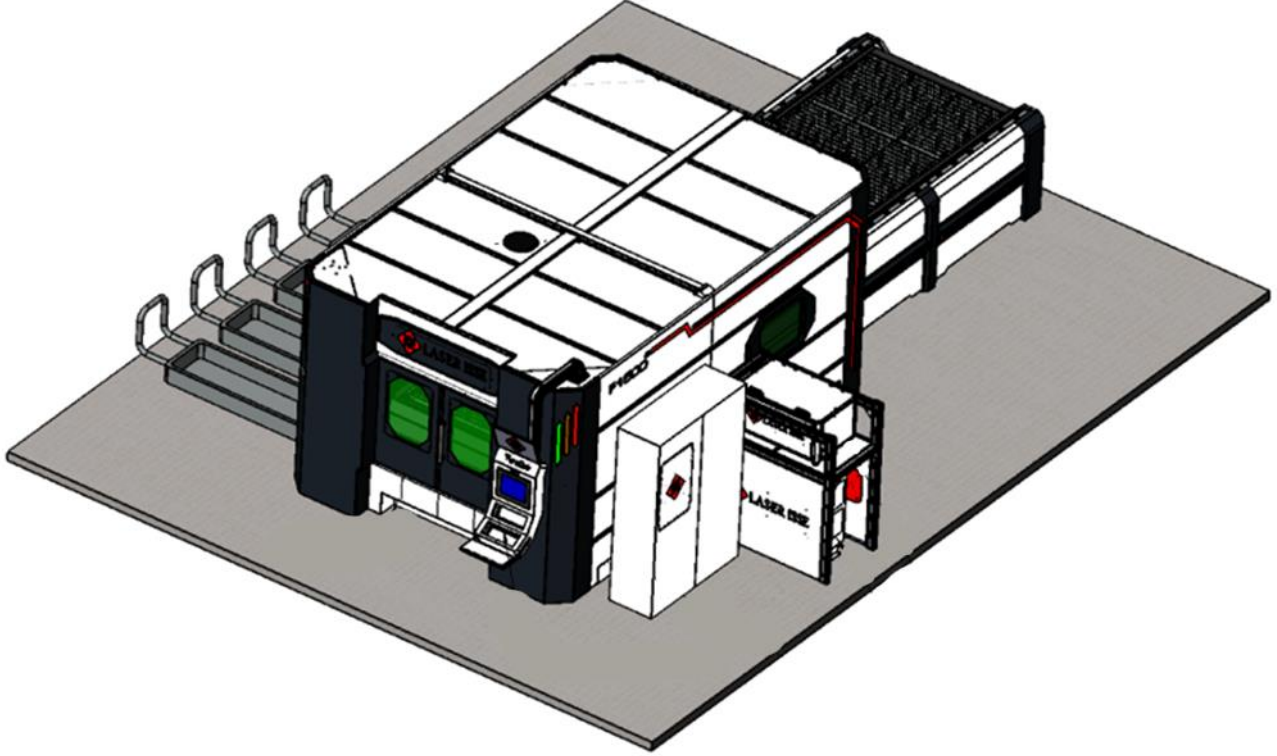




LASER ISSE

www.laserisse.com

FIBER LASER CUTTING MACHINE INSTRUCTIONS AND TRAINING MANUAL



LASERISSE LAZER TEKNOLOJİLERİ SEÇKİN BIRZAT VE SELAHATTİN BURAK
CELİKKAYA KOLLEKTİF ŞİRKETİ

*İstanbul Trakya Freezone Ali Rıza Cad. ,
No:26 Catalca /İstanbul 34540 Turkey

ISSE ULUS. TIC. ve LAZER TEK. SAN. LTD. STİ
**İkitelli O.S.B. Eskoop San. Sit. C3 Blok No: 86-96
Basaksehir İstanbul 34490 Turkey

E-mail: info@laserisse.com.tr
Cod. Item: **TURCCUT™**
FIBER LASER CUTTING SYSTEM

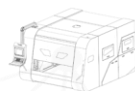




Table of Contents

1 THE OCCUPATIONAL HEALTH & SAFETY SIGNS AND SYMBOLS	7
1.1 Their Meanings.....	7
1.1.1 Do Not Walk or Stand Here	7
1.1.2 Crushing Hazard	8
1.1.3 Do Not Walk Or Stand Here Plate.....	8
1.1.4 General Warning Sign	9
1.1.5 Overhead Obstacle.....	9
1.1.6 Floor Level Obstacle	9
1.1.7 Counterrotating Rollers	10
1.1.8 Crushing Of Hands	10
1.1.9 Electricity.....	10
1.1.10 Electricity Cabinets.....	11
1.1.11 Arc Flash.....	11
1.1.12 Refer To Instruction Manual	12
1.1.13 Arc Flash Plate.....	12
1.1.14 Have a Look At Manual	13
1.1.15 General Mandatory Action Sign.....	13
1.1.16 General mandatory Action Sign Plate For The Maring Or Lifting Points	14
1.1.17 Wear Safety Gloves	14
1.1.18 Wear Safety Shoes.....	15
1.1.19 Wear a Hard Hat	15
1.1.20 Wear a Safety Harness.....	16
2 PREFACE	17
2.1 Preface Demonstration.....	17
3 CERTIFICATION	18
3.1 CE Certificate	18
3.2 CE Directive And Standards.....	19
4 ELECTRICITY REQUIREMENTS.....	19
4.1 Electricity Consumption	19
4.2 Adressing The Cruical Points.....	20
5 THE INSTRUCTION OF THE LASER CUTTING MACHINE & ITS BUTTONS... 20	

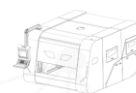




5.1 The Review of The CNC System Screen and Keyboards	20
5.1.1 Power Knob	21
5.1.2 Jog.....	22
5.1.3 Ref	22
5.1.4 Auto	22
5.1.5 Edit.....	22
5.1.6 Mdi.....	22
5.1.7 Auto Z up.....	23
5.1.8 Dry Run	23
5.1.9 Rtn Origin	23
5.1.10 Frame Run	23
5.1.11 Cycle Stop.....	23
5.1.12 Cycle Start	24
5.1.13 Err Ack	24
5.1.14 Reset 2	24
5.1.15 Air Test.....	24
5.1.16 O2 Test	24
5.1.17 N2 Test	25
5.1.18 Park Pos	25
5.1.19 Laser Dot	25
5.1.20 Hsu Test.....	25
5.1.21 Serv Pos	26
5.1.22 Laser On	26
5.1.23 Laser Off.....	26
5.1.24 Guide On/Off.....	26
Red Beam On/Off.....	26
5.1.25 Focus Home.....	26
5.1.26 Z Up.....	27
5.1.27 Z Dn.....	27
5.1.28 Rapid.....	27
5.1.29 Arrow Keys.....	28
5.1.30 Table Enable	28
5.1.31 Table A In.....	28
5.1.32 Table B In	29
5.1.33 Emergency Stop.....	29
5.1.34 Cutting Speed Knob.....	29
5.1.35 Spindle Knob	29
5.1.36 Operating System On/Off	30
5.1.37 Reset	30
5.1.38 Menu.....	30

6 THE INSTRUCTION OF THE CNC SYSTEM SCREEN..... 31

6.1 The Quick Behind-the-scenes Knowledge About G-Code..... 31





6.2 The Review of The Home Page of The CNC System Screen	32
6.2.1 PC Operation	33
6.2.2 Sheet Metal Working MGR.....	33
6.2.3 Calendar Laser Cut Condition DB.....	34
6.2.4 Laser Cut Condition DB	34
6.2.5 Laser Cutting	35
6.2.6 Laser Dashboard	35
6.2.7 Operator	36
6.2.8 Machine Setting	42
6.2.9 Data Logger	42
6.2.10 Maintenance Manager	43
6.2.11 Servo Viewer	43
6.2.12 Laser and HSU Alarms.....	44
6.2.13 Manual	44
6.2.14 Memo.....	45
6.2.15 Browser.....	45
6.2.16 Setting.....	46
6.2.17 Maintenance Display	46
7 CUTTING PROGRAM UPLOAD AND STARTING.....	47
8 ADJUSTMENT AND MAINTENANCE OF THE LASER CUTTING HEAD	55
8.1 Maintenance.....	55
8.2 LightCutter 2.0 Cutting Head Description and Maintenance.....	56
8.2.1 Centering And Adjusting The Laser Beam	57
8.2.2 Setting The Focal Position.....	59
8.2.3 Ceramic and Nozzle Replacement.....	60
8.2.4 Protection and Maintenance of Protection Glass Slide	61
8.2.5 Protective Glass Replacement	62
8.2.5.1 Situations Where Replacement Of Protective Glass Is Required.....	63
8.2.6 Axial Seal Replacement.....	67
8.3 Malfunctions	68
8.3.1 Electrical Malfunctions.....	68
8.3.2 Status Led Error Messages	68
8.3.3 Mechanical Malfunctions	69
8.4 ProCutter 2.0 Cutting Head Description and Maintenance.....	70
8.4.1 Meaning Of Led Indicators.....	71
8.4.2 Centering And Adjusting The Laser Beam	72
8.4.3 Setting The Focal Position.....	73
8.4.4 Ceramic and Nozzle Replacement.....	74





8.4.5 Protection and Maintenance of Protection Glass Slide	75
8.4.6 Protective Glass Replacement	76
8.4.6.1 Situations Where Replacement Of Protective Glass Is Required	77
8.4.7 Axial Seal Replacement.....	81
8.5 Malfunctions	82
8.5.1 Electrical Malfunctions.....	82
8.5.2 Mechanical Malfunctions	85
9 THE INSTRUCTION OF THE SAFETY MEASURES AND DAILY CHECKS OF THE LASER CUTTING MACHINE.....	86
9.1 The Steps Forwards For The Safety Measures And Daily Checks	86
9.2 Cleaning	86
9.2.1 Cleaning Schedule	87
9.3 Overall Maintenance	87
9.3.1 The Description of The Periodic Maintenance	87
9.3.2 General Precautions for Maintenance.....	87
9.3.3 Mechanical Maintenance	88
9.3.4 Cutting Head & Optical Maintenance	88
9.3.5 Laser Power Unit Maintenance	88
9.3.6 Chiller Maintenance	89
9.3.7 Maintenance of The Electrical Panel	89
9.4 Periodic Machine Table	90
9.5 Cleaning Fabric Bellows	91
9.6 Periodically Machine Maintenance Table	95
10 THE INSTRUCTION OF THE LUBRICATION OF THE LASER CUTTING MACHINE	96
10.1 The Main Purpose of Lubrication	96
10.2 The Maintenance And Lubrication Intervals	96
11. SPARE PARTS	99
11.1 Consumables List (Precitec Laser Cutting Head)	99
11.1.1 ProCutter 2.0.....	99
11.1.2 LightCutter 2.0.....	100





LASER ISSE

www.laserisse.com

12 GETTING THE MACHINE READY FOR OPERATION	101
12.1 Energizing The System	101
12.2 Turning on the Chiller	102
10.3 Giving Gas to System	102
12.4 Fanuc System Login	103
12.5 Positioning the Machine at the Reference Point.....	104
12.6 Changing the Table Position	104
13 ALARM LIST	106





1 The Occupational Health & Safety Signs And Symbols

1.1 Their Meanings

Overall, there are 4 categories stated below for safety signs and symbols. After an operator is conscious of most easily identifying whether the sign asks him to cease something, start doing something, take precautions or advising the operator to be equipped by latest emergency equipment. In brief, on the global scale, those pictures are recognized and transcend the language barriers to convey the potential hazards to the employees in by far the easiest manner. Furthermore, in fact, signs and symbols should not be interchangeably used even though they are thought that they are synonyms. The main distinction between them is that symbols might be differently interpreted by different persons while signs are descriptive and compulsory to be followed.

- Prohibition signs and symbols are depicted in red in the round shape in the black pictogram in the white background with the red edging crossed by the diagonal line, such as “Do not touch”.
- Warning signs and symbols are depicted in yellow in the triangular shape in the black pictogram in the yellow background with the black edging, such as “Electric shock”.
- Mandatory signs and symbols are depicted in blue in the round shape in the white pictogram in the blue background, such as “Wear safety glasses”.
- Emergency signs and symbols are depicted in green in either rectangular or square shape in the white pictogram in the green background, such as “Emergency exit”.

1.1.1 Do Not Walk or Stand Here

The engines, shafts, delicate covers over mechanical mechanisms must not be even stood on let alone walk.



1.1.1 Fig. Do Not Walk Or Stand Here

[Source: ISO 7010:2011, P024]





1.1.2 Crushing Hazard

The mobile components of the stationary machines, laser stacking cars and changing tables, pose a potential threat to the persons adjacent to them in terms of being crushed in the occupational accident. Therefore, the steps taken in being in touch with those machines require to become attentive.



1.1.2 Fig. Crushing Hazard

[Source: ISO 7010:2011, W019]

1.1.3 Do Not Walk Or Stand Here Plate

During operating process, standing in the surrounding of the mobile components of the stationary machines, namely the changing tables and laser stacking cars, might be more likely to result in being crushed.



1.1.3 Fig. Do Not Walk Or Stand Here Plate

[Source: ISO 7010:2011, W019 and P024]





1.1.4 General Warning Sign

General warning signs are used in a way the particular obstacle, hazard or condition is not covered by a standard sign. In the surrounding of the nozzles, the cutting machine and pneumatic and hydraulic systems, the end user must be cautious about his or her initiative.



1.1.4 Fig. General Warning Sign

[Source: ISO 7010:2011, W001]

1.1.5 Overhead Obstacle

The end user might be injured by some components falling down on her or him in the immediate vicinity of the some machines, namely changing tables. Therefore, the end user must be careful about even the first step taken by her or him to approach the machines in the laser cutting line.



1.1.5 Fig. Overhead Obstacle

[Source: ISO 7010:2011, W020]

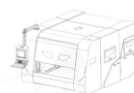
1.1.6 Floor Level Obstacle

The end user might trip on the rails of the loading car and fall down on the ground. Hence, preventing trips and fall injuries to arise must become implemented. Last but not least, it must be ensured that all staff look after when in the vicinity of a floor level obstacle.



1.1.6 Fig. Floor Level Obstacle

[Source: ISO 7010:2011, W025]





1.1.7 Counterrotating Rollers

In the vicinity of the components revolving, the end user become careful about the steps forwards and backwards for interrupting the ongoing process.

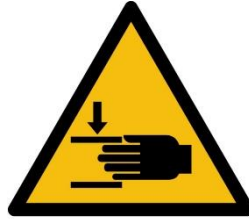


1.1.7 Fig. Counterrotating Rollers

[Source: ISO 7010:2011, W025]

1.1.8 Crushing Of Hands

The hand of the end user might get stuck in the changing tables by the deficiencies in being careful. Hence, the end user must look after to prevent their hand from being stuck somewhere by paying closest attention to the ongoing process.

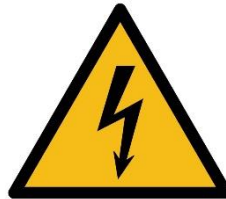


1.1.8 Fig. Crushing Of Hands

[Source: ISO 7010:2011, W012]

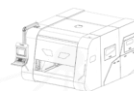
1.1.9 Electricity

The electrical control panels, electrical junction boxes and engine covers expose the end user to becoming prone to the electric current. Hence, the end user must pay closest attention to getting in contact with them.



1.1.9 Fig. Electricity

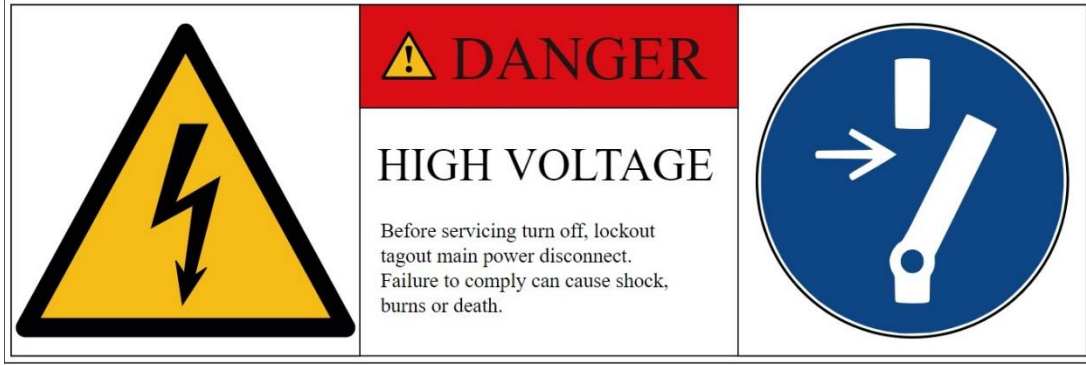
[Source: ISO 7010:2011, W012]





1.1.10 Electricity Cabinets

The things highlighted in the section of ‘‘Electricity ‘‘ are valid for this section as well. Additionally, before making amendments to even one component, the electrical enclosures must be turned off, which necessarily means that their power outage deliberately must be implemented.

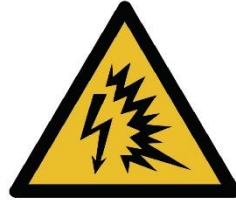


1.1.10 Fig. Electricity Cabinets

[Source: ISO 7010:2011, W012 and M021]

1.1.11 Arc Flash

The electrical control panel, electrical junction boxes, handle of the electrical enclosures and areas between the plugs and sockets might result in the arc flashes. As a consequence of it, the precautions must be taken before getting closer to them.



1.1.11 Fig. Arc Flash

[Source: ISO 7010:2011, / Amd 8:2017, W042]





1.1.12 Refer To Instruction Manual

Through this sign, what is aimed at is to put the emphasis on reading the ‘ ‘ Instruction & Training Manual of Laser Cutting Line ’ ’, which necessarily means raising the comprehension of the instruction and training manual. The more the end user is conscious of the instruction and training manual, the less likelihood there is inherently to become liable to the potential occupational hazards. This sign is capable of becoming encountered in the surrounding of the control panel of the laser cutting line, the laser cutting cell control panel, the CNC system screen and the cnc system screen keyboard.

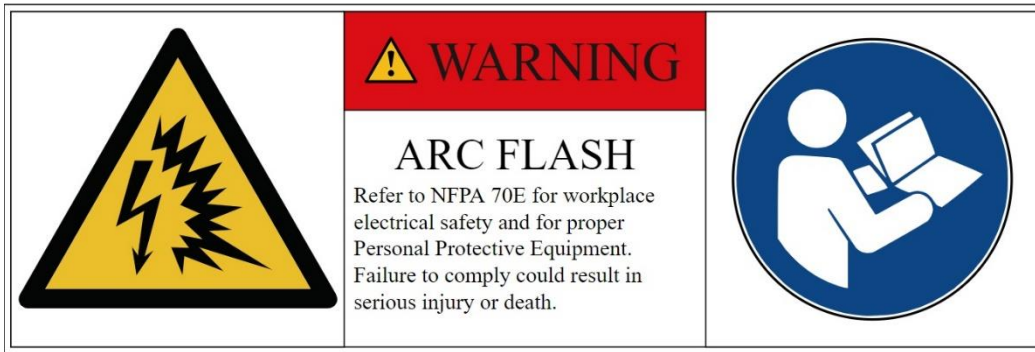


1.1.12 Fig. Refer To Instruction Manual

[Source: ISO 7010:2011, M002]

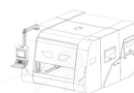
1.1.13 Arc Flash Plate

The things emphasized in the section of ‘ ‘ Arc Flash ’ ’ are valid for this section as well. Furthermore, NFPA 70E corresponds to a standard of the NFPA, the acronym of ‘ ‘ National Fire Protection Association ’ ’, in accordance with the title of ‘ ‘ Standard for Electrical Safety in the Workplace ’ ’. The NFPA is by far best known for releasing the National Electric Code.



1.1.13 Fig. Arc Flash Plate

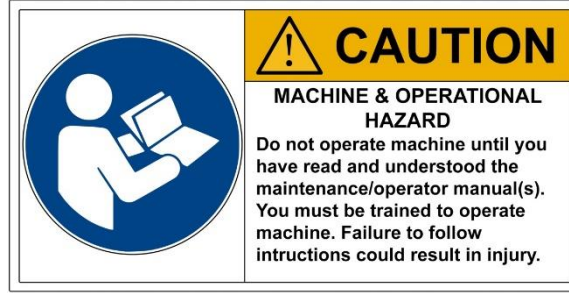
[Source: ISO 7010:2011, Amd 8:2017, W042 and ISO 7010:2011, M002]





1.1.14 Have a Look At Manual

The things emphasized in the section of ‘‘ Referring to Instruction Manual ‘‘ are valid fort his section as well. Moreover, the end user must be granted an intensive education so that the end user is able to most appropriately operate the machines. On the other hand, this education is not adequate on its own unless the end user utilizes ‘‘ Instruction & Training Manual of Laser Cutting Line ‘‘. Otherwise, the probability of the failure for operating the machines is high, which could lead to the occupational injures.



1.1.14 Fig. Have a Look At Manual

[Source: ISO 7010:2011, M002]

1.1.15 General Mandatory Action Sign

The general mandatory action sign signifies a mandatory action. This sign is to inform employees and guests that the particular actions must be taken to remain safe. This might involve the need to utilize Personal Protective Equipment or taking precautions to keep you safe in a potentially hazardous environment. They are mounted on the areas for all the staff to easily see.



1.1.15 Fig. General Mandatory Action Sign

[Source: ISO 7010:2011, M001]





1.1.16 General mandatory Action Sign Plate For The Maring Or Lifting Points

The load the sheet material onto the table, a special Crane, also known as a Crane, must be used to lift and lower the respective load. If the load of the sheet raw material falls on someone or somewhere, it can be seriously injured. In addition, the places where there is a table to be loaded require the end user to pay more attention to the ongoing process.



1.1.16 Fig. General Mandatory Action Sign Plate For The Marking Or Lifting Points

[Source: ISO 7010:2011, W015 M001]

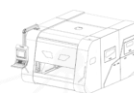
1.1.17 Wear Safety Gloves

Safety (protective) gloves are needed to prevent injuries to the hands and comply with the hazard prevention hierarchy. If all action in term os " elimination, substitution, engineering controls " or " administrative controls " is incapable of reducing the risk to an adequate degree, the worker wear safety gloves against getting his or her hands to be caught up in the changing tables, motors, and chains. As well as that, thermal protection is a must for avoiding occupational hazards, particularly shortly after the over 2mm thick sheet raw material is cut in the laser cutting machine or the eccentric fly shear due to the workpiece having a high temperature caused by the cutting process.



1.1.17 Fig. Wear Safety Gloves

[Source: ISO 7010:2011, M009]





1.1.18 Wear Safety Shoes

Safety shoes, also known as steel-toe boots are a pair of the durable shoes having a protective reinforcement in the toe protecting the foot from falling objects or compression. Safety shoes play a key role particularly in the manufacturing industries. Occupational health and safety legislation or insurance requirements requires the utilization of such shoes in some settings. Furthermore, it might mandate certification of such boots and the display of such certification directly on the boots. The markings on the shoe label will indicate the national or international standards that the shoe was intended to meet and identify the level of protection offered for impact, compression, penetration and electric shock. While working in the factories, safety shoes are effective in keeping the feet of industrial employees safe from sharp and heavy objects. The appropriate safety shoes must be worn for each individual duty. As well as that, they must become resistant to slipping. Not only the supervising employees but also the regular employees visiting particular sites where safety shoes are compulsory must obey this respective rule. Take the laser cutting line for example. In this surrounding, irrespective of whether they're superior or inferior, everyone must put on the safety shoes to approach any single machine.

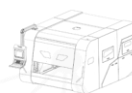


1.1.18 Fig. Wear Safety Shoes

[Source: 7010:2011, M0008]

1.1.19 Wear a Hard Hat

A hard hat is type of helmet primarily used in the workplace environments namely industrial sites to protect the head from injuries on account of falling objects, impacts with other objects debris, electric shock. Suspension bands inside the helmet spread the weight of the helmet and the force of any impact over the top of the head. Moreover, a suspension also ensures the space of more or less 30mm between the shell of the helmet and the head of the wearer. Hence, if an object strikes the shell, the impact is less likely to be directly passed on to the skull. Additionally, some helmet shells have a mid-line reinforcement ridge to develop impact resistance. In brief, owing to the nature of the machines in the laser cutting line, there are many points where the end user is able to pass while bending their head. Additionally, make sure that before entering the interior of the laser cutting cell, a hard hat needs to become worn. Consequently, a hard hat is a must for operators.





1.1.19 Fig. Wear a Hard Hat

[Source: ISO 7010:2011, M018]

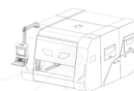
1.1.20 Wear a Safety Harness

Just in case the maintenance must be conducted in the places where they are higher the ground when there is the need of holding someone in a constant manner and there is the likelihood of falling down, the respective employee must be equipped by a safety harness.



1.1.20 Fig. Wear a Safety Harness

[Source: ISO 7010:2011, M018]





2 Preface

2.1 Preface Demonstration

In order for this document to be copied, reprinted and translated in whole or in part, it is necessary to obtain a clear permission from our company. This instruction book can not be published, in whole or in part. And it cannot be used unauthorized for competition purposes.

Reserves the right to make technical changes for improvement.

- ! This machine is for commercial use only. Any use other than this purpose and material is deemed improper and implies misuse of the machine. If used in this way, all responsibility belongs to the user.
- ! The safety equipment of the machine has been used to prevent an occupational accident and their removal from the machine, modification or decommissioning may result in a work accident. In this case, all responsibility belongs to the user.
- ! The electrical-electronic and CNC system and mechanical parts of the machine are under warranty for 2 years. Malfunctions resulting from user error or the use of the machine not in accordance with the instruction book will be excluded from the scope of warranty.





LASER ISSE

www.laserisse.com

3 Certification

3.1 CE Certificate

CERTIFICATE No. : 18335556/IST/18

SGS

EC-ATTESTATION CERTIFICATE
AT-ONAY SERTİFİKASI

Date/Place of Issue : 17.10.2018/ İstanbul
Sertifika Yayın Tarihi/Yer

Valid Until : 17.10.2023
Sertifika Geçerlilik Tarihi

Name of Applicant : İSSE ULUSLARARASI TİCARET VE LAZER TEKNOLOJİLERİ SAN. LTD. ŞTİ.
Başvuru Sahibi
İOSB. Eskoop San. Sit. C-3 Blok N:88-90-92-94-96-98-100-102-104 Başakşehir-İstanbul/Turkey

Name of Manufacturer : İSSE ULUSLARARASI TİCARET VE LAZER TEKNOLOJİLERİ SAN. LTD. ŞTİ.
Üretici
İOSB. Eskoop San. Sit. C-3 Blok N:88-90-92-94-96-98-100-102-104 Başakşehir-İstanbul/Turkey

Description of Product : FIBER LASER CUTTING MACHINES
Ürün Tanımı
Fiber Laser Kesim Makinaları

Model(s) : # F500, F1000, F1500, F2000, F3000, F4000, F5000, F6000, F500 RS,
Model(ler)
F1000 RS, F1500 RS, F2000 RS, F3000 RS, F4000 RS, F5000 RS, F6000 RS. #

Assessment Performed : Conformity to Annex I's Applicable Paragraphs of
Uygulanan Değerlendirme
2006/42/EC Machinery Directive & 2014/35/EU Low Voltage Directive.
2006/42/AT Makina Emniyeti Yönetmeliği Ek-I Gerekliliklerine Uygunluk &
2014/35/AB Belirli Gerilim Sınırları İçin Tasarlanan Elektrikli Ekipman İle İlgili Yönetmeliği.

