Friendess, Inc.

Friendess HypCut Laser Cutting Control System

User Manual

Version:19.01A

Welcome

Thanks for using HypCut Laser Cutting Control System!

HypCut system is designed for planar laser cutting applications consists production management, cutting technique, machining control, intelligent automation, quick debug, device diagnosis& maintenance, local and remote assistance modules to help users accomplish the high efficiency in production.

HypCut system must work under HypTronic master station.

Please note that this user manual is only an operation description of the main program of HypCut system. Please refer to other manuals or contact our technical support for other tools or details required advanced permissions.

This document is based on HypCut 19.01A Version. Due to the continuous updating of system functions, the HypCut system you use may differ in some respects from the statement in this manual.

If you have any questions or suggestions in the usage, welcome to contact us at any time!

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 parameter setting!

Improper parameter setting and operation may reduce the cutting performance, or even cause damage to machine parts and human body. HypCut 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.

Contents

1. Quick Start 5
1.1 Function Features 5
1.2 Access, upgrade, and restore the system 7
1.3 Start operation 7
1.3.1 Start-up System 7
1.3.2 User Interface 9
1.4 Standard Production and Operation Process 11
1.4.1 Select Production Mode 11
1.4.2 Import Task File 11
1.4.3 Graphic Correction 12
1.4.4 Cutting Technique 13
1.4.4 Specify Zero Point 14
1.4.5 Assist Function 15
1.4.6 Start Machining 16
2. Plan 18
2.1 Brief Introduction 18
2.2 Task File& Drawing 19
3. Production Module 20
3.1 Volume Production/Flexible Production 20
3.1.1 Drawing Information Bar 20
3.1.2 Function Bar 21
3.2 Prepare List 23
3.2.1《Prepare List》Function Bar 24
3.3 Custom Module 25
4. Debug 26
4.1 Graphic Functions 26
4.1.1 Select 26
4.1.2 Transform 27
4.1.3 Size 27
4.1.4 Automatic Snap 28
4.1.5 Technique Setting 28
4.1.6 Cooling point 29
4.1.7 FlyCut 29
4.1.8 Ring Cut 30
4.1.9 Release 31
4.1.10 Array 32
4.1.10.1 Rectangular array 32
4.1.10.2 Full fill 32
4.2 Machining and Dry Run 33
4.3 Simulation 34
4.4 Error Measure 34

5. Cutting Technology 35
5.1 Cutting Technique 35
6. Diagnosis Module 36
6.1 Diagnosis Window 36
6.2 Alarm 37
7. Maintenance 38
8. Setting 39
8.1 Soft Limit Protection 39
8.2 PLC Process 40
9. Coordinate system 41
9.1 Mechanical Coordinates System 41
9.1.1 Program Coordinate System 42
9.1.2 Find Zero Point after Interrupt 42

1.Quick Start

1.1 Function Features

- Machining module is separated from Nesting. The graph-optimization functions are easy to use and guarantee the machining quality.
- 《Plan》 module can be networking with CypNest to send task file from office to machine also manage the local production data and generate the report automatically for benefit analysis.
- 《Production》 is main module with Flexible and Volume production mode for options to reach the multiple-scenario and batch production requirements.
- 《Debug》 module is for adjust cutting technique and cutting samples support DXF、LXD、G、NC file format, and standard G code from ACTcut、Lantek.
- 《Technique》 module can help users to build a well-established technique library and manage the material and cutting parameter data conveniently.
- 《Diagnosis》 highly integrates the management and data analysis of core machine device in nine block which is very convenient for users to troubleshoot and check usage information of each components.
- 《Maintenance》 module monitor the working status of each device of machine and make advice to users about the maintenance and repair according the pre-set security line and equipment service time.
- Support local edit and optimize of drawings, reduce preparation time before production.
- Support quick find edge function to improve the efficiency in standard shape plate machining process.
- Visual reproduction for remnant plate and process monitor. Drag the graphic to the plate and quick start production.
- Automatic nozzle clean and replace process, task file switch, follower calibration, and laser beam centering and maintenance module for assisting

production process.

- File optimization includes: remove duplicates, connect unclosed segments, remove minimal graphic and distinguish inner and outer contour and set machining sequence automatically.
- Support various type pierce patterns include: lightning pierce, multi-segment pierce, progressive pierce, pre-pierce, group pre-pierce and set separate parameter from cutting process like duty cycle, frequency, laser pattern, gas , pressure, peak power, delay and follow height etc.
- Edit frequency and power curve in real time, you can also set related parameter for start process of cutting.
- Memory the break point of machining process and trace forward or backward the cutting path.
- Users can locate to any position of the graphic and start machining.
- Powerful expansion capability with more than 50 editable process and 30 PLC.
- Support input and output signal assignment, alarm and warning programming.

1.2 Access, upgrade, and restore the system

HypCut system built-in the HypTronic master station can directly open after computer startup.

HypCut system only provide simple functions for graphic process. It will work in best performance with CypNest nesting software.

HypTronic main station provides quick restore function to help users restore the default setting when system error occur.

You can also contact supplier or technical support to get the install program for later use and upgrade.

1.3 Start operation

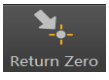
1.3.1 Start-up System

HypCut program will start and self-check in HypTronic startup. Or you can double click HypCut software icon

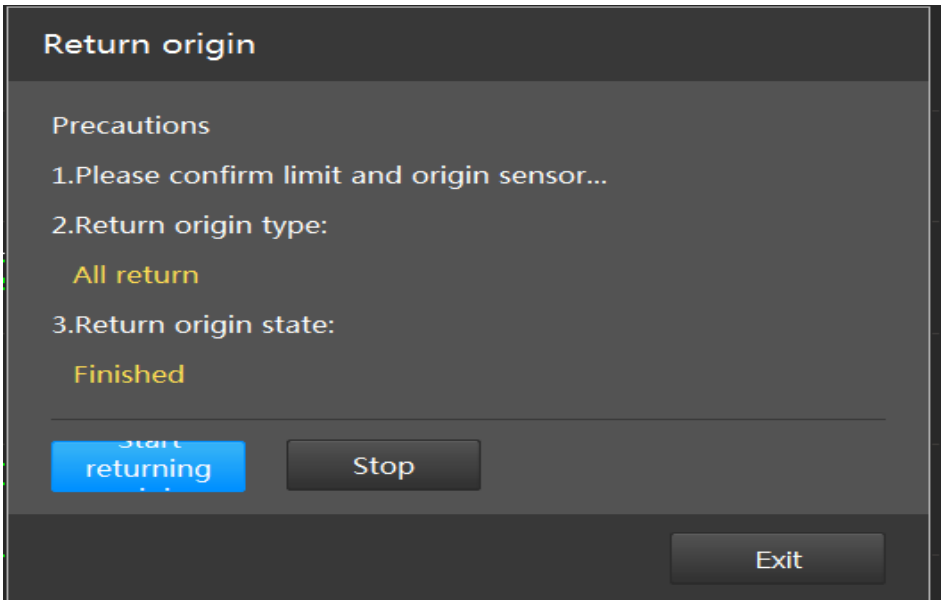
on the desktop.

Confirm all electric components are properly connected and started. Program will execute module loading and self-check process after self-check passed will prompt return origin dialogue box.

Reliable and correct coordinates is important for machining functions of HypCut, it's recommended that execute return origin to build coordinates every time after startup machine. If not execute return origin after started program, it will prompt "please execute return origin" warning and can only execute low speed jog operation and disable all other function until return origin completed.

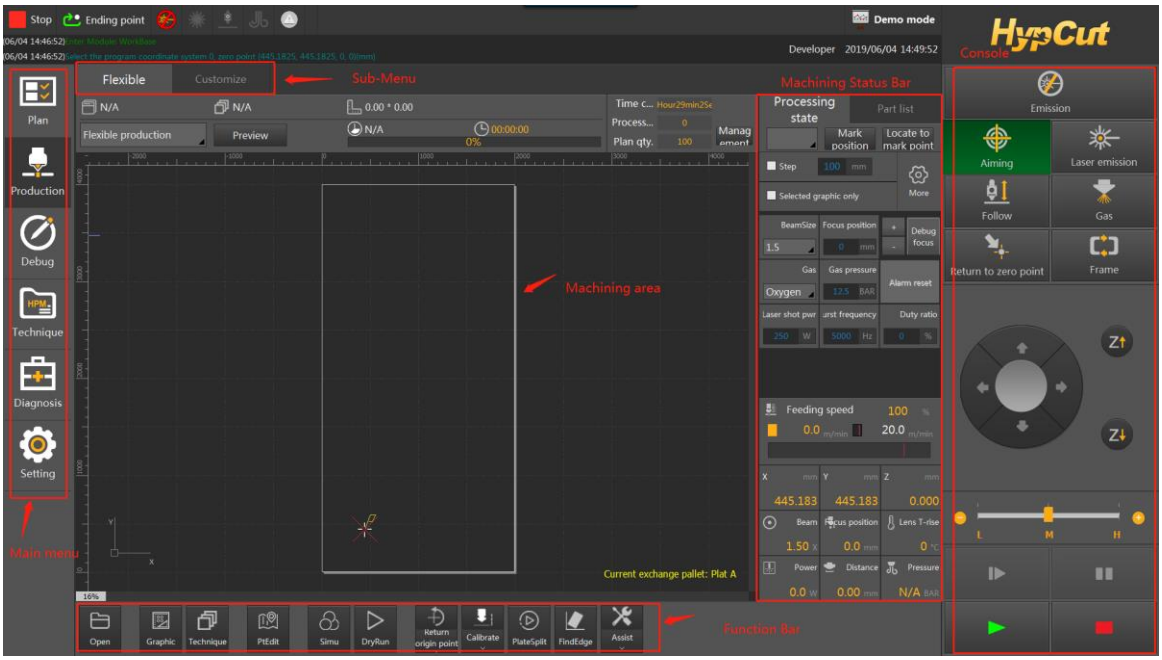
When button in blinking status, press the button will execute return origin process. When the 

button in grey status, press the button will execute return program zero point process.



Note: When there are other alarms exist when start the program cannot execute return origin. Only after other alarm removed can execute return origin.

1.3.2 User Interface



The center zone in black is the graphic display area, the white frame is the machine working frame.

The grid and ruler will adjust when zoom the view.

System status column: Display the current machine status and activated automation functions by highlight icon. There are permanent icons and activated icons. The permanent icons from left to right are: working state, return position after task ends, shutter, laser, follow, blow, warning; Non-permanent icons are displayed only after the related function enabled.

Information/ Alarm Bar: Double click the message box to check the program log; the message highlighted in red or yellow means current in warning/ alarm status, double click the alarm box to check the detailed alarm message.

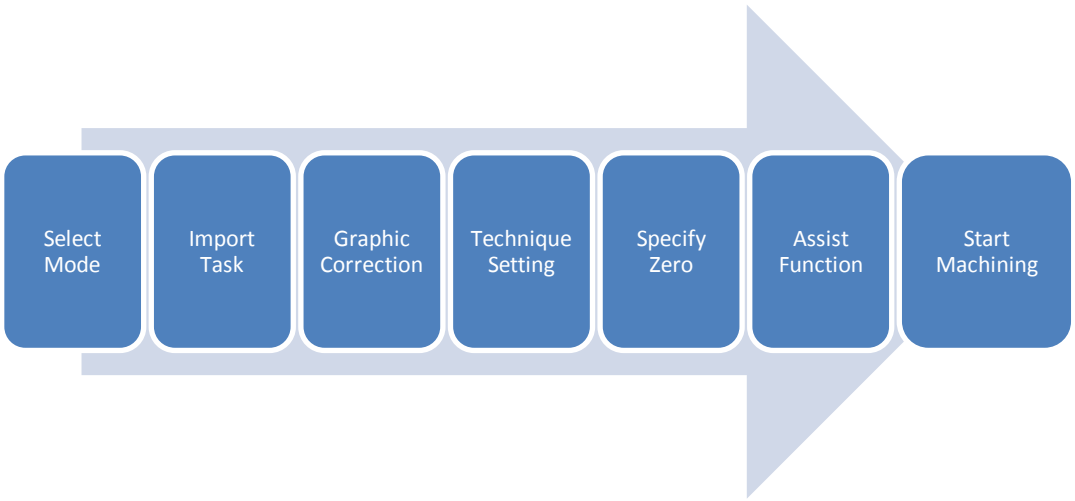
On the left side of the main page is "Level 1 Menu": You can switch between main function modules and the selected will be highlighted in black.

