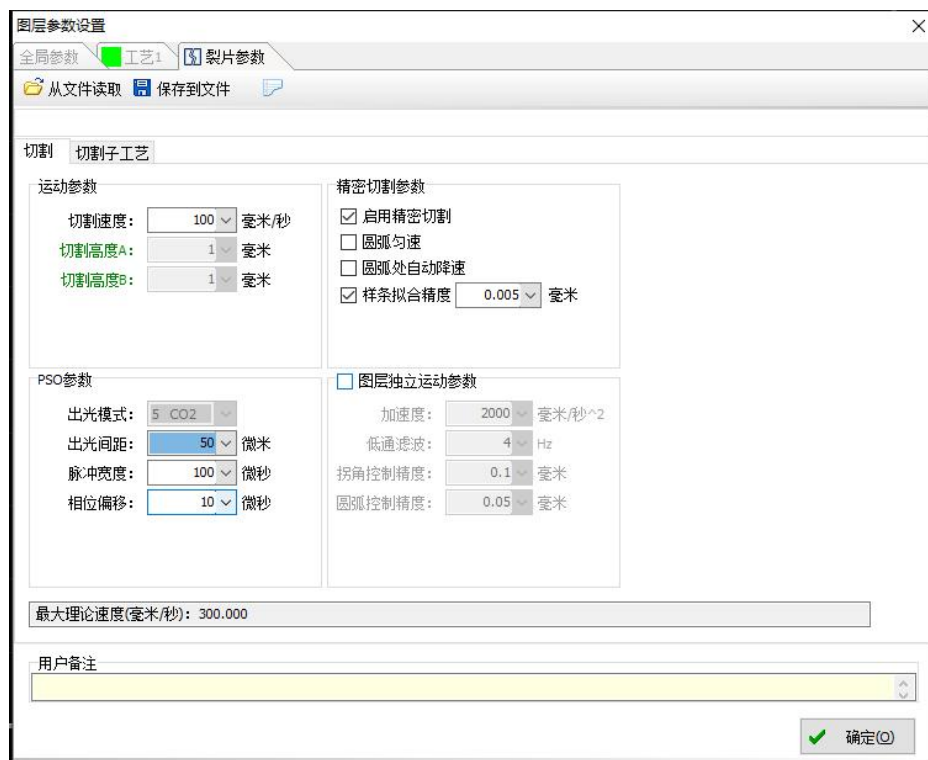
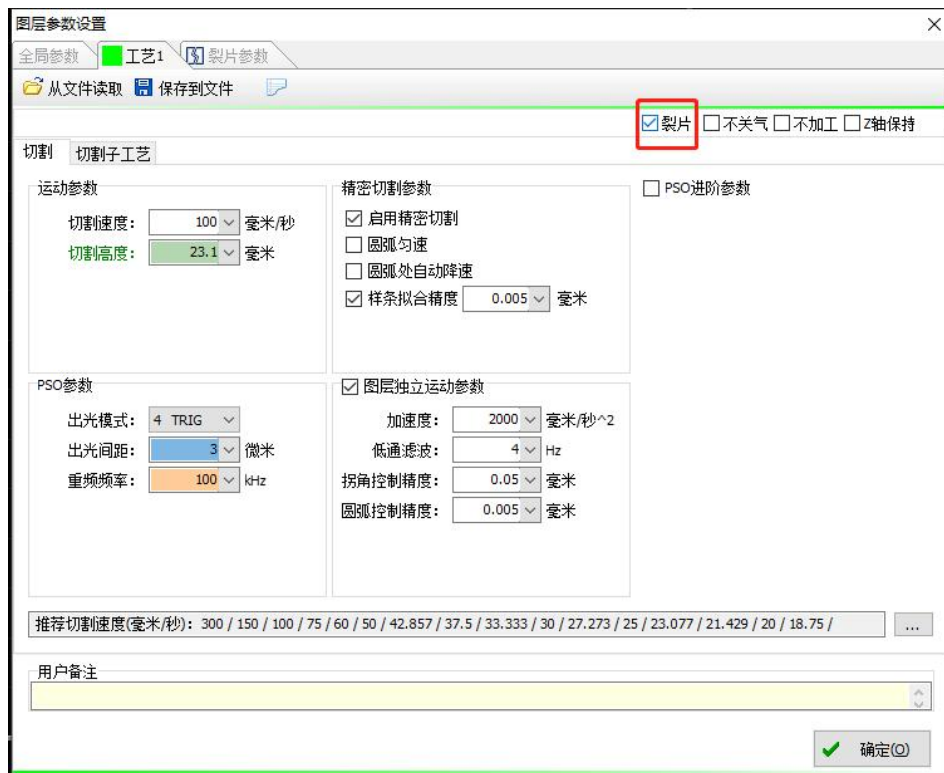


