ERMAKSAN FIBERMAK

MOMENTUM GEN-3

OPERATOR INSTRUCTIONS version 3.8 (20.03.2018)

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LASER TECHNICAL SERVICE

OPERATOR INSTRUCTIONS FOR LASER TRAINING

# LASER, TRANSMITTING BEAM AND CUTTING

Laser means Light Amplification by Stimulated Emission of Radiation.

It is produced by modules inside resonator. Resonator (left photo), modules and fiber cables (right)

Laser light is going inside the fiber cable. Fiber cable is transmitting the light without loss.
You can see an example fiber cable at down (photo 1), at the end of fiber cable light is spreading around (photo 2), so we are using optics for focusing the light. Focused light cuts metal.

The fiber cable is connected to Cutting Head, so we are using optics inside the head. As you see below photo (3) after fiber, we are using collimation lens to make the laser light straight.

After that we are using focusing lens for focusing the beam (laser light) for cutting.

Fiber cable

Chiller's Blue Water Pipes for Adjusting Head Temperature
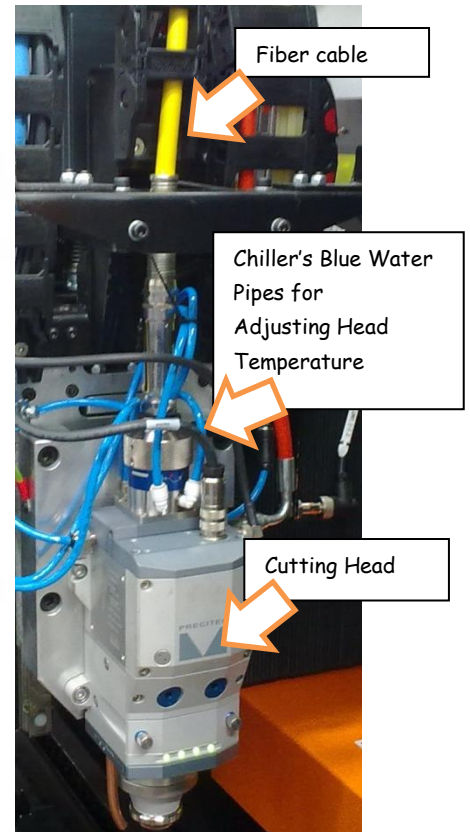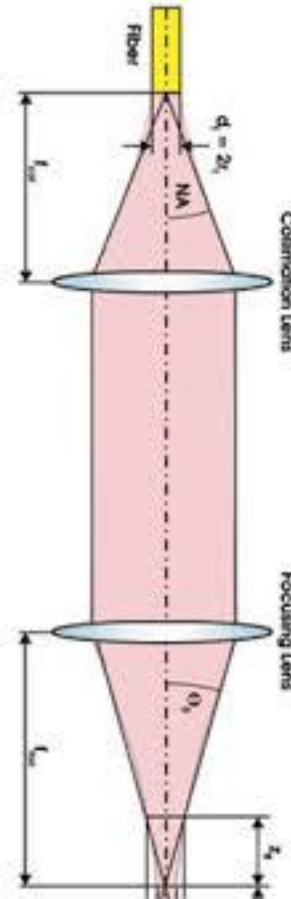
Cutting Head

We are using chiller for adjusting the temperature of resonator and cutting head with **water** .
We are using dust collector (extraction unit) for sucking the gas and particles while cutting.

TURNING ON AND TURNING OFF THE MACHINE

TURNING ON THE MACHINE

- Turn on the electrical cabinet switch

electrical cabinet switch

- Turn on the resonator switch

On/Off Switch

Key

- Turn the resonator key to robot mode. Wait for 3 minutes.
- Turn on the chiller.
- Turn on the extractor
- Turn on the compressor and air dryer

Wait the computer until windows loads the Twincat System Manager. Don't open any program in this time. The red window appears.
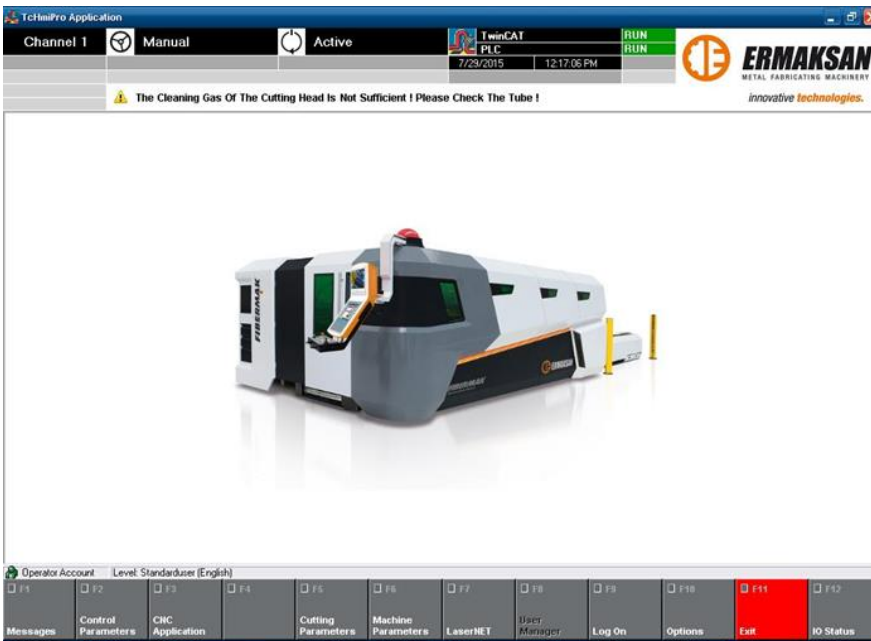
After this red TSM window disappears the LAN connections and Twincat System Manager logo comes to system tray. now you can use the programs.

Find the FibermakMG3 application and run it. User name Operator, there is no password just press ok.
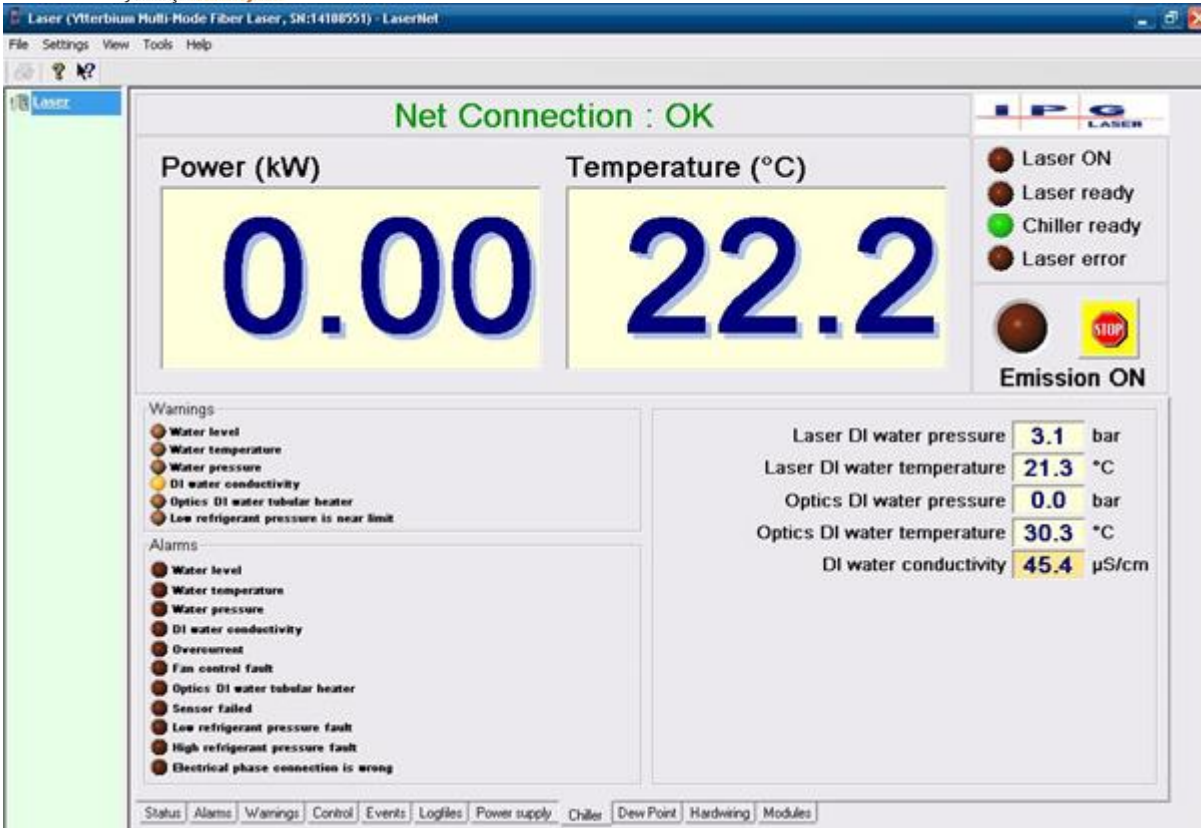

This is the application main window.

Check the laser status by clicking LaserNET link in the main menu
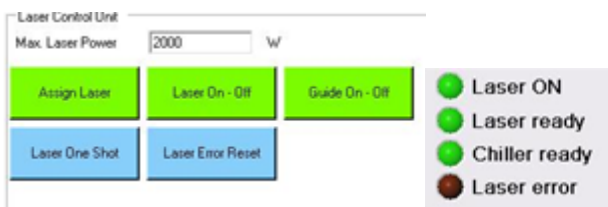
Check if there is any alarm on the LaserNET. Check the water temperatures, if they are not ok, wait until they are in the specifications.

For turning the resonator on click machine parameters

Fırst press **Assign Laser**, and **Laser On-Off** , wait for about 6 seconds. When the **Laser On-Off** button is green , laser is ready

For starting to use the machine first click cnc application, activate enable.

Click operation mode, select manual

After this you can use the options of the machine.

TURNING OFF THE MACHINE

- Before turning of any switch, press stop button in the LaserNET to stop the modules.

- Turn off every window in Windows. Turn off the Windows.
- Turn off the chiller, wait for 3 minutes.
- Turn off the resonator key first!!!
- Turn off the resonator switch
- Turn off the extractor
- Turn off the compressor and air dryer
- <u>Turn off the electrical cabinet switch after windows of the computer is off.</u>

TABLE CHANGING

Table change can be made with control parameters or directly from push buttons
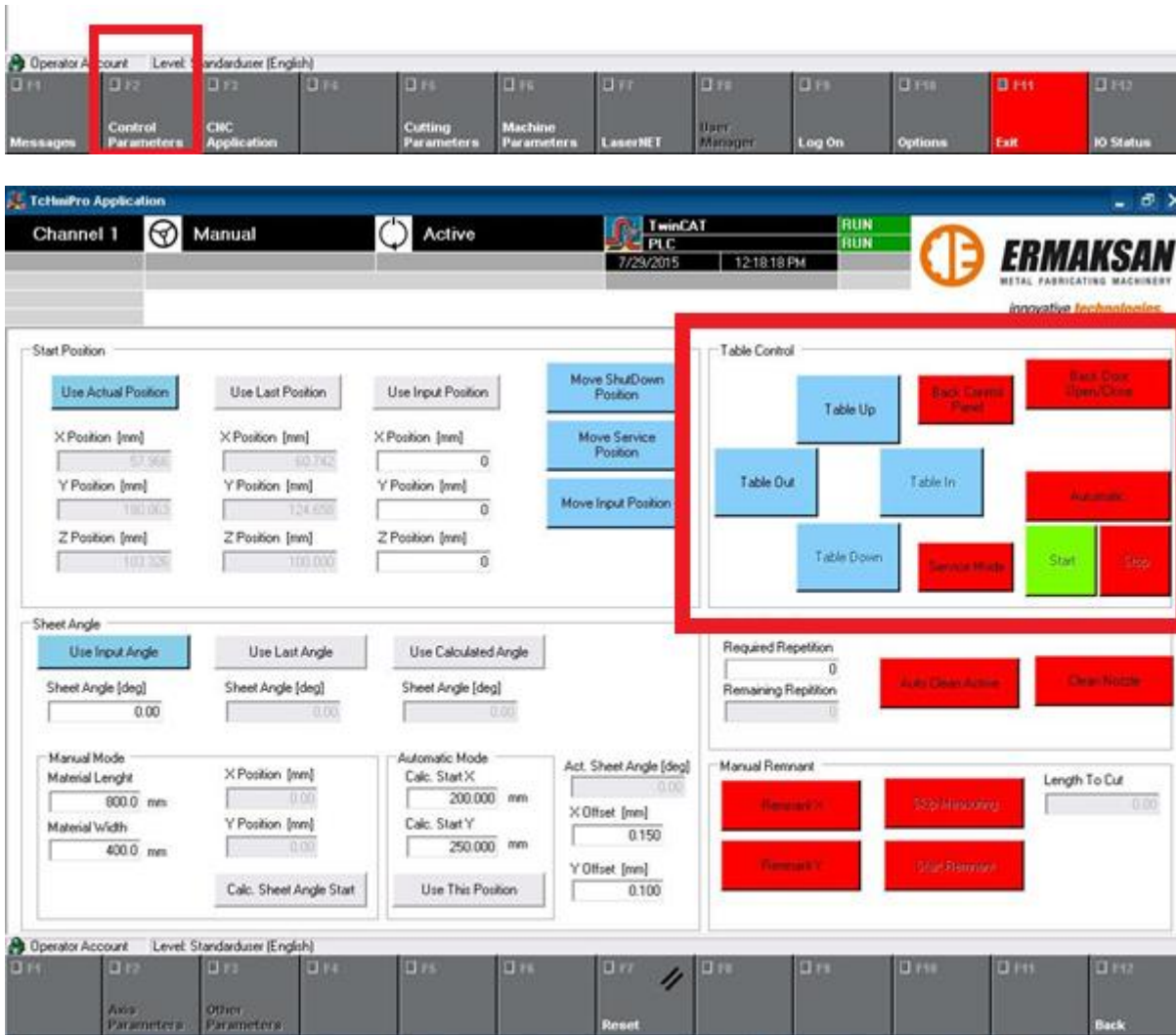
First check the conditions below

1. Z axis value must be above 100mm (3.937")
2. Front door must be closed
3. Light barrier's test button must be always on
4. Operation mode must be manual
5. If there is an error on messages, first reset the alarm
6. Activate or deactivate the "back panel control" enable

If these conditions are ok, you can change the table manually or automatically,

- When you change it manually press and hold the button (table in, table out, table up, table down) until table reaches its last position

if you see the letters blur, it means that you can not do that action. Plc forbids that action for that position of table. (for this example table in, table down blur, others not blur)

When you are using **table in** or **table out**, if table does not reach its final position, you can not close the **back door** and you cannot use **table up** and **table down** also

When you are using **table up** or **table down**, if table (loading unit) does not reach its final position, you can not use **table in** and **table out** also.

