ERMAKSAN
SAC İŞLEME MAKİNELERİ
yenilikçi teknolojiler.

FIBERMAK
MOMENTUM SERIES

MACHINE USER MANUAL



EFB SERIES

19.08.2019

Ver 3.0

www.ermaksan.com.tr

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Tel: +90 (224) 294 75 00 / Faks : +90 (224) 294 75 49

CONTENTS

1. INTRODUCTION 1

2. WARNING 2

3. THE WORKING PRINCIPLE OF THE LASER 2

4. SAFETY INSTRUCTIONS AND PRECAUTIONS 3

4.1. The Safe Usage Of The Machine 3
4.2. Operating Safety 3
4.3. Modifications Of The Machine 3
4.4. Protective Clothings 3
4.5. Warning Lamps and Lights 3
4.6. The Emergency Stop Procedures Of The Machine 4
4.7. The Usage Of The Non Original Parts 4
4.8. The Machine On-Off Procedures 4
4.9. The Machine Volume Levels 4
4.10. Overviews The Dangerous Situations 5
4.11. Environmental Conditions In The Machine's Operating Area 5
4.12. Dangerous Situations and Precautions 6
4.13. The Label Locations On The Machine, The Extraction Unit and The Loading-Unloading Unit 7
4.14. Safety Labels On The Machine 10
4.15. Safety Labels On The Extraction Unit 13
4.16. Safety Labels On The Loading-Unloading Unit 14

5. TRANSPORTING OF THE MACHINE 15

5.1. Transporting Of The Main Body 15
5.2. Transporting Of The Loading-Unloading Unit 16
5.3. Transporting Of The Laser Source 16
5.4. Transporting Of The Chiller Unit 17
5.5. Transporting Of The Extraction Unit 17
5.6. Transporting Of The Electricity Panel 18
5.7. Transporting Of Conveyor 18
5.8. Transporting Of The Body Platform 19
5.9. Transporting Of The Material Box 19

6. FIBERMAK MOMENTUM SERIES WITH BROAD STROKES 20

6.1. Main Body 21
6.2. The Cooling Unit (Chiller) 21
6.3. The Laser Source (Resonator) 22
6.4. The Extraction Unit 23
6.5. The Loading-Unloading Unit 24
6.6. Operator Control Panel 25
6.7. Conveyor 26
6.8. Machine Turn-On Procedure 27
6.9. Machine Turn-Off Procedure 30

7. CUTTING HEAD 31

8. HMI (HUMAN TO MACHİNE INTERFACE) 32

8.1. Messages 33

9. QUICK CONTROL BUTTONS 34

10. MAIN USER CONTROL PAGE 36

10.1. Machine Position Information 37
10.2. Machine Control 37

10.3. MANUEL MACHİNE CONTROL 37
10.4. AUTOMATIC MACHINE CONTROL 39
10.5. CUTİNG PARAMETERS 40
10.6. PİERCİNG PARAMETERS 42
10.7. LEAD-IN PARAMETERS 43
10.8. 3 POİNT PİERCİNG PARAMETERS 43
10.9. EDGE PARAMETERS: 44
10.6. CONTOUR MODE 45
10.7. CREATING A NEW MATERIAL PAGE WHICH DOES NOT EXIST IN DATABASE 47

11. NC GRAPHICS 48

12. M1 MENU 49

12.1. SHUTTLE TABLE CONTROL 50
12.2. FOCUS CONTROL 51
12.3. GAS CONTROL 52
12.4. LASER CONTROL UNİT 53

13. M2 MENU 54

13.1. USAGE OF THE STARTİNG POSİTİONS 55
13.2. USAGE OF THE SHEET ANGLE 56
13.3. HSU CALİBRATİON 57
13.4. DEVİCES CONTROL 57
13.5. MANUAL REMNANT 58
13.6. MAİNTANENCE PART 59
13.7. LCM CONTROL 59

14. M3 MENU 60

14.1. PROCUTTER SENSORS 61
14.2. AUTOMATİC CONTROL 61
14.3. MİSCELLANEOUS FUNCTİONS 62

15. CAMERA 62

16. JOB LIST 63

17. JOB CONTROL 64

18. WHAT IS THE LASER BEAM CENTERING AND HOW TO MAKE IT? 66

19. HSU CALİBRATİON 67

20. LANGUAGES 68

21. RESTARTING PLC AND SYSTEM MANAGER 69

22.1. PROFİLE CUTTİNG 70
22.2. PROFİLE OFFSET SYSTEM ZERO POİNT ADJUSTMENT 70
22.3. ACHİEVİNG PROFİLE OFFSET PROCESS 71
22.4. HOW TO DRAW PROFİLE OFFSET PROCESS İN LANTEK PROGRAMME 71
22.5. ACTİVATİNG THE PROFİLE CUTTİNG 73
22.6. PİPE CUTTİNG 73
22.7. PİPE – PROFİLE CUTTİNG DİFFERENCES 74

23. MAINTENANCE 77

23.1. MAİNTENANCE FOR CUTTİNG HEAD 79
23.2. CARE AND MAİNTENANCE OF PROTECTİVE WİNDOW CARTRİDGE 80
23.3. COLİMATİON LENS, FOCAL LENS AND UPPER PROTECTİVE WİNDOW 80
23.4. REPLACİNG THE PROTECTİVE WİNDOW 81
23.5. REPLACİNG THE AXİAL SCREW 82
23.6. MAINTAINING THE SENSOR INSERT 83

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

23.7. MAINTENANCE OF BEAM FORMING OPTICS (AUTHORIZED EDUCATED PROFESSIONALS ONLY) 84
23.8. CHILLER UNIT MAINTENANCE AND CLEANING INSTRUCTIONS OF CHILLER 84
23.9. RELATED PART EXPLODED VIEW 86

FIGURES

Figure 1 - Laser 2
Figure 2 - Representation Of The Label Locations 7
Figure 3 - Representation Of The Label Locations On The Top View 8
Figure 4 - Representation Of The Label Locations On The Cutting Head 8
Figure 5 - Representation Of The Label Locations On The Loading-Unloading System 9
Figure 6 - Transporting Format Of The Machines Main Body 15
Figure 7 - Transporting Format Of The Loading-Unloading Unit 16
Figure 8 - Transporting Type Of The Laser Source 16
Figure 9 - Transporting Format Of The Chiller Unit 17
Figure 10 - Transporting Type Of The Extraction Unit 17
Figure 11 - Transporting Format Of The Electricty Panel 18
Figure 12 - Transporting Format Of The Conveyor 18
Figure 13 - Transporting Format Of The Body Platform 19
Figure 14 - Transporting Format Of The Material Box 19
Figure 15 - The Machines Main Body and Components 20
Figure 16 - The Main Body 21
Figure 17 - Chiller Unit 21
Figure 18 - Temperature Control Scheme 21
Figure 19 - The Front Block Of The Resonator 22
Figure 20 - The Back Block Of The Resonator 22
Figure 21 - The Extraction Unit 23
Figure 22 - The Loading-Unloading Unit 24
Figure 23 - The Back Control Panel Of The Loading-Unloading Unit 24
Figure 24 - The Operator Control Panel 25
Figure 25 - Quick Control Panel 25
Figure 26 - Conveyor 26
Figure 27 - The Main Switch Of The Electricity Panel 27
Figure 28 - The Main Switch Of The Chiller Unit 27
Figure 29 - The Main Switch Of The Laser Source 28
Figure 30 - The Main Switch Of The Extraction Unit 28
Figure 31 - The Test Button Of The Loading-Unloading Unit 29
Figure 32 - The Shortcut Of The Interface Program 29
Figure 33 - Turn Off Button Of The Operating System 30
Figure 34 - Cutting Head 31
Figure 35 - HMI Opening Interface 32
Figure 36 - Read Warning Section Of PLC and TwinCAT 32
Figure 37 - CNC Error of the Machine 32
Figure 38 - Messages Screen 33
Figure 39 – Messages Details Screen 33
Figure 40 – Quick Control Buttons 34
Figure 41 - Main User Control Page 36
Figure 42 – Machine Position Information 37
Figure 43 - Manuel Machine Control 37
Figure 44 – Quick Control Panel 38
Figure 45 - Automatic Machine Control 39
Figure 46 – Cutting Parameters 40
Figure 47 - Ramp Statement 42
Figure 48 - Cutting Head Motion Selection 45
Figure 49 – New Parameter Button 47

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

Figure 50 - New Parameters Page 47
Figure 51 - Copy Paste Buttons 47
Figure 52 - Save Delete Buttons 47
Figure 53 - NC Grafics Unit 48
Figure 54 – M1 Menu 49
Figure 55 – Shuttle Table Control 50
Figure 56 – Focus Control 51
Figure 57 - The Theoretical Focus 51
Figure 58 - HMI Gas Control 52
Figure 59 – Pressure Sensor Output 52
Figure 60 - HMI Laser Control Unit 53
Figure 61 – M2 Menu 54
Figure 62 - HMI Starting Position Controller 55
Figure 63 – Sheet Angle Calculation 56
Figure 64 – HSU Calibration 57
Figure 65 - HMI Devices Control 57
Figure 66 - HMI Remnant 58
Figure 67 – Maintenence Part Buttons 59
Figure 68 – LCM Control Buttons 59
Figure 69 – M3 Menu 60
Figure 70 – Procutter Sensor Outputs 61
Figure 71 – Automatic System Control 61
Figure 72 – User Records & Maintenence Schedule 62
Figure 73 – Camera Button 62
Figure 74 - Job List 63
Figure 75 – Job Control 64
Figure 76 - Job Control 65
Figure 77 – Focus Control 66
Figure 78 - Laser Beam Centering 67
Figure 79 - Language Selection 68
Figure 80 - TwinCAT Symbol 69
Figure 81 - TwinCAT Reboot 69
Figure 82 - Profile Cutting 70
Figure 83 - Profile Sliding System 70
Figure 84 - Profile Fixing 71
Figure 85 - Profile cut-off active And Pneumatic Locking 71
Figure 86 - Lantek Sheet Edge Adjustment 72
Figure 87 - Lantek Location Drawing 72
Figure 88 - Drawing Gaps For Profile 73
Figure 89 - Profile Cutting and Fixing Offset 73
Figure 90 - Pipe Cutting 74
Figure 91 - Pipe Lay-Out on the Shuttle 75
Figure 92 - ERCut7 76
Figure 93 - Pipe and Profile Cutting 76
Figure 94 - Profile Cutting Angel Adjust Screen 77
Figure 95 - Lubricant Hoses Unit 78
Figure 96 - Ceramic Part and Nozzle 79
Figure 97 – Protection Glass Holder 80
Figure 98 - Protective Glass 81
Figure 99 - Axial Screw 82
Figure 100 - Cutting Head Sensor Region 83
Figure 101 – Conveyor Exploded View 86

Figure 102 - Hydrolic Tank Exploded View 87

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

1. INTRODUCTION

To accomplish the duties listed at this user manual, It is very important for the machine working functionally. ERMAKSAN FIBERMAK machine user manual is prepared so as to teach customers how to operate the machine, use the operator panel, the way of maintenance procedures, and the other fundamental necessities for the customers who bought FIBERMAK laser cutting machine. Please, contact +90 (224) 294 75 00 or send an e-mail to laserservice@ermaksan.com.tr to be knowledgabe in detail about the itemizations stated at the user manual, and if there is any other questions you desire to conduct. The topics related to information of safety and measures are included in this user manual and must be obeyed the instructions. Everything pertaining to the maintenance and utilisation are presented in this guide. Apart from what it has been told here if you do something different, Ermaksan is not responsible for this. In relation to the additional time, cover charge will be invoiced to our company for every day and every staff/day. Some or all of the itemizations stated in the guide might be altered or removed without giving a heads up. This user manual is prepared for FIBERMAK laser cutting machine which is produced in standard conditions. Private demands and additional features added to the machine are not included in the guide. In this case, what you get from the technical service staff as an information and machine equipment will be vaild.

This manual's original language is Turkish.

On behalf of ERMAKSAN, we wish you a prosperous business with the machine that you have.

ERMAKSAN A.Ş.

2. WARNING

This document is intended to facilitate use of the machine, to remind the user of functions and to shorten the education period. It is important to read comprehensively and carefully before starting to use the machine ***FIBERMAK MOMENTUM SERIES****. The related machine must only be used by persons who have received safety and operator training.*

3. THE WORKING PRINCIPLE OF THE LASER

Laser that the word consists of the initials 'Light Amplification of Stimulated Emission of Radiation' means to emit the light through a process of optical amplification based on the stimulated emission of electromagnetic radiation.

Photons are the basis of the laser which occurs during electron transitions between the particles of different energy levels.

For example; there are two different energy levels of a particle, E1 and E2 and assuming that E1 > E2. According to minimum energy principle, the particles tend to keep themselves at minimum energy level. Based on this, E1 level particle decreases to E2 level via electron exchange. During this exchange there will be a 'photon release'. The direction of the released photon is uncertain if the electron exchange begins spontaneously. To have a direction known photon; E1 energy level particle to be decreased to E2 energy level having an interaction with a different photon in E1-E2 energy level. By this way, the photon will have the same phase and direction with the photon which interacted. This is the working principle of laser and named as'stimulated radiation'.

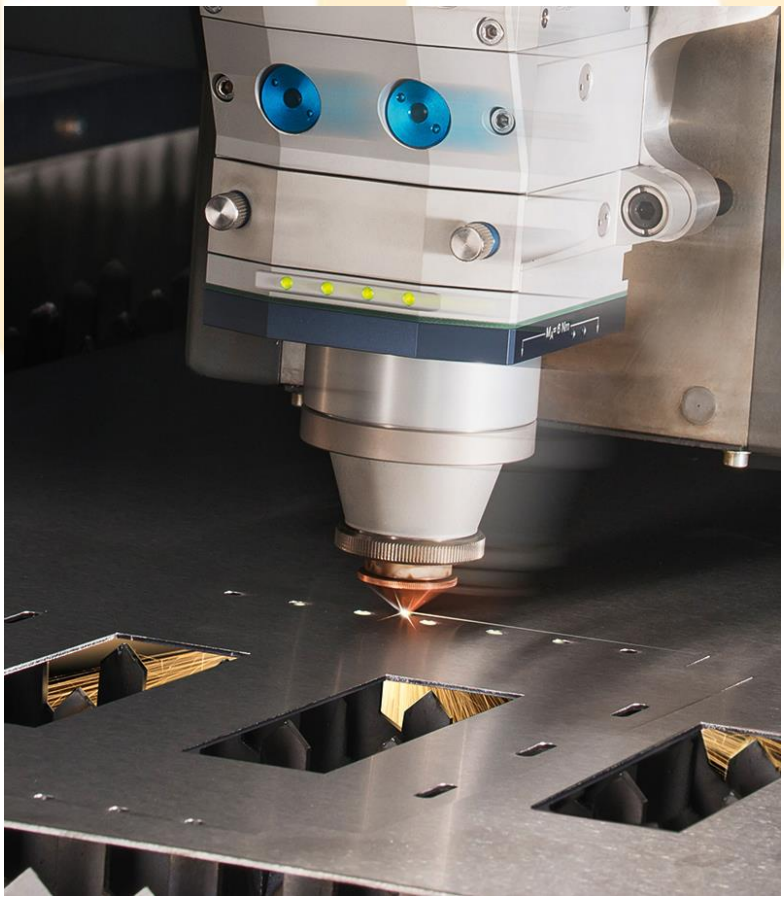


Figure 1 - Laser

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

4. SAFETY INSTRUCTIONS AND PRECAUTIONS

4.1. The Safe Usage Of The Machine

Machine information label (Label 11) shows the main technical features and the serial number for the machine. When you want to contact us about the machine, need to give this informations to enable a fast answer.

Information about the security of the machine and operation are described more fully in the subtitles.

4.2. Operating Safety

The machine is designed for safe operation. Nevertheless, it is dangerous that the machine is used by untrained staff in wrong operations. This;

- The dangers about the safety of operator
- The dangers about the machine and its equipments
- The dangers that cause the inefficient of machine

The machine must only be used by the operators who are trained about the machine and authorized by Ermaksan. Operators must have information about the user manual, safety warnings and the labels. The machine problems that become due to using by unauthorized staffs and using except of the machine, can be excluded from warranty coverage by Ermaksan.

It is also the operator's duty to ensure that only authorized persons are allowed to work on the machine.

Before starting the machine up, the operator must always assure himself that all persons are clear of danger area.

4.3. Modifications Of The Machine

Unauthorized changes or retrofitting of machine by owner or the operator are strictly prohibited. The manufacturer shall not be held liable for any injury to persons or material damage resulting therefrom. The owner or the operator is not permitted to dismantle or shut down any safety equipment. If set-up, maintenance or service work makes it necessary to dismantle or shut down such safety equipment, it is imperative that these safety devices be reassembled or reactivated immediately upon completion of such work.

4.4. Protective Clothings

The company owner must provide all of the protective clothes, gloves, glasses and equipments that these are necessary for safety of operators.

4.5. Warning Lamps and Lights

The warning lamp over the machine glows in three colors.
Green Color; If it glows in green color, it means that it is on the process.
Yellow Color; Machine stand by position.
Red Color; Machine is giving error and needs to be taken care of or (else) red color is not to dissapear.

4.6. The Emergency Stop Procedures Of The Machine

Manufacturer has taken all precautions to provide safety of the machine. There are 6 emergency stop buttons. If pressed any of these buttons 24 V at a fixed for control unıt and stopped cutting processings, movements of axes and the loading-unloading processings.

During the automatic mode, if one of the gates of the machine is turned on the system will stop working, cutting process and movement of axes as a safety precaution. However working in manual mode machine gates must be opened to be able to make working easier so for that reason in manual mode opening gates does not affect machine working.

Loading-unloading unit has Lauze Laser Light Curtain. This is used safety equipment to prevent accidents during the loading-unloading process. If anyone exceeds safety distance this system stops working of loading-unloading processing. After stopping if you want to continue working you have to press test button on the left side of loading unit. And also if any gates are opened or z axe has not enough height, loading-unloading process can't be started by the system.

The system takes power from electrical circuit which is connected to the main switch but the extraction unit, chiller and the resonator have their own switch. This systems can be switched on and off independent from main switch.

4.7. The Usage Of The Non Original Parts

Original parts and accessories have been designed especially for the machine. Replacements for these original parts and accessories other than those supplied by machine's manufacturer are not inspected and approved by the manufacturer. The incorporation and/or use of such products may, therefore, have an adverse effect on the function of the machine and diminish it safety.

4.8. The Machine On-Off Procedures

While the machine is opening, the following order must be observed

a) **The main switch of machine**
b) **The switch of chiller**
c) **The switch of resonator**
d) **The switch of extraction unit**

While the machine is closing, the following order must be observed.

a) **The switch of extraction unit**
b) **The switch of resonator**
c) **The switch of chiller**
d) **The main switch of machine**

4.9. The Machine Volume Levels

The maximum volume level during the machine works is 72,5 dB. The volume level can rise for instant when any trouble becomes. Operator should check on the machine according to noise level.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

4.10. Overviews The Dangerous Situations

The following overview is a summary of potential dangers that the machine may pose to life and health. The design and construction of machine, coupled with safety equipment installed in compliance with Machinery Directive, eliminates dangers of persons. Any measures that can be taken by the machine user to reduce any residual dangers indicated in the overview below.

4.11. Environmental Conditions In The Machine's Operating Area

- The air temperature must be between +5°C and +40°C.
- Temperature variation must be maximum 1,1°C per minute.
- Moist rate must be below %75.
- Vibrations on the base must be lower than 0,05 G in acceleration, and lower than 5 µm in vibration amplitude.
- The dust and solvent in the environment must be in minimum level.
- The machine shouldn't be placed under direct sunlight or any heater.
- The machine shouldn't be placed near main entrance doors.
- The machine should absolutely be placed far from divisions where there are dying units.

4.12. Dangerous Situations and Precautions

Danger Type	Danger Source	Danger	Additional Precautions
Mechanical Danger Crushing, shearing, blows	Moving axes(X,Y,Z)	Risk of injury	-
Electrical Danger Due to electrical contact	Direct contact with charged parts Indırect contact with parts that carry current when faulty	Lethal Danger Lethal Danger	- -
Thermal Danger Flames or explosion	Combustion/explosion in case of oxygenation Hot workpieces	Risk of injury	Personnel must use protective clothes and gloves
Infrared Laser Radiation Danger Laser	Spread of radiation above the safety cabin Radiation during service /maintenance/setting Works	Risk of injury Risk of injury	Customer must provide protection against possible exposure of personnel to radiation Protective clothing and laser safety glasses must be worn. Costumer must secure the danger area
The danger due to magnetic fields RF Magnetic fields	RF generator	Lethal danger for persons wearing cardiac pacemakers	These persons must stay clear of this area
Danger of fire	Occlusion the filters of extraction unit	Risk of injury	Costumer must keep a hand fire extinguisher for metal fires ready at all times
The danger due to hazardous substances Through contact with ır by inhaling toxic fluids, gases, mist, vapor and dust	Dust, aerosol Cutting Oil Thermal decomposition of lenses and mirrors	Health damage	Adequate ventilation at workplace must be assured. Observe all information in the operator's manual
Poisonous Gasses and Fume-Emitting Metals	Galvanized Sheet	Danger of intoxication	Protective Gas Mask, Gloves, and Work Uniform

Tablo 1 – Dangerous Circumstances and Their Precautions

!!! The general security codes and regulations should be considered to prevent the accidents that become as additional the warnings!!!