Figure 105 Setting the split process

If you need to enable the pre-ionization function of the CO2 laser, in the process-global parameters, check Enable pre-ionization, and set reasonable frequency and pulse width parameters, and the pre-ionization function will take effect immediately after clicking OK; after enabling pre-ionization, the running software will output a pre-ionization signal, and when the



software is closed or processing, the pre-ionization will be turned

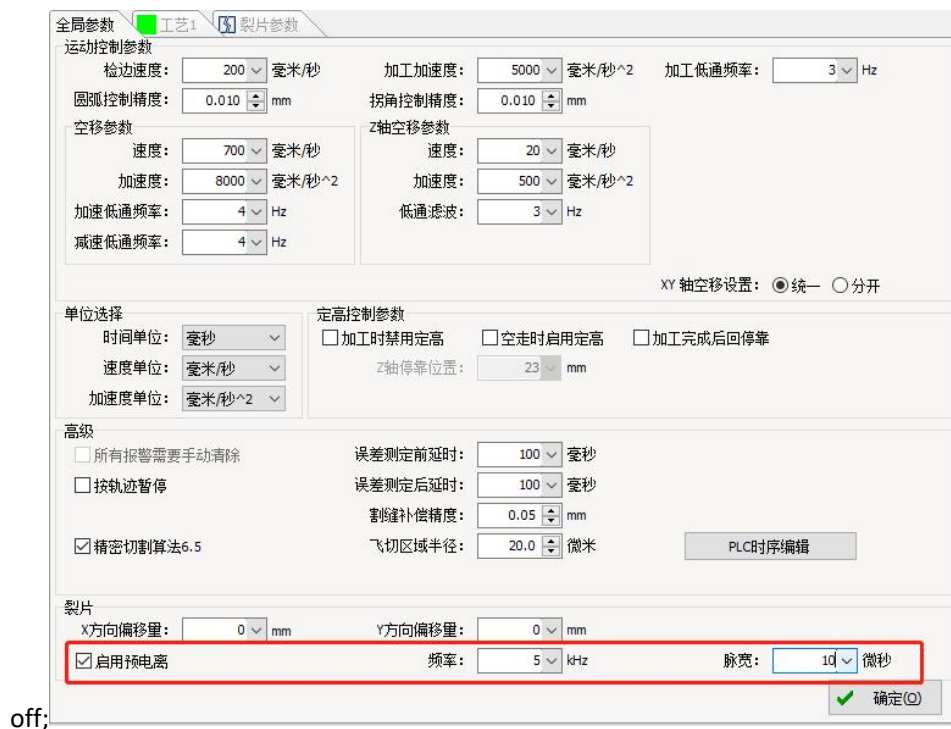


Figure 106 Pre-ionization

Note: To turn off individual splits, just uncheck "Enable independent splits" in the platform configuration tool.

7.5.2 Actual processing

1. non-visual processing

After clicking to start processing, the cutting will be carried out according to the cutting parameters in the process, and it will stop after the cutting is completed, and no slivers will be processed.

Click "Split Start" in the console. The software will move the split head to the starting point of the processing track according to the configured deviation value, and split according to the split parameters in the PLC. You can pause and continue when splitting.



Figure 107 lobes start icon

2. visual processing

In visual processing, it is similar to the conventional visual positioning cutting process, the difference is that the software will automatically make the offset from the sliver to the center of the camera according to the sliver head to the cutting head (the deviation value of the sliver x



and y direction in the process—global parameters) and visual calibration (the deviation value from the cutting head to the camera), and realize the slivers processing.