- When you want to change the table automatically, press automatic button, when it is green, press start button, you can stop in the middle of the process also. In automatic mode you don't have to press and hold the button. It is one click button

- When you want to control the table from back panel you have activate "back control panel" as shown in picture below
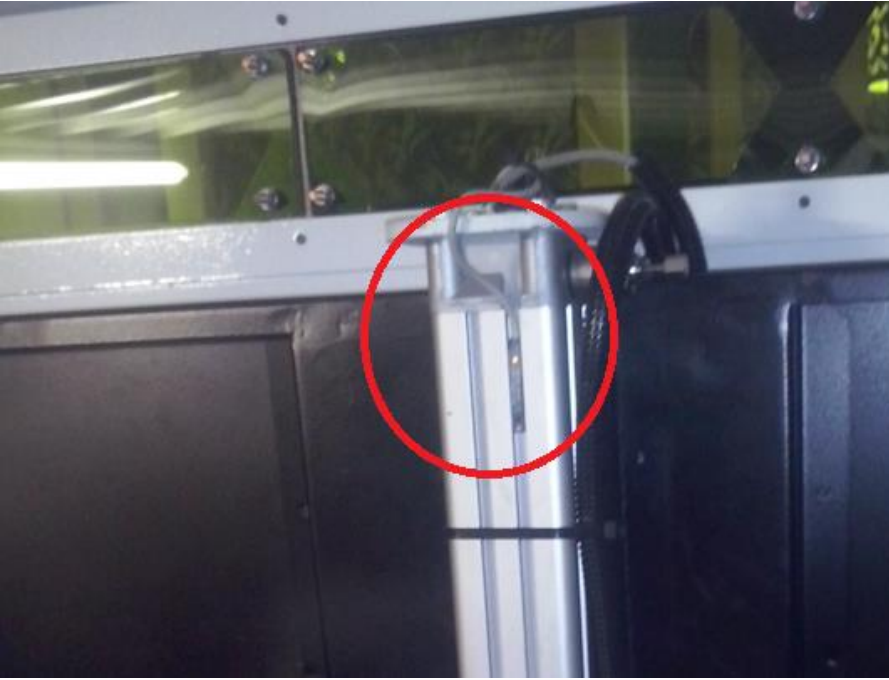

This is the backpanel. You can see the function on the below picture.

When the back door is open "**back door open/close**" button color must be green

When the back door is closed "**back door open/close**" button color must be red


This is the back door pneumatic sensor. There are two of them.

Those are the slowing and stopping switches. When the table is in place those must be touched.

There is one on top table, one on bottom table, one in front in the machine.

You can see table lock pneumatic and light bar led in below picture. When led is green it is ok, when it is red it means barrier is been interrupted.

Table lock pneumatic

Light barrier LED
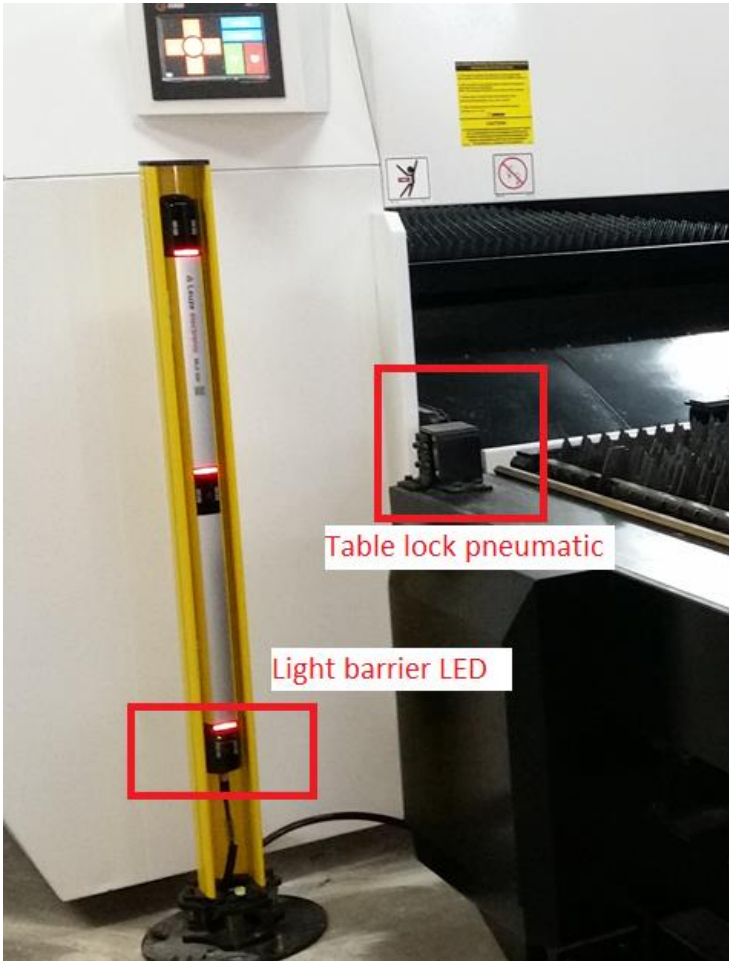
The photo below gives closer look to pneumatic lock cylinder shown with circle, and you can see sensor placed on cylinder shown with arrow . If the table is in place, the cylinder must be locked and sensor led must be off. When there is no table on loading unit, the cylinder is unlocked and sensor led must be on.
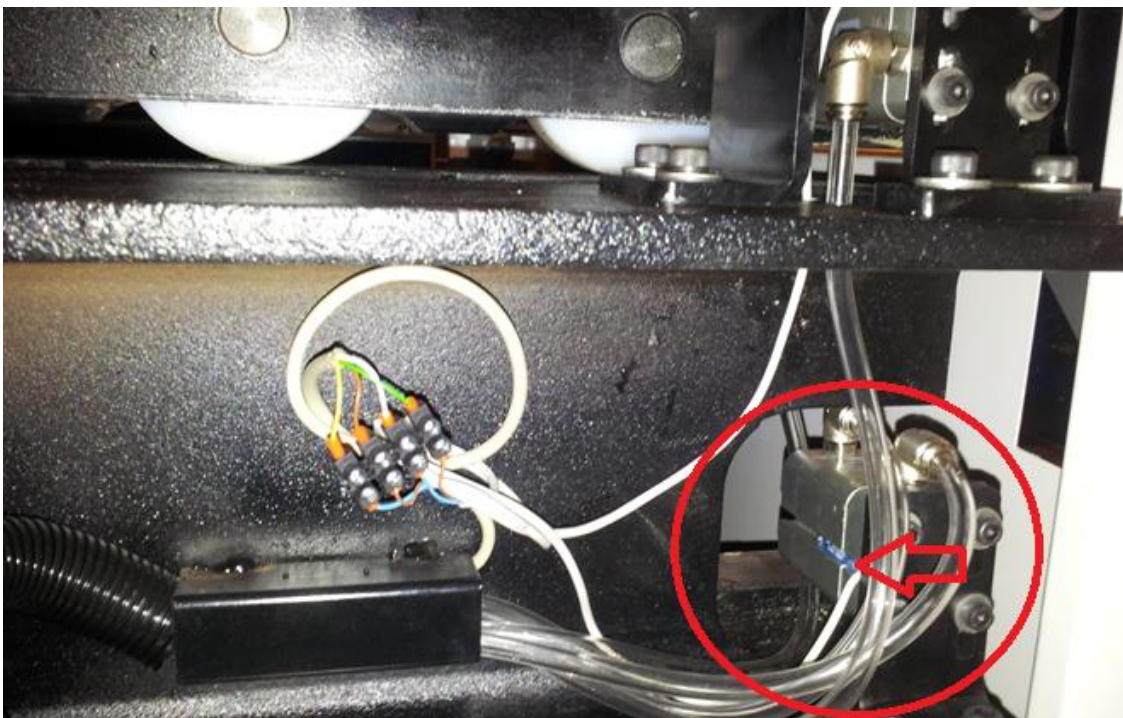
You can see table limit switches and cross switch in below picture. There are 4 hydraulic pistons like below picture. Totally 12 switches on pistons.

bottom table limit switch

top table limit switch

cross switch
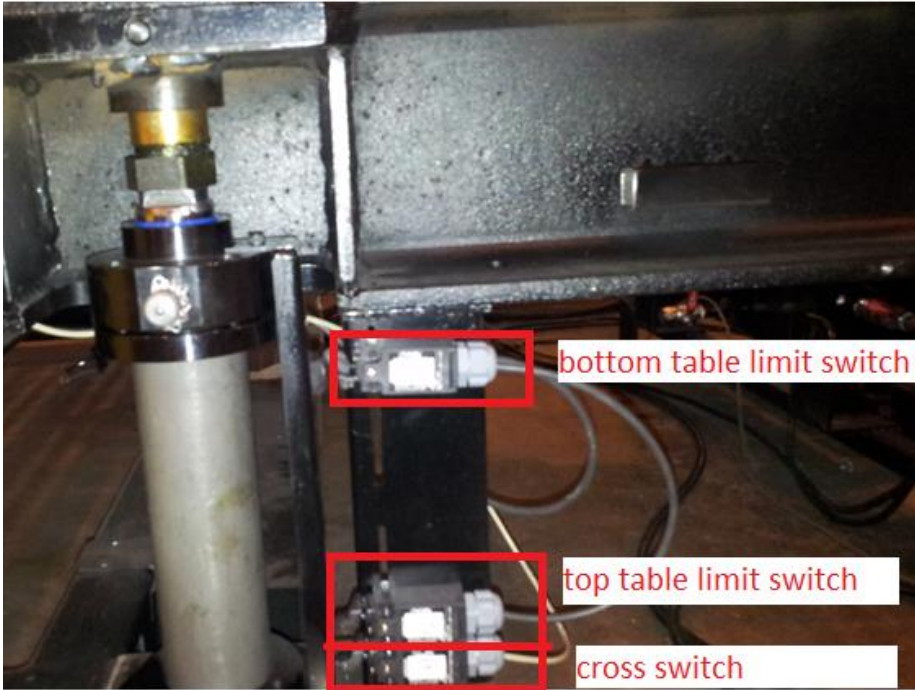
CUTTING STEPS

1. **PROTECTION GLASS CHECK**: YOU SHOULD CHECK EVERYDAY AND WHEN CUTTING IS BAD
2. **Operation mode → Manual   *Enable Motors* (in CNC Application)**
3. **BEAM CENTERING** : CHECK AND ALIGN BEAM CENTERING EVERYDAY and when cut quality is bad (**machine parameters**)
4. **NC PROGRAM COPY** : PREPARE LANTEK CODE FOR SHEET DIMENSIONS AND THICKNESS
5. **TABLE CHANGING:** PLACE THE SHEET ON TABLE, AND SEND TABLE INSIDE **(control parameters)**
6. **CUTTING PARAMETERS**: ACTIVATE THE CORRECT CUTTING PARAMETER   (**cutting parameters**)
7. **NOZZLE CHECK**: PLUG THE NOZZLE WRITTEN IN THE CUTTING PARAMETER (**cutting parameters**)
8. **HSU CALIBRATION**: IF YOU CHANGE NOZZLE, DO HSU CALIBRATION (**machine parameters**)
9. **GAS TEST**: MAKE GAS TEST (PURGE GAS-FILL LINES) BEFORE CUTTING (**machine parameters**)
10. **START POSITION**: ASSIGN YOUR PROGRAM'S HOME POSITION (**control parameters)**
11. **Operation Mode→ Automatic   (in CNC Application)**

≡	📂 Program	C:\NC Codes\00109.nc

12. **SELECT PROGRAM**: SELECT PROGRAM YOU WANT TO CUT THE SHEET WITH (**cnc application)**
13. **OPTIONS WHILE CUTTING**: CHECK PART, ONLY PIERCE, STARTING PROGRAM AFTER RESET etc.

1. PROTECTION GLASS CHECK

Protection glass check should be done every morning before cutting and when the cutting is bad.

You can see protection glass cartridge below. It has two screws loosen these to take out the cartridge. There is no o-ring on the protection glass. There is only a metal cover, and it is not locked.
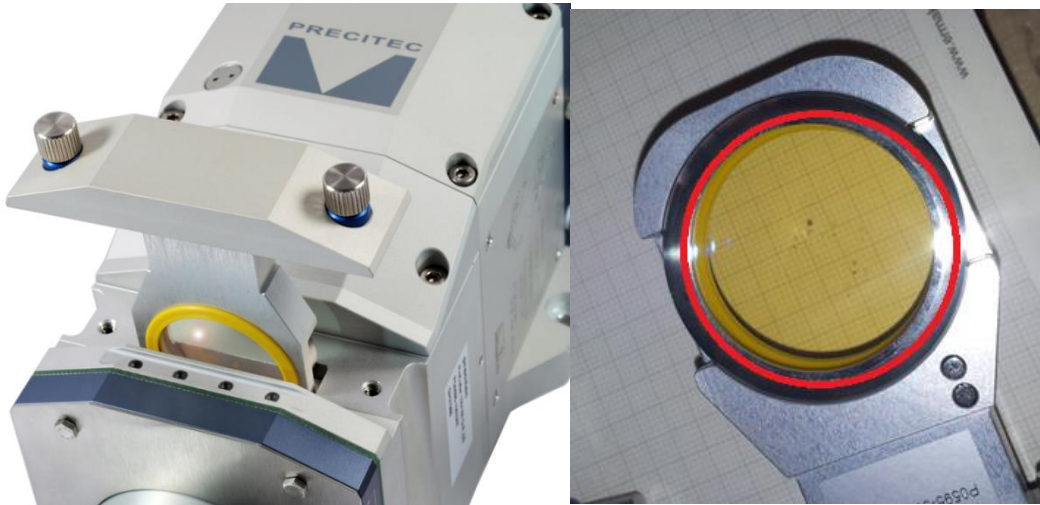

The yellow o-ring above must not be damaged. The metal part is shown with red circle above.
So don't turn the glass cartridge sideways. You can clean it while it is on cartridge, but first you must close the hole of cutting head with blue service tool. Service tool is in below photo.

