Betriebsanleitung

Instruction manual

Mode d'emploi

SL10

SiroLasertec

Identification Data

Tool / Machine / System	
Model Designation:	Welding Laser System
Type:	SL 10
Year of Manufacture:	2025
Serial Number:	_____
Customer Registration:	
Company Name:	
Order No.:	
Location:	
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Instruction Manual:	
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1 Foreword

1.1 Introduction

This instruction manual contains important information for the safe, proper and economic operation of the welding laser system. Its observance prevents hazards, reduces repair costs and downtime and increases the reliability and service life of the welding laser system.

The instruction manual must always be available and be read and applied by every person who carries out work on or with the welding laser system.

To this belong, amongst other things

- the operating and elimination of faults during operation,
- the maintenance (care, servicing and repair),
- the transportation.

1.2 Copyright and Property Rights

- Make this instruction manual accessible only to authorized personnel.

This instruction manual is protected by copyright law.

The disclosure or duplication of documents, also in the form of extracts, as well as the exploitation and communication of its contents are not permitted insofar as not expressly permitted by us in writing.

Infringements shall be punishable and shall commit the offender to pay damages. All rights for the exercising of industrial property rights are reserved by Siro Lasertec.

1.3 Information for the Operating Company

This instruction manual is an essential component of the welding laser system.

- Ensure that all people who work with or on the welding laser system observe this instruction manual.
- Spare parts must comply with the technical requirements specified by Siro Lasertec. This is always guaranteed with the use of original spare parts.

2 Safety

The welding laser system has been designed and built in accordance with the state-of-the-art of technology and the recognized safety-related regulations.

When operating the welding laser system, hazards for the personnel who work on or with the welding laser system and / or impairment of the welding laser system as well as other material assets can occur when they:

- are operated by untrained or uninstructed personnel,
- are not used in accordance with the intended purpose and / or
- are improperly maintained.

2.1 Information about Signs and Symbols

In this instruction manual, the following designations and / or signs and symbols are used for giving particularly important information:

- Work and / or operating steps are identified with bullet points. Carry out the steps in the given sequence.
- Lists are identified with indents.

DANGER

This is a warning of an imminent threat of a dangerous situation with the inevitable consequence of most serious injuries or death if the specific instruction is not followed exactly.

WARNING

This warns of a dangerous situation that could lead to serious injuries to people or to death if the specific instruction is not followed exactly.

CAUTION

This is a warning of a potentially dangerous situation possibly resulting in moderate or minor injuries if the specific instruction is not followed exactly.

INFORMATION

This is a warning of a potentially dangerous situation possibly resulting in material damage if the specific instruction is not followed exactly.

This is an indication of useful information about safe and proper handling.

- Observe the warning signs, operating labels or component markings attached to the welding laser system. They must not be removed.
- Always maintain these signs and symbols in a fully legible condition.

2.2 Intended Purpose

The welding laser system is working equipment for the welding of metal joints by means of pulsed laser beams

- Observe the specifications in Chapter 3, Section Technical Data. Always comply unequivocally with these specifications.

Also belonging to use for the intended purpose is the compliance with the instructions

- for safety,
- for operation and control,
- for maintenance and service,

specified in this instruction manual.

Other uses or use over and above this shall be considered as use not for the intended purpose. The operating company shall bear the sole liability for any damages resulting from this. This shall also likewise apply to any unauthorized modifications made to the welding laser system .

2.3 Reasonably Foreseeable Misuse

The following stated example processing procedures shall be considered as use not for the intended purpose:

- The use and / or processing of explosive substances.
- The processing of materials other than those stated for the intended purpose.
- The operation of the welding laser system in potentially explosive atmospheres.
- The operation of the welding laser system without fully fitted safety devices.
- Use by private users or users without professional instruction and training.
- The storage of explosive or highly flammable materials in the vicinity of the welding laser system.
- The installation of the welding laser system in unprotected, weather-exposed rooms or halls.

2.4 Residual Risks

Even with the compliance with all safety regulations, the residual risks described below remain during the operation of the welding laser system.

- As the employer / operating company, ensure that all personnel that work on or with the welding laser system are aware of the residual risks.
- Follow the instructions that prevent the residual risks from leading to accidents or injury or damage.

During setup and preparation work, it may be necessary to disassemble in-house fitted safety devices. Various residual risks and potential dangers which every operator must make him- or herself aware of arise through this:

DANGER

Danger to life due to electric shock

Electric shock can result in fatal injuries.

- **Before all repair, setup and maintenance work, disconnect the welding laser system from the power supply.**
- **Secure the welding laser system against unintentional switching back on.**
- **In addition, activate an Emergency Stop button.**

WARNING

Danger from optical radiation

Class 4 laser light is very dangerous for the eyes and dangerous for the skin. Even diffusely scattered radiation can be dangerous. The laser beam can cause fire and explosion hazards. The closed slats in front of the work chamber downgrade the laser radiation to Class 1.

- **Avoid exposing the eyes or skin to direct or scattered radiation.**
- **Before starting up the welding laser system, check that all safety devices are installed and function correctly.**
- **Never operate the laser with open or damaged slats in front of the work chamber.**

2.5 Description of the Safety Devices

2.5.1 Position of the Emergency Stop Devices

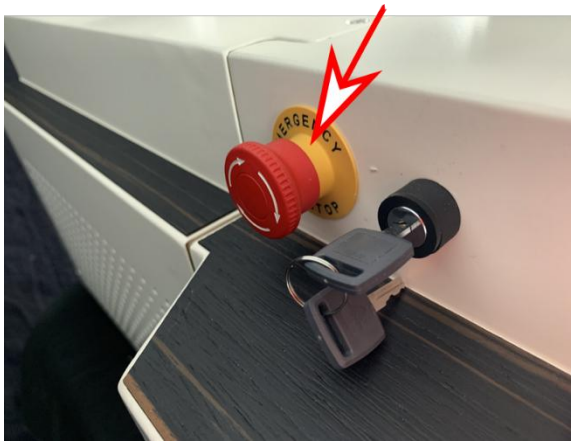


Illustration 1 Emergency Stop

An Emergency Stop button (arrow) is present on the left-hand side next to the microscope.

- Trigger the Emergency Stop devices once per year.
- Check the function – all drives must come to a safe stop
- Record this process.

2.5.2 Protection of the Eyes against Laser Radiation

Devices on the equipment that guarantee complete eye protection of the operator and other people in the vicinity of the welding laser system:

Safety Beam Shutter

The safety beam shutter prevents the generation of laser pulses or the unwanted emission of laser radiation from the laser beam source and is closed

- When there is no control voltage applied to it,
- When it delivers no or an incorrect status message to the control system.

Release of the Laser Pulse

The release of the laser pulse takes place only when

- the setting of the laser nominal values has been completed
- the recharging of the energy reservoir has been completed
- the foot switch has been pressed down.

Other Devices for Eye Protection:

- a large observation window in laser protection polymer for the safe direct observation of the welding operation.
- automatic UV and glare protection in the beam path of the stereo microscope is activated during the welding.
- the entire laser beam path is optically sealed towards the outside.

The device fulfils all the conditions for complete eye protection.

Thereby, the single condition for laser Class I is satisfied.

2.5.3 Protection of the Skin against Laser Radiation

The protection of the skin against laser radiation cannot be process-relatedly completely ensured as hands need to be put in the danger area.

The device is intended for use in dental laboratories, in goldsmiths‘ workshops and many other workshops and laboratories.

The operating procedure cannot be automated as every workpiece is an individual item. Manual work is necessary as a large number of the most diverse materials with different dimensions, outward forms, surface qualities, fit tolerances, electrical, mechanical and thermal properties must be joined with each other in various combinations or must be surface-treated.

Laser radiation protective gloves are generally speaking very cumbersome and only suitable for rough welding work. The same applies to the use of holders, tweezers, etc. Therefore, this device must be classed as work equipment for manual work from which the risk of minor injuries can occur.

Due to the equipment design, the danger area is restricted to the hands of the operator only. Through exposure to laser radiation, localized burn injuries to the skin tissue can occur in the event of incorrect operation.

Direct laser radiation striking your hands can be avoided through:

- never holding your hands in the direct laser beam.
- looking through the stereo microscope and positioning the workpiece so that the welding point is in sharp focus and lies in the cross-hairs
- as far as possible, ensuring that your hands cannot be seen in the viewing area of the stereo microscope.
- keeping your hands still whilst triggering the laser pulse using the foot switch.
- repeatedly looking through the stereo microscope and checking your hands and the position of the workpiece.

Not only the direct laser radiation is dangerous for the skin but also radiation reflected and scattered by the workpiece or a tool.