Standard(s) / Standart(lar) : # EN ISO 12100:2010, EN 60204-1:2006/AC:2010. #
Değerlendirme Dayanağı

Base of Assessment : In the opinion of SGS the submitted technical file TR-MD-18335556-1
Değerlendirme Dayanağı
satisfies the requirements of the Machinery Directive 2006/42/EC Annex-VII
TR-MD-18335556-1 Numaralı Teknik Dosya, Makina Emniyeti Yönetmeliği
Ek-VII Gerekliliklerini Karşılıdığı SGS Tarafından Saptanmıştır.

Assessor ID No. / Denetçi No : TR-IND-S19
Değerlendirme Tarihi/Yer
Date/Place of Assessment : 05.10.2018 / İstanbul – Turkey

Test reports in technical file TR-MD-18335556-1 are reviewed and found to be acceptable. The certificate is valid as long as the relevant directives and harmonised standards written above are current. The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives.
TR-MD-18335556-1 numaralı Teknik Dosya içindeki test raporları incelenmiş ve uygun bulunmuştur. Bu sertifika referans alınan ilgili yönetmelikler ve standartlar güncel olduğu sürece geçerlidir. Üretici firmanın sorumluluğunda uygunluk beyanının düzenlenmesi ve ilgili tüm AB yönetmeliklerine uygunluğunun sağlanması sonrası aşağıda gösterilen CE işareti kullanılabilir.

CE

This EC-Attestation Certificate is only valid for the equipment and configuration described in conjunction with the data detailed above. It refers only to the sample submitted to SGS Supervise Gözetme Etüd Kontrol Servisleri A.Ş. for testing and certification. Any modifications made to the product shall immediately be reported to SGS Supervise Gözetme Etüd Kontrol Servisleri A.Ş. office in order to examine whether this certificate remains valid.
Bu Sertifika, SGS Supervise Gözetme Etüd Kontrol Servisleri A.Ş.'ye sunulan örnek makina üzerinde yapılan değerlendirmeler referans alınarak düzenlenmiş olup, yukarıda bilgileri verilen ürünler için geçerlidir. Üretici tarafından ürün üzerinde yapılacak olan her türlü modifikasyon işlemleri mevcut sertifikanın geçerliliğini değerlendirmek adına SGS Supervise Gözetme Etüd Kontrol Servisleri A.Ş. ye bildirilmek zorundadır.

For and on behalf of
SGS Supervise Gözetme Etüd
Kontrol Servisleri A.Ş.
Müge OKUMUS

SGS
Bağlar Mah. Osmanpaşa Cad. No.95
İç İstanbul Plaza, E Girişi
Güneşli 34209 İstanbul - TURKEY
t: 90.212.3684000 (Pbx)
f: 90.212.2964782-83
e: sgs.turkey@sgs.com
S-CRS-EE-F-51 Rev.00 11/2016 Page 1 of 1 F150201M

SGSPAPER
18335556

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service printed overleaf. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any other holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Clients instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

3.1 Fig. CE Certificate



3.2 CE Directive And Standards

Relevant EC Directives

European Directives	Machine safety directives	(2006/42/EC)
	Low Voltage Equipment Directives	(2006/95/EC)

Relevant EC Directives

European Directives	Safety in machines–Laser processing machines	EN ISO 11553-1:2008
	Safety in machinery– General principles for design – Risk assessment and reduction of risks	EN ISO 12100:2010
	Safety in machinery - Electrical equipment of machinery - Part 11: Requirements for high-voltage equipment used at voltages not exceeding 36 kV above 1000 V AC or 1500 V D.A.	EN 60204-11:2000/AC:2010

4 Electricity Requirements

4.1 Electricity Consumption

Three-phase electric power, 380 VAC

1 Neutral

1 Earth 0.3 Ω

Machine Power	Required Power Cord	UPS Need
1000 WATT	16 mm ²	40 kVA
1500 WATT	16 mm ²	40 kVA
2000 WATT	18 mm ²	50 kVA
3000 WATT	20 mm ²	60 kVA

4.1 Fig. Electricity Consumption





4.2 Addressing The Crucial Points

- 1) The cable thickness is depended on machine condition-power and distance between machines. When selecting the machine cable, the machine power consumption should be reported to the cable supplier.
- 2) The UPS system, uninterruptable power supply, must be compatible with the CNC system. This information must be reported to the UPS supplier.
- 3) The UPS system must have a transformer. The machine must not be exposed to harmonic waves.

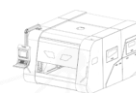
5 The Instruction Of The Laser Cutting Machine & Its Buttons

5.1 The Review of The CNC System Screen and Keyboards



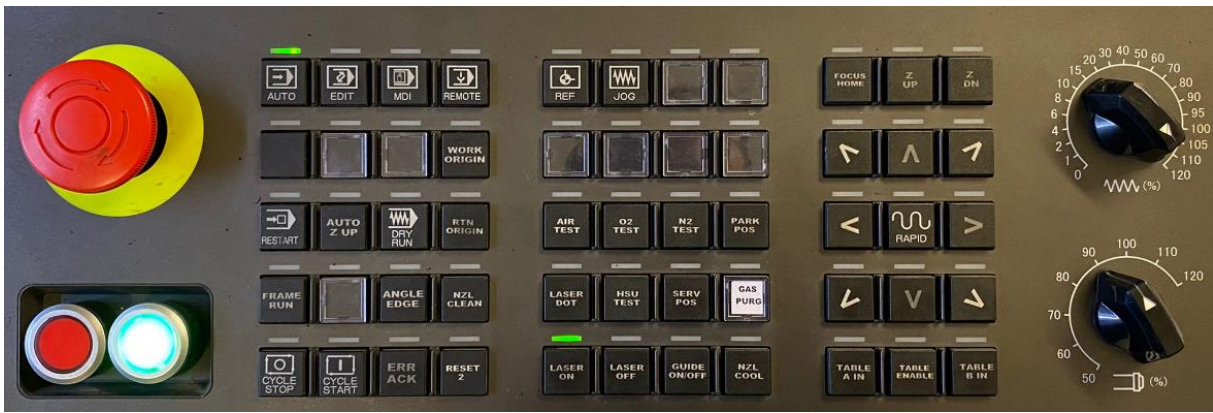
5.1.a Fig. The Review of The CNC System Screen

This screen use for control all machine line. You can find this control panel front of the machine. Display gets every information about operating, maintenance and control .We can upload CAM files to machine memory using USB and Data_SV Section .End user is able to open CAM files for suitable production.





The CNC screen system keyboard fastened just under the CNC system screen in the control panel has starting 2 speed knobs having their dial and 1 emergency stop.



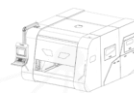
5.1.b Fig. The Review of The CNC System Keyboard

5.1.1 Power Knob



So as to energize the laser cutting machine, the power knob must be from "Off-0" to "On-1".

5.1.1 Fig. Power Knob





5.1.2 Jog



Unless ‘‘Jog’’ produces green light, the all axis motors are incapable of being moved anywhere in a manual mode. Therefore, during cutting, it was automatically turned off to prevent anyone from jeopardizing the laser cutting process.

5.1.2 Fig. Jog

5.1.3 Ref



‘‘Ref’’ plays a role in calibrating the laser cutting head so that it solely moves within the enclosure of the working table without exceeding the dimension limits of the working table. The cutting head moves to the reference point by pressing the Ref key and any direction in the X, Y, Z directions.

5.1.3 Fig. Ref

5.1.4 Auto



This button uses for pass the automatic mode. The machine can work in the automatic mode with CAM program in the memory after press this button. This button should be active (led indicator should be green) before cycle start.

5.1.4 Fig. Auto

5.1.5 Edit



The Edit button must be active to transfer for cutting program from NC memory or USB driver to machine, edit and execute the NC code.

5.1.5 Fig. Edit

5.1.6 Mdi



This mode uses for manual digital input. When you want to change some machine setting, you need to use this button for changing.

5.1.6 Fig. Mdi





5.1.7 Auto Z up



It raises the +Z axis (cutting head) to the maximum point then press this button.

5.1.7 Fig. Auto Z Up

5.1.8 Dry Run



When you would like to see how works CAM programs in the real simulation ,you should press this button with automatic mod button and cycle start.

NOTE:Only piece.

5.1.8 Fig. Dry Run

5.1.9 Rtn Origin



Brings the all machine axis to the predetermined home position.

5.1.9 Fig. Rtn Origin

5.1.10 Frame Run



Simulates the outer contour of the shape to be cut in Jog mode.Frame Run uses for see the cutting area with piece + buffers.

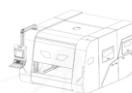
5.1.10 Fig. Frame Run

5.1.11 Cycle Stop



By this button, the end user is allowed to cease the ongoing cutting process. This button that after pressing it, you are able to continue the cutting process just through pressing “Cycle Start” again.

5.1.11 Fig. Cycle Stop





5.1.12 Cycle Start



This button uses for starting which you wanted program at the memory.

5.1.12 Fig. Cycle Start

5.1.13 Err Ack



It helps to remove the error and alarm messages that occur in the system. When the program encountered a error while working ,machine pass to jog mode and you can start to work step by step .We need to remove this error using this button.

5.1.13 Fig. Err Ack

5.1.14 Reset 2



It works simultaneously with the reset button. If this button continues to light, the error continues.

5.1.14 Fig. Reset 2

5.1.15 Air Test



After making a selection of auxiliary gases "Air" is used to turn on the sensor, in charge of the plug of the air cylinder manifold, so that during cutting the laser cutting head releases this particular gas towards the sheet raw material on the working table to ensure the cut quality of the workpiece.

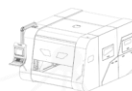
5.1.15 Fig. Air Test

5.1.16 O2 Test



After making a selection of auxiliary gases " O₂ Oxygen" is used to turn on the sensor, in charge of the plug of the oxygen cylinder manifold, so that during cutting the laser cutting head releases this particular gas towards the sheet raw material on the working table to ensure the cut quality of the workpiece.

5.1.16 Fig. O2 Test





5.1.17 N2 Test



After making a selection of auxiliary gases, “N₂ Nitrogen” is used to turn on the sensor, in charge of the plug of the nitrogen cylinder manifold, so that during cutting, the laser cutting head releases this particular gas towards the sheet raw material on the working table to ensure the cut quality of the workpiece.

5.1.17 Fig. N2 Test

5.1.18 Park Pos



For a safe operation in the cabin, the cutting head is sent to the right opposite corner of the table according to the operator with this button. For this function to be active, the machine must be active in Auto mode.

5.1.18 Fig. Park Pos

5.1.19 Laser Dot



The Laser Dot key is used to manually fire the laser beam .This only uses when centering.

5.1.19 Fig. Laser Dot

5.1.20 Hsu Test

"Hsu Test", which defines the z axis as a home is used for the laser cutting head to recognize the upper surface of the sheet placed on the working table and to define this height as a measurement to pinpoint the start location that it is able to start cutting according to this starting point in the Z axis. After pressing “Hsu Test”, the laser cutting head descends to the upper



surface of the sheet until touching it with the end of the nozzle. Due to this, the end user must not press " Hsu Test " unless there is the surface of a sheet over the working table. Before starting cutting each individual workpiece from the sheet , defining " Hsu Test " as a home is required.

5.1.20 Fig.Hsu Test





5.1.21 Serv Pos



In order to perform maintenance operations (nozzle, protection glass replacement, etc.) related to the cutting head, the cutting head is brought to the closest point to the operator by clicking this button. Auto mode must be active for this function to work.

5.1.21 Fig. Serv Pos

5.1.22 Laser On



Pressing “Laser On” activates the chiller and the beam of the laser so that the end user is allowed to start cutting a sheet . Unless this button produces white light, the beam of the laser won’t be activated. Last but not least, “Laser On” corresponds to activating chiller.

5.1.22 Fig. Laser On

5.1.23 Laser Off



“Laser Off” deactivates the chiller and the beam of the laser. Whenever “Laser Off” is pressed, the chiller and the beam of the laser are automatically off. In this case, if the end user attempts to cut a sheet after opening a particular cutting program in the control panel, this means test cutting.

5.1.23 Fig. Laser Off

5.1.24 Guide On/Off



Red Beam On/Off

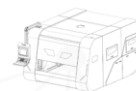
5.1.24 Fig. Guide On/Off

5.1.25 Focus Home



It works together with the Reference Home button. It is used to reset the focus position.

5.1.25 Fig. Focus Home





5.1.26 Z Up



“Z up” moves the +Z axis (laser cutting head) in a way it moves upwards and raises over the sheet .

5.1.26 Fig. Z Up

5.1.27 Z Dn



“Z down” moves the -Z (laser cutting head) in a way it moves downwards and descends to the sheet.

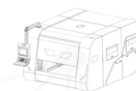
5.1.27 Fig. Z Dn

5.1.28 Rapid



Simultaneously pressing “Rapid” an done of other direction buttons will raise the speed in any axes to the maximum degree.

5.1.28 Fig. Rapid





5.1.29 Arrow Keys

Direction keys allow the cutting head to be moved manually.



1: It provides manual movement of the X and Y axis between the +Y axis and the -X axis.

2: It provides manual movement of the Y axis the +Y axis.

3: It provides manual movement of the Y and X axis between the +Y axis and the +X axis.

4: It provides manual movement of the X axis the -X axis.

5: It provides manual movement of the X axis the +X axis.

6: It provides manual movement of the Y and X axis between the -Y axis and the -X axis.

5.1.29 Fig. Arrow Keys

7: It provides manual movement of the Y axis the -Y axis.

8: It provides manual movement of the Y and X axis between the -Y axis and the +X axis.

5.1.30 Table Enable



Table enable function must be active in order to changing the tables (take out or take them in).

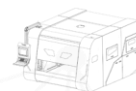
5.1.30 Fig. Table Enable

5.1.31 Table A In



It enables the movement of Table A when the jog mode is active and the table enable function is active (Table A in, Table B out).

5.1.31 Fig. Table A In





5.1.32 Table B In



It enables the movement of Table B when the jog mode is active and the table enable function is active (Table B in, Table A out).

5.1.32 Fig. Table B In

5.1.33 Emergency Stop



This button uses for don't wanted emergency situations. Operators and maintener can use this button for as soon as emergency situations.

5.1.33 Fig. Emergency Stop

5.1.34 Cutting Speed Knob

‘‘Cutting Speed Knob’’ is used to make an adjustment for either raising or reducing the pace of the laser cutting process in a manual manner. There is the dial engraved on the circle around the knob indicating the measurement from %0 to %120. When it indicates %0, the speed of the laser cutting head becomes 0 mm per minute, thus it does not move anywhere. Similarly, %120 corresponds to %100, hence this ensures that whatever the cutting speed entered in the control panel is applied to the laser cutting head. Last but not least, the purpose of this knob is to allow the end user to accordingly alter the pace of the cutting process without changing the value of the cutting speed in the control panel particularly during cutting and also we can reduce cutting power same percentage with cutting speed.



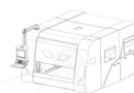
5.1.34 Fig. Cutting Speed Knob

5.1.35 Spindle Knob



This knob uses for setting unload working speed. This mean is that we can setting passed speed without laser beam.

5.1.35 Fig. Spindle Knob





5.1.36 Operating System On/Off



These buttons uses for turn on and turn off the operating machine the green button activates the control and the operating system, the red button deactivates it.

5.1.36 Fig. Operating System On/Off

5.1.37 Reset



It helps to remove the error and alarm messages that occur in the system.

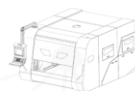
5.1.37 Fig. Reset

5.1.38 Menu



This button opens the main menu. The desired action is selected from this menu.

5.1.38 Fig. Menu





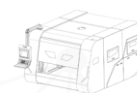
6 The Instruction of The CNC System Screen

6.1 The Quick Behind-the-scenes Knowledge About G-Code

The laser cutting machine is managed by the Computer Numerical Control (CNC) embedded its control panel. The end user is capable of solely operating the laser cutting machine through the CNC System Screen and its keyboard. Before the laser cutting process started, the laser cutting machine must comprehend each peripheral step in the way the sheet raw material is desirably cut. Therefore, the laser cutting machine needs G-Code.

G-Code, also known as RS-274, is the most widely used CNC system programming language. G-Code instructions are provided to a machine controller, also known as an industrial computer, which tells the motors where to move, how rapid to move and what path to follow. A cutting tool of the laser cutting machine moves according to these instructions through a toolpath cutting away material to leave only the finished workpiece and/or, an unfinished workpiece is precisely positioned in any of up to nine axes around the three dimensions relative to a toolpath and either or both can move relative to one another.

Additionally, G-Code has the open parameters being able to be changed by the end user through the usage of AutoNest and cncKad released by the company of Metalix CAD/CAM Sheet Metal. Moreover, the end user is allowed to tailor these parameters by the programs of Metalix CAD/CAM Sheet Metal to suit the requirements of the workpiece desired. So as to ensure the most cost-effective way to derive the desired workpiece from the sheet raw material in terms of leaving as a few leftovers from the sheet raw material as possible, the placement of the workpiece in the Autonest program plays a significant role. Ultimately, after forming the "NC" file in the program of cncKad, via the USB data storage device, the end user is able to open it in the CNC system screen and edit it if necessary to cut the workpiece from the sheet raw material placed the working table in the laser cutting machine.





6.2 The Review of The Home Page of The CNC System Screen



6.2 Fig. The Review of The Home Page of The CNC System Screen

1:PC Operation

2:Sheet Metal Working MGR

3:Calendar

4:Laser Cut Condition DB

5:Laser Cutting

6:Laser Dashboard

7:Operator

8:Machine Setting

9:Data Logger

10:Maintenance Manager

11:Servo Viewer

12:Laser and HSU Alarms

13:Manual

14:Memo

15:Browser

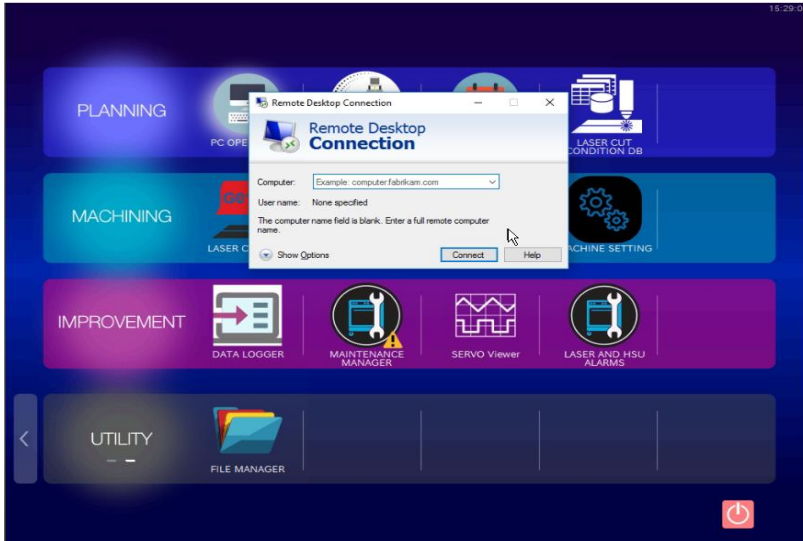
16:Setting

17:Maintenance Display





6.2.1 PC Operation



PC Operation is a function to display and operate the remote computer screen on the CNC indicator screen by connecting the CNC to the Windows OS remote computer (PC remotely connected) through Ethernet. This function uses the Windows remote desktop and allows you to use applications of the remote computer on the CNC screen.

6.2.1 Fig. PC Operation

6.2.2 Sheet Metal Working MGR

The sheet metal working manager application allows you to centralize the following two types of information required at production sites.

- Cutting condition information used in the CNC functions

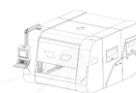
Example: Cutting data, piercing data, edge data, power control data, offset

- Cutting condition information useful for maintenance

Example: Cutting condition name

No.	Name	Feedrate	Power	Pulse Bottom	Freq.	Duty	Assist Gas Press.	Ty
1		1000.000	3000	3000	5000	100	1.20	
2		1000.000	3000	3000	5000	100	1.20	
3		1000.000	3000	3000	5000	100	1.20	
4		0.000	0	0	1	0	0.00	
5		0.000	0	0	1	0	0.00	
6		0.000	0	0	1	0	0.00	
7		0.000	0	0	1	0	0.00	
8		0.000	0	0	1	0	0.00	
9		0.000	0	0	1	0	0.00	
10		0.000	0	0	1	0	0.00	
11		0.000	0	0	1	0	0.00	
12		0.000	0	0	1	0	0.00	

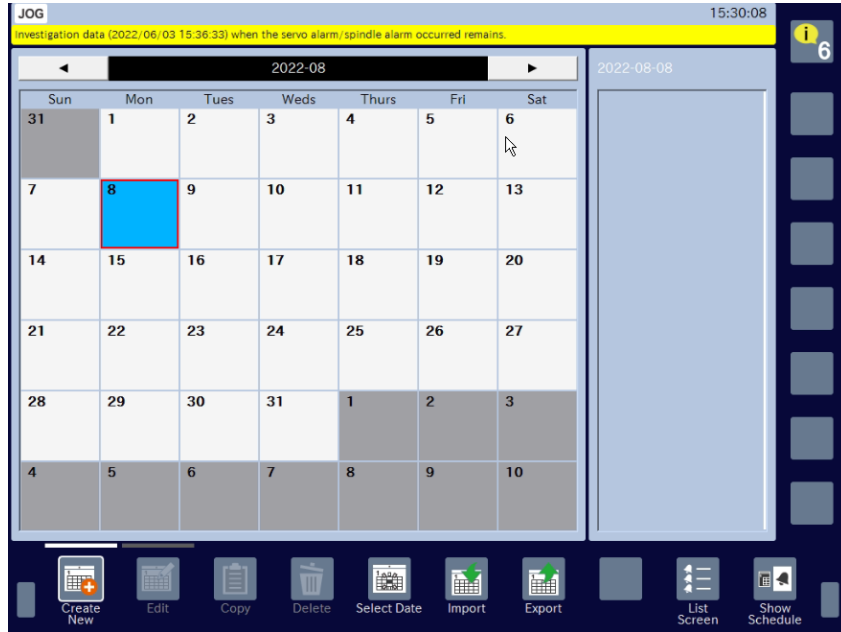
6.2.2 Fig. Sheet Metal Working MGR





6.2.3 Calendar Laser Cut Condition DB

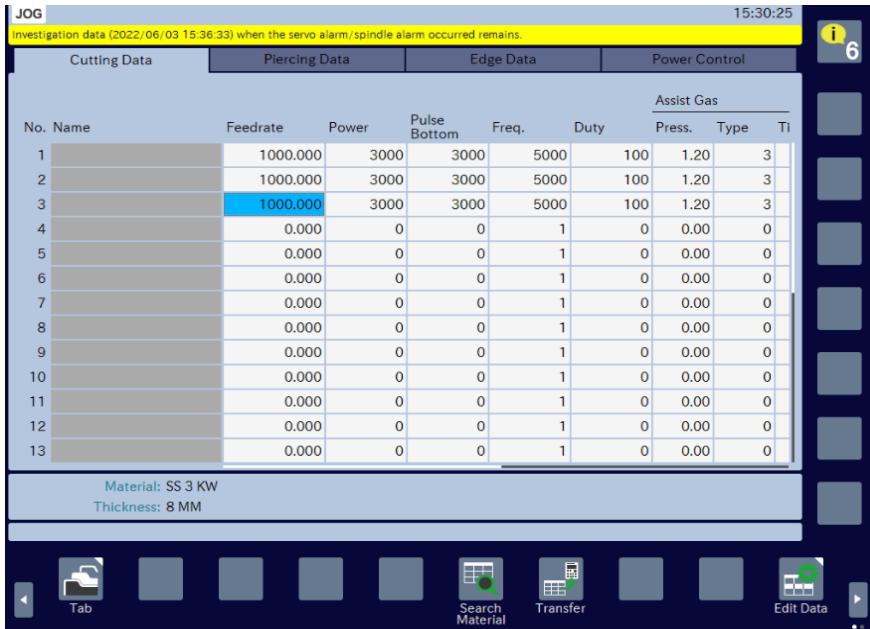
Calendar is an application to register, check, and edit schedules. You can register schedules from applications other than Calendar.



6.2.3 Fig. Calendar Laser Cut Condition DB

6.2.4 Laser Cut Condition DB

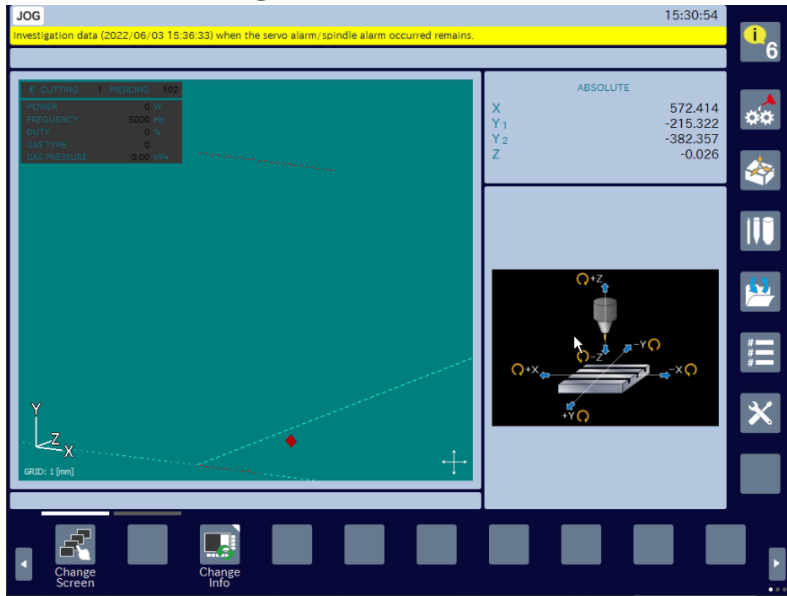
On this screen, the parameters required for laser cutting and the type and thickness of the material to be cut are selected.