On the right side of the main page is "**Console**": The most frequently used operation buttons like laser, blow, follow, Jog, speed switch, frame, return origin/zero point, start/pause/continue etc., are displayed. If HyPanel mounted the console in software will be hidden and replaced by the physical button on HyPanel.

Beside the console is the "**Machining Information Bar**": It provides step, select, quick setting, technique, speed feeding and coordinates etc.

At the bottom of the interface is the "**Function Bar**": This bar integrates the main operation entrance under current module.

1.4 Standard Production and Operation Process



1.4.1 Select Production Mode

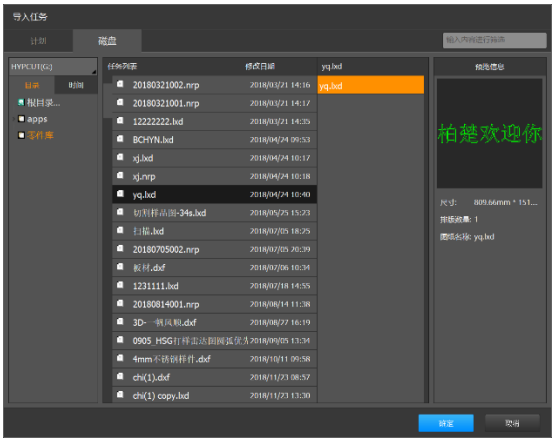
Enter in Production module from left side of main page, you can switch the production mode from top left: Volume production/Flexible production.

Volume Production: Use workpiece coordinate system, the zero point is fixed. Suitable for continuous production of large quantities of standard plates. You can specify a fixed position or use find edge function to get fixed zero point.

Flexible Production: Use floating coordinate system and the zero point is not fixed. Suitable for flexible production of small batch of special-shaped plates. Zero point under flexible mode is decided by "start from current position" or find edge result.

1.4.2 Import Task File

After select the production mode, click "Open" to import the task file.



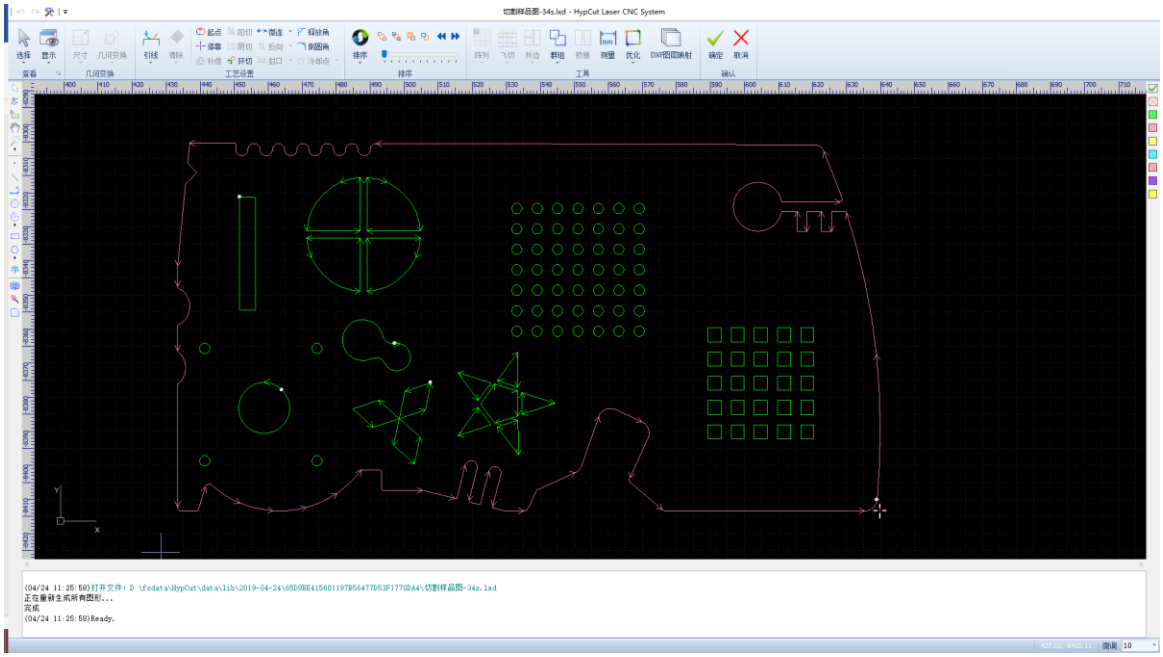
Note:① Volume production only supports nrp, lxd and lxds formats; Flexible production additionally supports dxf, nc file.

② Plan entrance stores all file imported in HypCut, from disk entrance is new file.

1.4.3 Graphic Correction

You can adjust the dock position, lead line, compensation, micro-joint, size etc., click

at bottom to enter in graphic edit page:

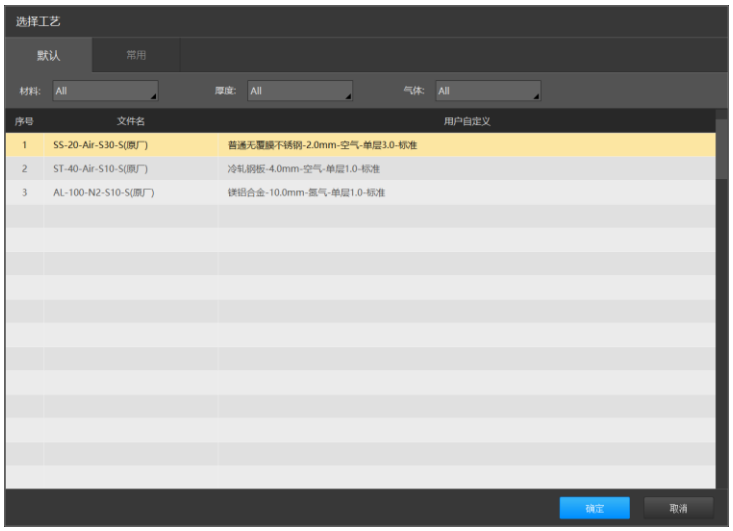


Graphic correction module provides comprehensive CAD edit functions. Details can refer to the related chapter.

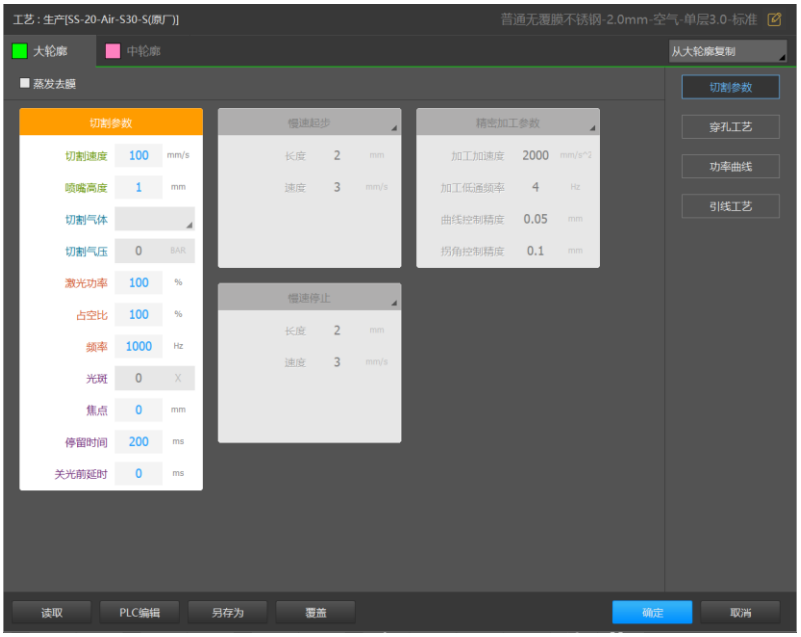
1.4.4 Cutting Technique

If there is no cutting technique in imported file, technique filter will prompt for matching cutting technique; You can modify or select cutting technique by click '

at bottom.



Click 'Ok' to match the cutting technique with task file:



You can check and modify cutting parameter by 'Technique' button. You can click 'Read' at bottom to replace technique parameter from the filter.

Note:

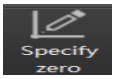
1. File imported from Plan entrance will relate with the technique from last machining;

2. Any cutting parameter change during machining won't affect the parameter in technique library, if you need to save the parameters change click 'Cover' to replace the original parameter;

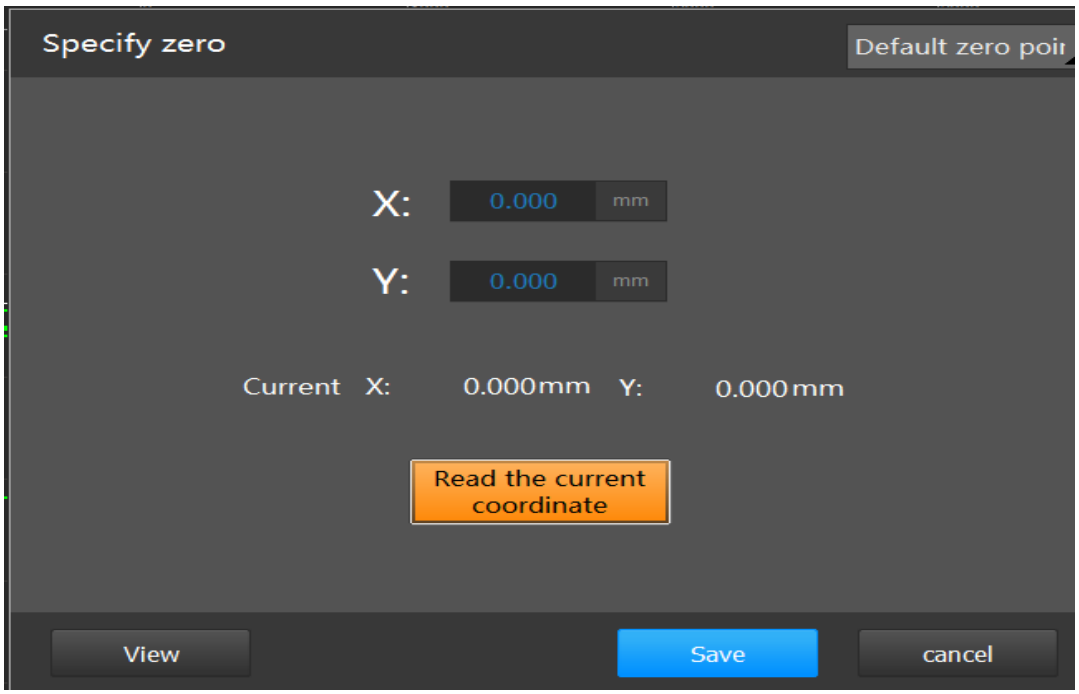
3. Under Volume production mode, program will save the cutting technique of unfinished task file in cache to make sure users can resume the task file production successfully.

1.4.4 Specify Zero Point

Volume Production Mode: Use workpiece coordinate system under volume production mode. Specify a reference zero point by 'Specify Zero' function before production.

Click the 

button at bottom page to open the function window.



You can enter a specified coordinate or move laser head to any position fit to start production then set as a zero point for production.