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

4.13. The Label Locations On The Machine, The Extraction Unit and The Loading-Unloading Unit

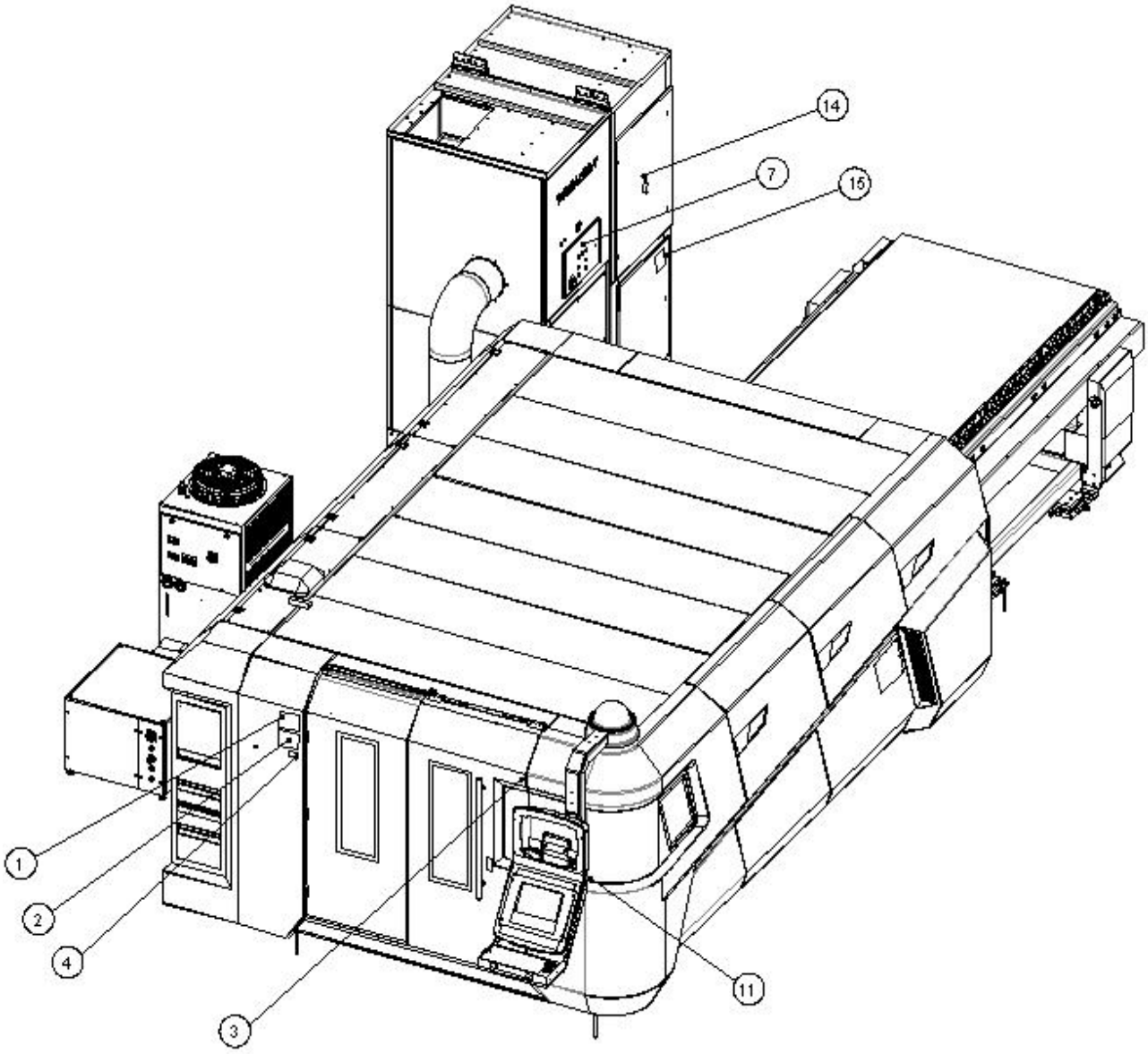


Figure 2 - Representation Of The Label Locations

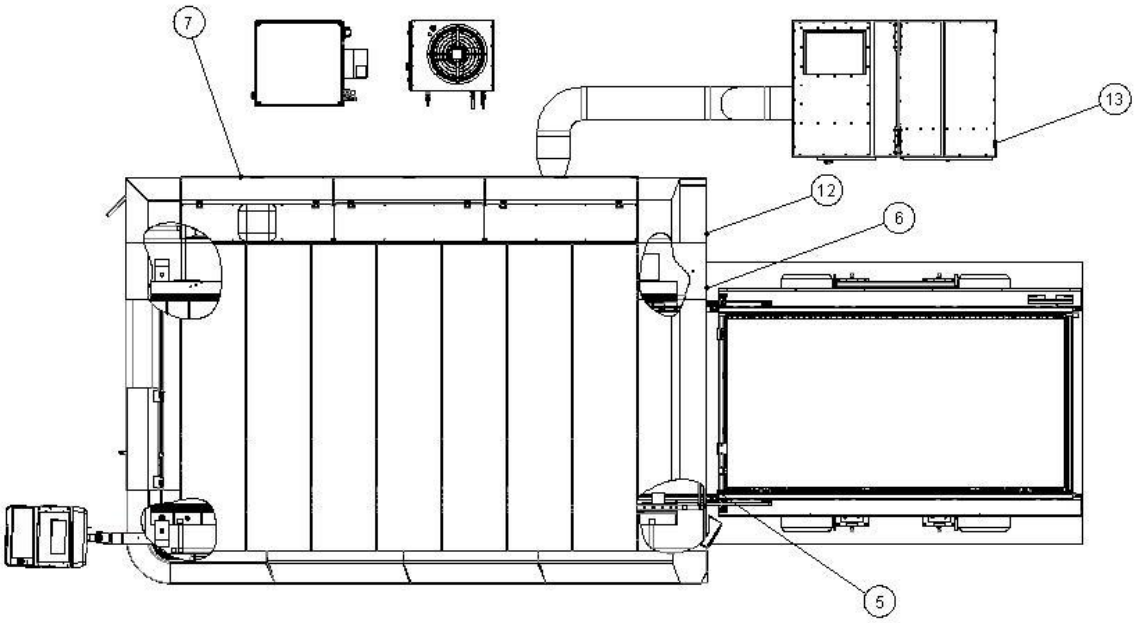


Figure 3 - Representation Of The Label Locations On The Top View

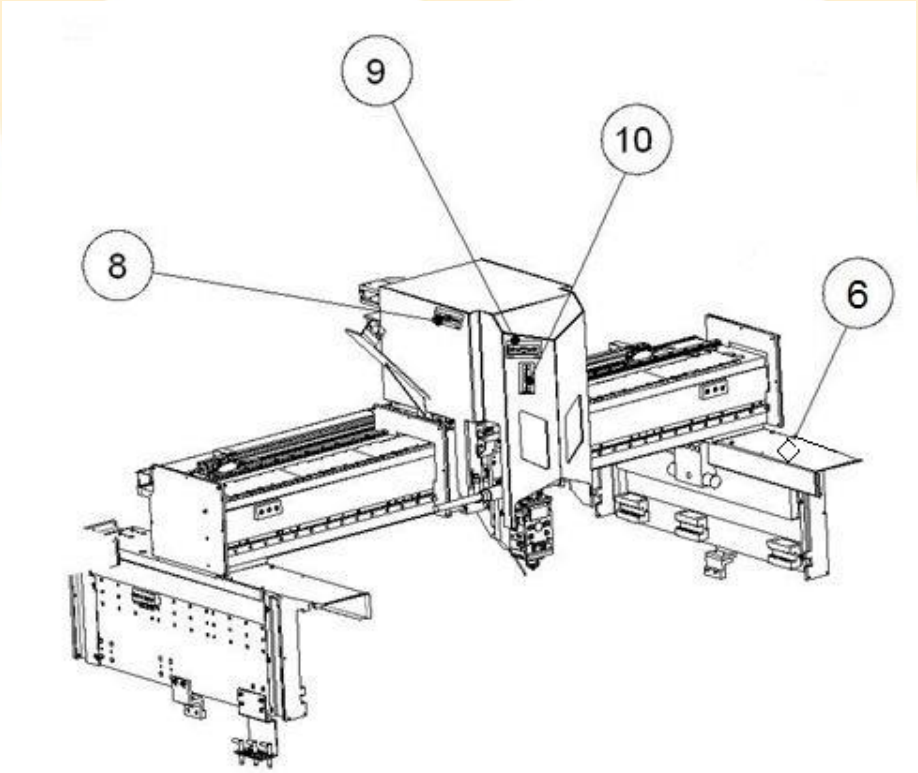


Figure 4 - Representation Of The Label Locations On The Cutting Head

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

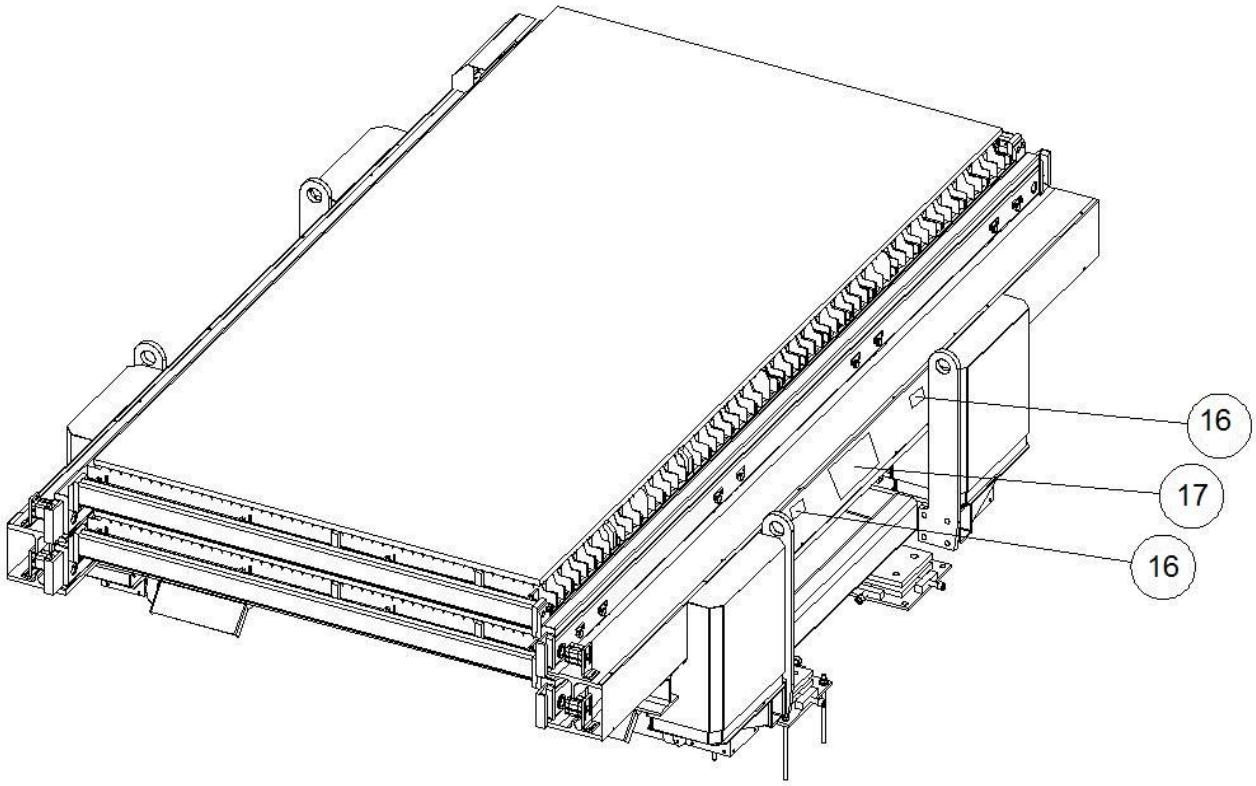
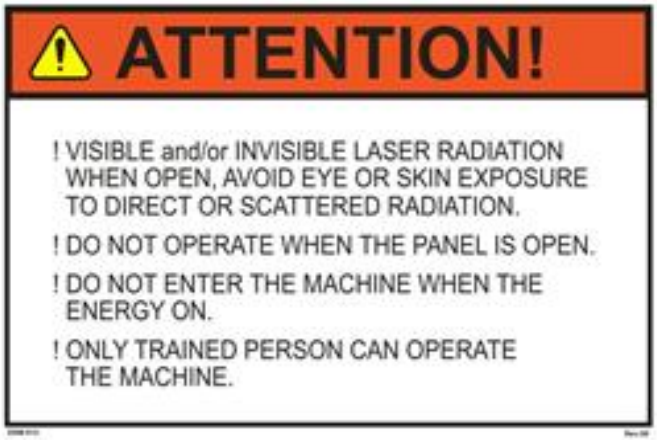


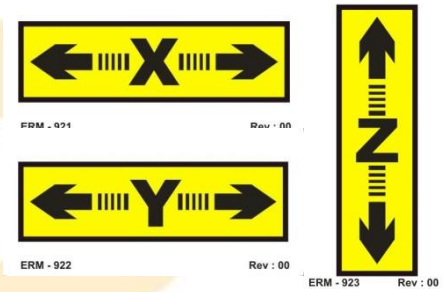
Figure 5 - Representation Of The Label Locations On The Loading-Unloading System

4.14. Safety Labels On The Machine

- **Label 1** - **Machine usage and safety label**	
- **Label 2** - **Machine usage and safety label**	
- **Label 3** - **Machine usage and safety label**	
- **Label 4** - **Machine usage and safety label**	

Tablo 2 – Machine Safety Labels 1

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

- **Label 5** - **When approaching the movement machine elements, the safety distance must be protected. Otherwise can be reason of serious injuries**	
- **Label 6** - **Indicates the required fields where must not be pressed on. If warning is not avoided can be injuries and also can harm to machine.**	
- **Label 7** - **Declares that the electrical danger.**	
- **Label 8** - **Label 9** - **Label 10** - **The above labels are used to show the moving directions of movement machine elements.**	

Tablo 3 – Machine Safety Labels 2

- **Label 11** - **This label shows the general technical specifications of the machine (data label)**	
- **Label 12** - **This label shows the terms of machine usage** - **Don’t touch with bare hands** - **Protect from moisture** - **Can be broken** - **Wear safety shoes** - **Read the user manual** - **Wear gloves**	

Tablo 4 – Machine Safety Labels 3

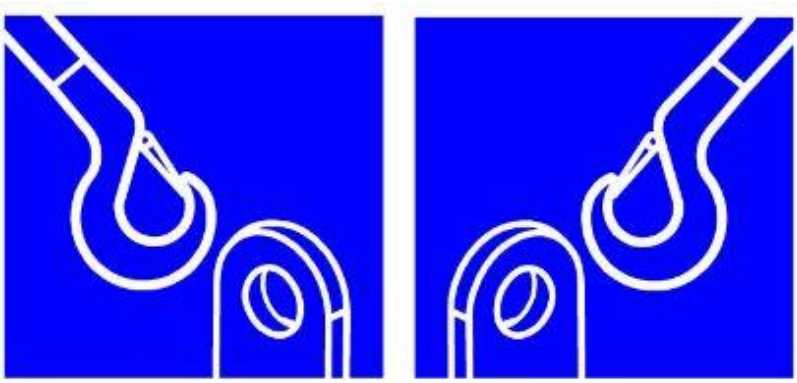
Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

4.15. Safety Labels On The Extraction Unit

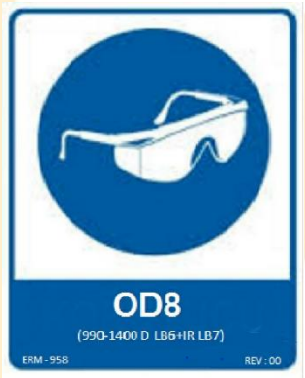
- **Label 13** - **This label (information label) contains the informations about the extraction unit.**	
- **Label 14** - **This label shows the place to intervene in a fire.**	
- **Label 15** - **This label shows that against the possibility of dangerous gases should be use the protective mask.**	
- **Label 16** - **This label declares that the electrical danger.**	

Tablo 5 – Extraction Unit Safety Labels

4.16. Safety Labels On The Loading-Unloading Unit

- **Label 17** - **This label shows the transport shape of loading-unloading unit.**	
- **Label 18** - **This label shows the true transporting shape for the unit.**	

Tablo 6 - Loading-Unloading Unit Safety Labels

- **Label 19** - **This label shows the operator recommended to wear a specified protection glasses while the laser emission is on.**	

Tablo 7 - Protection Glass Safety Label

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

5. TRANSPORTING OF THE MACHINE

Machine is delivered together with following equipments.

- **Main Body**
- **Loading-Unloading Unit**
- **Laser Source**
- **Chiller Unit**
- **Extraction Unit(Optional)**
- **Electricity Panel**
- **Conveyor**
- **Body Platform**
- **Material Box**

Each lifting cable which will be used during transporting of the machine elements, must have at least 6 tons as a lifting capacity. The maximum angle between chains or the lifting cables must be maximum 40°. Please select length of the cords or chains according the requirement.

5.1. Transporting Of The Main Body

The machine is transporting with hook helping as the following picture.

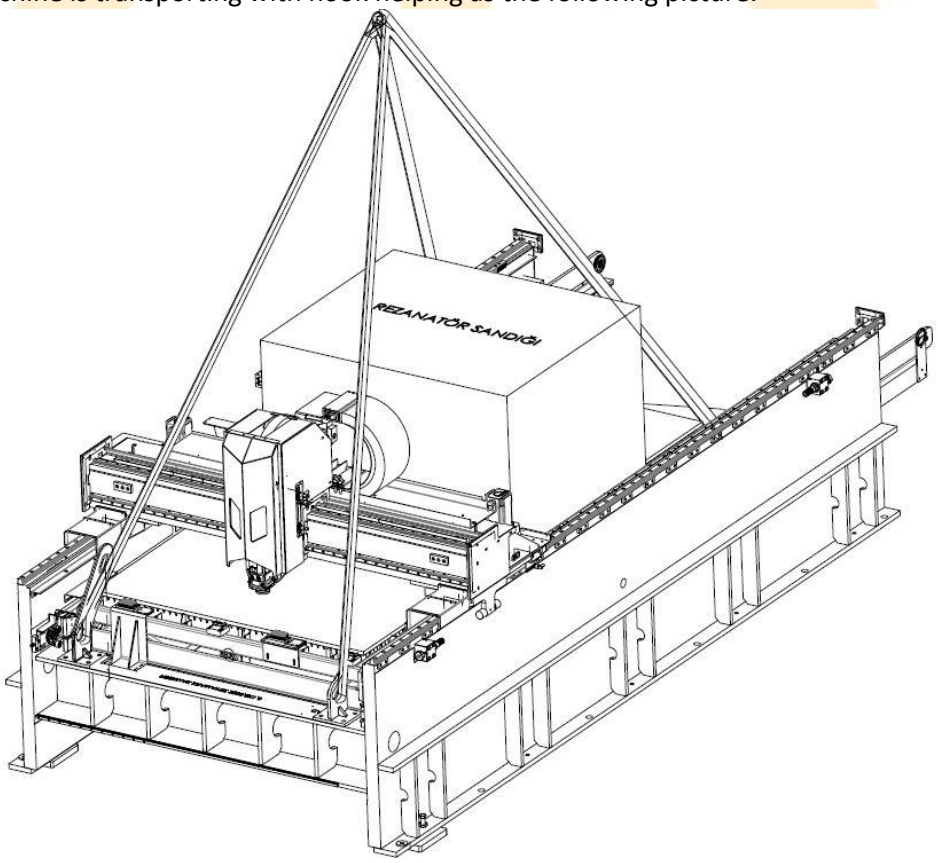


Figure 6 - Transporting Format Of The Machines Main Body

5.2. Transporting Of The Loading-Unloading Unit

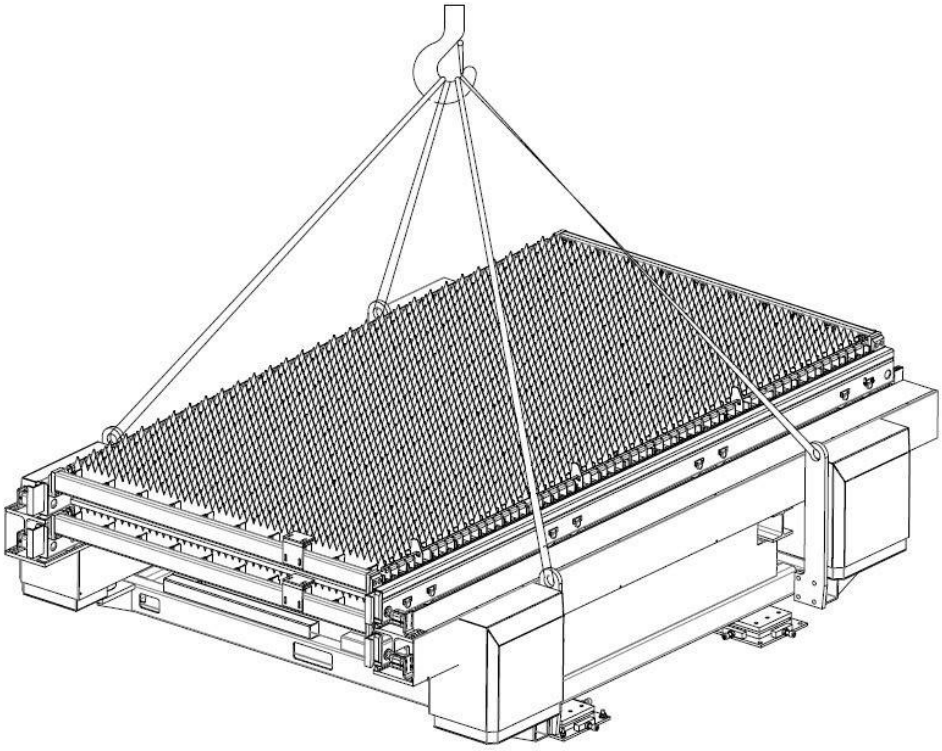


Figure 7 - Transporting Format Of The Loading-Unloading Unit

5.3. Transporting Of The Laser Source

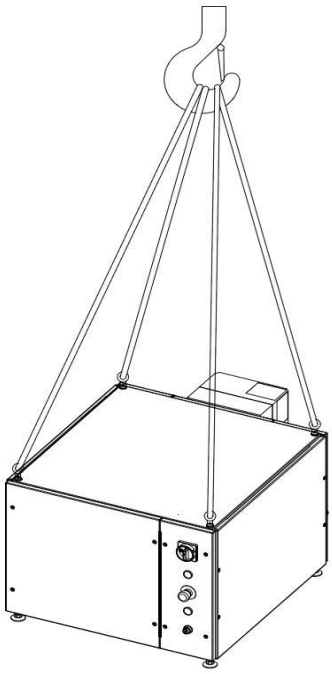


Figure 8 - Transporting Type Of The Laser Source

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

5.4. Transporting Of The Chiller Unit

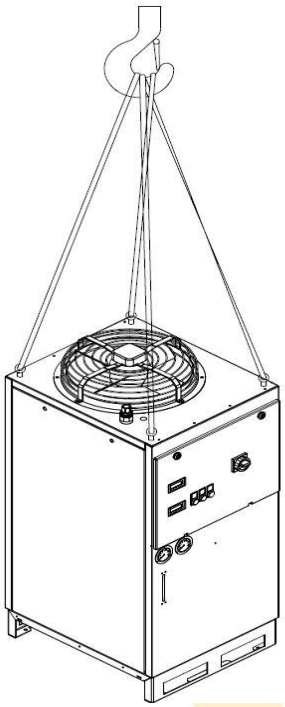


Figure 9 - Transporting Format Of The Chiller Unit

5.5. Transporting Of The Extraction Unit

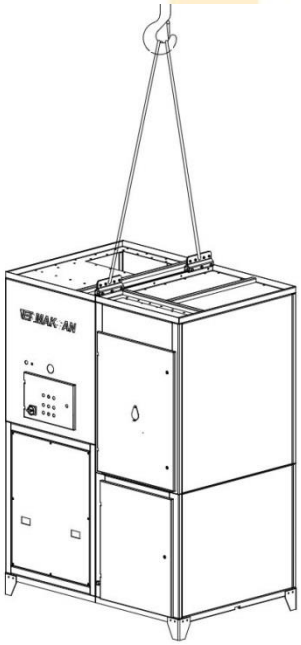


Figure 10 - Transporting Type Of The Extraction Unit

5.6. Transporting Of The Electricity Panel

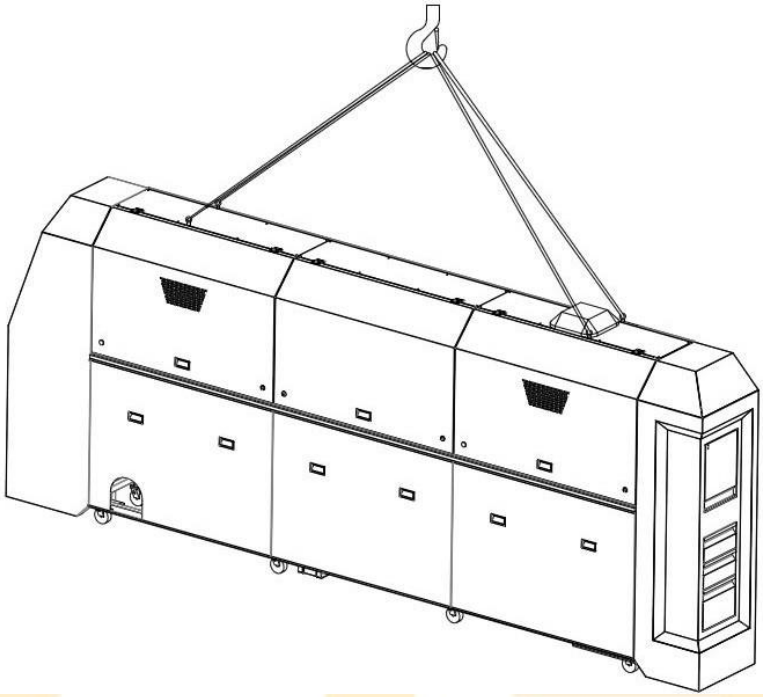


Figure 11 - Transporting Format Of The Electricty Panel

5.7. Transporting Of Conveyor

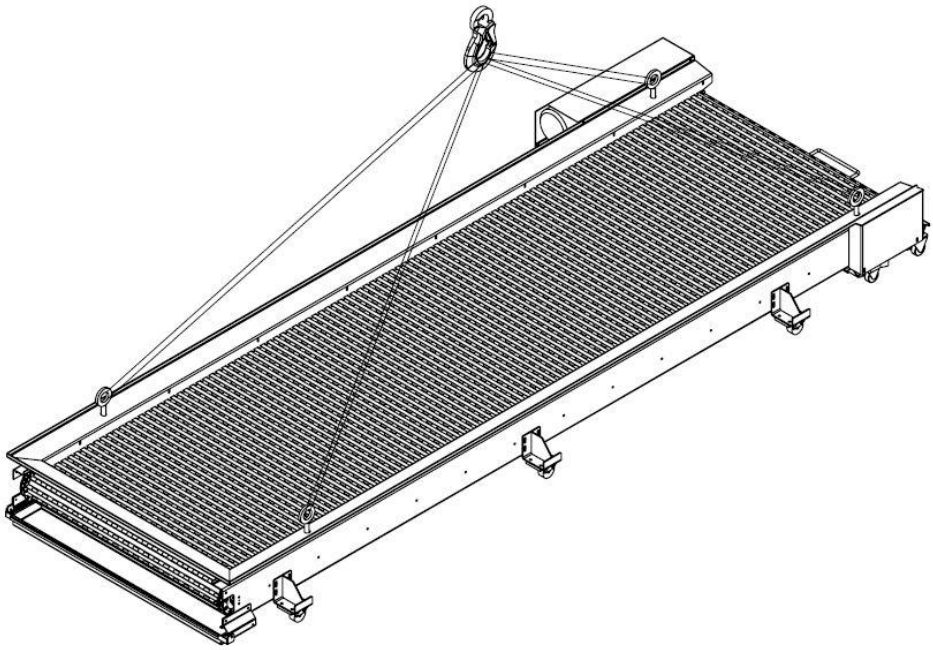


Figure 12 - Transporting Format Of The Conveyor

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

5.8. Transporting Of The Body Platform

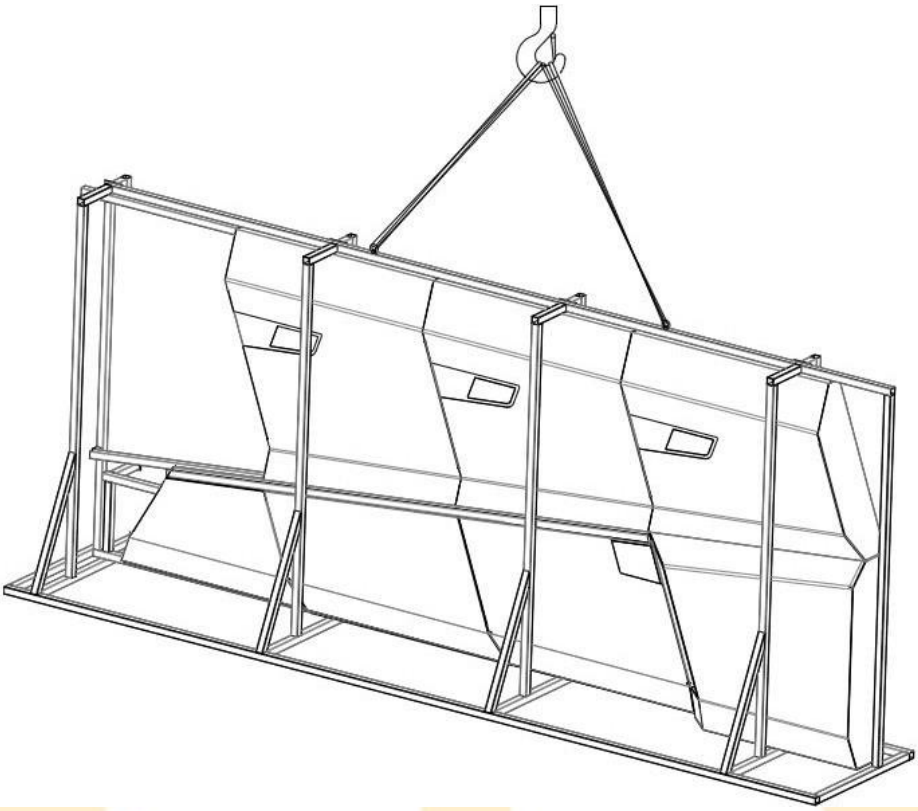


Figure 13 - Transporting Format Of The Body Platform

5.9. Transporting Of The Material Box

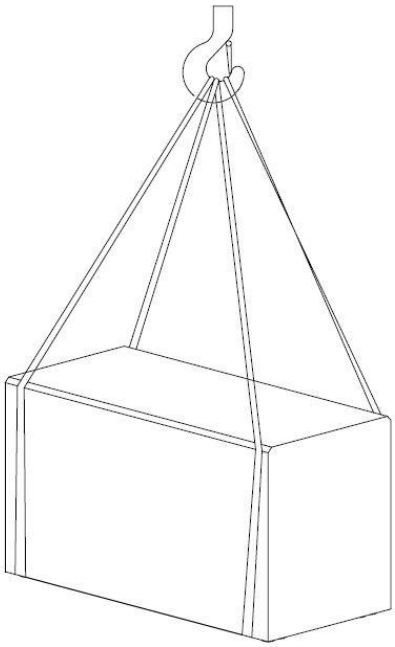


Figure 14 - Transporting Format Of The Material Box

6. FIBERMAK MOMENTUM SERIES WITH BROAD STROKES

FIBERMAK CNC laser cutting benches have following main components.