6.2.4 Fig. Laser Cut Condition DB



6.2.5 Laser Cutting

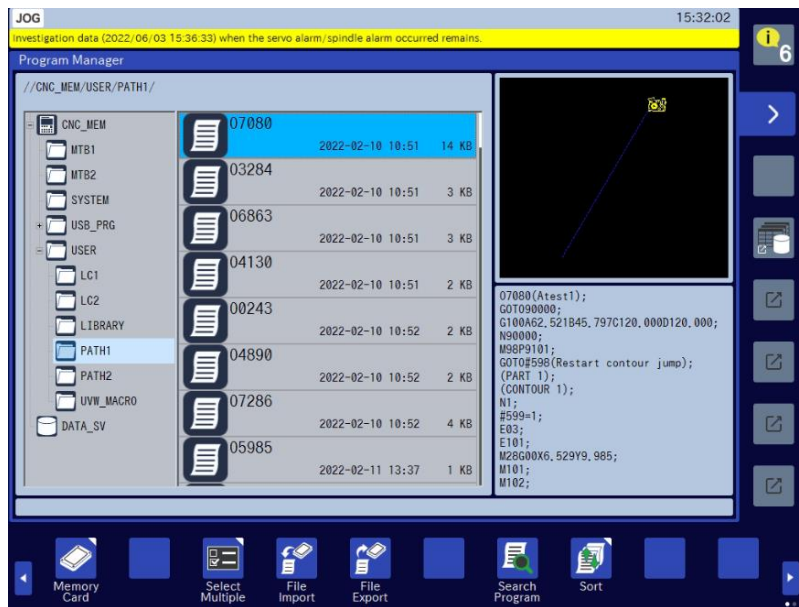


On this screen, the G-codes created for the laser cutting process and the simulation of the cutting process can be seen.

6.2.5 Fig. Laser Cutting

6.2.6 Laser Dashboard

The NC files and images that we have uploaded to the cutting machine before appear on the laser dashboard screen. When a new NC file is loaded, it should be observed from this screen. Additionally, the G codes of the NC file are displayed in the lower right pane. (This picture is example)



6.2.6 Fig. Laser Dashboard



6.2.7 Operator

The operator screen which used after program selection and parameter setting. There are many functions on this screen. These functions are as follows;



6.2.7 Fig. Operator

1:Piercing Data

Incremental Piercing Height: Drilling height is adjusted.

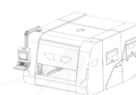
Piercing Type: The number of pierce parameters used in the piercing data page is written. There are various pierce type for all sheet type. This determine as soon as possible production type.

2:Pre-Setting

Frame Operation Feed: Sets the speed of the frame run command.

Ping Pong Height: Sets the transition height between the two contours to be cut.

Back After Pause Distance: It determines the waiting height at the transition to the next contour.





3:Edge/Angle Setting

The laser head scans the sheet, detecting all its edges, and then calculates the angular misalignment of the sheet.

Edge / Angle Feedrate: Speed of the laser head during scanning.

Edge Source Off: It determines how far the head will move after the end of the sheet metal while edge detection is performed.

Sheet Size: It determines the dimensions of the whole sheet. While scanning, half the size of the sheet is scanned.

Orgin Offset: After the Edge/Angle process is completed, it determines and sets how far the origin point will start from the starting corner of the sheet.

Edge Search Height: It determines the distance between the laser head and the sheet metal while the edge/angle function is operating.

4:Post Setting

In this function, necessary adjustments are made when any problem or interruption is encountered in the cutting or to start cutting directly from the desired contour. The point to be considered here is that the Home point where the program is started should be fixed and the location of the sheet should not be changed.

Part : Indicates the total number of contours in this job.

Current Contour : It shows the contour number found instantly during the cutting process.

Restart Contour : This is the part where the number of the desired contour is entered. After the contour number is entered here, the program is started again.

Current/Restart : It is used to reset the number of contours that the machine keeps in its memory.

5:Manual Mode Data

Focus: The focus in the parameter automatically falls to this part. However, it can also be changed manually in this part.

Auto Gas : Sets whether the gas flow is on or off at transitions between the contours.

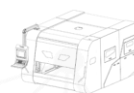
Pressure : During the gas test in jog mode, the pressure of the exiting gas is determined.

Time : It determines the gas discharge time in gas test.

Puff Pressure : It is used to determine the amount of gas used in the centering command.

6:Height Calibration

HSU Calibration : The calibration is very important for get the quality production. If cutting head doesn't calibration ,it will effect to cordition of cutting heigh. Therefore the machine will





give a warning for setting calibration at the first time and then the operator should the calibration adjustment for different type productions (sheets thickness) at every time.

7:Origin Set

In this part, the place to start laser cutting is marked. The cutting head is moved and choose the desired position in Jog mode with the arrow keys and the position is kept in the machine's memory (Home) thanks to this function.

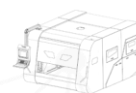
8:Sheet Management

In this section, it gives information about the sheet inventory, how many pieces of which material is left, and sheet information in the cutting program.

SR. NO.	MATERIAL TYPE	THICKNESS (mm)	PROGRAM NAME	NUMBER OF SHEET	REMAINING SHEET	RST	SELECT	SHEET STATUS GRAPH
1	SS	1.50	10	10	10	■	■	100%
2	MS	1.00	20	4	4	■	■	20%
3	SS	0.80	30	8	8	■	■	27%
4	OTHER	2.50	40	6	6	■	■	15%
5	OTHER	3.00	50	6	6	■	■	12%
6	OTHER	3.50	60	6	6	■	■	10%
7	OTHER	4.00	70	7	7	■	■	10%
8	OTHER	5.00	80	9	9	■	■	11%
9	OTHER	8.00	90	1	1	■	■	1%
10	OTHER	10.00	91	5	5	■	■	5%

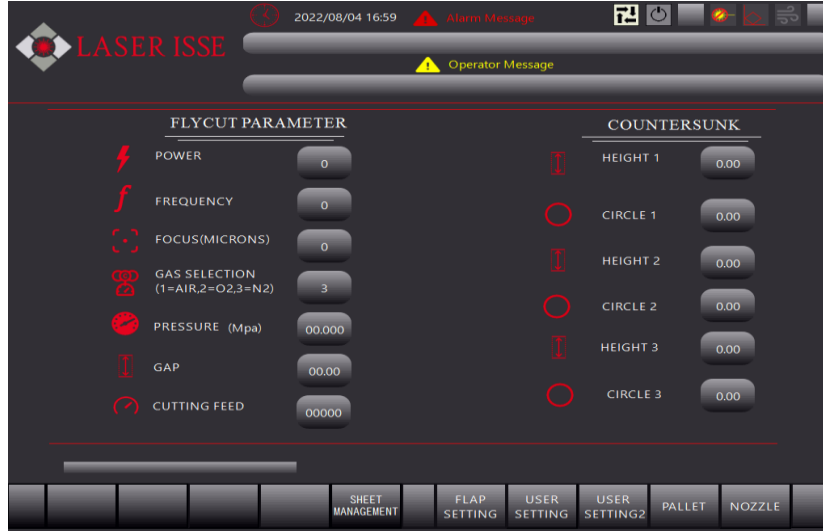
Additional interface elements: 2022/08/04 16:59, Alarm Message, Operator Message, 1085, FLYCUT, FLAP SETTING, USER SETTING, USER SETTING2, PALLET, NOZZLE.

6.2.7.a Fig. Sheet Management



9:Fly Cut

On this page, parameter settings can be made for Flycut and countersunk, which are special cutting methods.



6.2.7.b Fig. Fly Cut

10:Flap Setting

There are 6 areal exhaust exit. These areas can be programmed for when start and stop to get rid of dusts. Operator is able to change that which flap will open or close as type of production.



6.2.7.c Fig. Flap Setting



11:User Setting 2



6.2.7.d Fig. User Setting 2

A:Line Cut

This function allows cutting in a straight line between 2 specified points.

Start Point : It allows us to select the starting point for the line cutting. While the cutting head is in Jog mode, the head is brought to the target point with the arrow keys and the desired position is saved by clicking the rotating arrow sign.

End Point : It allows us to select the ending point for the line cutting. While the cutting head is in Jog mode, the head is brought to the target point with the arrow keys and the desired position is saved by clicking the rotating arrow sign.

Line Cut : This tab is clicked to start the line segmentation between the Start point and End point.

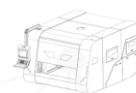
B:One-Shot

This function is used when attempting ignition or centering for the laser. The following sub-segments are the parameter settings of this function.

Power : At least 20% of the laser power must be entered in this segment. Otherwise, the laser will not fire. Recommended value is 1000 W.

Frequency : Recommended value is 5000 Hz.

Duty : Recommended value is 100%.





Piercing Time : Recommended value is 0.2 s.

One Shot Gas Selection : Manual use :It depends on which type gas that used.

Pressure(Mpa) : Recommended value is 0.1 Mpa to centering.

C:Cutting Condition Selection

It makes use of the line cut command to automatically pull from the program.

D:INC Feed Selection

12:Pallet

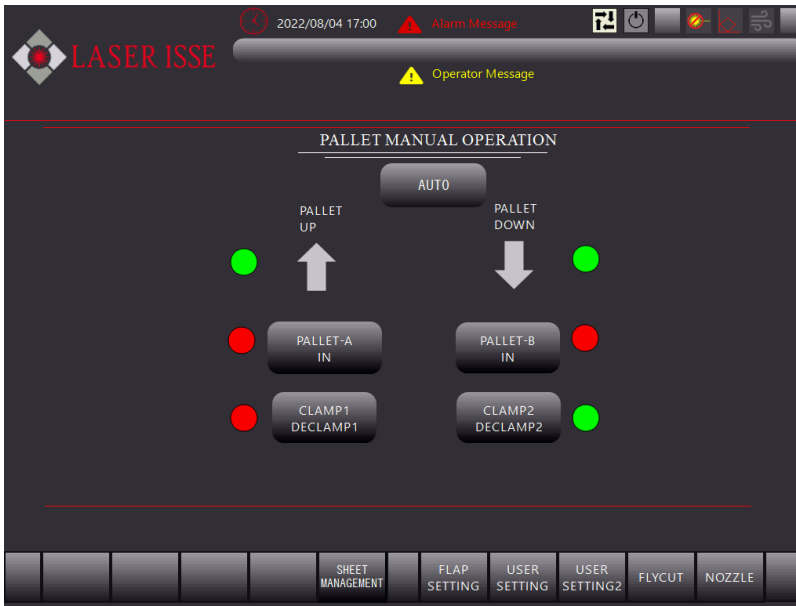
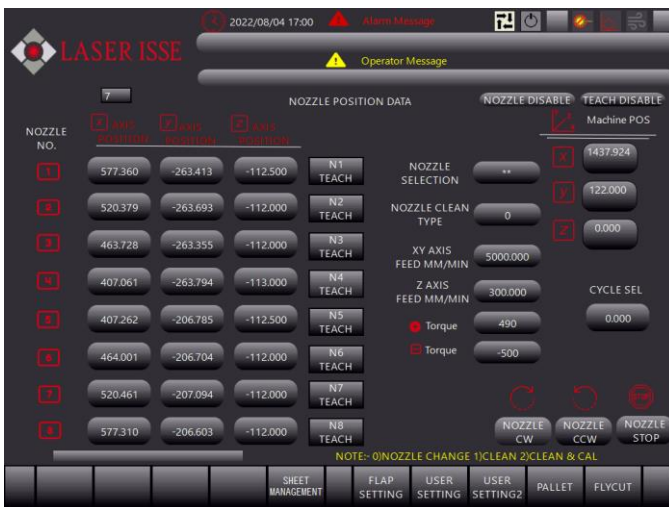


Table changer is done at manual mode and automatic mode.If would like to change table in manual mode ,it is necessary to change mod (auto mode / manual mode), open the table door and then Clamp 1 and Clamp 2 disactive.If are these steps okey,it is possible to press Pallet A In button and Pallet B In button if which wanted table.This process takes place more slowly than changing the table automatically.

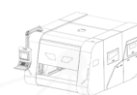
6.2.7.e Fig. Pallet

13:Nozzle



In this section, nozzle cleaning and replacement are provided.

6.2.7.f Fig. Nozzle





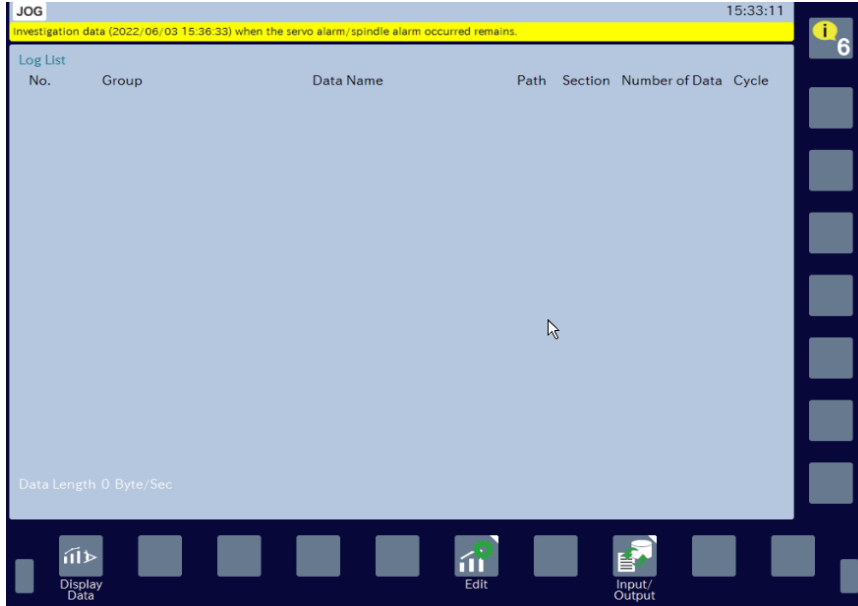
6.2.8 Machine Setting

In this tab, machine settings are make.



6.2.8. Fig. Machine Setting

6.2.9 Data Logger



The Data Logger function is an application to collect the data inside CNC regularly and accumulate them in the database in the storage. Data stored in the database can be displayed in list form. These data are used in other applications such as MAINTENANCE MANAGER function.

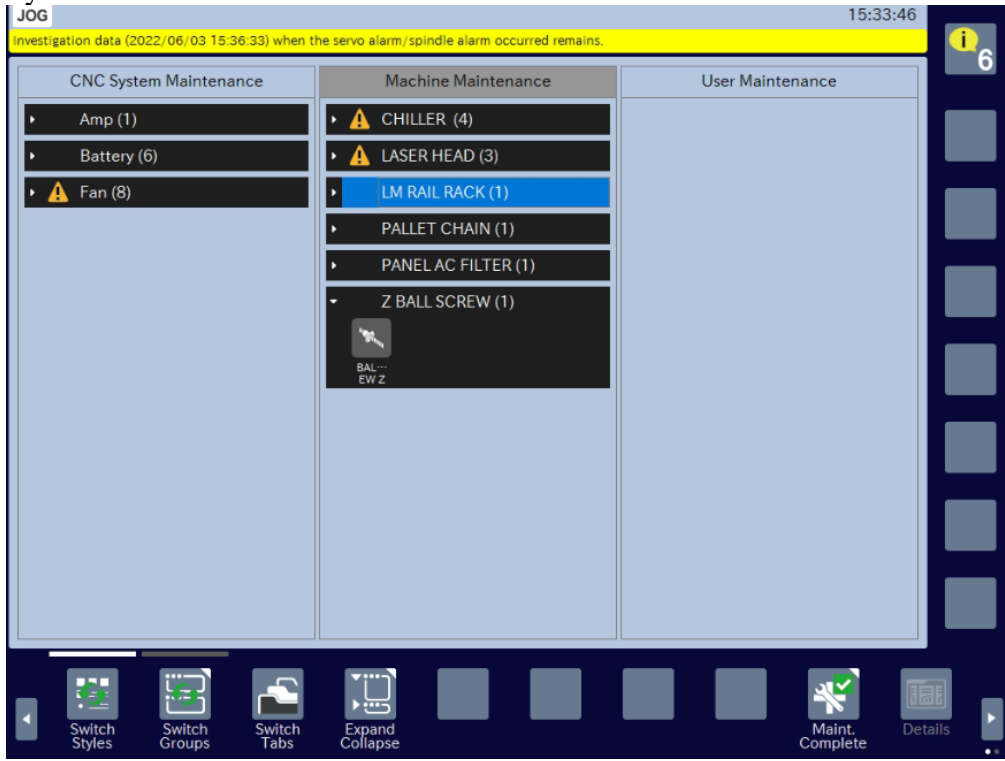
6.2.9 Fig. Data Logger





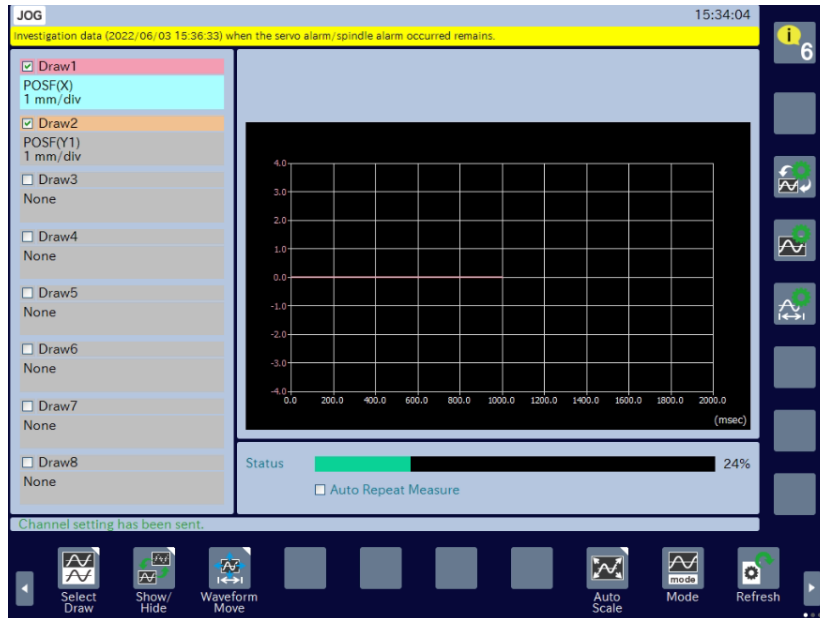
6.2.10 Maintenance Manager

The Maintenance Manager function is an application that monitors the state of a maintenance target, and notifies alarms and maintenance timings for efficient preventive maintenance of machinery.



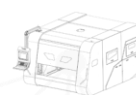
6.2.10 Fig. Maintenance Manager

6.2.11 Servo Viewer



We can find various information about the servo motors.

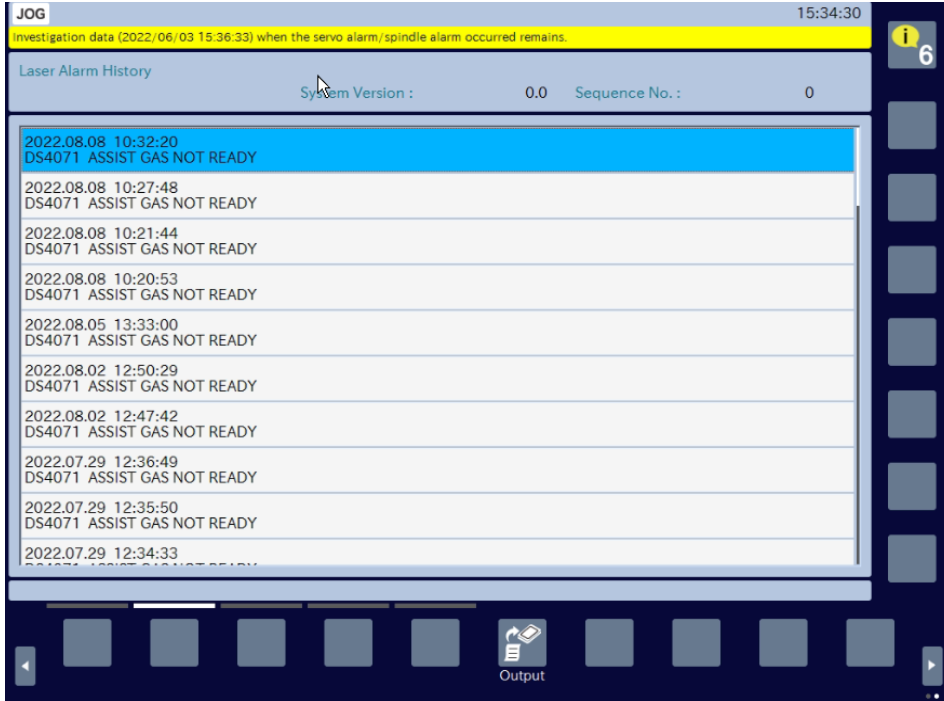
6.2.11 Fig. Servo Wiewer





6.2.12 Laser and HSU Alarms

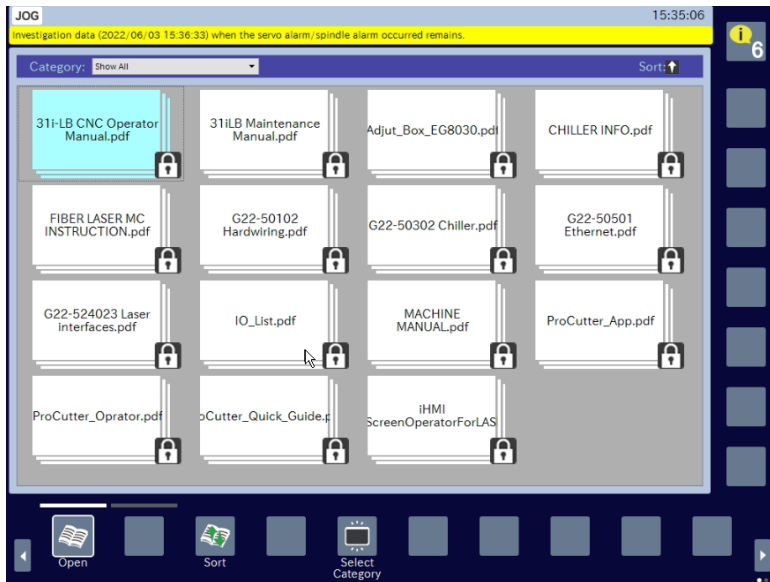
It is the page that specifies the alarm codes and their meanings.



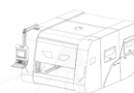
6.2.12 Fig. Laser and HSU Alarm

6.2.13 Manual

Manual is an application to manage and view manuals. In the Manual List screen, manuals are listed in icon format. You can view, add, and delete manuals.



6.2.13 Fig. Manual

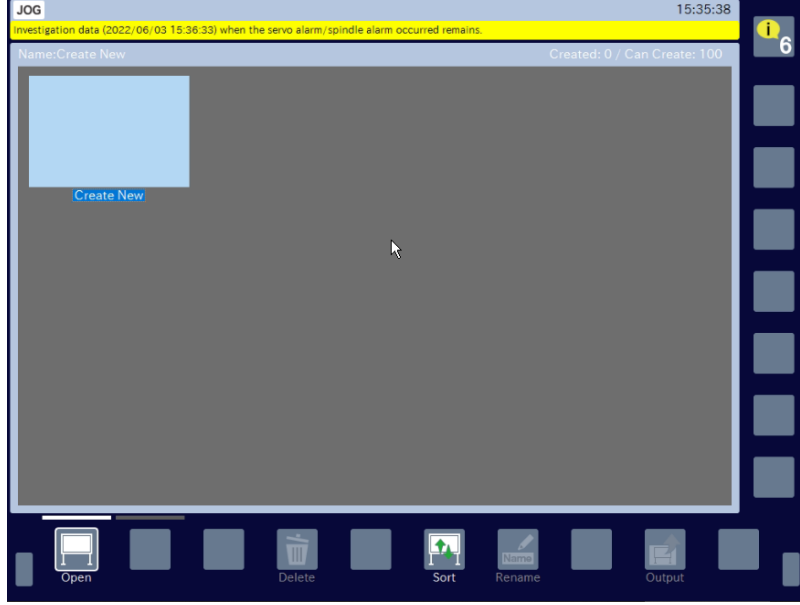




6.2.14 Memo

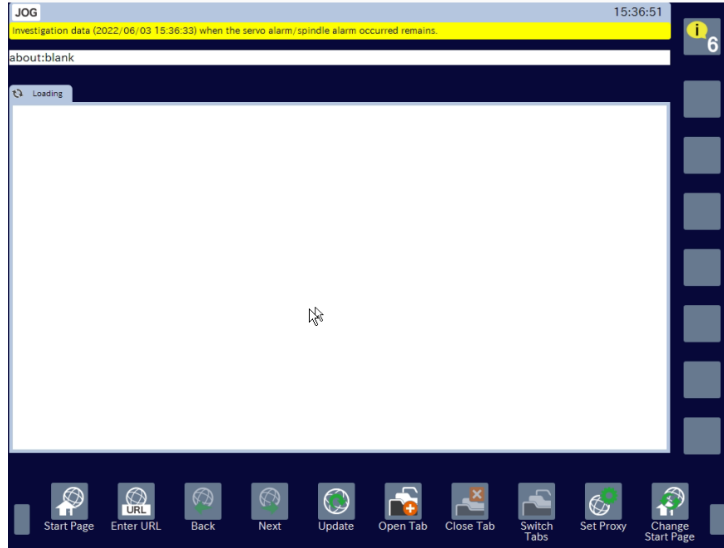
The memo function is an application that allows you to enter text, draw lines, and insert images to a screen called "whiteboard." You can use it for notes and messages.

You can create and edit multiple whiteboards. You can also convert a whiteboard itself to an image format and output to an external device (USB memory, memory card).



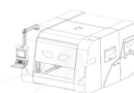
6.2.14 Fig. Memo

6.2.15 Browser



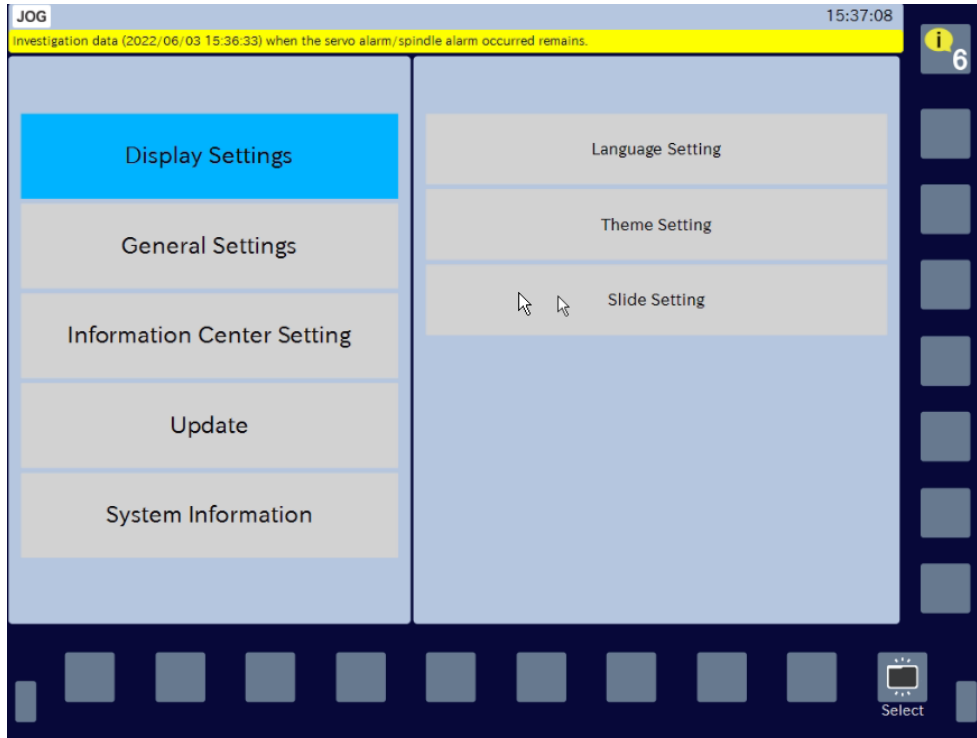
Web Browser allows you to browse Web pages on the CNC screen.