Click 'View' check the recorded zero point, add or delete history zero point. Click drop down menu on top to switch to history zero point.

Execute frame function under 'Specify Zero' page will start from current position. Close

'Specify Zero' page and execute frame function it will start from pre-set Zero point.

Flexible Production Mode: Use floating coordinate system under flexible production mode. It will start from current position when task begin.

Note:

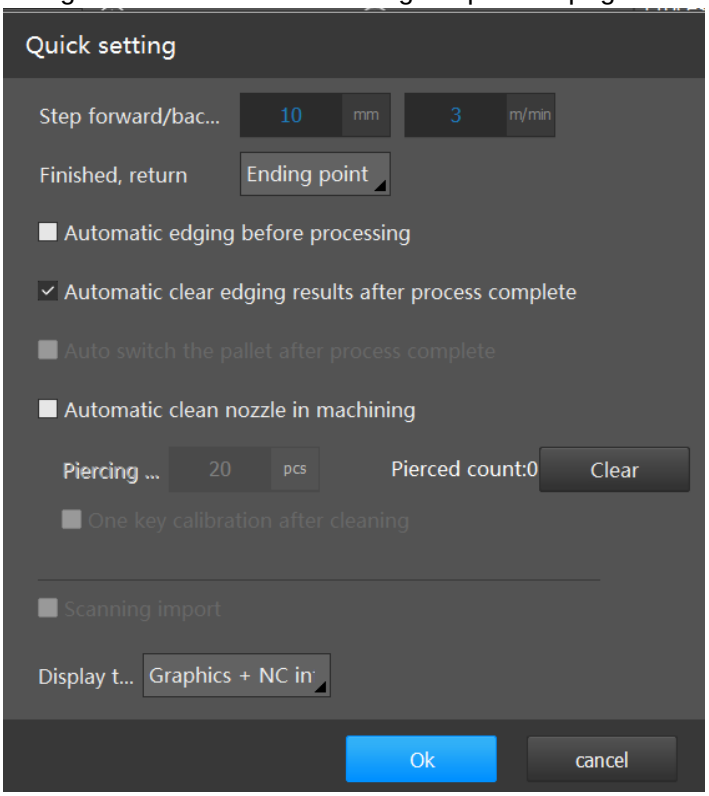
1. It's recommended to specify the proper zero point by execute frame or find edge function in case of accident cause by wrong zero point.

1.4.5 Assist Function

Besides standard production HypCut also provides extra functions to assist production and improve efficiency and automation.

Assist function setting enter from

at right top of the page.



Forward/Backward: After resume from pause position, cutting path will move backward or forward by this setting then start cutting;

Return position after file end: Laser head will return to this position after file ends.

Find edge before start: Enable this function program will execute find edge process automatically before start machining. The purpose of find edge is to calculate the deviation angle when plate is not upright put on machine bed. This process will reduce time of manually correct the plate deviation angle and improve automation efficiency.

Clear find edge result after process: Clear the find edge result of last time after production ends so that it won't affect the next production task.

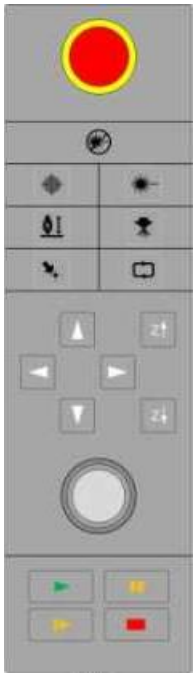
Enable exchange pallet after process end: If the machine mounted exchange pallet, you can set if switch working table automatically after file ends.

Auto clean nozzle: Laser head will move to the preset position of brush automatically after reach the specified pierce times to clean the nozzle. Ensure the machining continuity. Mainly used for machining of material like stainless steel, aluminum, copper, etc., which are easy to cause slag in cutting.

Scan in: Scan the QR code on report generated by CypNest nesting program can quick import the task file.

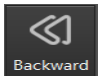
1.4.6 Start Machining

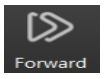
Before start machining please confirm there is no system alarm and assist functions, zero point and technique settings of the task file are all correct. You can execute Frame function to confirm the cutting area is within the plate.



Click open the laser shutter and open the guide laser.

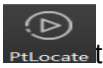
Before machining click laser head will move along the frame of the task area.

Then click start machining, click pause the process. In pause status you can control laser head up and down, or open/close laser and gas; in pause status, you can press 



button to move backward or forward along the cutting path; Click resume machining process.

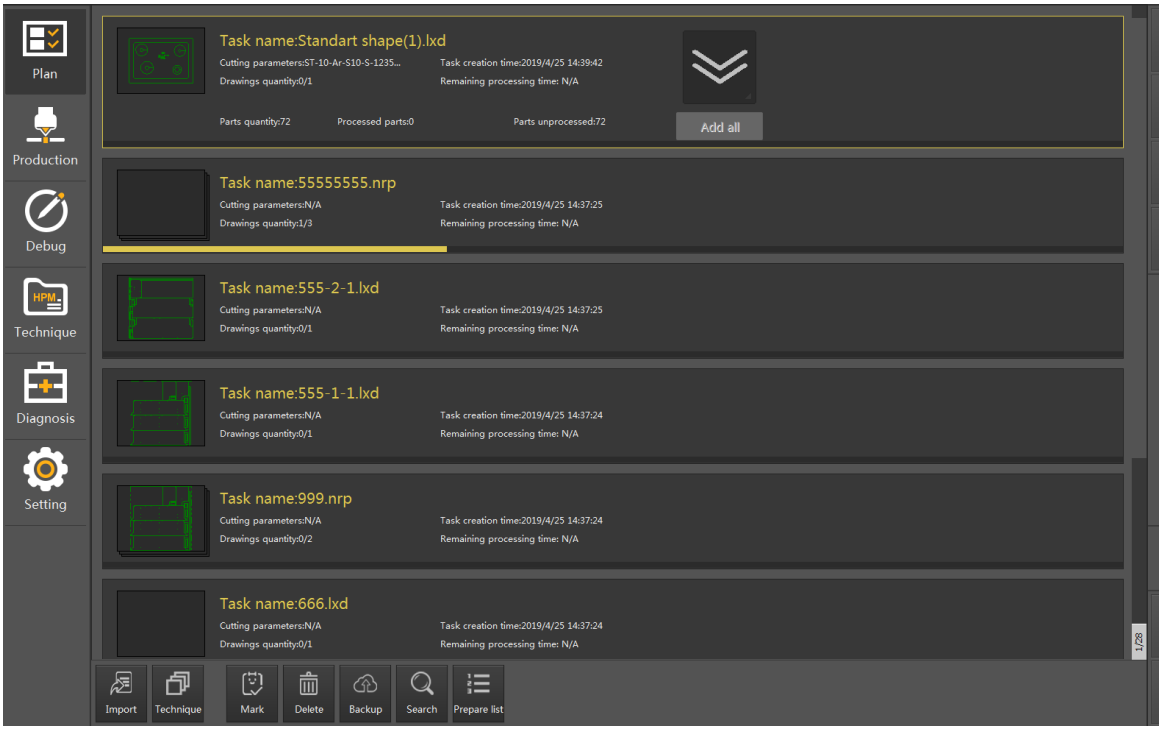
Rotate the knob to adjust the machining speed rate, the range is from 1~120%.

Click to stop machining and 

to locate to the break position (if change the graphic and machining parameter it can't locate to the break point), click to resume the machining.

2.Plan

HypCut provides a dedicated access for CypNest program--《Plan》:In this module you can manage the order and task file, check production progress, and backup the history data.



In Plan module displays the newly added, unfinished or history task status.

2.1 Brief Introduction

HypCut will save the history task into database for later use or production analysis. All file added will be saved in the Plan module database and listed by generate date.

Import: Import the task file from CypNest or external storage media to task list in Plan module.

Graphic correction: Edit the lead line, compensation, and start point etc., of the graphic.

Technique: Set machining technique to the selected task file.

Delete: Delete the specified file from task list.

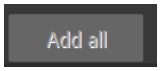
Backup: Backup the history data to the storage medium or network termination.

Date: Search the machining record in specified time range.

Prepare list: You can quick view the basic information of task file. The number at right bottom shows the file number in list.

2.2 Task File& Drawing

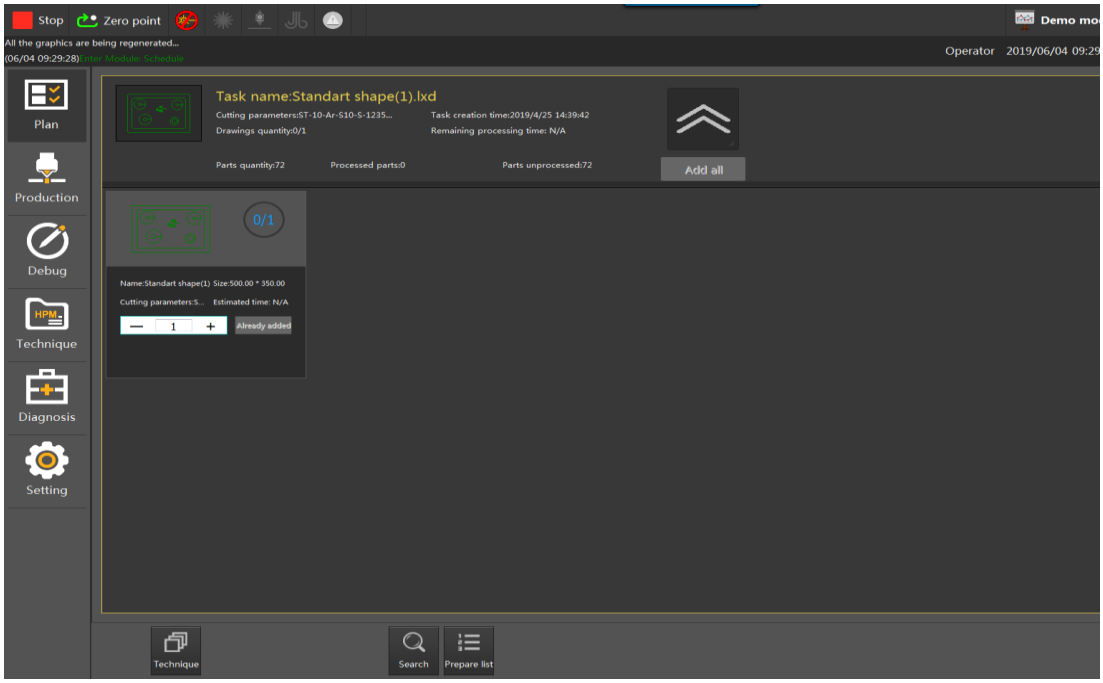
Create the task file in CypNest and import into HypCut system by network or USB device. In HypCut you can check the task and history record in Plan module.

Click 

to add all drawings in this task to prepare list in production module ready for machining. Click

to mark the task as finished status whether the task finished or not.