Scattered laser radiation striking your hands can be avoided through:

Especially objects with reflective, bright surfaces can scatter or divert the laser radiation so that even at a great distance from the welding point there is still the risk of a certain local burn injury.

- Where possible, not wearing jewellery on the arms or fingers when working with laser radiation.
- Wearing thin cotton or leather gloves. Thus, you not only protect your skin against laser radiation but also against burn injuries from hot workpieces. This is especially necessary with materials such as silver or copper with good thermal conductivity.

2.5.4 Welding Fumes

Fumes harmful to health can occur during welding work. Welding fumes are a hazardous substance.

The exact composition and the extent of the danger are dependent on the materials involved in the welding. For the maintenance of the purity of the respiratory air, the employers' liability insurance association**,** therefore, requires that appropriate welding fume extraction is used during welding work with the laser.

The integrated extraction system of the welding laser system is only approved for the extraction of laser welding fumes.

It must not be used for other purposes such as, for example, the extraction of

- highly flammable or explosive gases
- liquids of any kind
- organic substances.

The exhaust openings must always be kept clear. The welding fume extraction system must only be operated with a non-flammable filter fleece.

2.6 Labels and Signs on the Welding Laser System

Sign	Meaning	Attachment Point
	Rating plate with the information: – Name and full address of the manufacturer – Model: – Type / Designation: – Machine No.: – Year of Manufacture: – Technical Data (for example, electrics, weight) – CE Mark	Clearly legible on the welding laser system
	Warning of dangerous electrical voltage	Signs on all terminal boxes, switch cabinets and control cabinets for low voltage.
	Protective earth connection	Next to the earthing screws
	Warning of Class 1 laser radiation	On the outside of the welding laser system
	Warning of Class 4 laser radiation	On the laser unit.

2.7 Operating Personnel / User Groups

Personnel that handle the welding laser system must satisfy the following requirements:

Personnel	Activities	Necessary Qualifications
Hauliers	Transport from site to site	Qualification as a transport specialist for machines
Transporters	Transport within the works	Trained for the transportation with lifting equipment (crane, forklift, AGV, etc.)
Electrical Technician	Electrical installation	Skilled electrician
Commissioning Engineer	Initial commissioning, recommissioning	Qualified personnel with under-standing of process-related systems

Personnel	Activities	Necessary Qualifications
Setter	Machine setting	Qualified personnel with under-standing of process-related systems
Operator	Operation	Semi-skilled assistant
Electrical Maintenance Personnel	On electrical parts: Fault finding Service Maintenance Decommissioning Dismantling	Skilled Electrician
Disposer	Disposal of the machine	Waste disposal expert

2.8 Safety Instructions for the Operating Personnel

Every person assigned to work on or with the welding laser system must have fully read and understood this instruction manual.

- Start the welding laser system only with it in a technically faultless condition as well as only for its intended purpose, safety and risk aware and in compliance with this instruction manual.

No liability whatsoever shall be assumed for injury, damage and / or accidents that arise from the non-observance of this instruction manual.

- Immediately rectify all faults.
- Always keep the instruction manual readily available at the welding laser system.
- Do not wear jewellery.
- Only reliable, trained and qualified personnel who have reached the statutory minimum permissible age in accordance with the Young Persons Employment Act may work on or with the welding laser system.
- Personnel to be trained, taught, instructed or who are undergoing general training may only work whilst under the constant supervision of an experienced person.

If safety-related changes occur on the welding laser system:

- Immediately shutdown the welding laser system.
- Secure the welding laser system.
- Report the event to the responsible position / person.

2.9 Safety Instructions for the Maintenance Personnel

- Observe the time limits for recurring checks / inspections prescribed or specified in the instruction manual.

2.9.1 Preparation for the Maintenance Work

Appropriate workshop equipment is required for the carrying out of the maintenance work.

- Only carry out set up, maintenance and repair work as well as fault finding with the welding laser system disconnected.
- Insofar as is necessary, secure the maintenance area with a red and white safety chain and a warning sign.
- Before starting the service / repair / care work, clean contamination or maintenance products off the connections and screw fittings in particular.

2.9.2 Carrying Out the Maintenance Work

- Never stand under suspended loads.
- During replacement, carefully attach and secure individual components and larger assemblies to the lifting equipment so that the hazard arising from them is minimized. Use only suitable and technically perfect lifting equipment and lifting tackle with adequate load bearing capacity.
- During the maintenance and repair work, always tighten loosened screw connections in accordance with the specifications and using a torque wrench.
- Ensure the safe and environmentally friendly disposal of operating and auxiliary materials and replacement parts as described in Chapter 0.

2.10 Information about Special Types of Hazard

2.10.1 Electrical

Work on the electrical equipment of the welding laser system must only be carried out by skilled electricians or by instructed personnel under the supervision of a skilled electrician in accordance with the electrical engineering regulations.

- Before opening the control cabinet, switch off the welding laser system at the key switch and remove the key.
- Switch electrical components on which inspection, maintenance and / or repair work is to be carried out to zero potential.
- Use only original fuses with the specified current rating.
- Secure the operating equipment used for the switching off against unintentional or automatic switching back on (lock away the fuse, block the circuit breaker, etc.).
- With switched off electrical components, first check the freedom from voltage then isolate neighbouring live components.

- During repairs, ensure that structural features are not changed to the detriment of safety (for example, do not reduce creep and air gaps and clearances through insulation).

When working on live components (only in exceptional situations) it is necessary to:

- Call in an additional person to activate the Emergency Stop button or the mains isolating device in an emergency.
- Use only electrically insulated tools.

The proper earthing of the electrical system must be ensured by means of protected conductor systems. Permanent installation is necessary with a leakage current to earth (PE) >3.5 mA.

- Regularly check cables for damage.
- Immediately replace defective cables.

For further information, see also Chapter 6.2.4 Safe Maintenance of the Electrical Devices.

Due to the special properties of laser radiation and the biological effects resulting from it, special protective and precautionary measures are necessary during the use of laser radiation.

Lasers are classified in accordance with their hazard potential. In each individual case, the necessary protective measures arise from this.

Of special importance are protective measures for the protection of the operator in the use of powerful lasers in engineering and medicine.

Laser Class	Definition
Class 1	The accessible laser radiation is not dangerous under reasonably foreseeable conditions. 1. Lasers that are so encapsulated that the escape of radiation is completely prevented. 2. Lasers with very low power (40 µW for blue light). Even with longer exposure, these lasers cause no damage to the eyes even when optical instruments (magnifying glasses, lenses, telescopes, etc.) are held in the beam path.
Class 1M	The accessible laser radiation lies in the wavelength range from 302.5 nm to 4 000 nm. The accessible laser beam is not dangerous for the eyes as long as the cross section is not reduced by optical instruments (magnifying glasses, lenses, telescopes, etc.)! The laser must not be harmful during the exposure of the naked eye. Eye damage can occur if optical instruments are present during the exposure.

Laser Class	Definition
Class 2	The accessible laser radiation lies in the visible spectral range (400 nm to 700 nm). It is also not dangerous for the eyes at a short exposure time (up to 0.25 s). Additional radiation components outside the wavelength range of 400 - 700 nm comply with the conditions for Class 1. The power of the lasers of Class 2 is limited to 1 mW. The eye is adequately protected against damage through incidental short-term looking into the radiation by the eyelid closure reflex that occurs within 0.25 s due to the dazzling effect of the radiation. This also applies if optical instruments are present in the beam path. ● Avoid intentional, sustained looking into the beam path. If the laser also emits radiation of other wavelengths, these must be completely harmless to the eyes.
Class 2M	The accessible laser radiation lies in the visible spectral range of 400 nm to 700 nm. It is not dangerous for the eyes at a short exposure time (up to 0.25 s), as long as the cross section is not reduced by optical instruments (magnifying glasses, lenses, telescopes, etc.). Additional radiation components outside the wavelength range of 400 - 700 nm comply with the conditions for Class 1M. Lasers with lower power up to 1 mW. They are not harmful to the naked eye due to the eyelid closure reflex. Eye damage can occur if an optical instrument is present during the exposure.
Class 3R	The accessible laser radiation lies in the wavelength range from 302.5 nm to 106 nm and is dangerorous for the eyes. The power respectively the energy is a maximum of five times the limit value of the permissible radiation of Class 2 in the wavelength range from 400 nm to 700 nm. The lasers of this Class are in principle dangerous for the eyes. The level of danger is limited in that the power in the visible range may not exceed 5 mW and outside the visible range must not exceed five times the power of Class 1 lasers.
Class 3B	The accessible laser radiation is dangerous for the eyes and in specific cases also for the skin. The radiation of Class 3B lasers (medium power) is dangerous for the eyes, not only with direct exposure but also with exposure to reflected radiation. In the upper power range, these lasers can also damage the skin. The power is limited to 500 mW.