- **Main Body**
- **Chiller (Cooling Unit)**
- **Laser Source**
- **Extraction Unit**
- **Shuttle Table**
- **Control Panel**
- **Cutting Head**
- **Conveyor**

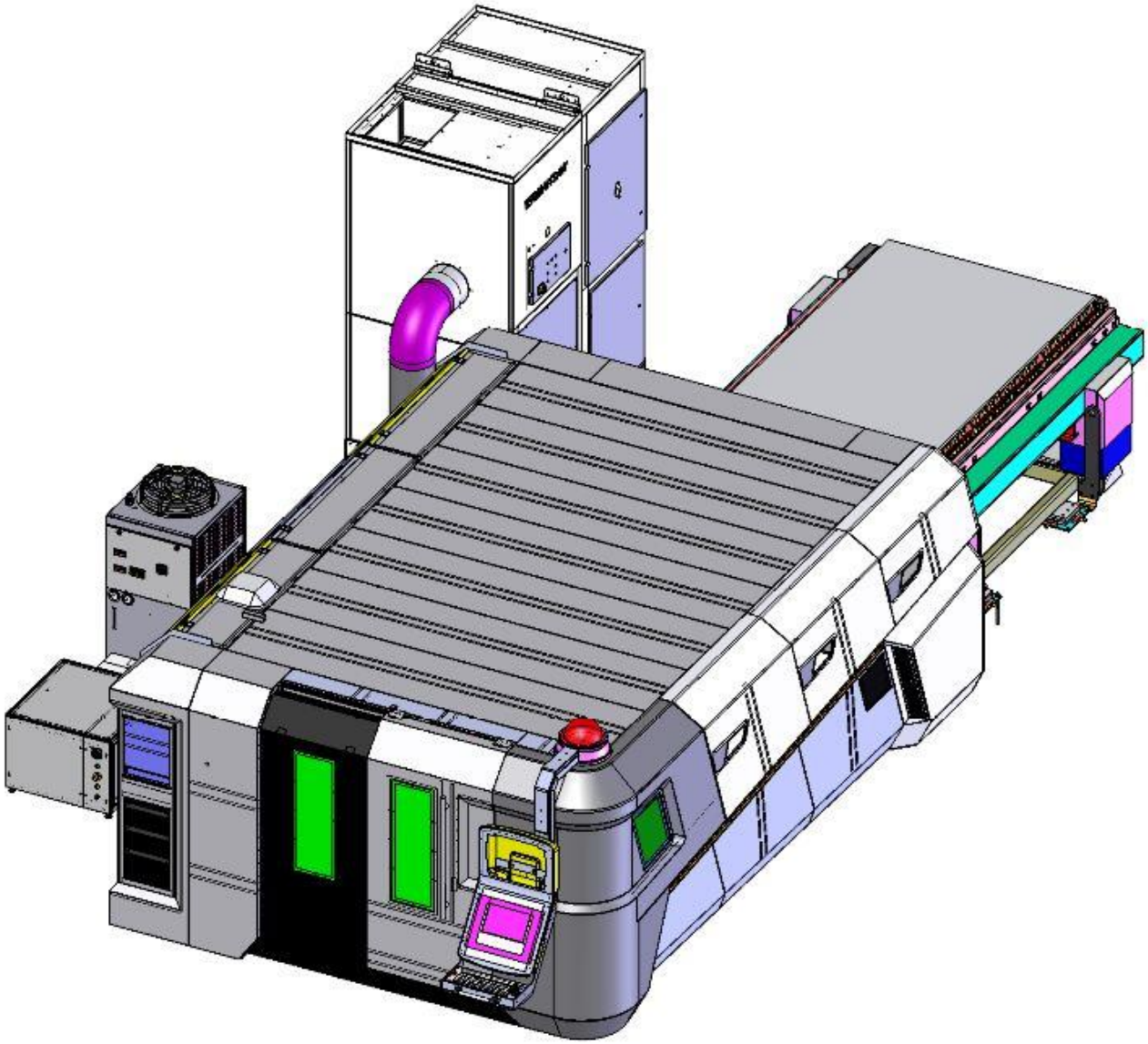


Figure 15 - The Machines Main Body and Components

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

6.1. Main Body

Automation panel, axes, laser cutting head, the control panel is located on main body and where the processing is based on the system can be defined as a component of the skeleton.



Figure 16 - The Main Body

6.2. The Cooling Unit (Chiller)

The system has two different cooling types which includes water and air cooling. Dry air cooling is used for the rulers and the nozzles



All the necessary cooling with water system (laser welding, cutting head, linear engines) operation is performed with this auxiliary component.

Figure 17 - Chiller Unit

Water is divided into two which come from the Chiller. One goes to the laser source and the other goes to the body. Hoses which go to the body cool the lineer engines and the entry of fiber cable. Heated water returns to the chiller and is cooled and given again to the system. Thus cold water loop is provided continiously

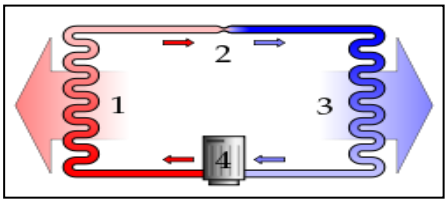


Figure 18 - Temperature Control Scheme

6.3. The Laser Source (Resonator)

Laser beam for the cutting is generated in this component.

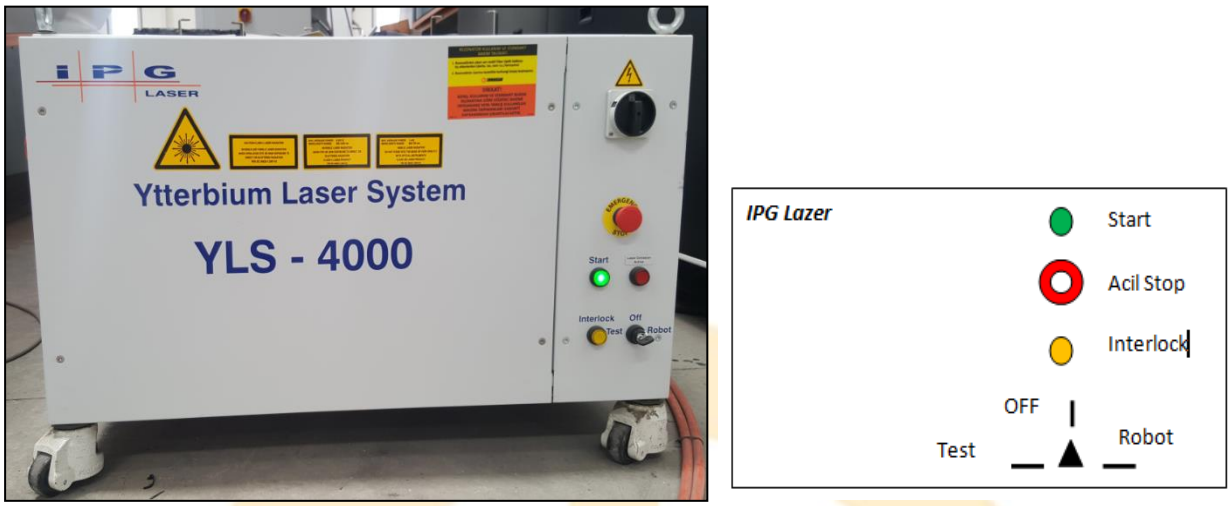
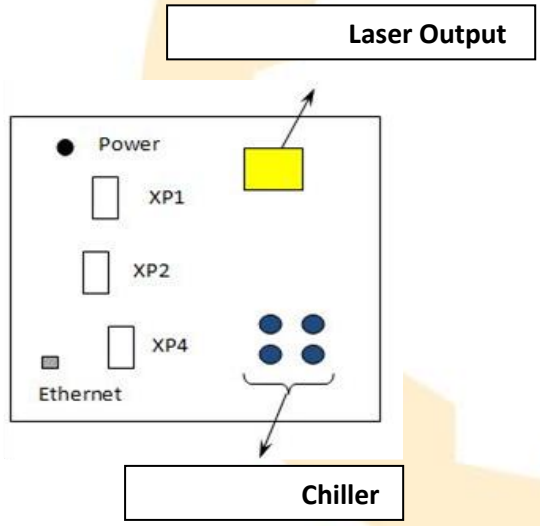


Figure 19 - The Front Block Of The Resonator



- **Connection of power cable**
- **Connection of XP1 I/O (Hardwiring)**
- **XP2 Safety Interface**
- **XP4 Analogue Control**
- **Ethernet Connection**
- **Laser output**
- **Connections of laser units**

Figure 20 - The Back Block Of The Resonator

Laser beam which is generated from the laser source are carried by FIBER cable to the cutting head. After the focus, cutting is done with auxiliary gases. There are two different modes for working; “Test” and “Robot”. You can change the mode by using key on them. Also you can get the detail informations from the user manual of IPG.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

6.4. The Extraction Unit

This component sucks the gases and the dust particles which are released during the cutting process. This component prevents inhaling the gases and the dust during the cutting process.

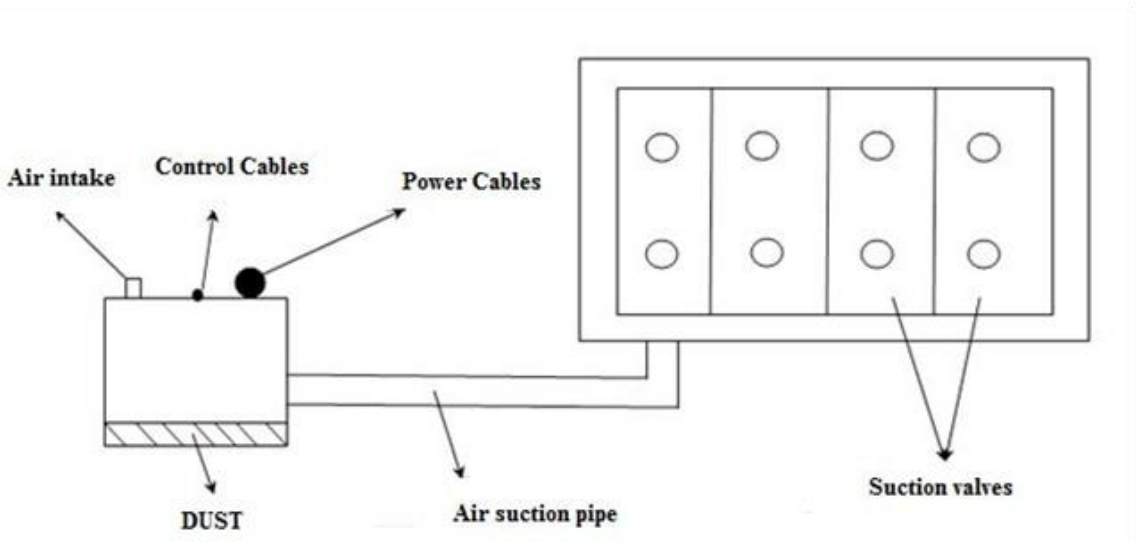




Figure 21 - The Extraction Unit

Where the Laser cutting head is working only that valve is activated. So the extraction power is high.

6.5. The Loading-Unloading Unit

This component consists of two movable tables and it is used to speed up operations. While the processing a table is continuing inside of the machine, finished work can be collected from the behind table and sheet can be loaded for the next job. The system can be operated in two different ways, including automatic or manual.



Figure 22 - The Loading-Unloading Unit

With the light protection barriers which surrounds the shuttle table, accidents that may occur during loading and unloading process are prevented.



Using the back control panel is safer for control of the shuttle table

Figure 23 - The Back Control Panel Of The Loading-Unloading Unit

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

6.6. Operator Control Panel

This panel controls the system and operates the functions according to the user's directives. This component consists of the touch screen, the keyboard, the emergency stop button, the function buttons, the speed setting potentiometer and USB Insert.



HMI is controlled from this screen.

Figure 24 - The Operator Control Panel

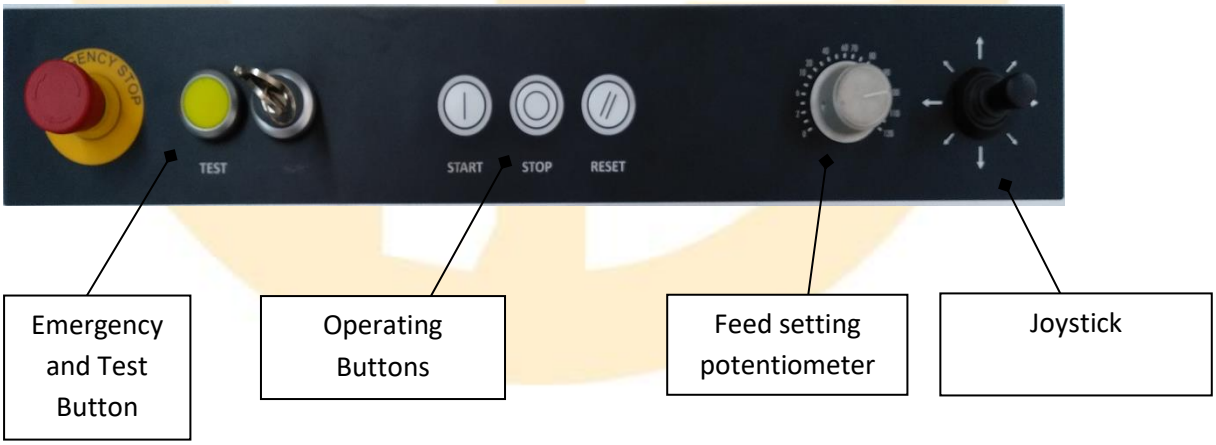


Figure 25 - Quick Control Panel

6.7. **Conveyor**

After cutting process, conveyor is a band system which carries falling pieces from grids and slags to collection chamber.



Figure 26 - Conveyor

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

6.8. Machine Turn-On Procedure

To open the machine must be observed the following order.

Automation Board is energized by opening the main switch board.



Figure 27 - The Main Switch Of The Electricity Panel

Chiller switch must be turned to ON position. Always you must open the Chiller before the laser source.

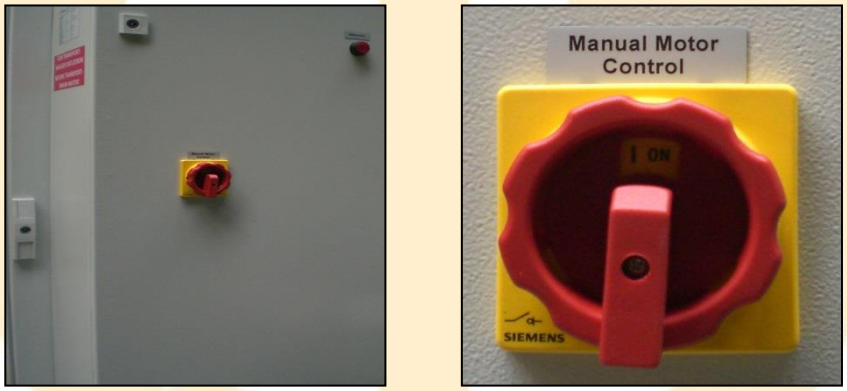


Figure 28 - The Main Switch Of The Chiller Unit

The switch of the laser source is opened and the key is adjusted according to the desired mode to be use. You can set ”Test” mode or “Robotic” Mode. But you have to choose Robot mode for the cutting process.



Figure 29 - The Main Switch Of The Laser Source

Energization of Extraction Unit and the opening of the fan switches. After keys are opened, the power lamb gives continuous light and the extraction unit is tested briefly.



Figure 30 - The Main Switch Of The Extraction Unit

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

If all energization is appropriate, suitability of the light curtain is provided by pressing the “Test OK” button which is located behind of body.

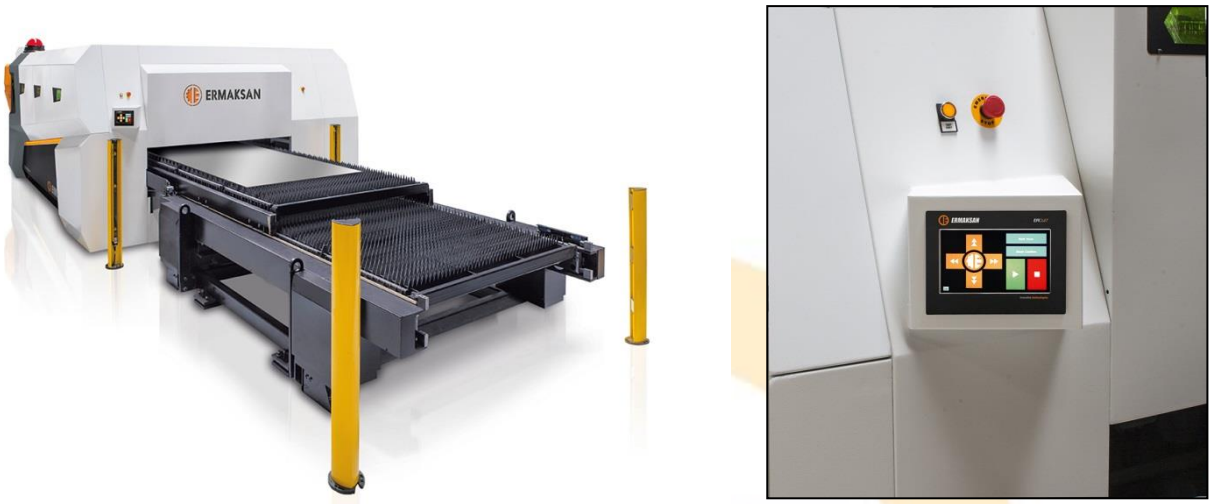


Figure 31 - The Test Button Of The Loading-Unloading Unit

When Windows is opened completely at the screen of control panel, HMI is opened as double-click the shortcut of “TcApplication”.



Figure 32 - The Shortcut Of The Interface Program

6.9. Machine Turn-Off Procedure

“Off procedure” must be done as reverse of “On procedure”. The control panel must be closed before the main switch of machine is closed. This process is the same as closing Windows.

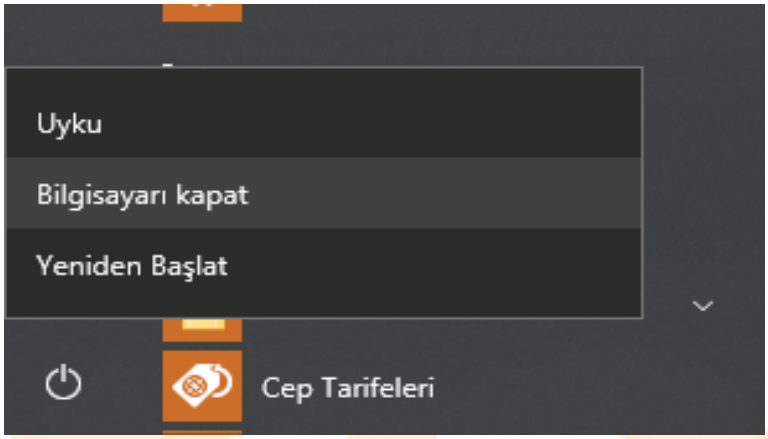


Figure 33 - Turn Off Button Of The Operating System

To protect IPC (Industrial PC) must be closed the main switch after closing screen.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

7. CUTTING HEAD

The laser beams are carried to the cutting head with the fiber cable which the beams are produced by the laser unit. Cutting head transfers this beams to processing surface.

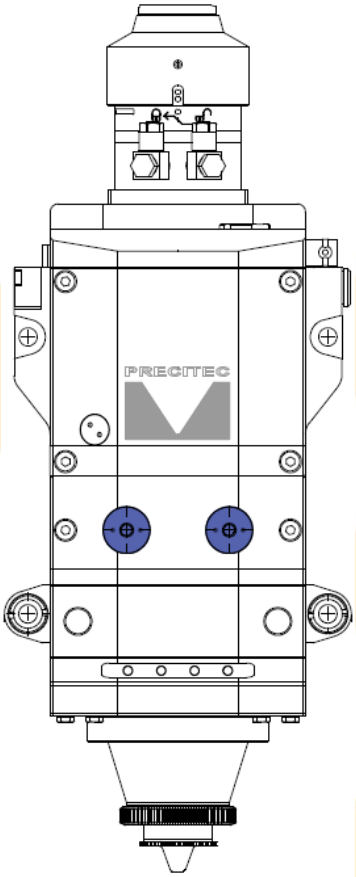


Figure 34 - Cutting Head

Beams which are regulated from FIBER Cable Collimation are transferred to Focus Unit.

- **Laser beam** can be set to desired focus helping with the lenses in the focus unit.
- **Protection Glass;** this part protects lens from slags that they becomes during the cutting.
- **Height adjustment sensor (Sensor Insert);** an element of the height control system which is used to adjust the distance between the processing surface and the cutting head. These informations are transferred to a upper unit in order to translated into numerical values.
- **Ceramics**; the basic aim is to protect the cutting head and also helps to do hight control.
- **Nozzle** provides directed to auxiliary gases and also helps to do height control

8. HMI (Human to Machine Interface)

When HMI interface first turned on, this view will show up on the screen.



Figure 35 - HMI Opening Interface

If there is an error related with the Twincat or PLC an error message will pop-up and give you the related information. In this case machine should be restarted first and Twincat program icon should be checked for related errors.

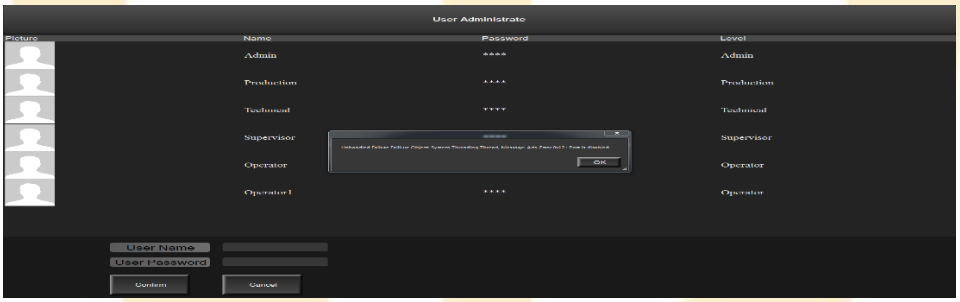


Figure 36 - Read Warning Section Of PLC and TwinCAT

If this case takes place the machine CNC can not be started and operator can not use the machine.

