AMTEK

STRUCTURAL STEEL ROBOTIC AUTOMATION


# Laser Cutting Machine User Manual

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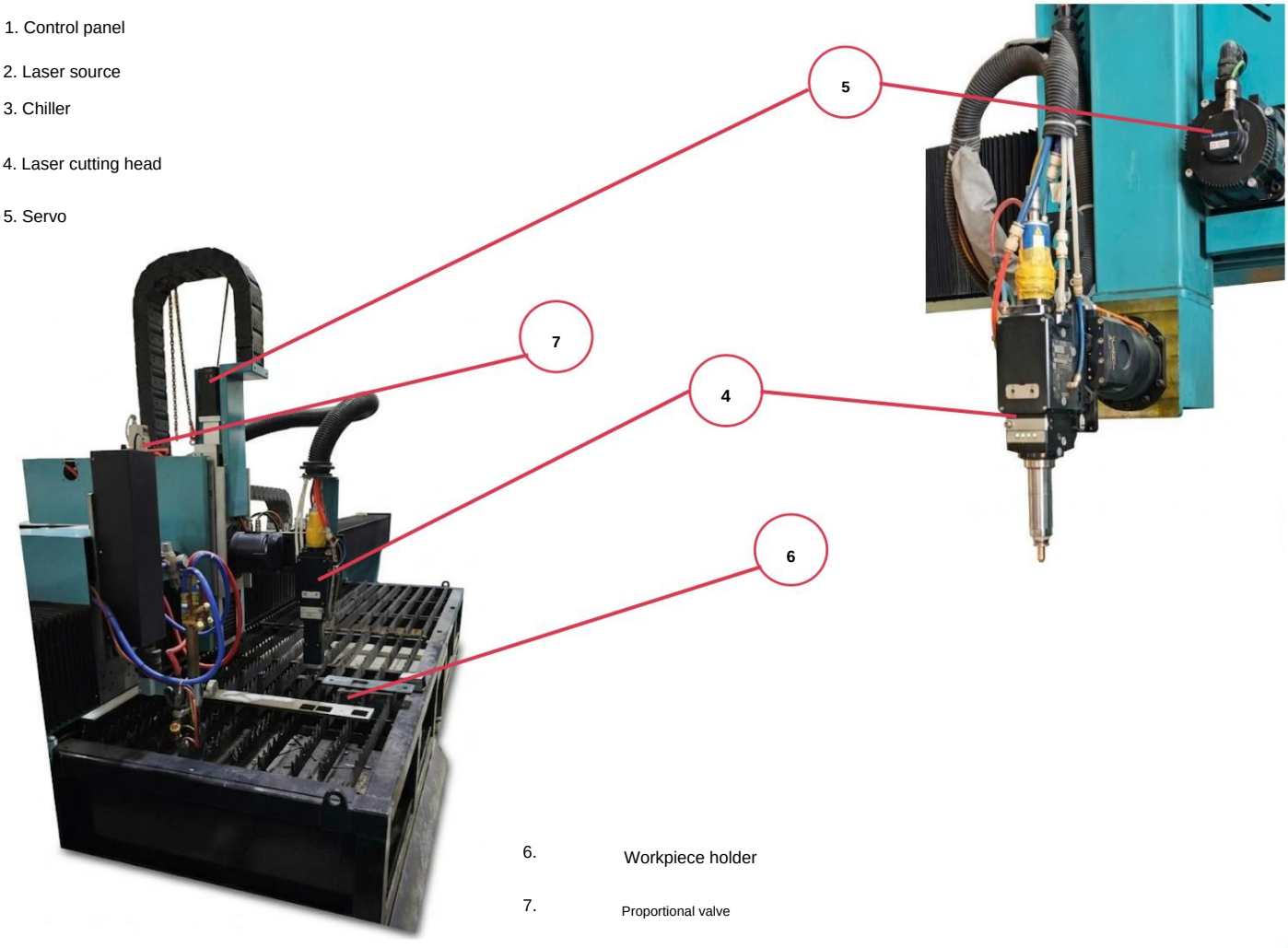
# 1 . INTRODUCTION TO THE MACHINE OVERVIEW

## 1.1 Overall structure of the machine


1. Control panel
2. Laser source
3. Chiller
4. Laser cutting head
5. Servo




6. Workpiece holder
7. Proportional valve

8. Lubrication system

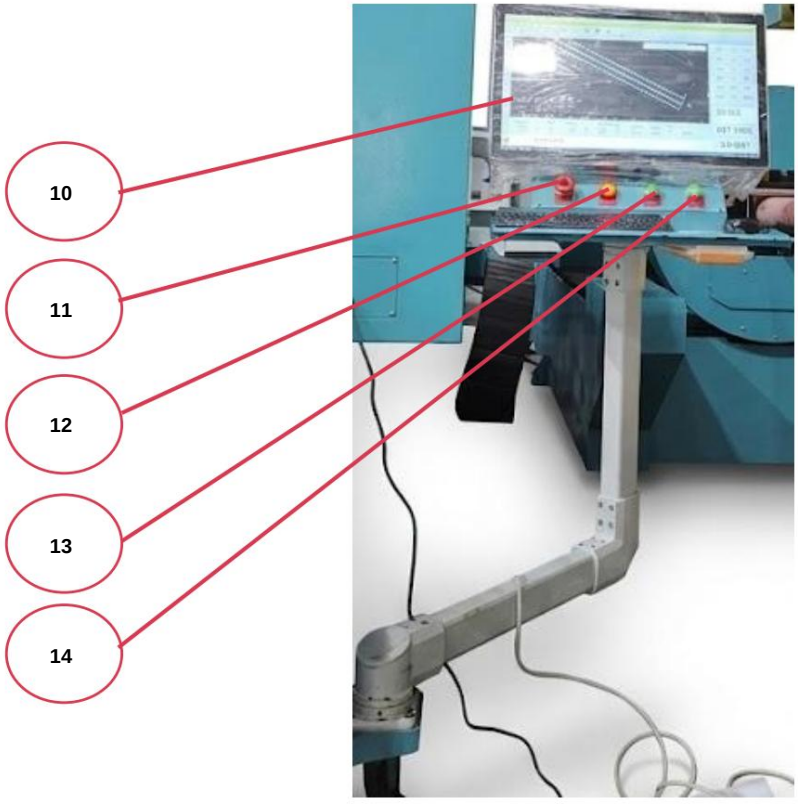
9. Air filter



10. Control column and screen 11. E-stop button

12. Indicator lights

13. Spindle Start Button 14. Run Button



## 1.2 Safety Regulations

• Do not look directly at the laser • Do not open

the door while the machine is cutting

• Do not place flammable materials near the machine.

## 2 . PROCESS OF OPERATION IN A MACHINE

Step 1: Turn on the main circuit breaker supplying power

to all the computers (at this point, the computer screen will...)

light up)

Step 2: Check that the correct type and type of gas (Oxygen, N2, Air) is attached to the hose.

Step 3: Check if the pressure is sufficient to run.

- Oxygen > 2 bar (minimum)
- Nitrogen > 8.5 bar (minimum)
- Air >9 bar (minimum)

For compressed air and N2, adjust the pressure gauge according to the specific cutting parameters.

Step 4: Check the chiller


• Check for water leaks around the machine. • Check if the water level is at the average level. • Are there any error messages after the chiller has been turned on?

Step 5: Start the chiller

• Turn on the MCCB on the chiller and check that the temperature drops below 22.5°C before turning on the laser.

Step 6: Once the chiller reaches the correct temperature and shows no error messages.

• Flip the switch on the laser source to REM mode.

• Then check if there are any error messages.


Step 7: On the computer screen

• Open the FiberLaser software… ÿ Search ÿ Control ÿ ON Main Power ÿ Close tab

FiberLaser...

Step 8: On the computer screen

• Open the FACUT software

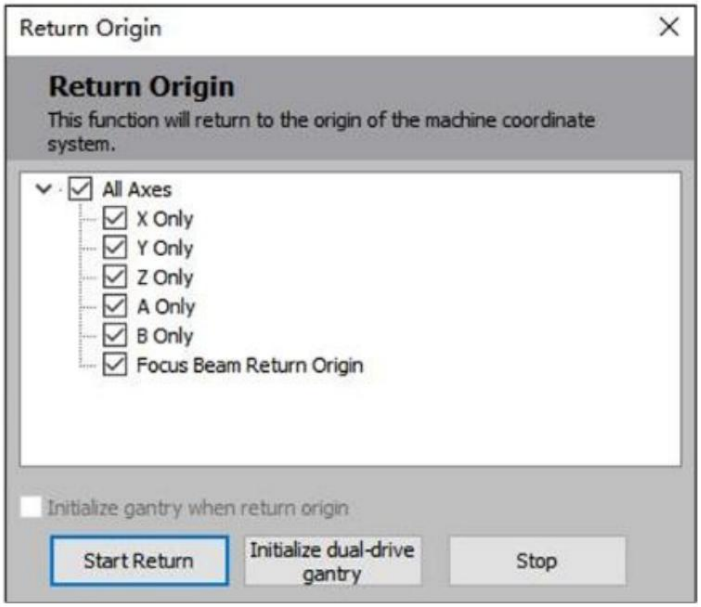

Step 9: In the FACUT software

• Select Production ÿ Return to Origin ÿ Select the axes to be Originated ÿ Start Return ÿ Wait 1

After you've finished resetting to the original state, close the tab.

• Check for any obstructions on the machine frame and material table before starting.

Return Origin



Step 10: Check for no alarms after returning to the original settings.

• After pressing the home button, check the screen for any error messages. If there are none, you can proceed.

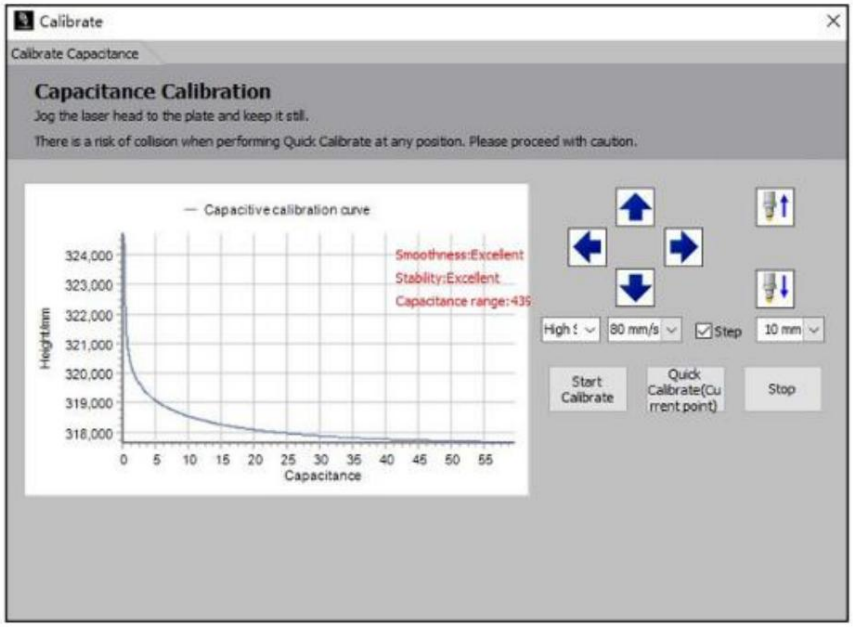
The author continues

Bÿÿc 11: Capacitance Calibration

• After completing the resetting or changing the cutting nozzle, electrical calibration must be performed.

container

• Select Production ÿ Capacitance Calibration ÿ Move the cutting head down away from the material surface 20mm ÿ Start Calibrate.




# KI ÿ MTRATR ÿ ÿ CHKHIC ÿ T

## 3.3.1 Cutting head

ÿ Check that the nozzle is the correct type and size according to the specifications, and that the cutting hole is not deformed or clogged with burrs.

ÿ Check that the nozzle threads are not broken or misaligned.

ÿ Check the ceramic for dirt or misalignment.