Click
to check the drawing of the task:

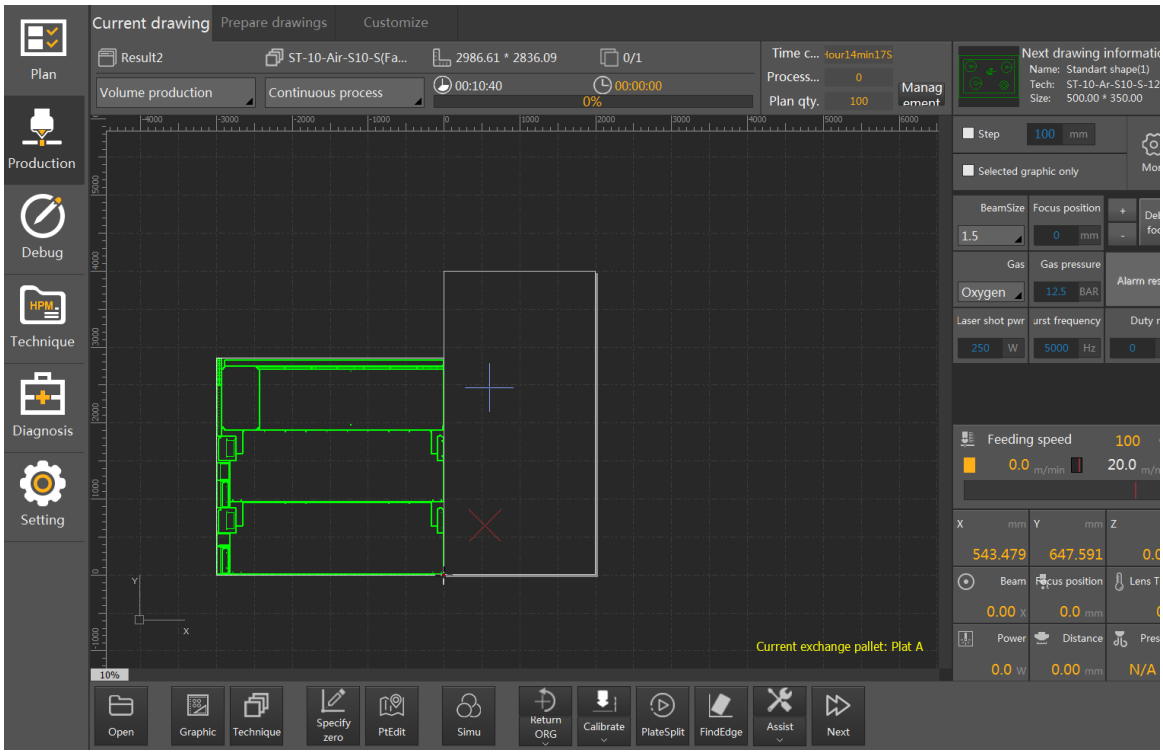


Unfold the task you can see the machining speed, status, parameter setting and add the drawing to the prepare list for machining. You can also edit the graphic or technique of the drawing.

Click
return to task list.

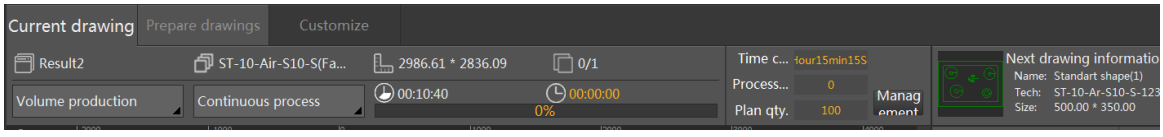
3.Production Module

This chapter introduces the core module of HypCut system--《Production》 which can meet different production scenario.



3.1 Volume Production/Flexible Production

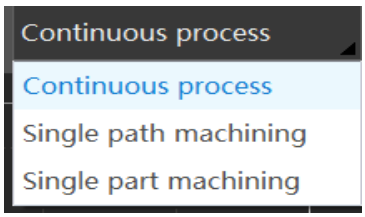
3.1.1 Drawing Information Bar



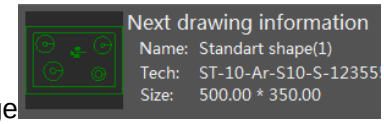
At the top of 《Current Drawing》 is drawing information bar. The message from left to right is: drawing name; technique name; plate size; drawing number; Volume production production mode switch; estimated machining time; actual

machining time;

machining progress bar.



Beside the progress bar is the mode switch of machining process: The default setting is continuous process, under this mode system will stop after whole drawing completed; Under 'single path' mode, system will stop after one single path completed, press continue process next single path; Under 'single part' mode, system will stop after one single part completed, press continue process next part. This function is for cutting technique adjust or exhibition demonstrate.

When there are multiple drawing in prepare list, you can see the preview of the next drawing at the top right area in the page 

. Click preview to unfold the detailed information of the next drawing.

3.1.2 Function Bar

The main operation buttons of HypCut are at the bottom function bar:

Open: Add a drawing to quick start the production. When there is no technique setting on the drawing, program will prompt technique filter to help user match suitable cutting technique.

Graphic: Click this button will enter drawing edit page. You can edit lead line, compensation, start point etc.

Technique: Set machining technique to the drawing. Operator access level can only use the technique data not able to change the original technique data. Modify the drawing under stop status will lose the break information of the machining process. In the machining status

cannot modify the cutting parameters.

Specify Zero: Under Production module use workpiece coordinates and pre-set zero point for machining. Modify zero point by <Specify Zero> to manually input a new coordinate or select a position. It can save 9 custom zero point under workpiece coordinates to help user quick start different production batch. Under <Specify Zero> page to execute frame function, current position of laser head is reference point. While in other page to execute frame function take the pre-set zero point as reference.

PtEdit: Under stop status to record the break point or manually locate to a specified position.

Simulation: Just display the moving path on the drawing to help user check the machining sequence no actual motion movements in machine. You can also adjust the simulation speed by rotary switch.

Dry Run: Move along the actual machining path without laser, gas and follow function to help user check the motion function. This function only available under expert-level.

Return origin: Click this button will execute all axis return origin. Click the drop down menu to execute single axis return origin;

Calibrate: User can calibrate the capacitance by manually select a position or executed automatically at preset position.

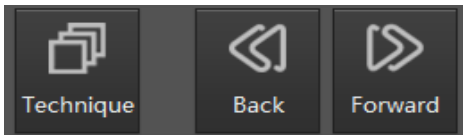
PlateSplit: Find the plate edge and cut in plate from outside;

Find Edge: Calculate the offset angle and zero position of standard rectangle plate;

Assist function: Provide some assist functions like lubrication and cycle test machine;

Next: Under stop status, to switch in the next drawing for production;

When pause the machining process, you can modify the cutting parameters and resume the process by specified position.



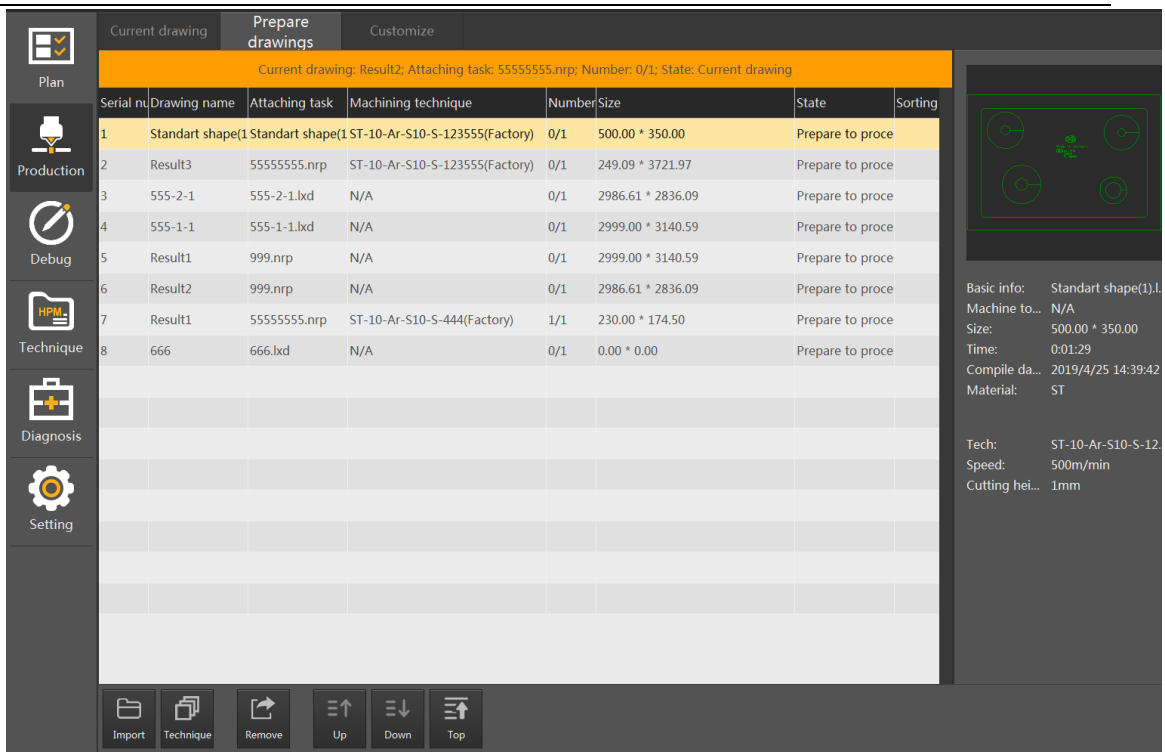
Backward: When pause the machining, click the button to move back along the cutting path;

Forward: When pause the machining process, click the button to move forward the cutting path;

3.2 Prepare List

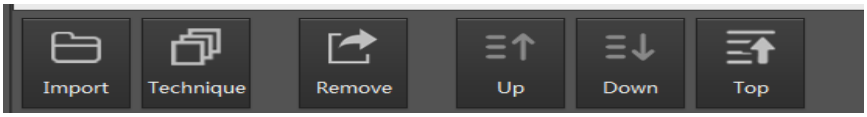
In HypCut users can modify other drawing parameters when system is in machining to reduce the time on preparation on drawing and improve the efficiency. Click 'Next' switch the new drawing and quick start new production batch.

Drawing will be added in as the sequence in prepare list. When current drawing not finished and switch in the next drawing, unfinished drawing will be at the top of the prepare list. When the drawing finished production and switch the new drawing, finished drawing will be saved in history record.



3.2.1《Prepare List》Function Bar

At the bottom of prepare list page displays all operation buttons.



Import: Only can import Nrp or Lxd format file from Plan module or external storage device.

Technique: Match cutting technique for selected drawing.

Graphic: Set lead line, compensation, start point etc.

Remove: Remove the selected drawings from the 'Prepare list'.

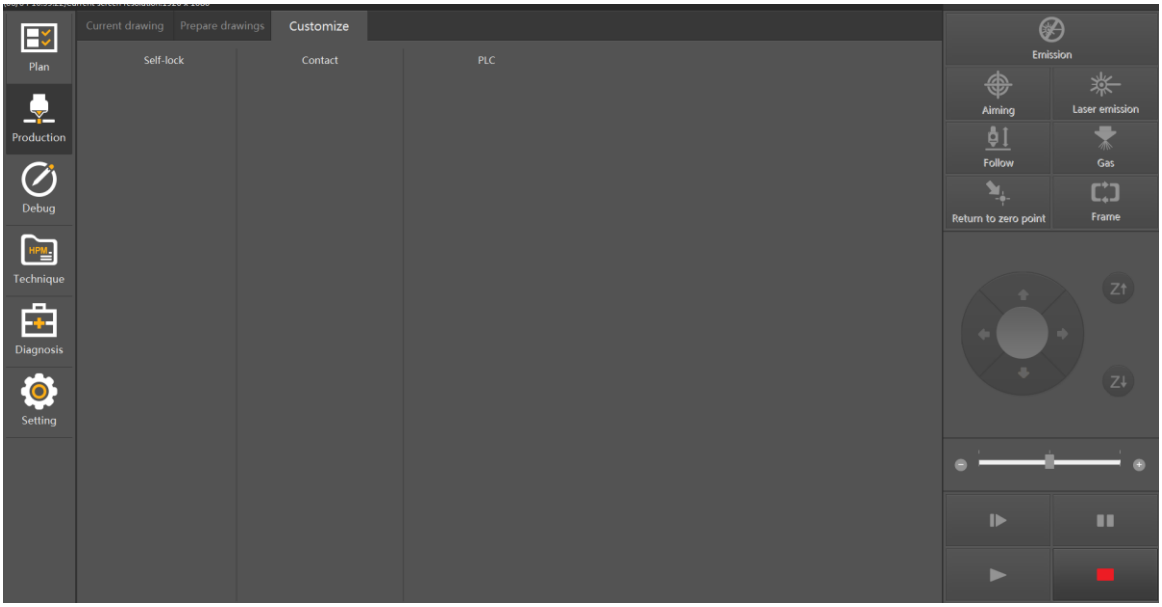
Up: Move up the ranking of selected drawing in the list;

Down: Move down the ranking of selected drawing in the list;

Top: Move the selected drawing to the top of the list.