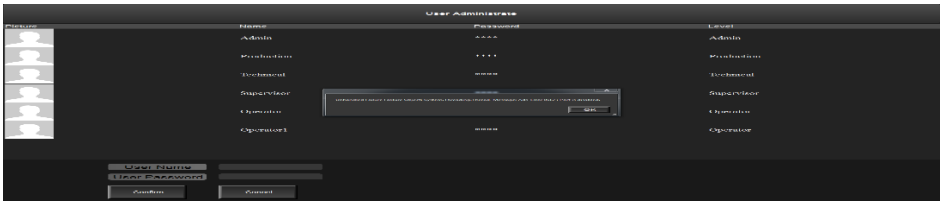


Figure 37 - CNC Error of the Machine

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

8.1. **Messages**

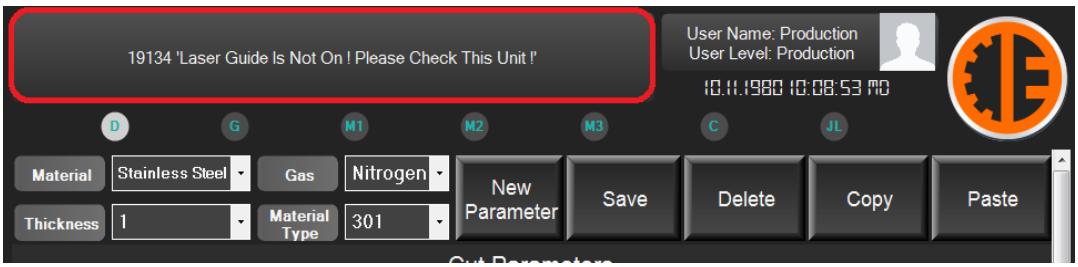


Figure 38 - Messages Screen

On the main HMI screen warning, error and information messages can be seen directly. For more detailed information about the warning or error double click or double tab red marked area. More detailed messages will be shown as below figure.

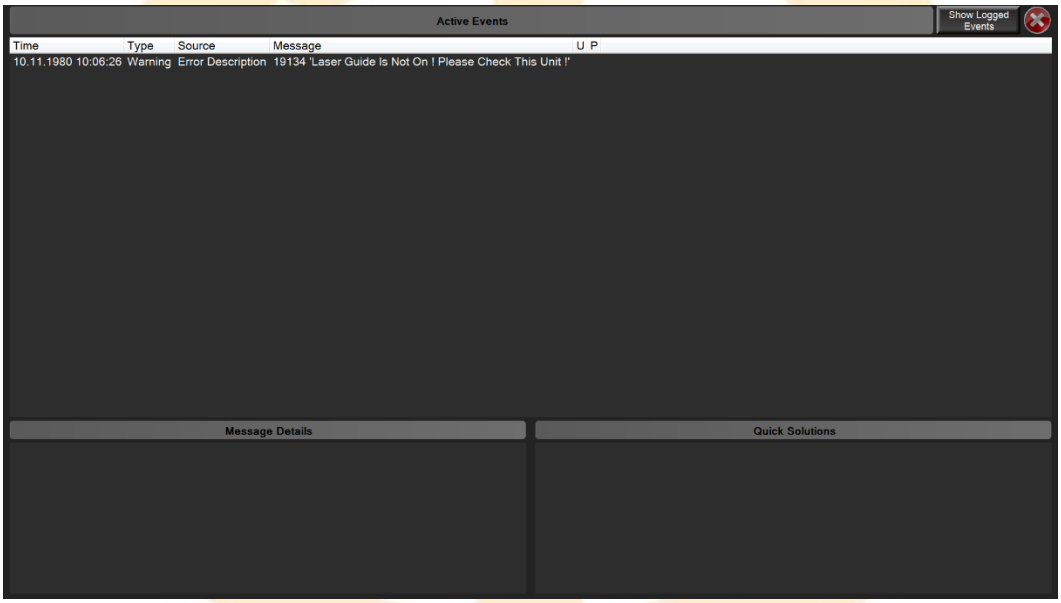


Figure 39 – Messages Details Screen

9. QUICK CONTROL BUTTONS



Figure 40 – Quick Control Buttons

In this menu, operator can reach quick control buttons. These buttons helps the operator to use the machine without accesing the menus. Some buttons has open and close functions and some buttons has multiple sub sections.

For example Test Run button has only open and close function. But No Pierce button has multiple sub sections such as No Pierce – No Pierce No Lead In.

- **Last Start Position:** The machine is placed to a last programme start position by pressing this button after the machine is reset in automatic mode.
- **Z Safety Position:** If the stop command is given to programme in the automatic mode, Z-axis rises to the height where it is defined as safe, if this visible button is pressed.
- **Machine Safety Position:** If the stop command is given to the programme in the automatic mode and this visible button is pressed, cutting head gets to the position which has been predefined.
- **Film Burn One Part: (Sub sections)** One of the Film Burning buttons below should be active as the code generated for film burning from Cad Cam (Film Burn) is to be operated.
- **Film Burn All Parts: (Sub sections)** As the button is active, for any part, first of all it operates film burning and then starts cutting. By the time this button is active, “only pierce” option cannot be selected.
- **Film Burn All With Pierce: (Sub sections)** As the button is active; for complete sheet of material first of all it operates the film burning and then starts cutting. When this button is active, “only pierce” option cannot be selected.
- **Check Part: (Sub sections)** This function stops the machine after cutting the part for a check. Two options available one with stops the machine right over the last contour. The other one stops the machine after moved to the other parts first piercing position.
- **Single Block:** This must be activated to be able to be processed step by step of the processed code. It might be used on automatic mode.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

- **Backward Mode:** It is used to be processed backwardly of the processed code. It might be used on the automatic mode.

- **Test Run:** You can use it for enabling the processed code to be processed without turning on the laser. It might be used in automatic mode.

- **Part Pierce: (Sub sections)** When starting to cut, it is an option of first of all, all the piercing parameters' performing and then of the cutting of the contour.

- **No Pierce: (Sub sections)** It is used to achieve the cutting process without piercing. It is preferred for thin sheets. If it is been pressed again it cuts without Lead-in, it is used for the cutting directly over the surface of the contour.

- **Move Service Position:** It is used for to take the cutting head to the service position.

- **Laser Assign:** It is used for assigning the laser. Laser can not put in on position without assigning it.

- **Laser On:** It is used for opening the laser. Assinging must be done first.

- **Laser Guide:** It is to open a laser pointer under the cutting head. It will shoe the cutting head actual position.

- **HSU Calibration:** It ıs used for calibrating the Height Sensor Unit. This will hep the cutting head to stay as desired distance from the cutting material.

- **Clean Nozzle:** It is used for to clean nozzle tip. It uses a special place in the machine. After the cleaning the cutting head will perform a HSU calibration and will go to zero position of the machine.

10. MAIN USER CONTROL PAGE



Figure 41 - Main User Control Page

This page is include all information and data necessary for the operator and for cutting.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

10.1. Machine Position Information



Figure 42 – Machine Position Information

In this section cutting head actual position is shown. X and U axis are simultaneous axis, so X and U axis positions must be same. If there is a problem related with mechanical or electrical conditions there can be seen lag between the axis. If this error is greater than 1mm machine will stop the process automaticly for not causing mechanical damage.

10.2. Machine Control

In this section machine can be control in 2 ways such as Automatic and Manuel. MDI mode can only be used for Manuel Data Input but this section is only allowed to be used by Ermaksan technicians or engineers.

10.3. Manuel Machine Control

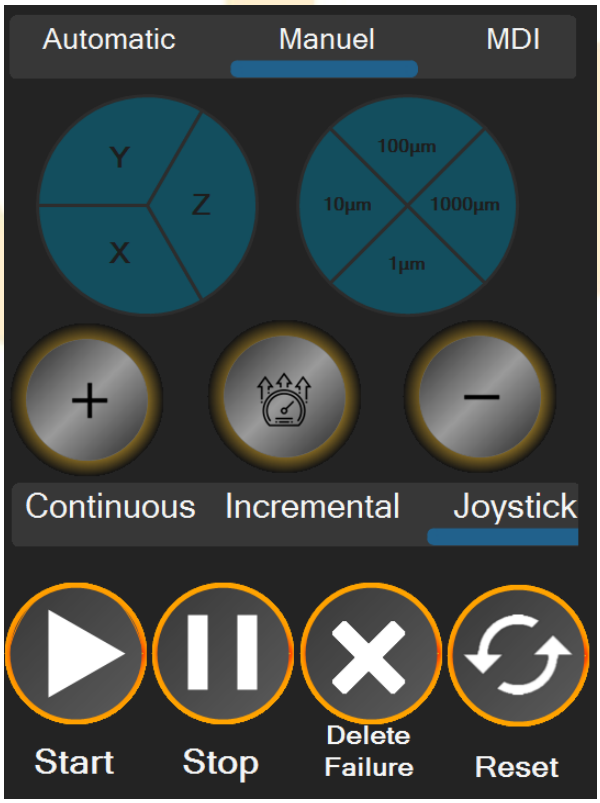


Figure 43 - Manuel Machine Control

In this section machine axis can be operated manually. First jog type must be selected from Continous, Incremental or Joystick modes.

In Continous mode operator should select the axis which will be moved and by pressing (+) and (-) icon axis will be moved in that direction.

In Incremental mode operator should select the axis and the incremental level from the menu and by pressing (+) and (-) icon axis will be moved in that direction with desired incremental distance.

In Jostick mode operator will operate the machine axis with joystick. In this mode only Z axis can be controlled from screen. X- and U axis can only be operated with joystick.

Start and Stop buttons will not work in manuel mode.



Figure 44 – Quick Control Panel

Velocity of the motion can be altered by either the feedrate can be diminished or enhanced with the help of a reosta onto the keyboard. This choice helps us take control of the feedrate either during the cut-off or manual movements.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

10.4. Automatic Machine Control

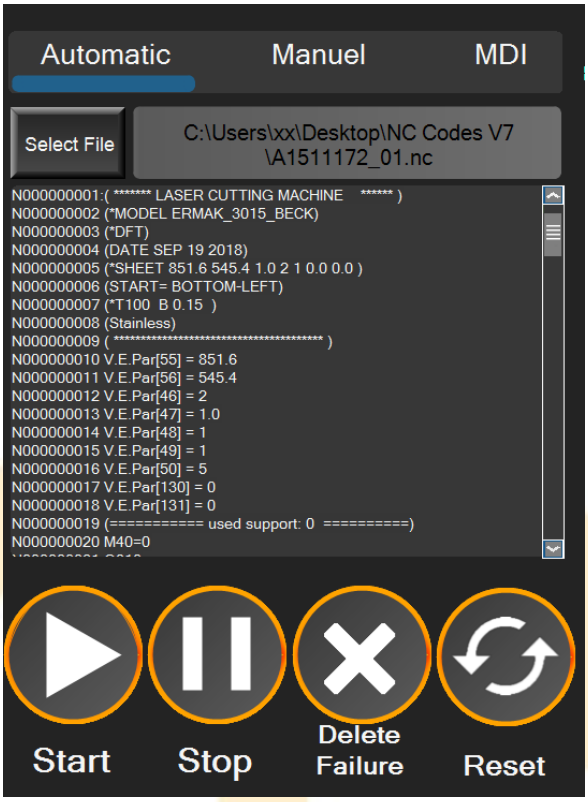


Figure 45 - Automatic Machine Control

In this section machine will be ready for operating. The program to be cut (.nc file) can be selected from Select File button. After the desired program selected Start button will begin the operation.

10.5. Cuting Parameters



Figure 46 – Cutting Parameters

Power: Laser power during the cutting process.
Height: Can be described as the distance between Nozzle and the sheet. This value can be entered maximum 9 mm.
Feedrate: Velocity of the cutting process.
Gas Selection: This parameter describes which assist gas will be used in cutting process.
Pressure: Pressure of the assist gas in cutting process is defined by this parameter (maximum O2 pressure = 10 bar, maximum N2 pressure = 25 bar)
In Kerf: This parameter is used to change the dimensions of inner contours. This parameter can take positive and negative values. If the entered value is positive the dimension of the contour will be smaller. Else if the entered value is negative the dimension of the contour will be greater.
Out Kerf: This parameter is used to change the dimensions of inner contours. This parameter can take positive and negative values. If the entered value is positive the dimension of the

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

contour will be greater. Else if the entered value is negative the dimension of the contour will be smaller.
Lense: This is used for informing the user and describes the total focal length of the lense.
Nozzle: This parameter describes the diameter of the nozzle and used for informing the user.
Focal: This parameter describes focal length. The values can be entered between -13 and +9 for 150mm (6”) lens and between -20 and +15 for 200mm (7,5”) lens.
Power at F=0: This parameter is used to define power where the feedrate equals to zero.
Acc Mode (acceleration): This is used for defining the percentage of acceleration in cutting process. Any value between 0 and 100 can be entered. 0 and 100 represent the maximum acceleration.
Delay Time: This is used to make the laser head wait while laser on at the start point of the contour after lead-in for entered time.
Clean Time: This is the time for blowing gas after piercing. After blowing gas for entered time, process goes on.
Tip Touch Delay Check: This is the adjustment about tip touch control. It can be set as ON or OFF. OFF means tip touch delay is not active so at any tip touch condition it will stop the machine in 1 milisecond. ON means tip touch delay is active. In this condition if the tip touch duration takes more time than the entered value machine will stop immediately. Otherwise machine goes on its process.
Tip Touch Delay: If the Tip Touch Delay Check is adjusted as ON then the entered value will be effective otherwise it is not important.
Modulation: This parameter determines if modulation on or off for frequency in cutting process.
Frequency (Hz): This parameter is used for to determine the frequency cycle between 0 – 5000 Hz. (Consider the formulation F = 1/T).
Duty Cycle (%): The length of time the laser beam is actually cutting as compared to the entire work cycle time with percentage.

10.6. Piercing Parameters

Power: This parameter is just used for informing the operator. Real power which is used in the operation is defined by the LaserNet program.
Single Pulse Mode: This parameter defines if PWM (Pulse Width Modulation or frequency mode) is on or off.
Duty Cycle (%): The length of time the laser beam is actually cutting as compared to the entire work cycle time with percentage.
Frequency (Hz): This parameter is used for to determine the frequency cycle between 0 – 5000 Hz. (Consider the formulation F = 1/T).
Height: This parameter is used to define distance between nozzle and the sheet during the piercing process.
Program No: This parameter is used to define which LaserNet program will be used in the piercing process.
Gas Type: Describes which gas type will be used in the process.
Pressure: Describes the pressure value of the process.
Gas Time: It is possible to make gas flow before starting the piercing process. And this parameter is used to define flowing time.
Duration: This parameter is used to define duration of the process.
Lense: Informs the user about which lens is used in the system.
Nozzle: Informs the user about size of the nozzle which is used for piercing process.
Focal: Defines the focal length of piercing process.
Clean Time: Defines the duration of gas flowing after piercing.
Tip Touch Check: This is the adjustment about tip touch control. It can be set as ON or OFF. OFF means tip touch delay is not active so at any tip touch condition it will stop the machine in 1 milisecond. ON means tip touch delay is active. In this condition if the tip touch duration takes more time than the entered value machine will stop immediately. Otherwise machine goes on its process.
Tip Touch Delay: If the Tip Touch Delay Check is adjusted as ON then the entered value will be effective otherwise it is not important.
Ramp: It is used to activate Ramp Mode. (OFF = > ramp mode is not active; ON => ramp mode active.)
Ramp Time: This parameter is used to adjust the ramp duration. If entered value of “duration”, is bigger than the “ramp time” system will go on piercing process at the height where ramp was ended.
Start Pressure: Defines the value of pressure at the beginning of ramp mode piercing.
End Pressure: Defines the value of pressure at the end of ramp mode piercing.
Start Height: Defines the value of height at the beginning of ramp mode piercing
End Height: Defines the value of height at the end of ramp mode piercing.

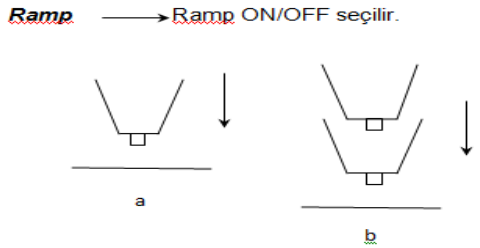


Figure 47 - Ramp Statement

a- Shows the normal piercing process

b- Shows ramp mode piercing process

b- During piercing process values changes;

From Start Height => to End Height

From Start Pressure => to End Pressure

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

Focal Ramp: This parameter determines if the focal ramping option on or off.
Focal Time (ms) : This parameter is used for to determine the focal ramping time.
Start Focal: Focal position of the Focal Ramp start.
End Focal: Focal position of the Focal Ramp end.
After Focal Ramp: Focal position after the Focal Ramp process ends.
Ramp Pulse Mode: This parameter determines if the ramp pulse mode option on or off.
Ramp Power Time (ms) : Total ramp time of power.
Ramp Start Power (W) : Starting power value in watts.
Ramp End Power (W) : Ending power value in watts.
After Ramp Powerv(W): Power value after the ramp power process ends.
Ramp Start Duty (%): Starting duty value in percentage.
Ramp End Duty (%) : Ending duty value in percentage.
After Ramp Duty (%): Duty percentage after the ramp power process ends.
Ramp Start Frequency (Hz) : Starting frequency value in Hz.
Ramp End Frequency (Hz) : Ending frequency value in Hz.
After Ramp Frequency (Hz) : Frequency value after the ramp power process ends.

10.7. Lead-In Parameters

Power: This parameter determines the power of the lead in process.
Modulation: This parameter determines if modulation on or off for frequency.
Duty Cycle (%): The length of time the laser beam is actually cutting as compared to the entire work cycle time with percentage.
Frequency (Hz): This parameter is used for to determine the frequency cycle between 0 – 5000 Hz. (Consider the formulation F = 1/T).
Height (mm): This parameter is used to define distance between nozzle and the sheet during the piercing process.
Pressure (bar): Describes the pressure value of the process.
Focal: Defines the focal length of piercing process.
Lead-in Feedrate: The velocity of cutting the distance between the piercing point and real contour start point is defined by using this parameter.
Delay Time: This parameter determines the delay time for lead-in in milliseconds.

10.8. 3 Point Piercing Parameters

3 Point Pierce: This parameter determines if the 3 point piercing mode is on or off.
Nozzle (mm): Informs the user about size of the nozzle which is used for piercing process.
Lense (mm): Informs the user about which lens is used in the system.
Clean Time (ms): Defines the duration of gas flowing after piercing.
Tip Touch Delay Check: This is the adjustment about tip touch control. It can be set as ON or OFF. OFF means tip touch delay is not active so at any tip touch condition it will stop the machine in 1 milisecond. ON means tip touch delay is active. In this condition if the tip touch duration takes more time than the entered value machine will stop immediately. Otherwise machine goes on its process.
Tip Touch Delay (ms): If the Tip Touch Delay Check is adjusted as ON then the entered value will be effective otherwise it is not important.
Point Time (ms): This parameter determines the time to make the piercing process and this process is among 3 points.
Point Power (W): This parameter determines the power to make the piercing process and this process is among 3 points.

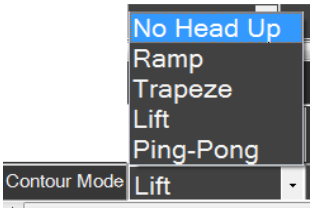
Point Duty (**%**): This parameter determines the duty to make the piercing process and this process is among 3 points.
Point Frequency (Hz): This parameter determines the frequency to make the piercing process and this process is among 3 points.
Point Height (mm): This parameter determines the height to make the piercing process and this process is among 3 points.
Point Pressure (Bar): This parameter determines the pressure during the piercing process and this process is among 3 points.
Point Focal: This parameter determines the focal length to make the piercing process and this process is among 3 points.

10.9. Edge Parameters:

Edge Function: This parameter determines to on or off edge frequency option.
Power: This parameter determines the power of the lead in process.
Modulation: This parameter determines if modulation on or off for frequency.
Duty Cycle (%): The length of time the laser beam is actually cutting as compared to the entire work cycle time with percentage.
Frequency (Hz): This parameter is used for to determine the frequency cycle between 0 – 5000 Hz. (Consider the formulation F = 1/T).
Height (mm): This parameter is used to define distance between nozzle and the sheet during the piercing process on edge.
Pressure (bar): Describes the pressure value of the process.
Focal: Defines the focal length of edging process.
Pre Feed (mm/min): This parameter is used for to define the feed before it comes to edging corner (parameter).
Pre Distance (mm): This parameter is used for to define the distance before it comes to edging corner (parameter).
Wait Time (ms): This parameter defines the wait time at the edging corner.
Post Feed (mm/min): This parameter is used for to define the feed after it finished edging parameters.
Post Distance (mm): This parameter is used for to define the feed after it finished edging parameters.
Edge Angle (*): This parameters defines the angle will be used for edging condition. For sharp edging generally used as 90 degrees. However it depends on graphic for tooth cutting this should be less then 90 degrees or at least related degree.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

10.6. Contour Mode



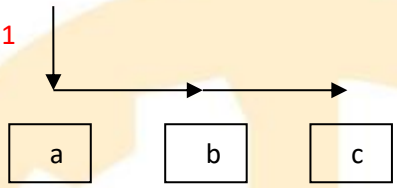
These parameters are used to adjust path specifications from one contour to another.

Figure 48 - Cutting Head Motion Selection

Move type: One of five different move types should be selected;

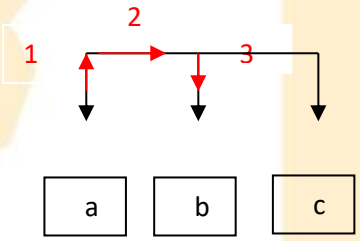
- Respectively;

No Head Up:



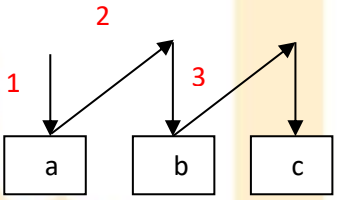
Moving from end of contour a, to the beginning of contour b; Laser cutting head will not rise and moves to position. (Position of Z axis will not change).

Ramp:

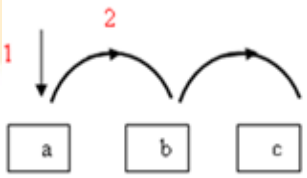


Moving from end of contour a, to the beginning of contour b; These steps will be followed.
.

Trapeze:

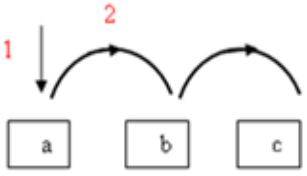


Moving from end of contour a, to the beginning of contour b; These steps will be followed.



Moving from end of contour a, to the beginning of contour b;These steps will be followed. Laser cutting head will move by arcs

Lift:



Ping-Pong:

Moving from end of contour a, to the beginning of contour b;These steps will be followed. Laser cutting head will move by arcs. This move type is similar with Lift but slower and action is completed by few small moves.

- **Contour Mode Distance Adjustments:**

  Min. Contour Distance (mm): This parameter determines the the minimum contour distance for travveling the cutting head.
  Max. Contour Distance (mm): This parameter determines the the maximum contour distance for travveling the cutting head.
  Small Head Up (mm): This parameter is used for to determine the minimum head up height.
  Large Head (mm): This parameter is used for to determine the maximum head up height.
  Feedrate (mm/min): Movement speed at non cutting condition or between parts.
  Gas Close: This option determines the if the cutting gas will be closed or opened during the movement between the parts.

- **If the distance between two consecutive contours**;

  - is smaller than the entered Min. Contour Dist. Value then laser cutting head will not rise up.
  - is between the entered Min Contour Dist. And Max. Contour Dist. Values then the laser cutting head will rise up as much as the entered Small Head-up value.
  - is bigger than the entered Max Contour Dist. Value laser cutting head will rise up as much as the entered Large Head-up value.