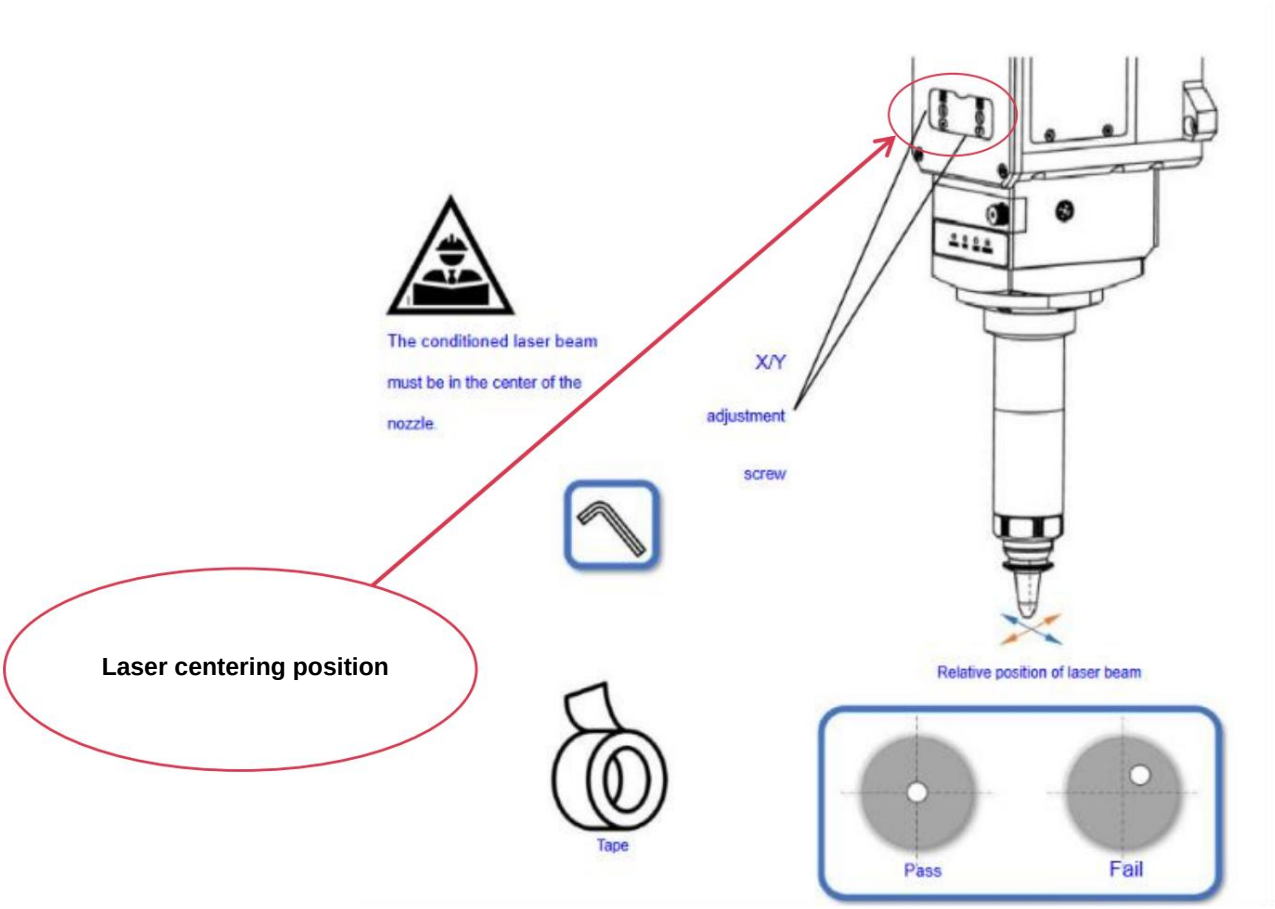
ÿ Check that the bottom protective glass is completely clean and free from yellowing.

ÿ If it gets dusty, you can use a cleaning tool.

ÿ If the glass is heavily scratched or covered in grime, it must be replaced with a new one. In case of further damage...

If the glass gets scratched, it will affect the glass layer above or cause serious damage to the cutting head.

ÿ Check the laser center: by sticking a piece of clear tape over the nozzle opening, then lightly firing a laser beam and checking if the laser center is centered within the nozzle ring. ÿ If it is off, adjust the direction of the laser center on the cutting head so that the center is precisely in the middle of the nozzle ring.




### 3.2 Gas

ÿ Check if the pressure on the pressure gauge is sufficient.

ÿ Check the water filter and drain the water each time the machine runs.

ÿ Check for any gas leaks.

### 3.3 Machine

ÿCheck the machine table for any foreign objects or obstructions in the XY frame's movement path.

ÿ Check that the pumps have been fully lubricated.

ÿ Check the smoke extractor (not yet installed)

ÿ Check the cable chain for any entanglement or breakage.

# 4 . NOZZLE

## 4.1 Differentiation

• Single:

the Cutting stainless steel, aluminum, and copper.

o Nitrogen ( 2), Compressed air

1 core layer

• Double:

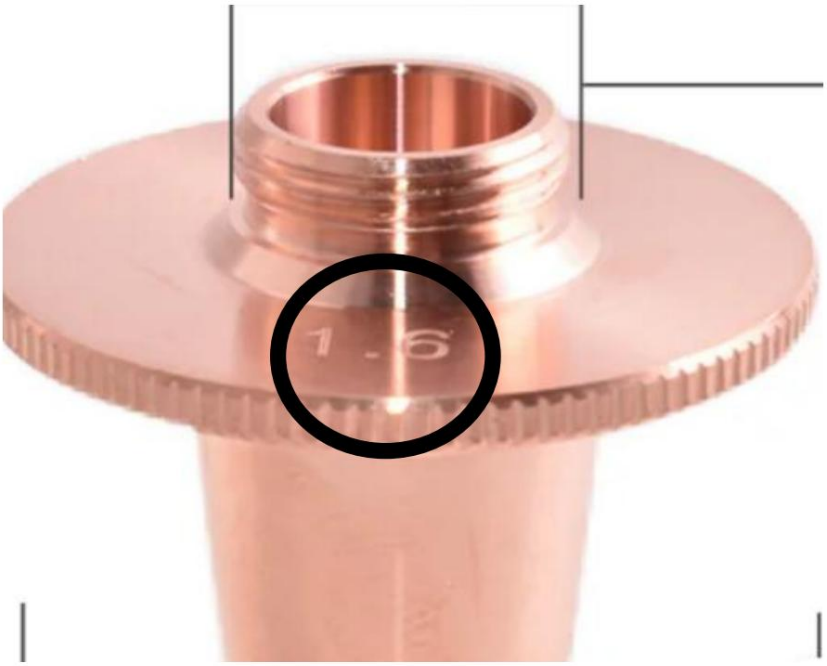
the Cutting iron, carbon steel

Oxy ( 2)

o 2 layers nested together (with an inner core)

## 4.2 Diameter

- 1.0
- 1.2
- 1.5
- 2.0
- 3.0
- 4.0
- 5.0 ….




## 4.3 When to replace the nozzle

- **The nozzle hole is distorted or deformed:** A standard nozzle hole should be a perfect circle. If the hole... If the nozzle is oval-shaped, dented, or chipped (usually due to an off-center laser beam hitting the nozzle wall or a slight collision with the workpiece), the airflow will be completely deflected.
- **Nozzle clogged with stubborn slag:** During the piercing or cutting process, metal slag is ejected and adheres tightly to the nozzle tip. If a nozzle cleaning rod or scraper fails to remove it, this slag will interfere with the laser beam and obstruct the airflow.
- **Worn or damaged nozzle threads:** The threaded part that connects to the cutting head is loose, causing cutting gas to leak out or preventing the nozzle from being held securely, resulting in inaccurate height sensing distance.

- **Height sensor error:** A deformed or excessively clogged cutting nozzle will alter the capacitance of the cutting head. The machine will continuously report the error, and the cutting head will malfunction.
  It jerks or fails to grip the workpiece surface (constantly undulating).
- **Sudden drop in cutting quality: Even though** the laser centering is 100% accurate, the protective glass is clean, and the gas pressure is sufficient, the cutting line still has a lot of burrs, thick slag buildup, or fails to cut through the workpiece.

- **The laser center is constantly misaligned:** You just adjusted the center, but after cutting for a while, the center becomes misaligned again.
  The nozzle usually moves to another location because it has become too hot and has undergone thermal deformation during cutting.

## 4.4 When should the laser center be re-checked?

- **At the beginning of each shift:** It is advisable to make it a habit to perform a centering test (using adhesive tape/clear tape) at the start of each shift to ensure the machine is stable after a night of inactivity.
- **When changing workpiece thickness significantly:** When switching from cutting thin workpieces (low or zero negative focal length) to very thick workpieces (deep positive or negative focal length), rechecking the center at the new focal length will help ensure a safer cut.
- **The cut edge is beveled to one side:** When cutting a straight line or square, you see one edge is perfectly straight, but the opposite edge is beveled/angled.
- **Uneven slag (cutting slag) adhesion:** Slag is densely adhering to one side of the part, while the other side is less so. clean.

• **The cutting head does not feed the material in a certain direction: The** cutting machine cuts very smoothly in the X+ direction, but when Turning the cutter in the Y direction results in an incomplete cut or sparks flying back up.

• **The cutting nozzle heats up quickly or becomes deformed:** The laser beam deviates and strikes the inner wall of the nozzle hole, causing the nozzle to fail quickly or the hole to melt. • **Changing the nozzle size**

**(hole diameter):** For example, switching from a 1.2 mm nozzle to a 2.0 mm nozzle or vice versa. • **After cleaning or replacing the protective glass (window glass):** The process of disassembling and reassembling the glass assembly can cause This can slightly shift the mechanical position of the cutting head.

• **After the cutting head is impacted (pierced):** If the cutting head accidentally impacts the workpiece due to workpiece warping during cutting, the height sensor or cutting head fixation may become misaligned.

## 5 . GAS CUTTING

## 5.1 Oxygen

• The laser heats the material + oxygen participates in the combustion reaction => generating additional heat. • This means: The laser only creates the ignition source. It is the combustion reaction that enables the cutting process to be faster.

Advantage

ÿ High speed ÿ Can cut thick steel

Weakness

ÿ Black edges ÿ Oxide layer ÿ Difficult to paint

**5.2 Nitrogen** • Nitrogen does NOT burn. It does NOT produce heat.

It just:

• Blow away molten metal • Protect the cutting edge from oxygen

Therefore:

The laser must completely melt the material itself => high power is required.

## 5.3 Air

Air consists of: • 78% Nitrogen • 21% Oxygen other gases

Because of the presence of oxygen:

• There is a slight fire

• Not as pure as nitrogen • Not as potent as oxygen => quality is somewhere in between.

**The three types of air must be:** ÿdry ÿclean ÿoil-free

If any:

- water
- oil
- dust

then it will:

• Burnt lens • Damaged ceramic nozzle • Dirty nozzle • Reduced power

**If:**

• Cutting stainless steel while using oxygen results in black edges and the product is unusable. • Cutting steel while using nitrogen wastes gas.

ÿ very slow

• Air contains water

ÿ Lens explodes.

• Nitrogen tank is almost empty

ÿ Pressure drops ÿ Slag gradually increases.

• Changed the gas but forgot to change the cutting technique (cutting recipe).

ÿ The cut doesn't go through or the edges burn.

# 6. MATERIAL

## 6.1 Carbon Steel

• Identification:

Black surface with reddish-brown rust.

## 6.2 Stainless

• Identification:

• Bright silver surface, rust-free

# 7. CUTTING SOURCE

## 7.1 Peak power

It is the output power.

Power decided

• ability to penetrate materials

.

cutting speed

• Cutable thickness

The higher the power

ÿ Cuts faster

ÿ thicker cut

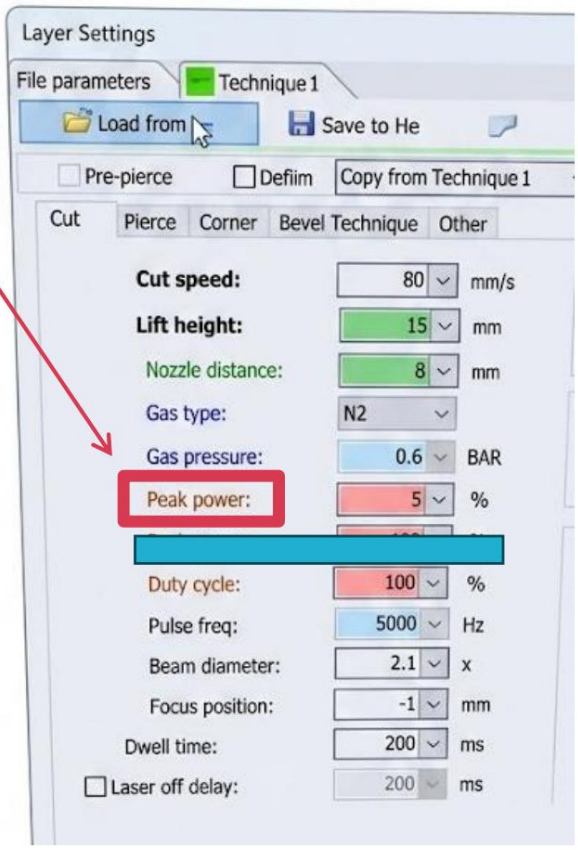
But

ÿ Easily burns at the edges

rough edges

ÿ large heat-affected zone

When should I increase the power?