6.2.15 Fig. Browser



6.2.16 Setting

You can configure the settings for the entire application on iHMI.



6.2.16 Fig. Setting

6.2.17 Maintenance Display

Relative: The part containing the servo position values.

Machine: The part containing the machine coordinate values.



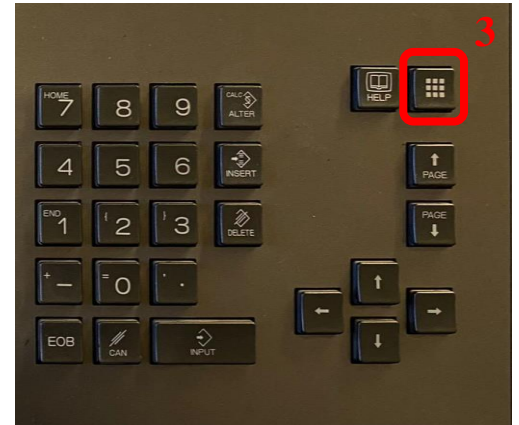
6.2.17 Fig. Maintenance Display

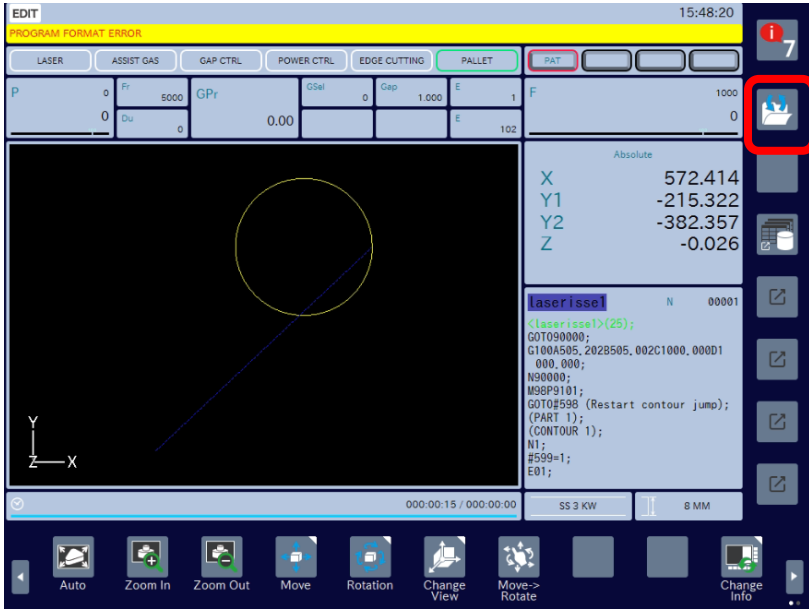
7 Cutting Program Upload And Starting



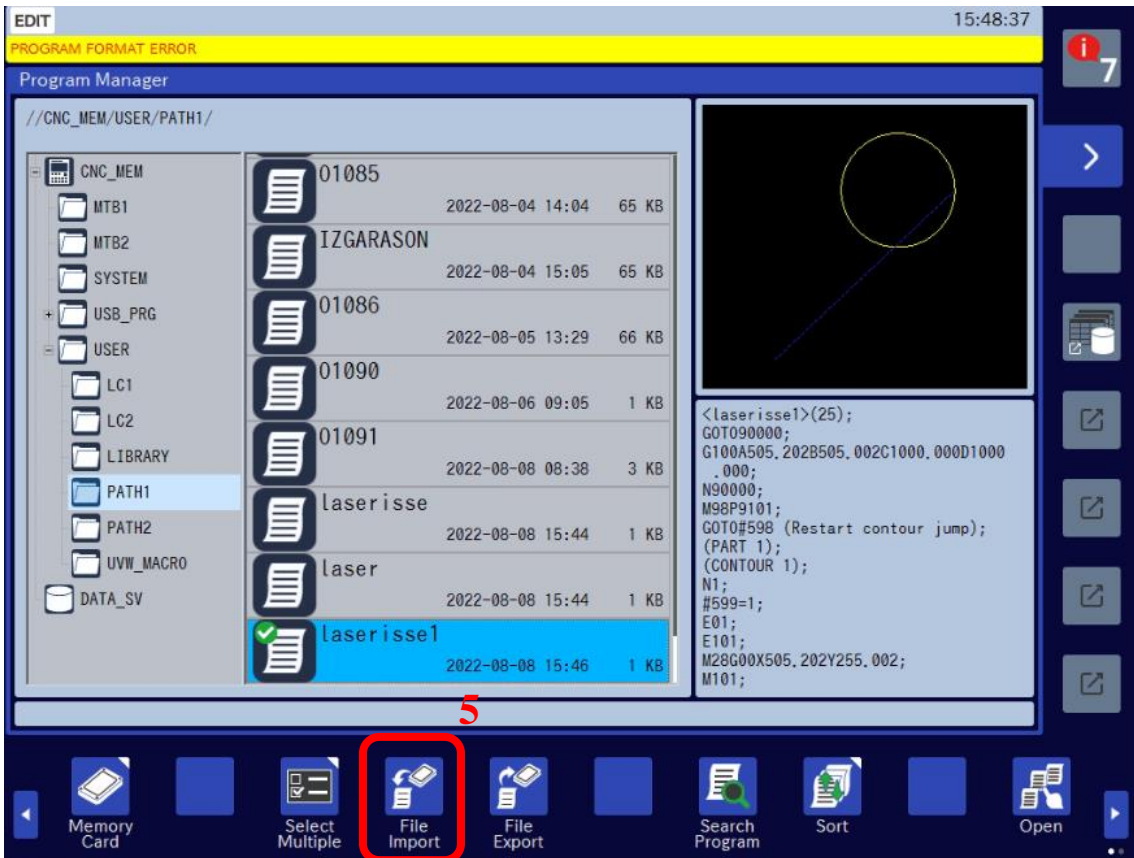
First, the G codes belonging to the laser cutting process and created from the Metalix program are uploaded to the USB, and then inserted into the USB socket (1) and the (2) Edit button pressed .

In order to come to the Laser Dashboard screen, press the (3) button and select the Laser Dashboard tab from the screen that opens.

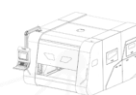


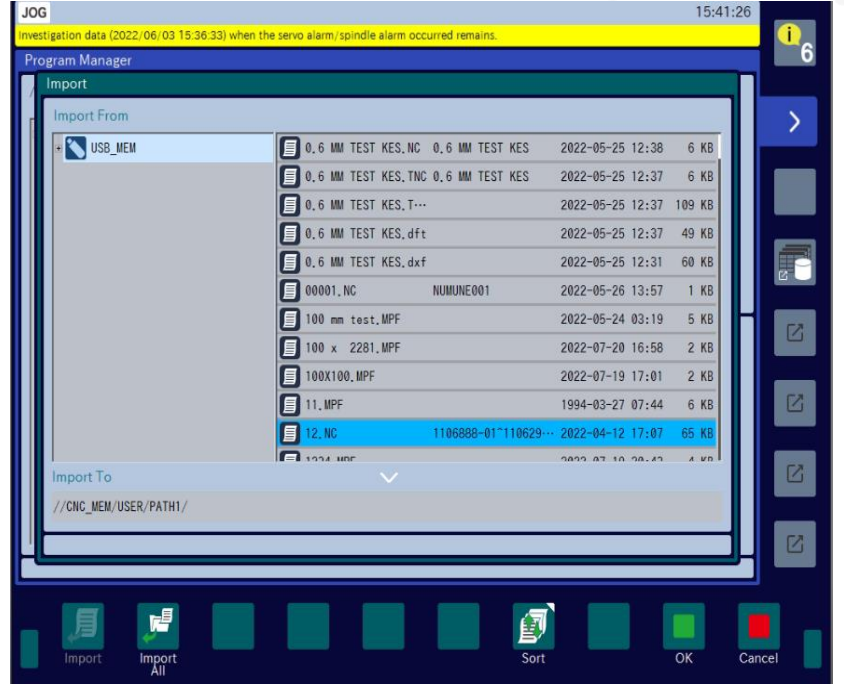
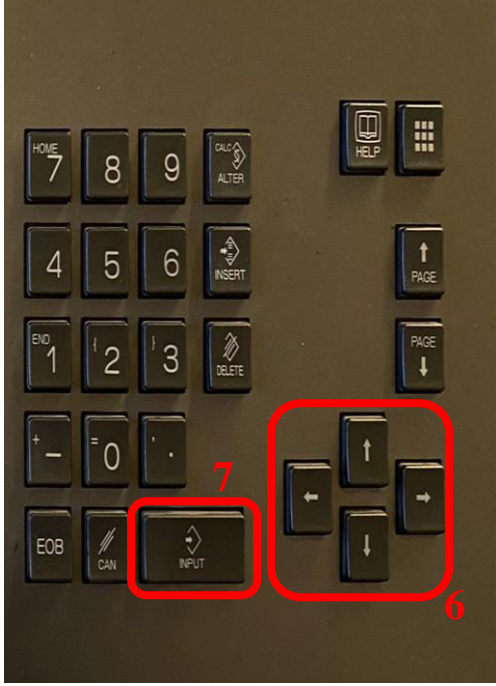


On the Laser Dashboard screen that opens, the icon number 4 is clicked on.

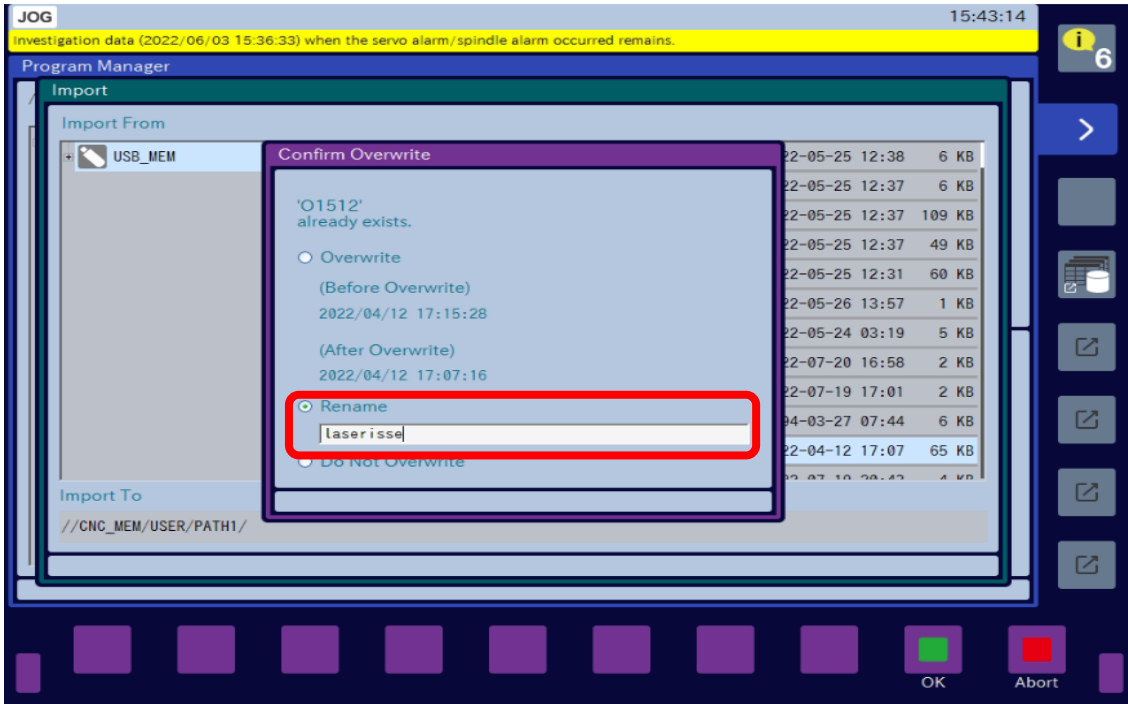


File import (5) tab is selected. NC file that you want to select from the screen that opens, is selected with the arrow keys (6) and the input key (7) is pressed.

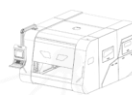


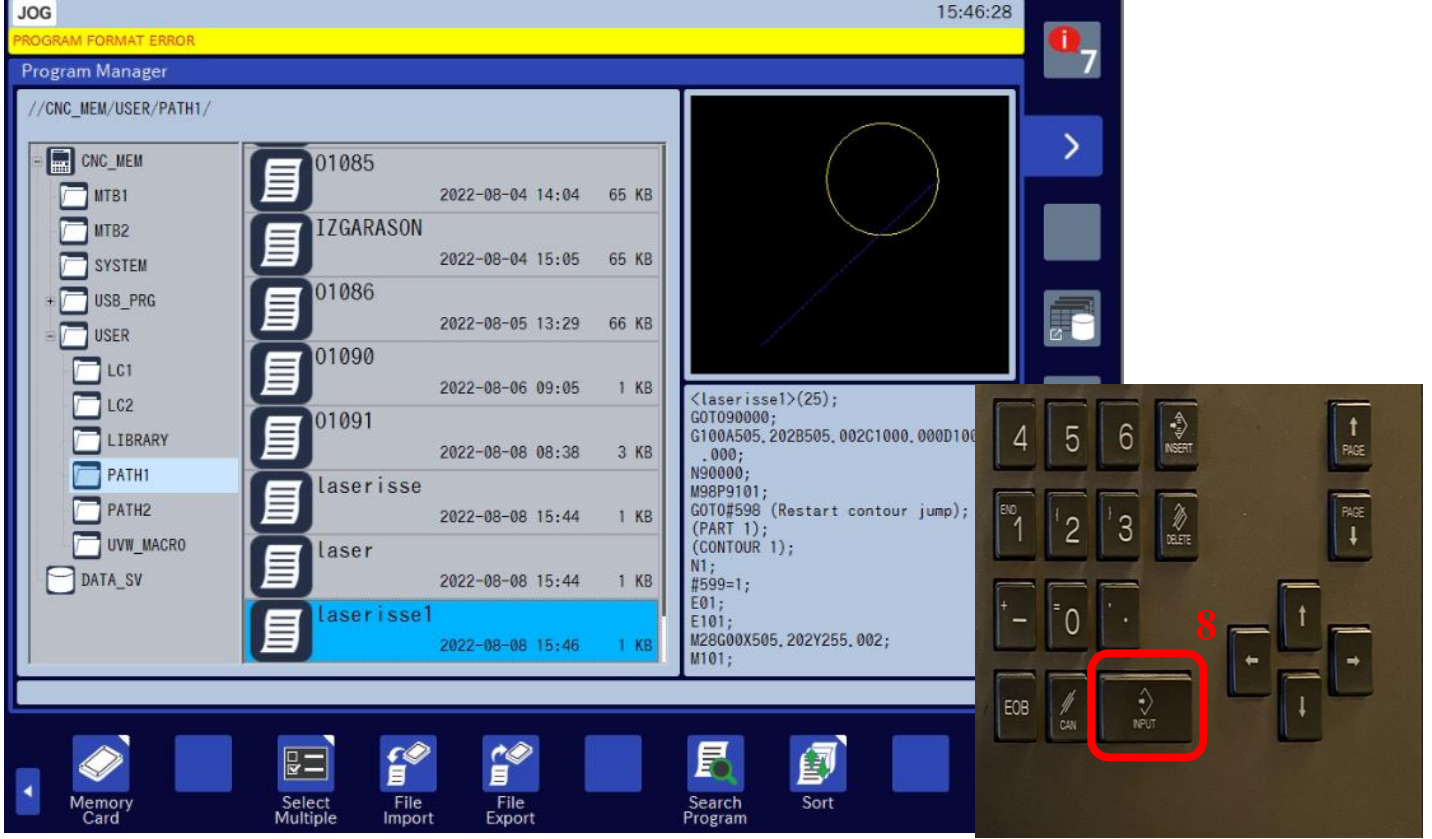


Rename editing is done on the Confirm Overwrite page that opens.



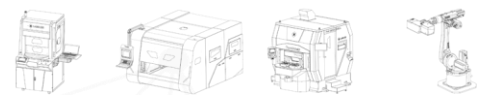
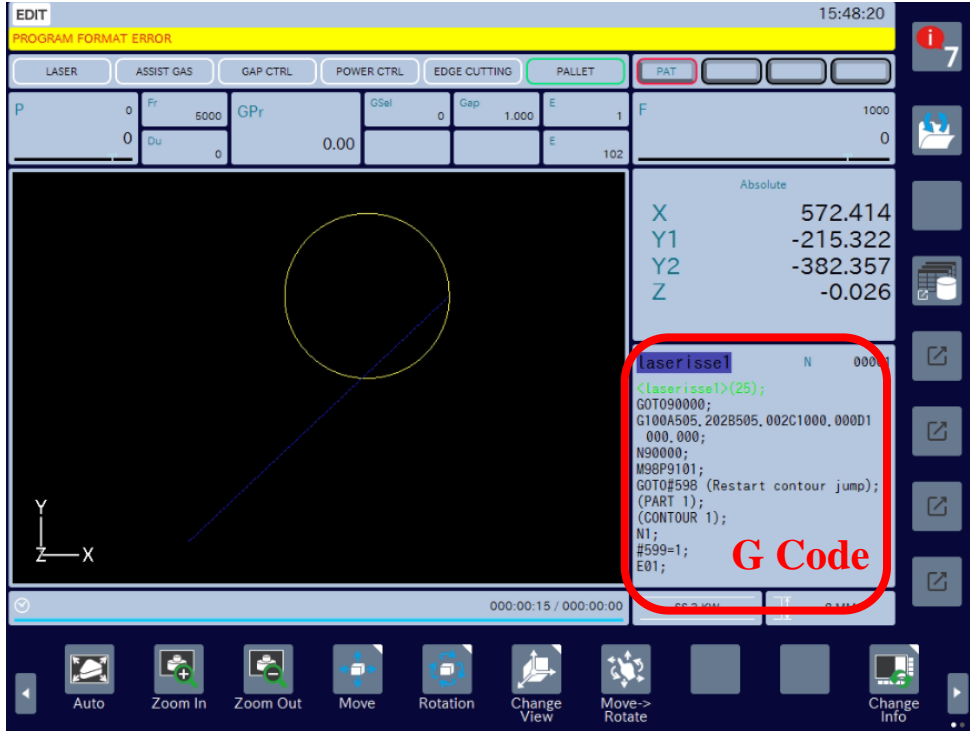
From the Program Manager page, the file we saved with the name we want is reached and the file is selected with the input button (8) .





On the page that opens, there are the images of the products we will cut and the G codes of our NC file.

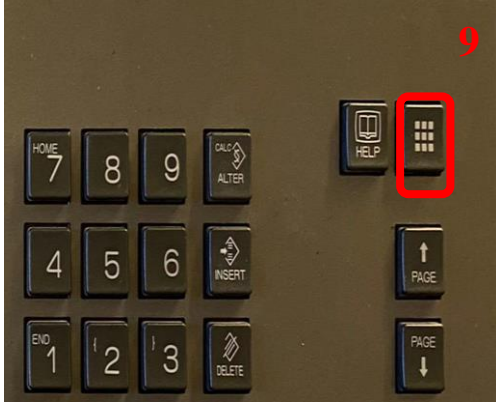
In this way, our NC file is thrown into the cutting machine.





LASER ISSE

www.laserisse.com



Then press the (9) button and go to the main menu and click on the Laser Cut Condition DB tab. In this section, material selection and cutting parameters are entered and adjusted.

You can edit the parameters if Edit Data (11) is clicked on this screen.

EDIT 15:50:50

PROGRAM FORMAT ERROR

7

No.	Name	Feedrate	Power	Pulse Bottom	Freq.	Duty	Assist Gas		
							Press.	Type	Ti
1		1000.000	3000	3000	5000	100	1.20	3	
2		1000.000	3000	3000	5000	100	1.20	3	
3		1000.000	3000	3000	5000	100	1.20	3	
4		0.000	0	0	1	0	0.00	0	
5		0.000	0	0	1	0	0.00	0	
6		0.000	0	0	1	0	0.00	0	
7		0.000	0	0	1	0	0.00	0	
8		0.000	0	0	1	0	0.00	0	
9		0.000	0	0	1	0	0.00	0	
10		0.000	0	0	1	0	0.00	0	
11		0.000	0	0	1	0	0.00	0	
12		0.000	0	0	1	0	0.00	0	
13		0.000	0	0	1	0	0.00	0	

Material: SS 3 KW
Thickness: 8 MM

Executing...

10 12 11

Tab Search Material Transfer Edit Data





Parameters Page

MEM 17:36:01

A warning was detected in "Fin Fan-1#Servo Amp-12".

5

Cutting Data

Cutting Data Individual Settings

Power Control

No.	Name	Value
1	LARGE CONTOUR	
2	LARGE CONTOUR	
3	LARGE CONTOUR	
4		
5		
6	2.5 MM DOUBLE	
7		
8		
9		
10		
11		
12		
13		

No.	Name	Value
1	Feedrate [mm/min]	1100.000
	Power [W]	3000
	Pulse Bottom [W]	3000
	Frequency [Hz]	5000
	Duty [%]	100
	Assist Gas Pressure [MPa]	0.05
	Assist Gas Type	3
	Assist Gas Time [s]	0.0
	Gap Amount [mm]	1.100
	Offset Value [mm]	0.000
	Select Edge	201
	Select Start-up	0
	Select Power Control	0
	FOCUS (microns)	2500
	NOZZLE (1-8)	0

Assist Gas	Press.	Type	Ti
	0	0.05	3
	0	0.05	3
	0	0.05	3
	0	0.00	0
	0	0.00	0
	0	0.00	0
	0	0.00	0
	0	0.00	0
	0	0.00	0
	0	0.00	0

Material: M
Thickness: T

Previous Data Next Data OK Cancel Apply

Feedrate: Feed rate is the velocity at which the cutter is fed, that is, advanced against the workpiece.

Power: Laser source maximum output power.

Pulse bottom: Laser source minimum output power.

Frequency: Makes the laser frequency adjustment.

Duty: It is used together with the laser frequency. It determines the ignition continuity.

Assist gas pressure : The pressure of the auxiliary gas required for cutting is entered in this section as MPa.

Assist gas type : Numbered gas connections are selected from this section.

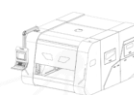
Assist gas time : It determines the time that the gas will be blown during cutting. If the value is set to 0, continuous gas blowing is performed.

Gap amount : Cutting height is adjusted.

Offset value : Safety value for product.

Select edge : The line number for which you will use the edge parameter is written.

Select start up : Not used.





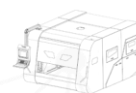
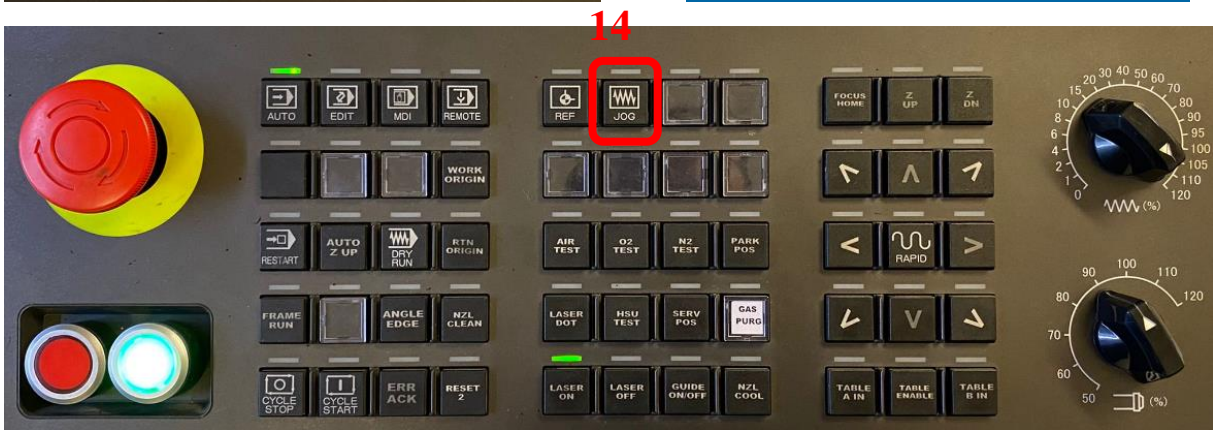
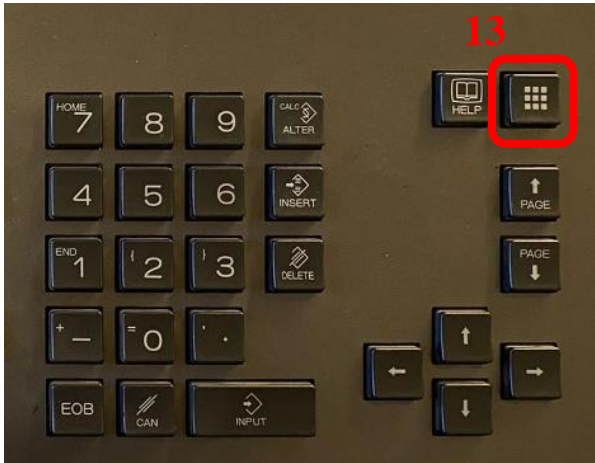
Focus : Focus position is adjusted.

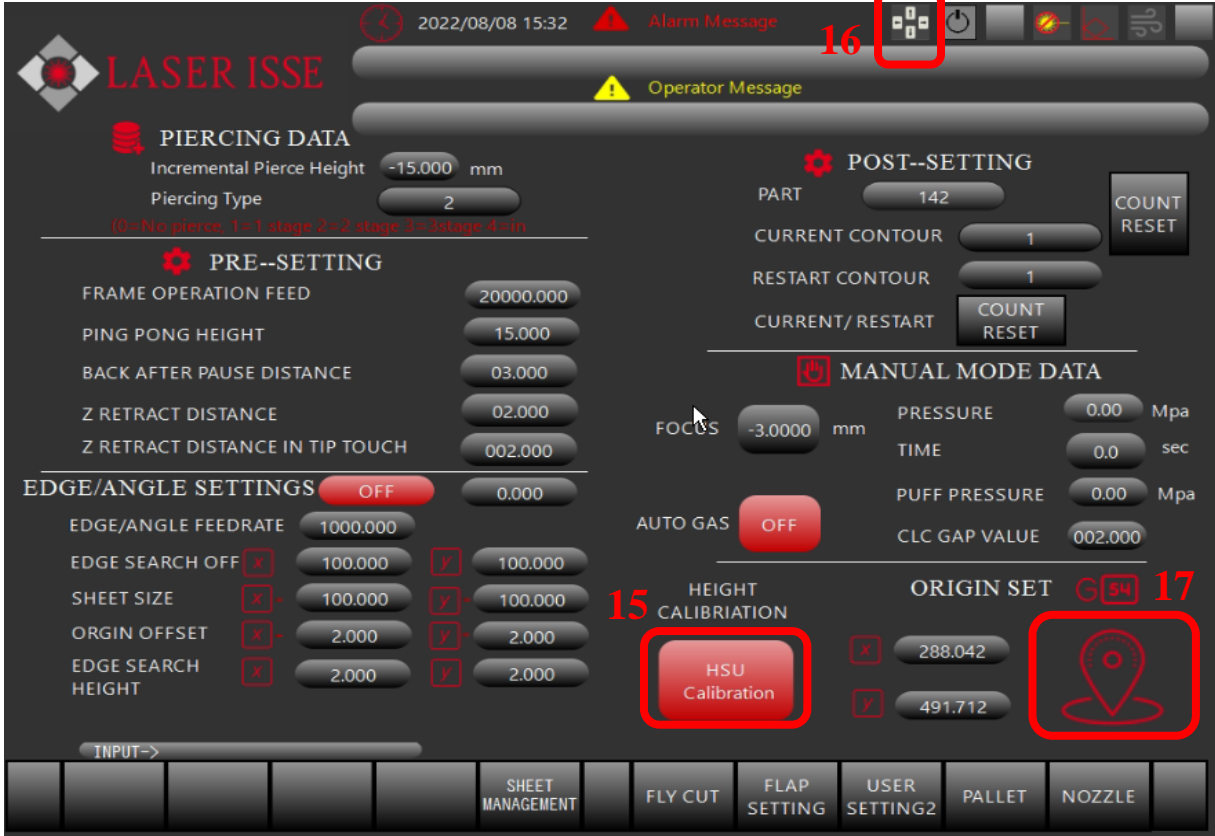
Nozzle : The nozzle diameter used in the parameter is written.