## 2. BEAM CENTERING (ALIGNMENT) (<u>machine parameters</u>)

Beam centering is very important for good cutting and for optic parts
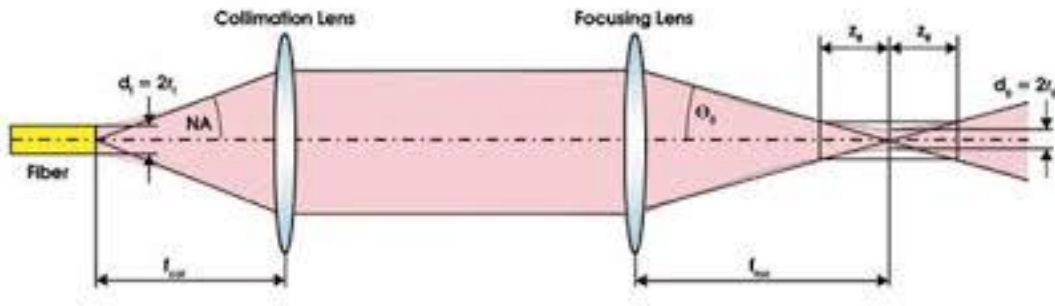
These are the optic parts in a cutting head, there are two more protection glasses also, but they don't have function for changing the beam's geometry.

The beam must be in the center of nozzle, because pressure must be homogeneous, and the beam must be vertical for a good cut.

You can see the cartridge photo below. You can see the beam centering screws in blue color (1 and 2)
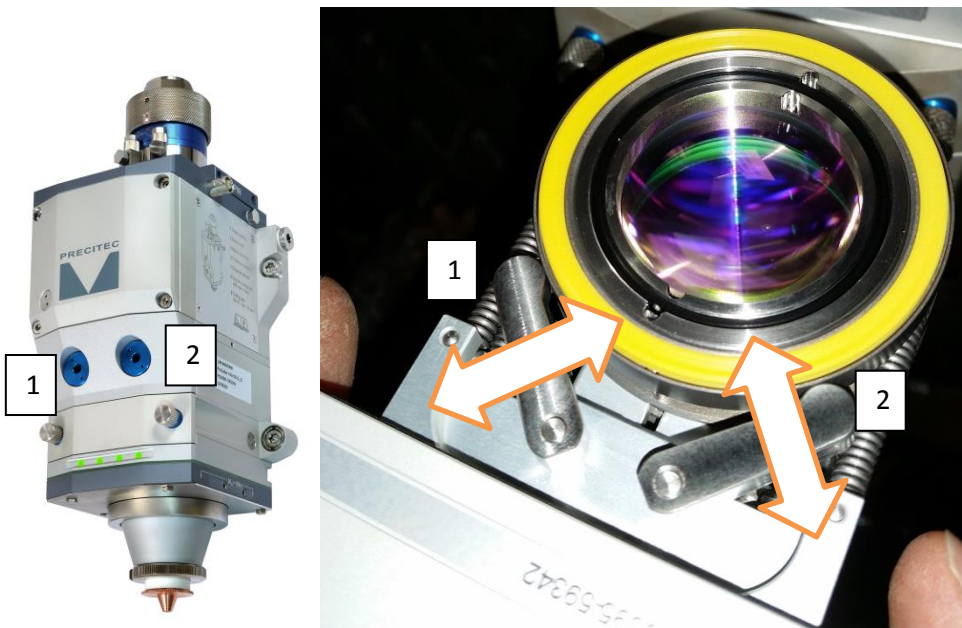
On the second picture you can see lens and lens cartridge and screw movement.

Tightening the screw pushes the lense inside the cartridge

Loosening the screw pulls the lense inside the cartridge

You should be gentle while tightening or loosening the screw

And it is very sensitive,so tighten or loosen the screw very slowly to find the center better.

Before starting beam centering plug 1.0 or 1.2 nozzle for the best accuracy.

Click machine parameters in the main menu for starting beam centering

First press **assign laser**, and **laser on-off** , wait for about 6 seconds. When the **laser on-off** button is green, laser is ready

Before clicking laser one shot, write 1 or 2 to **focal distance** `Focal Distance  2` and click **focal test** `Focal Test` , **focal distance** becomes **focal output** `Focal Output  2`

Use <u>carbon copy paper</u> for beam centering. Rub the paper to nozzle

Put the <u>paper tape (masking tape)</u> on the nozzle 0 degrees

Press laser one shot, take the tape from nozzle, look at the hole with same angle

  Paper tape on the nozzle

The nozzle hole must be circular. Damaged nozzles can't be a reference.

If you don't have carbon copy paper use dust from extraction unit bucket.

Paper tape after oneshot

Paper tape without oneshot
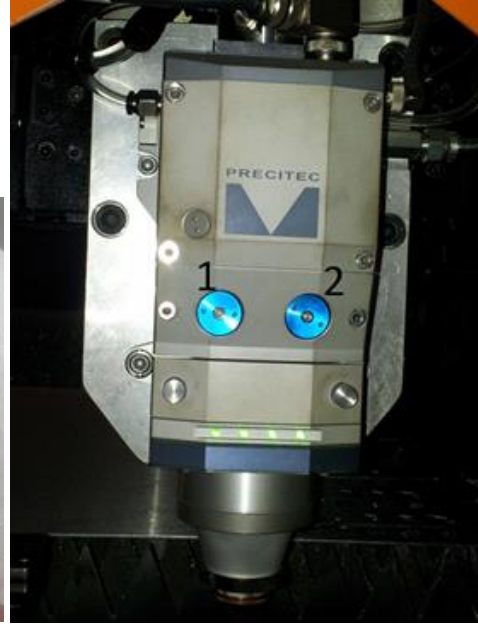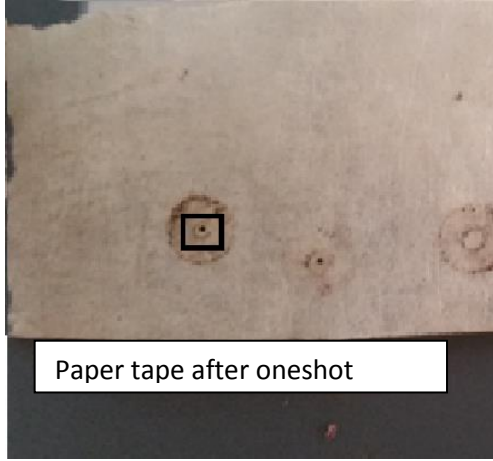
The outer circle is not important, the inner circle and the **hole of laser beam** is important
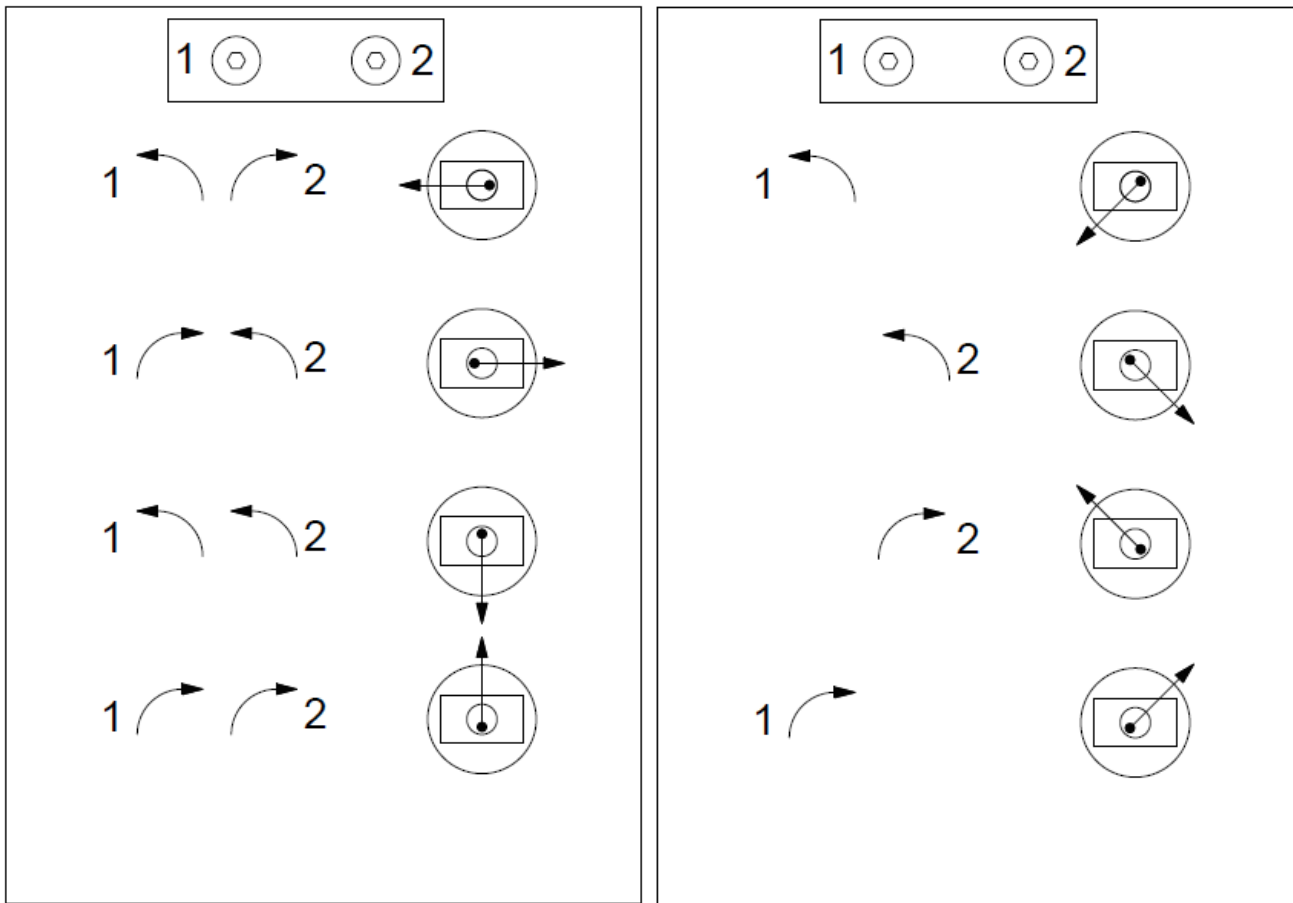
Follow the above instructions depending on the position of the **laser beam hole** in the small circle

1 and 2 are the screws on the cartridge. You can adjust them with 4 allen key

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SAC İŞLEME MAKİNELERİ
yenilikçi teknolojiler.

3.NC PROGRAM COPY : COPY THE NC PROGRAM WITH USB STICK OR NETWORK TO BECKHOFF CONTROLLER , CHECK LANTEK CODE SHEET DIMENSIONS, THICKNESS,MATERIAL,GAS TYPE

Computer   Beckhoff   TeamViewe
             FBWF ...

FibermakMG3   NC Codes

Paste nc code file (i.e. 0125.nc) into NC Codes

```
N000000001:( ****** LASER CUTTING MACHINE    ****** )
N000000002 ( ****************************************** )
N000000003 ( DATE      : 27/07/2015  )
N000000004 ( MATERIAL  : X5CrNi  )
N000000005 ( THICKNESS : 2  )
N000000006 ( SHEET SIZE : 3000 x 1500  )
N000000007 ( ****************************************** )
N000000008 V.E.Par[55] = 3000      X AXIS
N000000009 V.E.Par[56] = 1500      Y AXIS
N000000010 V.E.Par[46] = 2         MATERIAL TYPE
N000000011 V.E.Par[47] = 2         THICKNESS
N000000012 V.E.Par[48] = 1         CUTTING GAS
N000000013 V.E.Par[49] = 30        NUMBER OF PARTS
N000000014 V.E.Par[50] = 160       NUMBER OF CONTOURS
N000000015 V.E.Par[130] = 0        PIERCING OPTION
N000000016 V.E.Par[131] = 0        FILM BURNING OPTION
```

X AXIS AND Y AXIS VALUES MUST BE SAME WITH THE SHEET

Material types:	
"AlMg3"	1
"X5CrNi"	2
"ST 42"	3
"Copper"	4
"Galvanized"	5
"Brass"	6
Gas types:	
Oxygen	0
Nitrogen	1
Cutting air	2

4. CUTTING PARAMETERS: ACTIVATE THE CORRECT CUTTING PARAMETER

Before cutting first choose the correct cutting parameter

Choose the correct cutting parameter and save it

5. NOZZLE CHECK: Plug the nozzle written in the cutting parameter

Malzeme		Giriş Hızı [mm/dak]	Lens [mm]	Nozzle [mm]	Odak	Hız=0 iken Güç[W]	İvmelenme [%]	Gecikme Süresi [ms]	Temizleme Süresi [ms]
Steel	Kes 1	1100	150	1.2	2.8	1500	18	0	0
Kalınlık [mm]	Kes 2	1300	150	1.2	2.8	1500	18	0	0
6	Kes 3	1400	150	1.2	2.8	1500	18	0	0
	Uçan Kesim	0	0	0	0	0	0	0	0
Numara	Küçük Delikler	0	0	0	0	0	0	0	0
0	Markalama	12000	200	0	-2	250	0	0	0
Malzeme	Film Yakma	0	0	0	0	0	0	0	0
Steel									

Check the nozzle value of the parameter (for oxygen use "d" nozzle, for nitrogen "hd" nozzle)
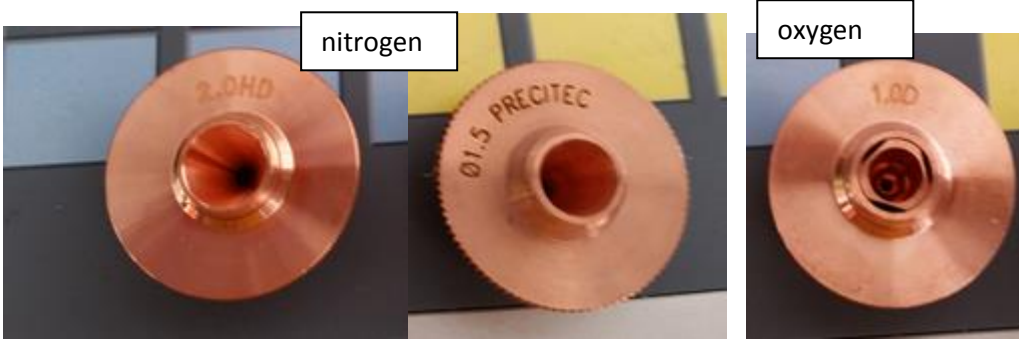
nitrogen   oxygen

HD nozzle types (for nitrogen) inside empty   D nozzle (for oxygen) inside half full

First choose nozzle type(HD or D nozzle) ,then check the diameter (nozzle value) in cutting parameters (1.5 or 2 or 1 or 2 or 3 etc.)