• No penetrating cuts

• Edges are still stuck together

• The speed is too slow

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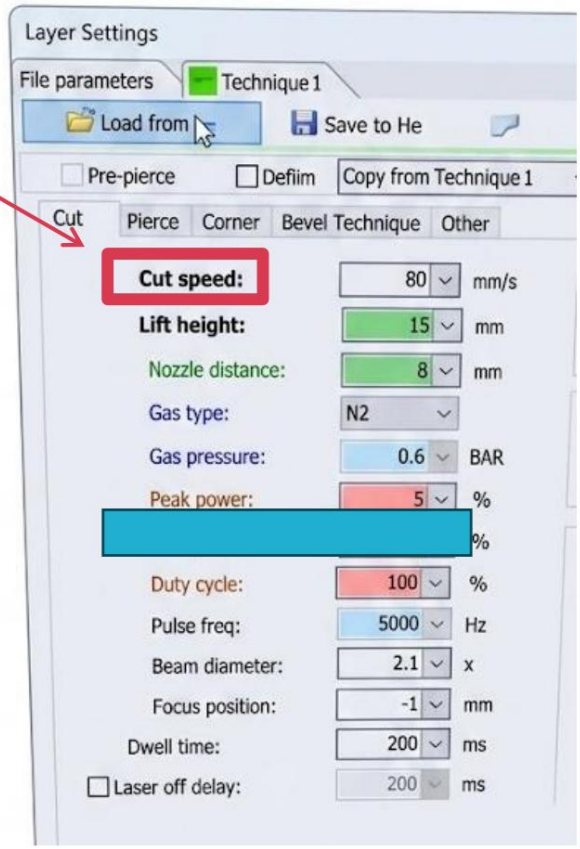
When will it decrease?

• Edge burning

• Corners overheat - Small holes become deformed

# 7.2 Speed (Cut speed)




This is the speed at which the cutting head moves during cutting.

If Speed is too fast:

The laser didn't have time to cut.

ÿ not penetrating

ÿ still slag

ÿ The cut line is broken

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If Speed is too slow

Laser heating for too long

ÿ fire

ÿ wide edge

ÿ deformation

## 7.3 Focus

It is the focal point of the laser beam.

Focus influence

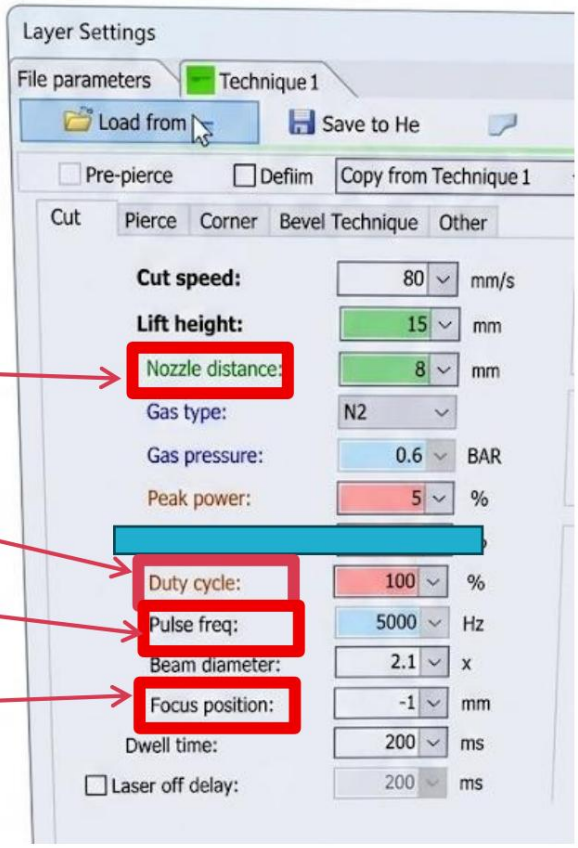
The biggest impact

• cutting slot width

• penetration ability

slag

gloss




## 7.4 Duty cycle

The laser is currently on.

Duty increase

ÿ

More heat

Duty reduced

ÿ

Less heat.

## 7.5 Frequency

It is the number of times the laser switches on and off per second.

## 7.6 Nozzle Distance

The distance between the nozzle and the material during cutting.

## 7.7 Corner Power

Power when passing through a corner.

## 7.8 Corner Speed

Speed when going through a corner.

## 7.9 Jump Height

Cutting head lifting height when moving but not cutting.

## 7.10 Jump Speed

The running speed is not cut off.

## 7.11 Micro Joint

The small bridge holds the parts in place so they don't fall.

## 7.12 Film Cut

Use while the material still has its protective film.

## The relationship between the parameters (most important)

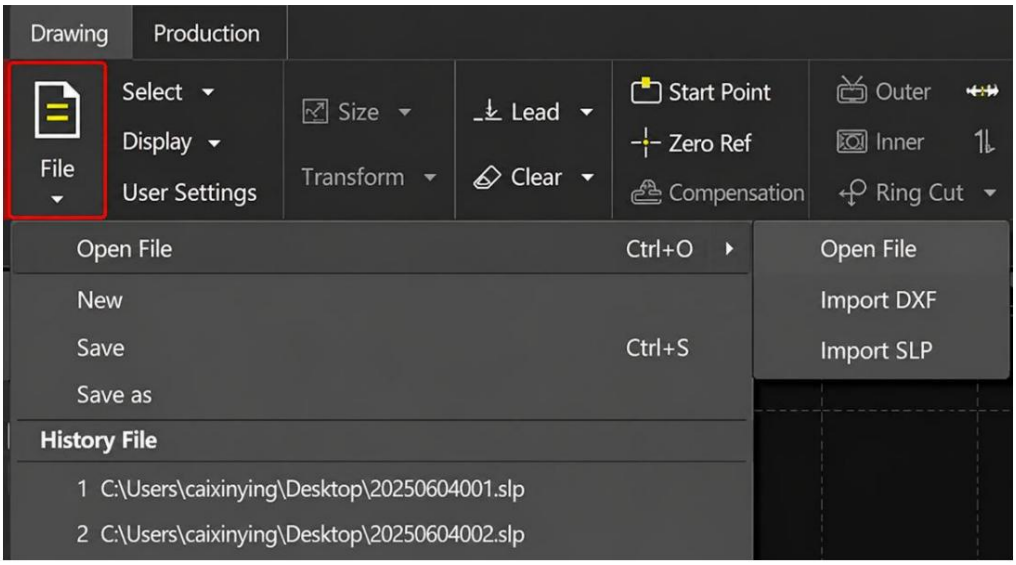
| Increase parameters | Main effects | Often requires further adjustment. |
|---|---|---|
| **Peak Power ÿ** | Better penetration, higher temperature. | Speed ÿ or Duty ÿ |
| **Cut Speed ÿ** | Less heat | Peak ÿ or Duty ÿ or Frequency ÿ |
| **Focus more on the sound** | Energy descends to the depths. | Speed ÿ, Gas ÿ |
| **Duty ÿ** | Temperature rises | Speed ÿ or Peak ÿ |
| **Frequency ÿ** | Smoother cut edges | Peak ÿ or Duty ÿ |
| **Nozzle Distance ÿ** | Weak air pressure, easily burrs. | Speed ÿ or Gas ÿ |

# 8. THAOT Á C ÿ ÿ H ÿ AV À C Ô NGC ÿ

### 8.1 Open the file

FACut supports operations such as Open File, New, Save, and Save As for drawing files. It also supports importing *.dxf and *.slp files. Additionally, the File dropdown menu provides quick access to recently opened files.

Open File: Replace the current file with the selected file and open it directly.

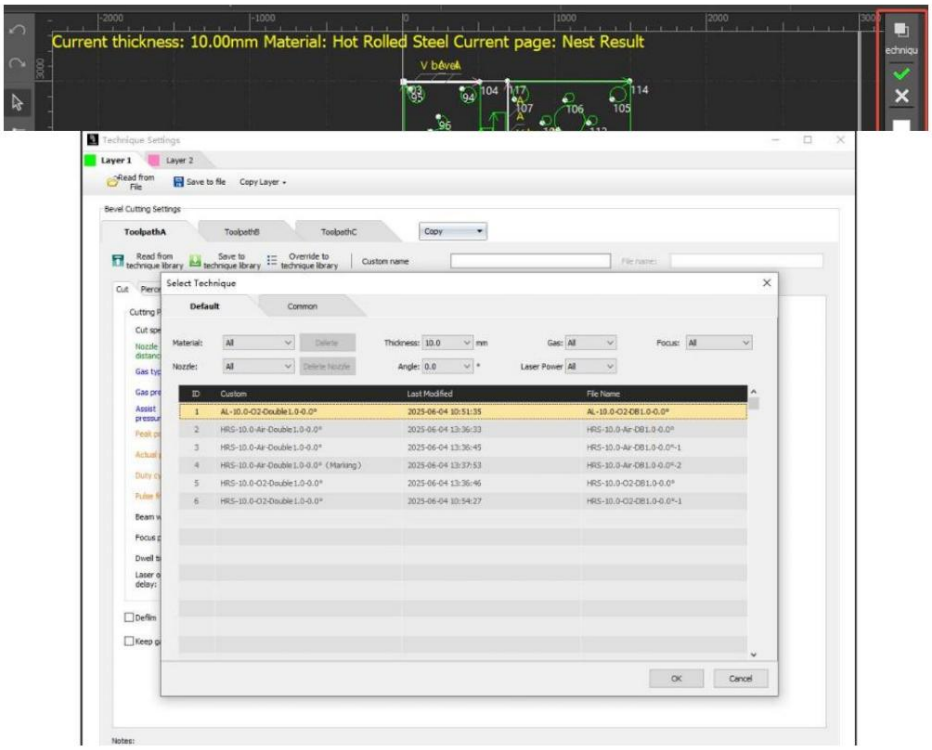



ImportFile: The imported drawing will appear floating in the cursor's view. Its reference point will coincide with the snap point pre-set in the software.

Click anywhere in the interface to place the drawing into the current file without affecting the existing content.

## 8.2 Chia layer

Select a part or toolpath and use the technical settings panel on the right to assign the appropriate layer. For complex bevels, you can assign multiple toolpaths to a single layer or each toolpath to a separate layer.




In the Engineering settings, you can directly import parameters from the engineering library. Techniques or configurations of specific technical parameters for piercing, cutting, etc.

ÿNotice: InFACut, technique library parameters are stored based on Toolpath, not Layer

## 8.3 Saving and reading technical specifications

### 8.3.1 Save technical specifications

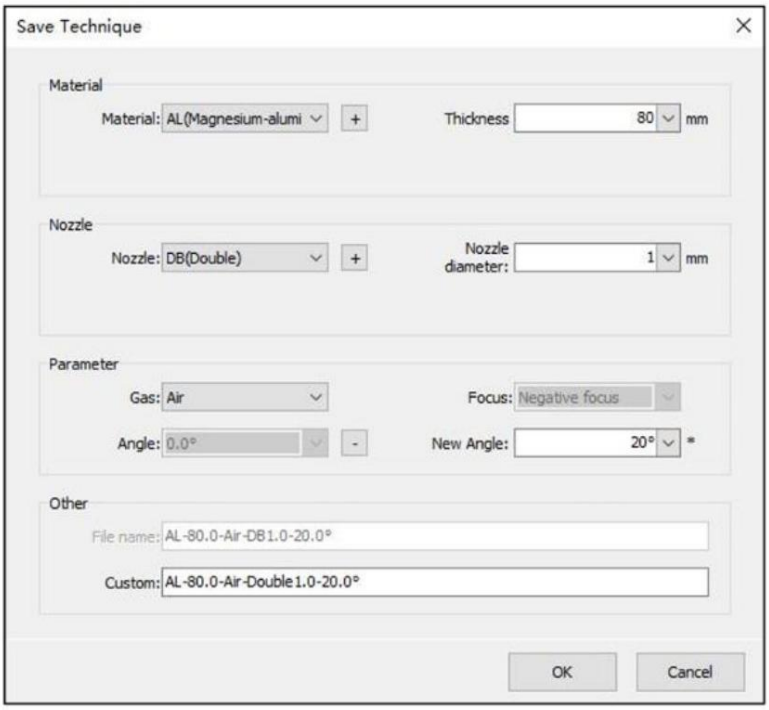
Click **Save to Technique Library** to open the Save Technique window , where you can set the material type, thickness, ore name, ore diameter, gas type, and angle for the process. The file name will be generated based on these parameters. Note: This file name is only used within the technique library and is different from the file name when saved to a file. After saving, the technique can be viewed in the technique library. You can also set a custom name for easier searching and use.

FACut offers several available materials, and users can press + on the right to add custom materials. The name and abbreviation of the faucet must be defined manually.
Alternatively, you can do this by pressing + to add a custom tap. The cutting angle is default.

The default angle is 0° (straight cut), but users can add custom angles using the + symbol.