You can select the material type and thickness from the Search Material (10) section.

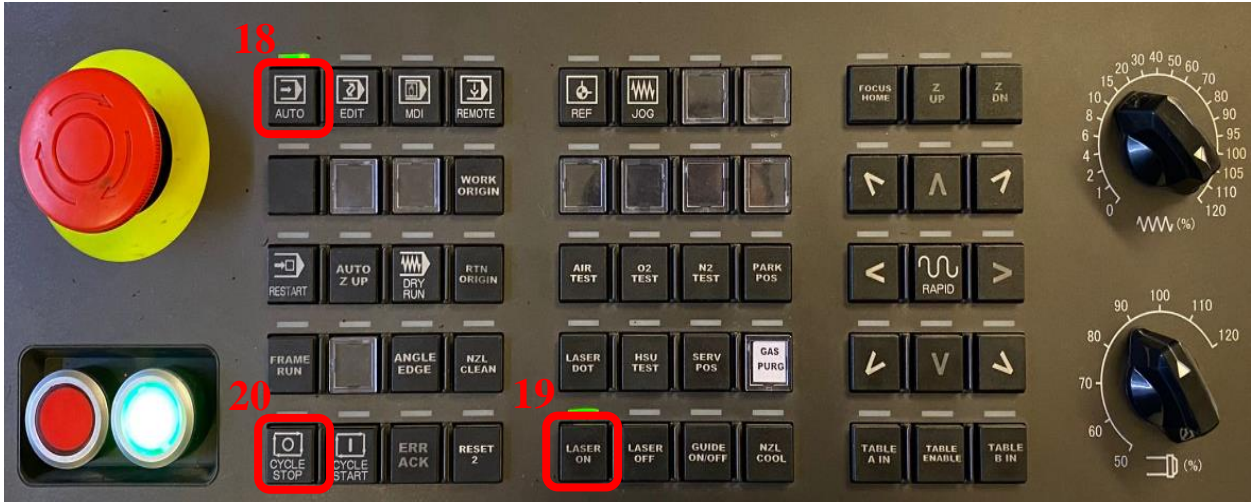
After setting the cutting parameters, material thickness and material type, the values are transferred by clicking on the Transfer tab (12) .

Finally, the calibration of the head and the starting position are determined. For this, firstly, the (13) key is pressed. The Operator tab is clicked on the main screen that opens. The Jog key (14) is pressed on the keyboard. In this way, the jog mode is activated. For the calibration of the machine, the number (15) Hsu Calibration is clicked. It takes time according to the speed you will choose. During the calibration process, the icon number (16) on the operator screen will turn green. The icon when the calibration process is finished will return to its original state. Then, the cutting head is taken to the point where laser cutting will start with the arrow keys and this position is saved by pressing the icon number (17).





In order for the cutting to start, the laser cutting machine is put into auto mode by pressing the Auto button (18). The Laser On button (19) is pressed and the laser is activated. Finally, the Cycle Start button (20) is pressed and the laser cutting starts.





8 Adjustment And Maintenance Of The Laser Cutting Head

Any repair or maintenance work must be carried out only by qualified personnel with special knowledge and training provided by Laserisse. Laserisse will not be liable for any damage caused by any action other than the training and instructions provided.

Personnel Requirements

- Specialized personnel must be trained and informed about dangerous situations according to regulations and safety notes.
- The instructions of the machine manufacturer must be followed by qualified personnel.
- Prescribed protective equipment must be used.

8.1 Maintenance

Protection / Cleaning

The following work should be done regularly and before working on the laser head:

- Make sure that the connections, head stability, protection slide and nozzle (nozzle electrode) are fixed as desired and do not move.
- Remove any dirt.

Pressure frequency

The laser head should be periodically checked for leaks. If necessary, equipment should be replaced.

Wearable equipment

If the following parts are damaged, maintenance or replacement should be done.

- Nozzle electrode and ceramic parts
- Protection glass (protective glass slide)

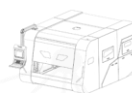
Electrical contact

Make sure that the sensor works in accordance with the system and that the electrical contact status is appropriate.

The surfaces of the following materials must be clean:

- Nozzle electrode and ceramic
- Internal sensor and BNC connections

Corrosion of water cooling channels



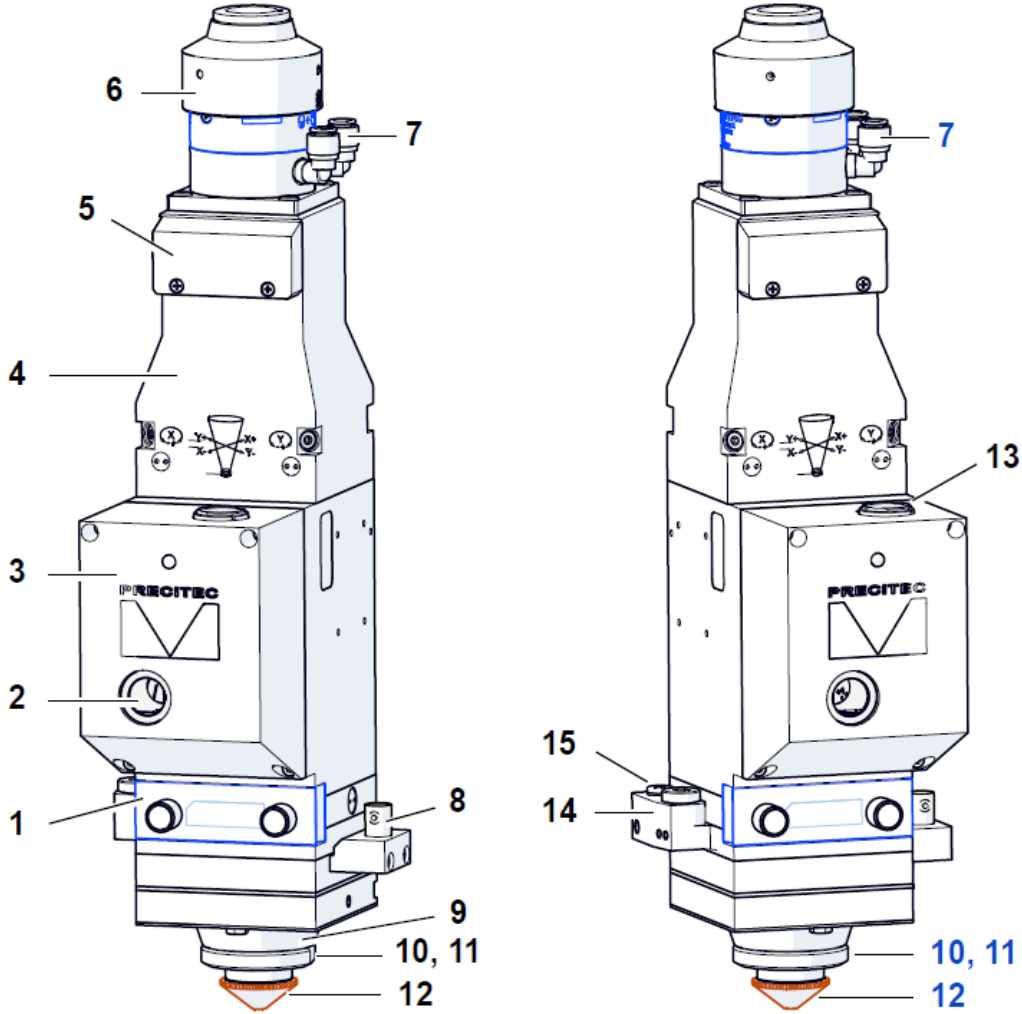


The internal maintenance instructions given by the laser manufacturer or the cooling unit manufacturer must be observed to avoid any corrosion.

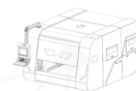


It is recommended to change the TurcCut coolant every 6 months for healthy operation. The water used should be drinkable (clean water).

8.2 LightCutter 2.0 Cutting Head Description and Maintenance



8.2 Fig. LightCutter 2.0





- 1 Protective window cartridge(Bottom)
- 2 Focus Position Display
- 3 Adjustment module (focal position)
- 4 Collimating module COL
- 5 protective window cartridge(Top)
- 6 Fibre socket (e.g. QBH)
- 7 water links
- 8 BNC connection
- 9 Sensor insert SE
- 10 Nut MU
- 11 Ceramic part KT
- 12 Nozzle DE (nozzle electrode)
- 13 19-Pin Connector
- 14 G1/8 connection, left (cutting gas)
- 15 Colling Gas Connection

8.2.1 Centering And Adjusting The Laser Beam

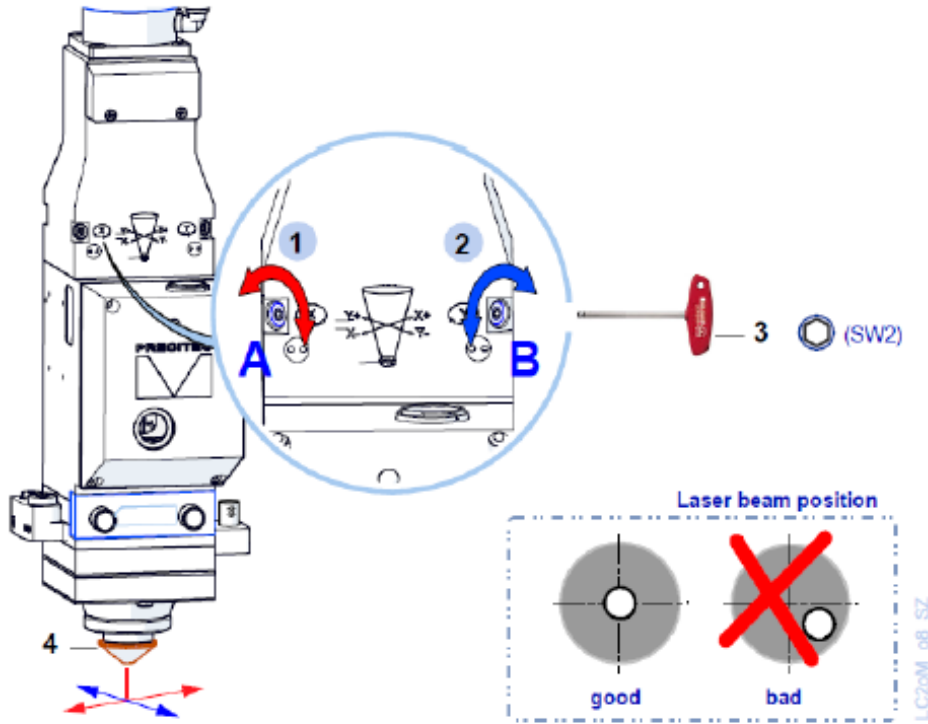


Fig. 4-7 Commissioning: Laser beam position - Focusing lens

- 1 Adjusting screw A
- 2 Adjusting screw B
- 3 Allen key (size 2)
- 4 Nozzle DE (nozzle electrode)

8.2.1 Fig. Centering And Adjusting The Laser Beam





Centering Steps

1. Centering is done with two adjusting bolts (1 and 2).

Adjustment range: ± 1.5 mm

Tool : Allen key (size 3 mm)

When the laser beam is adjusted, the nozzle diameter suitable for cutting and the laser beam should coincide with the middle of the nozzle.

2. A tape is attached to the bottom (end) of the nozzle.

3. After the tape is adhered, the program related to centering should be run on the robot. Then low-power firing is done. The fired part should come to the middle of the nozzle, if not, re-centering is required.

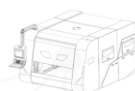
4. Center using the centering and adjusting bolts.

Maximum adjustment range ± 1.5 mm.

5. Adhere a sample tape again. Ignite at low power, thinking that it is coming over the material again. The fired part must come to the middle of the nozzle, if not, re-centering is required.

Repeat these steps until the laser is centered .

NOTE: When adjusting the laser beam position, the system must not be pressurized (without gas) and the axis movements must be turned off.



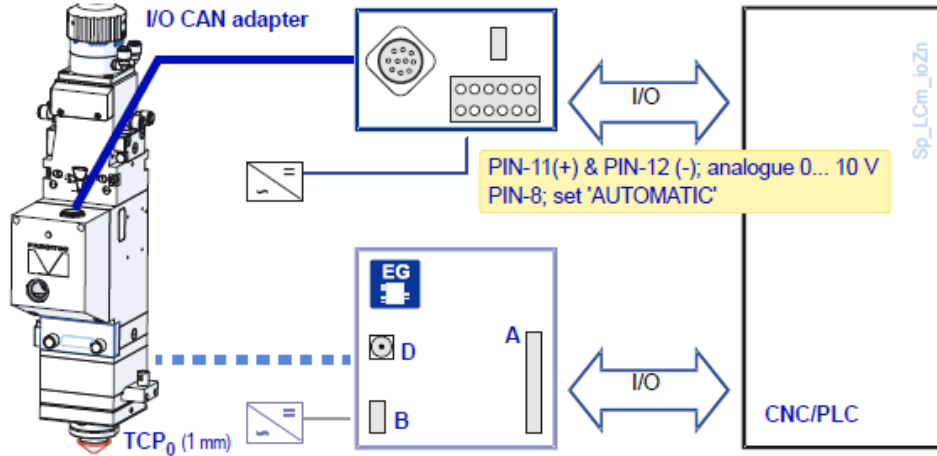


8.2.2 Setting The Focal Position



When centring/ adjusting the focusing lens, the **distance controller must be switched off.**

Adjusting element (analogue voltage - I/O adapter - CNC/PLC)

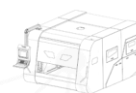


Adjustment range (motor-controlled)

Adjustment range(F125/F150) +11 to -8 mm (5.44 V = nominal focal position)
 TCP₀ 1 mm in front of the nozzle tip
 (View from the outside onto the nozzle tip)

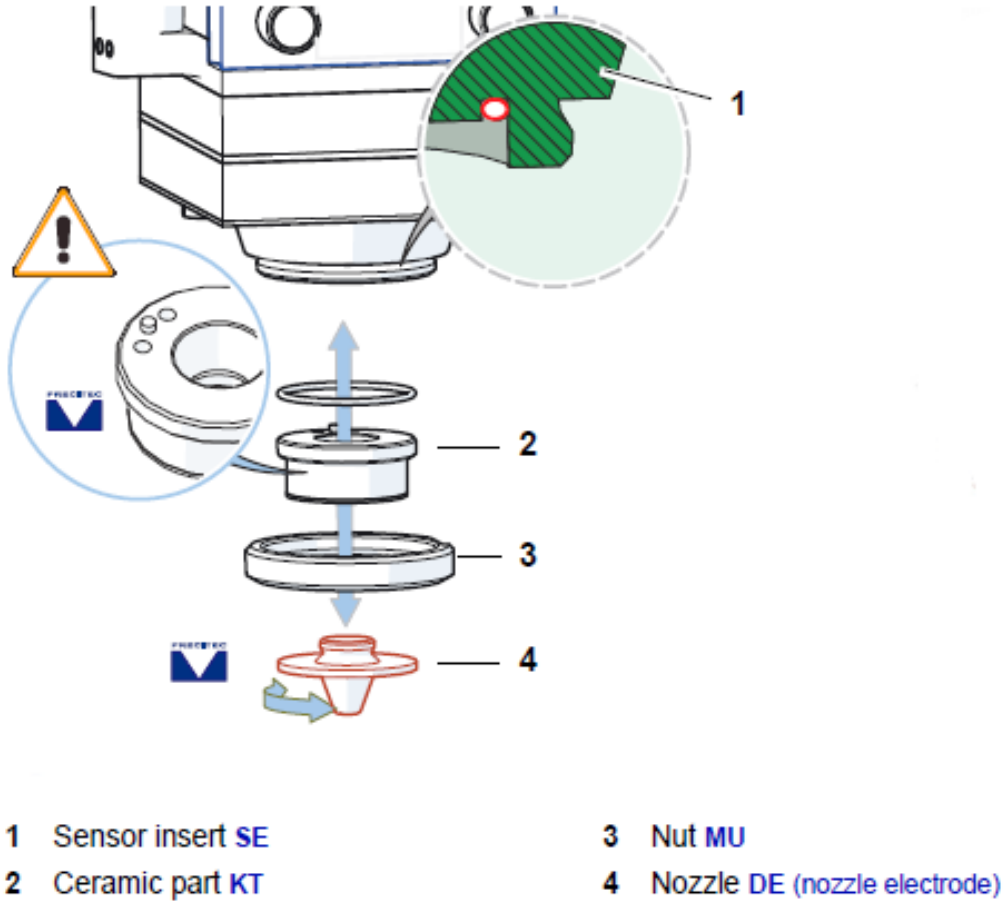


Typically, focusing lenses are manufactured with a maximum nominal focal length tolerance of $\pm 1\%$ (according to the manufacturer's specifications). As a result, the adjustment range can be limited. The focal position can thus vary depending on the lens. Information about the actual focal position determined at the factory is supplied together with each laser head and must be observed during commissioning/adjustment.





8.2.3 Ceramic and Nozzle Replacement



8.2.3 Fig. Ceramic and Nozzle Replacement

NOTE: Use only spare parts produced by TurcCut.

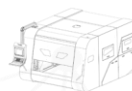


ATTENTION!

The nozzle and the gripper part should be tightened only by hand. (Do not use tools!) If you use tools, the ceramic part may be damaged. In addition, the surface of these materials touching each other should be clean.

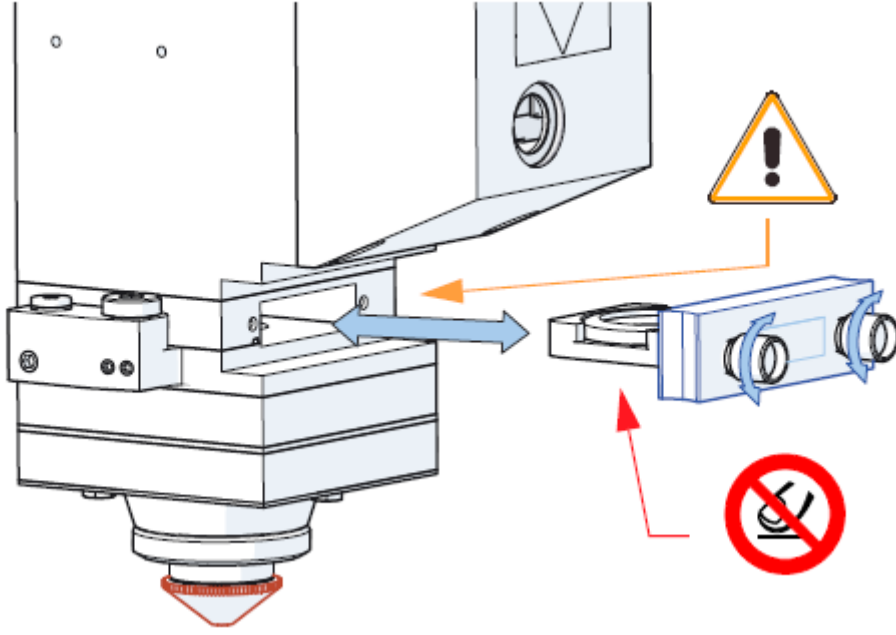
- Clean the ceramic part (2), replace it if necessary.
- If the nozzle (4) is damaged or hit by a laser beam, it must be replaced.
- Manually, the nozzle is tightened to the internal sensor.

NOTE: During the ceramic change, O-ring ($\varnothing 26.00 \times 1.50$ Viton) replacement is also required.





8.2.4 Protection and Maintenance of Protection Glass Slide

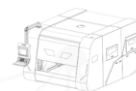


8.2.4 Fig. Protection and Maintenance of Protection Glass Slide

Sled removal, replacement, and installation

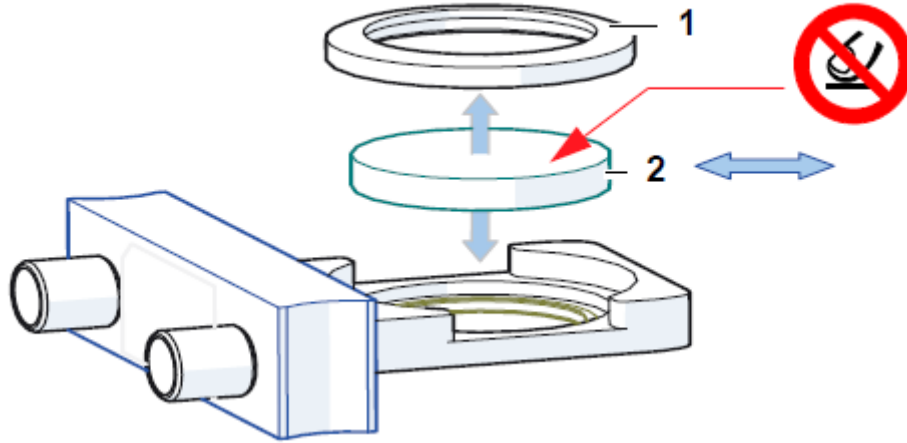
You need to have a spare ready during any glass replacement or slide change. If you do not have a second slide, it is recommended to order one via TurcCut. Otherwise, the sled slot should not be left open during the process, it should be isolated with any film, tape or insulated equipment.

1. By turning the two screws on the slide where the protection glass is located, counterclockwise, the protection glass slide is dismantled. (Horizontal position)
2. The part that is opened urgently must be closed with a protective film or paper tape and protected from dust.
3. Remove the protective film or paper tape from the laser head, place the cover glass slide (with shield glass) horizontally on the laser head until it locks into place. Pay attention to the direction of the shield glass slide when doing this. An incorrectly installed slide will not click into place.





8.2.5 Protective Glass Replacement



1:Holder Ring 2:Protection Glass

8.2.5 Fig. Protective Glass Replacement

Protective glass removal

1. Place the sled on the clean surface.
2. Be careful when lifting the retaining ring (1) from the cover glass frame and remove the glass (2) from the slide (with gloves).

Protection glass cleaning

With the lotion and pads provided, dip the protection glass and the pad and clean the protection glass. Blow with clean air and check its cleanliness. Repeat until clean. If the protection glass can no longer be cleaned or damaged, it must be replaced.

Installing protective glass

1. Carefully put the protective glass into the sled.
2. The retaining ring (1) is placed on the protection glass (2).



Attention-Clean workspace

Make sure that the laser cutting head is in the clean area during any maintenance or replacement. Do not allow smoke and pollution to enter the laser head. Dirt and dust particles can damage laser components.



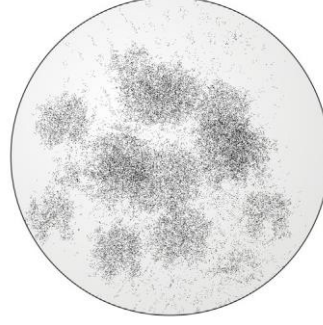
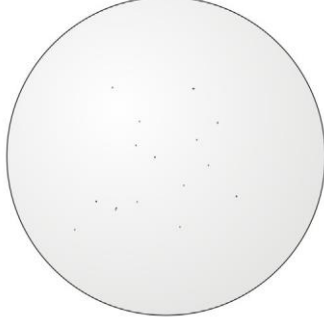


8.2.5.1 Situations Where Replacement Of Protective Glass Is Required

Contaminated protective window



Protective windows are mainly contaminated by spatter and fumes from the cutting process. Depending on the contamination level, they can be cleaned and used again.



1 Slightly contaminated protective window

2 Heavily contaminated protective window

If the protective window can no longer be cleaned, it must be replaced.

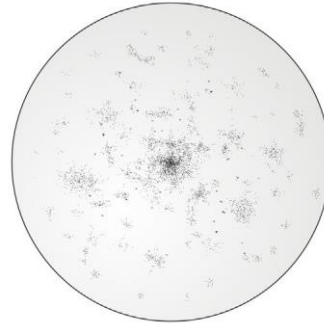
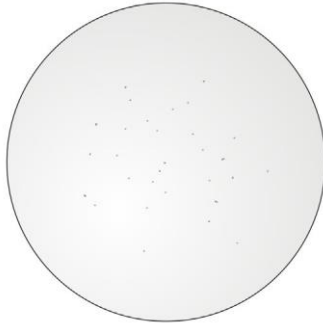


Caution: Dirty protective windows must never be used and inserted again. Any dirt that comes off the glass surface would cause burn marks on the lens or otherwise damage the lens and the sensor insert.

Contaminated lens



When the lens is dirty, you must first check whether the upper side or underside is contaminated. This will tell you the cause of the contamination.



1 Slightly contaminated lens

2 Heavily contaminated lens





Contamination will result in a scattered laser beam, bad cutting quality and reduce the lens service life.

Causes of contaminated underside (side pointing to the workpiece):

- Wrong input pressure (too low), specifically when cutting with nitrogen
- Distance to workpiece surface is too small • Lens is not focused / wrong cutting speed
 - Workpiece quality, mainly rust
 - Auxiliary gas pressure too low
 - Thermal lens curvature caused by material stress, scratches on lens or surface, metal spatter, etc.

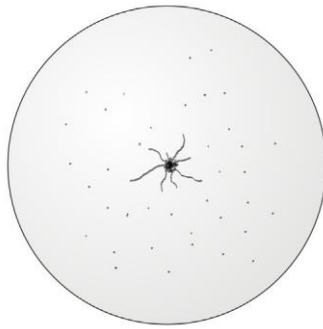
Causes of contaminated upper side (side pointing to the collimator):

- Beam delivery system not sealed (holes in the compensators). Small particles get into the beam delivery system and on the upper side of the lens which causes an uneven heat distribution.
- Contamination caused by oil / liquids (clogged filters and air separators)

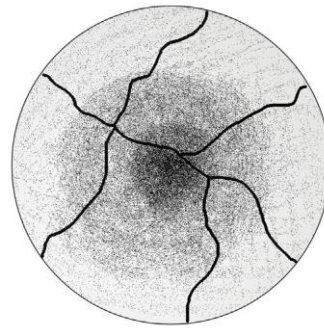
Damaged lens - Part 1



The lens damage pattern can be an indicator of typical causes.