3.3 Custom Module

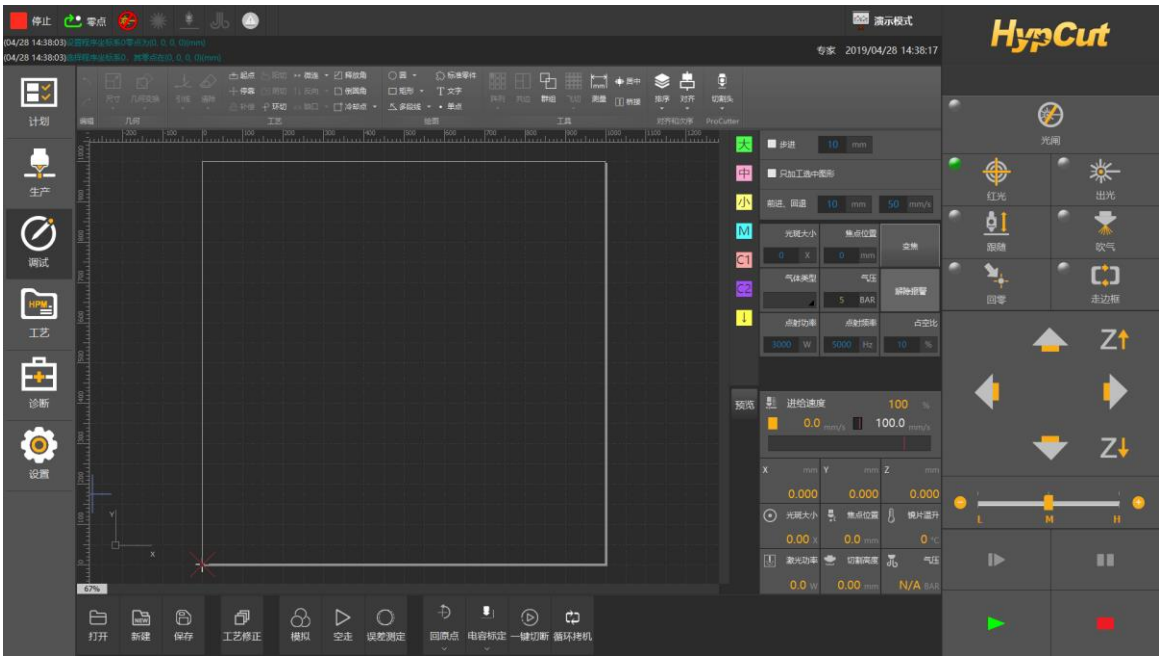
Users can control the customized output signal and specified PLC process.



4.Debug

Debug provides abundant graphic edit function and position locate operation to help manufactures test machine performance and cutting technique.

Debug module also can be used for production in the same operation process with CypCut. And only use floating coordinates system. Contain the necessary CAD and graphic optimization functions.

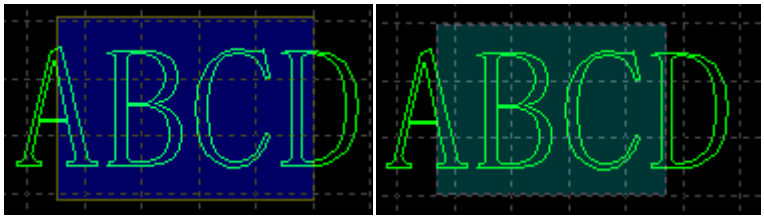


4.1 Graphic Functions

4.1.1 Select

HypCut provides abundant options to select specified graphic. The basic operation is 'Click', click to select the graphic. Another operation is 'frame selection', drag mouse create a selection frame. There are 2 patterns of 'frame selection': one is drag the selection frame from left to right, only the graphic entirely covered in the frame box can be selected; The other pattern is to drag the selection frame from right to left, the graphic with any part covered in the frame will be selected.

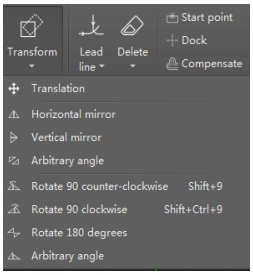
The frame box of both drag patterns are shown below. The left frame box is drag from left to right, only 'BC' selected; right frame box is drag from right to left, 'ABCD' all selected. Use either way to select the graphic as needed.



Select graphic meanwhile press Shift can newly select or deselect graphic without affecting previous selected graphic.

4.1.2 Transform

In 'Transform' drop down menu provides functions to transform the graphic like mirror, rotate, align and zoom the graphic.

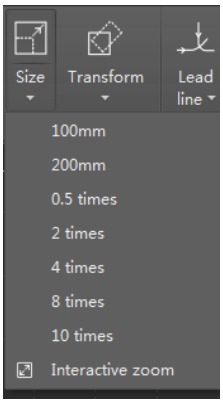


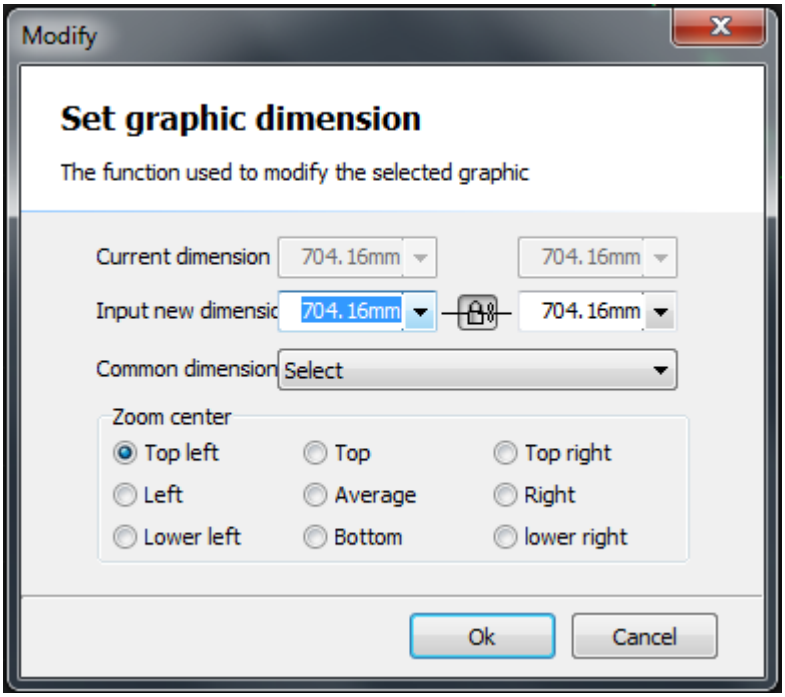
4.1.3 Size

There are several options for quick zoom the graphic size as specified rate in drop down menu. As shown on the right:

For example, "100 mm" will zoom the graphic width to 100mm, '2 times' will zoom the graphic 2 times larger of original one.

You can also input an accurate size to transform the graphic size.





When the lock icon in locked status , change one of the value of width or length the other one will change accordingly. Unlock the lock icon to change the width and length separately.

"Zoom center" can specify the relative position of new graphic with the original one. For example, select 'Top left', the transform will be based with top left direction.

Notice: The lead line and compensation won't change with the graphic size modification.

4.1.4 Automatic Snap

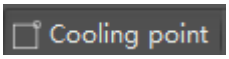
Automatic snap functions include graphic border snap to another one, graphic snap to a key point etc.

4.1.5 Technique Setting

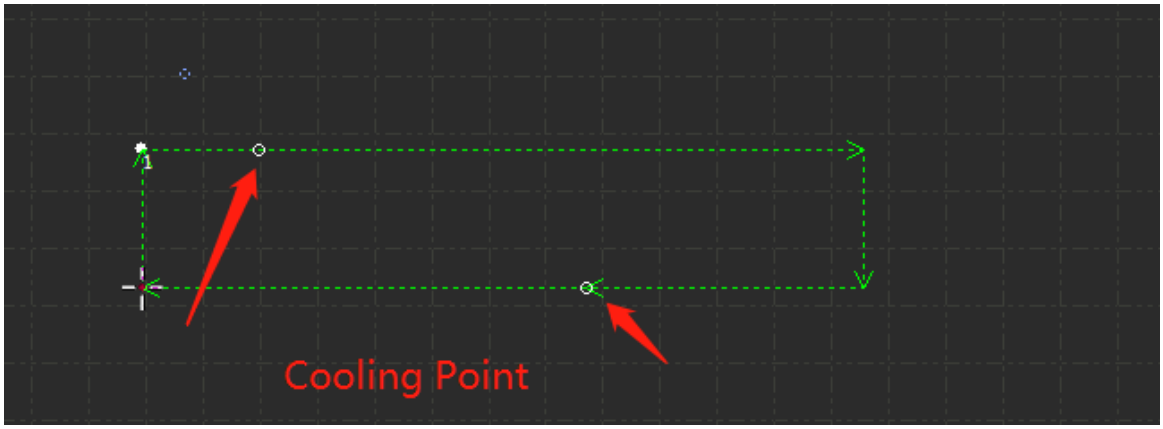
This chapter describe the functions relate with cutting technique. Users need to set the parameter according the material, laser, gas. Which are directly involved in the cutting technique. All parameters value should just be reference not a guide value.

Warning! **Improper or incorrect parameters may result bad cutting performance even damage the machine.**

4.1.6 Cooling point

Click 

button and point to the graphic to add a cooling position. It will turn off laser at cooling point and open gas maintain a delay time set in global parameter page, then continue the cutting. Cooling point displayed as a dot:



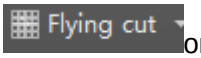
Click multiple times to add more than one cooling points.

You can also add cooling point automatically by click the "Cooling point" drop down menu and set related parameters. You can choose to add cooling point at lead-in position and sharp corner. The cooling point add on the lead-in line will change and delete with lead-line. 'Clear cooling' won't remove the cooling point on lead line.

4.1.7 FlyCut

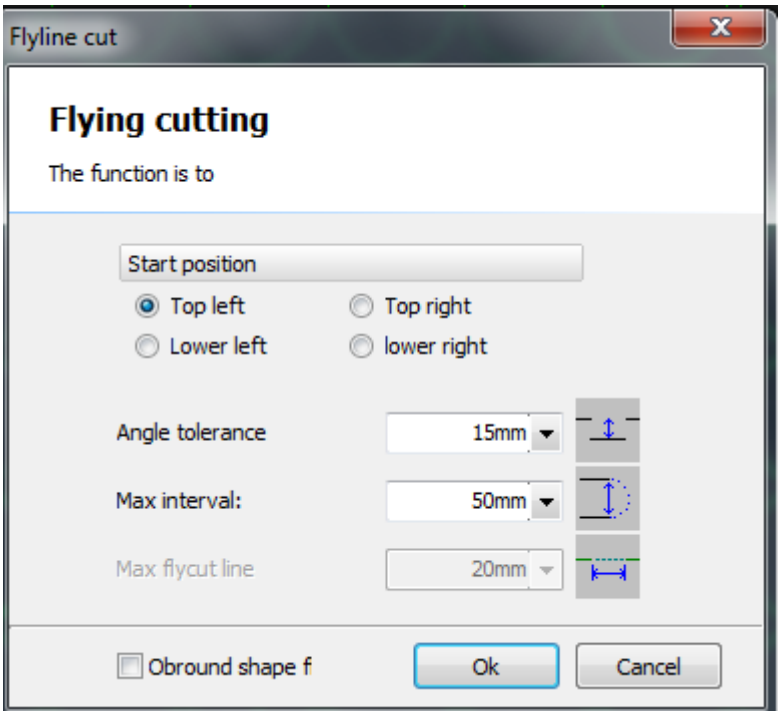
When the Graphic is regular shape and arranged in organized array, you can use fly cut mode to improve the efficiency.