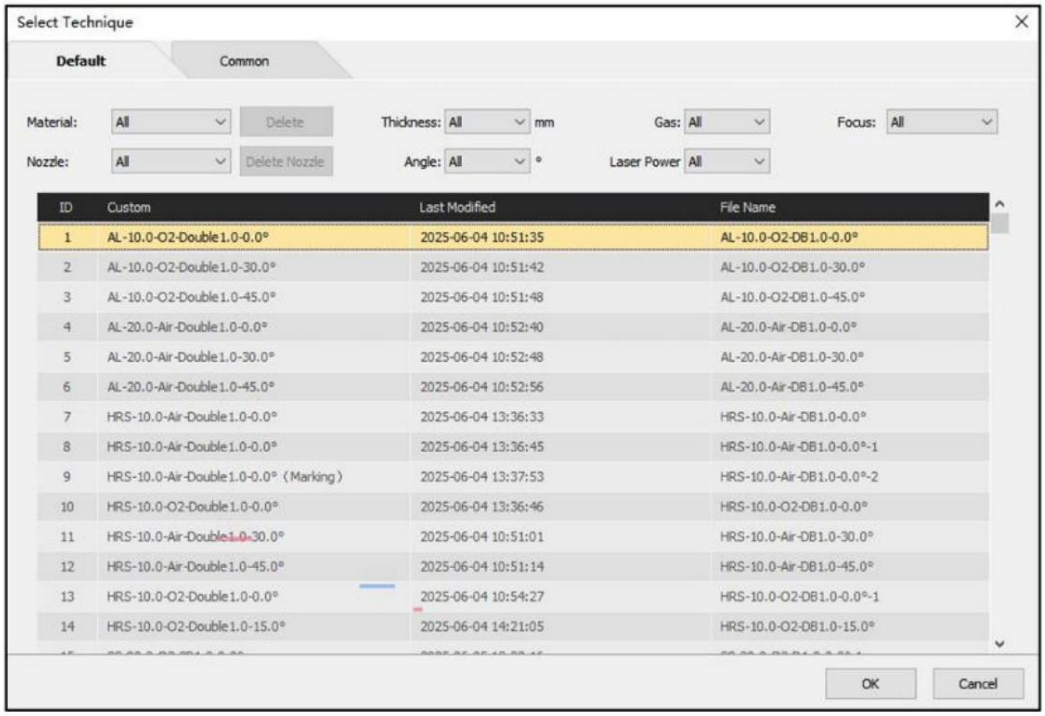
Press OK to save the current parameters as a technique, or - to delete them.

The number just added.




8.3.2 Reading the technical specifications

Click **Read from Technique Library** to select a saved toolpath technique and override the current technique; you can also click **Override to Technique Library** to override a technique already set in the library with the current technique (the filename remains the same).

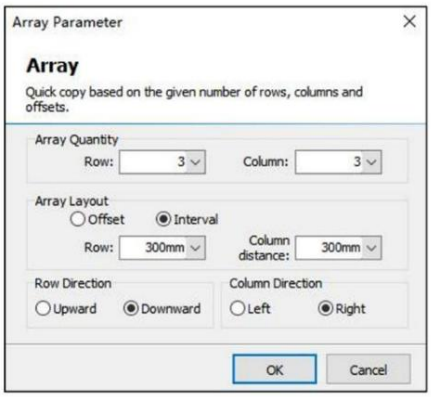



8.3.3 Reading from a file and saving to a file

Click Save to File to save the current Layer Parameters as a material library file (*.lcm). To load a saved process, **Read from file** and select the required material library file. This will overwrite all toolpath engineering parameters and user-defined names for the current layer.

## 8.4 Array

An array is a multiplication and arrangement of multiple objects to form a grid.

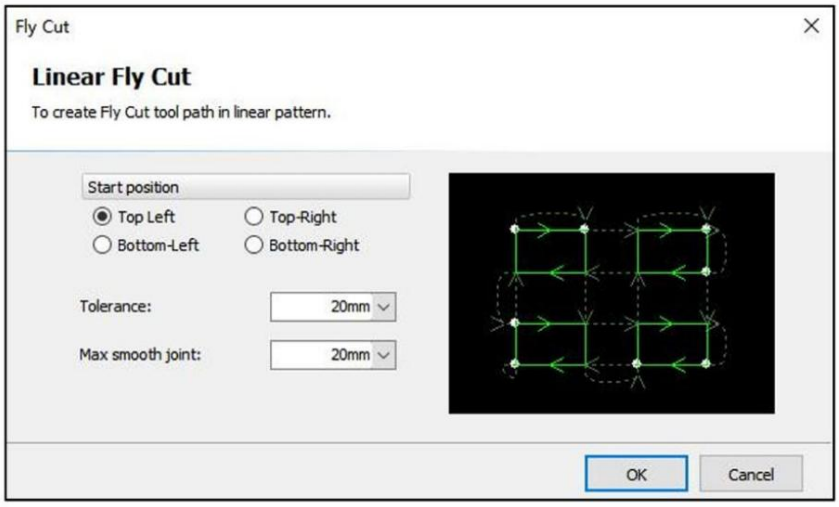



When **Array Layout** is set to **Offset,** the row/column spacing refers to the distance between the same reference point of the shapes. When set to **Interval,** it refers to
The distance between the nearest edges in the horizontal/vertical direction.

## 8.5 Fly Cut

When the shapes are regular (e.g., rectangles, full circles, polygons) and arranged in a certain pattern, fly cutting can join straight segments in the same direction into a continuous cut. This increases cutting speed and reduces time.

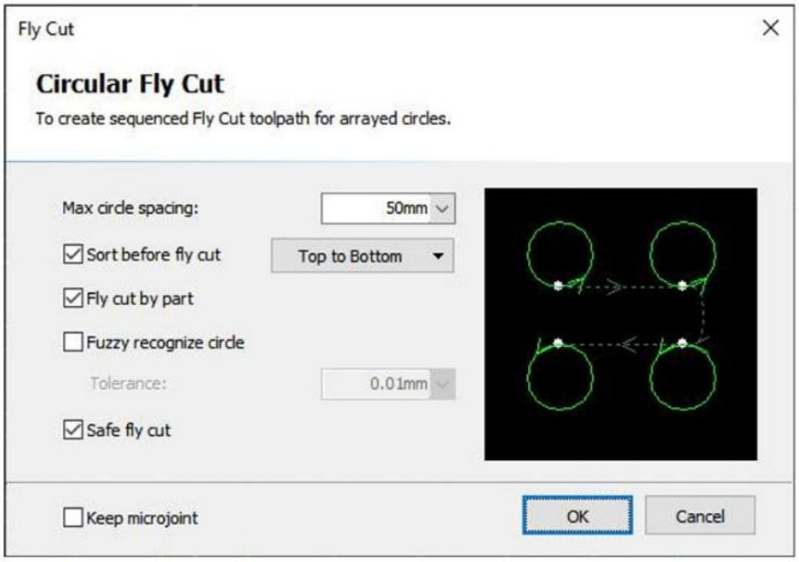
Click on **Fly Cut** or **Linear Fly Cut** in the dropdown menu to go to the settings page.
Parameters of linear fly cut.



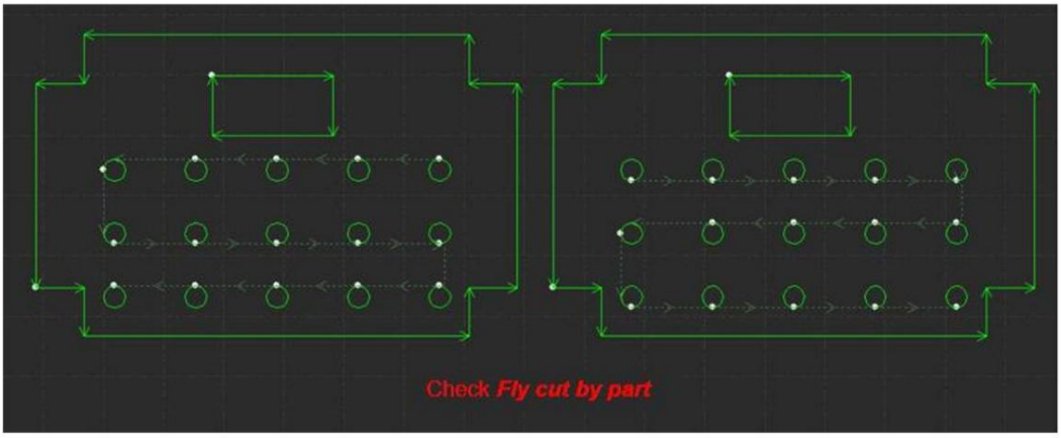
When all the shapes arranged are circles, pressing Fly Cut will open the settings.

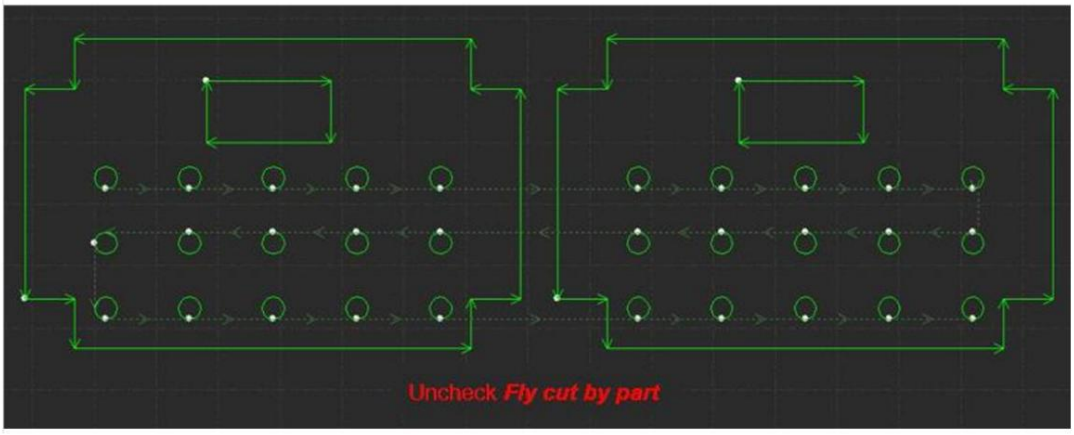
Set **the Fly Cut** to a circular shape, or you can select it from the dropdown menu.

When both a circle and a square are selected, the machine will cut away each inner section accordingly.




The rule is to arrange the pieces before cutting them into sections.



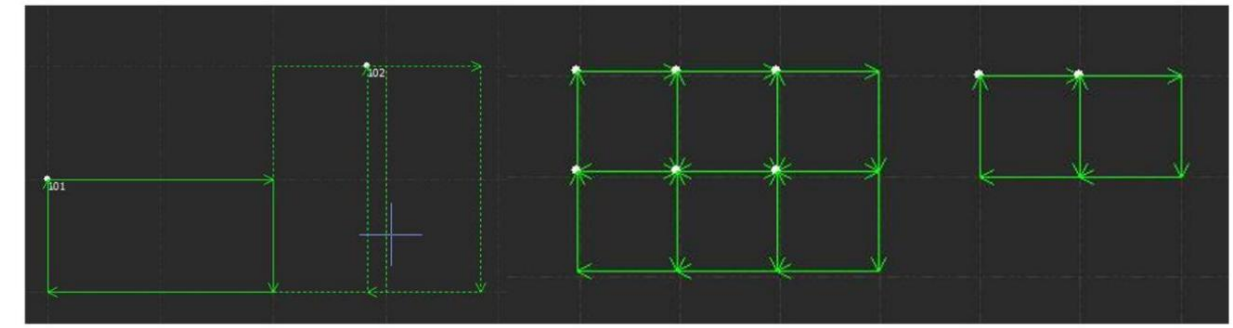
Safe fly cut: Avoid small holes and shapes inside when making fly cuts (minimum support: circle diameter > 0.5 mm).

You can configure **Fly cut overcut** via **Global Parameter** ÿ **Motion Control Params** ÿ **Path Interpolation Parameter** to ensure the details are separated after cutting.

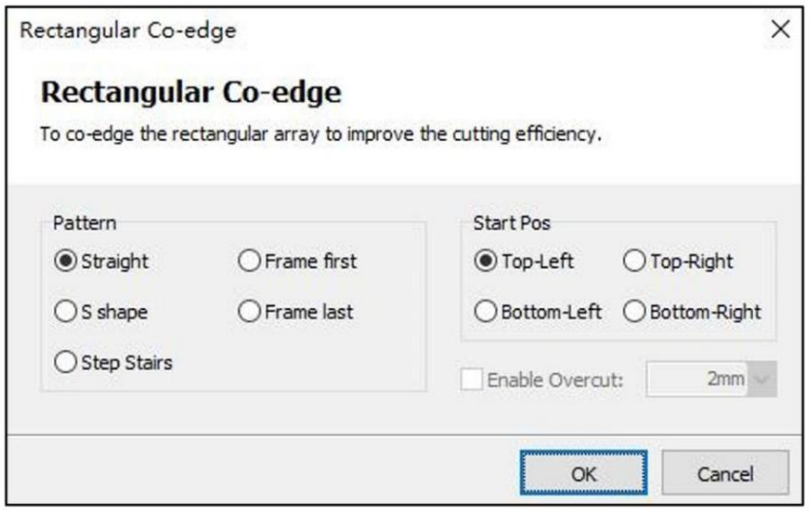
## 8.6 Co-edge

### 8.6.1 Manual Common Edge

Co-edge is the process of combining the common edges of multiple parts into one, reducing the actual cutting length and clearance between parts to increase machining efficiency and sheet metal utilization. FACut supports creating parallelogram-shaped co-edge arrays and co-edge arrays.
V/Y/X/K bevel.




Select two or more images, click Co-edge, and FACut will attempt to combine the selected parts. If the selected parts are recognized as an array, the Rectangular Co-edge dialog box will appear. Choose a co-edge style and click OK to create the co-edge layout. Once co-edged, the participating parts will be grouped together as a co-edge.