7.5.3 Others _

1. Sliver start configuration IN port trigger

In the platform configuration tool - general input, you can configure the start action of the I N port associated with the split, which is used for external buttons to trigger the split process;

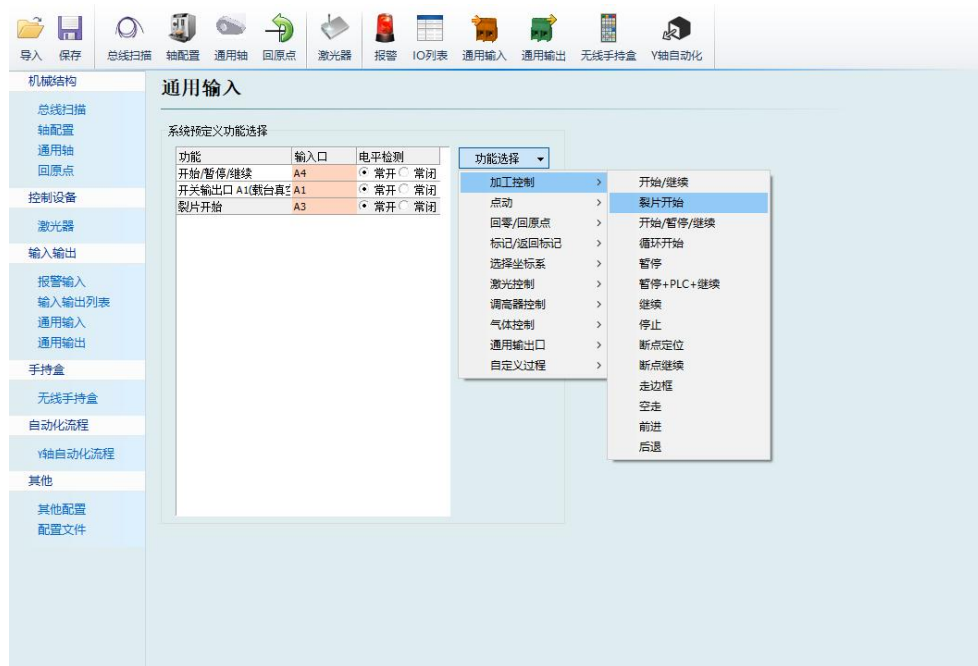


Figure 108 IO triggers split start

2. Split plc process editing

In the software numerical control - PLC process (password 6 1259023) - processing flow, there are two action nodes "split start" and "split end". You can customize and edit the PLC process at these two nodes to realize actions such as opening and closing I O ports, realizing the positioning and movement of general axes, etc.;



Figure 109 Splinter PLC edit

Note: Standalone shards do not support automated processes.

7.6 Servo debugging function

Software-NC-Servo debugging to enter this function, the password is 6 4309023 ;

The servo debugging function only supports high-tech drives running in HD mode for the time being, and support for other modes or drives will be added later ;

After the parameters are adjusted, you need to trigger the button to write X or write Y, and then the parameters will be written into the drive to take effect;

The servo debugging function will directly modify the motion-related parameters of the driver. Professional or experienced personnel are required to use this function, and when using it, it is necessary to pay attention to the rationality of the parameters to avoid abnormal axis status caused by unreasonable parameters;