  Gas Option: This parameter is used to decide whether the gas will be close during the motion between two consecutive contours. Selection can be done as ON or OFF. If OFF is selected then the gas will be flowing until NC program ends. If it is adjusted as ON then system will compare the distance of two consecutive contours and the entered value of Dist. For Gas Close. If the real distance is bigger than the entered value then gas will be close during the motion..
  Dist for Gas Close: If “Gas Option” was adjusted as ON, this distance parameter will be used to decide to close gas or keep flowing.
  Cleaning Time: If there is a wish to change used gas type during the cutting process, then the next gas type will flow for the entered time value to prevent mixing of gases
  Dist for No Head-up: If the distance between two consecutive contours is smaller than the entered value. Laser cutting head will rise up as much as the value of Small No Head-up parameter. This parameter is used if and only if when No head-up move type was selected.
  Small No Head-up: If the distance between two consecutive contours is smaller than the entered Dist for No Head-up value. Laser cutting head will rise up as much as the value of this parameter. This parameter is used if and only if when No head-up move type was selected.
  Large No Head-up: If the distance between two consecutive contours is greater than the entered Dist for No Head-up value. Laser cutting head will rise up as much as the value of this parameter. This parameter is used if and only if when No head-up move type was selected.
  Important Note: If the entered values are out of specified parameter limits then a warning sign will appear inside of the incorrect box.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

10.7. Creating a new material page which does not exist in database

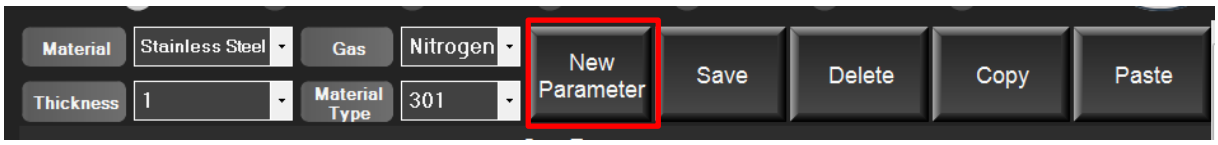
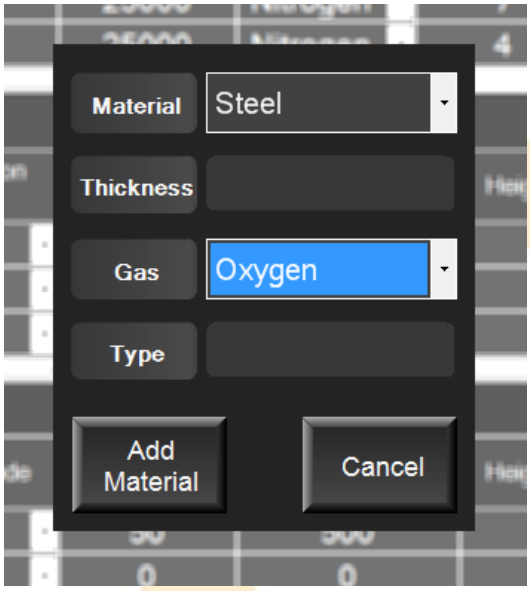


Figure 49 – New Parameter Button

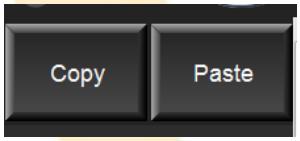


After tapping the button which is named as "New" at the left bottom of the window, material type, thickness and the number should be defined.

When "Add" button is pressed the new material page will be added.

When the new page is filled with the necessary parameters values it is ready to use in cutting processes

Figure 50 - New Parameters Page



The new page can be edited by using "Copy" and "Paste" buttons.

Figure 51 - Copy Paste Buttons

By using "Copy" button, when the page which is requested to copy is displayed, copy process can be completed. And then after opening the new parameter page by using "Paste" button the copied values can be assigned to the new page. Before pressing "Copy" button, "Paste" button is disabled to be pressed as it is seen in the picture above.



Figure 52 - Save Delete Buttons

After parameter alteration, it is better to be saved with the **Save** button.

"Delete" button is used for deleting parameter page belonging to material.

11. NC GRAPHICS

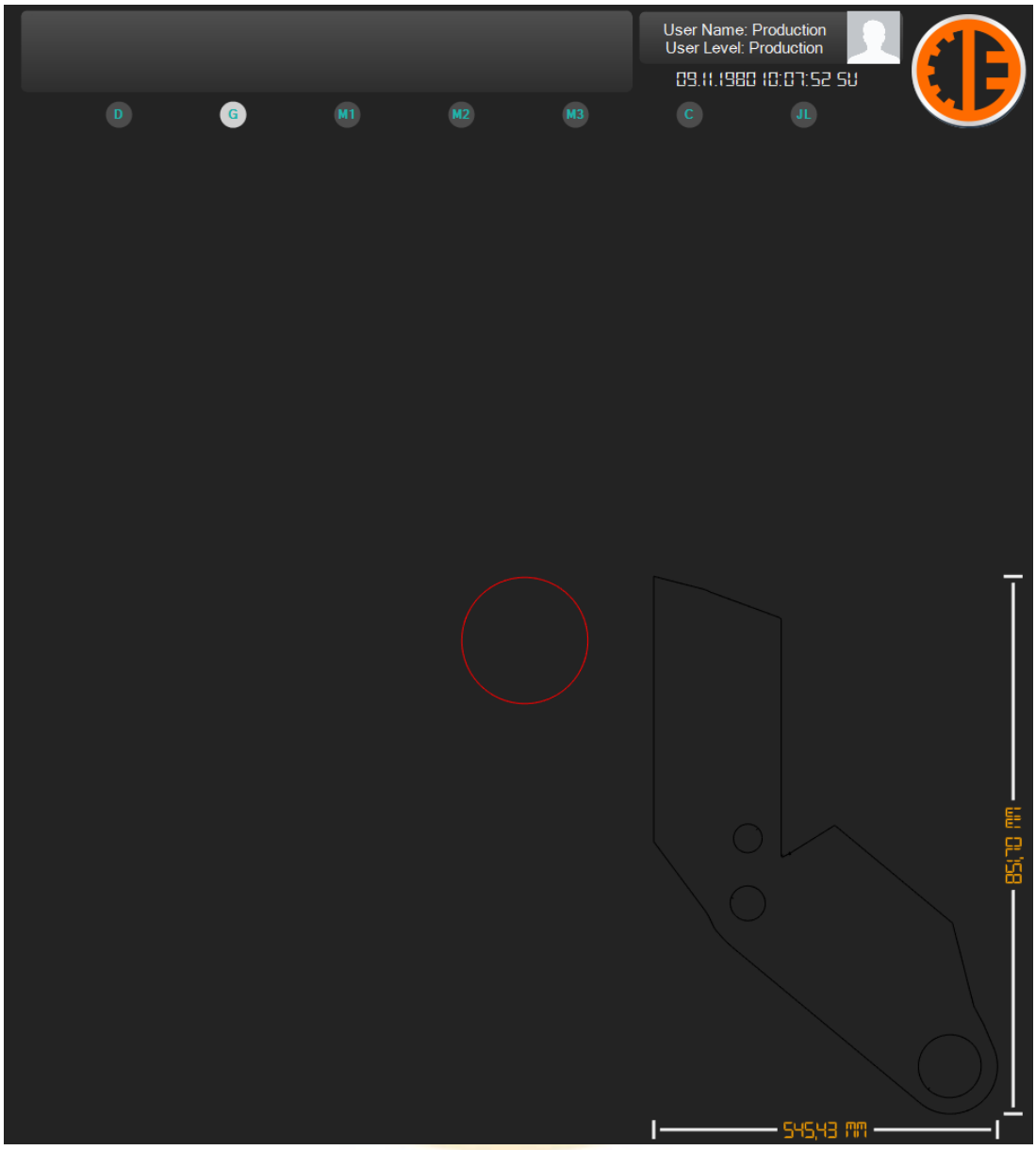


Figure 53 - NC Grafics Unit

This menu is used to display the drawing of the running G code in real time. Operator can zoom in and out with double finger zoom in and out. Graphic screen give information about the size of the .nc code. The size of the graphic is always include piercing and lead-in information as well. So the dimentions for the parts will or might be different from the original size of the parts. The graphic screen will only show the whole .nc code information. If it is only one part it will show its size, if it is a whole shhet it will show the size of the cutten size of the sheet.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

12. M1 MENU



Figure 54 – M1 Menu

From M1 Menu operator can reach menus listed and explained below.

12.1. Shuttle Table Control

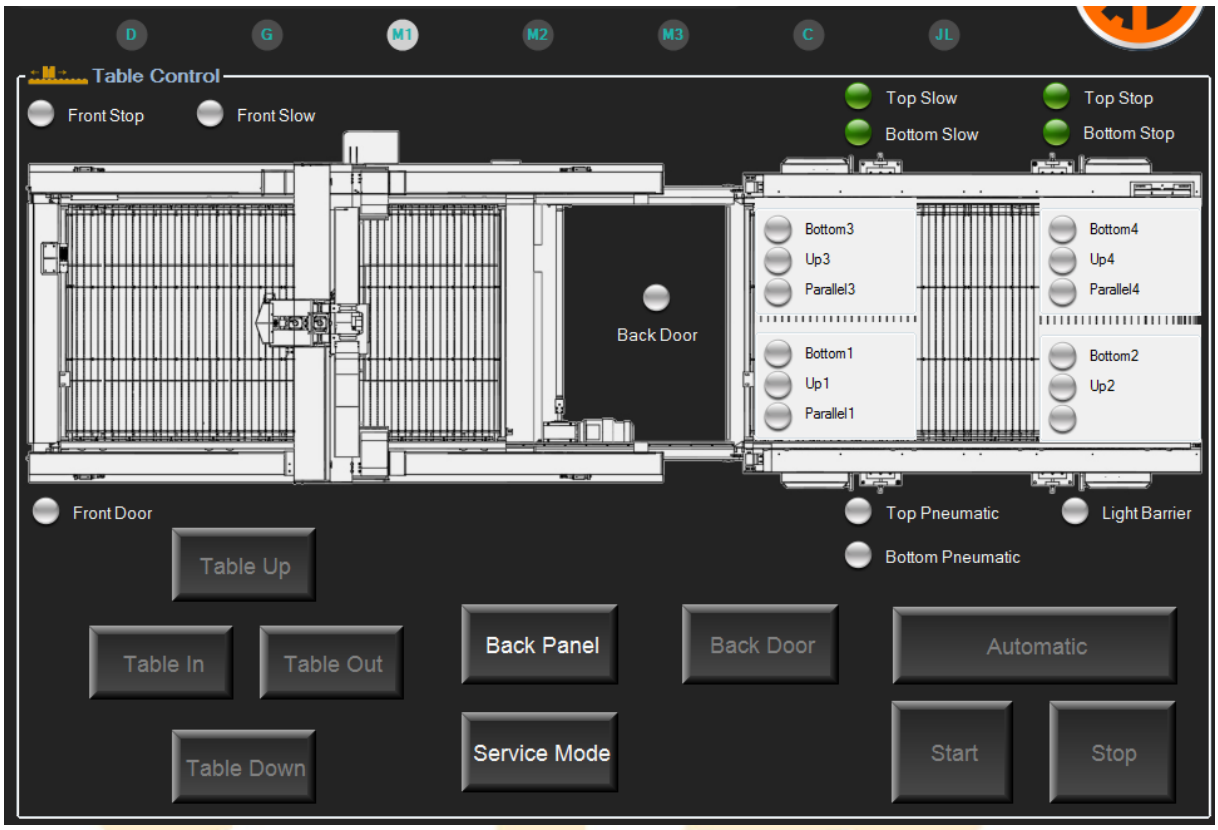


Figure 55 – Shuttle Table Control

Shuttle table system is controlled by this section. If positions of the rails are not correct or other conditions are not suitable, these buttons become less evident and cannot be pressed them.

Buttons;

Table Up: It is used for lifting up the tables at rear side. Both of the pallets must be exactly placed in back or forth line position.

Table Down: It is used to take down the tables at rear side. Both of the pallets must be exactly placed in back or forth line position.

Table In: This button is used to take into one of the table, if the positions of the tables are appropriate. (Tables are at bottom-inside the top table or tables are at top-inside the bottom table)

Table Out: This button is used to take out the inside table. If the positions of the tables are appropriate, button can be used.

Open/Close Back Door: It is used for opening / closing the back safety door. When the door is open button's colour is green, when closed it will be red.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

Automatic: It is used to run the shuttle table automatically. If Automatic button is pressed, as soon as start button is triggered, system will run automatically. When automatic mode is active, colour of the button will be green, in other status it will be red colour.
Stop: While operating in automatic mode, shuttle table can be stopped by pressing the Stop button to interrupt if desired. However, while moving back or forth movement if stopped by using this button, "Table In" or "Table Out" buttons must be used to complete the movement. In automatic mode start cannot be triggered again. During the up and down movements in such a case there is no need to use manually. It can be selected as automatic mode and run again by "Start" button.
Back Panel Active: Touch panel at the rear is used for controlling of shuttle table unit. While the panel is active the colour of this button is green.
Service Mode: It is used to set the service mode if shuttle table unit lost its balance. If there is no sign of balance fault on the controlling card of the shuttle table unit, this button will not be enable to use.

12.2. Focus Control

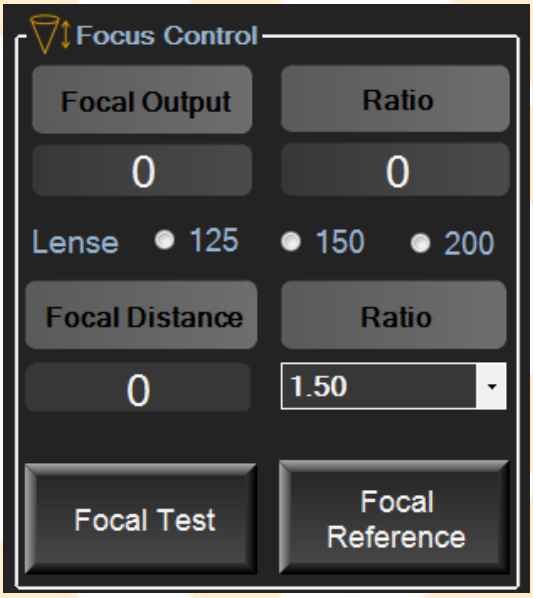


Figure 56 – Focus Control

Focal Reference: It is used for making the cartridge at the head take a reference. If the LED on the cartridge is red, it is understood that focal reference is out of order. By pressing the button, reference taking process is achieved and later on the LED on the cartridge gives green light.
Focal Test: It is used for activating focal distance value. When pressing the button, it is generated analog output voltage appropriate for the value entered the Focal Distance section.
Focal Distance: The value written here is activated with focal test button.
Focal Output: The value show the focal position online.
Ratio: This value can only be used if the cutting head is related with the ratio level. Else it is N/A.

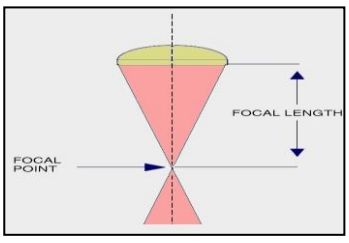


Figure 57 - The Theoretical Focus

12.3. Gas Control

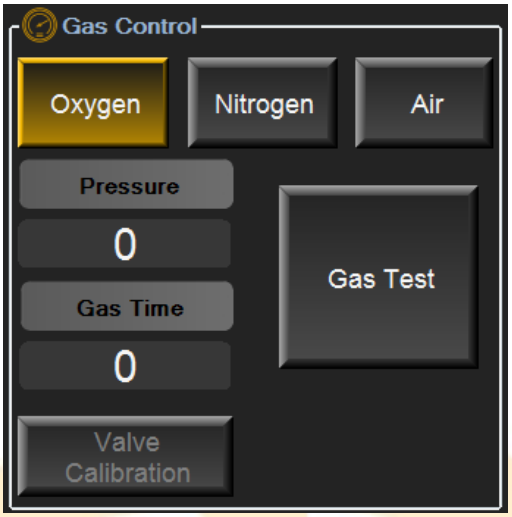


Figure 58 - HMI Gas Control

Max O_2 Pressure and Max N_2 Pressure are the technical info regarding proportional valve which is used. Unless it is entered correctly, gas pressure cannot be adjusted properly.

Gas selection to be tested is made. The color of the selected gas button becomes green. Test Pressure, Test Time are determined and test may get started by pressing the Gas Test button. The color of the button is green during the testing.

In the main screen, It can be read out that how much gas flow in bars at the output.



Figure 59 – Pressure Sensor Output

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

12.4. Laser Control Unit

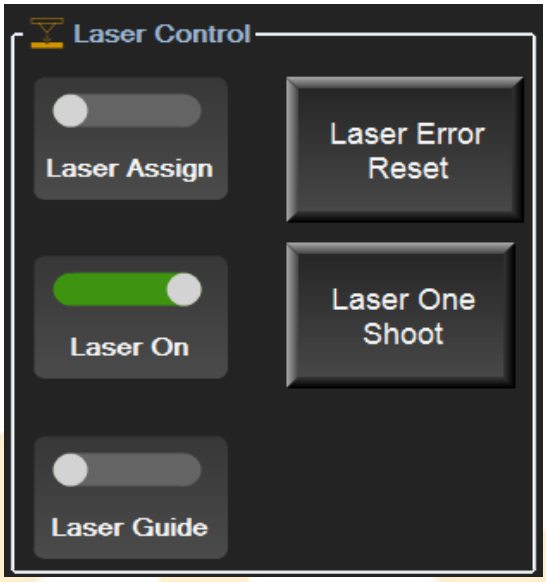


Figure 60 - HMI Laser Control Unit

Laser On/Off: It is used for preparing the laser together with laser assignment signal.
Lazer Assignment: It is used for preparing the laser together with Laser ON/OFF signal
Laser Guide ON/OFF: It is used for turning ON/OFF the laser guide.
Laser Error Reset: It is used for resetting the laser source.
Lazer One Shot: It is used for laser beam centering. It gives a temporal short term laser output and is expected to leave a trace on adhered tape. (It activates number 1 program on LaserNet.)

13. M2 MENU



Figure 61 – M2 Menu

From M2 Menu operator can reach menus listed and explained below.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

13.1. Usage Of The Starting Positions

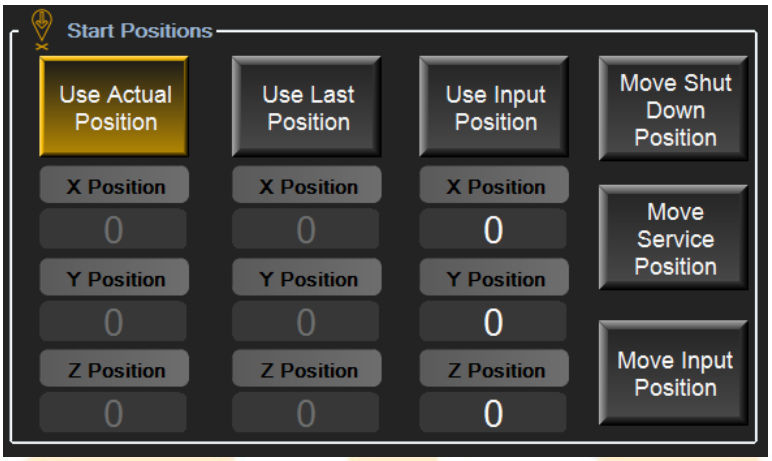


Figure 62 - HMI Starting Position Controller

It is selected from here that which starting position would be used for cutting programme (in nc format). According to the selection above, cutting programme accepts the coordinates of that position as zero '0' and starts from that position.

Use Actual Position: This tab is used if the head position is adjusted manually and wanted to use as 'starting position'. When the mode of machine is automatic and pressed the start button, the position of the head is assumed to be zero and the cutting starts from this. (If this choice is done)

Use Last Position: This tab is used if restarting the cutting programme (in nc format) by using last starting position. If this is selected, cutting programme will begin cutting from the latest starting position regardless of the current position of the laser head.

Use Input Position: This tab is used if described values would be used for the starting position of the cutting. It is not important where the laser head was or which point was used in the last process for starting position.
In this section the permissible values to enter for 3000 x 1500 mm machine are;

0-3000 mm on X axis, 0-1500 mm on Y axis, 0-145 mm on Z axis.

Move Shut Down Position: This is used to move the head to the predefined the "shutdown position". The head starts to move when the button is pushed.

Move Service Position: This is used to move the head to the predefined the "service position". The head moves the service position when the button is pushed.

Move Input Position: If Use Input Position is selected and this button is pressed, the head moves to the position which was entered.

13.2. Usage Of The Sheet Angle

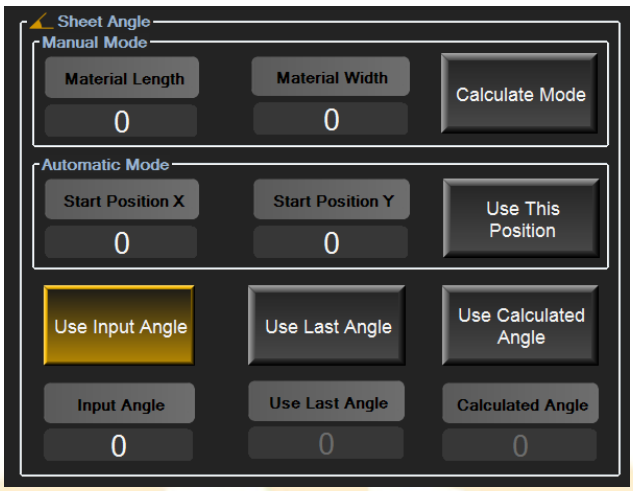


Figure 63 – Sheet Angle Calculation

"Sheet Angle" the angle option which was selected will be used during cutting operation.

- **Use Input Angle:** The entered angle value will be used in the cutting. If required angle is entered and "Start" button was pushed, cutting will be done with the entered angle.
- **Use Last Angle:** In order to use the same cutting angle which was used in the last run of cutting program (NC) this angle option should be selected and then clicking the Start button will be enough.
- **Use Calculated Angle:** If there is a calculated angle and this option is selected before the "Start" button is pressed then the calculated angle will be used in the cutting process.
- **Manual Mode:** While operating angle calculation, the cutting head must be inside of the sheet. After the procedure provided, measurement is done according to the entered dimensions of the material as the calculation button pressed. For this reason the material length and the material width values must be entered correctly. Otherwise, the head may crash to the grid plates.
- **Automatic Mode:** The material can be placed to a different position instead of (0,0), in this case position of X and Y must be entered here to execute the program starting from those X and Y position.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

13.3. HSU Calibration

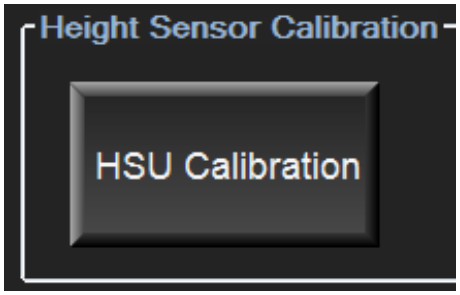


Figure 64 – HSU Calibration

When the button is pressed which is shown above, capacitive sensor of the EG8030 will be calibrated.

This operation can be implemented as described below;

First of all laser cutting head should be placed over an sheet which its size is enough and thickness is between 3mm and 8mm. After pressing this button the expectation is self calibrating of the sensor according to the metal density at different heights. When the motion ends the process is finished. If this calibration is interrupted due to any reason, this implementation should be repeated.

Warning: Once auto-calibration gets started the process must not be ceased.

13.4. Devices Control

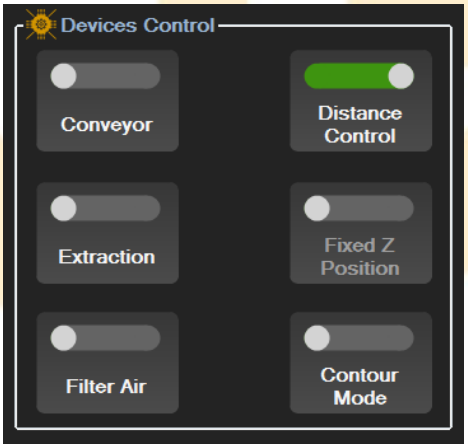


Figure 65 - HMI Devices Control

This section is available only in manual mode

Distance Control: It is used to activate/deactivate the distance control.
Conveyor: It is used to operate / stop the conveyor.
Extraction: It is used to operate / stop the extraction unit.
Filter Air: It is used for testing the Filter Air outlet. It is operated as ON-OFF.

Fixed Z Position: It is used only for a special purpose that keeps the cutting head to a fixed position. In this case capacitive sensor will be off position.
Contour Mode: If there are spline lines in the graphic this mode will make them as a line or radius related to the graphic.

13.5. Manual Remnant

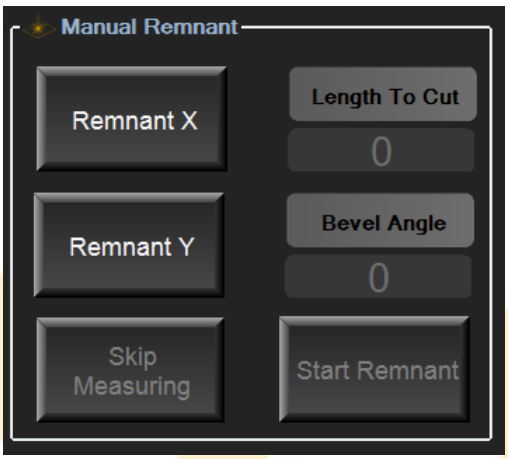


Figure 66 - HMI Remnant

The remnant function which uses:

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.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

13.6. Maintanence Part

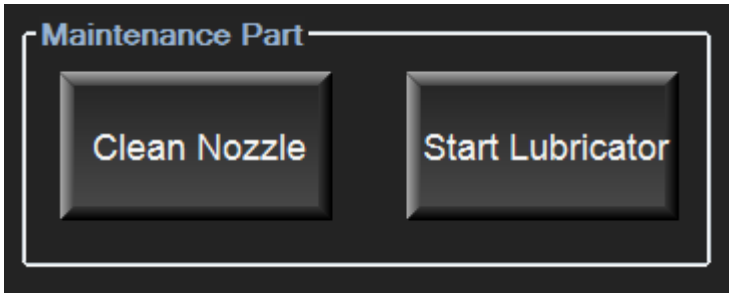


Figure 67 – Maintenence Part Buttons

- **Clean Nozzle:** It is used for to clean nozzle tip. It uses a special place in the machine. After the cleaning the cutting head will perform a HSU calibration and will go to zero position of the machine.
- **Start Lubricator:** It is used for to start the rack and pinion system lubrication.