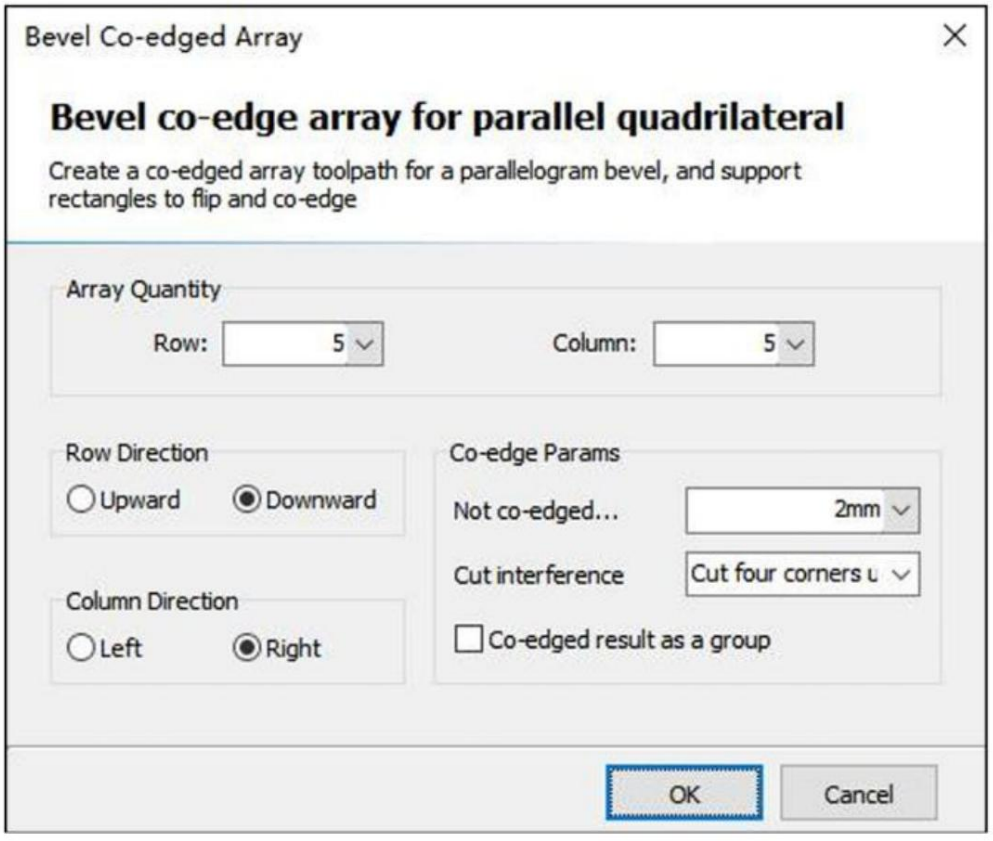
**Note :** If any details in the group contain internal geometry (e.g., holes), group that detail along with all its internal geometry before applying co-edge. Otherwise, the relationship between the internal geometry and the co-edge group will become invalid, potentially causing issues in processing order or recognizing the inner/outer contour.

### 8.6.2 Common bevel edge

Draw a rectangle or parallelogram using a split line, then select **Auto Split** or **Manual Break.** After splitting, you can apply corner rounding properties to these separate lines.

Select the parallelograms you want to arrange along their common edges, click Bevel Co-edged Array in the Co-edge dropdown menu, where you can set the number of arrays, row orientation, and spacing between non-co-edge sections (use when it's not possible to do this).
(All edges fit together perfectly). Press OK to create the common bevel edge array.

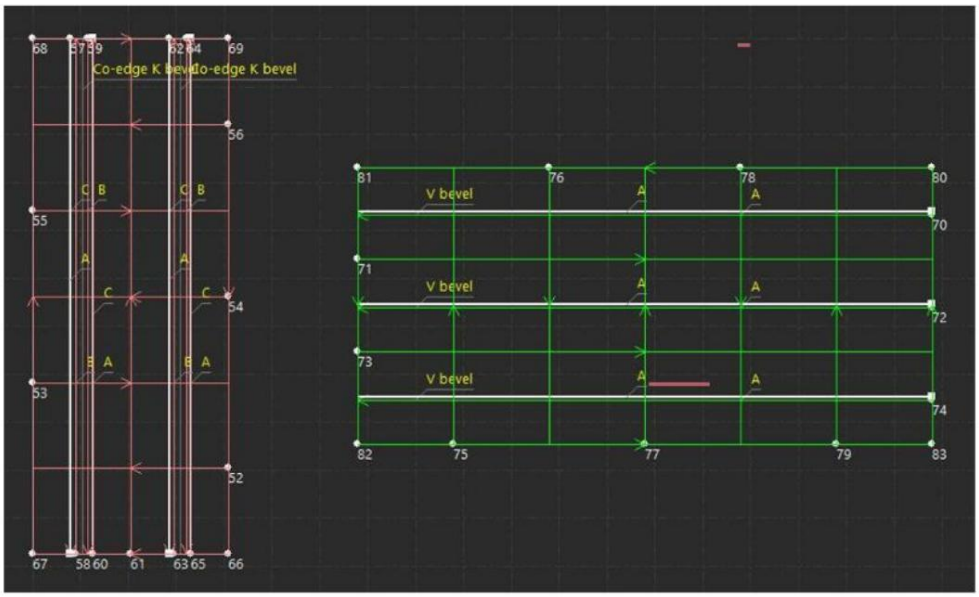
If the selected graphic cannot be joined edge-to-edge, a message will be displayed indicating that the operation is not possible.

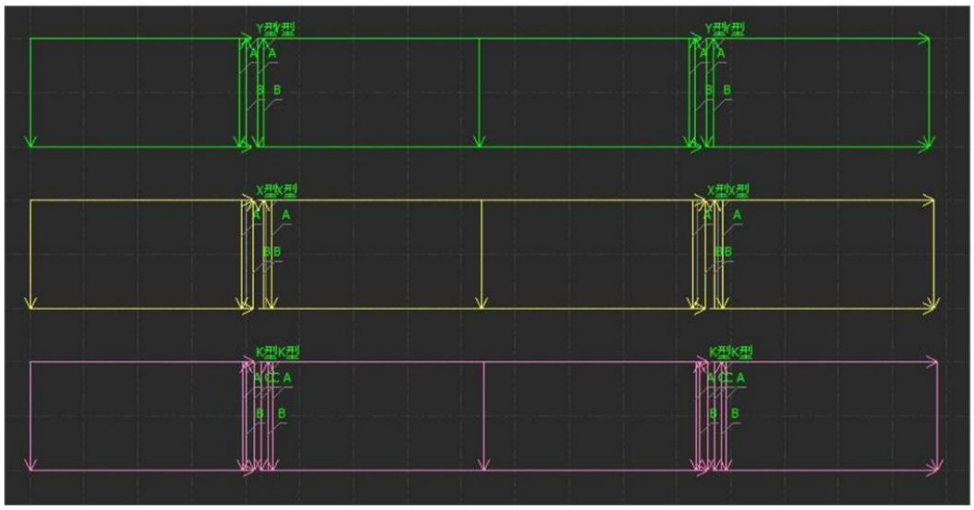



Failure occurred in the logs & alerts interface.

FACut supports inverted co-edge for V-bevels and full co-edge for symmetrical X/K-bevels. If a row/column cannot be fully co-edged, FACut will insert a dummy co-edge.
based on the approximate number of unco-edged sections.

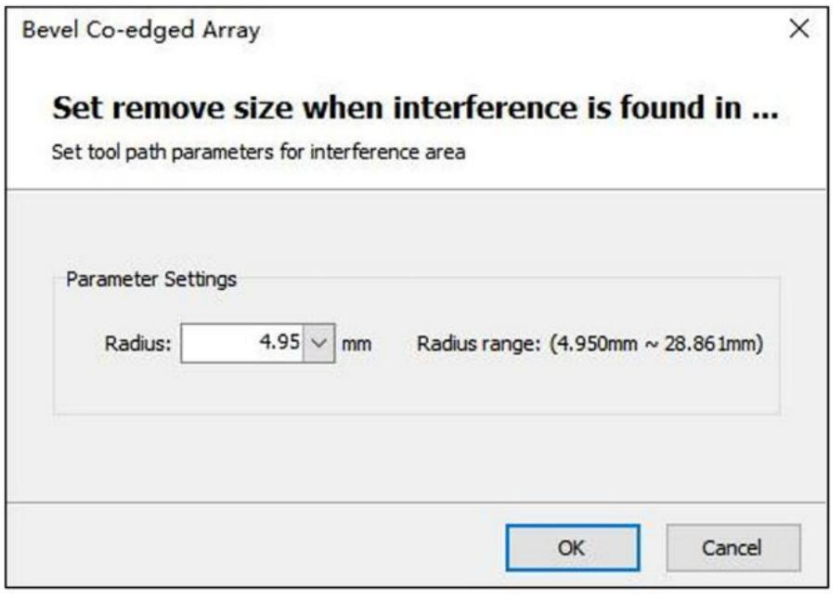
The diagrams below illustrate full/reverse coupled edge arrays and pseudo-edge arrays.
Part.



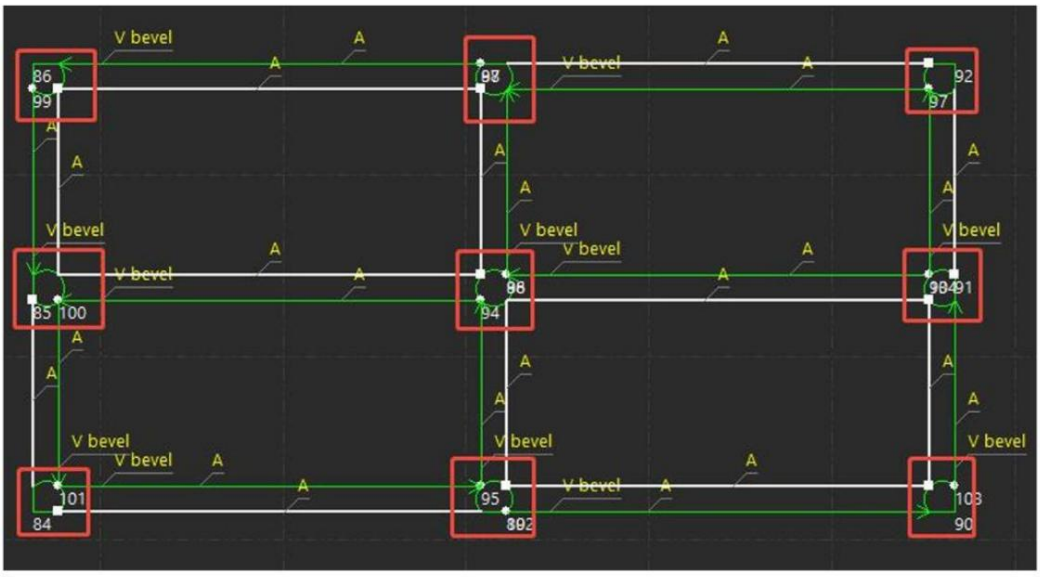
FACut now supports chamfering for parts with chamfers on adjacent edges.
After setting the array parameters and clicking OK, an additional dialog box—"Set
**remove size when interference is found in Bevel Co-edged Array"—will** appear. By doing so...

By setting the radius, the system will automatically create bevels in conflicting areas to prevent collisions between adjacent beveled toolpaths during cutting.




Set size removal upon collision detection in chamfered array

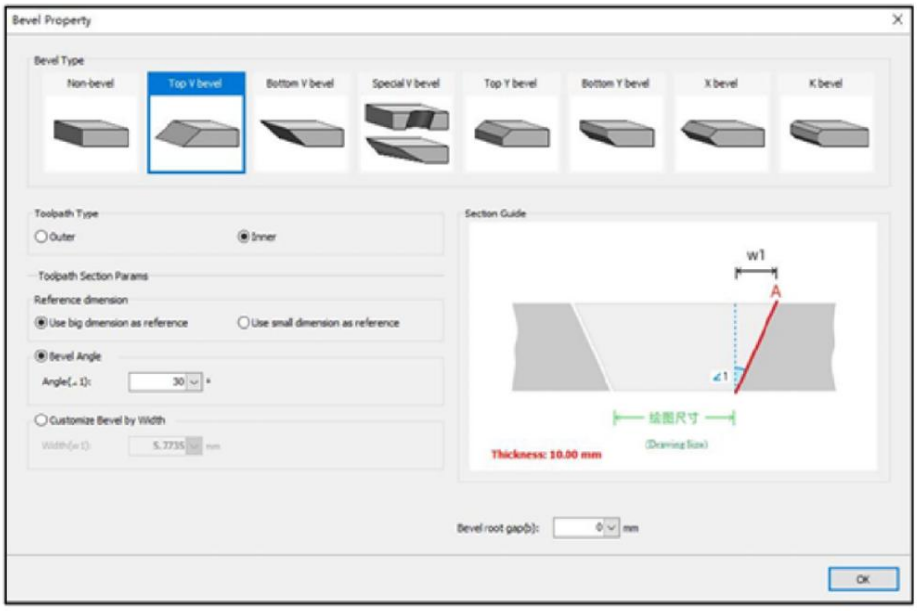
Diagram of beveled edges



# 9. C À I ÿ ÿ TC ÿ TV Á T ( BEVEL )

## 9.1 Cutting and Squeezing Properties

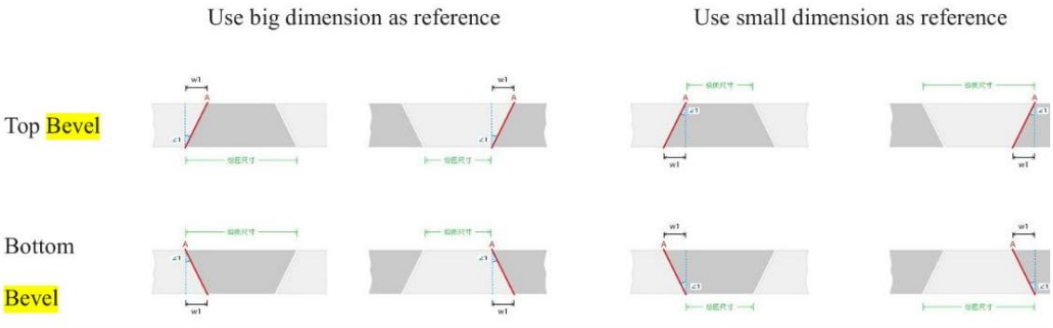
### 9.1.1 V-bevel cutting




Choose the appropriate chamfering

style. Before setting the chamfering parameters, confirm the type of tool path (internal or external) of the workpiece. Next, identify the top/bottom bevels based on the reference diagram (the colored areas indicate the remaining details).