伺服参数设置

设置伺服参数
设置驱动器的参数。
非位置模式、非HD Controller方式均不能设置其他驱动器参数。
橙色表示该参数已被修改。

X轴 Y轴 Z轴

基础参数

运行模式: 非位置模式

控制器方式: 非HD Controller

全局增益

惯量比: 0

点运动平滑方式: 模式0

点运动平滑值: 0

自适应增益因子: 0

PID增益

微分增益: 0Hz

比例增益: 0Hz

微分-积分增益: 0Hz

积分增益: 0Hz

扭矩滤波器1: 0ms

扭矩滤波器2: 0%

导入 导出

写入X 写入Y 写入Z

退出

Figure 110 Servo debugging function

Servo debugging parameters	
operating mode	Not editable, the current version only supports location mode
controller mode	DC ontroller mode of the high-tech drive
Inertia ratio	Rotation: load inertia / motor mover inertia Straight line: load mass/motor mover mass
point motion smoothing	Mode 0 is not smooth Method 2 is S-curve smoothing
Point motion smoothing value	If point motion smoothing mode 2 is enabled, it needs to be set, and the xy axis smoothing value needs to be consistent to ensure motion consistency
adaptive gain factor	The range is 0.1 to 3. The larger the value, the higher the rigidity. It is recommended to set a value of 0- 5 - 1.5
differential gain	To reduce the speed error, the general debugging sequence of the following four parameters is: Differential gain -> Differential integral gain -> Proportional gain -> Integral gain
proportional gain	Used to reduce position error
Derivative-Integral Gain	Used to reduce both dynamic and steady-state errors
Integral gain	Used to reduce the steady state error
Torque filter 1	The smaller the parameter, the higher the rigidity
Torque filter 2	The larger the parameter, the higher the rigidity



7.7 Cross-group fly-cut

Use the cross-group flying cutting function to visually locate all the supporting files, and then use the flying cutting function to connect the corrected trajectories to further improve the efficiency of visual positioning and processing.

1. How to use

Multi-camera: All positioning and reprocessing functions will be enabled by default. You only need to use the new version of the flying cut to connect the tracks that need to be connected first when drawing;

Single camera: Use the new version to fly to connect the tracks that need to be connected when drawing, and then check and locate all groups in the visual positioning settings before processing (only valid for single camera);



Figure 111 Enable cross-group fly-cutting of a single camera



7.8 Support to set the selected graphic as the first point mark

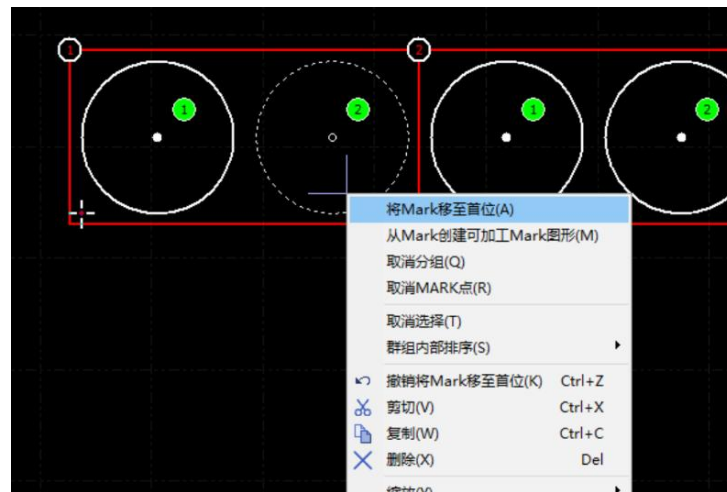


Figure 112 Set as the first Mark

This function allows to move the selected Mark point to the first point, which is convenient for setting the order of Mark points on drawings.