Laser Class	Definition
Class 4	The accessible laser radiation is very dangerous for the eyes and dangerous for the skin. Even diffusely scattered radiation can be dangerous. The laser beam can cause fire and explosion hazards. Lasers of Class 4 are high power lasers. Their radiation is so intense that damage is to be expected with any kind of exposure of the eyes or the skin. In addition, there is the risk of fire or explosion with lasers of this Class.

The operating company of the laser facility is responsible for compliance with the protective measures.

- Provide suitable fire-extinguishing facilities.
- Ensure that the laser devices are assigned to a laser Class and are labelled accordingly.
- Report the operation of Class 3R, 3B and 4 laser facilities to the responsible market surveillance authorities.
- When operating such lasers, define and mark out the laser area.
- As the operating company of Class 3R 3B and 4 laser facilities, appoint a qualified person as Laser Protection Officer.
- Instruct the personnel that operate Class 1M, 2, 2M, 3R, 3B or 4 laser facilities, or those that can be present in the laser area of Class 1M, 2, 2M, 3R, 3B or 4 lasers, in the effects of the laser radiation and the necessary protective measures.
- Provide suitable PSR laser glasses, protective clothing or protective gloves for the operation of Class 3R, 3B and 4 laser facilities.

The operating company is also responsible for the compliance with the special safety requirements for the operation of the different laser types.

2.10.2 Raw Material, Solvents, Oils, Greases and other Chemical Substances

- When handling raw material, solvents, oils, greases and other chemical substances, observe the applicable regulations and safety data sheets of the manufacturers of these substances with respect to storage, handling, use and disposal and comply with them.
- All work with corrosive cleaning agents and substances can cause serious chemical burns and serious eye injuries!
- Therefore, always wear personal protective equipment during all work with chemical substances:
  - Safety glasses,
  - Safety gloves,
  - Protective clothing resistant to the substances,
  - Safety shoes.

- In the event of eye or skin contact, immediately flush the affected areas with plenty of water. Suitable facilities (eye wash bottles, wash basin, shower) must be available in the workplace vicinity!
- After washing, apply skin care to the cleaning agent and disinfectant-affected skin. Skin damage can be avoided through the preventive application of skin protection products and suitable skin care.
- Choose the care products to be applied according to the exposure to the harmful substances and the individual condition of the skin. A fat-containing care product should mainly be used.
- Do not eat, drink or smoke and never store foodstuffs in rooms in which there are chemicals!

2.10.3 Noise

In the normal operation of the welding laser system the equivalent continuous A-weighted sound pressure level at the operator workstation is below **80** dB(A).

- As the operating company, provide the operating personnel with the appropriate protective equipment when, due to the local conditions, there is a higher sound pressure level at the operating site of the welding laser system.

3 Product Description

Illustration 2 Welding laser system SL 10

Item	Designation
1	Touchscreen operating panel
2	Microscope
3	Observation window
4	Work chamber with protective slats
5	Key switch
6	Emergency Stop button

3.1 Function

The SL 10 welding laser system is a very compact tabletop device for manual use. It delivers short, high-energy invisible laser pulses for the welding of metal joints.

The workpieces are placed in the integrated laser-safe work chamber for processing. The workpiece is positioned under the stereo microscope by hand and held for welding. If both hands are in the work chamber, no laser radiation can escape to the outside.

3.2 Construction of the Welding laser system

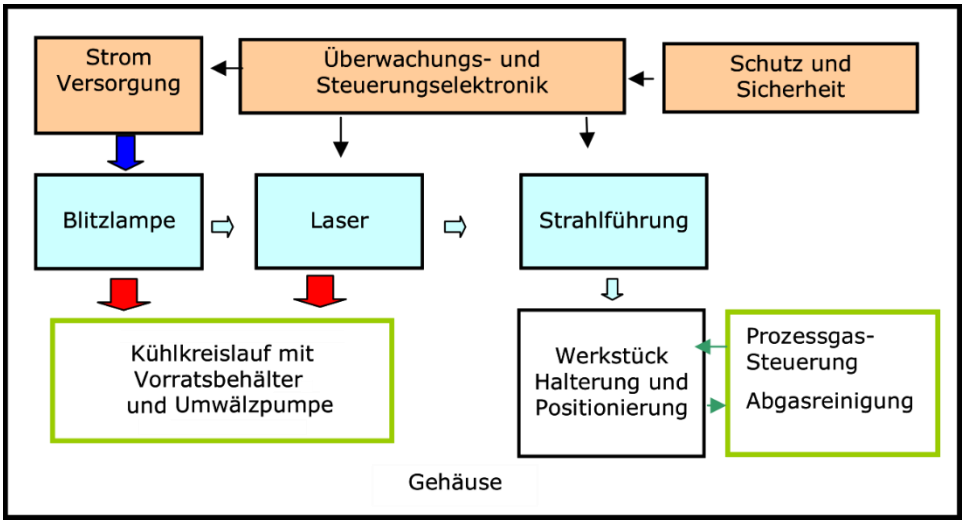


Illustration 3 Construction Block Diagram - In the picture, left to right, top to bottom: Power supply, Monitoring and control electronics, Protection and safety, Flashbulb, Laser, Beam guidance, Cooling circuit with storage vessel and circulation pump, Workpiece holder and positioning, Process gas control, Exhaust gas purification, Housing.

All functions for the operation of the SL 10 welding laser system are integrated in the housing.

The core of the welding laser system is the solid-state laser. It receives its energy from a flashbulb that is operated by a power supply unit with high electrical efficiency. The laser flash is guided through the observation microscope on to the workpiece via a carefully coordinated beam path.

In the closed cooling water circuit, the cooling water is pumped through the pump chamber of the laser and cools down the flashbulb and the laser rod. The heat generated is dissipated into the ambient air via a heat exchanger and a fan.

The shielding gas, for example, argon, required for the protection of the weld seam is externally supplied via a connection fitted on the back of the device. The shielding gas can be routed directly to the weld point via a rigid as well as a flexible supply line in the work chamber. The gas flow is controlled via the foot switch.

The welding fumes generated during the welding are extracted out of the welding chamber.

3.3 The Work Chamber

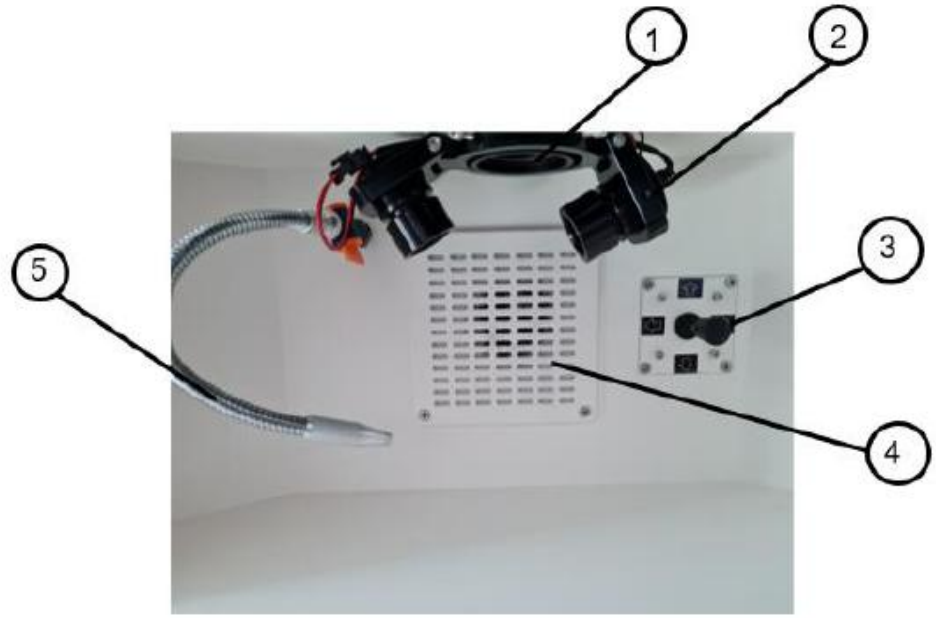


Illustration 4 Work Chamber

Item	Designation
1	Laser with focusing lens
2	Work chamber light (2X)
3	Joystick
4	Filter
5	Shielding gas hose

In the center at the top, the laser beam is emitted from the protective glass protected focusing lens (1). At the top in the middle, the laser beam emerges from the protected with a protective glass focusing lens (1) off. The working chamber and the workpiece are illuminated by an LED ring light (2) on the Illuminated edge of the exit opening. The air in the working chamber is through a Filter (3) vacuumed. The brightness of the ring light can be adjusted by rotating the Dimmer (4) can be changed. The welding parameters can move through that of the joystick (5) can be changed. By pressing the button (6), the microbeam enabled. With the flexible nozzle (7), the shielding gas can be supplied precisely

3.4 Electrical

The welding laser system is connected to the electrical energy supply via a mains plug.