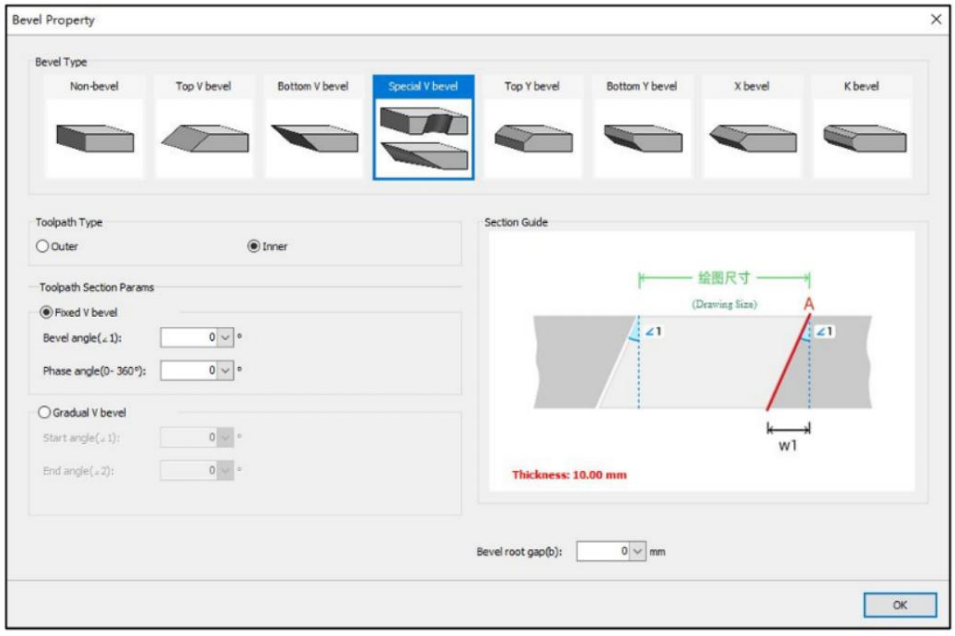
For standard V-bevels, set Angle ÿ1 and Reference Dimension. Alternatively, you can customize the bevel width. The relationship between V-bevel geometry and cross-section diagrams is illustrated below. Drawing dimensions refer to the size of the selected shape.



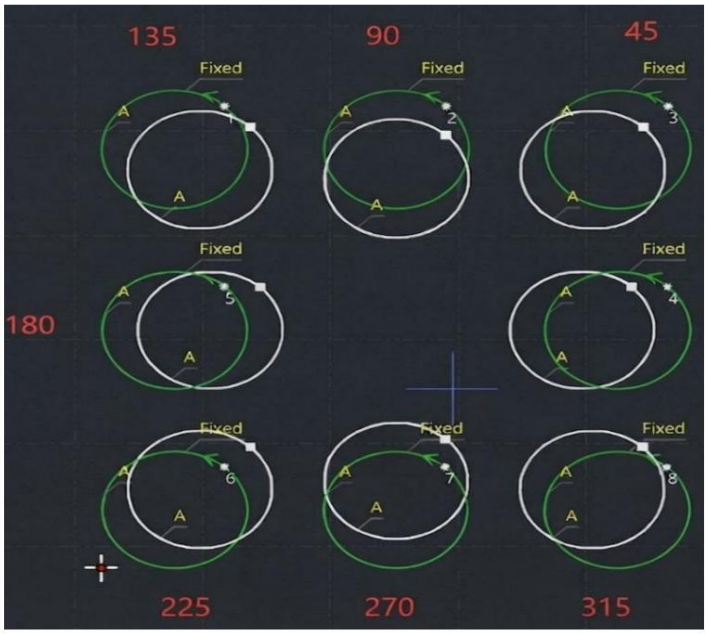

V-bevel parameter and cross-sectional diagram

### 9.1.2 Fixed V-bevel cutting

If the parts need to be cut and welded with round or square tubing, select Fixed V Bevel and set the Bevel Angle and Phase Angle accordingly in Special V Bevel; if you need to machine a tapered bevel, select Gradual V Bevel in Special V Bevel and set the Start Angle.




Fixed chamfer parameter V



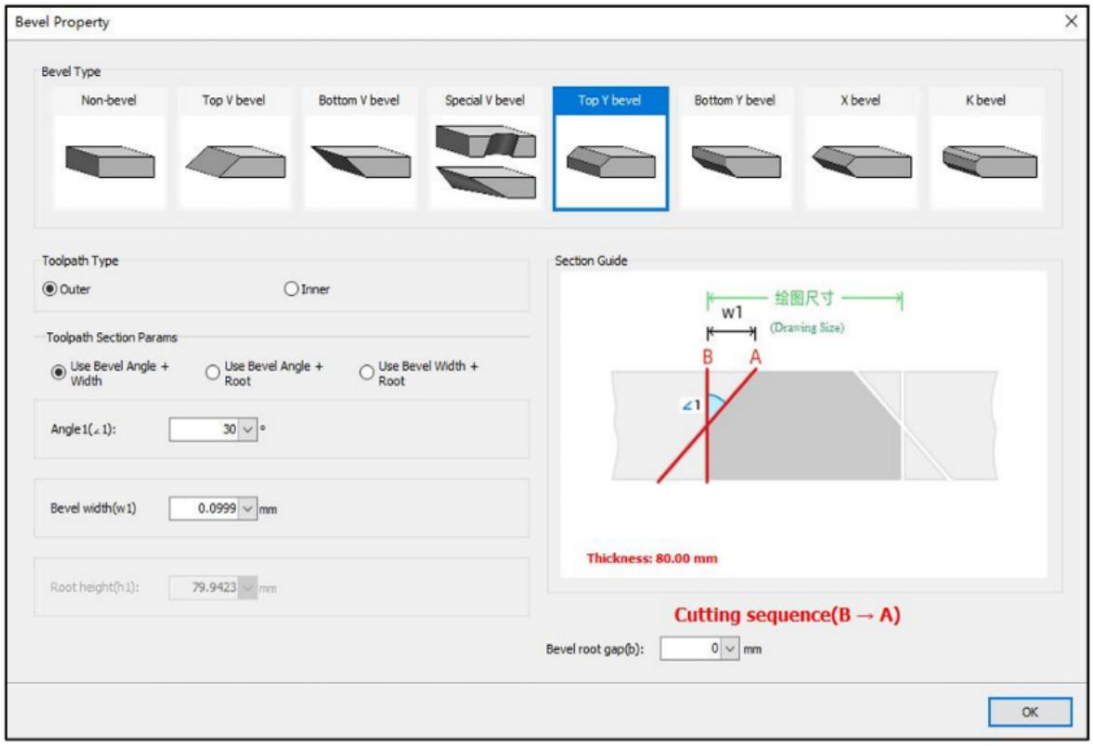

Fixed V bevel

The diagram shows how the upper and lower surfaces align with the phase angle.

### 9.1.3 Y-bevel cutting

For Ybevel, there are three supported toolpath parameter combinations: Use Bevel Angle + Width, Use Bevel Angle + Land, and Use Bevel Width + Land.

Depending on the selected combination, the corresponding input fields will appear. Fill in the required values and press OK.

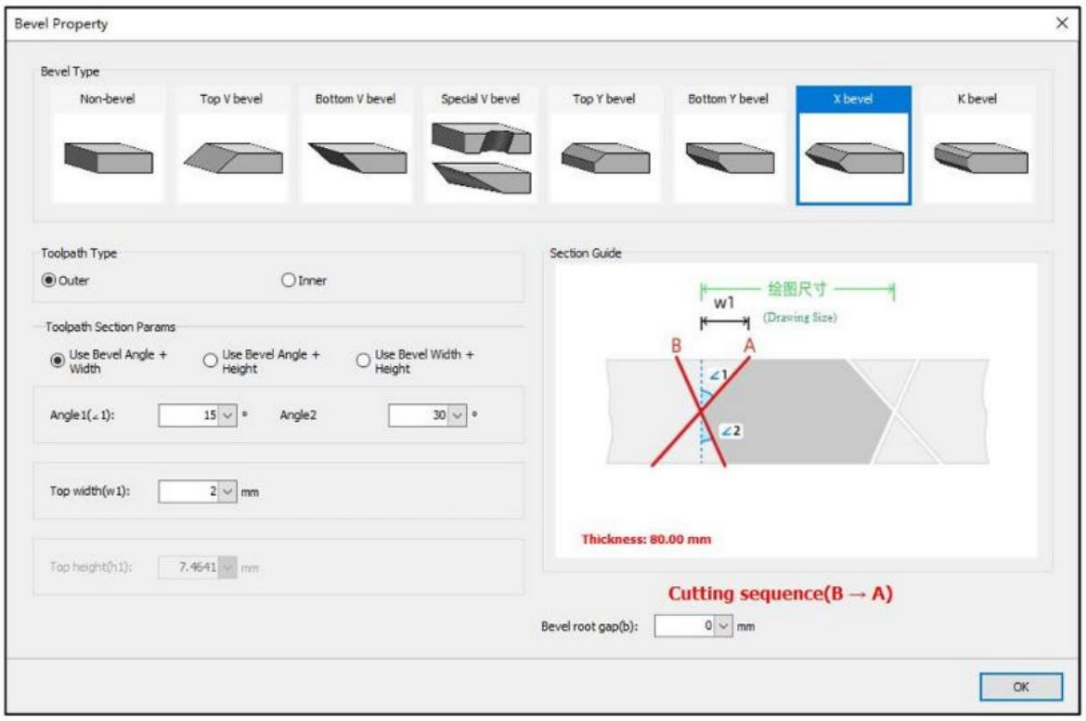



Y-bevel parameter

### 9.1.4 Bevel cutting X

For X-bevel, there are three supported tool bay parameter combinations: Use Use Bevel Angle + Width, Use Bevel Angle + Height, and Use Bevel Width + Height. Depending on the chosen combination, corresponding input fields will appear. Fill in the required values and press OK.

X-bevel parameter

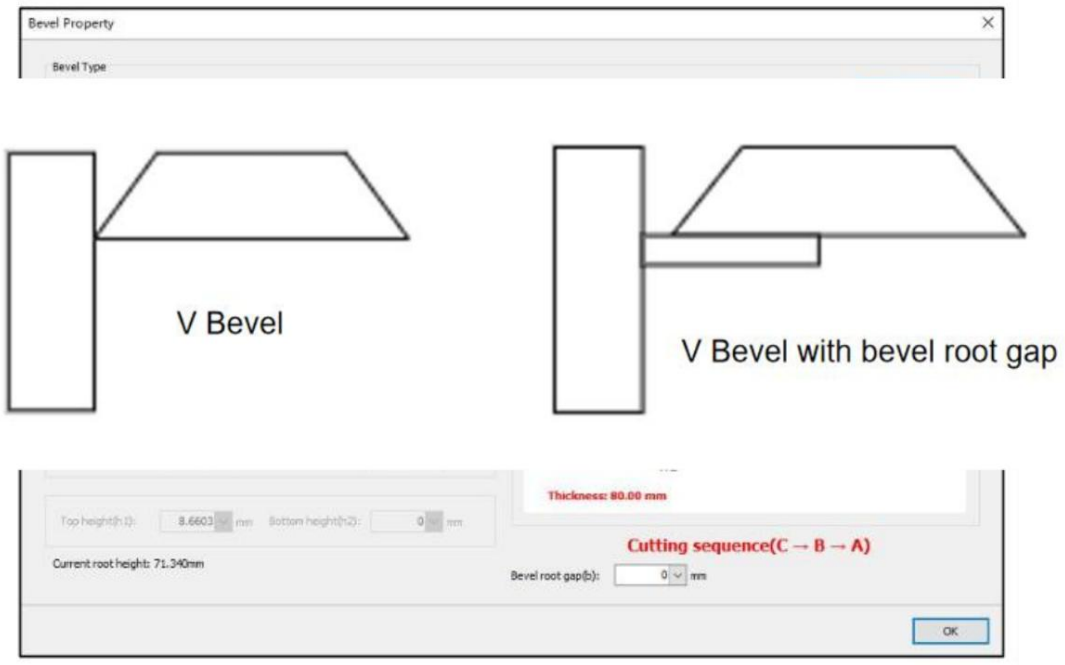


9.1.5 Bevel cutting K

For K-bevel, there are three supported toolbath parameter combinations: Use Bevel Angle + Width, Use Bevel Angle + Height, and Use Bevel Width + Height.