Before start fly cut mode, set the process sequence of the graphic then create the fly cut path to reduce the unnecessary moving.

Click 

or open drop down menu for fly cut setting.

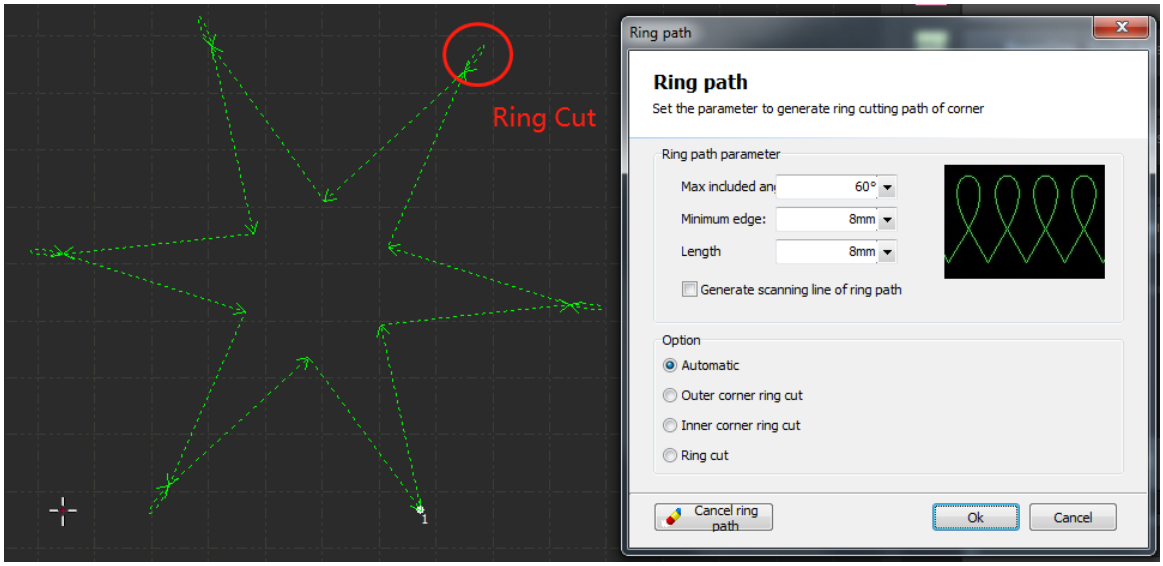
Start position is reference position to start machining. Ax tolerance is the allowable offset of the graphic in the array; Max interval means it will create a curve for change direction under this value; ax distance means that two



4.1.8 Ring Cut

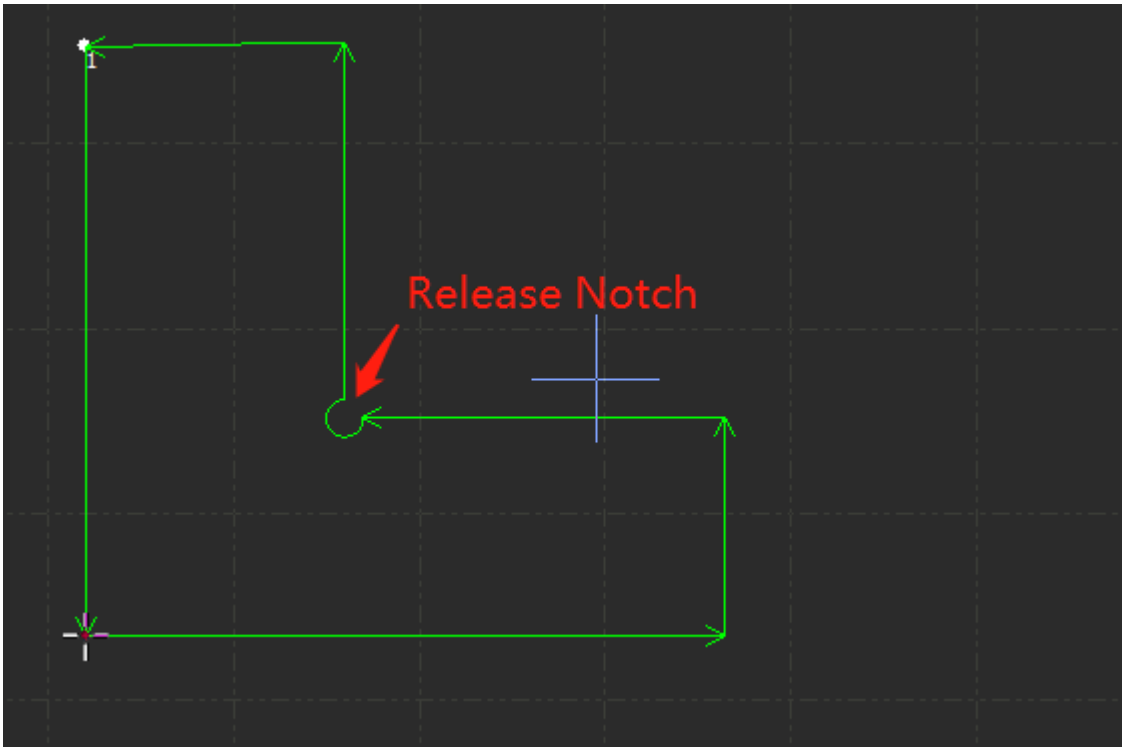
Select the graphic and click

to create a ring path at the corner to improve cutting performance.



4.1.9 Release

Click Release notch to create a release gap at the corner for the bending process of the workpiece.



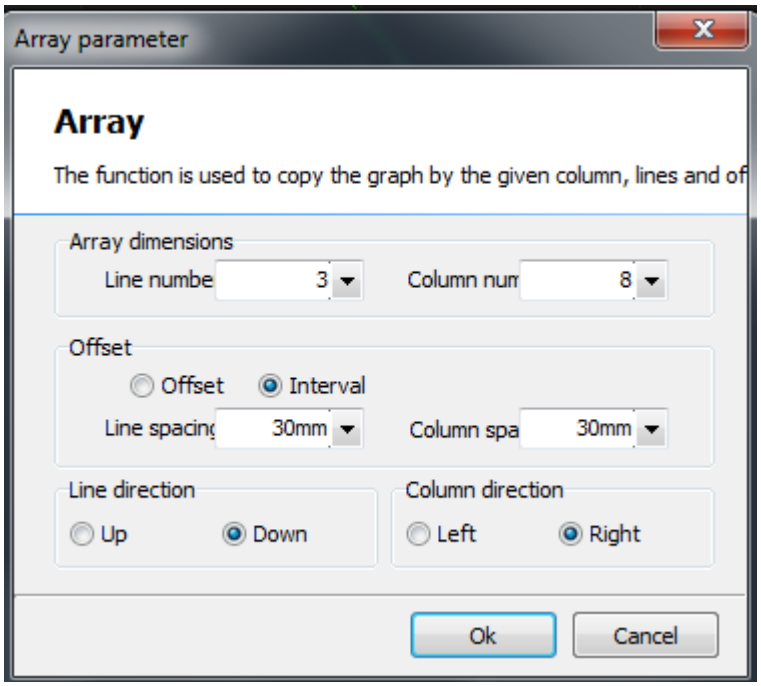
4.1.10 Array

There are 4 Array patterns in HypCut to copy the object as specified way.

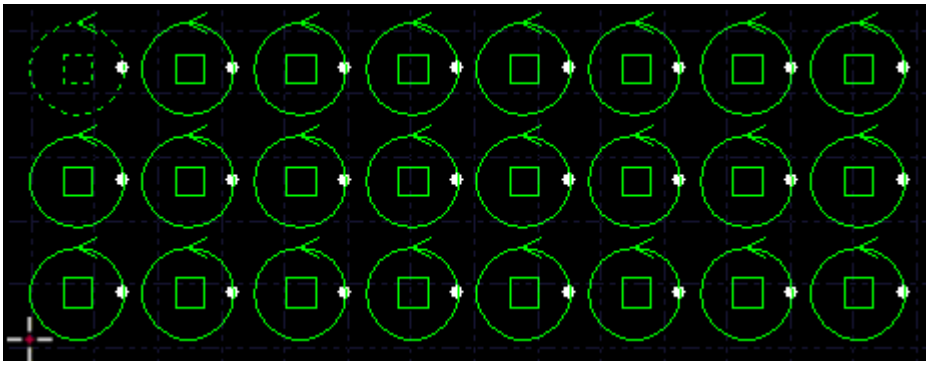
4.1.10.1 Rectangular array

Click the drop down menu of the

will show this page:

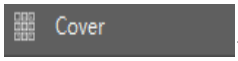


Set the lines and columns to duplicate the object:

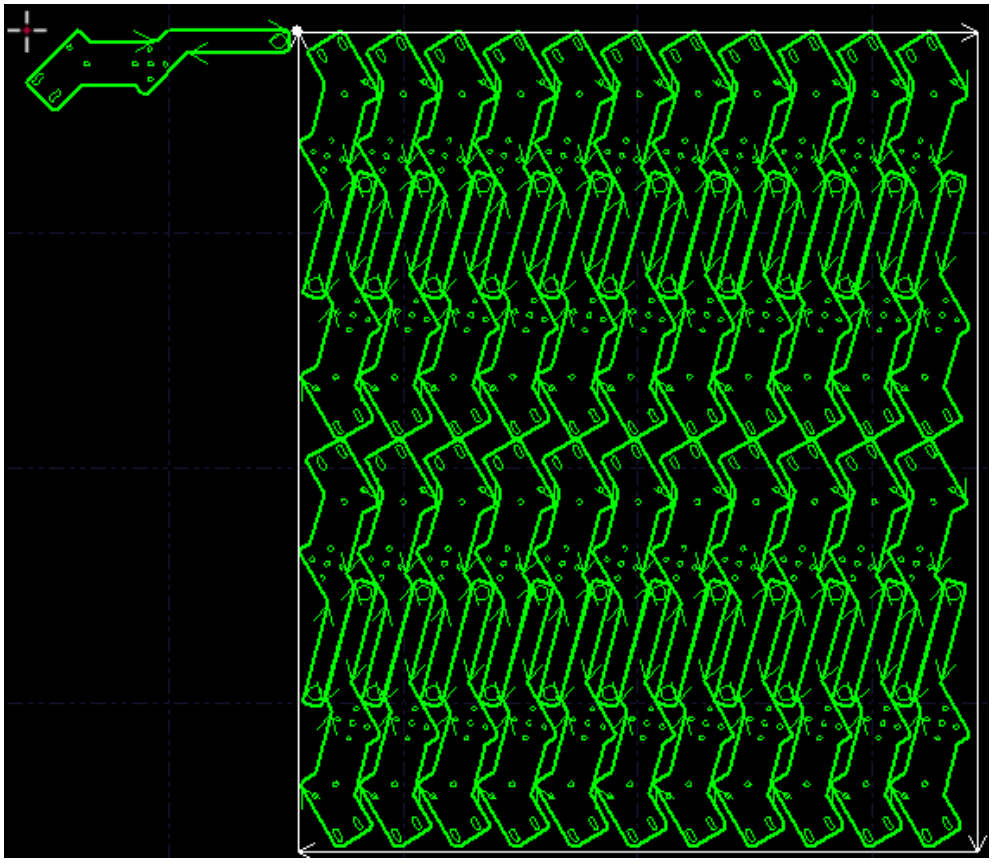


4.1.10.2 Full fill

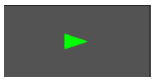
Full fill pattern used for the production of one single part nested in a whole plate, click

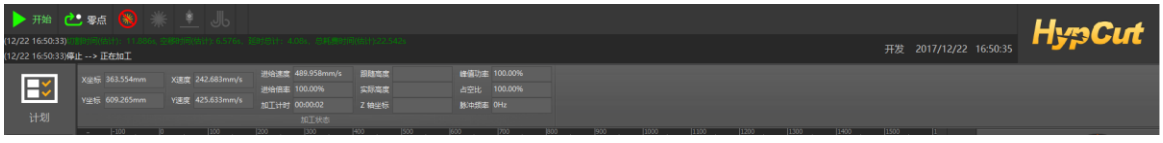


the part will be nested in plate as given settings. Plate setting refer to 'Nesting' section. Actual result shown as below:

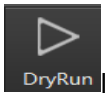


4.2 Machining and Dry Run

Click  start machining, there will be monitor of machining process like coordinates, speed, time count and following height etc.