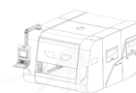
1 Star-shaped cracks



2 Broken lens



Uneven heat distribution in focusing optics often causes star-shaped cracks or lens breakage.





Causes (1):

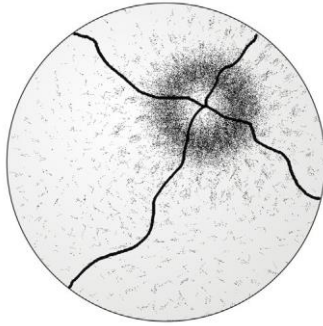
- Interaction between laser beam and metal spatter
- Irregular beam shape• Insufficient lens cooling

Causes (2):

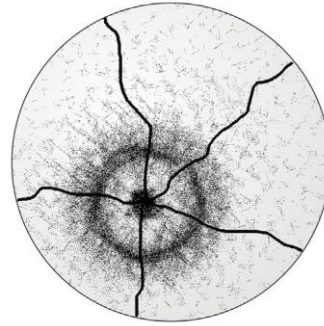
- Oil residue on the lens upper side absorbs a large amount of laser power and leads to irregular heat distribution (hot spots) which causes the lens to explode.
- Contaminated gas (e.g. from the compressor feeding compressed air to the beam system)

This error goes from the top to the bottom and creates a hole that opens up from the lens centre. Brown residue or local, irregular discolouration on the upper side indicates that oil products are present on the lens surface. The optical error is caused by contamination in the beam delivery system/purging air system.

Damaged lens - Part 2



3 Beam mode error



4 Beam alignment error

Causes (3):

- Deformed mode
- Wrong mirror alignment
- Laser generator cooling defect

This results in a large cracks running over the edges and a burn mark which is not centred in one area of the lens upper side.

This type of burn mark is typical of a beam mode error. A deformed mode can create a very high amount of energy which concentrates in a small spot on the lens and causes the lens to explode.

In most cases a beam mode error is caused by a wrongly aligned mirror or defect in the beam delivery cooling system.





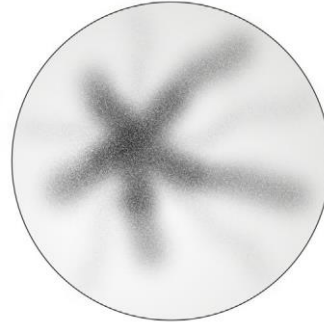
Causes (4):

- Beam not centred
- Beam is not parallel with one or more axes and hits the lens holder.

Damaged lens - Part 3



5 Broken edges



6 Damaged coating

Causes (5):

- Metal burr on processed surfaces • Contamination (metal particles) in the holder

A defective lens holder exerts high pressure on the optics' edges, resulting in broken edges or scratches along the perimeter.

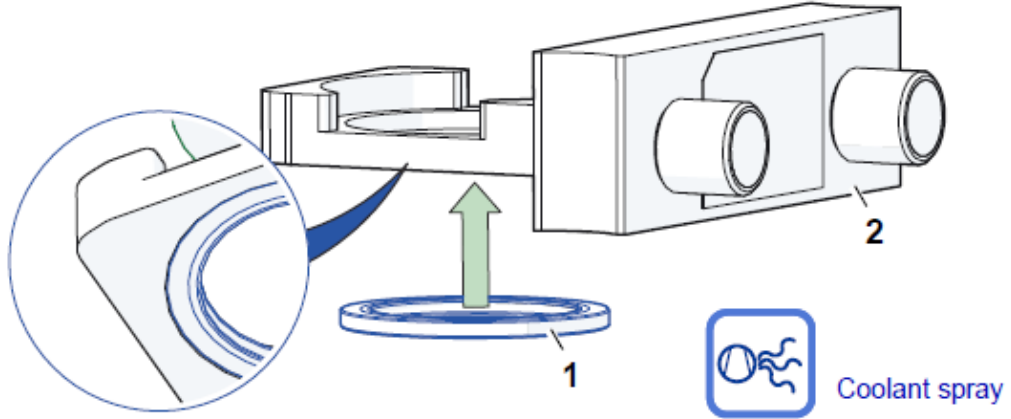
Causes (6):

- Improper cleaning (residue might still be present) • Wrong cleaning agents, bad quality
 - Too aggressive cleaning agents (cause scratches)
- Bad lens quality





8.2.6 Axial Seal Replacement



1:Seal **DR**

2:Sledge

8.2.6 Fig. Axial Seal Replacement

Periodically check for skid leaks.

In case of any leaks or problems, the gasket must be replaced.

For convenience, the spray is sprayed and firmly seated.



Caution-Ambient temperature

Different materials have different expansion coefficients. For example, the coefficients of aluminum, steel and plastic are different. When the ambient temperature drops below 10 °C, the correct positioning of the joint gaskets should be checked during replacement.

NOTE: To maintain the healthy operation of the laser head, TurcCut recommends replacing these gaskets once a year.





8.3 Malfunctions

8.3.1 Electrical Malfunctions

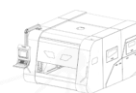
Malfunction	Cause	Action to be taken
Distance display is wrong and changes depending on the position of the machine	Sensor cable damaged or loose plug-in connection	– Replace the sensor cable or fix the plug-in connection
Minor standoff distance changes	– Sensor temperature drift – Worn nozzle – Contamination	Repeat reference point/ two point calibration, incl. [NozzLost]
Measuring distance of distance sensor system too small, large laser head distance when approaching the workpiece	Ceramic part contaminated/ wet	– Clean and dry off the ceramic part – Check the cutting gas

Error analysis: Electrical malfunctions

8.3.2 Status Led Error Messages

LED indicator	Cause	Action to be taken	
LED lights up RED	not operational	after a voltage cut	– Check the 24V connection(power supply unit) – Carry out reference travel
		after faulty reference travel	– Check the reference travel procedure at the machine controller – Carry out reference travel
	Servo overload	Motor current consumption too high, mechanical problems (doesn't move smoothly)	– Check the mechanical parts – Carry out reference travel
	Laser head too hot	Excess temperature	– Let the laser head cool down – Carry out reference travel
LED does NOT light up	no power supply	broken cable or faulty, loose connection	– Check the 24V connection(power supply unit)
	linear drive not within the target value range (position not permitted)	Switching output 'POS.REACHED' not set	– Check the signals
		Linear drive position beyond linear drive limit	– Check the linear drive setpoint position

Error analysis: Status LED error messages





8.3.3 Mechanical Malfunctions

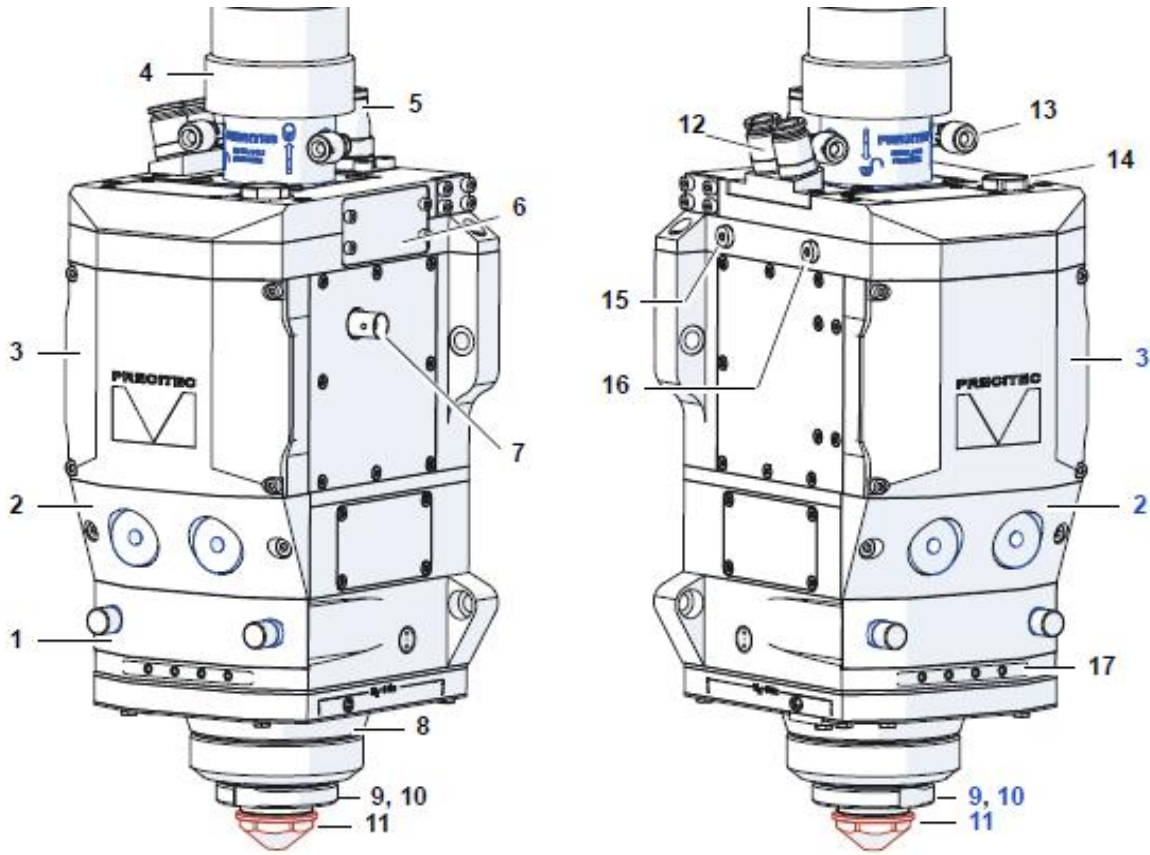
Malfunction	Cause	Action to be taken
Cutting gas pressure does not build up	Cutting gas hose is not connected properly	– Connect the cutting gas hose properly
	Protective window cartridge loose or protective window damaged	– Replace the protective window cartridge or push in until it clicks into
	Seals (O-ring) between ceramic part and sensor insert leak	– Replace the worn seal
	Cutting gas escapes somewhere else	– Send the laser head back for repair
Nozzle gets too hot	Laser beam obstructed (bad focus centring)	– Check focus centring
Lens centring device difficult to turn	Thread on adjusting screws damaged or dirty	– Send the laser head back for repair
Focal position cannot be found in the adjustment range of the vertical adjustment device	Wrong focal length of the focusing lens or focusing lens damaged	– Replace the laser head – Send the laser head back for repair
Bad cut	<ul style="list-style-type: none">• Focus diameter too large• Wrong focusing lens installed in the laser head• Focusing lens damaged or wrong focal length	– Replace the laser head – Send the laser head back for repair
	Bad focal position/ focus centring	– Check the focal position/ focus centring, remove the error if necessary.
	Protective window dirty	– Clean the protective window and replace if necessary
	Alloy affects results (<i>workpiece</i>)	– Adapt the cutting parameters

Error analysis: Mechanical malfunctions



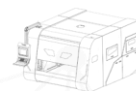


8.4 ProCutter 2.0 Cutting Head Description and Maintenance



- | | |
|--|--|
| 1 Protective window cartridge | 10 Ceramic part KT X |
| 2 Focusing unit FF (focusing lens) | 11 Nozzle DE (nozzle electrode) |
| 3 Collimating unit FC (collimating lens) | 12 Water connections, $\varnothing 8$ (collimating area) [D] |
| 4 Fibre socket (collimator) | 13 Water connections, $\varnothing 6$ (fibre socket) [E] |
| 5 Cutting gas connection, $\varnothing 10$ [A] | 14 19-pin connector DI (I/O interface) |
| 6 Protective window cartridge COL (collimator) | 15 Cooling gas (nozzle) [B] |
| 7 BNC connection (sensor system) [F] | 16 Auxiliary gas [C] |
| 8 Sensor insert SE | 17 Status indicator (4 x LED) |
| 9 Nut MU | |

8.4 Fig. ProCutter 2.0





8.4.1 Meaning Of Led Indicators

The status indicators (LEDs 1...4, from left to right,(10)) inform the user about the condition of the laser head and its components, based on the data received from the integrated monitoring electronics.



Focal position (1)

GREEN	ready for operation <i>Reference travel completed successfully. Focal position within the permitted tolerance range (target position).</i>
RED	malfunction <i>Faulty reference travel servo overload Motor current consumption too high, mechanical problems (doesn't move smoothly).</i>
OFF <i>(does NOT light up)</i>	linear drive position outside the setpoint value <i>when positioned to a new setpoint, during reference travel or if the position setpoint value is not permitted No power supply or faulty, loose connection</i>



Temperature / humidity# (2)

GREEN	ready for operation <i>normal operation, no error</i>
ORANGE...RED	increased head temperature (<i>top limit range</i>) or increased lens temperature (<i>top limit range</i>)
RED	head temperature limit exceeded
flashes RED <i>1 x per second</i>	focusing lens temperature exceeded
flashes RED <i>3 x per second</i>	collimating lens temperature exceeded
flashes RED# <i>10 x per second</i>	humidity limit value exceeded
OFF <i>(does NOT light up)</i>	no supply voltage <i>broken cable or faulty, loose connection</i>



Pressure (3)

GREEN	ready for operation <i>normal operation, no error</i>
RED	protective window cartridge leak ⇒ <i>pressure too high</i>
flashes RED <i>1 x per second</i>	cutting gas pressure ⇒ <i>max. pressure exceeded</i>
OFF <i>(does NOT light up)</i>	no power supply <i>broken cable or faulty, loose connection</i>

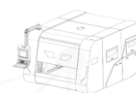


Protective window / diffused light# (4)

GREEN	ready for operation <i>normal operation, no error</i>
ORANGE...RED	increased protective window temperature (<i>top limit range</i>)
RED	protective window temperature exceeded
flashes RED <i>1 x per second</i>	protective window not inserted
flashes RED <i>3 x per second</i>	protective window cartridge/ protective window cartridge <i>col.</i> missing
flashes RED# <i>10 x per second</i>	diffused light limit value exceeded (<i>protective window/ protective window COL/ beam path</i>)
OFF <i>(does NOT light up)</i>	no power supply <i>broken cable or faulty, loose connection</i>

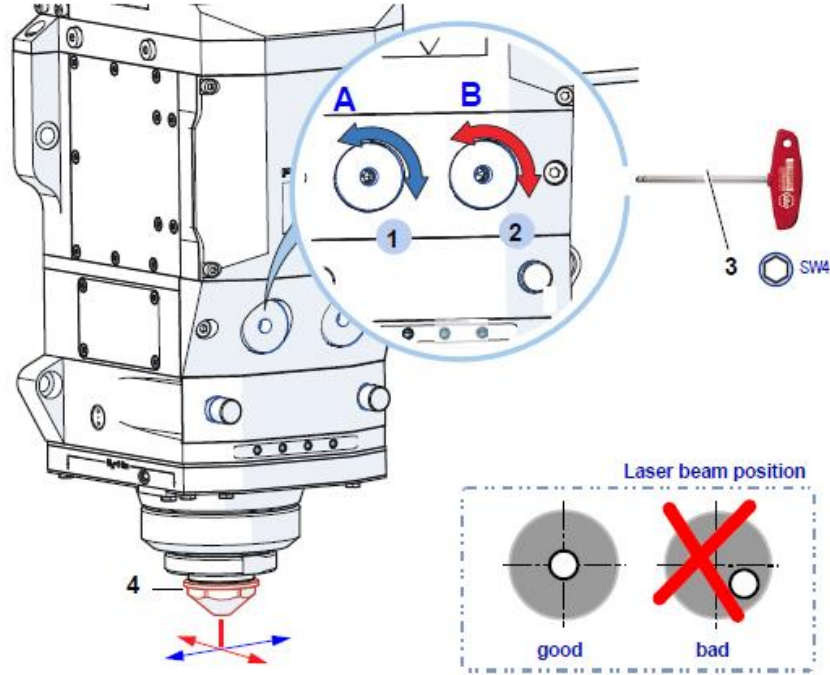


If an LED lights up red, the system/machine must be stopped immediately (noting the process condition) and the cause must be checked.





8.4.2 Centering And Adjusting The Laser Beam



- 1 Adjusting screw, A
- 2 Adjusting screw, B

- 3 Allen key (size 4)
- 4 Nozzle DE (nozzle electrode)

8.4.2 Fig. Centering And Adjusting The Laser Beam

Centering Steps

1. Centering is done with two adjusting bolts (1 and 2).

Adjustment range: ± 1.5 mm

Tool : Allen key (size 4 mm)

When the laser beam is adjusted, the nozzle diameter suitable for cutting and the laser beam should coincide with the middle of the nozzle.

2. A tape is attached to the bottom (end) of the nozzle.

3. After the tape is adhered, the program related to centering should be run on the robot. Then low-power firing is done. The fired part should come to the middle of the nozzle, if not, re-centering is required.

4. Center using the centering and adjusting bolts.

Maximum adjustment range ± 1.5 mm.

NOTE: When adjusting the laser beam position, the system must not be pressurized (without gas) and the axis movements must be turned off.



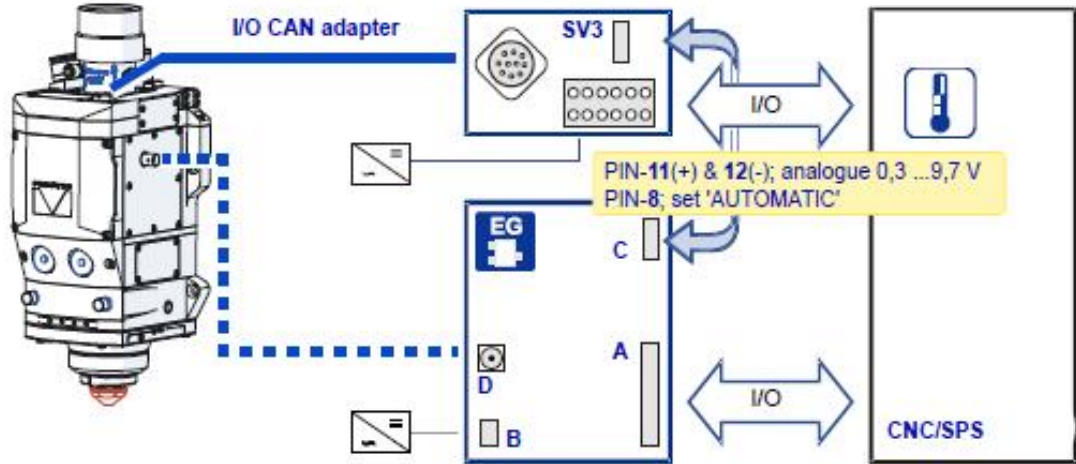


8.4.3 Setting The Focal Position



When checking the standoff distance, the system must not be under pressure and the laser must be switched off.

Adjusting element (analogue voltage - I/O-CAN adapter - CNC/PLC)



Changing the focal position

The focal position can be set by an external analogue signal (0.3...9.7 V) and queried via the I/O interface

Focal position (motor-controlled)

Focal position [mm] see paragraph "Focal position, voltage adjustment"

TCP₀ 1 mm below the nozzle tip (nominal focal position)

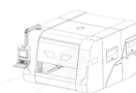
(View from the outside onto the nozzle tip)



Typically, focusing lenses are manufactured with a maximum nominal focal length tolerance of $\pm 1\%$ (according to the manufacturer's specifications). As a result, the adjustment range can be limited.

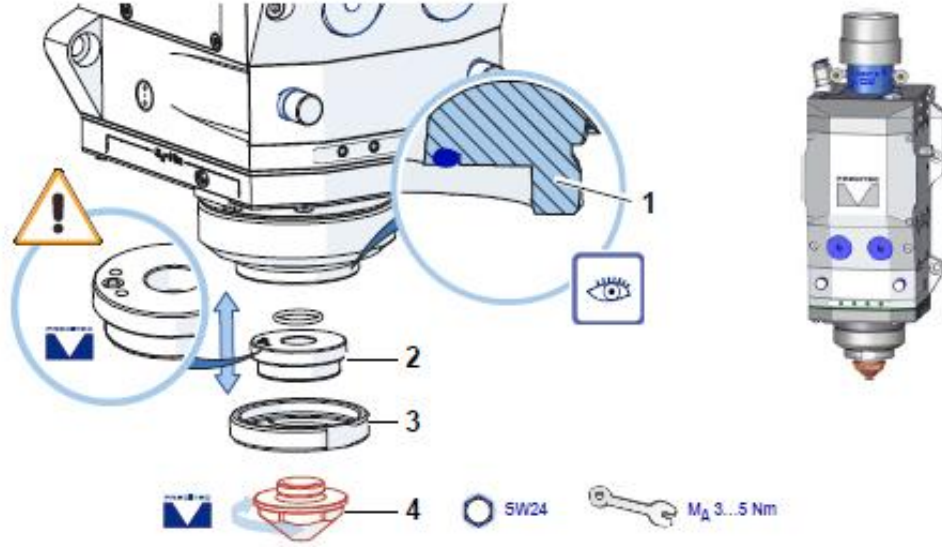
The focal position can thus vary depending on the lens. This must be taken into consideration when carrying out any adjustment (focus offset).

Mechanical manufacturing tolerances, aspect ratios of the optics used and fibre end tolerances also influence the actual focal position.





8.4.4 Ceramic and Nozzle Replacement



- 1 Sensor insert SE
2 Ceramic part KT

- 3 Nut MU
4 Nozzle DE (nozzle electrode)

8.4.4 Fig. Ceramic and Nozzle Replacement

NOTE: Use only spare parts produced by TurcCut.

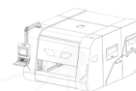


ATTENTION!

The nozzle and the gripper part should be tightened only by hand. (Do not use tools!) If you use tools, the ceramic part may be damaged. In addition, the surface of these materials touching each other should be clean.

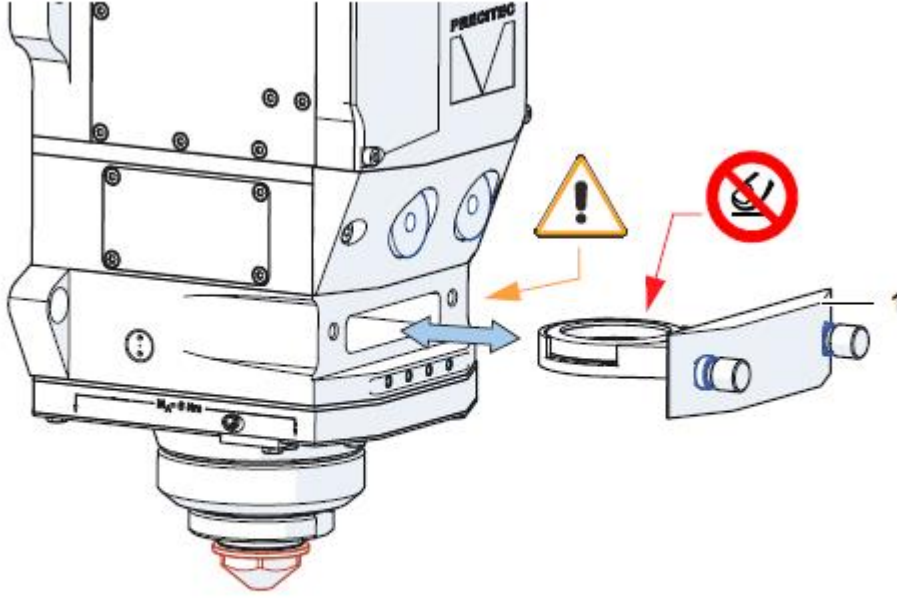
- d. Clean the ceramic part (2), replace it if necessary.
e. If the nozzle (4) is damaged or hit by a laser beam, it must be replaced.
f. Manually, the nozzle is tightened to the internal sensor.

NOTE: During the ceramic change, O-ring ($\varnothing 26.00 \times 1.50$ Viton) replacement is also required.





8.4.5 Protection and Maintenance of Protection Glass Slide



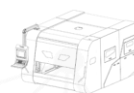
1 Cartridge (protective window)

8.4.5 Fig. Protection and Maintenance of Protection Glass Slide

Sled removal, replacement, and installation

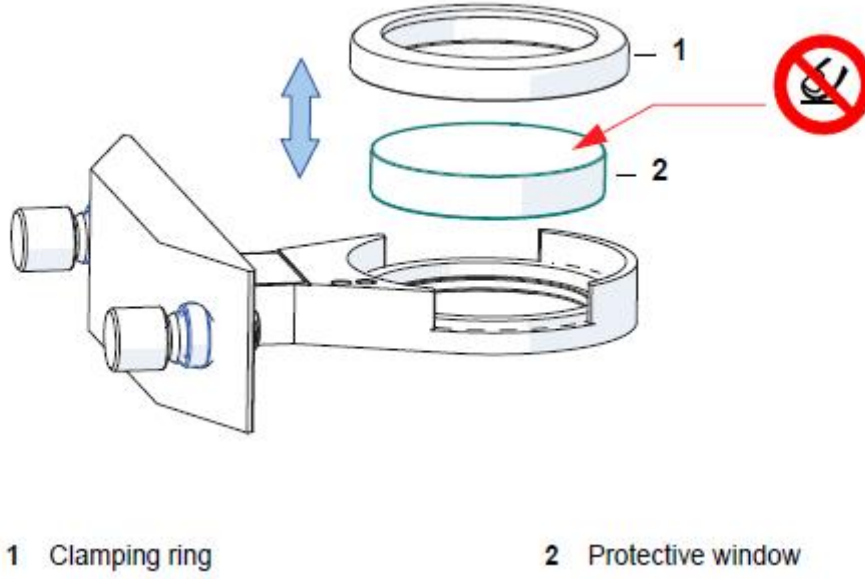
You need to have a spare ready during any glass replacement or slide change. If you do not have a second slide, it is recommended to order one via TurcCut. Otherwise, the sled slot should not be left open during the process, it should be isolated with any film, tape or insulated equipment.

1. By turning the two screws on the slide where the protection glass is located, counterclockwise, the protection glass slide is dismantled. (Horizontal position)
2. The part that is opened urgently must be closed with a protective film or paper tape and protected from dust.
3. Remove the protective film or paper tape from the laser head, place the cover glass slide (with shield glass) horizontally on the laser head until it locks into place. Pay attention to the direction of the shield glass slide when doing this. An incorrectly installed slide will not click into place.





8.4.6 Protective Glass Replacement



8.4.6 Fig. Protective Glass Replacement

Protective glass removal

1. Place the sled on the clean surface.
2. Be careful when lifting the retaining ring (1) from the cover glass frame and remove the glass (2) from the slide (with gloves).

Protection glass cleaning

With the lotion and pads provided, dip the protection glass and the pad and clean the protection glass. Blow with clean air and check its cleanliness. Repeat until clean. If the protection glass can no longer be cleaned or damaged, it must be replaced.