3.5 Shielding Gas

The shielding gas, argon 4.6, is required for the welding of special materials such as, for example, titanium.

3.6 Cooling Water

Distilled water is used to cool the laser system. There is a tank in the welding laser system. If the control of the welding laser system signals a shortage of water, the water must be topped up by the operator – see 5.3.1 Commissioning.

3.7 Technical Data

Dimensions (L x B x H)	600 x 450 x 490	mm
Total weight	37	kg
Electrical connection	230 / 50	V / Hz
Peak pulse power	3,5	kW
Maximum averaged power	60	W
Pulse frequency	1 - 20	Hz
Pulse duration	0.1 - 10	ms
Beam diameter	0.2 – 2.0	mm

4 Transport and Installation

4.1 Transport

The welding laser system has been manufactured and set up by Siro Lasertec.

If transport of the welding laser system is necessary, observe the following instructions.

WARNING

Risk of crushing when lifting and transporting the welding laser system

Through the incorrect lifting and transportation, the welding laser system can tip over and fall down.

- **Only lift and transport the welding laser system with at least two people in attendance.**

Acceptable Load (**trade association specification**)	**Frequency of Lifting and Carrying**			
	Occasionally		Frequently	
Age	Women	Men	Women	Men
15 to 18 years	15 kg	35 kg	10 kg	20 kg
19 to 45 years	15 kg	55 kg	10 kg	30 kg
Older than 45 years	15 kg	45 kg	10 kg	25 kg

4.2 Installation

DANGER

Life-threatening injuries possible

Through incorrect installation, people may suffer an electric shock, for example.

- **As the operating company, allow installation work to be carried out only by skilled personnel trained for the purpose.**

The operating company must ensure the electrical power supply.

- Check the scope of delivery for completeness by means of the packing list delivered with the welding laser system.
- Claim for possibly missing or defective parts stating the exact details in accordance with the packing list.
- Set up the welding laser system in a clean room. Preferably on a sturdy table. Maintain a distance from walls of at least 500 mm on all sides in order to ensure heat dissipation.

4.2.1 Safety Devices

- Comply with the relevant applicable and regulatory safety regulations.

5 Operation

Every person involved with the operation, maintenance and repair of the welding laser system must have thoroughly read and fully understood this Chapter “5 Operation”.

5.1 Safe Operation

Work on the welding laser system must only be carried out by trained or instructed personnel. Danger to life and limb can occur in the event of improper and / or incorrect use.

The welding laser system must only be operated by authorized, suitably skilled personnel.

Due to his or her professional training, knowledge and professional experience as well as knowledge of the accident prevention and health and safety regulations, a suitably skilled person is able to assess and carry out the work assigned to him or her and recognize potential hazards when he or she also satisfies the necessary personal requirements for the work, for example, can work independently.

- Use the welding laser system only for the purpose that is normal or is specified by the manufacturer.
- Always only operate the welding laser system in a technically perfect condition in order to avoid accidents.
- Do not use third-party parts on the welding laser system as otherwise compliance with the necessary safety is not guaranteed.
- Refrain from all working methods that impair the safety of the welding laser system
- Report immediately any changes (that impair safety) occurring on the welding laser system to the responsible supervisor.
- Immediately shutdown welding laser system in the event of a fault impairing safety. First put the welding laser system back into operation after the fault has been rectified.
- Do not disassemble or manipulate any safety devices. Do not render safety devices inoperative.
- Do not remove covers from drive sections before the dangerous movements have come to a complete standstill. Correctly re-fit the covers before putting back into operation.

5.1.1 Instructions for the Operating Company

- As the operating company, ensure that the functional checks of the safety devices on the welding laser system are carried out by trained personnel, not only before the initial commissioning but also before every further new commissioning.
- As the operating company, provide the operating personnel with the necessary personal protective equipment (PPE) and also ensure that it is used.

5.1.2 Electro-technical Instructions

DANGER

Threat to life from electric shock

An electric shock can have fatal injuries as a consequence.

- **Connect the welding laser system and additional devices in accordance with the instructions. Unequivocally comply with the regulations.**
- **At regular intervals, check all safety-related switching devices for their correct function.**
- **Never remove, bypass or adversely affect safety devices (such as, for example emergency switches, limit switches or key switches).**
- **Allow the controls of the system to be operated only by trained and instructed personnel.**
- **Allow repair and maintenance work to be carried out only in the disconnected condition (voltage free) and only by a qualified electrician.**

A qualified electrician is someone who, due to his or her professional training, knowledge and experience as well knowledge of the relevant regulations, is able to assess the work assigned to him or her and to recognize potential hazards.

5.2 Operating Controls

The welding laser system is operated using the elements described in the following.

5.2.1 User Interface

Illustration 4 Operating Panel

The user interface of the welding laser system is a 7-inch colour touchscreen with 1024 x 600 pixels. This screen can display the real time image of the laser weld point and various status indicators and operating parameters, etc. Via the touchscreen the operator can switch the device on and off and set the parameters.

5.2.2 Operating Side

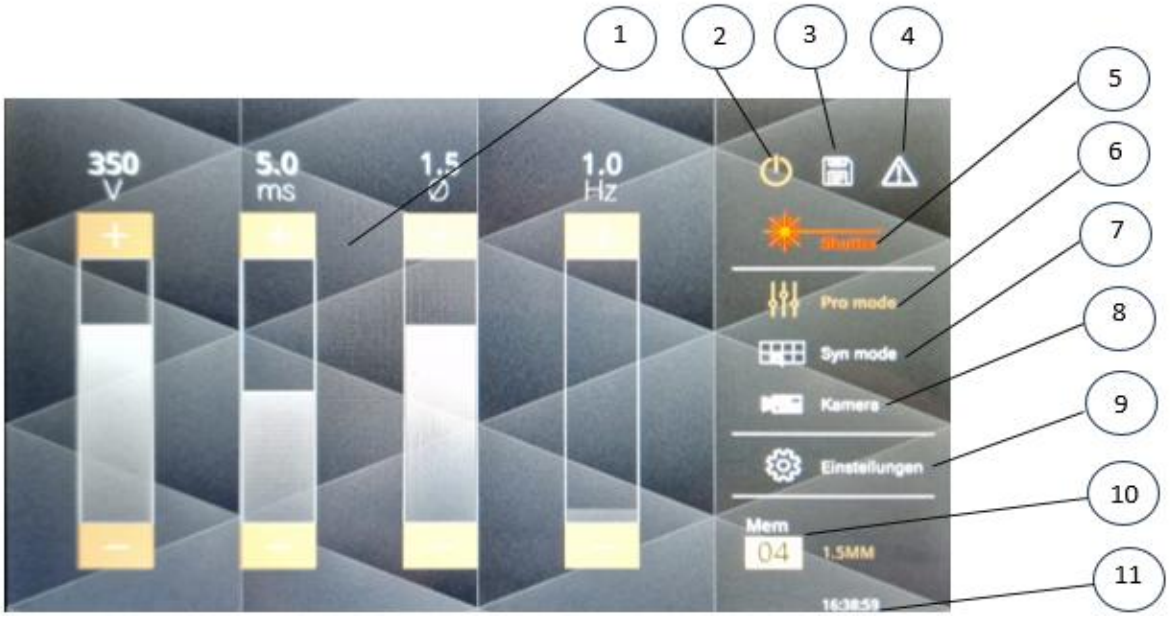


Illustration 5.1 Operating Side

Item	Designation
1	Display of the selected programme and the parameters.
2	After pressing the “On/Off” button, the cooling water pump starts and the storage capacitor is charged.
3	“Save” button to save the currently displayed parameters in the current memory location
4	Show error messages
5	 : The shutter is closed.  : The shutter is open. After operating the foot pedal the laser can now operate.
6	“Pro mode” – button for freely setting the desired welding parameters
7	“Syn mode” – button for preset welding programs according to material and welding task.
8	“Camera” button shows the workpiece in real time.
9	“Settings” button for changing and checking the system parameters
10	“Memory” button to select a storage location
11	Current time

You have the option of changing the parameters directly by entering them by touching the display or by operating the joystick within the working chamber.