7.9 Circular precision flying cutting supports S-type path planning

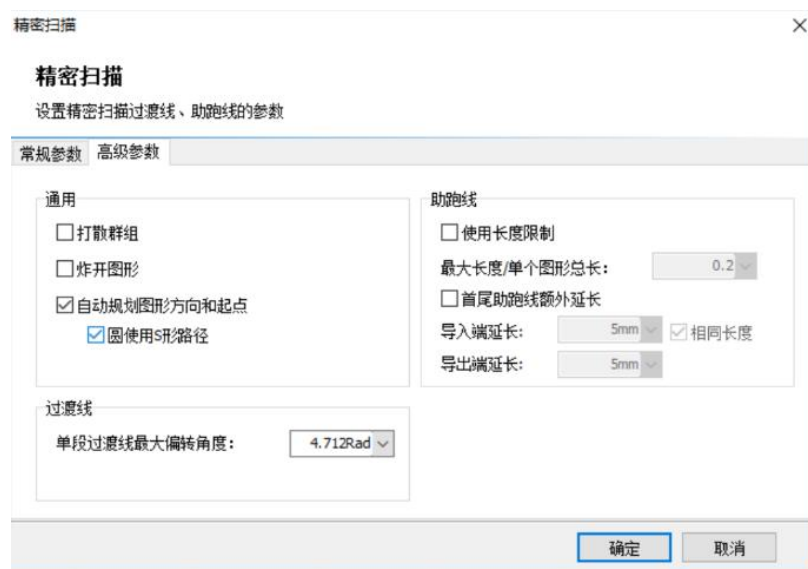


Figure 113 Array circle S-shape flying cut setting open

S-type flying cutting can make the alignment of the head and tail points of the array circle better during the flying cutting process, and the efficiency will not be reduced at the same time.

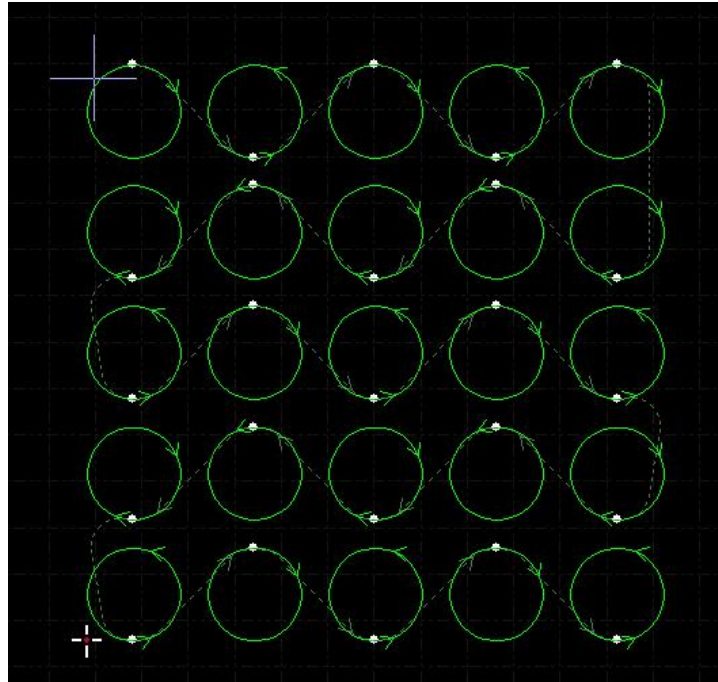


Figure 114 Array circle S-shaped flying cutting renderings

7.10 Added camera gamma setting

1. The adjustment range is 0~100, the default value is 0, when it is 0, the gamma correction will not be enabled;
2. When the adjustment value is from 1 to 100, the screen becomes brighter first, then darkens, and the contrast is enhanced;
3. Except for Daheng cameras, other brands of cameras support gamma value adjustment;

7.11 Manual sorting supports custom sorting

" Manual Sort " button in the main interface - sort button drop-down button to enter this function.