Installing protective glass

1. Carefully put the protective glass into the sled.
2. The retaining ring (1) is placed on the protection glass (2).



Attention-Clean workspace

Make sure that the laser cutting head is in the clean area during any maintenance or replacement. Do not allow smoke and pollution to enter the laser head. Dirt and dust particles can damage laser components.



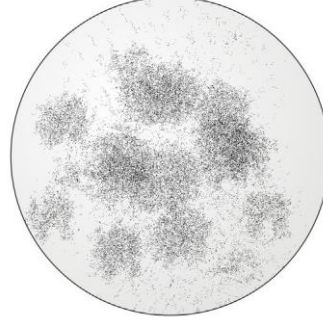
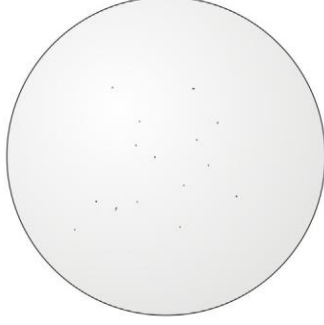


8.4.6.1 Situations Where Replacement Of Protective Glass Is Required

Contaminated protective window



Protective windows are mainly contaminated by spatter and fumes from the cutting process. Depending on the contamination level, they can be cleaned and used again.



1 Slightly contaminated protective window

2 Heavily contaminated protective window

If the protective window can no longer be cleaned, it must be replaced.

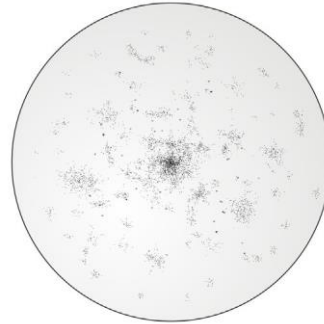
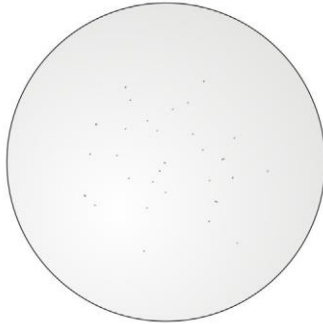


Caution: Dirty protective windows must never be used and inserted again. Any dirt that comes off the glass surface would cause burn marks on the lens or otherwise damage the lens and the sensor insert.

Contaminated lens

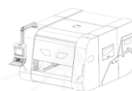


When the lens is dirty, you must first check whether the upper side or underside is contaminated. This will tell you the cause of the contamination.



1 Slightly contaminated lens

2 Heavily contaminated lens





Contamination will result in a scattered laser beam, bad cutting quality and reduce the lens service life.

Causes of contaminated underside (side pointing to the workpiece):

- Wrong input pressure (too low), specifically when cutting with nitrogen
- Distance to workpiece surface is too small • Lens is not focused / wrong cutting speed
 - Workpiece quality, mainly rust
 - Auxiliary gas pressure too low
 - Thermal lens curvature caused by material stress, scratches on lens or surface, metal spatter, etc.

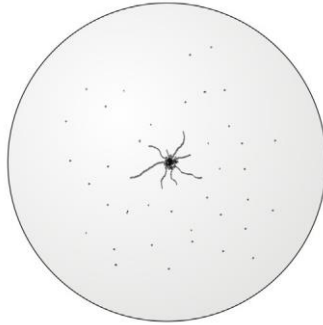
Causes of contaminated upper side (side pointing to the collimator):

- Beam delivery system not sealed (holes in the compensators). Small particles get into the beam delivery system and on the upper side of the lens which causes an uneven heat distribution.
- Contamination caused by oil / liquids (clogged filters and air separators)

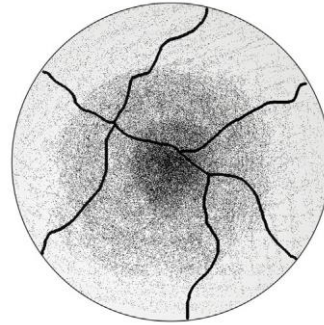
Damaged lens - Part 1



The lens damage pattern can be an indicator of typical causes.



1 Star-shaped cracks



2 Broken lens



Uneven heat distribution in focusing optics often causes star-shaped cracks or lens breakage.





Causes (1):

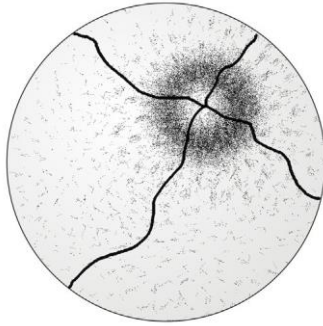
- Interaction between laser beam and metal spatter
- Irregular beam shape• Insufficient lens cooling

Causes (2):

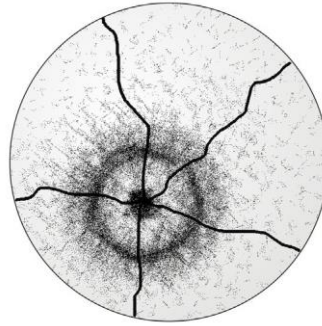
- Oil residue on the lens upper side absorbs a large amount of laser power and leads to irregular heat distribution (hot spots) which causes the lens to explode.
- Contaminated gas (e.g. from the compressor feeding compressed air to the beam system)

This error goes from the top to the bottom and creates a hole that opens up from the lens centre. Brown residue or local, irregular discolouration on the upper side indicates that oil products are present on the lens surface. The optical error is caused by contamination in the beam delivery system/purging air system.

Damaged lens - Part 2



3 Beam mode error



4 Beam alignment error

Causes (3):

- Deformed mode
- Wrong mirror alignment
- Laser generator cooling defect

This results in a large cracks running over the edges and a burn mark which is not centred in one area of the lens upper side.

This type of burn mark is typical of a beam mode error. A deformed mode can create a very high amount of energy which concentrates in a small spot on the lens and causes the lens to explode.

In most cases a beam mode error is caused by a wrongly aligned mirror or defect in the beam delivery cooling system.





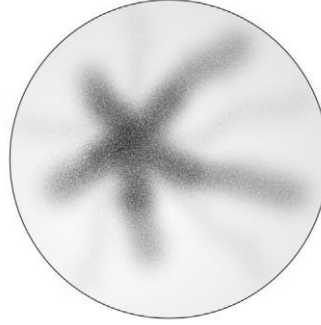
Causes (4):

- Beam not centred
- Beam is not parallel with one or more axes and hits the lens holder.

Damaged lens - Part 3



5 Broken edges



6 Damaged coating

Causes (5):

- Metal burr on processed surfaces • Contamination (metal particles) in the holder

A defective lens holder exerts high pressure on the optics' edges, resulting in broken edges or scratches along the perimeter.

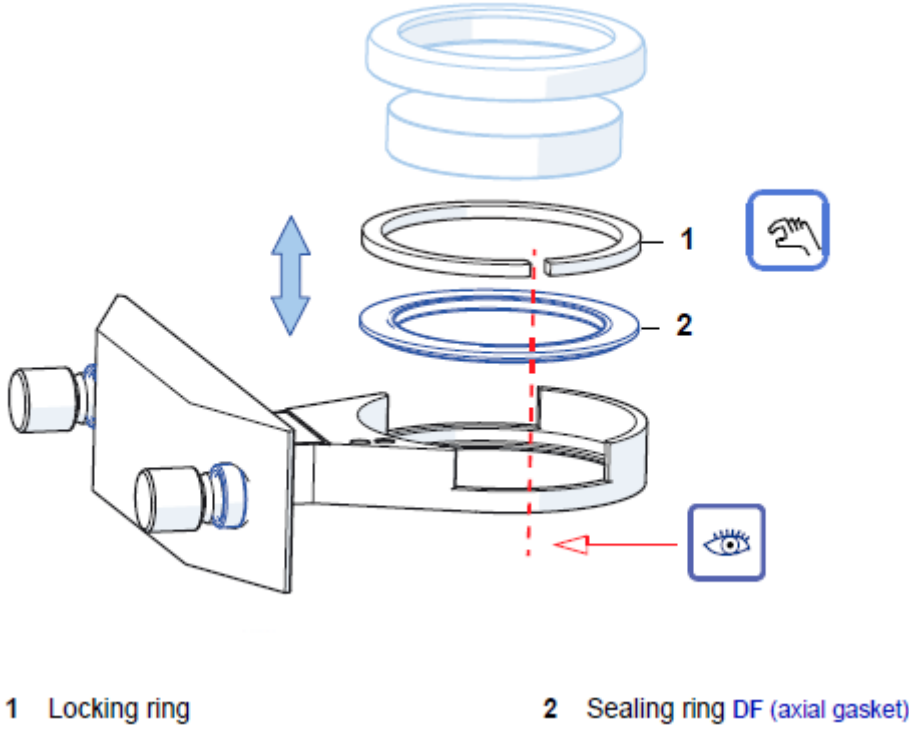
Causes (6):

- Improper cleaning (residue might still be present) • Wrong cleaning agents, bad quality
 - Too aggressive cleaning agents (cause scratches)
- Bad lens quality





8.4.7 Axial Seal Replacement



8.4.7 Fig. Axial Seal Replacement

NOTE: To maintain the healthy operation of the laser head, TurcCut recommends replacing these gaskets once a year.

Periodically check for skid leaks.

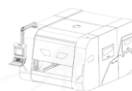
In case of any leaks or problems, the gasket must be replaced.

For convenience, the spray is sprayed and firmly seated.



Caution-Ambient temperature

Different materials have different expansion coefficients. For example, the coefficients of aluminum, steel and plastic are different. When the ambient temperature drops below 10 °C, the correct positioning of the joint gaskets should be checked during replacement.

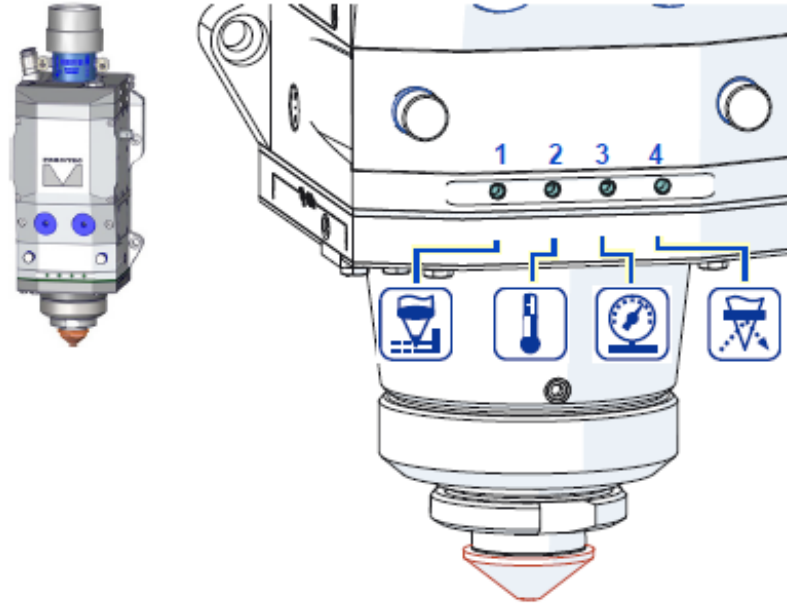




8.5 Malfunctions

8.5.1 Electrical Malfunctions




Status indicator
(4 x LED)

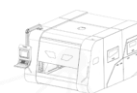


Malfunction	Cause	Action to be taken
All LEDs OFF, laser head not operational	No power supply (PIN-1, -2 / PIN-3, -4)	<ul style="list-style-type: none"> – Check the F2 fuse on the communication adapter (I/O interface) – Check the power pack and wiring
LEDs 1, 2, 3, 4 = ORANGE (malfunction) (lights up continuously (t > 30 s))	Internal hardware error	<ul style="list-style-type: none"> – Send the laser head back for repair
LED 1 and LED 3 = RED , LED 2 and LED 4 = OFF , ANALOG-OUT (PIN-6 = 8.125 mA)	Lasermatic® analysing electronics (EG) not detected: <ul style="list-style-type: none"> • The supply voltage was switched on for the laser head after the EG • The connection of the two devices was disconnected during operation. 	<ul style="list-style-type: none"> – Perform Res-PBus on the EG (knob) or switch the EG off and on. – Check the flat cable between the communication adapter (I/O interface) and EG
LED 1 ... LED 4 = light RED alternately (firmware update)	Firmware is being updated	<ul style="list-style-type: none"> – Do not interrupt the laser head power supply






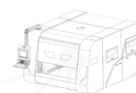
Malfunction	Cause	Action to be taken
 LED 1 - focal position		
always OFF (does NOT light up)	Focal position setpoint <0.3 V or > 9.7 V	<ul style="list-style-type: none"> – Check the focal position setpoint <i>(also depends on the image ratio)</i>
RED (drive malfunction) ANALOG-OUT (PIN-6 = 17.5 mA)	Drive overload, drive unit short circuit	<ul style="list-style-type: none"> – Carry out reference travel. If this does not correct the error, send the laser head back for repair.
RED (drive malfunction) ANALOG-OUT (PIN-6 = 16.875 mA)	Internal position error	<ul style="list-style-type: none"> – Carry out reference travel. If this does not correct the error, send the laser head back for repair.
RED (drive malfunction) ANALOG-OUT (PIN-6 = 16.25 mA)	Power supply (PIN-1, -2) too low	<ul style="list-style-type: none"> – Adjust the power supply unit's current limitation – Check the power supply unit's rating
RED (drive malfunction) ANALOG-OUT (PIN-6 = 15.625 mA)	Reference travel (faulty), drive cannot move to the required position	<ul style="list-style-type: none"> – Carry out reference travel. If this does not correct the error, send the laser head back for repair. – Switch laser head OFF/ ON
 LED 2 - temperature/humidity		
flashes RED [3 x per second] ANALOG-OUT (PIN-6 = 15.00 mA)	Collimating lens: max. temperature exceeded	<ul style="list-style-type: none"> – Temperature threshold (lens) too low – Laser power too high – Optics damaged
flashes RED [1 x per second] ANALOG-OUT (PIN-6 = 14.375 mA)	Focusing lens: max. temperature exceeded	<ul style="list-style-type: none"> – Temperature threshold (lens) too low – Laser power too high – Optics damaged
flashes RED [10 x per second] ANALOG-OUT (PIN-6 = 9.375 mA)	Humidity: limit value exceeded	<ul style="list-style-type: none"> – Humidity level too low – Faulty seal
RED ANALOG-OUT (PIN-6 = 13.75 mA)	Laser head: max. temperature exceeded	<ul style="list-style-type: none"> – Head temperature threshold too low – Laser power too high – Ambient temperature too high – Cooling circuit interrupted
 LED 3 - pressure (pressure control)		
flashes RED [1 x per second] ANALOG-OUT (PIN-6 = 12.5 mA)	Cutting gas pressure: max. pressure exceeded	<ul style="list-style-type: none"> – Pressure threshold too low – Check the gas supply
RED ANALOG-OUT (PIN-6 = 11.875 mA)	Leak – Protective window: max. pressure exceeded	<ul style="list-style-type: none"> – Pressure threshold too low – Check the gas supply – Faulty sealing ring (protective window cartridge)





Malfunction	Cause	Action to be taken
 LED 4 - protective window/diffused light		
flashes RED [10 x per second] ANALOG-OUT (PIN-6 = 13.125 mA)	Diffused light - Beam path - Strong backreflection - Optics defective	- Diffused light level too low - Check the optical components in the Flow Box .
flashes RED [10 x per second] ANALOG-OUT (PIN-6 = 10.625 mA)	Diffused light - Protective window: - Protective window contaminated	- Diffused light level too low - Replace the protective window
flashes RED [10 x per second] ANALOG-OUT (PIN-6 = 10.00 mA)	Diffused light - Protective window COL Protective window COL contaminated	- Diffused light level too low - Replace the protective window COL
flashes RED [3 x per second] ANALOG-OUT (PIN-6 = 19.375 mA)	Protective window cartridge missing or not screwed in firmly enough	- Install the protective window cartridge correctly
flashes RED [3 x per second] ANALOG-OUT (PIN-6 = 11.25 mA)	Protective window cartridge COL missing or not screwed in firmly enough	- Install the protective window cartridge COL correctly
flashes RED [1 x per second] ANALOG-OUT (PIN-6 = 18.75 mA)	Protective window missing	- Insert the protective window
RED ANALOG-OUT (PIN-6 = 18.125 mA)	Protective window: max. temperature exceeded	- Protective window is contaminated, clean or replace

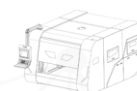
Malfunction	Cause	Action to be taken
Distance display is wrong and changes depending on the position of the machine	Sensor cable damaged or loose plug-in connection	- Replace the sensor cable or fix the plug-in connection
Minor standoff distance changes	- Sensor temperature drift - Worn nozzle - Contamination	Repeat reference point/ two point calibration, incl. [NozzLost]
Measuring distance of distance sensor system too small, large laser head distance when approaching the workpiece	Ceramic part contaminated/ wet	- Clean and dry off the ceramic part - Check the cooling gas (nozzle) <i>(observe the gas quality specifications, see chapter 7.1.2, page 7-67)</i>





8.5.2 Mechanical Malfunctions

Malfunction	Cause	Action to be taken
Cutting gas pressure does not build up	Cutting gas hose is not connected properly	- Connect the cutting gas hose properly
	Protective window cartridge loose or protective window damaged	- Replace the protective window cartridge or push in until it clicks into place
	Sealing ring on the protective window cartridge leaks	- Replace the worn seal
	Seals between connection head and sensor insert leak	- Replace the worn seal
	Seals between sensor insert and extension adapter leak (F250)	
	Seals between ceramic part and sensor insert leak	
	Cutting gas escapes somewhere else	- Send the laser head back for repair
Nozzle gets too hot	Nozzle cooling gas hose is not connected properly	- Connect the gas hose properly
	Cutting gas escapes somewhere else	- Send the laser head back for repair
	Laser beam obstructed (bad laser beam position)	- Check the laser beam position
Gases and liquids do not reach the cutting point	Gas and liquid hoses are not connected properly	- Connect the gas and liquid hoses properly
	Seals between connection head and sensor insert leak	- Replace the gasket set
	Gases and liquids escape at other places	- Send the laser head back for repair
Axial focal position adjustment device difficult to turn	Thread on lens centring device is damaged or dirty	- Send the laser head back for repair
Lens centring device difficult to turn	Thread on lens centring device is damaged or dirty	- Send the laser head back for repair
Focal position cannot be found in the adjustment range of the vertical adjustment device	Wrong focal length of the focusing lens or focusing lens damaged	- Replace the laser head - Send the laser head back for repair
Bad cut	<ul style="list-style-type: none">Focus diameter too largeFocusing lens not installed correctly into the laser head	- Send the laser head back for repair
	Bad focal position/ laser beam position	- Check the focal position/ laser beam position, remove the error if necessary
	Protective window dirty	- Clean the protective window and replace if necessary
	Alloy affects results (workpiece)	- Adapt the cutting parameters





9 The Instruction of The Safety Measures And Daily Checks of The Laser Cutting Machine

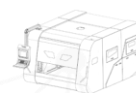
9.1 The Steps Forwards For The Safety Measures And Daily Checks

The safety measures and daily checks before energizing the laser cutting machine.

1. Make sure that all of the safety measures are taken and the sliding doors appropriately function.
2. Make sure whether the knobs of the gas cylinder manifolds have been turned to on or to off. If they are tightened, turn those relevant knobs either clockwise or counterclockwise so that the output of the gas cylinder manifolds are 10 bars for the auxiliary gas of Oxygen and 25 bars for that of Nitrogen.
3. Make sure that there is no leakage from the air pressure pipe and hose, there must be at least 6 bars air pressure in those connections.
4. Make sure there is no leakage from the cooling water hose of the chiller.
5. Make the check on the water level gauge on the chiller or not. If required, add the adequate amount of the cooling liquid into the chiller.
6. Make sure whether there are alerts given by the chiller or not. If the chiller alerts the end user to some defects, through following the steps written in its instruction manual, correct those respective defects.
7. Await until the temperature of the cooling liquid, also colloquially known as a coolant reaches 21 degrees Celsius in the cooling storage container 1, also colloquially known as a reservoir, and 19 degrees Celsius in the cooling storage container 2.
8. When the laser cutting machine is in the jog mode, move the laser cutting head in the x, y and z axes so as to be conscious of how it smoothly travels through its linear stages restricting it to the 3 axes of the motions to come to the realization of appropriately running the laser cutting machine.
9. Inspect whether the laser cutting head is mobile merely in the limited enclosure on the working table where the limit switch appropriately examines the limit of its travel.
10. Inspect whether the switches on the working table and 3 linear stages mounted on the lower frame of the laser cutting cell appropriately runs and their limit values are accurately set.
11. Make sure that the fabric bellow, with which the linear stages of the 3 axes are covered for preventing them from the dust and contamination, has not been worn out.
12. Make a check of whether the entire buttons appropriately function and they produce the relevant color when they are pressed.
13. So as to have a sense of the touch, feel the surface of the linear stages of the 3 axes. In doing so, the end user will be conscious of whether those respective surfaces have the adequate lubrication applied or not. More significantly, the whole surfaces of the linear stages must have a thin layer of the lubrication ensured by the appropriate lubricant.
14. The machine and its components must be thoroughly cleaned up by a lint free cloth soaked in the light machine grease.

9.2 Cleaning

- The machine and its parts not painted should be thoroughly cleaned up by a lint free cloth soaked in light machine oil.





- The painted parts should be wiped by a soft cloth slightly soaked in mild detergent moistened by water.
- The screen of the control panel should be cleaned up by a cloth either slightly moistened or soaked in mild detergent.
- The windows should be wiped by a lint free cloth.
- The machine enclosure should be thoroughly cleaned annually or as needed.
- Cleaning up the components of the machine every three years and per year is a must.

9.2.1 Cleaning Schedule

During cleaning with the help of air, in accordance with Occupational Safety & Health, a pair of glasses must be worn.

	Daily	Weekly	Every 3 months	Every 6 months	Annually
Coil Fed Rollers		✓ WD-40			
Coil Fed Panels		✓ Air, Wet wipes			
Working Table		✓ either Air or A wire brush			✓ Full
Lineer Stage			✓ Lineer stage grease		
X-Y Axes Fabric Bellows		✓ Air			
The Beneath Part of Working Table					✓ Comprehensive
Laser Cutting Head		✓ Cloth			
Vacuum Channels - Motors			✓ Air		

9.3 Overall Maintenance

9.3.1 The Description of The Periodic Maintenance

Related Machinery, equipment, tools or worn systems are the work that includes the replacement of parts that are due for periodic replacement or the end of their life, performing lubrication and cleaning operations and making their adjustments in accordance with technical instructions and user manuals.

9.3.2 General Precautions for Maintenance

- 1) Be sure to turn off the power before maintenance. Otherwise, it may cause injury with electrical shock or unexpected table move.
- 2) Do not touch directly by hand when cleaning chips.
- 3) When doing cleaning with compressed air or working with a pipe, wear protective glasses.

NOTE: When the type of material to be cut changes, the vacuum filter should be cleaned before cutting.





4) Before entering the laser enclosure, clear of the place to be 1 step backwards from water and oil.

5) Ensure a place to stand safely.

9.3.3 Mechanical Maintenance

1) Cleaning the interior and exterior parts of the machine and its fabric bellows.

Note: Initially, inside out, the machine must be cleaned by the end user.

2) Rack & pinion must be kept clean.

3) X, Y and Z axes must be control and maintenance.

4) The gear boxes, the majority of components of the motors, such as a proportional-integral-derivative controller, also colloquially known as, PID controller or three-term controller, must be cleaned.

5) Chain control, reducer control and their maintenance must be implemented.

6) Cable channels and equipment control must be implemented.

7) Control and renewal of gas hose and water hose must be implemented.

8) Replacement of cutting gas particulate residue trap filters must be implemented.

9.3.4 Cutting Head & Optical Maintenance

❖ Laser cutting head control, maintenance and cleaning

❖ QBH socket control and water flow values control

❖ QBH block control and maintenance

❖ Collimator block control and maintenance

❖ Focus block control and maintenance

❖ Sensor block and maintenance

❖ Control and maintenance of sensor cable and replacement of the sensor block cover plate

❖ Replacement of all sealing gaskets

❖ QBH optical control and cleaning

❖ Collimator lens control and maintenance

❖ Focus lens control and maintenance

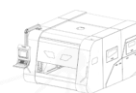
❖ Water pipe coupling, hose and equipment control and its replacement if required.

9.3.5 Laser Power Unit Maintenance

1) Control of power values by providing a computer connection

2) Temperature rise control

3) Power supply control





4) Fiber optic cable control

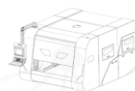
9.3.6 Chiller Maintenance

- a. Chiller air filter cleaning
- b. Chiller water filter cleaning, if it is necessary to change it
- c. Draining the chiller water and refilling it
- d. Chiller electrical control and maintenance (role, fuses, deformation checks of cables)

9.3.7 Maintenance of The Electrical Panel

- 1) Cleaning the panel and the controls of the drivers
- 2) Controls of role and fuses
- 3) Lighting control and maintenance
- 4) Fans control and maintenance

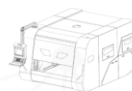
NOTE: Only maintenance service included. Part replacement is not included. During maintenance, time transportation and housing belongs to customer.





9.4 Periodic Machine Table

REQUIRED MAINTANENCE	DAILY	WEEKLY	MONTHLY	YEARLY
Chiller water level control	•			
Control of gas line and pressure.	•			
Checking the cutting head before starting work (Nozzle, ceramic, protection glass)	•			
Fan filter of the cooling system should be cleaned weekly. (It changes according to the working environment.)		•		
To clean of all accessible surface on the machine from metal powder. (Note: If it is to be cleaned with air, should be use protective glasses and tape must be attached to the nozzle part of the cutting head.)		•		
If there is a scrap car, it should be emptied.		•		
Control of oil amount and pressure if there is a pump unit.		•		
The fabric bellows should be removed <u>monthly</u> and the slides and racks should be cleaned with a cloth, then oiled with fine oil. (It changes according to the working environment.)			•	
The water of cooling system must be changed every 3 months. Mains water should be used for SPI Laser and pure water should be used for Laser ISSE Laser.			•	
The particle filters of the cooling system must be changed every 6 months.			•	
Heavy maintenance and controls of the machine must be carried out by the selling company Laser ISSE.				•





9.5 Cleaning Fabric Bellows

1) The laser cutting machine must be cleaned up until there is no longer iron powder in it after wearing a pair of safety glasses!

NOTE: When the dry compressed air is utilized, a pair of safety glasses must be put on!



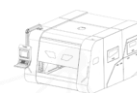
9.5.a Fig. Clening Linear Stage Components

2) Fabric bellows are loosened by the allen key.



9.5.b Fig. Cleaning Linear Stage Components

3) Separate the fabric bellow from the machine by hand and then, move it up to the degree to which you are able to maximize to clean up it.





9.5.c Fig. Cleaning Linear Stage Components

4) The rack and linear stage are sprayed with fuel-oil to clean.

NOTE: The liquids resulting in corrosion must not be used.