Illustration 6.2 Joystick

By moving the joystick to the left or right, the desired parameter can be selected. By moving the joystick up or down, the value can be increased or decreased

5.2.3 Emergency Stop Button and Key Switch

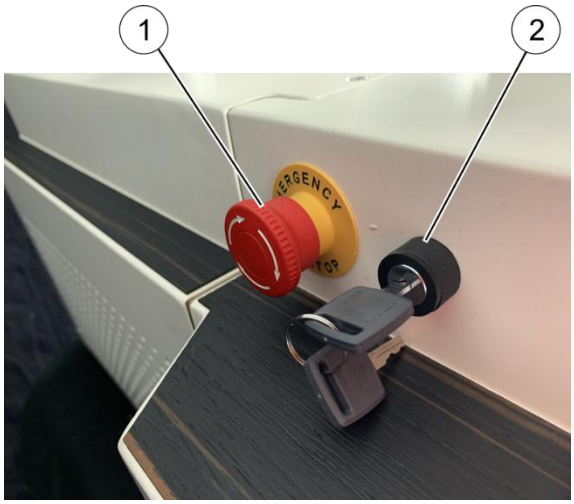


Illustration 7 Emergency Stop Button and Key Switch

Item	Designation
1	Emergency Stop button
2	Key switch

After pressing the Emergency Stop button (1) the welding laser system is brought to a safe stop

- **Only use the Emergency Stop button in the event of danger for people and / or the welding laser system**
- **Do not use the Emergency Stop button as an off-switch**

The welding laser system is switched to operational readiness by means of the key switch (2).

5.2.4 Foot Switch

Illustration 8 Foot Switch

The laser is triggered using the foot switch.

5.2.5 Cross-hair Rotary Control

Illustration 9 Cross-hair Rotary Control

The position of the weld point is set using the rotary control in the upper area of the work chamber.

5.3 Commissioning, Switching On and Off

WARNING

Danger from optical radiation

Class 4 laser light is very dangerous for the eyes and dangerous for the skin. Even diffusely scattered radiation can be dangerous. The laser beam can cause fire and explosion hazards. The closed slats in front of the work chamber downgrade the laser radiation to Class 1..

- **Avoid exposing the eyes or skin to direct or scattered radiation.**
- **Before starting up the welding laser system , check that all safety devices are installed and function correctly.**
- **Never operate the laser with open or damaged slats in front of the work chamber.**

5.3.1 Commissioning

- Insert the mains plug into a suitable socket outlet
- Switch on the welding laser system using the key switch.
- Wait that system is finished with booting

Illustration 10 Setting

- Press the Settings button in right-hand to open the Settings.

Illustration 11 Water Inlet

Filling up with water:

- Insert the water hose at the indicated point (red arrow) on the back of the device (Water Inlet). The hose must be firmly seated.
- Place the other end of the hose in a container of distilled water.

Illustration 12 Filling up with Water

Item	Designation
1	“Add Water On” button
2	Status lamps

- To start the water infeed, press the “Add Water On” button.

The process stops automatically when the device has been filled with sufficient distilled water.

- Afterwards, remove the hose.

After pressing the “Power” button, all the status lamps on the right-hand side without laser must light up green.

- Now switch off the laser again – see 5.3.3 Switching Off.

5.3.2 Shielding Gas Connection

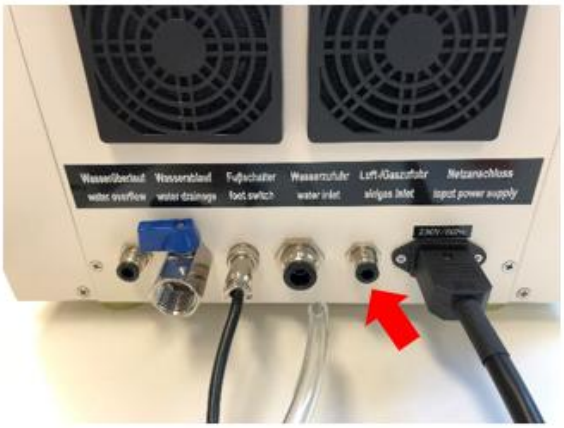


Illustration 13 Gas Connection

- If required and using a suitable hose, connect a bottle of argon 4.6 shielding gas to the welding laser system.
- Insert the hose at the indicated point (red arrow) on the back of the device (Air Inlet). The hose must be firmly seated.

5.3.3 Switching On

- Switch on the welding laser system using the key switch.
- Please wait until the system is finished with booting

Illustration 14 Start

Item	Designation
1	On / Off button
2	Safety shutter button

The laser has a safety shutter, this must be opened once on every start.

- To do so, press the icon (2) on the display. The laser is only operationally ready with the safety shutter switched to green.
- Always start the device in the following start sequence:

Key Switch	On / Off Button	Wait 30 -45 seconds	Safety Shutter Button

5.3.4 Switching Off

- Press the On / Off button.
- Switch off the welding laser system using the key switch.
- Wait 30 – 45 secons
- For longer periods out of operation, pull out the mains plug.

5.4 Operation

Pro mode

• For freely setting the

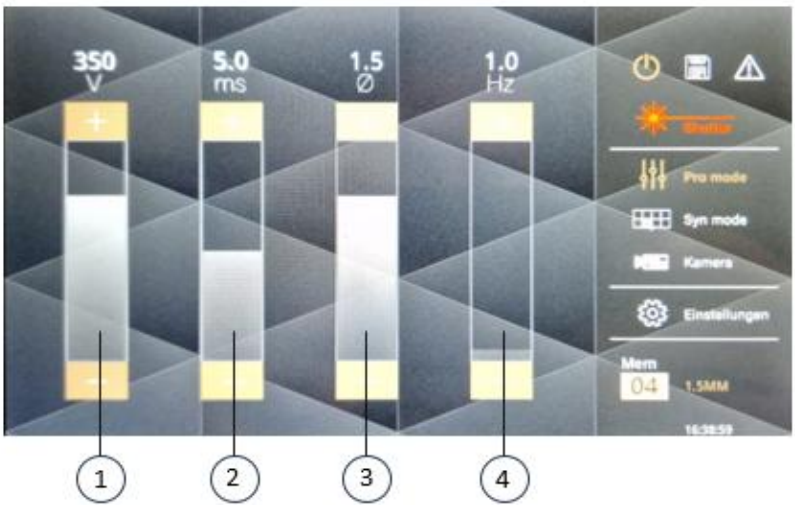


Illustration 15.1 Parameters Page

Item	Designation	Description
1	Voltage (V)	Setting the output voltage per laser pulse
2	Miliseconds (ms)	Setting the pulse duration per laser pulse
3	Diameter (Ø)	Setting the spot diameter in millimeters
4	Hertz (Hz)(	Setting the repetition rate of the laser pulse per second

Syn mode

- Preset welding parameters that can be selected according to material and welding task. This mode is aimed primarily at users with little welding experience. These basic values can be fine-tuned in “Pro mode”.

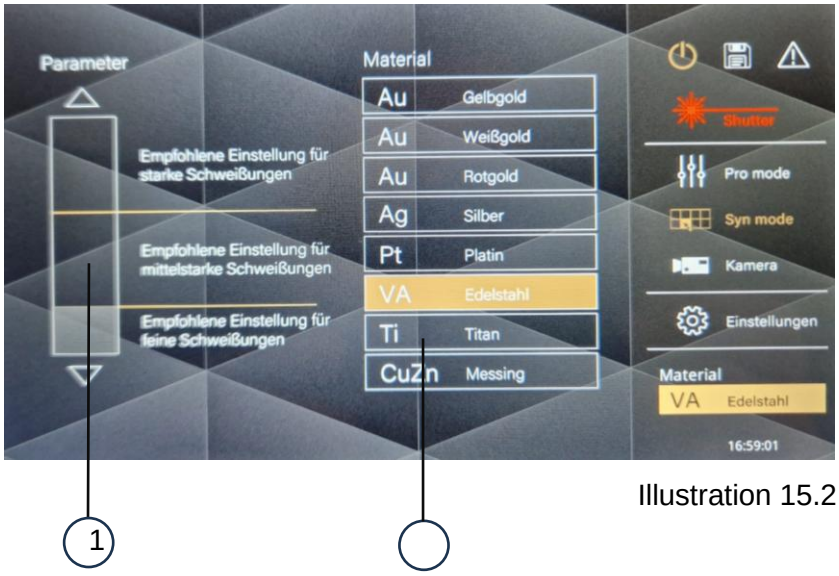


Illustration 15.2 Syn mode

Item	Designation	Description
1	Type of welding	Setting the intensity of welding parameters
2	Material	Selection of the material to be processed

Camera

- . Shows the workpiece in real time and also allows individual settings of the welding parameters