6. HSU CALIBRATION: It is better to do a calibration after changing nozzle or after every full sheet even if you don't change nozzle.
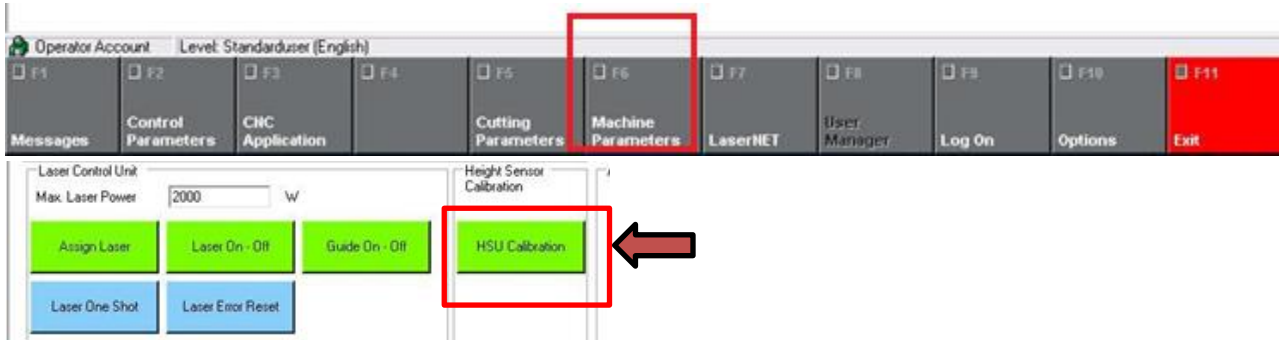
7. GAS TEST: If necessary make gas test (purge out gas) before cutting
   Click machine parameters in the main window

Then select the gas you want to test, and write test pressure, test time and click gas test the values below are not very strict. You can use different time and pressure also.

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You can use gas exhaust manual to purge the gas inside the hose. Then fill the hose with gas needed.

Cutting with oxygen   *if you did not cut anything before   test oxygen pressure:2 bar, time 30s

                             *if you have cut with oxygen before   test oxygen pressure: 1bar,time 15 s

                             *if you have cut with nitrogen before test oxygen pressure:5 bar,time 60s

Cutting with nitrogen *if you did not cut anything before   test nitrogen pressure:5bar,time 10s

                             *if you have cut with oxygen before   test nitrogen pressure:5bar,time 30s

                             *if you have cut with nitrogen before test nitrogen pressure:5bar,time10s

fActualValue is the sensor measurement feedback. It should be same with test pressure.

 Sample nitrogen test   sample oxygen test

8. **START POSITION**: Arrange position with different options (manual or automatic)

Most of the options are in the control parameters

A. You can arrange the start position with the help of laser guide (light) and dont use any option of sheet angle and start position
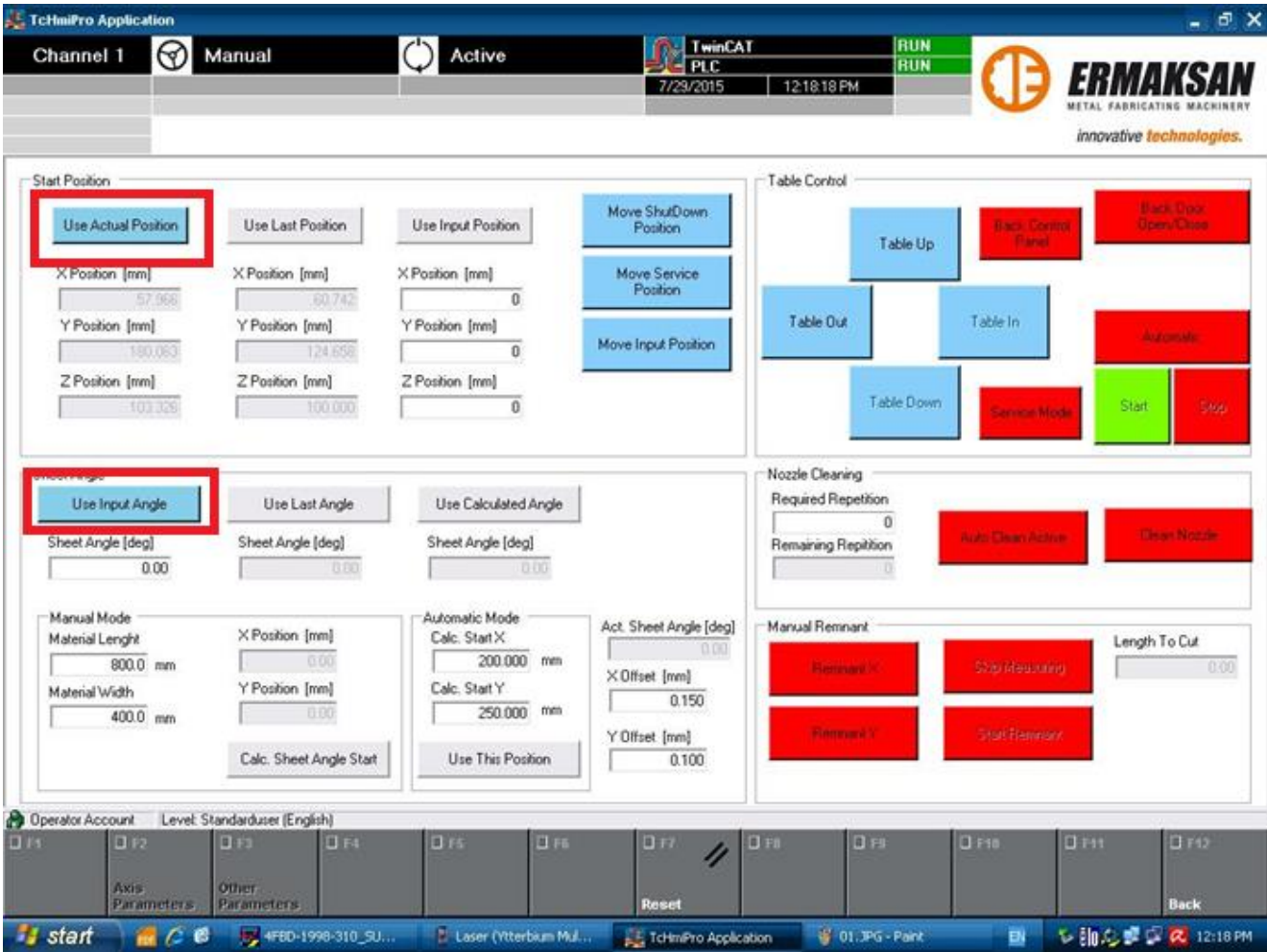
B. Manual calculation: write the dimensions of the sheet, place the cutting head on the sheet, and press calculate angle. After that you should activate "use calculated angle"
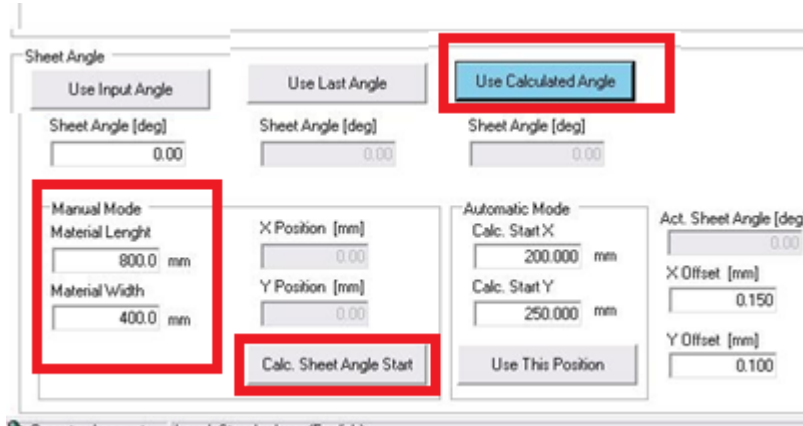
C. Automatic calculation : after selecting the program activate the **auto detect plate** in the **job control** menu
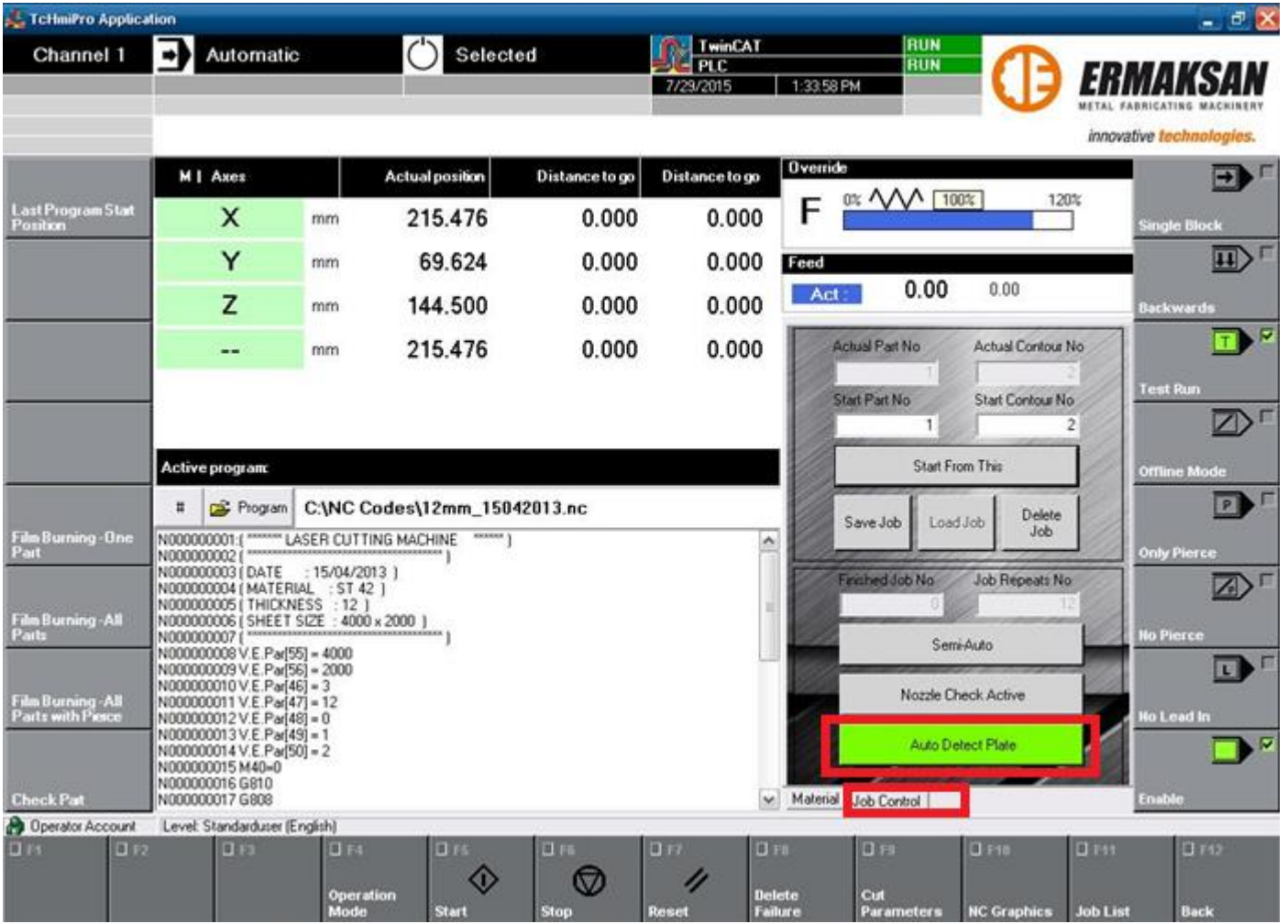
Use calculated angle in the control parameters is activated automatically when you activate auto detect plate
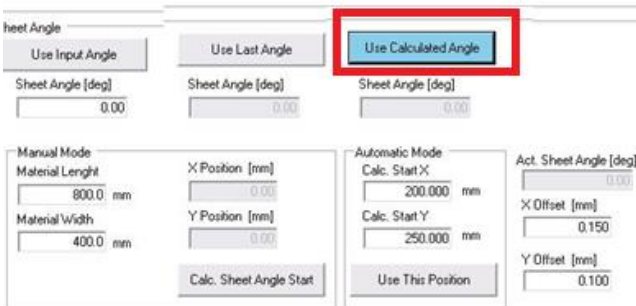
for manual and automatic calculation modes there are two different way to start

A. Start from the actual position

If you don't activate use this position option, the machine will start calculating angle from actual position
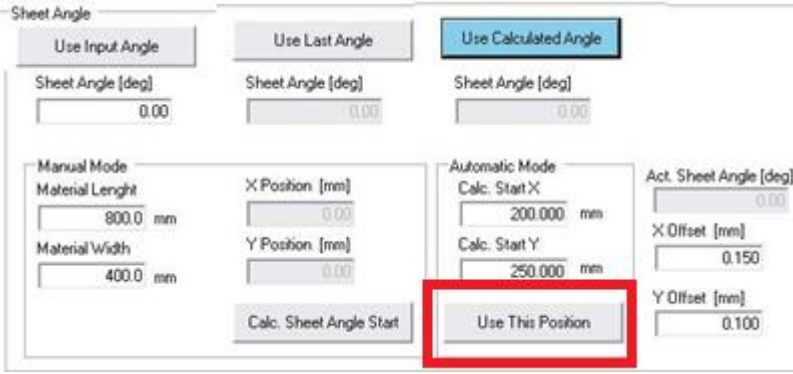
B. Start from a specific position