Depending on the selected combination, the corresponding input fields will appear. FACut will automatically calculate the land height for the K bevel. Enter the required parameters and press OK.

Chamfer parameter K

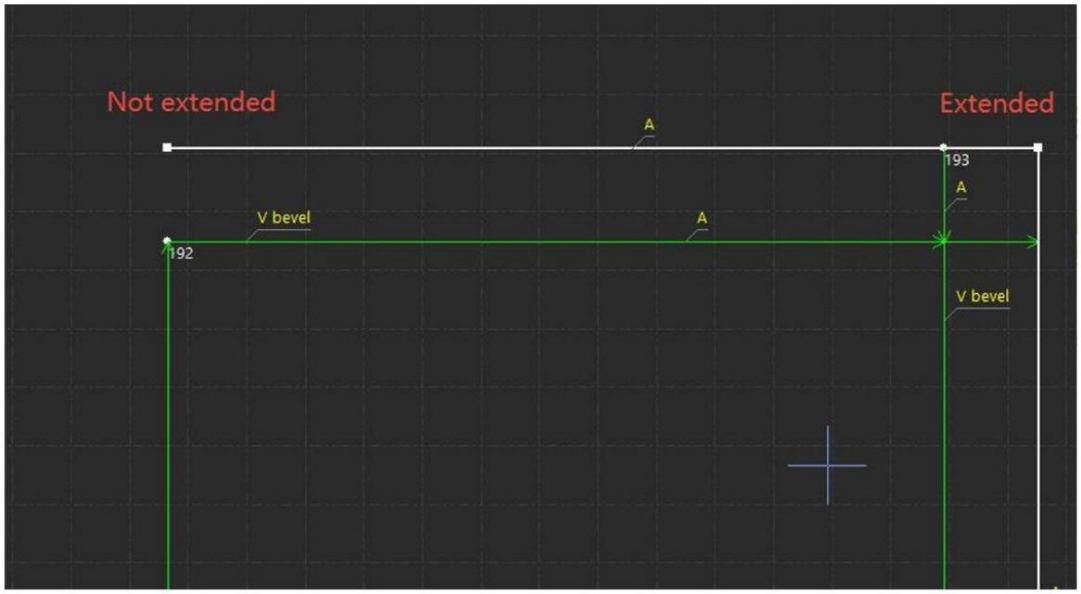



To allow the weld to penetrate deeper, use **a Bevel Root Gap** in your process.

### 9.2 Widening the bevel

After chamfering, the resulting toolpath is usually closed to ensure the integrity of the part. However, in some complex cases or after compensation adjustments, the cutting path may become non-closed.

To resolve this issue, select the two unjoined ends of the toolpath.




Then click Bevel Extend in the Extend toolbar to restore the continuity of the path. The Bevel Extension dropdown menu offers the following modes:

ÿ **Manual Extend:** Select specific edges to extend.

ÿ **AutoExtend:** Automatically extends all chamfered edges in the selected geometry.

ÿ **GeneralExtend:** Automatically extends all eligible bevel edges in view.

Present.

To remove previously applied bevel extensions, select the geometry and click **Cancel Bevel Extend** from the dropdown menu.

Additionally, enable the **Auto Extend After Compensation** feature to automatically extend the compensation period.

the corner edges after applying chamfering.

# 10. TRY IT OUT

## 10.1 Frame

Press and hold the Fn + Frame keys on the remote control to perform an outer frame test. of the drawing

## 10.2 Dry Run

Press and hold Fn+DryRun on the remote control to perform a non-cut test run. cutting path

## 11ÿ . REMOTE

**Start:** Start the cutting program ÿ **Pause:** Pause

the cutting program ÿ **Continue:** Continue cutting

after pausing

ÿ **Stop:** Stops the cutting program immediately. ÿ

**Gas:** Blows gas directly from the cutting head (O2, N2, or Air, depending on selection).

ÿ **Shutter:** Turns the laser on/off ÿ **Aiming:** Turns

on the red beam of the cutting head ÿ **Back:**

Returns to the previous section ÿ **Forward:**

Moves to the next section ÿ **Laser:** Directly

fires a small laser beam -> used to check the laser center ÿ **FN:** Common button for Drycut,

Frame, and Zero

ÿ **DryCut:** Runs along the drawing contour but the laser is not turned on (+Fn)

ÿ **Frame:** Runs a square shape that encompasses the entire drawing (+Fn)

ÿ **Low:** Press and hold + to change the axis direction to **low** speed .

ÿ **High:** Press and hold + axis direction to run the axis at **high** speed.

ÿ **Step:** Press and hold + to move the axis in small steps.

ÿ **ZeroFn:** Return to the zero point (+Fn)

ÿ ÿ: Y+ axis movement ÿ ÿ:

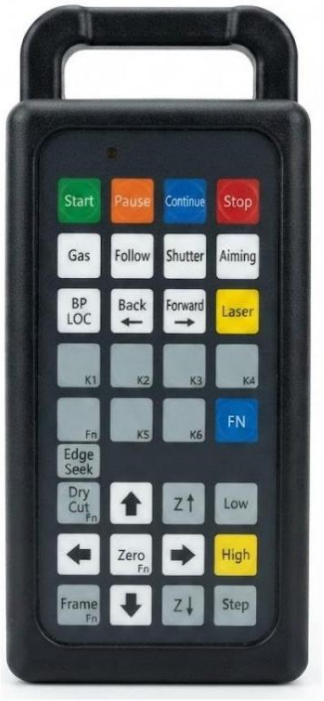
Y- axis movement

ÿ **ÿ:** X-axis movement ÿ **ÿ:**

X-axis movement

ÿ Zÿ: Z+ axis movement ÿ

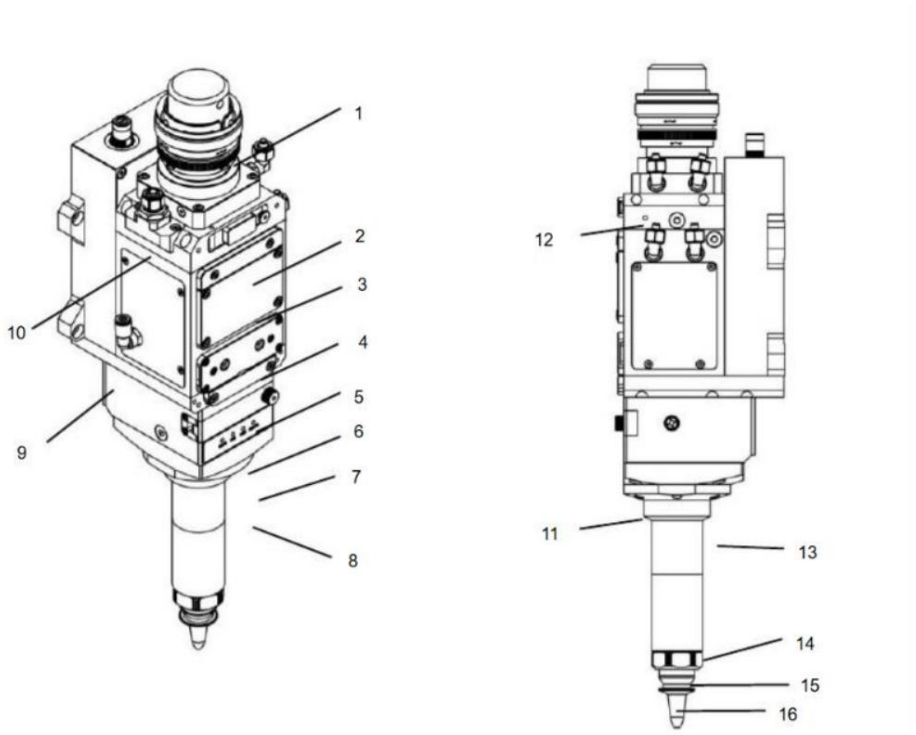
Zÿ: Z- axis movement



# 12. DAUCA TLASERBOCILT 482P

# (M=2.5)30KW

## 12.1 External structure of the cutting head




1. **Laser fiber:** The fiber optic connector guides the laser beam to the cutting head.

**2. First Upper Protective Window:** The top protective glass (first layer) helps prevent...
Dust and smoke are being blown back into the optical components inside.

**3. 2nd Upper protective window:** Upper protective glass (second layer), increased protection.
Enhances the protective capabilities of optical systems.

**4. Collimation unit:** A collimator that causes the laser beam to diverge.
from optical fiber to parallel beam.

**5. Focusing unit:** This unit focuses the parallel beam of light onto a microscopic cutting point on the material surface.

**6. 2nd Lower protective window:** The lower protective glass (second layer), located near
The cutting area should be protected from heat and dirt.

**7. 1st Lower protective window:** Lower protective glass (first layer), latch
The final barrier protects the converging lens.

**8. Working indicator:** A light or device that indicates the operating status of the head.
cut.

**9. Nozzle cooling air interface:** The port that supplies cooling air to the cutting nozzle.

**10. Cutting gas interface:** The port for supplying cutting-assisted gas (like 2, 2 or compressed air).

**11. Cooling water outlet: The** outlet of the cooling water system (usually going to the unit)).
refrigerant).

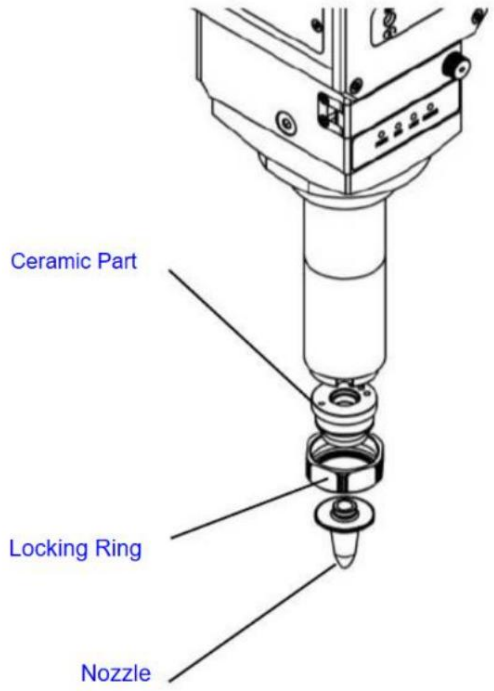
**12. Cooling water inlet: The inlet** for the cooling water, which helps stabilize the cutting head temperature when running at high power.

**13. Protective Screw:** A protective screw that surrounds the lower body of the cutting head.

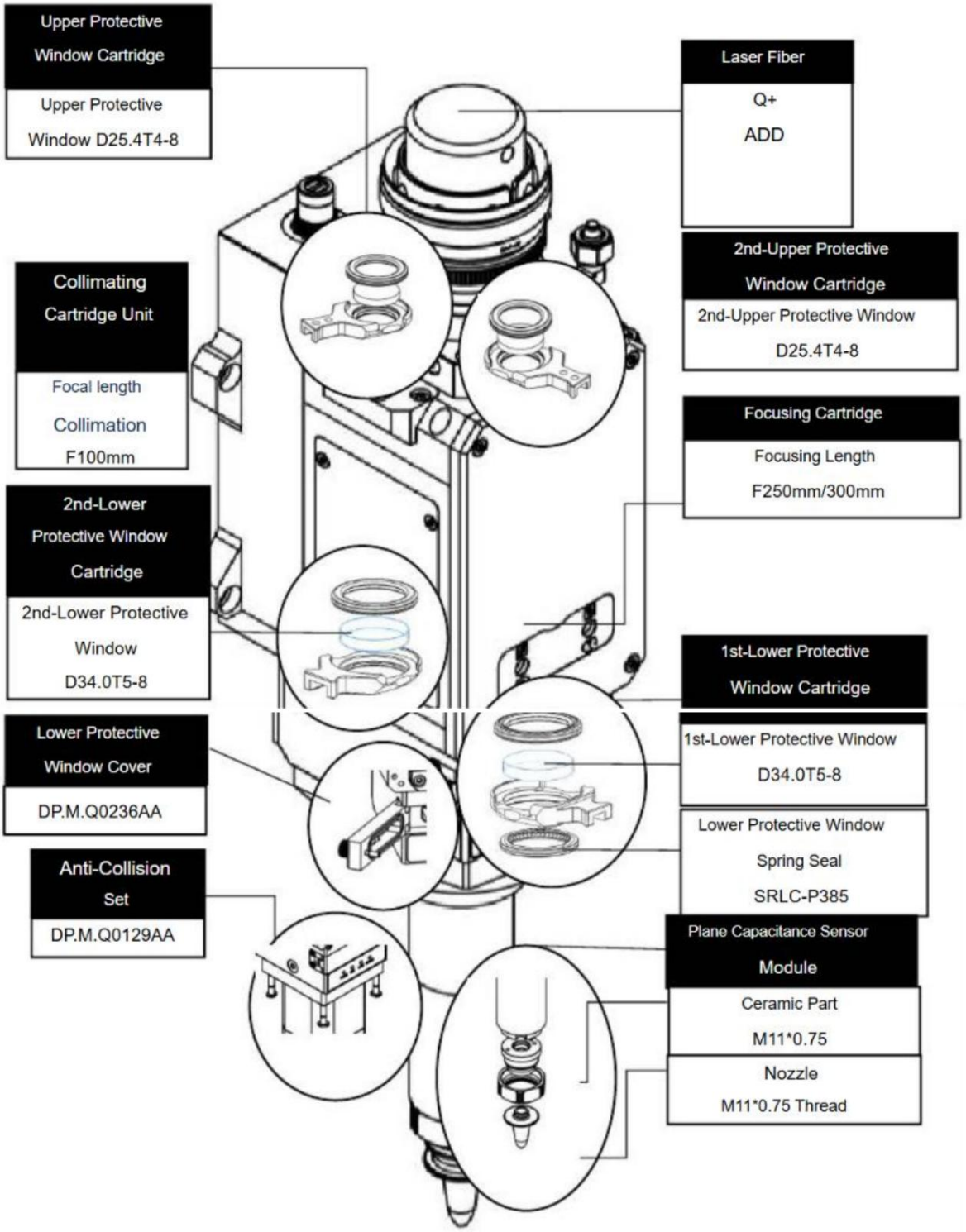
**14. Ceramic body lock ring:** A locking ring that secures the ceramic body.