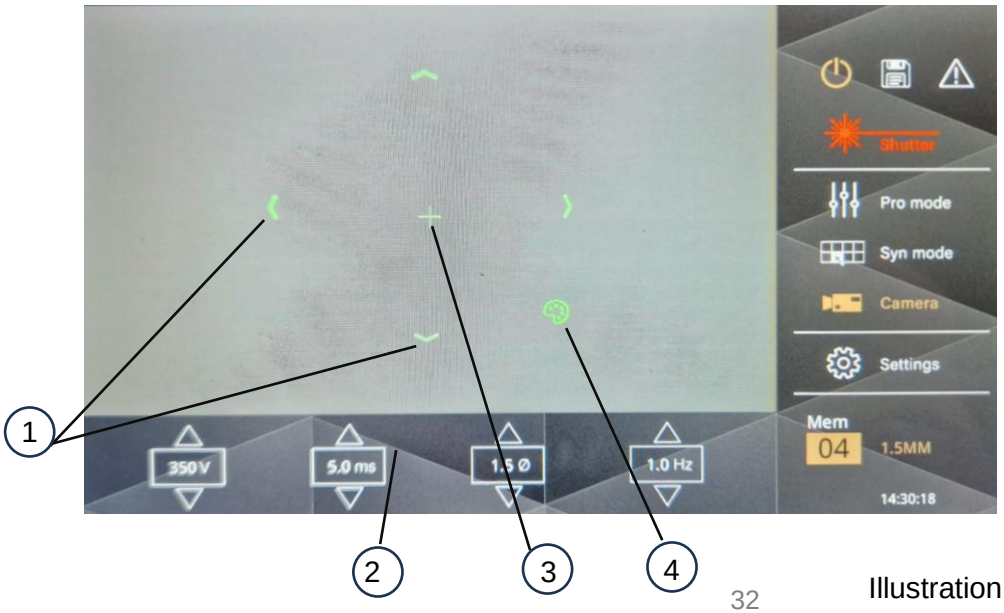


Illustration 15.3 Camera

Item	Designation
1	Direction indicators for moving the crosshairs
2	Parameters voltage [V], pulse duration [ms], pulse frequency [Hz] and laser spot diameter [mm]
3	Crosshairs (alignment and color can be optimized by pressing
4	Setting the color of the crosshairs

5.4.1 Cross-hair Adjustment

- Check that the laser shot is in the centre of the cross-hairs.

It can occur that this has shifted during transport.

If the cross-hairs and the laser shot coincide, the last step can be skipped.

If the cross-hairs and the laser shot do not coincide, proceed as follows:

- Place a suitable object in the center of the work chamber and focus on it. A small lift table and a metal plate are ideally suitable for this.

During the adjustment, the surface of the metal plate must be in focus. Thus, you see a perfect, sharp image through the microscope.

Illustration 16 Rotary Control

- Now loosen the locking screws of the 3 rotary controls in the upper area of the work chamber.
- Turn the appropriate rotary control. In doing so, the position of the weld point is changed.
- For adjustment, enter the following settings via the touchscreen:
  200V / 0.5ms / 0.0 Hz / 0.2mm.

- Trigger a single laser pulse by pressing the foot pedal.
- Check the coincidence of the weld point with the center of the cross-hairs.
- Keep readjusting as often as is necessary until the weld point and cross-hairs coincide.

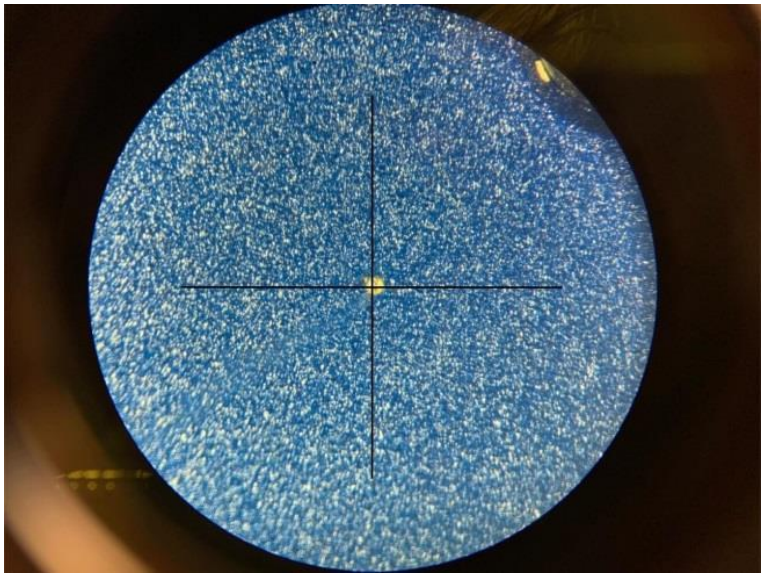


Illustration 17 Adjustment

Make use of the parameter list, syn mode menue in screen or book a laser training at Siro Lasertec for your first welding tests.

5.5 Faults

Some of the operating faults listed here can be rectified with the help of the instruction manual, for example, water shortage, cross-hair adjustment or defective laser lamp.

For the rectification of a possible fault, the housing must be opened only when the welding laser system has been taken out of operation.

In the event of faults that cannot be rectified following the instructions in the Chapters Service and / or Maintenance, contact the Technical Customer Service of Siro Lasertec.

6 Maintenance

The *Maintenance* chapter is sub-divided into the areas of Care, Maintenance and Repair. This is intended to simplify the planning of the respective necessary maintenance work.

The instructions described in this chapter are to be seen as the minimum requirements. Depending on the operating conditions, further instructions may be necessary in order to maintain the welding laser system in an optimum condition. The specified time periods relate to single shift operation. Maintenance instructions for specific components can be found in the relevant documentation of the component suppliers in Chapter 8.

The maintenance and service work described in this chapter must only be carried out by the specially trained maintenance personnel of the operating company.

For maintenance and repair work in specialist fields, for example, electrics, only skilled employees trained in the respective specialist field may carry out the work.

For repairs and spare part orders, we refer you to the drawings and parts lists belonging to the documentation in Chapter 8 *Annexes*. This also applies to the Siro Lasertec bought-in parts.

We shall accept no liability whatsoever in particular for defects that are related to the following causes: Poor maintenance, use of non-original spare parts, modifications without the written consent of the seller, repairs carried out badly by the buyer or normal wear.

The spare parts to be used must comply with the technical requirements specified by Siro Lasertec. This is always guaranteed with the use of original spare parts.

- Read the regulations and safety data sheets of the manufacturers and the instructions in the relevant instruction manuals of the operating company with regard to storage, handling, operation and the disposal of gases, greases, oils and other chemical substances. Comply unequivocally with these Regulations and instructions.
- Ensure the safe and environmentally friendly disposal of operating materials and replaced parts.
- Observe the safety instructions on the following pages.

6.1 Care / Cleaning

The care of the welding laser system is in the main limited to the weekly cleaning of dust and other deposits from all surfaces.

- Simply brush off or wipe down the welding laser system. Application to sensitive surfaces is advised against.

INFORMATION

Material damage through incorrect cleaning

The incorrect cleaning of the welding laser system can lead to malfunctions and damage.

- **Do not choose aggressive cleaning agents that attack metal and plastic surfaces and hose connections.**
- **Never clean sensitive components with rough brushes and heavy mechanical pressure. Use only lint-free cleaning cloths.**
- **Never clean the welding laser system using a water jet or high-pressure cleaner.**
- **All water-based industrial cleaners can be used without restriction.**

Appropriate care helps to maintain the welding laser system machine in a constantly proper functional condition.

- Thoroughly clean the welding laser system at least once per week.
- Do not use any aggressive cleaning agents or solvents (damage to seals) or emery paper for cleaning.

INFORMATION

- Do not clean the welding laser system using compressed air. By doing so, dust or dirt particles can get on to seals and sealing surfaces and damage them.

6.2 Maintenance

6.2.1 General Maintenance Instructions

A high level of availability of the welding laser system is positively influenced through compliance with the care and maintenance intervals.

- Regularly inspect welding laser system and inform the responsible person if repairs or maintenance work are necessary.

6.2.2 Preparation of the Repair and Maintenance Work

- When working only use the correct tools and replace worn parts such as screws or nuts only with original spare parts.
- Carefully identify components before their disassembly.

WARNING

Injuries possible due to inadequate visibility

With poor visibility, potential sources of danger cannot be properly recognized.

- **Only carry out repair and maintenance work on the welding laser system with adequate lighting.**

6.2.3 Checking of the Safety Devices

- Check all safety equipment and devices in accordance with the Maintenance Plan (Chapter 6.3) or the safety check list in the Annexes.
- Document these checks in an inspection logbook.