If you want to start the calculation of the angle from a specific position , activate the option "use this position
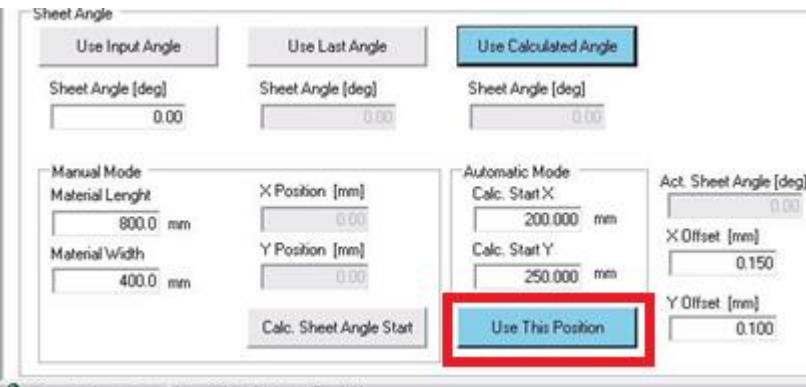
This is generally for serial cutting

9. **SELECT PROGRAM**: select the program that you want to cut the sheet with

After checking everything you can click cnc application in main window

And then click operation mode and select automatic
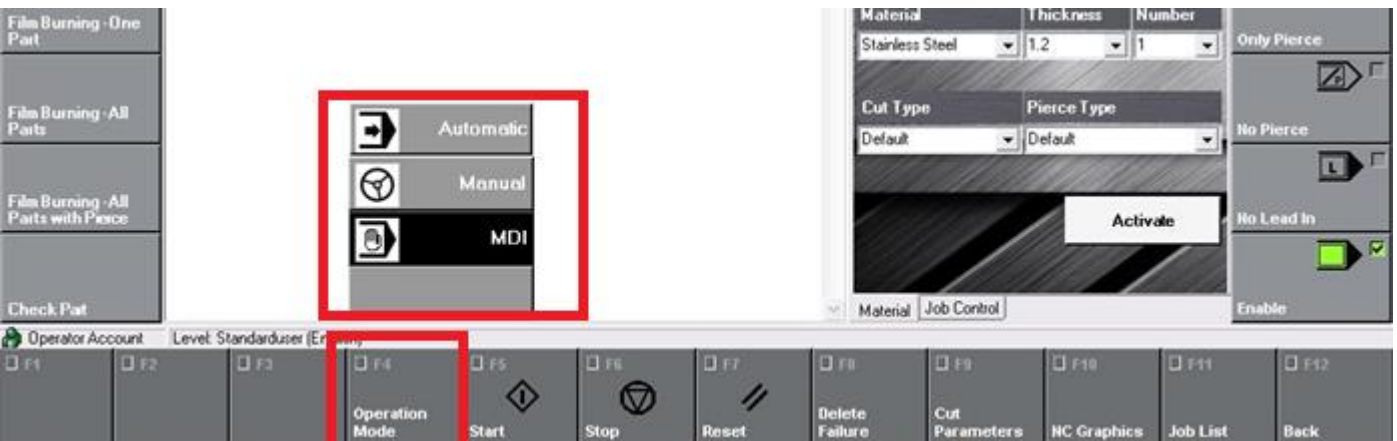
Click program button and choose (find) the program that machine will cut
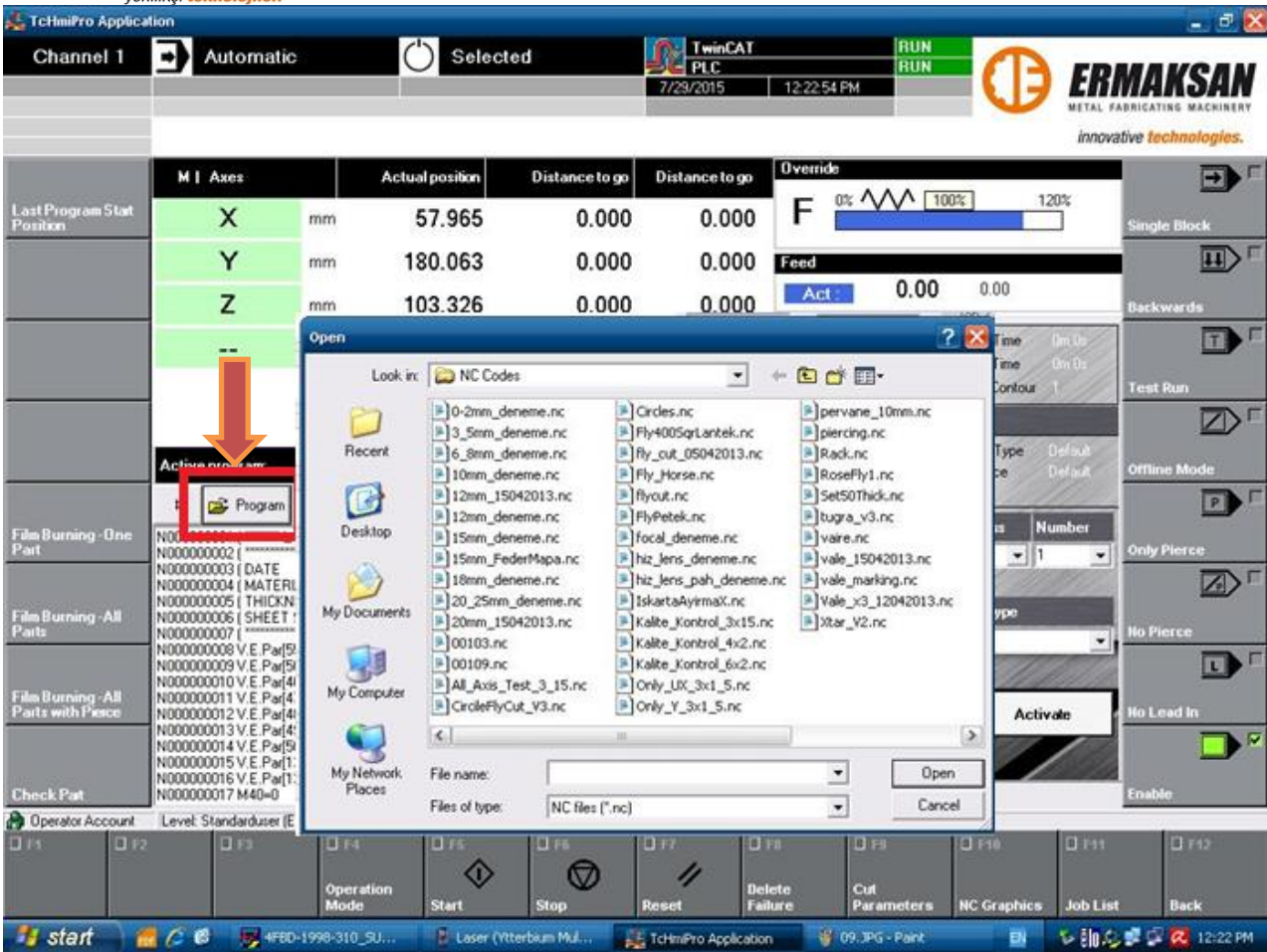
10. **OPTIONS WHILE CUTTING**: check part, test run, only pierce, starting after reset

when cutting continues , if you stop the machine , z axis and machine safety positions comes to screen , if there is a blue background color in the code, it means that you can start cutting without doing something
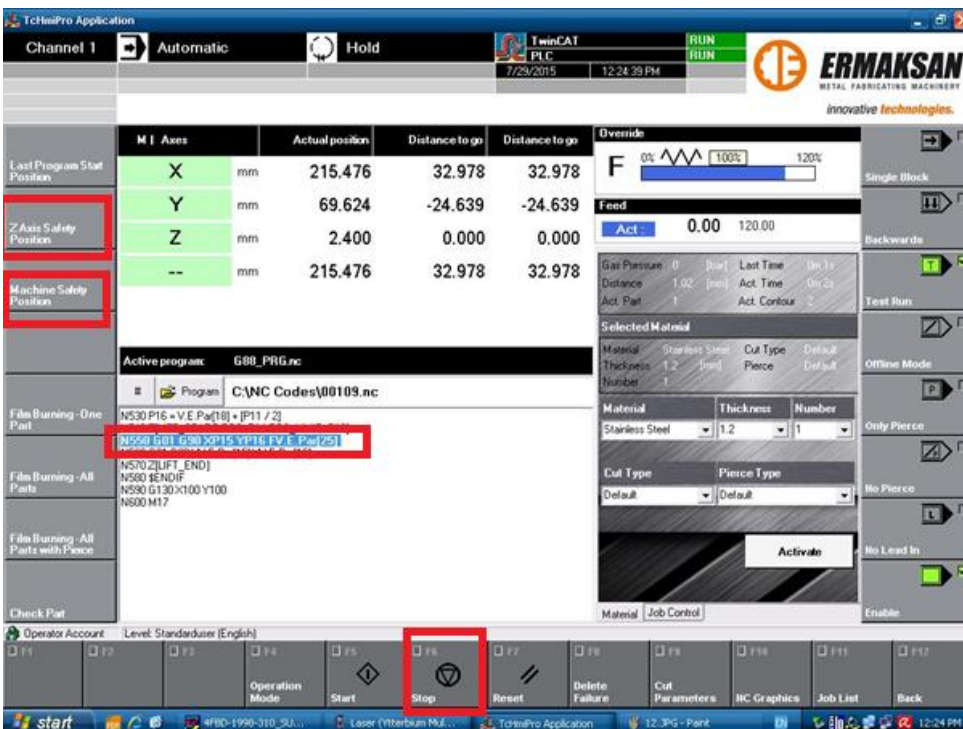
If an alarm comes while cutting machine stops. First click Delete Failure if the alarm have been erased you can continue cutting by pressing "start" button.

But if you pressed the reset, the machine loses program, so you have to arrange the start position and arrange the last part and contour that machine was cutting.

| | In top screenshot, you can continue the cutting program on the left picture. Because there is blue background color on a code line. Cutting start current position | In top screenshot, you can't continue the cutting program on the right picture. Because the code reset. Cutting starts from beginning. |