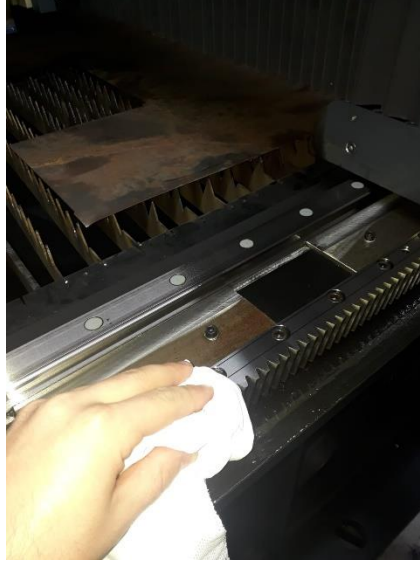
9.5.d Fig. Cleaning Linear Stage Components



LASER ISSE

www.laserisse.com

5) The fuel-oil on the surface of the rack and linear stage must be cleaned up by a lint free cloth.



9.5.e Fig. Cleaning Linear Stage Components

6) The surface of the rack and linear stage you are unable to clean because of the inconvenience of their shape is sprayed with dry compressed air.

NOTE: When the dry compressed air is utilized, a pair of safety glasses must be put on!



9.5.f Fig. Cleaning Linear Stage Components





LASER ISSE

www.laserisse.com

7) The contaminated oil dripping from the rack and linear stage must be thoroughly cleaned up.



9.5.g Fig. Cleaning Linear Stage Components

8) After cleaning, gaze at the particular part of the machine and address the damages on the rack and linear stage. If there are the damages, get in touch with authorized individuals from Laser Isse.



9.5.h Fig. Cleaning Linear Stage Components





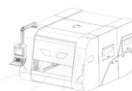
19) After cleaning the rack and linear stage, tighten the fabric bellows by allen key whose size is 4.



9.5.i Fig. Cleaning Linear Stage Components

9.6 Periodically Machine Maintenance Table

MAINTENANCE THAT NEEDS TO BE DONE	DAILY	WEEKLY	MONTHLY	ANNUALY
Gears		●		
Oil check of the conditioner	●			
Pistons of the machine	●			
Lubrication of the working shear chuck		●		
Lubrication of bearings.		●		
Grease nipples on the machine (with pump).			●	
Dust and cleaning of the working mechanism.	●			
Machine general maintenance and controls.				●





10 The Instruction of The Lubrication of The Laser Cutting Machine

10.1 The Main Purpose of Lubrication

Lubrication is the process or the technique of the utilization of a lubricant, a substance helping to lowering the friction between surfaces in mutual contact and ultimately eliminating the heat generated when the surface move, to diminish the friction and wear and tear in a contact between two surfaces.

The sufficient lubrication allows the smoothest continuous operation of machine elements, lowering the rate of wear and preventing excessive stresses or seizures at bearings. When lubrication breaks down, components could destructively rub against one another, leading to heat, local welding, destructive damage and failure.

Wear, necessarily meaning that the damage caused by continuous use over a long period, is the damaging, gradual removal or deformation of material at solid surfaces. Causes of wear could become mechanical, such as erosion, or chemical, namely corrosion. Moreover, the wear in machine elements, together with other processes such as fatigue and creep, causes functional surfaces to degrade, ultimately resulting in the material failure or the loss of functionality, relatively malfunction. Additionally, the wear of metals arises by the plastic displacement of the surface and near-surface material and by detachment of particles which from wear debris, ranging from millimeters to nanometers. This process might occur through the contact with other materials, nonmetallic solids, flowing liquids, solid particles or liquid droplets entrained in flowing gasses.

In brief, the purpose in this case is to primarily diminish the friction and make a greatest contribution to a far better and most efficient functioning of a mechanism throughout the laser cutting line.

10.2 The Maintenance And Lubrication Intervals

Lubrication is by far the most essential quality for the laser cutting machine to most constructively and cost-effectively run also in terms of its lifespan. As a consequence of it, on a regular basis, an essential maintenance work on the single line progressive lubrication system must be conducted. Moreover, the end user must constantly make a check on whether the linear stages of the 3 laser cutting axes have the adequate greasing layer in order for the laser cutting head to flexibly and smoothly enough to travel through them. As to the single line progressive lubrication system integrated with the laser cutting machine, it has the central pump unit electrically operated, progressive metering devices, and system control unit as well as a piston detector. First and foremost, the central pump delivers the lubricant through several supply lines to the greasing surfaces either directly or via progressive metering devices. Last but not least, the piston detector delivers a signal to the control unit to get the system to become manageable. Furthermore, this system ensures a broad spectrum of metering quantities from 0.007 to 2.4 cubic centimeters per outlet and cycle.





In brief, the following laser cutting machine components must be lubricated in order to diminish the effect the wear and friction resulting in the excessive heat in the linear stage of the 3 axes bring.

1) The Bottom Storage Cars

The daily cleaning work must be conducted on the bottom storage cars. Just in case those bottom storage cars are not thoroughly cleaned, the contamination and even tiniest dust particles in them get into the laser cutting head components, particularly respectively protective window, focusing lens and collimating lens. This brings about the damage in those parts after the beam of the collimated laser overlaps them, which ultimately unavoidably resulting in the defects in the quality of the laser cutting. Lastly, the compressed air one of the means to clean them.

2) Working Table Chain

The interval between the two lubrication work conducted on the working table chain is once in 3 months. The lubricants recommended are the following. One of them is the "Würth, HHS DRYLUBE" chain lubricant whose volume and product code are respectively 400 milliliters and 0893 106 6. The other one is the "SKF LHMT 68" chain greaser.

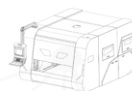
3) Front Door Chain

The interval between the two lubrication work conducted on the front door chain is once every 6 months. One of them is the "Würth, HHS DRYLUBE" chain lubricant whose volume and product code are respectively 400 milliliters and "0893 106 6". The other one is the "SKF LHMT 68" chain greaser.

4) Front Door Linear Stage depicted as 5, 6 and 7 in addition to the linear stages of the x, y and z axes.

The interval between the two lubrication work conducted on the linear stages of the x, y and z axes is once in 6 months. Overall, there are 8 linear stages mounted on the front door. 4 of them are on the each door area. Additionally, there are 2 linear stages on both the x and y axes in the lower frame of the laser cutting cell. Last but not least, after lubricating the linear stage, who is also colloquially associated with rack, the pinion of the x, y and z motors inherently become lubricated.

The oil level is checked once a week. The lubrication pump works automatically in certain time periods.



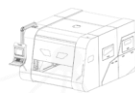


LASER ISSE

www.laserisse.com



10.2 Fig. Lubrication Pump

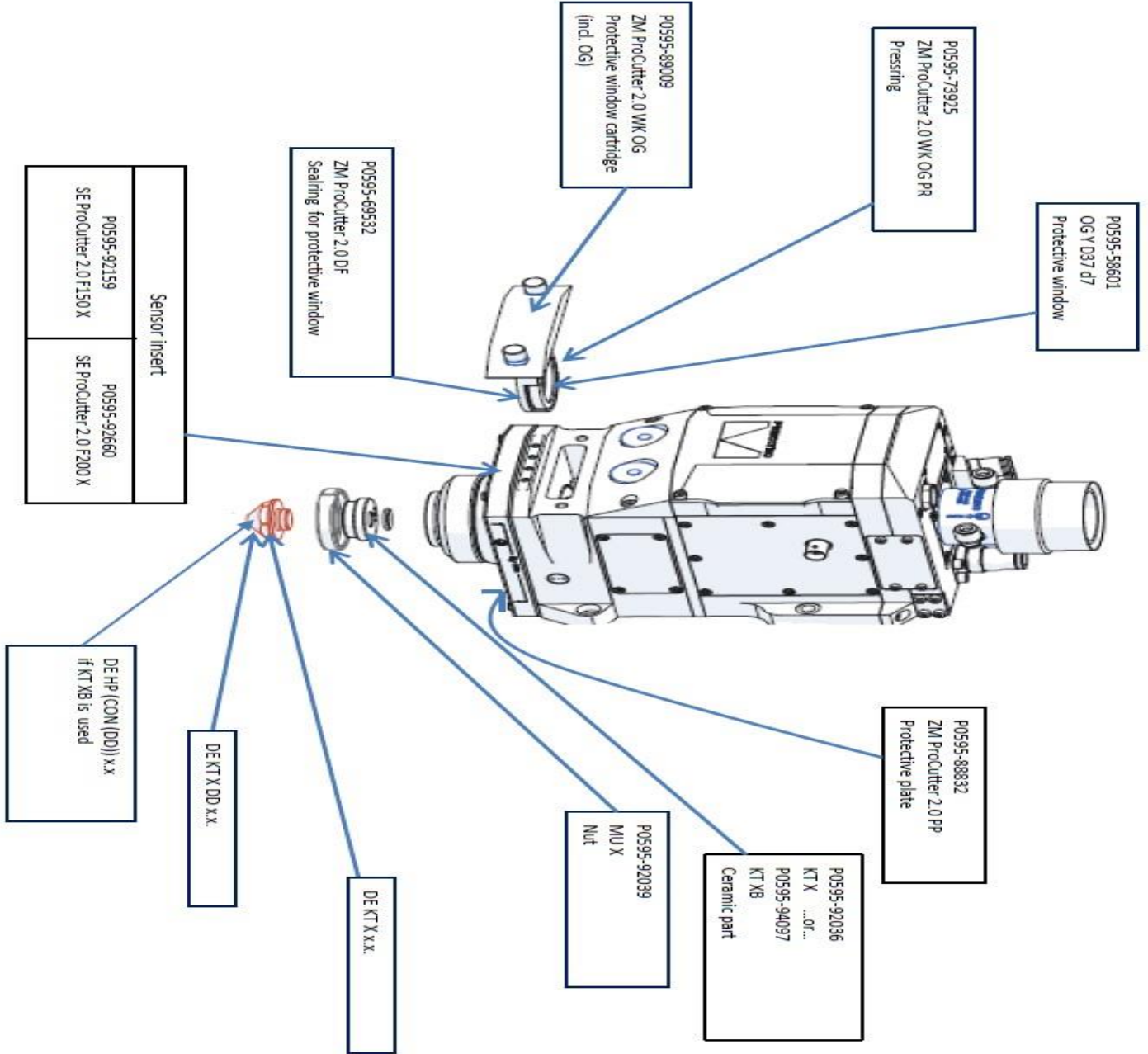




11. Spare Parts

11.1 Consumables List (Precitec Laser Cutting Head)

11.1.1 ProCutter 2.0





12 Getting the Machine Ready for Operation

In this section, information about the steps to be followed by the operator or authorized person will be given when the machine is started for the first time or if it needs to be restarted in case of a possible power failure.

There is a sequence that needs to be taken care of while making the machine ready for operation. It is possible for the machine to operate when this order is exceeded, but the recommended order will bring about a problem-free operation. The sequence of operations is as follows, in outline:

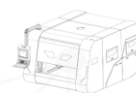
1. Energizing the system.
2. Turning on the chiller.
3. Giving gas to the system, adjusting the gas to the recommended pressure value.
4. Fanuc system login
5. Positioning the laser head to the reference point via.
6. If it is required, bringing to the change position the table.

12.1 Energizing The System

In order for the machine to work, it must first be energized. This process is done from the electrical panel. At this stage, all that needs to be done is to turn the main power knob to the ON position.



12.1 Fig. Power Knob





12.2 Turning on the Chiller

Correct start-up and proper operation of the chiller is very important for the smooth operation and safety of the laser head. When the electrical panel is active, the chiller is automatically activated. It is checked whether it is at the recommended temperature value. If not, it is set to the recommended temperature value. No operation should be started before the coolant reaches the recommended temperature value.



12.2 Fig. Chiller

10.3 Giving Gas to System

First of all, the gas valve should be opened and the fullness of the gas cylinders should be checked from the nitrogen regulator. If it is confirmed that there is enough gas in the cylinders to start operation, the pressure level is brought up to the recommended level from the nitrogen regulator. Before proceeding to the next stage, despite a possible gas leakage, the nitrogen regulator can be monitored for a while, and it can be checked whether there is a leak by activating the Cutting Gas Test (O2 Test, N2 Test, Air Test) on the CNC system screen.

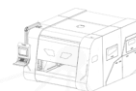
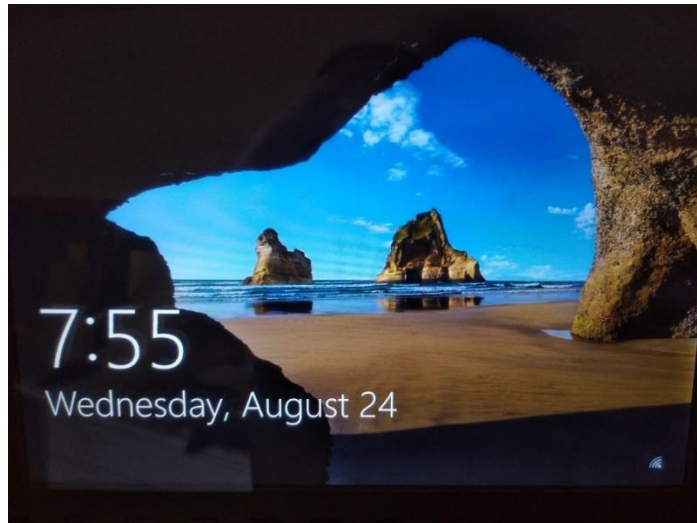


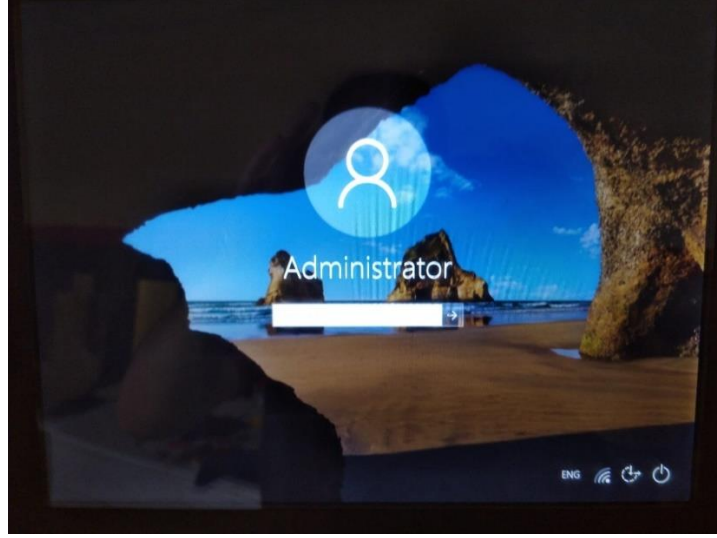


12.3 Fig. Nitrogen Regulator

12.4 Fanuc System Login

On the opened CNC screen (Operator panel), the password is entered by typing "opencnc". After the Fanuc CNC interface is loaded, the machine is positioned to the reference point.





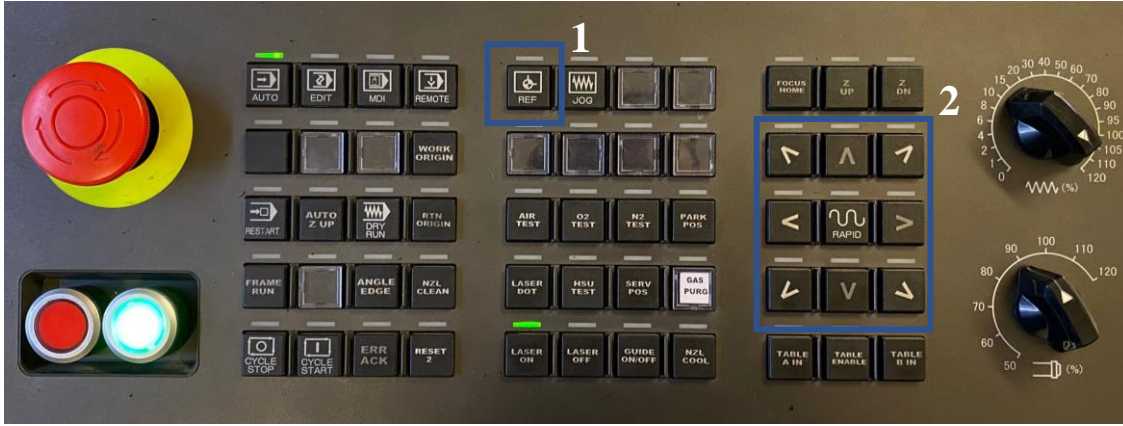
12.4 Fig. Fanuc System Login

12.5 Positioning the Machine at the Reference Point

When you reach this stage; The machine must be energized, the chiller and laser device must be turned on correctly, the system must be gassed, and the ventilation system must be operational. Then, when the CNC system screen is fully opened, the laser head must be sent to the reference point before proceeding with any operation. Before proceeding to the reference point, it should be ensured that there is no object on the table inside that may damage/hit the laser head. After that, as you can see in Figure 12.5, the steps are as follows:

1: Press Ref button.

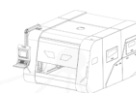
2: Press Arrow buttons.



12.5 Fig. Machine keyboard

12.6 Changing the Table Position

Before the laser cutting process is performed on the machine, the required material must be placed in the machine. If the material is placed in the machine, the calibration process should be performed. If not, the appropriate table should be taken out and the material should be loaded on the table. Table Enable button is activated. If table A is outside and loading is done





LASER ISSE

www.laserisse.com

on this table, table A is taken into the machine by pressing the Table A In button. Otherwise, table B is taken in by pressing the Table B In button and calibration is performed.



12.6 Fig. Table changing





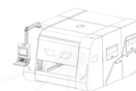
13 Alarm List



LAZER ISSE FANUC SERIES ALARM LIST

FANUC

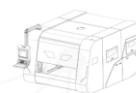
Number	Alarm / Warwing Type	Alarm / Warwing Code	Alarm / Warwing Name	Explain
1	Alarm	EX 1000	PUSH BUTTON	RELEASE EMERGENCY PUSH BUTTON
2	Alarm	OT0500	X+ AXIS OVER TRAVEL	X+ OVER TRAVEL (SOFT 1) (FOR X+ DIRECTION)
3	Alarm	OT0501	X- AXIS OVER TRAVEL	X- OVER TRAVEL (SOFT 1) (FOR X- DIRECTION)
4	Alarm	OT0500	Y1+ AXIS OVER TRAVEL	Y1+ OVER TRAVEL (SOFT 1) (FOR Y+ DIRECTION)
5	Alarm	OT0500	Y2+ AXIS OVER TRAVEL	Y1- OVER TRAVEL (SOFT 1) (FOR Y+ DIRECTION)
6	Alarm	OT0501	Y1- AXIS OVER TRAVEL	Y1+ OVER TRAVEL (SOFT 1) (FOR Y- DIRECTION)
7	Alarm	OT0501	Y2- AXIS OVER TRAVEL	Y1- OVER TRAVEL (SOFT 1) (FOR Y- DIRECTION)
8	Alarm	OT0500	Z+ AXIS OVER TRAVEL	Z+ OVER TRAVEL (SOFT 1) (FOR Z+ DIRECTION)
9	Alarm	OT0501	Z- AXIS OVER TRAVEL	Z- OVER TRAVEL (SOFT 1) (FOR Z- DIRECTION)
10	Alarm	NC-SV0411	Z EXCESS ERROR	Z EXCESS ERROR (MOVING) (PLEASE CHECK PARAMETER)
11	Alarm	NC-PS0128	ILLEGAL MACRO	ILLEGAL MACRO SEQUENCE NUMBER (COUNTER ERROR, CHECK ACTUAL PART COUNTOUR)
12	Alarm	NC-SW0100	PARAMETER ENABLE	PARAMETER ENABLE SWITCH ON (BEGIN ERRORS) (NEEDS RESET, REFERANCE AND FOCUS HOME)
13	Alarm	NC-DS0021	START ERROR	START ERROR CONE TOUCH MACRO (NECESSERAY RESET, CALIBRATION, REFERANCE AND FOCUS HOME)
14	Alarm		CALIBRATION NOT COMPLETED	CYCLE CAN'T START
15	Alarm	EX1064	NITROGEN GAS	NITROGEN GAS (ASSIST GAS) PRESSURE FAILURE, CHECK X4.7
16	Alarm	NS-DS4071	ASSIST GAS	ASSIST GAS NOT READY
17	Alarm	EX 1025	PALLET B IN	"PALLET B IN " NOT POSSIBLE, CHECK A DECLAMP OR INPOSITION
18	Alarm	EX 1036	DOOR	DOOR NOT OPEN X6.0
19	Alarm	EX 1035	DOOR	DOOR NOT CLOSED (CHECK SIDE DOOR)
20	Alarm	EX 1027	PALLET A IN	"PALLET A IN " NOT POSSIBLE, CHECK B DECLAMP OR INPOSITION
21	Warwing	2031	FOCUS REFERANCE	PLEASE PERFORM FOCUS REFERENCING
22	Warwing		NOZZLE	NOZZLE CLEAN
23	Warwing		GUIDE BEAM	CHECK GUIDE BEAM
24	Warwing		NOZZLE	NOZZLE CENTERING CHECK





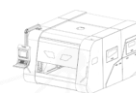
Picture Directory

1.1.1 Fig. Do Not Walk Or Stand Here	7
1.1.2 Fig. Crushing Hazard	8
1.1.3 Fig. Do Not Walk Or Stand Here Plate	8
1.1.4 Fig. General Warning Sign.....	9
1.1.5 Fig. Overhead Obstacle	9
1.1.6 Fig. Floor Level Obstacle.....	9
1.1.7 Fig. Counterrotating Rollers.....	10
1.1.8 Fig. Crushing Of Hands	10
1.1.9 Fig. Electricity	10
1.1.10 Fig. Electricity Cabinets	11
1.1.11 Fig. Arc Flash.....	11
1.1.12 Fig. Refer To Instruction Manual.....	12
1.1.13 Fig. Arc Flash Plate.....	12
1.1.14 Fig. Have a Look At Manual.....	13
1.1.15 Fig. General Mandatory Action Sign	13
1.1.16 Fig. General Mandatory Action Sign Plate For The Marking Or Lifting Points	14
1.1.17 Fig. Wear Safety Gloves	14
1.1.18 Fig. Wear Safety Shoes	15
1.1.19 Fig. Wear a Hard Hat	16
1.1.20 Fig. Wear a Safety Harness	16
3.1 Fig. CE Certificate.....	18
4.1 Fig. Electricity Consumption	19
5.1.a Fig. The Review of The CNC System Screen.....	20
5.1.b Fig. The Review of The CNC System Keyboard.....	21
5.1.1 Fig. Power Knob	21
5.1.2 Fig. Jog.....	22
5.1.3 Fig. Ref.....	22
5.1.4 Fig. Auto.....	22
5.1.5 Fig. Edit.....	22
5.1.6 Fig. Mdi.....	22
5.1.7 Fig. Auto Z Up	23
5.1.8 Fig. Dry Run.....	23
5.1.9 Fig. Rtn Origin	23
5.1.10 Fig. Frame Run.....	23
5.1.11 Fig. Cycle Stop.....	23
5.1.12 Fig. Cycle Start.....	24
5.1.13 Fig. Err Ack.....	24
5.1.14 Fig. Reset 2.....	24
5.1.15 Fig. Air Test	24
5.1.16 Fig. O2 Test.....	24
5.1.17 Fig. N2 Test.....	25
5.1.18 Fig. Park Pos	25





5.1.19 Fig. Laser Dot.....	25
5.1.20 Fig.Hsu Test	25
5.1.21 Fig. Serv Pos	26
5.1.22 Fig. Laser On.....	26
5.1.23 Fig. Laser Off	26
5.1.24 Fig. Guide On/Off	26
5.1.25 Fig. Focus Home	26
5.1.26 Fig. Z Up	27
5.1.27 Fig. Z Dn	27
5.1.28 Fig. Rapid.....	27
5.1.29 Fig. Arrow Keys	28
5.1.30 Fig. Table Enable	28
5.1.31 Fig. Table A In	28
5.1.32 Fig. Table B In	29
5.1.33 Fig. Emergency Stop	29
5.1.34 Fig. Cutting Speed Knob.....	29
5.1.35 Fig. Spindle Knob	29
5.1.36 Fig. Operating System On/Off	30
5.1.37 Fig. Reset.....	30
5.1.38 Fig. Menu	30
6.2 Fig. The Review of The Home Page of The CNC System Screen.....	32
6.2.1 Fig. PC Operation.....	33
6.2.2 Fig. Sheet Metal Working MGR	33
6.2.3 Fig. Calendar Laser Cut Condition DB	34
6.2.4 Fig. Laser Cut Condition DB	34
6.2.5 Fig. Laser Cutting.....	35
6.2.6 Fig. Laser Dashboard	35
6.2.7 Fig. Operator	36
6.2.7.a Fig. Sheet Managment.....	38
6.2.7.b Fig. Fly Cut	39
6.2.7.c Fig. Flap Setting	39
6.2.7.d Fig. User Setting 2.....	40
6.2.7.e Fig. Pallet.....	41
6.2.7.f Fig. Nozzle.....	41
6.2.8. Fig. Machine Setting	42
6.2.9 Fig. Data Logger	42
6.2.10 Fig. Maintenance Manager.....	43
6.2.11 Fig. Servo Wiever	43
6.2.12 Fig. Laser and HSU Alarm.....	44
6.2.13 Fig. Manual	44
6.2.14 Fig. Memo	45
6.2.15 Fig. Browser	45
6.2.16 Fig. Setting	46
6.2.17 Fig. Maintenance Display	46





8.2 Fig. LightCutter 2.0.....	56
8.2.1 Fig. Centering And Adjusting The Laser Beam.....	57
8.2.3 Fig. Ceramic and Nozzle Replacement.....	60
8.2.4 Fig. Protection and Maintenance of Protection Glass Slide.....	61
8.2.5 Fig. Protective Glass Replacement.....	62
8.2.6 Fig. Axial Seal Replacement.....	67
8.4 Fig. ProCutter 2.0.....	70
8.4.2 Fig. Centering And Adjusting The Laser Beam.....	72
8.4.4 Fig. Ceramic and Nozzle Replacement.....	74
8.4.5 Fig. Protection and Maintenance of Protection Glass Slide.....	75
8.4.6 Fig. Protective Glass Replacement.....	76
8.4.7 Fig. Axial Seal Replacement.....	81
9.5.a Fig. Clening Linear Stage Components.....	91
9.5.b Fig. Cleaning Linear Stage Components.....	91
9.5.c Fig. Cleaning Linear Stage Components.....	92
9.5.d Fig. Cleaning Linear Stage Components.....	92
9.5.e Fig. Cleaning Linear Stage Components.....	93
9.5.f Fig. Cleaning Linear Stage Components.....	93
9.5.g Fig. Cleaning Linear Stage Components.....	94
9.5.h Fig. Cleaning Linear Stage Components.....	94
9.5.i Fig. Cleaning Linear Stage Components.....	95
10.2 Fig. Lubrication Pump.....	98
12.1 Fig. Power Knob.....	101
12.2 Fig. Chiller.....	102
12.3 Fig. Nitrogen Regulator.....	103
12.4 Fig. Fanuc System Login.....	104
12.5 Fig. Machine keyboard.....	104
12.6 Fig. Table changing.....	105