13.7. LCM Control

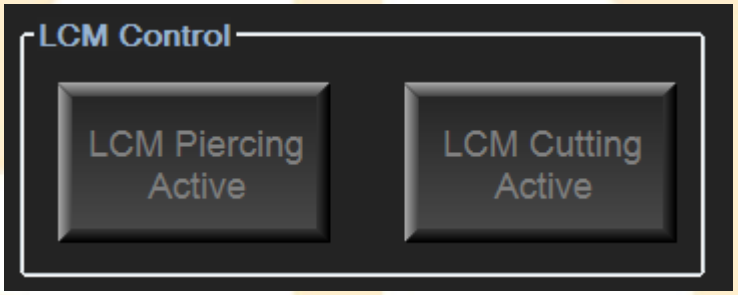


Figure 68 – LCM Control Buttons

This section is used with only if the cutting head has LCM unit on it. These button allows the operator to choose seperately the LCM unit active in piercing or in cutting or in both cases.

14. M3 MENU



Figure 69 – M3 Menu

From M3 Menu operator can reach menus listed and explained below.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

14.1. Procutter Sensors

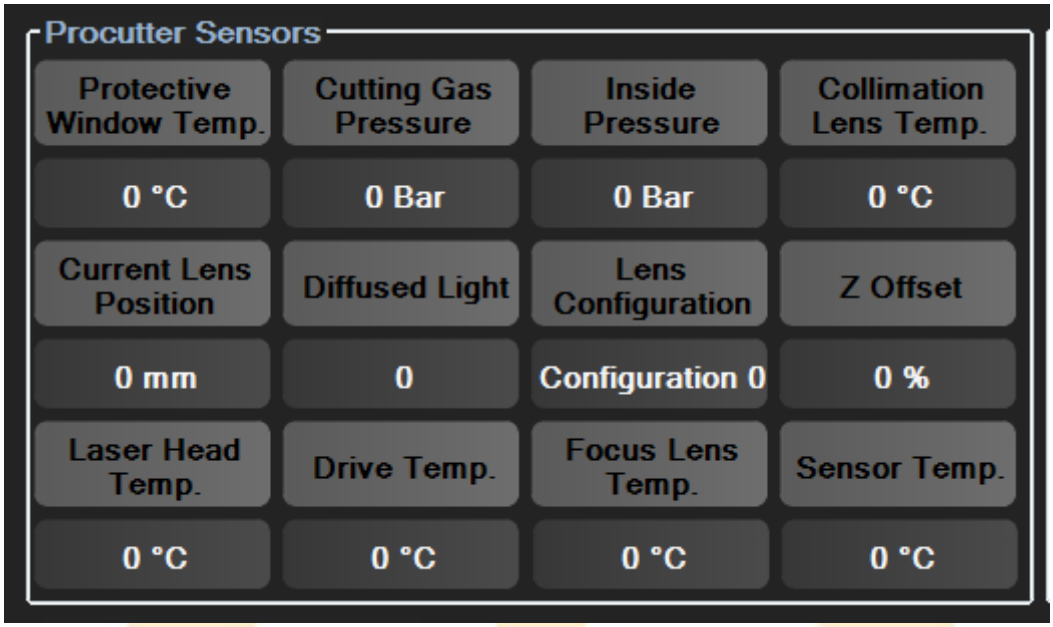


Figure 70 – Procutter Sensor Outputs

In this menu operator and technical service can observe the cutting head condition. This page is only information purpose and only shows sensor values.

14.2. Automatic Control

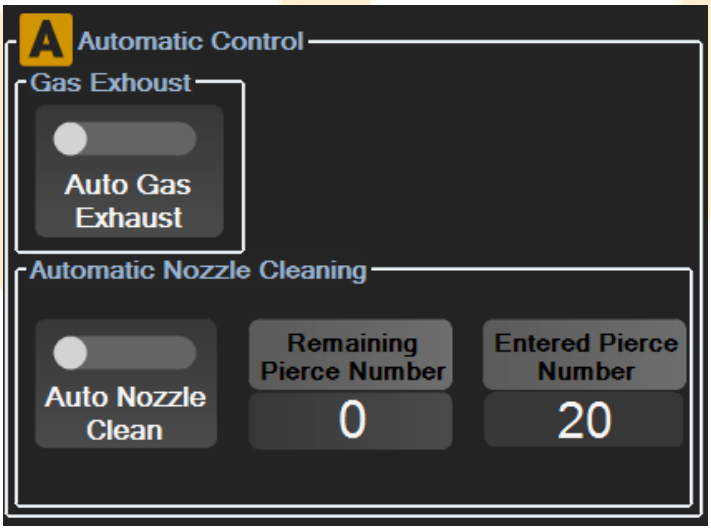


Figure 71 – Automatic System Control

In this menu operator can open and close some functions explained below.

Auto Gas Exhaust:

It is used for to make automatic gas exhausting between the piercings. Generally it is used with if different type of gasses are used in same program.

Automatic Nozzle Clean:

It is used to make the nozzle tip clean and HSU calibration after the entered number of piercings.

14.3. Miscellaneous Functions

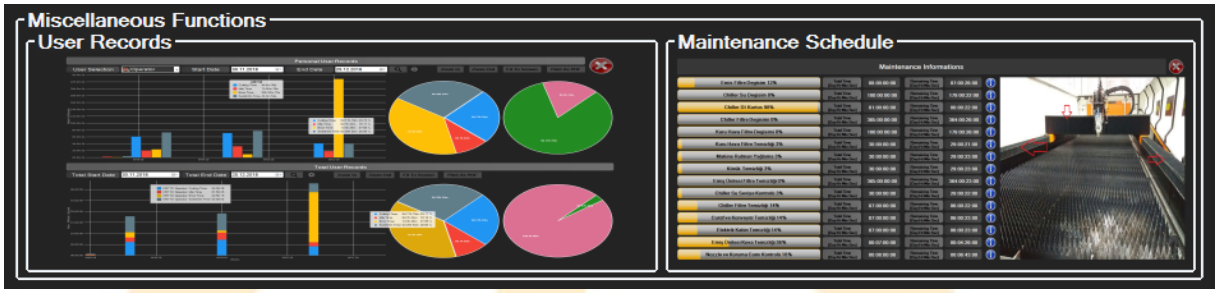


Figure 72 – User Records & Maintenence Schedule

User Records: In this section some related data about machine and cuttings can be observed by machine users.
Maintanence Schedule: In this section machine maintenance related times can be seen.

15. CAMERA

In the camera menu operator can see the cutting process in real time.



Figure 73 – Camera Button

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

16. JOB LIST



Figure 74 - Job List

At the job list section, all the cutting process which is lined up automatically can be done by giving job entry in the required numbers and types. As seen in the figure, all jobs could be repeated or deleted. The jobs entered over here can acquire the datas like material thickness automatically over Lantek Cad/Cam Programme. Besides, provided that there is a turret system over the machine, this system can select the sheet thickness automatically from the turret layers and can work in full automatic mode.

17. JOB CONTROL

If Job Control button is pressed, this window will be visible on the monitor and job orders can be given as the way it is in the Control Parameters menu.

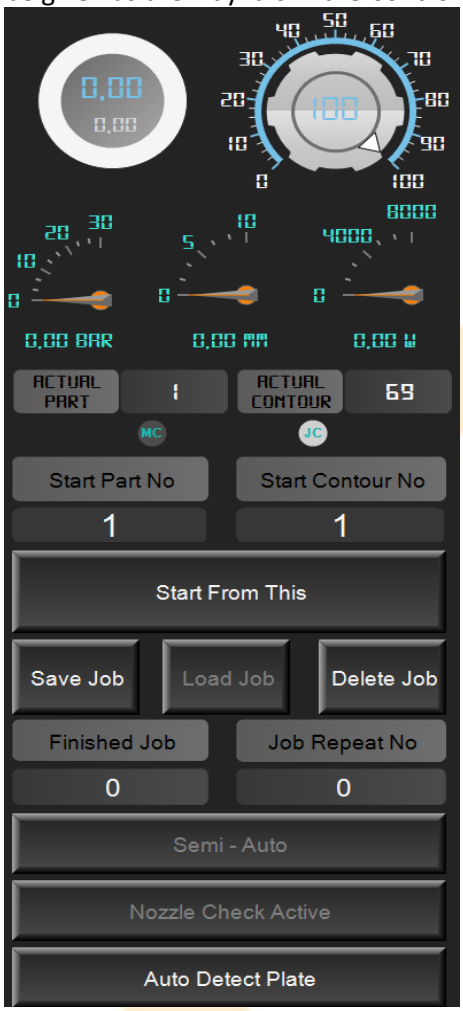


Figure 75 – Job Control

Actual part and contour numbers can be traced and the required part and contour are entered in the **Start Part No** and **Start contour No** section and is pressed the **Start From This** button; when the button turns into green, programme can be started.

If it is wanted more urgent work to be done during the cutting process;

For this process, job may be registered by using **Save Job** option. When pressing the **Save Job** button, system goes on working. In the next contour transition, machine stops and the information is given about the starting position of the work, cutting angle, and which part is left on which of the contour position. As the registration process is completed, button color turns to the red and stands as red till the completion and deletion of the registered job.

Provided that the registered job comes to an end; **Load Job** option is activated by pressing the button. Just as **Load Job** button is pressed, both of the button's own color and **Start From This** button's color turn to the green. After this stage, it is enough only to press the **"Start"** button. It mustn't be done anything during the process. Just as the cut-off gets going, the registered job is deleted and the buttons are positioned in their initial states.

If it is needed, Delete Job Button is possibly used for the deletion of the registered job.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

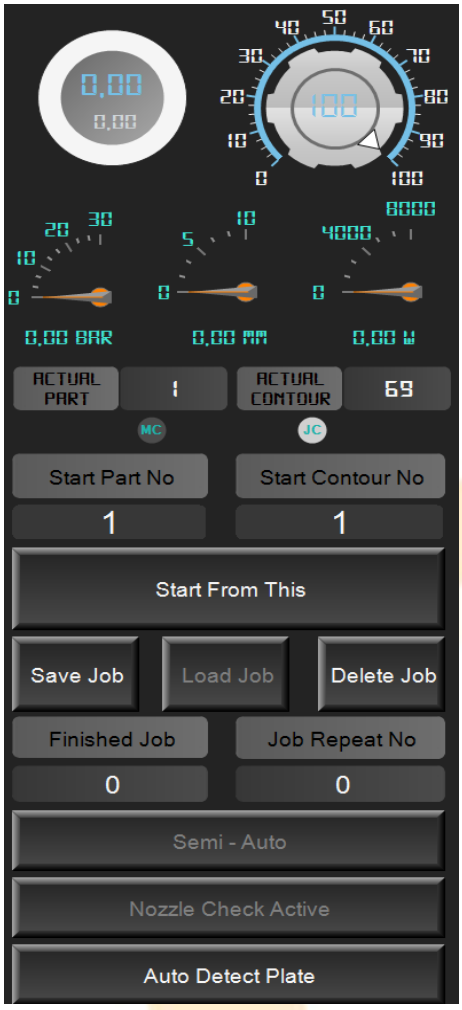


Figure 76 - Job Control

Semi-Automatic: Just as the semiautomatic option is not clicked on, machine works in a semi automatic mode. Operator is responsible for clicking on the start button again just as every sheet process is over.

Nozzle Check Active: As the nozzle control is not clicked on active, in every job alteration, machine starts working without nozzle control when passing to the new job.

Automatic: Just as it is clicked on the semiautomatic button, the option turns to the automatic mode. As the machine changes the table, the cutting gets automatically started without the need of an operator.

Nozzle Check Active: As this option is clicked on, the machine would want from you to take the cutting head to the service position to make a nozzle control.

Auto Detect Plate: As this option is selected, machine takes its positon in the starting point by detecting the plate automatically on the table by the change of a sheet.

18. WHAT IS THE LASER BEAM CENTERING AND HOW TO MAKE IT?

Nozzle centering is the adjustment of the laser to make it pass through the center of nozzle. This operation is implemented by using the adjustable screws which are placed on the cartridge. To be able to make this process easier, tip of the nozzle should be made a little bit stained with some dust and then a tape should be pasted. If the tape is placed well low powered laser may be shot for a short time. This operation can be done if the laser source is switched Robot mode by using Laser One Shot button. Else if the source is switched Test mode it should be implemented by using LaserNet.

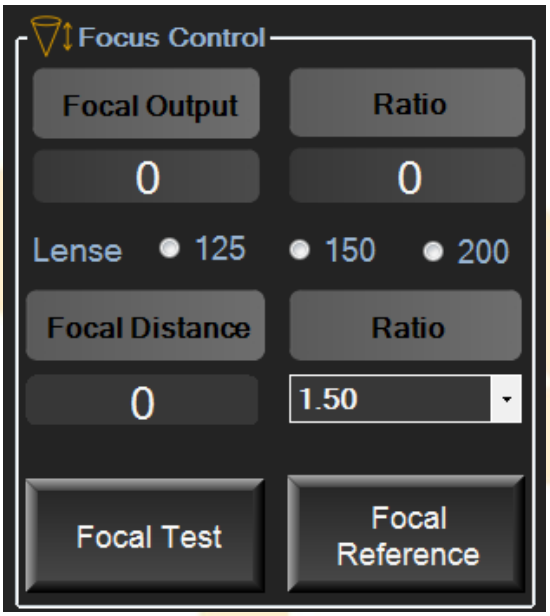


Figure 77 – Focus Control

If the laser is on **ROBOT** mode, this laser shot is done by entering ***zero (0)*** to the Focal Unit zone over the HMI and then pressing the **Laser One Shot** button, from the Control Parameters section and push the **Focal Test** button if it is on the TEST mode, it can be achieved from the **Control** Menu.

If the tape is spliced approximately 45 degrees of an angle (crosswise with the cutting head);

- The screw, which is placed at he left side from front view; if it is turned towards left laser will move towards left if it is turned towards right laser will move towards right.
- The screw, which is placed at he right side from front view; if it is turned towards left laser will move towards down if it is turned towards right laser will move towards up.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

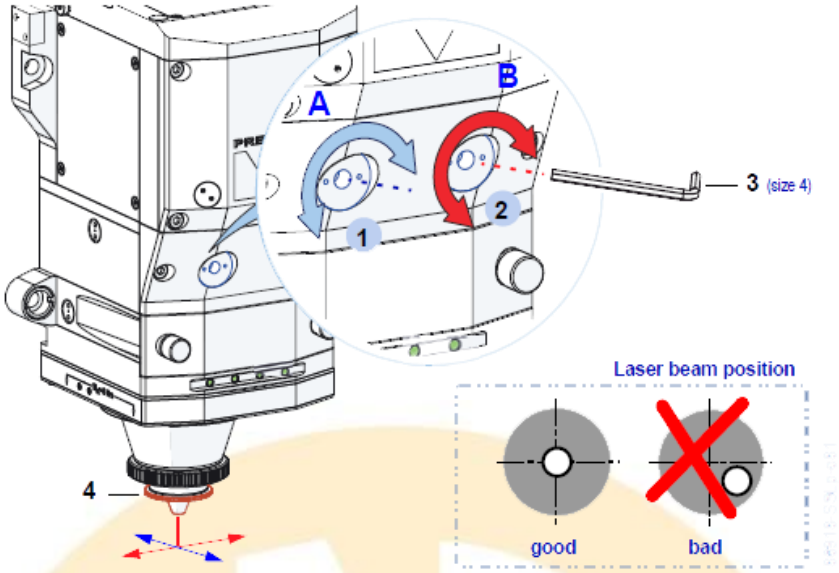


Figure 78 - Laser Beam Centering

1- Adjustable Screw A
2- Adjustable Screw B
3- Allen (4mm)
4- Nozzle

19. HSU Calibration

Height Calibration button;

When the button is pressed which is shown above, capacitive sensor of the EG8030 will be calibrated.
This operation can be implemented as described below;
First of all laser cutting head should be placed over an sheet which its size is enough and thickness is between 3mm and 8mm. After pressing this button the expectation is self calibrating of the sensor according to the metal density at different heights. When the motion ends the process is finished. If this calibration is interrupted due to any reason, this implementation should be repeated.

Warning: Once auto-calibration gets started the process must not be ceased.

20. LANGUAGES

Language of the HMI can be selected from this page. It can be selected from the list shown in figure. To open this section, operator should press Ermaksan logo button twice.

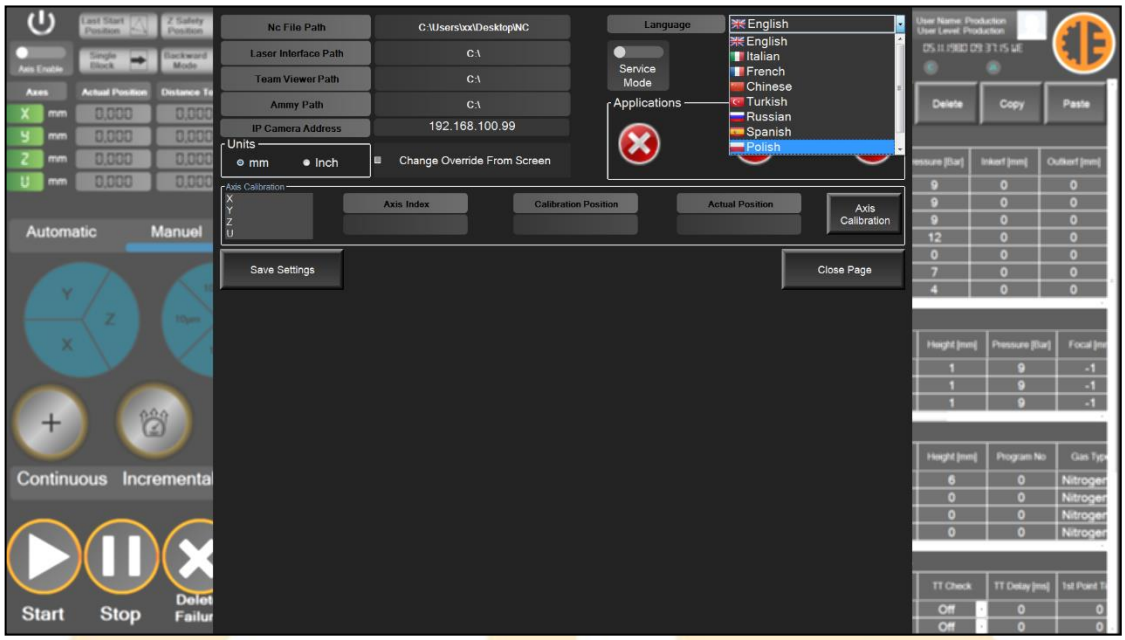


Figure 79 - Language Selection

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

21. RESTARTING PLC AND SYSTEM MANAGER

From “Windows Tool Bar”, “Twincat System Manager” icon should be clicked.

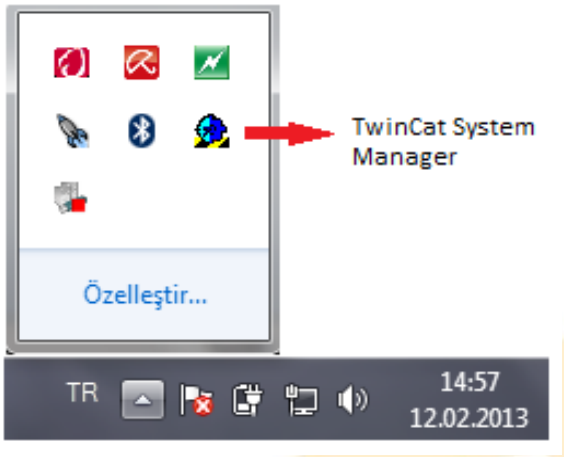


Figure 80 - TwinCAT Symbol

From “Windows Tool Bar”, “Twincat System Manager”, ‘’Restart’’ icon should be clicked.

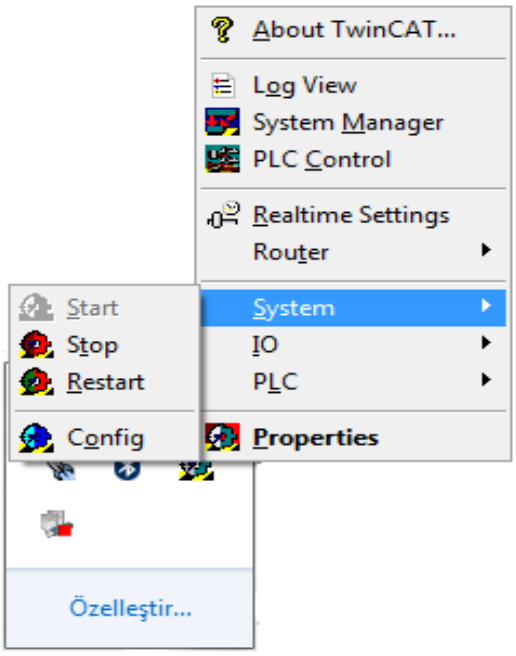


Figure 81 - TwinCAT Reboot

After this operation “System Manager” and “PLC” will restart in few seconds and their states will be “RUN” again.

22. PIPE AND PROFILE CUTTING

Pipe cutting is offered as an option for the machine. This profile can be bought as an addition to FİBERMAK or seperately profile and pipe cutting machine. For the profile cutting option, without any hardware alteration, it can be bought as a software. For the profile cutting option, by adding a hardware to the machine table, it ought to be introduced to the programme as a software. Other than these options, a FIBERTUBE cutting machine can be bought.

22.1. Profile Cutting

In one side profile cutting process other than sheet cutting, profile cutting active button is to be clicked on by entering profile height to the profile cutting active part at the machine parameters section. This kind of Cut-off process is exactly the same as sheet cutting.

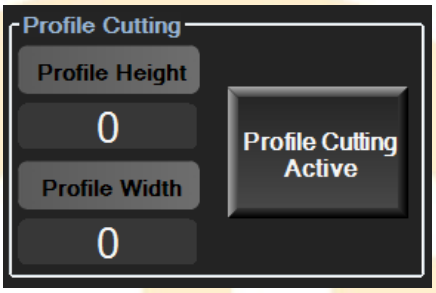


Figure 82 - Profile Cutting

Utilized drawing programme is Lantek; according to profile dimesions, sheet is to be sized and the parts to be cut over the surface of the sheet are to be positioned.

22.2. Profile Offset System Zero Point Adjustment

At the below figure, the first support left point is considered as the zero point. This part is possibly found via laser guide and a smooth-edged sheet. The value found at the machine parameters is entered the relevant section and registered.

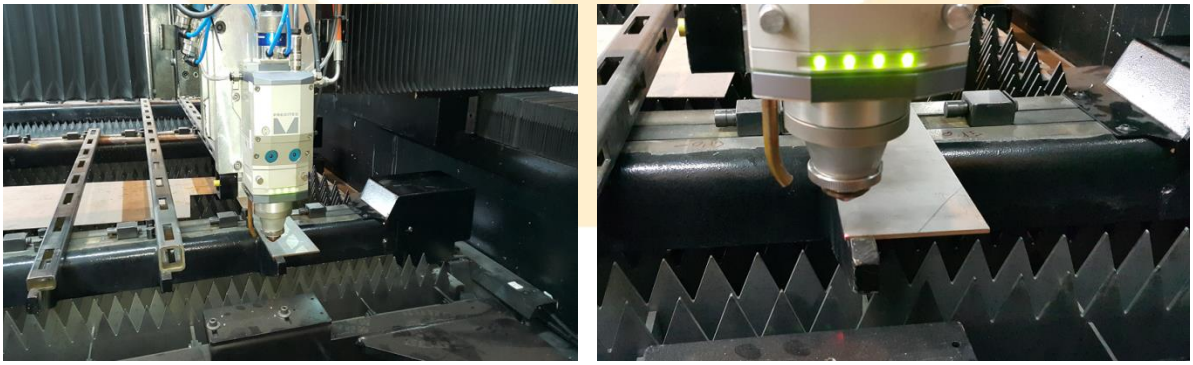


Figure 83 - Profile Sliding System

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

Axis values on the monitor are entered the relevant section at the machine parameters page and registered.

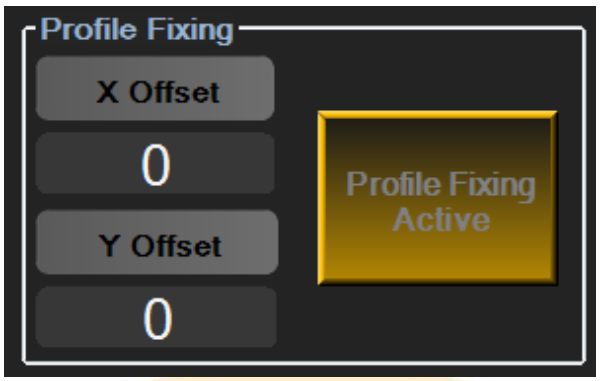


Figure 84 - Profile Fixing

Thus, zero point for the profile offset is registered to the permanent data.