For arranging part and contour number, click job control and write the actual part and contour number to Start part no and start contour no, and **press start from this**, it is green when activated
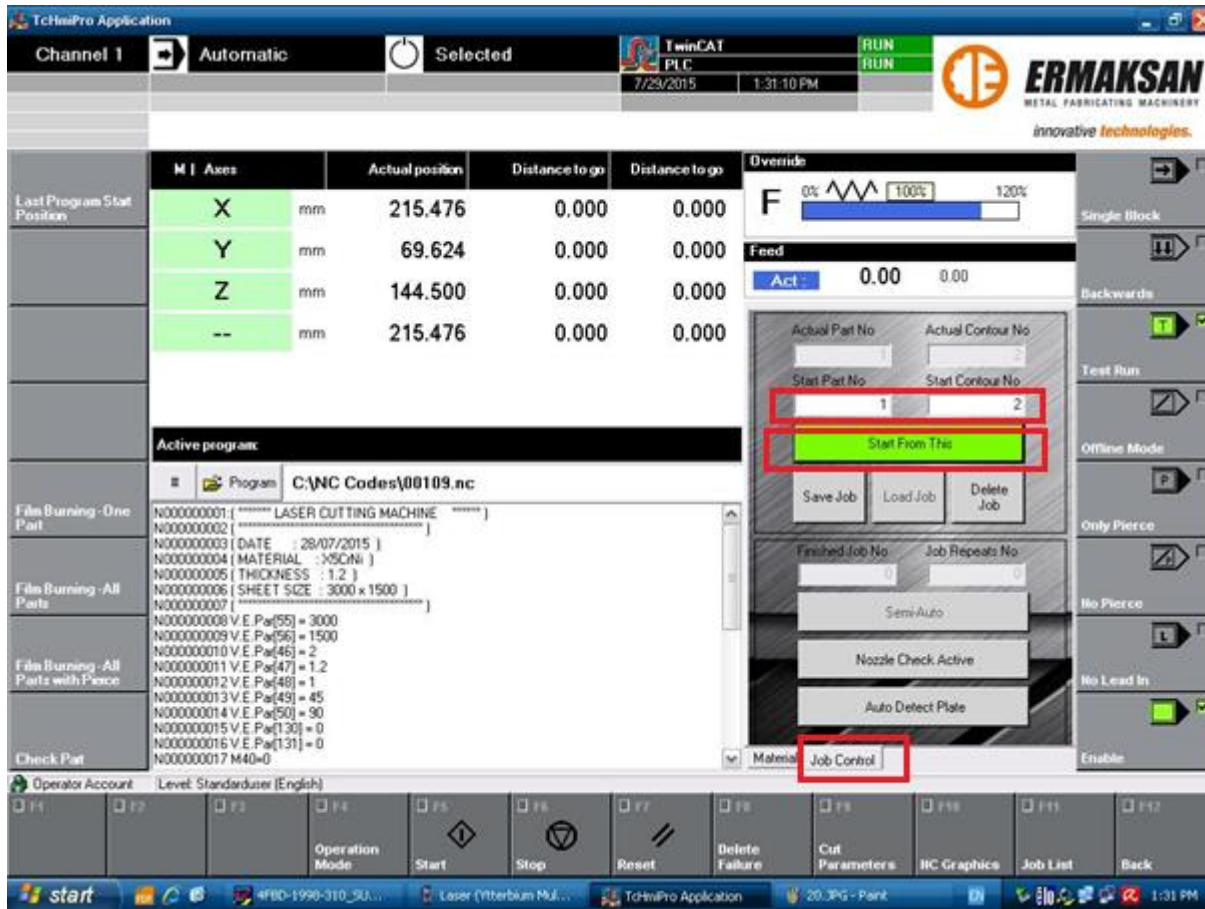
You can press "check part" to see cutting quality (Machine stops after cutting the part)
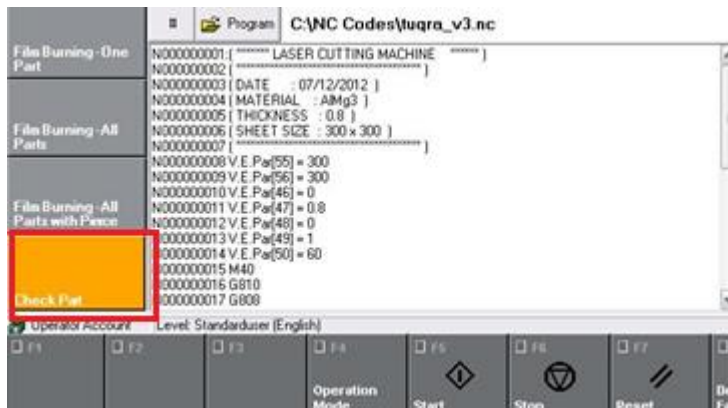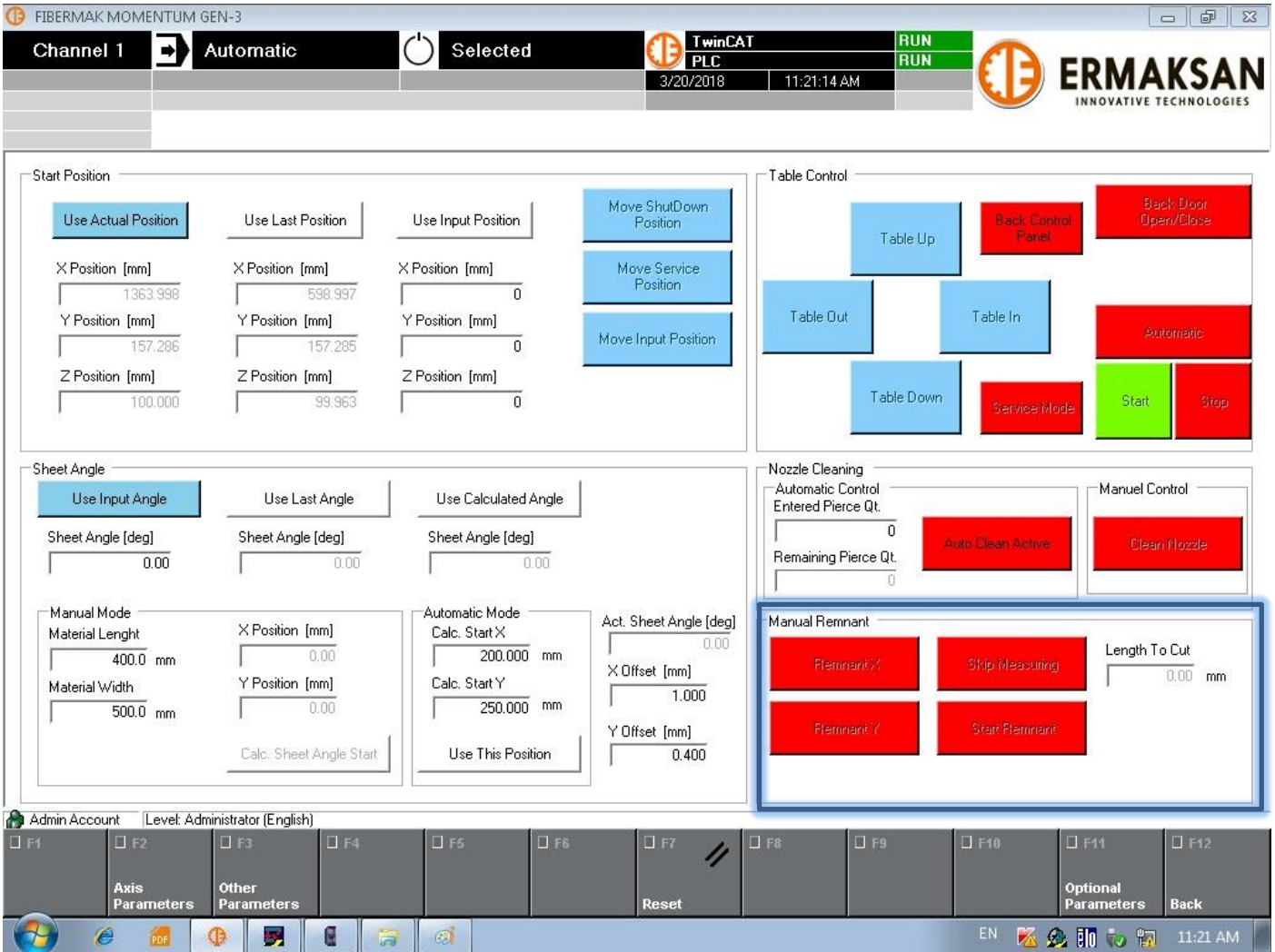
REMNANT CUT (SCRAP CUT)

Click cutting parameters.
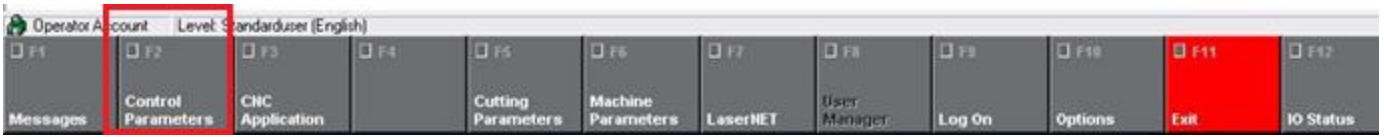
See manual remnant tab in below window.

Remnant X + Start remnant: Just as this key combination is used, this cutting head carries out the remnant process by measuring the sheet at the x coordinate when the cutting head is manually brought about to a place where we have a desire to make remnant.

Remnant Y + Start Remnant: Just as this key combination is used, this cutting head carries out the remnant process by measuring the sheet at the x coordinate when the cutting head is manually brought about to a place where we have a desire to make remnant.

Remnant X + No Remnant before measurement + Start remnant: In this key combination, remnant process is all-out manual. By turning up on the parts to be cut, the desired length to be cut is written at the cutting length part in terms of mm and start-remnant-key is clicked and then the machine is able to make the cut along the desired length at the x axis. Whereas the + value is written at the cutting part, it makes the cut in the direction of +X, the same way – value is written it makes the cut in the direction of – X.

Remnant Y + No Remnant before measurement + Start remnant: By turning up on the parts to be cut, the desired length to be cut is written at the cutting length part in terms of mm and start-

remnant-key is clicked and then the machine is able to make the cut along the desired length at the x axis. Whereas the + value is written at the cutting part, it makes the cut in the direction of +Y, the same way – value is written it makes the cut in the direction of – Y

WARNING: The length of the desired parts to be cut must be well-measured when the triple combinations are used and one must always take a good care for the cutting head or (else) the cutting head might have a risk to crash.

MATERIAL TAB

F =FEED: cutting or movement speed

FEEDRATE: percentage of cutting or movement speed

GAS PRESSURE : Cutting or piercing gas pressure

DISTANCE: Distance between nozzle and sheet

While Cutting, distance is 1, cutting distance depends on cutting parameter, while piercing, distance depends on piercing parameter.

LAST TIME: The last program time without interruption (reset)

ACTUAL TIME: The current program that the machine is cutting.

SELECTED MATERIAL: This is the parameter that machine is using while cutting. Such as material, thickness, gas type, cut type, pierce type

MATERIAL: Stainless Steel, Aluminium, Steel, Brass, Copper, Galvanized

THICKNESS: Between 0-25 depends on material and cutting power

NUMBER: Means selection of gas type in general

CUT TYPE: Cut1, Cut2, Cut3, Flycut, Marking, Film Burning, No Cut

PIERCE TYPE : Pierce1, Pierce2, Pierce3, Pierce Burn

For CUT TYPE and PIERCE TYPE we generally use default, default means we use lantek code for types.

ACTIVATE: After selecting material, thickness, number, click activate button to enable the cutting parameter that you chose.

SAVE AND LOAD JOB

Save job and load job are used for recording the beginning position of the program, last cut part and contour, and used angle.

Save job and load job can be used for the situations below

- When you have to turn of the machine
- While you are cutting a material , if you need to stop the machine , and start cutting another material
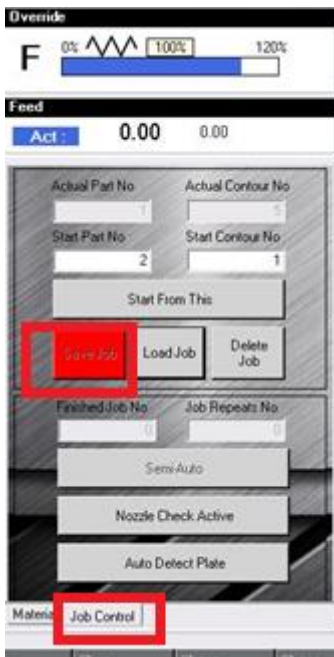
When you want to stop the machine with save job
Click job control and click save job.
The machine will stop at the end of contour.
You can continue other cutting programs now. But do not move the sheet that you saved or you can't continue later.

- Before loading the job, every condition should be correct

Conditions: Gas, nozzle, sheet (sheet place on the table),cutting program, cutting parameter

After these conditions are true, you can load job.

After clicking load job , the machine loads and activates
"last program start", "sheet angle", "start part no", "start contour no" and activates "start from this option shown above.
After loading the job, the data is been erased. So be careful not to make any mistake after saving job

CREATING NEW PARAMETER
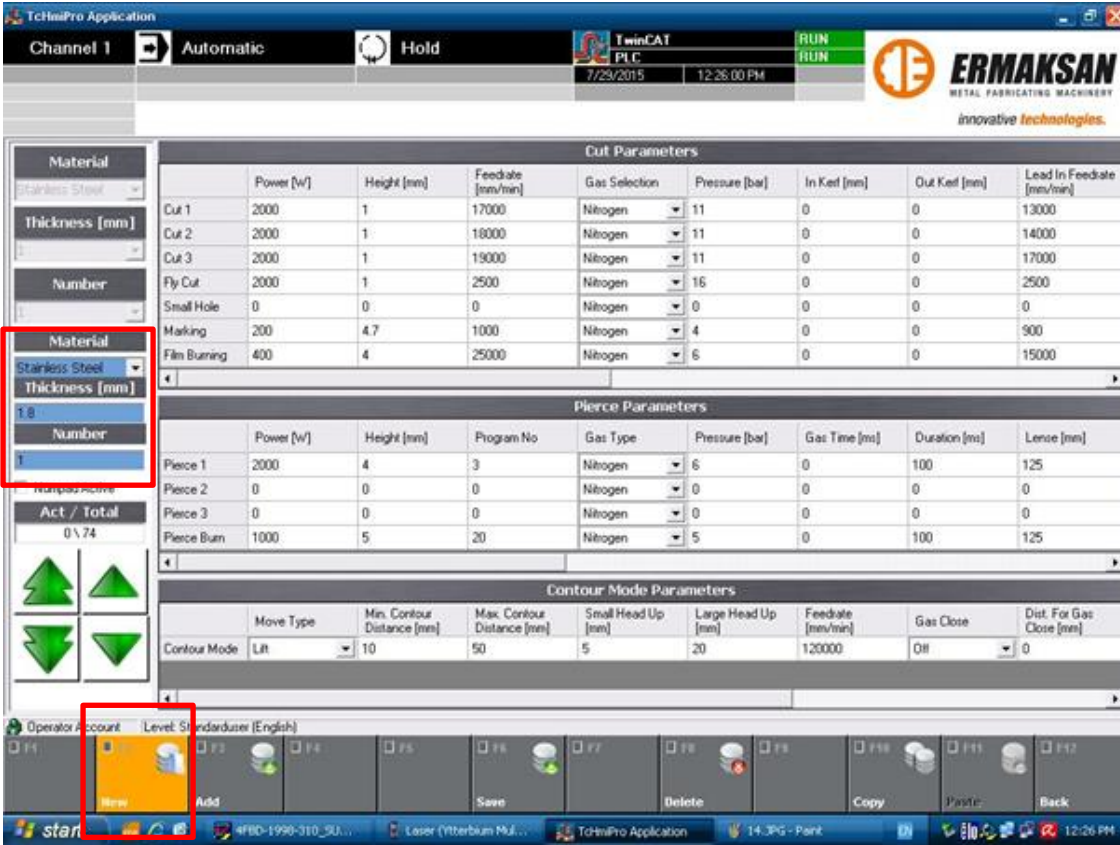
In cutting parameters click "**new**". background color of material list on the left, will become blue.

Select the material type from the list by clicking arrow button. write the thickness with keyboard

Write the number (gas type) with keyboard (0 oxygen,1 nitrogen,2 compresses air)

When you click "**add**" , new material window appears on the screen.
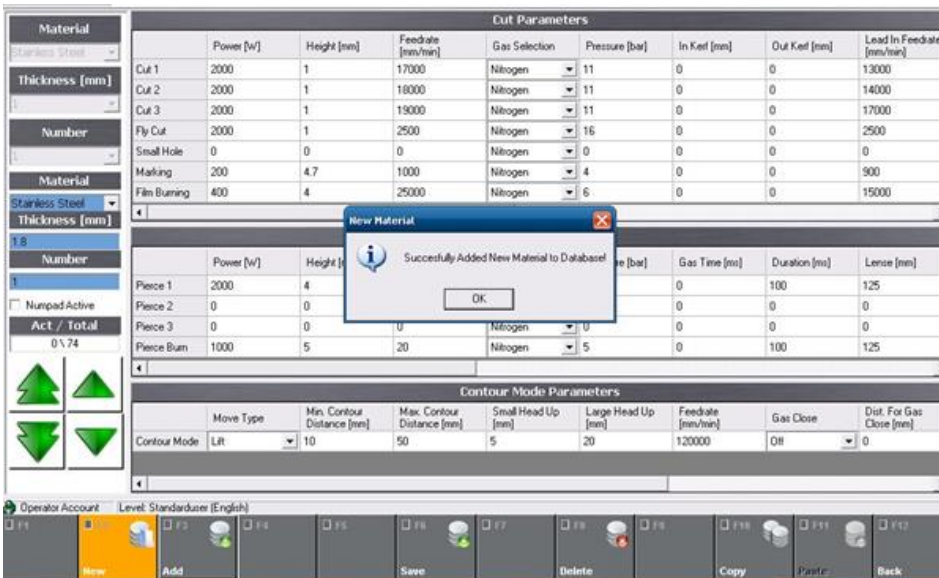
The new parameters are all empty (0, all values zero)

So you have to copy the nearest parameter to the new parameter.