When in above status cannot switch to other pages only File menu is available. If you need to modify the parameter in the machining process must pause the process.

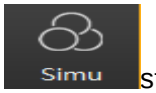
Click 

laser head will move along the actual cutting path with same speed and

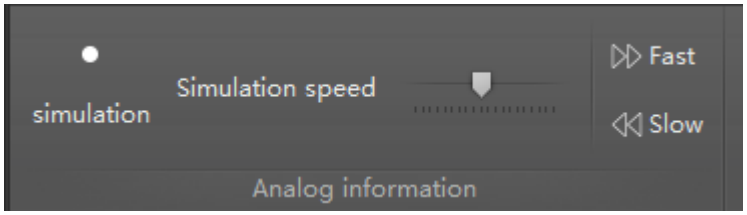
acceleration but laser, gas and follow function turning off. Meanwhile other functions like pause, resume, forward, backward and break point information all same with the actual cutting. Dry run can used to check the machining process without cutting the plate.

4.3 Simulation

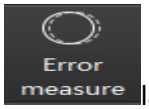
Users can simulate the cutting process check the cutting sequence in program. This process is separated with machine.

Click 

start simulation, tool bar will switch to CNC page.



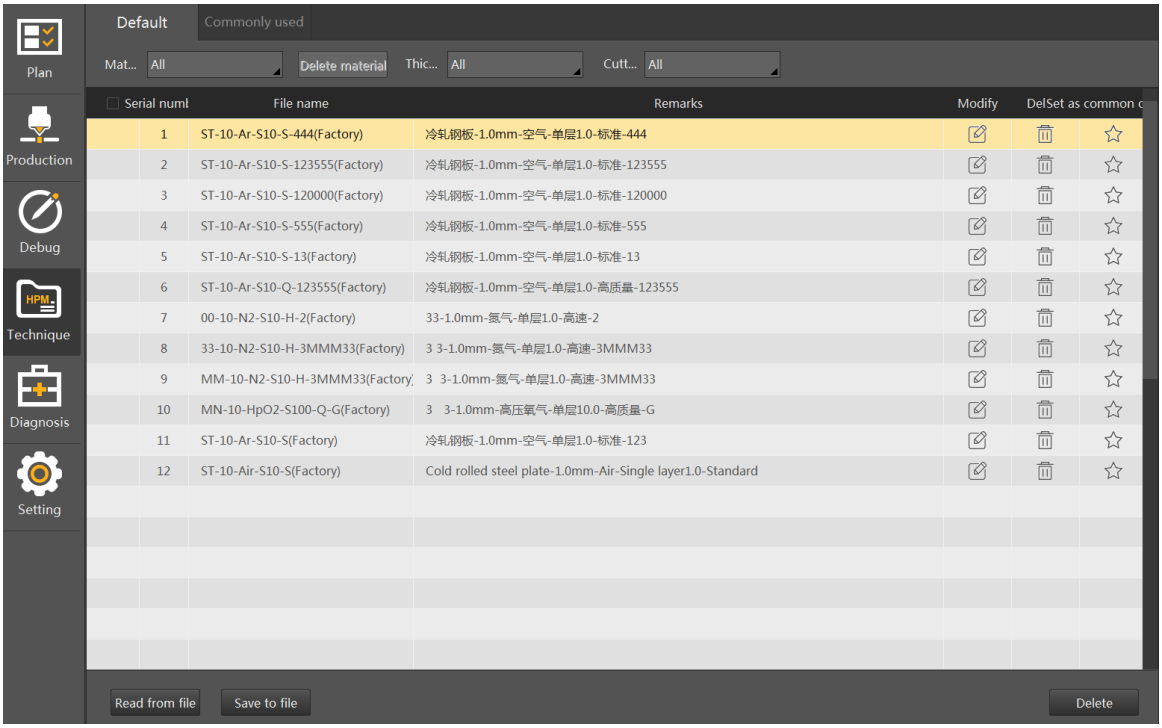
4.4 Error Measure

Click 

laser head will run through the graphic. Then program will display a dotted line in blue calculated by the motor feedback. Users can compare the reference path with the feedback path to adjust the related parameters.

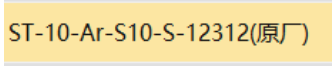
5. Cutting Technology

HypCut provides a module for cutting technique management.



5.1 Cutting Technique

Users can click and to lock or unlock a group technique parameters. Locked technique cannot edit.

Click to check or edit the technique parameters. Technique with mark 

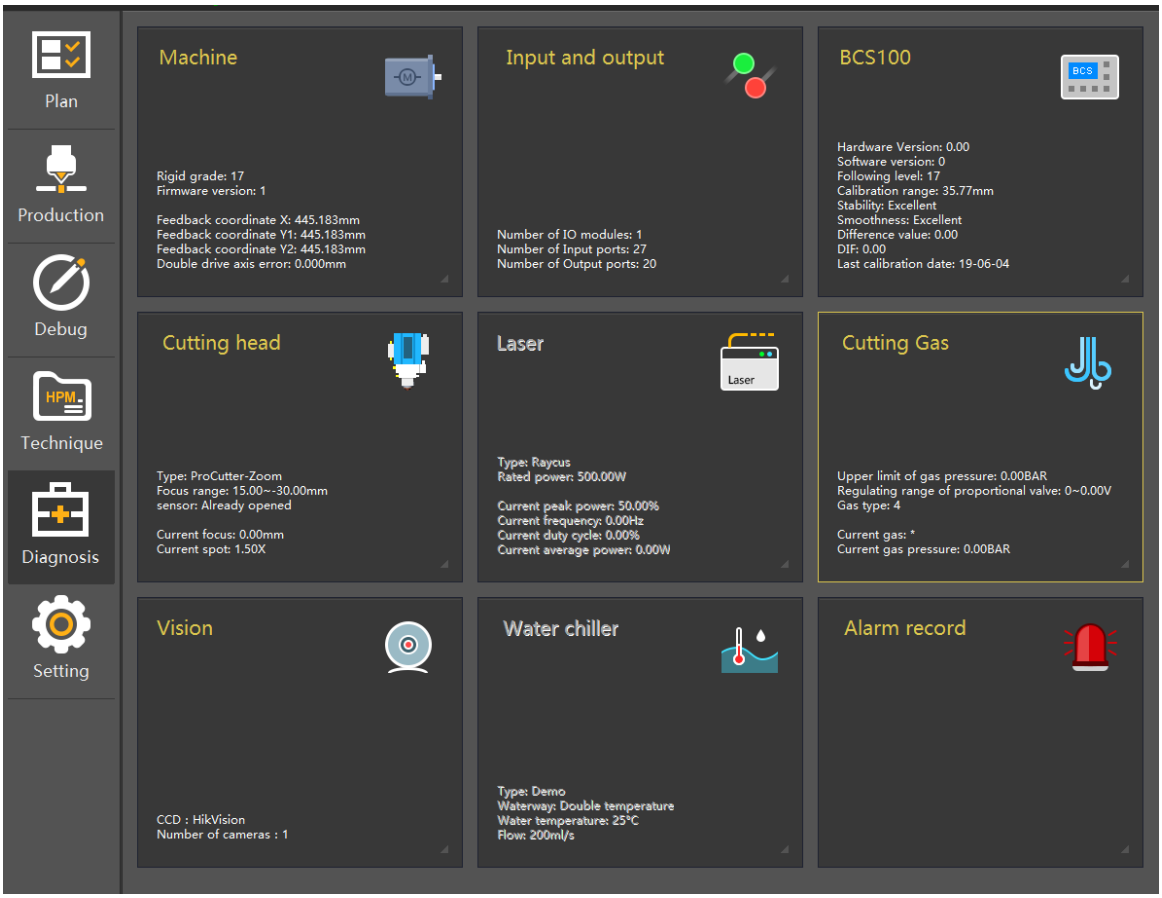
requires access level higher than operator level to edit.

Cutting technique naming rules: The technique named automatically by the material-thickness-cutting gas-nozzle-type-custom text.

Users can click mark the technique into commonly used list. So that you can quickly match the commonly used technique with the machining task.

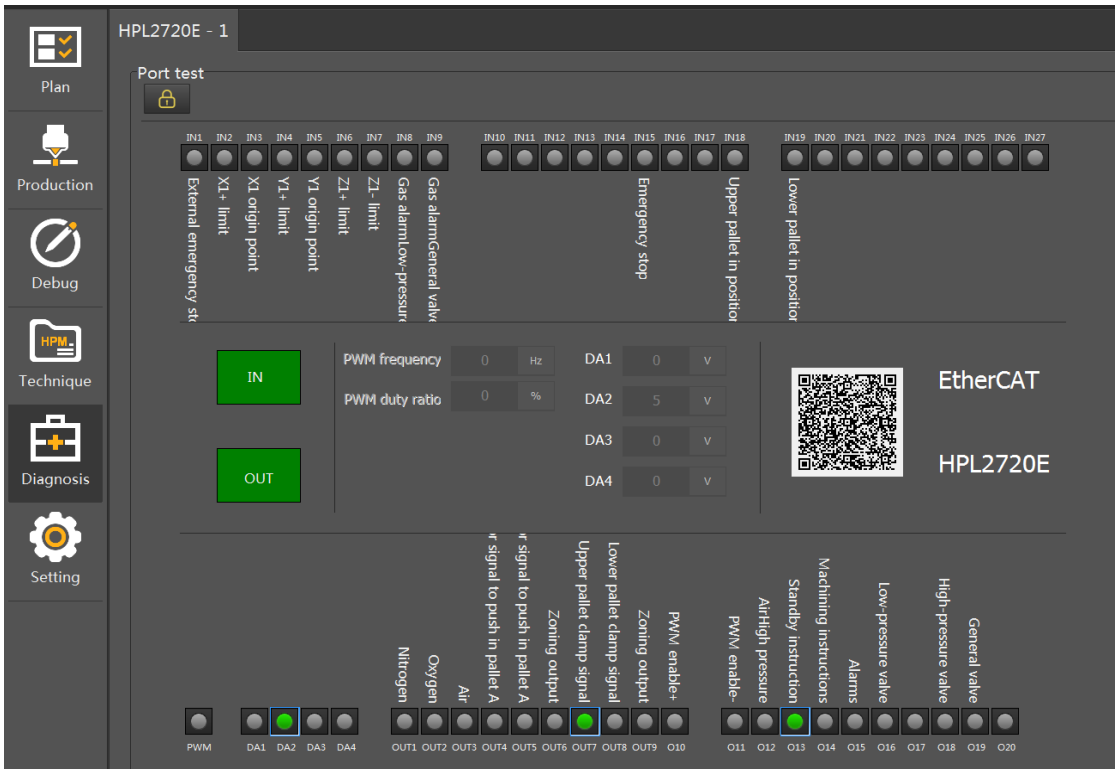
6. Diagnosis Module

Main peripherals of a laser machine are displayed in this page with diagnosis function for users to trouble shoot the malfunctions.