**15. Ceramic body:** The ceramic body provides insulation and transmits signals from the distance sensor between the cutting head and the material.

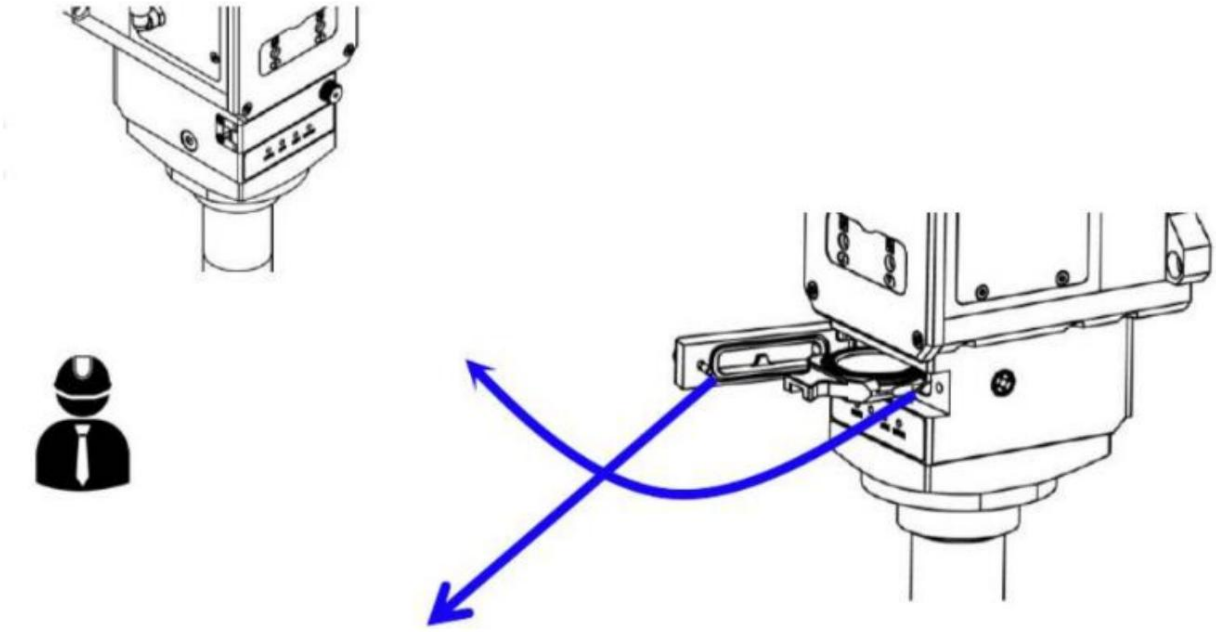
**16. Nozzle:** The cutting nozzle, where the gas and laser beam are focused to perform the cutting process.
material.



## 12.2 Internal structure of the cutting head



## 12.3 Procedure for replacing the lower protective glass



- **1. Loosen the screws and open the lower protective glasses compartment:** First, you need to unlock the latch to access the glasses tray.
- **2. Pull out the protective lens tray at the bottom:** Remove the lens tray from the cutting head.

  to make the replacement.
- **3. Close the glass storage compartment door:** After removing the tray, close the compartment door immediately to prevent

  It prevents dust and dirt from entering the optical chamber of the cutting head.
- **4. Remove the pressure ring:** On the glass tray, remove the retaining ring to release the old glass.

- **5. Replace the bottom protective glass:** Install the new glass panel in place of the old one.
- **6. Open the glass tray compartment door:** Reopen the compartment door to prepare to reinsert the glass tray.
- **7. Install the glass tray into the cutting head: Push** the glass tray (with the new glass installed) into position inside.

  Cut the ends and secure them in place.

  **Important note:** Because laser cutting environments produce a lot of metal dust and fumes, you need to be extremely careful to keep the new glass panel clean during installation, avoiding fingerprints or dust from adhering to the surface.

  The glass surface is to prevent it from burning when the machine is in operation.

# 13 . Q U A N S Á T T R O N G Q U Á T R Ì N H C ÿ T

## 13.1 Sparks

Standard:

ÿ Fewer sparks

ÿ Pale yellow ÿ Go straight down

ÿ Not shot back up

Error symptoms:

ÿ Sparks fly upwards ÿ No sparks

## 13.2 Cutting sound

Standard:

ÿ Continuous and steady hissing

Error message:

ÿ Pop-up sounds ÿ Crackling sounds

## 13.2 Penetration

Right from the start, it had to be completely pierced.

If the flame shoots back up, it means it hasn't penetrated **13.3 Cutting head.**

While running, the cutting head must be stable, without vibration or jumping. Observe carefully to prevent the cutting head from hitting the material. If it hits the material, immediately press Stop on the remote control ÿ Check the cutting head.

## 13.4 Loss of Capacitance

With stable capacitance, the cutting head will run very smoothly.

If the capacitance is lost, the cutting head will jump up and down, or penetrate the material.

Troubleshooting: ÿ Recheck the contact of the ceramic insulators.

ÿ Capacitance adjustment

## 13.5 Nozzle stuck

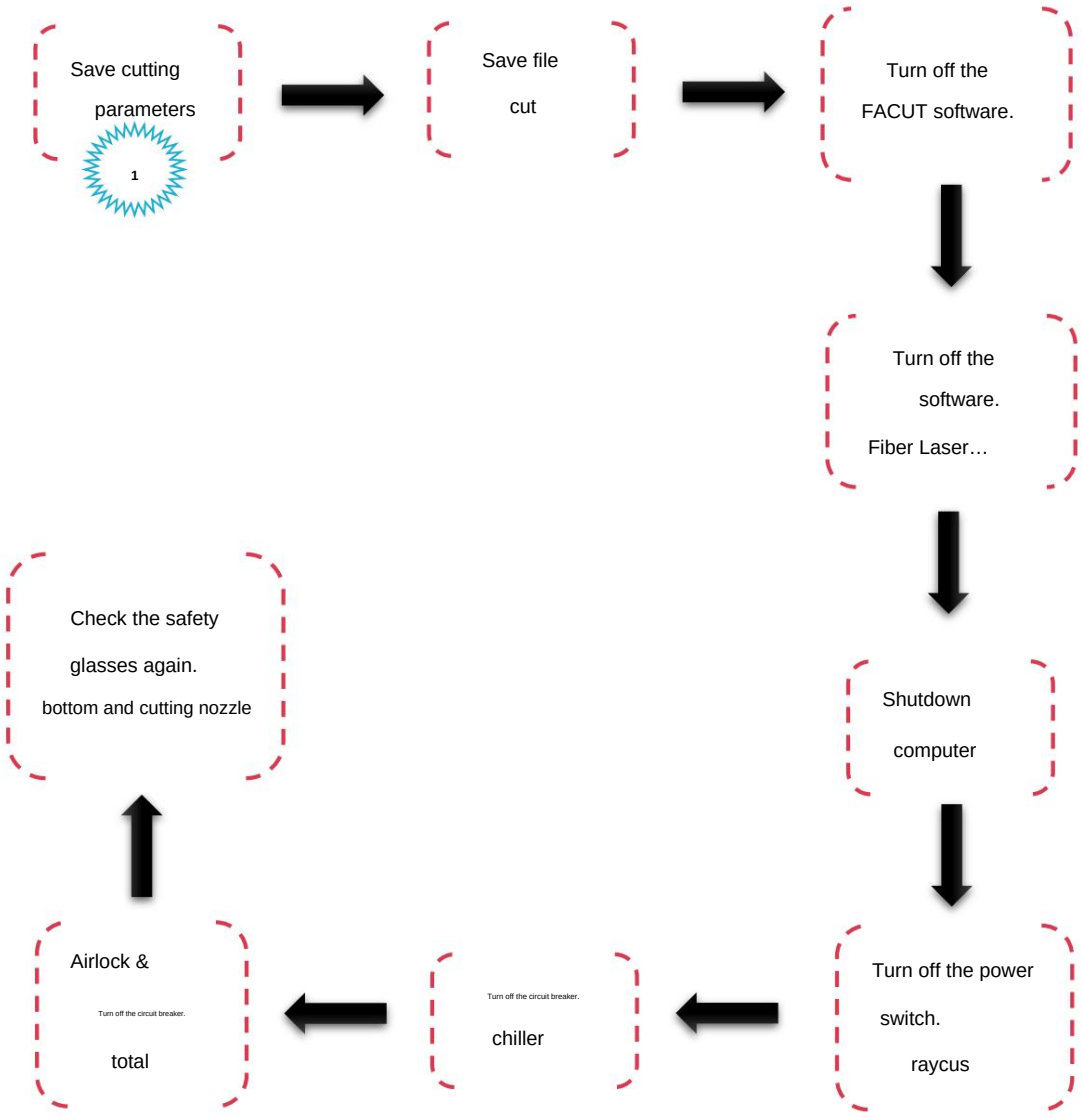
If you see burrs stuck in the nozzle, you must clean it.

### 13.6 Error Reporting

When an error occurs, do not reset and continue running; instead, identify the error and resolve it.

before

# 1 4 . QUYTRÌ NHKÿ TTH Ú CCA



# 1 5 . MAINTENANCE

## *Every day*

ÿ Check that the chiller water level is within a safe range.

ÿ Check that the water temperature is not higher or lower than 22.5 degrees Celsius during operation.

ÿ Check that the protective glass is clean, free from scratches, and has no yellowing or clouding.

ÿ Check that the nozzle is not bent, has no damaged threads, is not off-center, and is the correct type.

ÿ Check that the air pressure is not lower than the required level and meets the specifications.

ÿ Drain the air filter.

## *Weekly*

ÿ Cleaning electrical cabinets with low-pressure compressed

air ÿ Cleaning chillers with low-pressure compressed air

ÿ Check the tightening of the cooling fan screws.

ÿ Check that the cable is not broken or damaged.

ÿ Check for gas leaks

ÿ Check for water leaks

ÿ Check that the cable chain is not broken or detached.

ÿ Cleaning the rails

ÿ Check lubrication, add more oil if low.

ÿ Check that the ceramic is clean and free of cracks.

## *Monthly*

ÿ Tighten the screws on the electrical cabinet.

ÿ Check the relay

ÿ Check the contactor

ÿ Check the 24V power supply

ÿ Check the servo

ÿ Check the encoder

ÿ Check the guide rails

ÿ Check the gears

ÿ Check the rack

ÿ Check laser concentricity

ÿ Check capacitance

ÿ Check the lubricant level.

## ***3–6 months***

ÿ Replace the chiller water (if the water quality is not satisfactory)

ÿ Check the entire air system.

ÿ Check the laser source

ÿ Check the perpendicularity of the cutting edge.

ÿ Check the entire machine

## 16. TIÊU CHÍ ĐÁNH GIÁ HỆ THỐNG (PASS/FAIL)

| Content | Obtain |
|---|---|
| Turn on the machine according to the correct procedure. | ÿ |
| Perform a safety check before cutting. | ÿ |
| Choose the right nozzle according to the material. | ÿ |
| Choose the correct gas and pressure. | ÿ |
| Laser center check | ÿ |
| Capacitance test | ÿ |
| Assign the correct cutting parameters. | ÿ |
| Dry Run | ÿ |
| Test cut meets quality standards. | ÿ |
| Identifying and resolving basic errors | ÿ |
| Turn off the machine properly. | ÿ |
| Perform end-of-shift cleaning and maintenance. | ÿ |