22.3. Achieving Profile Offset Process

This process can be achieved from the back control panel or from Machine Parameters page.

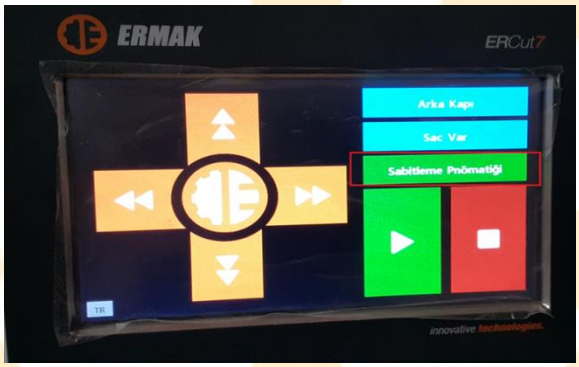


Figure 85 - Profile cut-off active And Pneumatic Locking

22.4. How to Draw Profile Offset Process in Lantek Programme

Provided that the user makes a process on the profile surface, no space should be remained among the sheet edges in the Lantek. For this reason, the user must make the following choices;

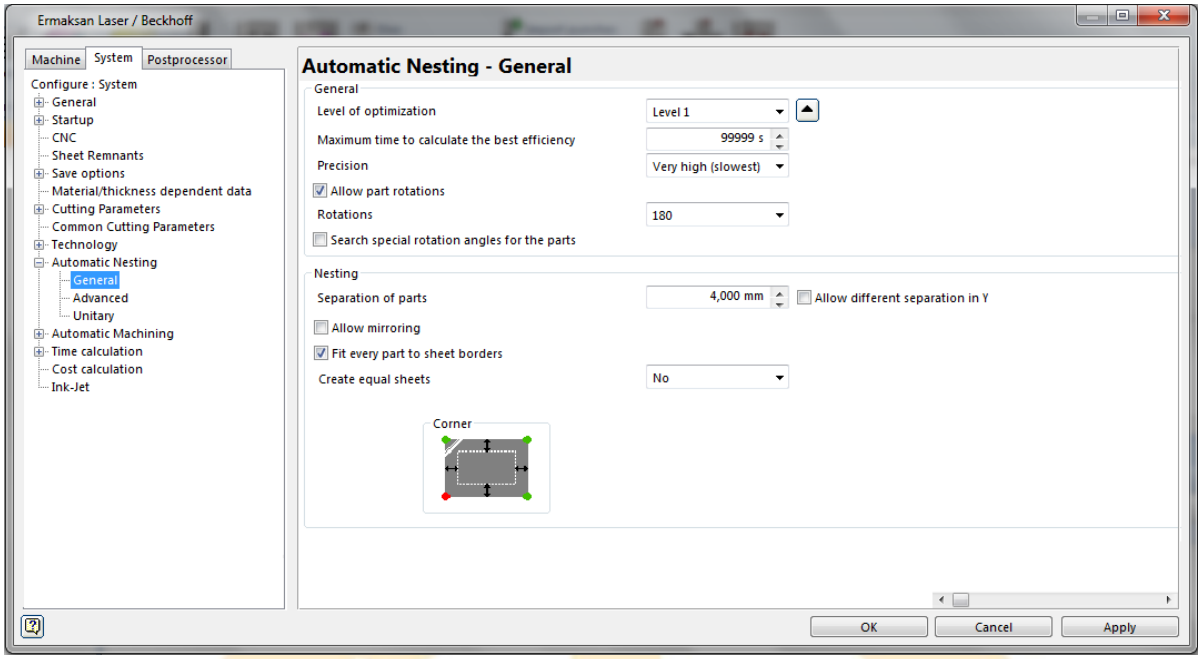


Figure 86 - Lantek Sheet Edge Adjustment

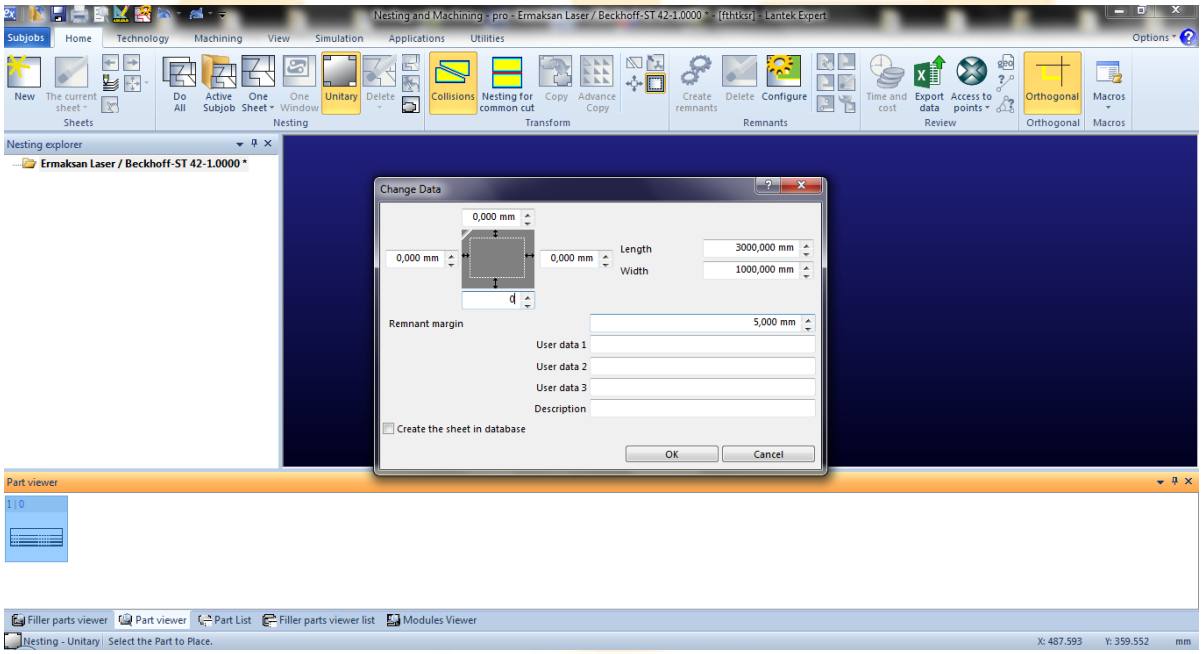


Figure 87 - Lantek Location Drawing

That the processing over the profile is to be made up on AutoCad or something like programmes and he/she must be carreful about the spaces between profiles. The distances between starting points of two profiles are 190 mm.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

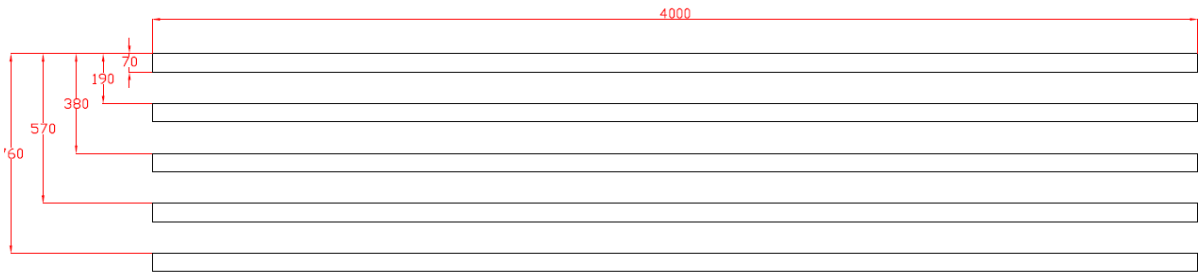


Figure 88 - Drawing Gaps For Profile

22.5. Activating The Profile Cutting

After the formation of the relevant cutting code, we load the cutting code into the CNC code and then we can start cutting by entering the below profile information.
Profile offset pneumatics must be locked and the height and width info belonged to the profile must be entered already.

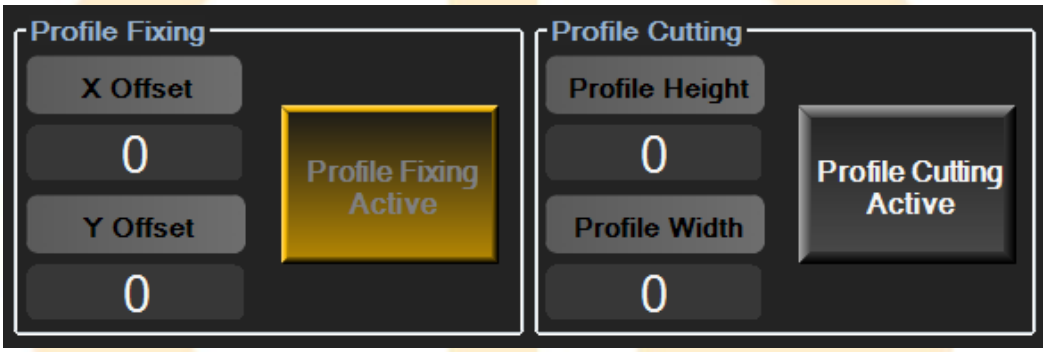


Figure 89 - Profile Cutting and Fixing Offset

22.6. Pipe Cutting

The drawing programme is Almacam in pipe cutting option. We adjust the clamp positions in Almacam programme and these same clamp positions should be wrtitten inside the control parameters, specifically in Control parameters 2, clamp positions. The correct entrance of the clamp positions is moliminous. If it is entered incorrectly, cutting head may have a possibility to crash the clamps.



Figure 90 - Pipe Cutting

Pipe Cutting tab is opened on the HMI with pipe cutting option. We can possibly cut parts by entering pipe and profile dimensions. Pipe cutting process in the pipe cutting machine is exactly the same as it has been mentioned in figure 22.2 Sample Cutting Section; the only difference is to enter the pipe and profile sizes correctly.

Standart Pipe Cutting Process:

1. Let's place pipe or profile that we want to have them cut by the machine.
2. We are selecting the Wall thickness of the material and assistant gas number.
3. Provided that material is a pipe, We a click on ysu callibration button for the pipe from the machine parameters section. As the callibration is over, everything is well-prepared.
4. If your material which is used is a profile, then with Radius blade, you should enter the Radius values of the profile correctly by measuring at the pipe cutting tab.
5. The divergences at the Radius values will slide your cutting from the mid point of the profile. We can start cutting by getting the machine into automatic mode and can select the programme which we have drawn at the Almacam.

22.7. Pipe – Profile Cutting Differences

- **System Differences**
  - **In pipe cutting V4, cutting area is not ment to be resricted. For instance, provided that the machine is 2 to 6 m, and in both of the tables, it is possible to make process onto the sheet.**
  - **Pipe cutting system has its own shuttle table, conveyor, and suction unit. There is a control page which belongs to pipe cutting shuttle table at the back panel.**
  - **Utilisation at the pipe-profile cutting side is as identical as the previous versions. Clutch legs are changed with regard to the type of pipe to get cut.**
  - **Different legs are used in rectangular, square and circle. Yet, according to the pipe types, upper and lower supports stated at the list of utilization must be used.**
  - **CAD-CAM is identical with the previous utilization. ALMACAM is in use.**

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

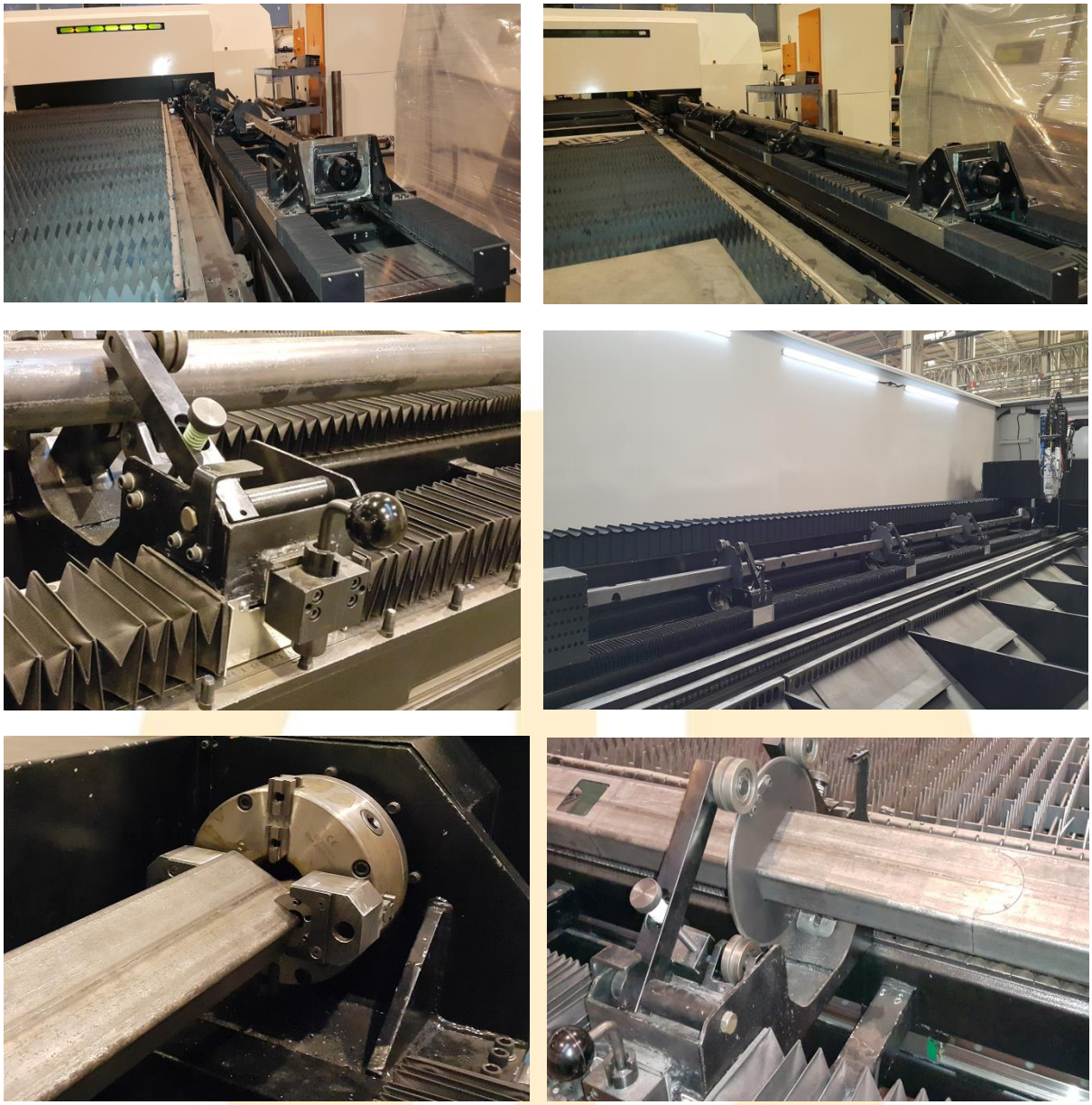


Figure 91 - Pipe Lay-Out on the Shuttle

- **Back Control Panel Patches**

  A different page which maintains the control of the pipe cutting shuttle at the back panel has been added. At this page, pipe cutting shuttle table, its back-and-forth movement, automatic movement start-stop and back panel on-off commands can be given. The user can make transitions between pages.



Figure 92 - ERCut7

- **The Buttons Added in HMI**

  The buttons added to HMI section are as seen below figure. These buttons Are used to control the pipe cutting Shuttle Table. Shuttle table can have back-and-forth and automatic movements. At this section, the conveyor belonged to pipe cutting can be used as well.

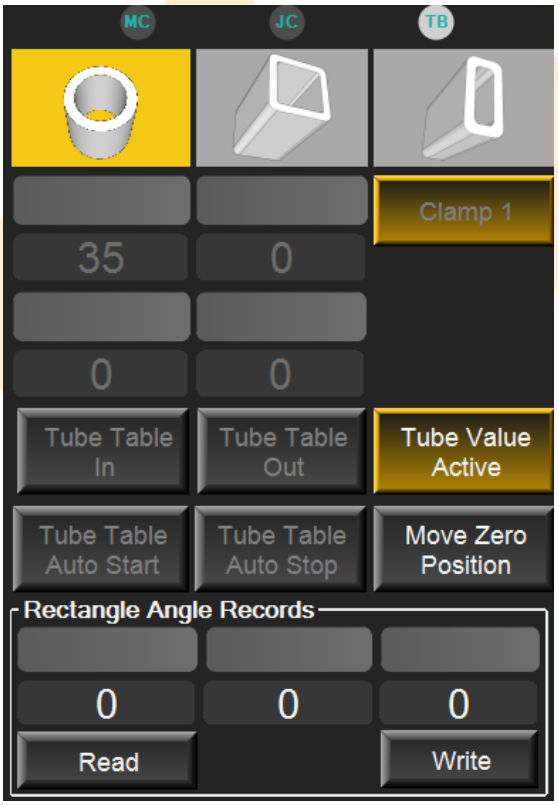


Figure 93 - Pipe and Profile Cutting

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

- **At the V4 Pipe Cutting, Entering the Rectangular Profile Angle Value to the system**

  In view of the clutch legs used, at the rectangular profile assembly, a particular angle divergence occurs. This divergence should be removed to be able to make a process onto the rectangular profile. Offset is given at the beginning of the cutting in which the the long edge will be put upside and have zero angle.

  At the previous versions, there are special clutch legs for every rectangular profile. That is because the user doesn't have to enter an angle value to the system. The user should record the offset angle which is essential for every rectangular profile since multiple rectangle legs in V4 are in use. This process is to be done from the below page. Profile values can be read from the relevant section or can be registered. The user does this only once. The value is recorded to the permanent data.

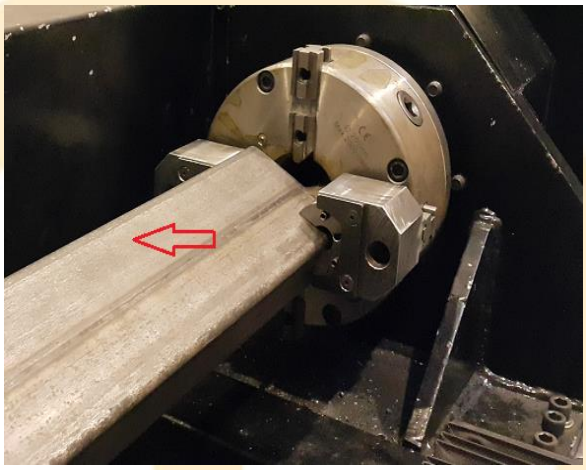


Figure 94 - Profile Cutting Angel Adjust Screen

23. MAINTENANCE

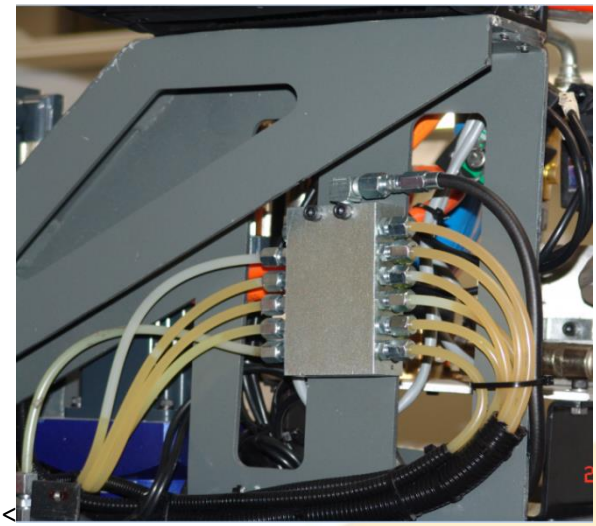
If you want to make maintenance first you have to turn off the machine completely. Procedure of on-off machine explained at Chapter 5. The owner or the operator is not permitted to dismantle or shut down any safety equipment if set-up, maintenance or service work makes it necessary to dismantle or shut down such safety equipment, it is imperative that these safety devices be reassembled or reactivated immediately upon completion of such work.

- **Maintenance Of All Axes**;

  There is automatic lubricating system on the machine and it lubricates all necessary points periodically. When the oil level at the tank of automatic lubricating system is too low, it gives alarm message on control panel. Loading of this unit is to be done with the lubrication pump.

  The Lubricant Used is MOBILLUX EP 004

Note: Probable deformations on lubricating pipes should be checked weekly.





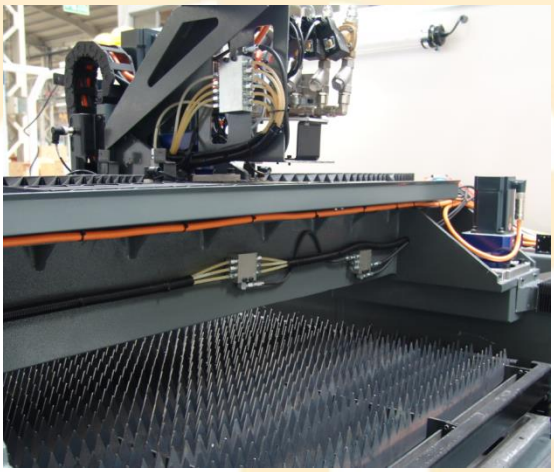


Figure 95 - Lubricant Hoses Unit

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

23.1. Maintenance For Cutting Head

- **Ceramic Part and Change Of Nozzle**

Ermaksan recommends cleaning the laser head carefully before carrying out any service or maintenance (repair) work.

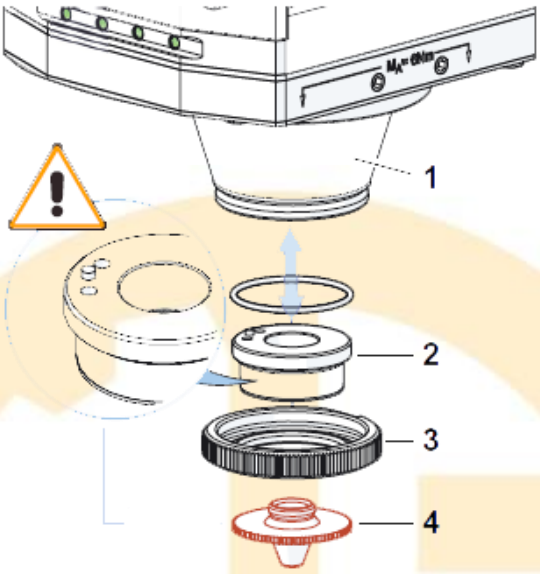


Figure 96 - Ceramic Part and Nozzle

1 Sensor Insert **SE**

2 Ceramic **KT**

3 Nut **MU**

4 Nozzlel **DE** (nozzle electrode)

- **Replacing the ceramic part**
  - Clean the ceramic part (3), replace if necessary.

Note: When replacing the ceramic part, the supplied O-ring (Ø26.00 x 1.50 Viton) must be replaced too. Service or maintenance (repair) work.

- **Changing The Nozzle**

  - The nozzle and the nut must only be tightened by hand (do not use any tools). Otherwise the ceramic part could be damaged. In addition to this, make sure that the contact surfaces on these parts are clean.
  - An adjustable hook spanner size 40/42 can be used for easy removal.
  - If the nozzle is damaged by the laser beam or after a collision, it must be replaced.
  - Screw the nozzle into the sensor insert by hand..

Warning!

- Any protective or safety equipment removed must be fitted again prior to the commissioning or setting up of the laser head - then checked to ensure it is working properly.

23.2. Care And Maintenance Of Protective Window Cartridge

The components which are fitted into the beam path of the laser head must be handled carefully.

Attention – Clean workplace!

Only carry out any maintenance and repair work on the laser head in a clean workplace.

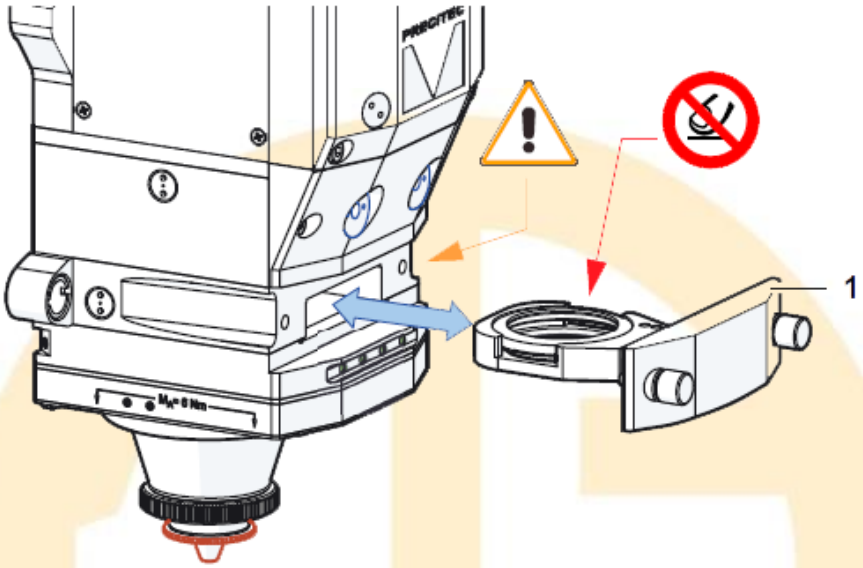


Figure 97 – Protection Glass Holder

1 Protection Glass Holder

23.3. Colimation Lens, Focal Lens and Upper Protective Window

Lenses and upper protective window must not be opened by customer or operator on the cutting head. Technical service would open it if necessary.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

23.4. Replacing The Protective Window



Attention - Clean workplace!