For example ,the best parameter for 1,8mm stainless steel with nitrogen is 2mm stainless steel parameter with nitrogen .this means that you must choose the best one that will fit.

Select and save the parameter that you want to copy (2mm stainless steel)

And then click copy

Select the new parameter (1,8mm stainless steel)
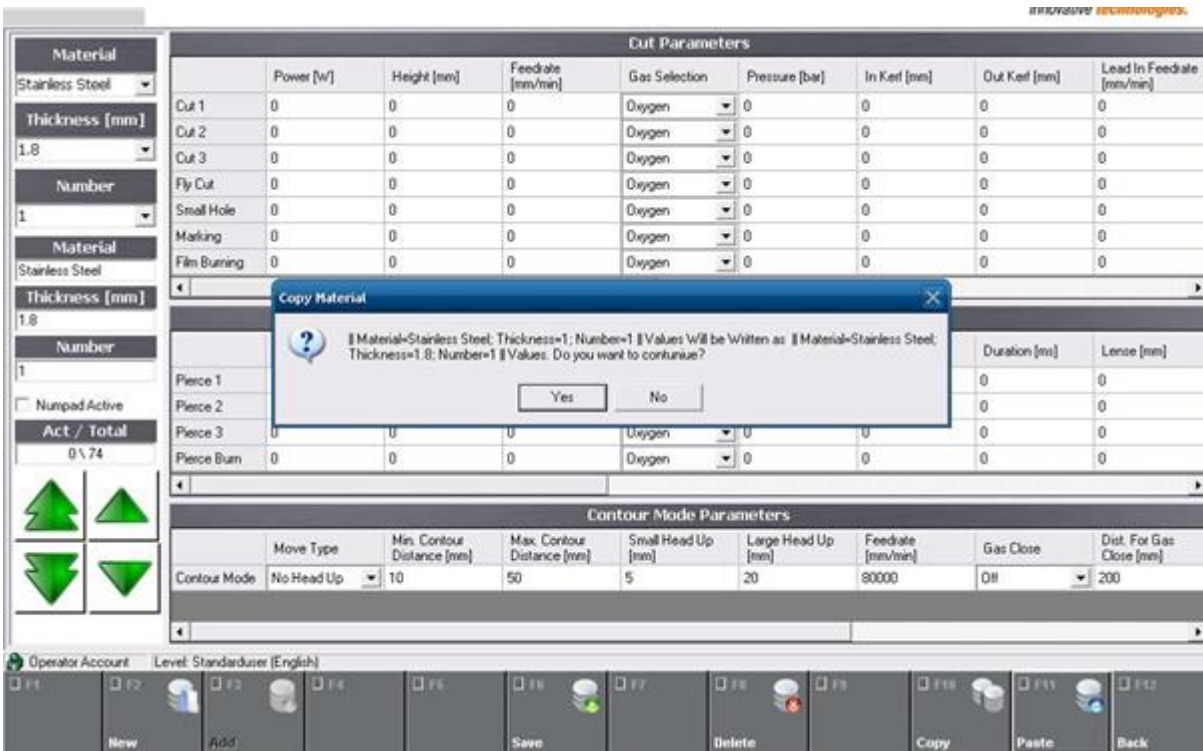
Click paste copy material window will appear. Click yes. And then save the parameter.

Then you can change feedrate, focal, pressure, power and acceleration if you need to do.

Again note that 2mm and 1.8mm are just examples. It can be any different thickness.

The important issue here is choosing the closest and correct parameter to copy.

JOB LIST

Job lists main purpose is to cut multiple sheets with one cutting code. If you need to cut multiple jobs, you can select the program once and continue cutting.

Click job list in cnc application.
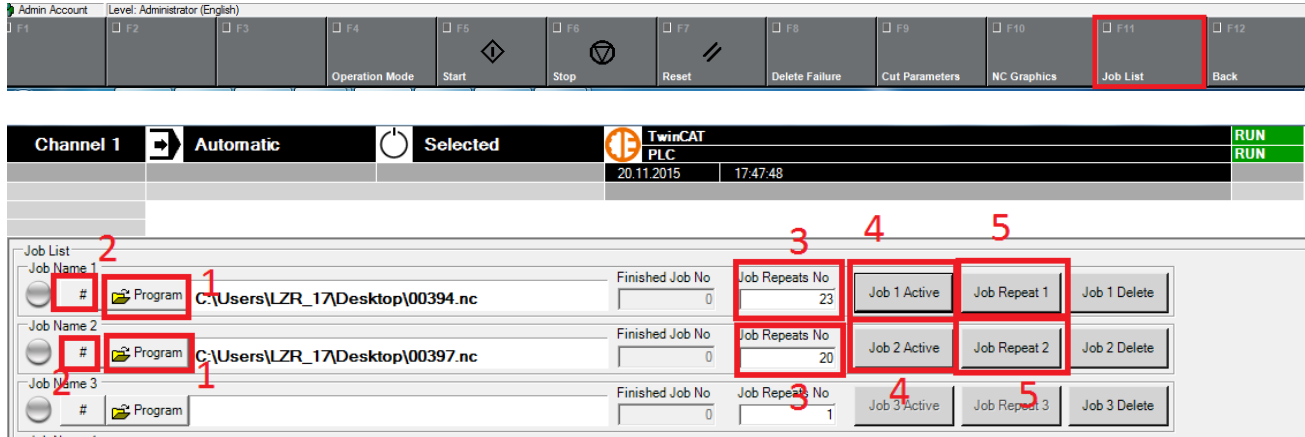
Click program button [1] , select the program that you will cut

Click job 1 active [4] , write repeat no [3] and activate job repeat 1 [5]

For job list lantek code (material,thickness,gas type) must be correct.

Because when you press start after arranging everything, the machine will automaticly activate cutting parameters for material thickness and gas type in lantek code.

If you make a code for steel 6mm , and you put 2mm stainless steel, the machine will activate the code for steel. So you can not cut stainless and damage machine optics.

If there is not a parameter for code, the machine will give error below.
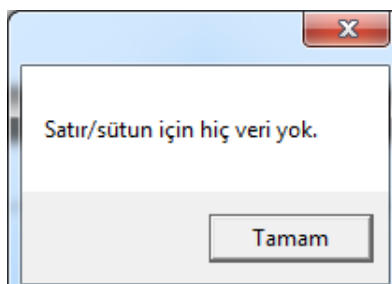
. In english "no data for raw /column "

With every program you finish job repeats no will decrease, when it is zero it will continue with next program.

Unless you deactivate job list, resetting the machine won't change the counter. And whatever program you choose on cnc application, machine will start /continue with job list.

JOB REPORT

Click CNC Application

Click job list

Click job report in job list

Click start report, after that start cutting, while cutting you will see the report. When you finish click generate report, report will be on desktop as workreport.pdf

ALARM AND WARNING MESSAGES

Click messages

You can see active messages.

Click view logged
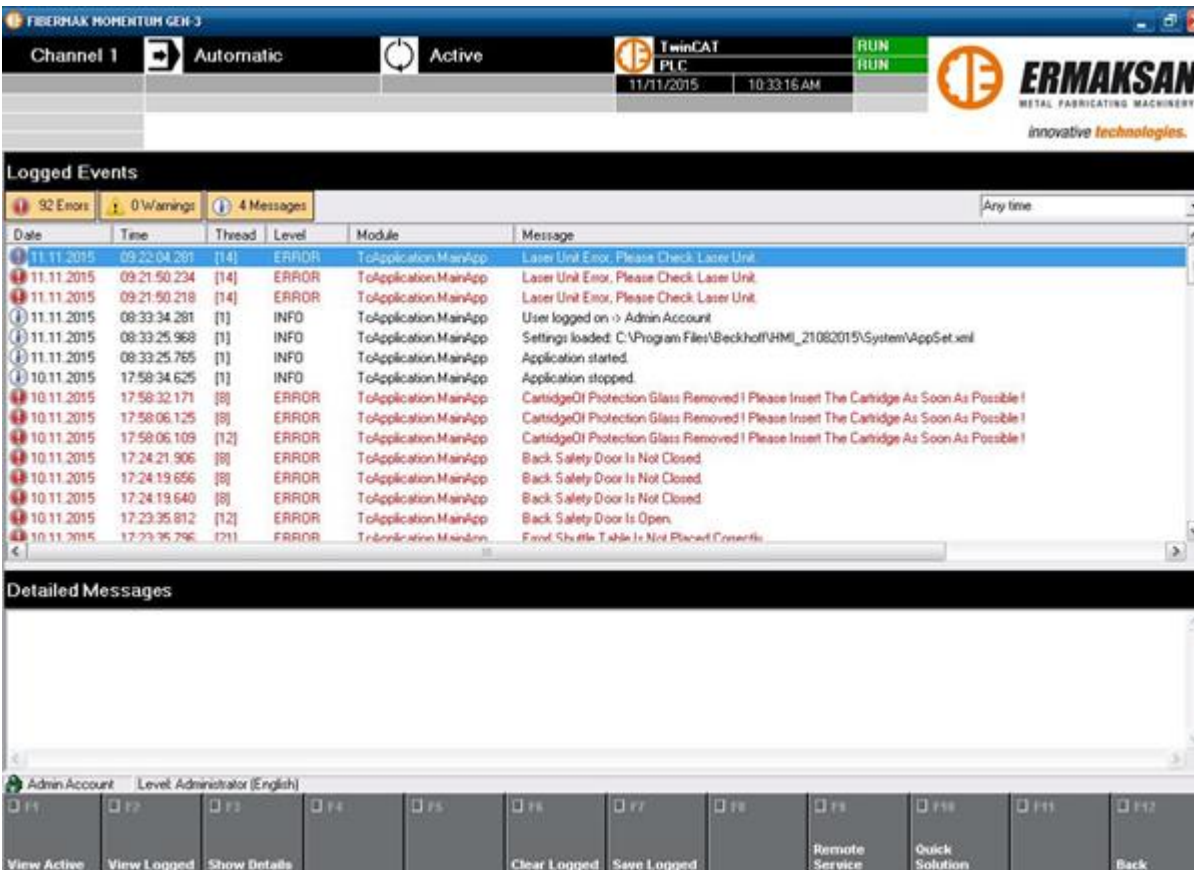
LASERNET

Main window of LaserNET

Chiller tab shows the chiller status

Events : alarms warnings and cutting process
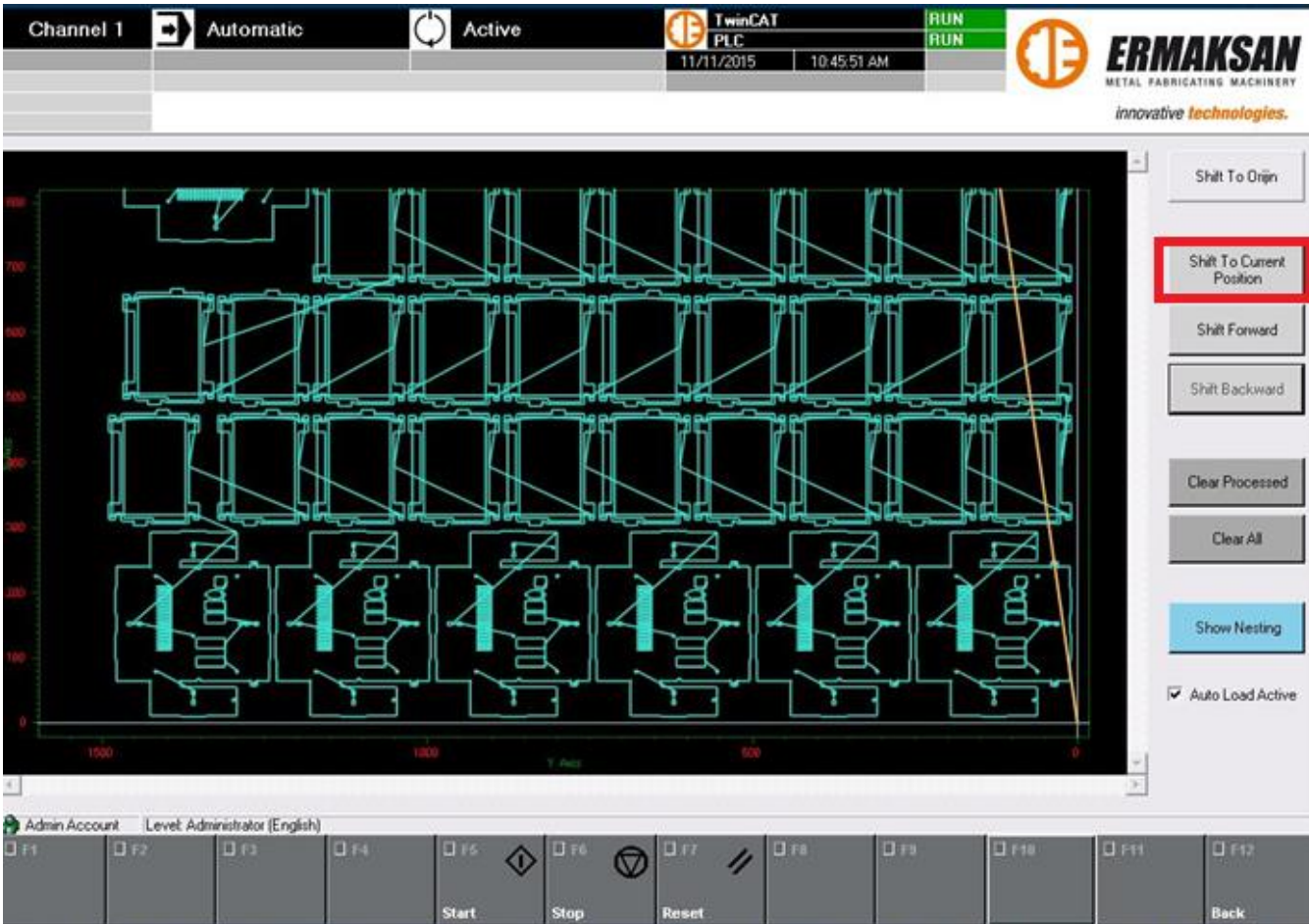

Modules tab

NC GRAPHICS

When you want to see the nesting, click NC graphics

You can see nesting, there are options on right side of the page.

You can click "shift to current position"
You can click "shift forward" or "shift backward" to see the whole nesting.

CUTTING THICK MATERIAL

First of all you can cut thick material with normal piercing and cutting process.