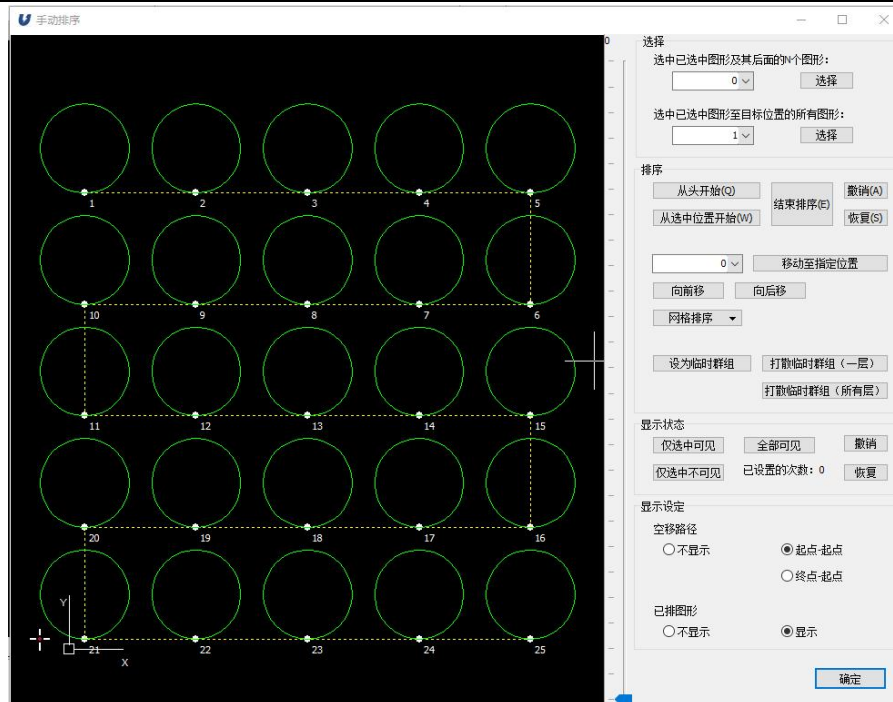


Figure 115 Manual Sorting Interface

7.11.1 Select graphics

1. mouse operation

Click the mouse to select the graphics.

2. button operation

(1) Select the selected figure and the N figures behind it

Starting from the graphic with the highest position in the selected graphic, select the next N graphics ; (a total of N+1 graphics are selected)

(2) Select all graphics from the selected graphics to the target position

Starting from the frontmost graphic in the selected graphics, select all the graphics between it and the target position; (including the frontmost graphic and target position graphics in the selected graphics)

3. other

Press and hold shift, and the filter will be added on the original basis ;
Both mouse operations and button operations take effect.

7.11.2 Graph sorting

1. Pull Sort Mode

(1) Enter/exit mode

Click " Start from scratch " / " Start from selected position " to enter this mode , click " End sorting " will end the drawstring sorting mode.

(2) Sort

Mouse operation:



Right-click the graph to arrange the graph into ;

Press the right mouse button and drag to form a line segment, and arrange all the graphics that intersect with the line segment in the order of intersection ;

Hold down Shift and right-click, a line segment will be formed between the last clicked position and this position, and the line sorting will be performed ;

Scroll bar operation:

Move the scroll bar on the right side of the screen to arrange graphics in and out according to the existing order ;

(3) Revocation/Restoration

Click " Undo " and " Redo ";

2. normal mode

(1) Enter/exit mode

Click the following button, it will automatically exit the pull line sorting mode and enter the normal mode;

(2) Sort

Key operation:

Move to after the current serial number graphic : set the serial number , move the selected multiple graphics or a single graphic into the set serial number graphic (the reordering of multiple graphics has been completed), which is equivalent to packaging and extracting the selected graphics, and then inserting them as a whole after the arrangement of the selected serial number graphics;

Move forward/backward: Click " Move forward " to move the selected graphic forward one position. Click " Move Back " for the same reason ;

Scroll bar operation:

Move the scroll bar on the right side of the screen to move the selected graphic to the specified position ;

Automatic sorting:

Click the corresponding button to automatically sort the selected graphics ;

(3) Temporary group

This group only takes effect under the manual sorting, and is used to fix the existing order of the selected graphics;

Set as a group: Click " Set as a group " to set the selected graphics as a temporary group and fix the internal order ;

Break up the group: click " break up the group (one layer) " , the group in the selected graph will be split, and only one layer will be split ; click " break up the group (all layers) " , the group in the selected graph will be split up, and all layers will be split ;



7.11.3 Setting Display Status

1. **set visible/invisible**

Click " Only selected and visible " to make the unselected ones invisible ;

Click " Only select invisible " to make all selected graphics invisible ;

2. **clear invisible**

Click <All Visible> to make all invisible graphics visible ;

3. **Undo/Redo**

Click <Undo> <Redo> ;

7.11.4 Others

1. **user help**

When the mouse hovers over the corresponding function block, a function prompt will pop up;

2. **sequential display**

- (1) **serial number**

Next to the starting point of each graphic, its current position number will be displayed;

When sorting by pulling lines, the position number of the current row will also be displayed next to the mouse;

- (2) **Connecting line**

Arranged graphics will connect the starting points with yellow dotted lines in sequence.