Only carry out any maintenance and replacement work on the cutting head in a clean workplace.

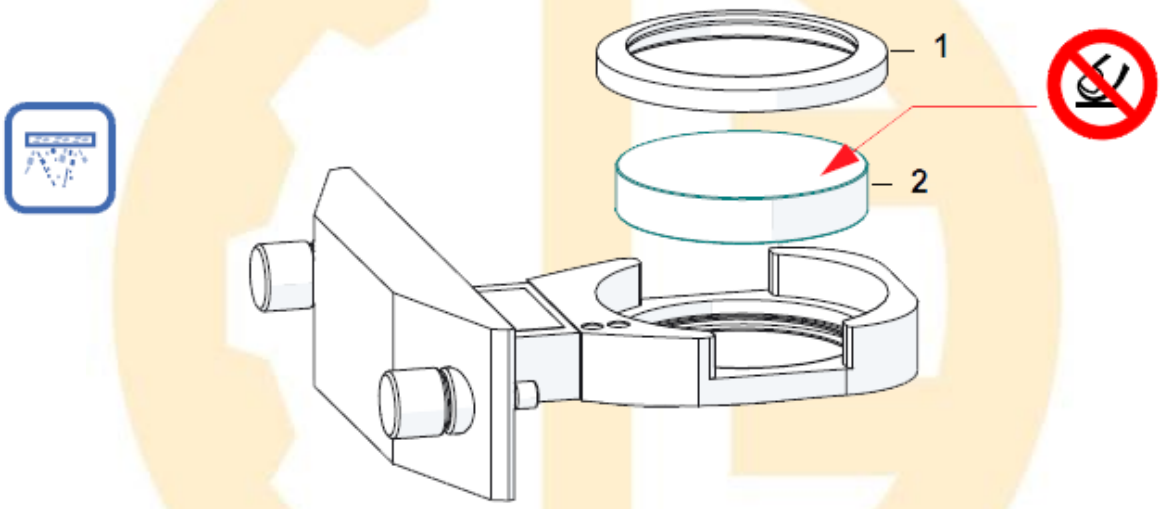


Figure 98 - Protective Glass

1 Cartridge

2 Protective Glass

23.5. Replacing The Axial Screw

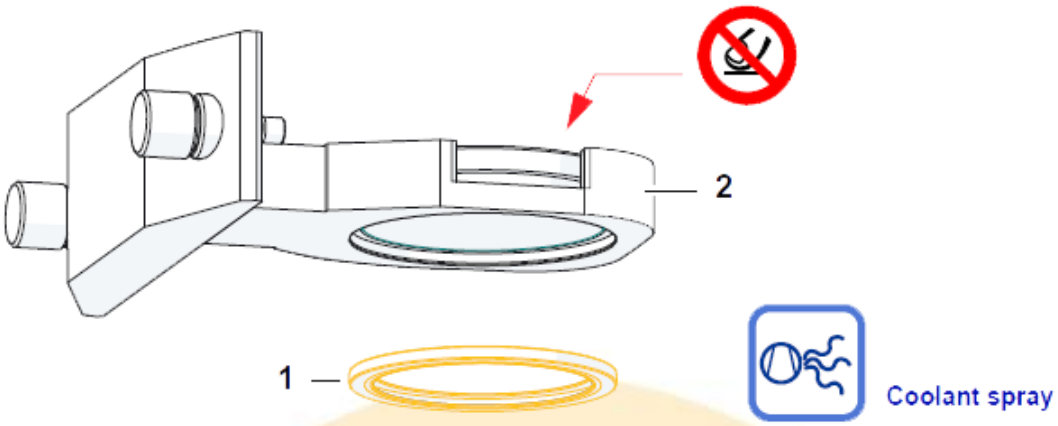


Figure 99 - Axial Screw

1 Sealing ring **DR** (axial gasket 0033694)

- *Eroded, damaged screws must be changed.*

Warning-Ambient Temperature!

Different materials such as aluminium, steel and plastic have different thermal expansion coefficients. If the ambient temperature drops below 10 °C, you must check that the sealing ring is positioned correctly, especially when replacing the cartridge.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

23.6. Maıntaınıng The Sensor Insert

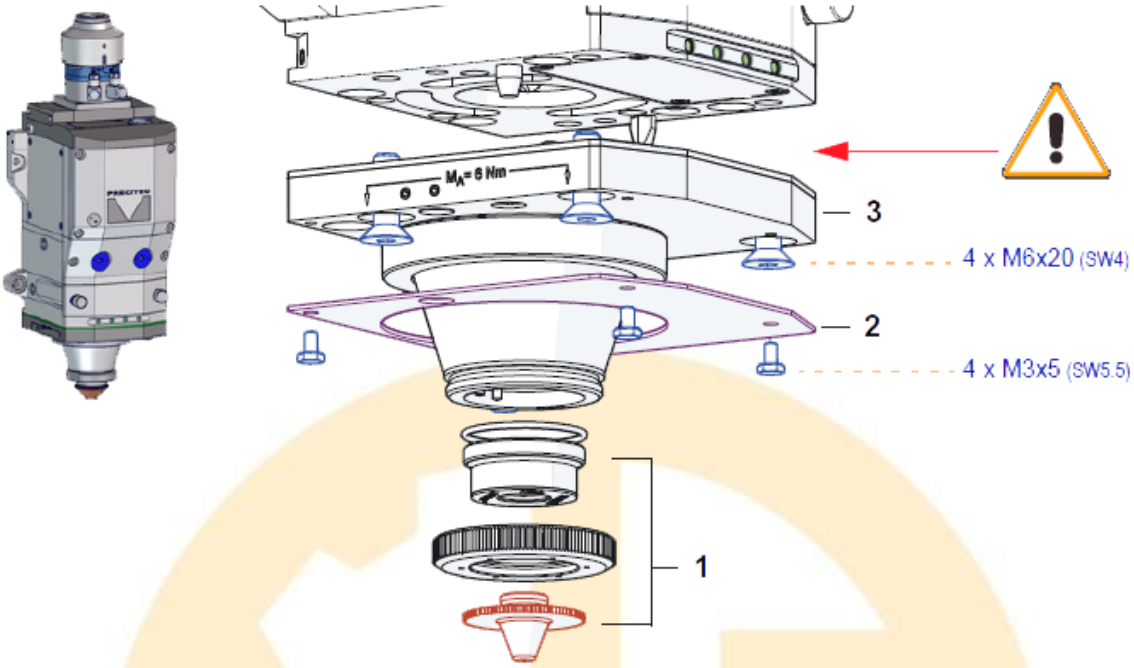


Figure 100 - Cutting Head Sensor Region

1 Nozzle **DE**, ceramic part **KT**

3 Sensor insert **SE**

2 Spatter protection plate **PP**

4 Extension adapter **VA**

- Undo the screws (2x hexagonal screws SW7) and remove the spatter protection plate (2).
- Undo the countersunk screws (4x Allen screws SW4) and remove the sensor insert (3).

Installing the sensor insert

- Attach the sensor insert (3) to the connection head and tighten the four countersunk screws (4x Allen screws SW4) with a torque of 6 Nm.

Note the locating pins on the laser head when doing this. These must engage into the sensor insert. The sensor insert must not get stuck.

Warning - Attention: If the O-ring on the sensor insert is positioned wrongly or defective, the laser head may leak.

- We recommend that you install a new ceramic part and O-ring (ø26.00 x 1.50 Viton) when replacing the sensor insert.

23.7. Maintenance of Beam Forming Optics (Authorized Educated Professionals Only)

When replacing optical components, a spotlessly clean working environment is absolutely imperative if repeatable and optimum processing results are to be achieved with the laser head. Even the smallest particles of dirt (not always visible under normal lighting conditions) can affect the results of the cutting process and reduce the service life of the beam shaping optics.

23.8. Chiller Unit Maintenance And Cleaning Instructions Of Chiller

WATER LEAKAGE

Check Point	Water leakage
Method	Visual Inspection
Clearance	weekly
Tools	Flashlight
Expenditure time	< 5 min
Description	Open the doors of the laser and chiller cabinet and look for water leaks, leaky connections, damaged pipes

WATER LEVEL

Check Point	Water Level
Method	Visual Inspection
Clearance	Weekly
Tools	-
Expenditure time	5-10 Min (inch refilling)
Description	Check the water level of Tap water and DI water reservoir using the according level indicators. Therefore open the rear door, right side of the laser (in case of integrated chiller) or the rear door of the chiller. If necessary refill Tap/ DI water using accordant filling nipple. For the external optics cooling circuit only DI water must be used

WATER FİLTER

Check Point	Water Filter
Method	Visual Inspection
Clearance	Monthly check/ annually exchange
Tools	19 mm / 23 mm wrench
Expenditure time	20 mins
Description	Once per month the filter at the water input nipple should be checked and cleaned if necessary to ensure optimum water flow rate.

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

AIR FILTER

Check Point	Air filter
Method	Visual Inspection
Clearance	Once a week
Tools	-
Expenditure time	5 min for visual control 30 min for filter exchange
Description	Please check the status and the level of pollution of the air filters at chiller side. A high degree of pollution reduces the air flow rate and also cooling efficiency of the chiller

WATER QUALITY

Check Point	Water Quality
Method	Visual Control
Clearance	Once in Three months
Tools	-
Expenditure time	15 min.
Description	Please check the water quality of both cooling circuits (DI and tab water) If you observe any sediments (e.g algas) in the water tank then deflate the tanks and water pipes by provided water output nozzles. If it is necessary please clean up the tanks and the relevant water pipes. In case of a complete water exchange please also clean up the water input filter at laser side

WATER CONDUCTIVITY

Check Point	DI Water Conductance > 25 µS
Clearance	If it is required
Tools	-
Expenditure time	30 min
Description	If the water conductance increases a value of over 25 µS (indicates a chiller warning laser software). Please check if the valve for Dı water cartridge needs to be exchanged

23.9. Related Part Exploded View

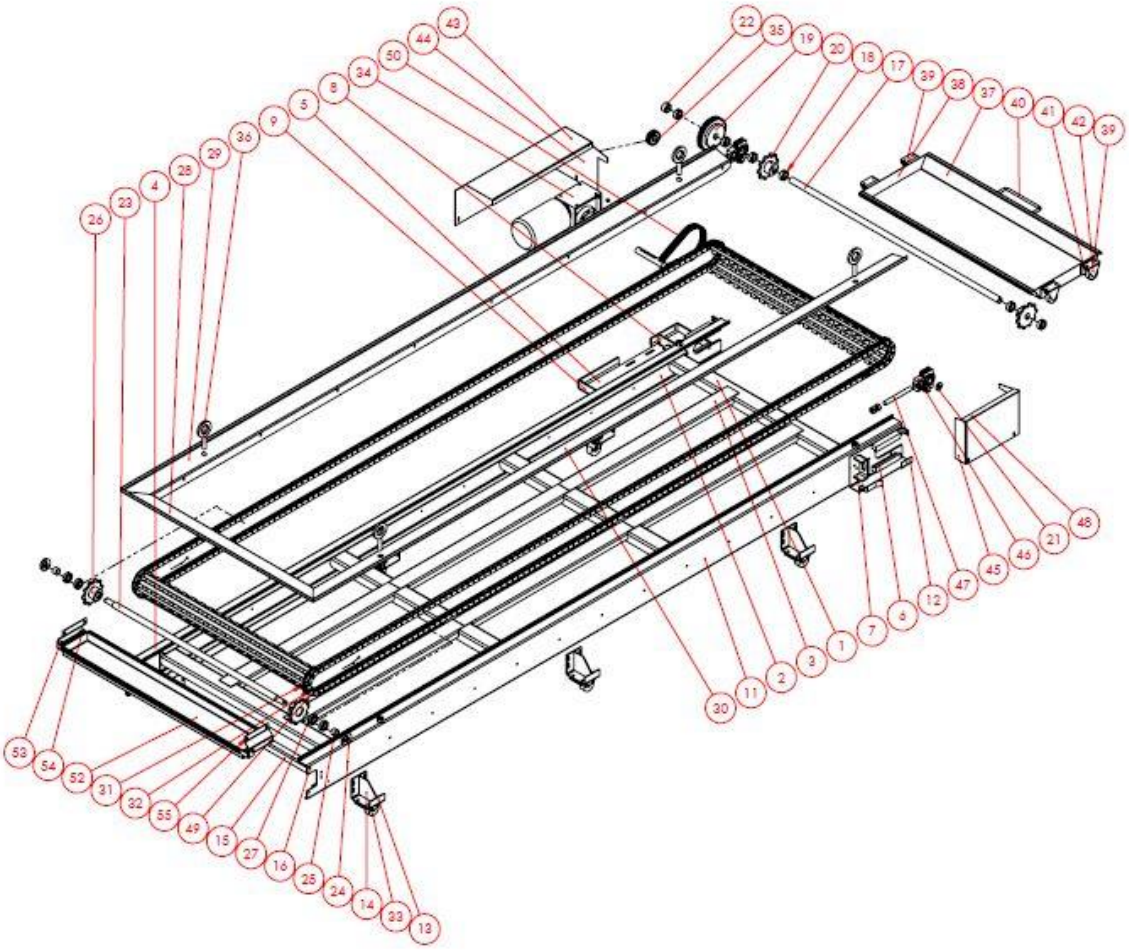


Figure 101 – Conveyor Exploded View

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

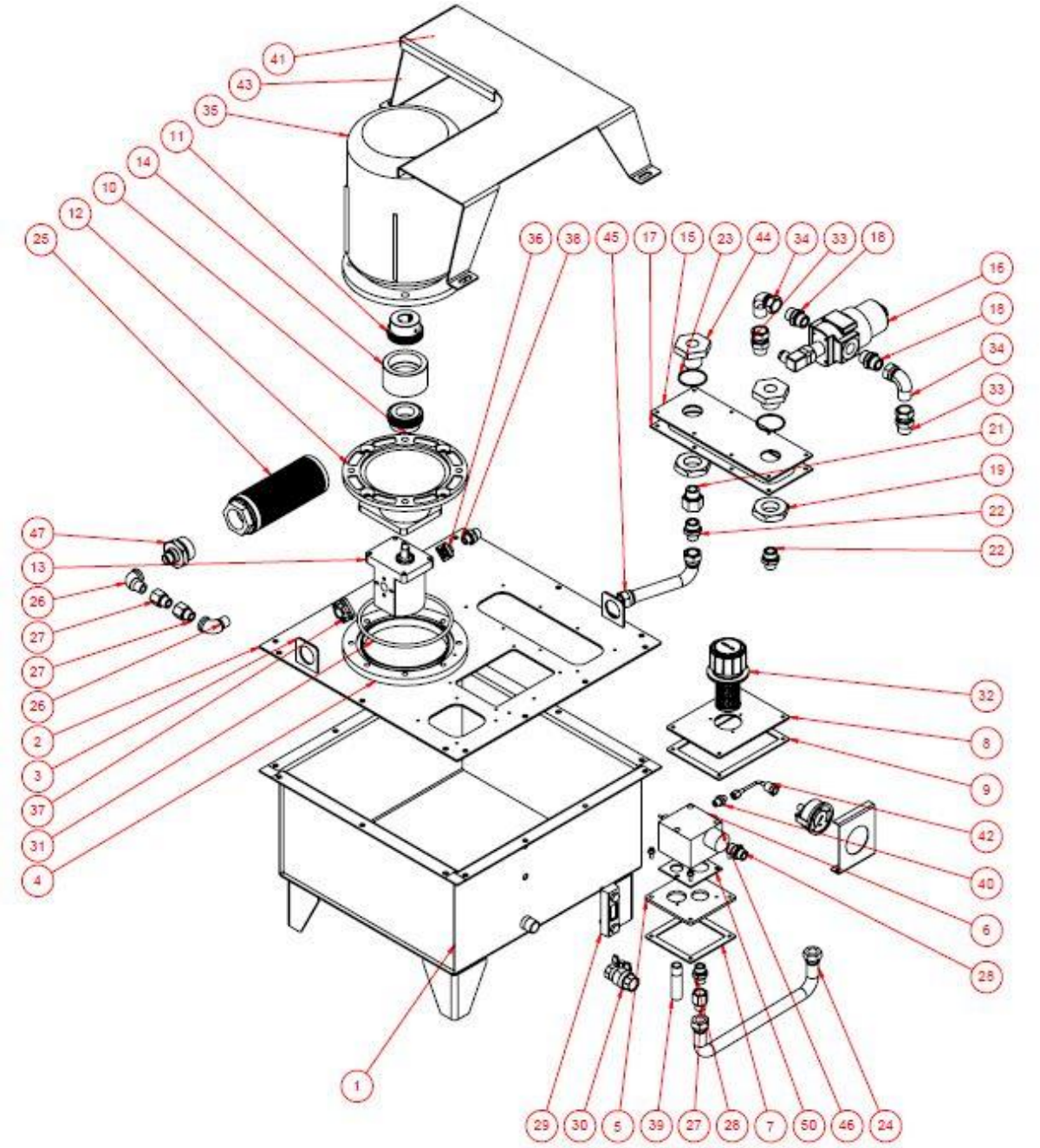


Figure 102 - Hydrolic Tank Exploded View

ERMAKSAN SAC İŞLEME MAKİNELERİ	**FIBERMAK LANTEK TRAINING PLAN**	DATE	
		MACHINE TYPE	
		SERIAL NUMBER	

NO	SUBJECTS	CONFIRMATION
1.	LANTEK installation and operation of the program	
2.	LANTEK Taking Back-up and displaying installation	
3.	Opening of the new folder, and work at work browser	
4.	Exporting and importing the parts such as DWG and DXF from beginning	
5.	Updating cutting speeds from Manage-machinery-technology table	
6.	Chancing the part properties (number-sheet type etc.) from Manage-Parts options	
7.	Composing New Data Base From Utility tools	
8.	Made drawing at drawing page	
9.	Part Verification process from drawing page	
10.	Demonstration of Marking processing	
11.	Making up new sheet and it's adjustment	
12.	Multiple pierce placement to the sheet and explanation of manuel and automatic processing	
13.	Common cutting describtion	
14.	Explaining of discard processing as manuel and automatic	
15.	Explanation of Film Burning	
16.	Making up the Micro connection	
17.	Explanation of Cutting technologies	
18.	Explanation of processing operation as manuel and automatic and making simulation	
19.	Changing the view of Screen menus	
20.	Displaying and explaining the Save and Print preview	
21.	Explanation of Cost account	

Authorised Technician (Name-Surname -Signature-Date) **Customers (Name, Surname Signature)**

Tablo 8 - FIBERMAK LANTEK TRAINING PLAN

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

ERMAKSAN SAC İŞLEME MAKİNELERİ	FIBERMAK MACHINE TRAINING PLAN	DATE	
		MACHINE TYPE	
		SERIAL NUMBER	

NO	SUBJECTS	CONFIRMATION
1	Introduction and operation of Main engines and auxiliary units (resonator, Chiller, Smoke Extraction)	
2	Displaying Emergency stop buttons	
3	Introduction of the light barrier at Loading and unloading system	
4	Housing demand of FIBER optic cable and other exposed connection elements (power cable and hoses)	
5	Demonstration opening and closing the utilities Gas and the air connections. Reporting pressure values	
6	Demonstration how to the use the Fıber Laser main electrical panel (switch, EG8030, etc.)	
7	Machine gas input must be set to max. N_2 28 bars and to max. O_2 10 bars.	
8	Operation of CNC and Operation of Machine	
9	Indroduction and chancing of head, nozzle types, seramic and protection glass	
10	Explaining the how and importance of laser beam centering.	
11	Demonstration Resonator and chiller alarm pages at LaserNet	
12	Taking reference to the axis (can be applied only to 6 X 2 machines)	
13	Demonstration the movings, stopping and speed adjustment of axis	
14	Transferring parts to Cnc which are Prepared with CAD/CAM and plotting them to the screen	
15	Demonstration backing up the database and Backing up the machine	
16	New material entering to Database , introduction of parameters , displaying chancing procedures	
17	Introduction how place sheet on table. Explaining of sheet stopper	
18	Operating of loading-unloading system	
19	Explaining the features of Status, Cut, Sheet, Periphery, Gas, Position and Job	
20	Showing the change of the chiller water	
21	Demonstration how to close main machine and auxiliary unıts (Resonator, Chiller, Extractor)	
22	Demonstration of Maintenance processings	
23	Displaying settings of Auxiliary gas (oxygen and nitrogen) pressure gauge and controlling the appropriateness of pressure gauge	
24	Controlling label information of Auxiliary gases	

Authorised Technician (Name-Surname -Signature-Date) **Customers (Name, Surname Signature)**

Tablo 9 - FIBERMAK MACHINE TRAINING PLAN

ERMAKSAN SAC İŞLEME MAKİNELERİ	**PERIODS OF FIBERMAK MACHINE MAINTENANCE, CLEANING AND CONTROL**	DATE	
		MACHINE TYPE	
		SERIAL NUMBER	
		NAME OF THE CUSTOMER	

NO	SUBJECTS	Week	Month	Year	Day	Hour
1	Lubrication of machine's rails and trolleys with PL10 grease (only for linear machines)		**X**			
2	Lubrication of Machine's bearings		**X**			
3	Control of Chiller's air filter	**X**				
4	Changing of Chiller's air filter		**6**			
5	Chiller water level control, if necessary, the addition of water (use distilled water only)	**X**				
6	Chiller water change (use distilled water only)			**X**		
7	Cleaning Chiller water tank (use distilled water only)			**X**		
8	Chiller DI filter change		**6**			
9	Draining of accumaled water from air tank which located in suction unit.	**X**				
10	Emptying the dust bucket which located at suction unit					**8**
11	Cutting of Electrical cabinet power and cleaning it with a dry cloth	**X**				
12	Cleaning filters of extraction unit (air holding or washing)		**X**			
13	Chancing filters of extraction unit			**X**		
14	Cleaning of dry air filter output		**X**			
15	Changing of dry air filter output		**6**			
16	Cleaning bellows		**X**			
17	Opening bellow and cleaning engine's way and dedusting it		**X**			

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49

18	Cleaning of slug draining boxes and conveyor	**X**				
19	Controlling of Nozzle, protection glass, gaskets and sensor inserts with hand and eye					**8**
20	Controling of Hose, cable and FIBER cable which are connected cutting head with hand and eye				**X**	
21	Controlling of the lubrication system		**X**			
22	Change gaskets with their mark which located slots of Cartridge and Protection Glass			**X**		
23	Controlling of hoses and clamps of Resonator and Chiller	**X**				

Authorised Technician(Name-Surname -Signature-Date) **Customers(Name, Surname Signature)**

Tablo 10 - PERIODS OF FIBERMAK MACHINE MAINTENANCE, CLEANING AND CONTROL

ERMAKSAN SAC İŞLEME MAKİNELERİ	FIBERMAK FINAL CONTROL FORM	DATE	RAPOR NO
		MACHINE TYPE	
		Custom name	
		SERIAL NUMBER	

NO	CONTROL CRITERIA	YES	NO
1.	Have you got levelling machine?		
2.	Was the machine hoods fitted completely?		
3.	Did you control electrical connections and if necessary, the direction of phase?		
4.	Did you control mount of Pneumatic system components and their leakage?		
5.	Did you control tightness for the connections of air, water and gas?		
6.	Did you start up Gas suction system? Did you test it?		
7.	Did you control cleaning of laser FIBER optic cable? Did you mount it?		
8.	Was the Resonator startup according to the rules?		
9.	Have you got levelling the loading-unloading unit? Did you test it's working? Did you startup it?		
10.	Were Machinery and auxiliary equipments mounted completely?		
11.	Was the Conveyor mounted the machine? Is it working correctly?		
12.	Did you startup the machine safety equipments (sick light barrier, door switch)?		
13.	Did you startup the machine safety?		
14.	Did you install required program and parameters to CNC?		
15.	Did you startup the axis and look of directions?		
16.	Did you enter soft limits of machine axes?		
17.	Did you operate loading-unloading unit in manual and automatic mode?		
18.	Did you make general cleaning on the machine?		
19.	Did you control angle calculation?		
20.	Given information about usage of machine?		
21.	Given information and education about usages of Controller?		
22.	Given information about usages of Cam programs (Lantek, Metalix, etc.) ?		
23.	A) Was Customer informed and educated about the Machine maintenance points and maintenance times?		
	B) Cutting parameters **(Sheet metal type, used gas, sheet thickness etc.)**		
24.	Did you test the cutting process with different types and thicknesses of sheet according to the customer production ?		
25.	Were spare parts and user's guide delivered completely?		
26.	Was Customer informed about the Machine safety instructions and labels?		
27.	Were the machine's back-ups taken?		

Authorised Technician(Name-Surname -Signature-Date) **Customers(Name, Surname Signature)**

Tablo 11 - FIBERMAK FINAL CONTROL FORM

Organize Sanayi Bölgesi, Lacivert Cad. No:6 16065 Nilüfer, Bursa / TÜRKİYE
Telefon : +90 (224) 294 75 00 - Faks : +90 (224) 294 75 49