6.1 Diagnosis Window

Users can click to check all signal status in machining process to debug.



Limit signal used to check if the limit switch well functioned; Monitor the laser emit by PWM signal; There also displayed other 20 input signals and 27 output signals status.

6.2 Alarm

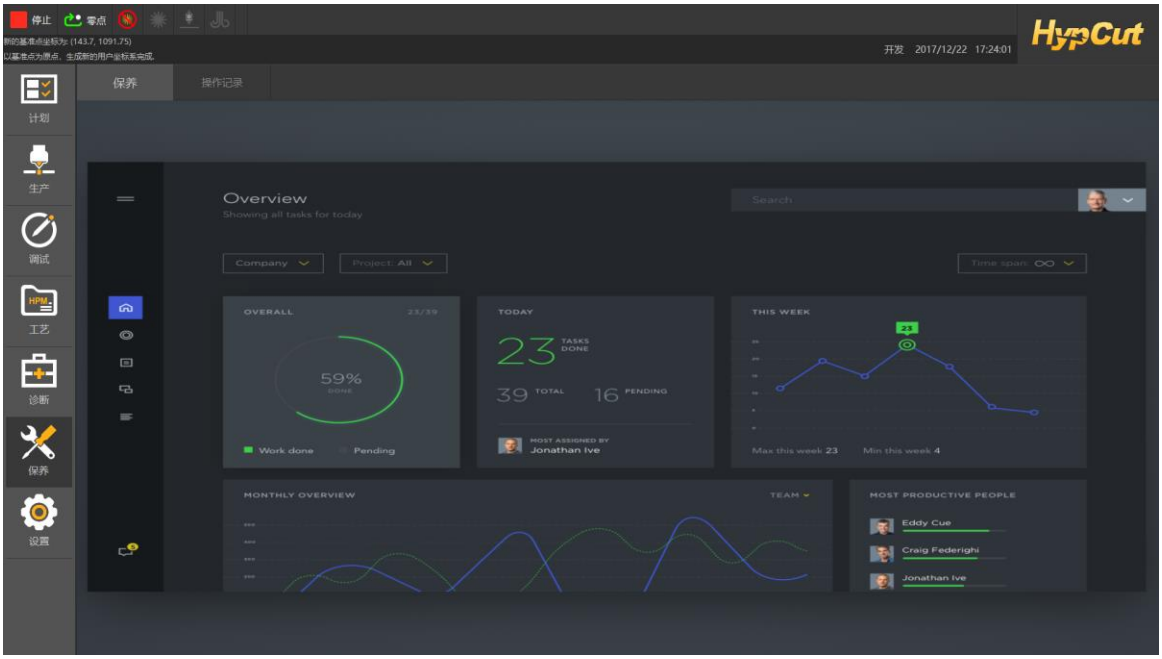
HypCut monitors all components when machine running. Once monitored an alarm will stop the machining and display the alarm message in red title. Motion function will be disabled until the alarm removed. Check the alarm source and remove the alarm then resume the machining. The alarm title shown as below:

Double click alarm title switch to the Diagnosis---alarm history page to check the alarm source and related solution.

Besides alarm HypCut will display the warning, notice and important message in different color once monitored abnormal process. These message won't stop the machining but still suggest notice these information and take precautions in advance.

7. Maintenance

System will send maintenance message by the preset time interval of each component like laser, gear and rack, reducer, water chiller and gas valve etc., to guide user implement the equipment maintenance and reduce failure rate.

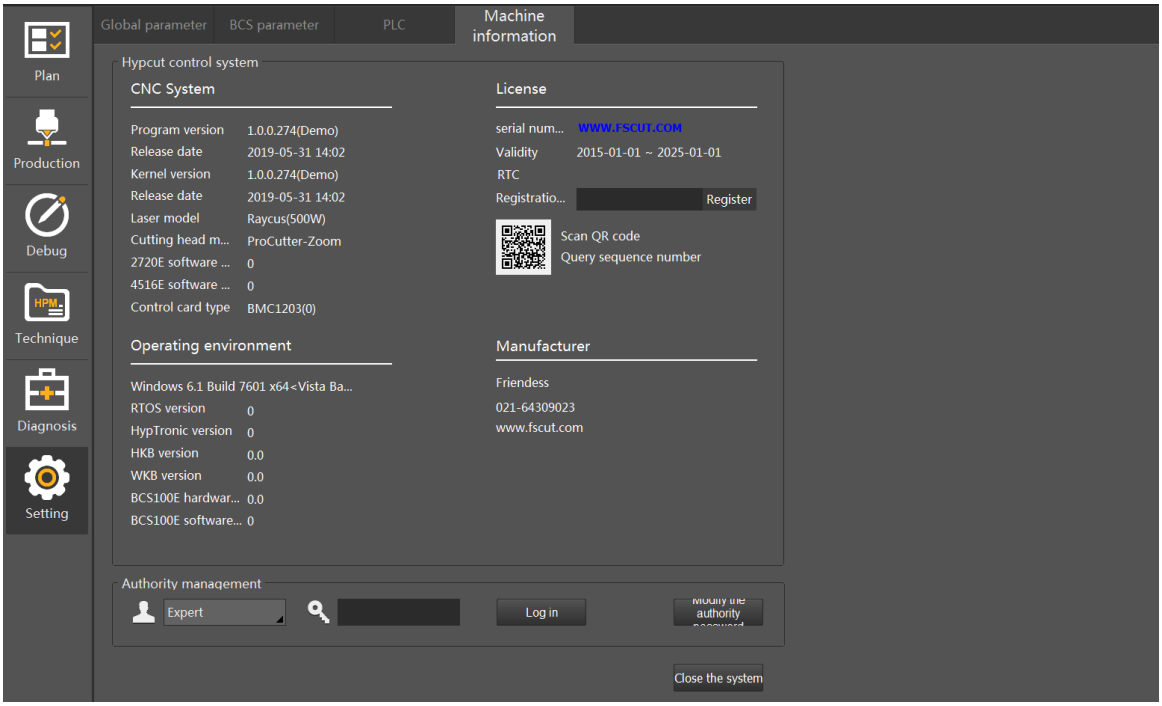


8. Setting

In setting users can login with different permission level like operator or expert to access or set the machine configuration.

Incorrect machine configuration will cause potential risk and injuries. Suggest expert level can only permitted by the trained professionals.

Common users can set the basic parameters and encryption and decryption etc.



8.1 Soft Limit Protection

HypCut use software limit to protect machine from over-travel, users can close the function in preference setting module. Default setting is soft limit being enabled.

When the system detect motion area will exceed the preset limit will prompt message box to warn users and not send motion command to prevent collision. Adjust the graphic within the machine travel range then start machining.

System will monitor the current position in real time and stop the motion once detected exceed the limit range.

Notice: Soft limit protection relies on correct coordinates. Therefore, every time change the machine config or system abnormal shut down users must execute return origin to create correct coordinates.

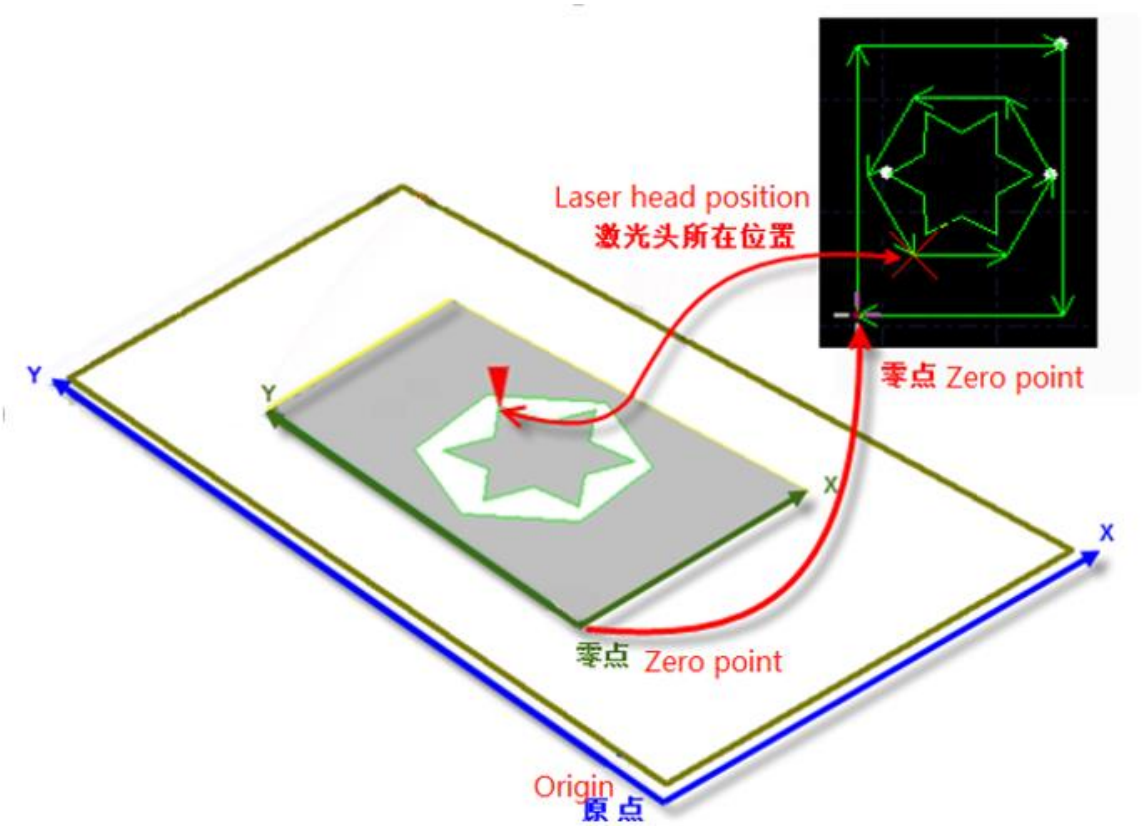
8.2 PLC Process

Click "PLC" button, and you can customize the PLC process and execute the process.

Notice: Inappropriate setting will cause serious consequence! Please contact our technicians if necessary.

9. Coordinate system

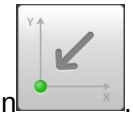
Modeling coordinate designing graphic not relevant with the machine, zero point marked by .The coordinate referred in machining process and machine position are shown below:



Click Preview in console will display the laser head position correspond with graphic.

9.1 Mechanical Coordinates System

Mechanical coordinate of the machine is defined by the mechanism. Coordinate system

is consistent every time execute return origin  .

HypCut defines coordinates with same rules no matter what mechanism applied. Stand front of the laser head, move right is X+ direction, move back is Y+ direction which means the left bottom is the minimum coordinate.

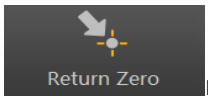
9.1.1 Program Coordinate System

Mechanical coordinate is consistent, HypCut also adopts workpiece coordinate. Workpiece coordinate X/Y direction same with the mechanical coordinate system, only 0 point different and called program 0 point. Program coordinate system is divided into floating coordinate system and workpiece coordinate system. Debug module adopts floating coordinate system.

Floating coordinates used in cutting samples or small quantity parts. Laser head will start machining from current position.

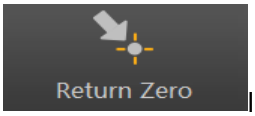
9.1.2 Find Zero Point after Interrupt

Situation 1

If machining process stopped by the accident but not affect coordinates, you can click 

return to zero point.

Situation 2

If accidents like power down or servo alarm stop the machining process and deviate the coordinates, must execute return origin then click 

locate to zero point