If, due to the existing operating conditions or other requirements, additional inspection positions or shorter inspection intervals need to be observed, they must be additionally recorded in the safety check list by a Safety Officer of the operating company.

If defects are detected during safety checks, the laser engraving machine must first be put back into operation following appropriate maintenance and release by a responsible officer of the operating company.

After the replacement and / or repair of electrical and / or electronic components, too, a visual inspection must be carried out whereby the settings in accordance with the relevant accompanying data sheets must also be checked.

6.2.4 Safe Maintenance of the Electrical Devices

Work on the electrical supply must only be carried out by a skilled electrician.

DANGER

Danger to life due to electric shock

Electric shock can result in fatal injuries.

- **Before all repair, setup and maintenance work, disconnect the welding laser system from the power supply by removing the mains plug.**
- **Secure the welding laser system against unintentional switching back on.**
- **In addition, trigger an Emergency Stop button.**

- As the operating company, specify the type and scope of the required checks.
- Specify the intervals for the recurring checks so that the welding laser system can be safely used until the next specified check.

Proven intervals for recurring checks for electrical working equipment (stationary) are generally: every 4 years. The checks must take place in accordance with the applicable electrical engineering regulations. Furthermore, the reduction of the inspection interval for all portable electrical devices to once per year is required.

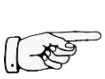
- Immediately rectify loose connections and damaged cables.

- Categorically never work with equipment under voltage. Only in exceptional cases with compelling reasons present is this allowed.
- As the operating company, record these compelling reasons in writing before the start of work under voltage.
- Only carry out work on live components in accordance with national requirements and procedures.

The work must only be carried out by skilled electricians or electrical engineering instructed personnel who have received specialist training.

6.3 Maintenance Plan

- Carry out the maintenance work at the following specified time intervals. The time intervals relate to single-shift operation Adapt the time intervals accordingly to multi-shift operation. This work ensures the consistent, trouble-free function of the welding laser system.



- Observe the Maintenance Plan in the Annexes of this instruction manual

The work that must be carried out weekly, monthly or annually at the indicated positions is shown in the Maintenance Plan.

Interval	Work to be carried out	Responsible Personnel
Daily	● Check the safety devices and safety equipment. ● Check the monitoring equipment. ● Check the indicator elements.	Operating personnel
Monthly	● Clean all the components of the system. ● Check all components for wear. ● Filter change	Maintenance personnel
Monthly	● Water change ● Cleaning and, if necessary, replacing the protective glass of the lens	Operating personnel
Every 6 months	● Check the electrical connections for firm seating. ● Check all safety devices, they must be checked individually, for: – condition – firm seating ● Check the Emergency Stop button with detent function for: – condition – function ● Check signal lamps for: – function	Maintenance personnel
Every 12 months	● Check the function of the entire system.	Service personnel

6.3.1 Maintenance of Outsourced Components

- Observe the maintenance instructions in the documentation of the outsourced components.

6.3.2 Water Changes

- For this, observe the Chapter, Commissioning, Filling up with Water.

- Place a container large enough to hold the water under the “Water Drainage” shut-off valve on the back of the welding laser system.
- Open the “Water Drainage” shut-off valve until the welding laser system is completely empty.
- Close the “Water Drainage” shut-off valve again.
- Press the Settings button r to open the Settings.
- Press the “Add Water ON” button
- When water no longer flows, press the “Add Water OFF” button
- Proceed with the filling with water as described in the Chapter, Commissioning, Filling up with Water.

6.3.3 Filter Changes

Illustration 18 Filter Cover

- Loosen the four indicated screws of the filter cover in the work chamber.

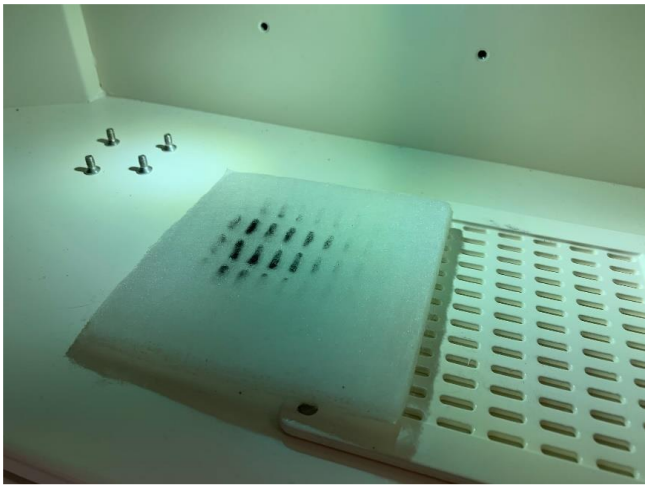


Illustration 19 Filter

- Replace the contaminated filter fleece.
- Secure the filter cover together with the new filter fleece again using the four fixing screws.

6.4 Repairs

Repair work on the welding laser system must only be carried out by the trained and authorized specialists of the operating company. The instructions in this chapter are limited to important general information and instructions that must be followed during repair work.

Categorically applicable to all assembly and dismantling work:

- Label all components together with their interrelationships.
- Identify the installation position and location and record this data.
- After re-installing, re-tighten all mechanical connections.
- Check the safety devices as described in Chapter 6.2.3 Checking of the Safety Devices.

6.4.1 Changing the Safety Glass of the Focusing Lens

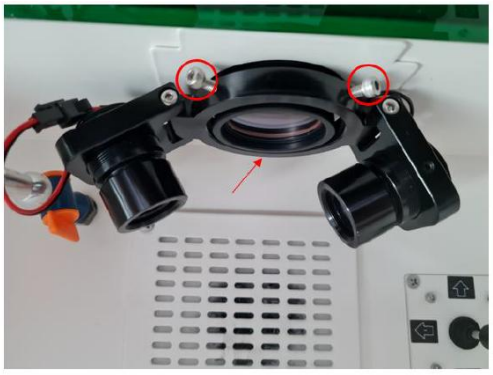


Illustration 20 Changing the Safety Glass of the Focusing Lens

Do not touch the glass body of the lamps and the protective glass of the focusing lens with bare hands.

- Loosen the three allen screws on the ring of the focusing lens. (The allen screws are shown outlined in red in Illustration 20).
- Pull down the lamps.
- Screw out the protective glass of the focusing lens.
- Fit the protective glass and the lamps again in the reverse order.
- Clean the protective glass of the focusing lens
- Remove the protective glass as described in point 6.4.1 and clean it with a suitable cleaning cloth for optics.
- For coarser soiling, you can also use a cleaning agent for optics

6.4.2 Clean the protective glass of the focusing lens

- Remove the protective glass as described in point 6.4.1 and clean it with a suitable cleaning cloth for optics.
- For coarser soiling, you can also use a cleaning agent for optics.

6.4.3 Laser Lamp Changes

In order to change the laser lamp, the housing must first be opened

Illustration 21 Housing Screws 1

- Remove the screws – outlined in red – on the top of the cover.