But if you want you can use small nozzle for piercing all the sheet first and big nozzle for cutting after piercing all sheet

- When we cut 10mm ,we use 1.2 d nozzle for piercing, 3.0 d nozzle for cutting
- When we cut 12mm ,we use 1.2 d or 1.5 d nozzle for piercing, 3.0 d nozzle for cutting
- When we cut 15mm ,we use 1.2 d or 1.5 d nozzle for piercing, 3.0 d nozzle for cutting

Before starting, activate **only pierce** option, plug the nozzle written on the cutting parameters.
After starting program, the machine will only pierce the piercing points,

     If you stop the machine, you can start the machine without reset

     If you reset the machine while doing piercing, you should click **last program start position** , and write **start position** and **start contour** in **job control** menu
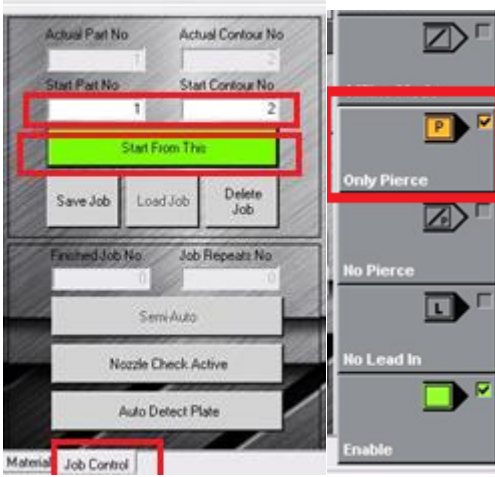
 in this case only pierce should be active (orange color)

- After finishing all piercings machine comes to **service position** and ask for changing the nozzle, in this case look at the **cutting parameters** and check for the cutting nozzle. Plug the cutting nozzle. Generally cutting nozzle is 3.0 d
- When you press **start** after changing the nozzle, the machine starts cutting the contours (**only pierce** option still active).
- While cutting continues if you **reset** the machine for any reason, you should first click **last program start position** , and write **start position** and **start contour** in **job control** menu. And after this you have to deactivate **only pierce** option, and activate **no pierce** option

- when no pierce is activated the color of icon is red

Test run, backwards, only pierce, no pierce , no lead in options can only be activated in **automatic** operation mode .
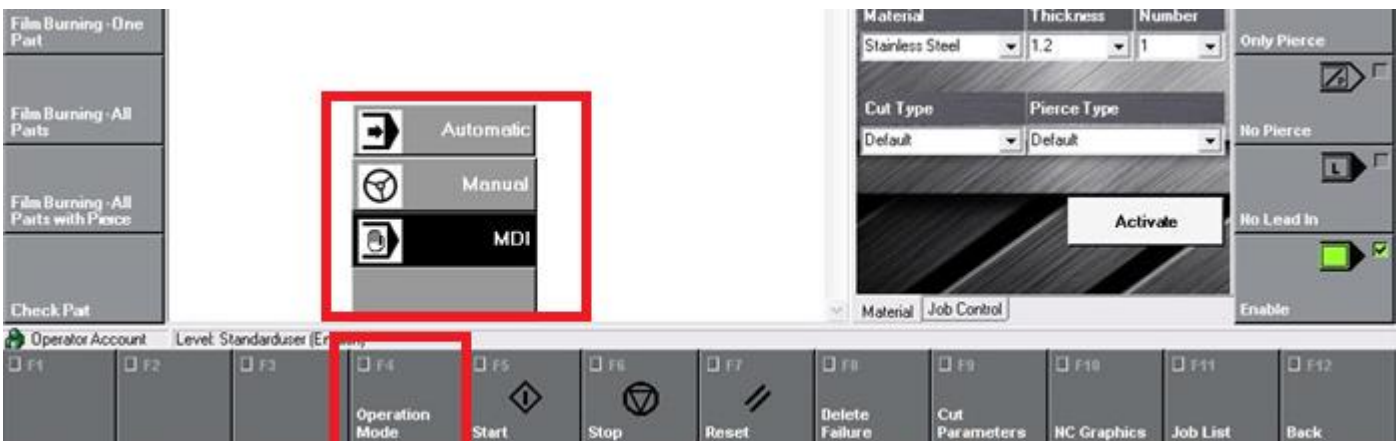

In **manual** mode all of them can be deactivated, but can not be activated.

In nitrogen cutting we don't change the nozzle for thick material

PROCUTTER

Procutter has four lights for displaying sensors and alarms. Lights has green, yellow, orange and red color. Green = Condition is good . Yellow = ok. Orange = value is a bit high. Red = alarm.
Blinking red= Missing component or malfunction
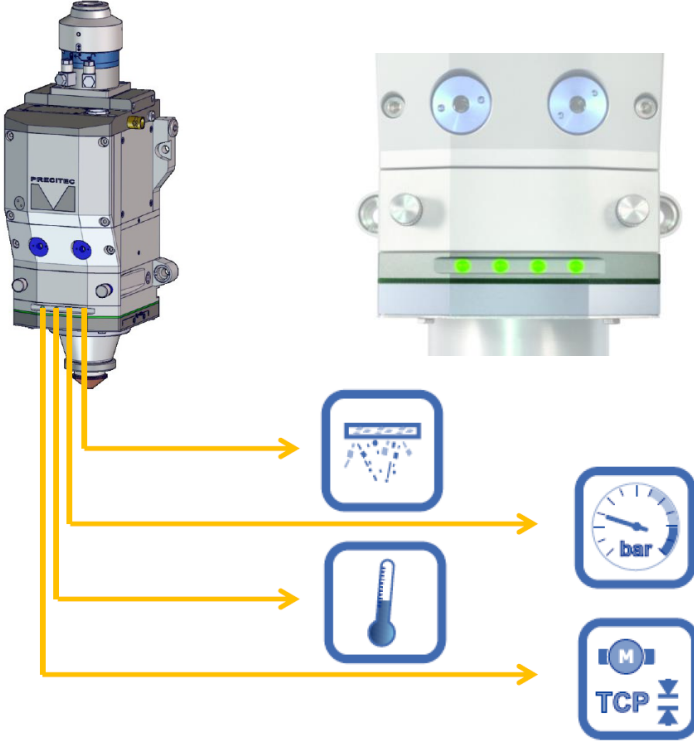
Starting from left

1st light= Focal monitoring : when cartridge is moving to target focal position, led is off, when it reaches target focal position, led is green
2nd light=Temperature monitoring: the light changes from green to yellow, orange and red depending on temperature of colimation lens, cutting lens and cutting head
3rd light= Gas monitoring : the light changes from green to yellow, orange and red depending on pressure inside cutting head
4th light=Bottom protection glas monitoring : the light changes from green to yellow, orange and red depending on temperature of bottom protection glass

REMOTE CONTROL PROGRAMS

We are using these programs for controlling the computer via internet connection. We generally connect to laser computer and lantek computer.

1. Ammyy
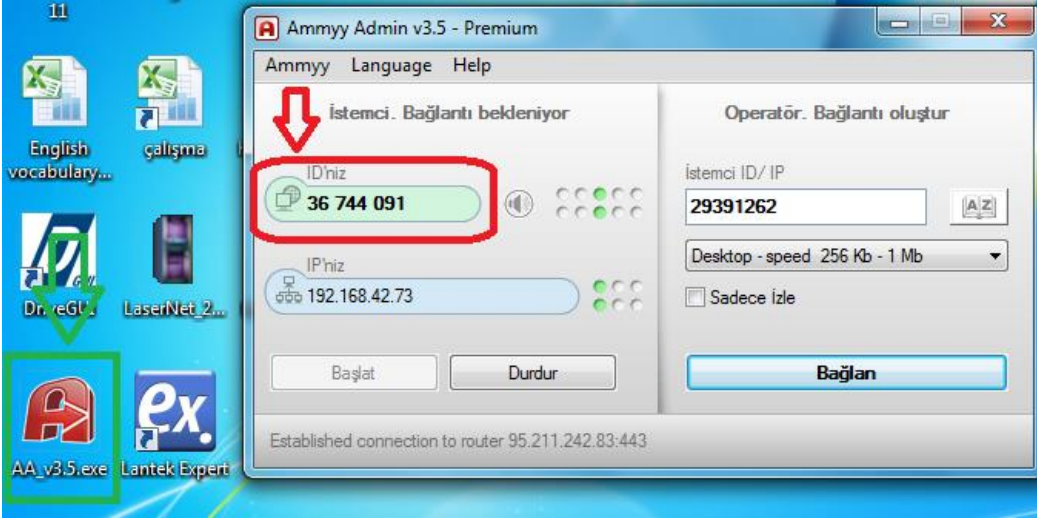
Run ammyy program shown above picture.

The id of the computer is shown with arrow. For this computer it is 36 744 091for every computer it is different. You will send us your ammyy id and we will connect. When we connect you must accept the connection request. There is no password for ammyy connection.
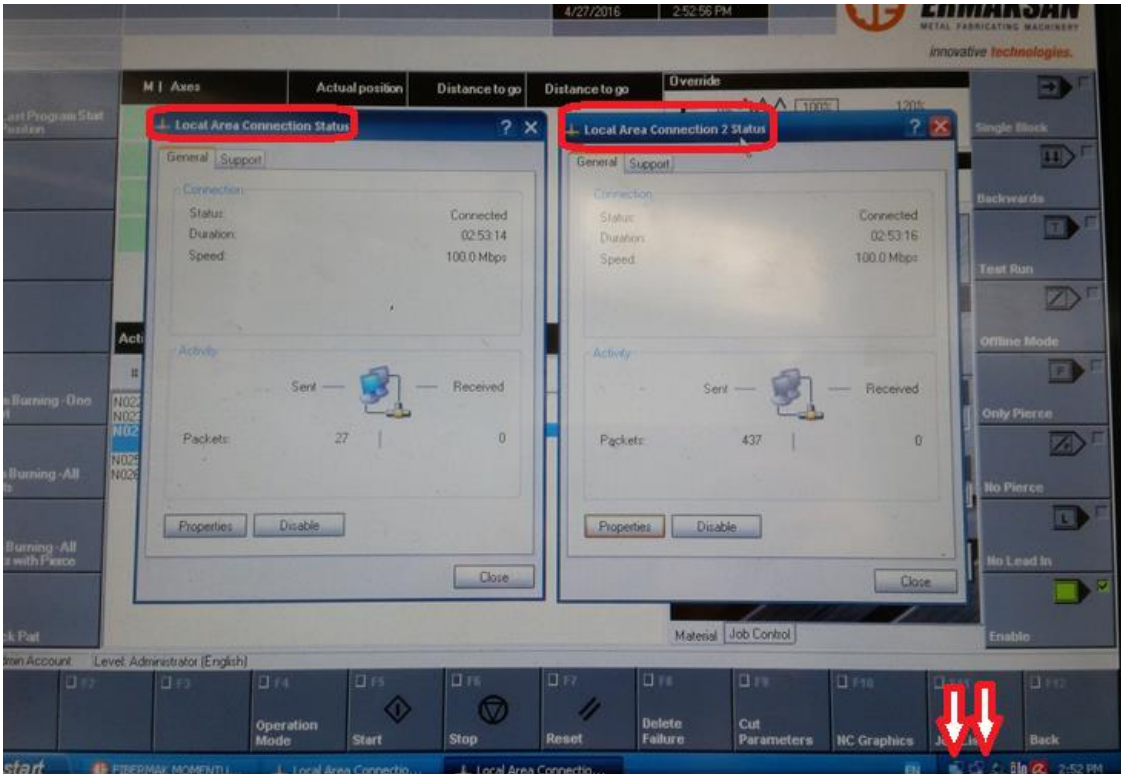
2. Teamviewer

When we need, we use teamviewer also. Run teamviewer, send us your id and password
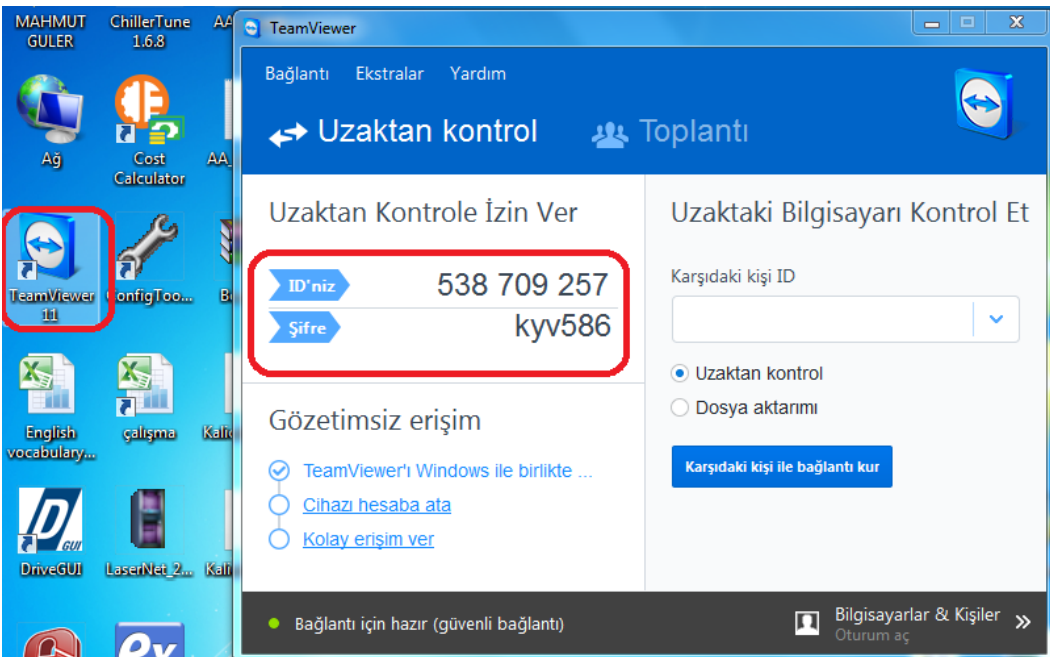
NETWORK CONNECTIONS

We are using two LAN connections, don't change any configuration of these LAN

192.168.0.1 ip address is communicating control program, motors and utilities

192.168.100.10 ip address is communicating control panel, switch and resonator (lasernet)

MAHMUT GÜLER

LASER TECHNICAL SERVICE ENGINEER