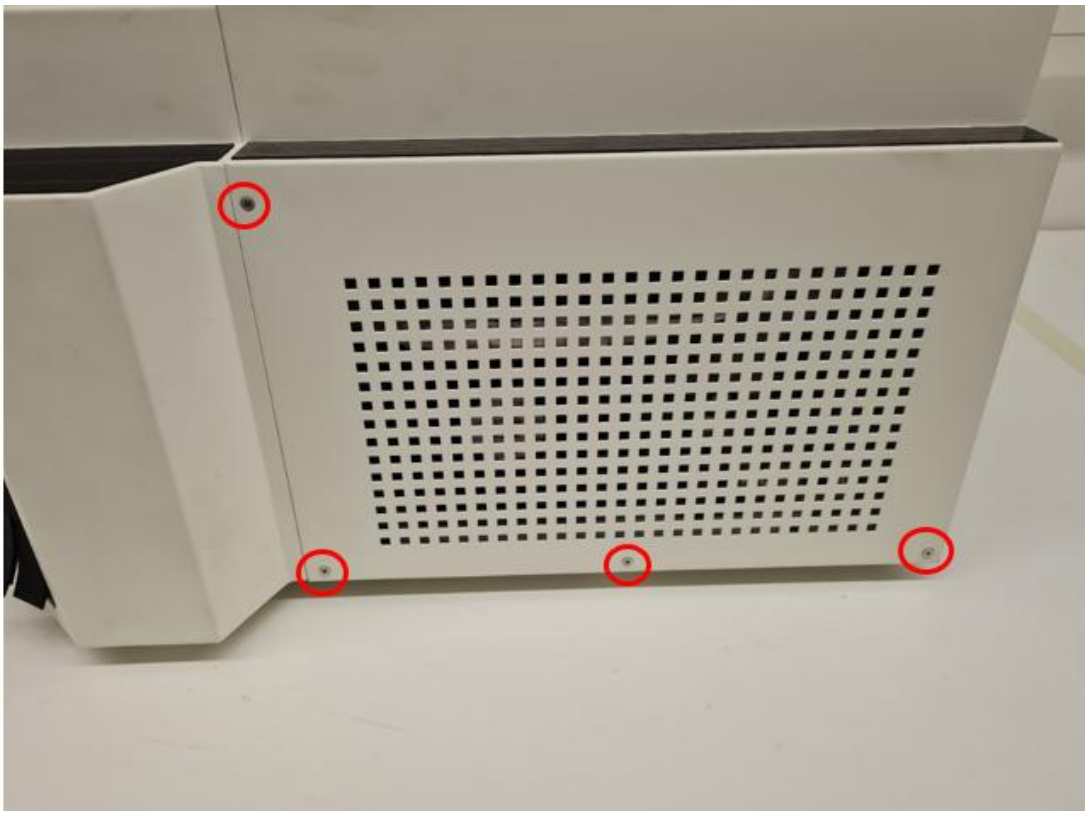


Illustration 22 Housing Screws 2

- Remove the screws – outlined in red – on the two sides.

Illustration 23 Cover Screws 3

- Remove the screws – outlined in red – on the back.

INFORMATION

Damage to the display connecting cables and the camera is possible.

The cables and connection plugs of the display and the camera can be damaged through the immediate complete taking down of the housing.

- **Carefully pull off the housing approx. 10 cm towards the back.**
- **Remove the connections of the display and the camera as described in the following.**
- **Only then remove the housing.**

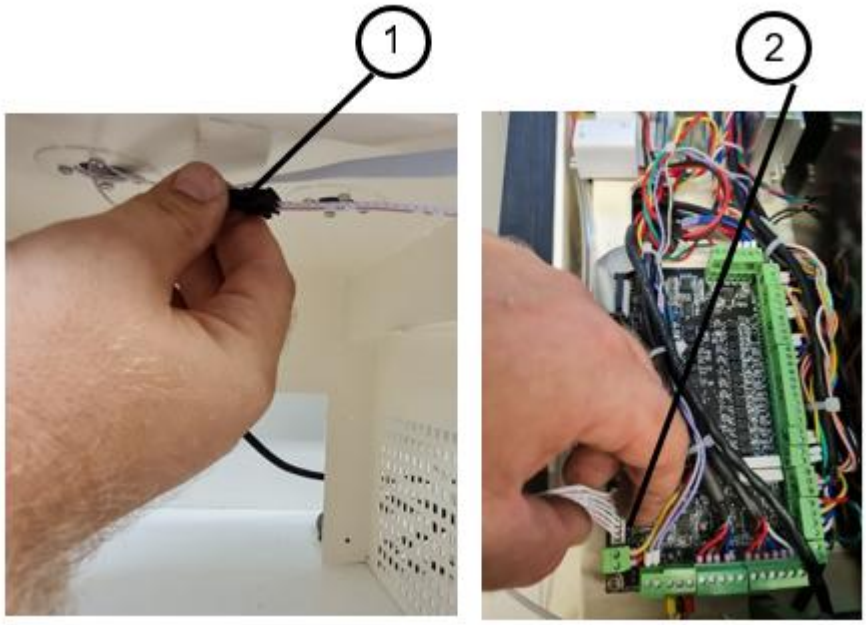


Illustration 24 Camera and Display Connections

Item	Designation
1	Connecting cable camera
2	Connecting cable display

- Pull of the two plugs (1) and (2) from the circuit boards or rather at cover of the housing.
- Place the housing behind the welding laser system.

Illustration 25 Resonator Cover

- Remove the screws of the resonator cover – outlined in red – and carefully place the cover down.

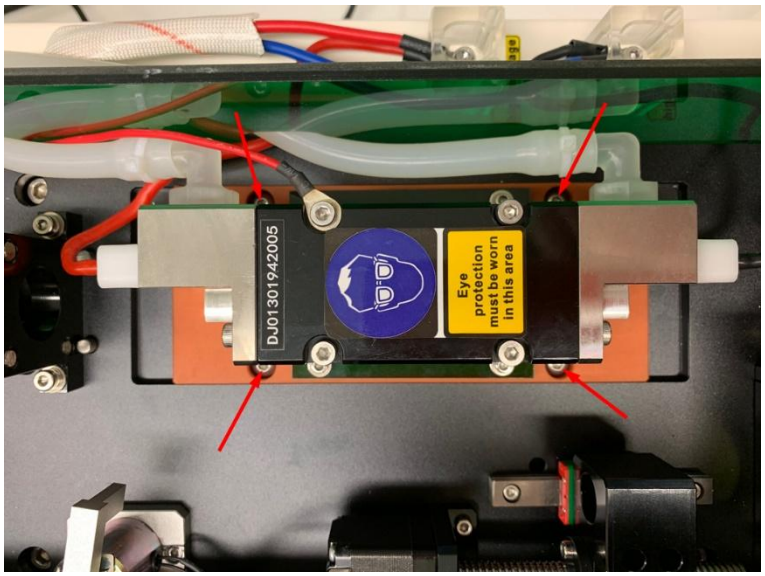


Illustration 26 Laser Lamp Base Plate

- Remove the four retaining screws – red arrows – of the orange baseplate of the cavity.

Illustration 27 Laserl Lamp Connecting Cables

- Remove the screws from the lugs of the connecting cables of the laser lamp.

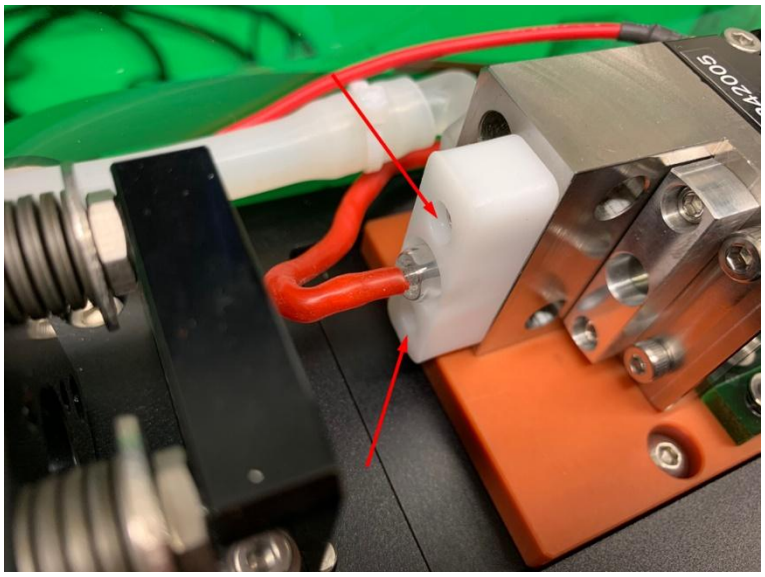


Illustration 28 Laser Lamp Holders

- Remove the screws on the red and black connections of the laser lamp - red arrows – from the white covers of the laser lamp.
- Pull off the white covers.
- Using tweezers, pull out the sealing rings on both sides.
- Lift the cavity with the base plate.

Do not touch the glass body of the laser lamp with bare hands.

- Carefully pull out the laser lamp in one direction.

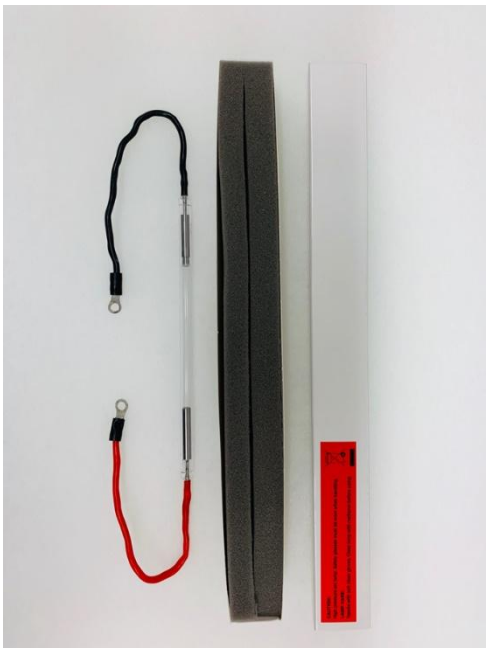


Illustration 29 Laser Lamp

- Remove the new laser lamp from its packaging and fit it.

The laser lamp is water-cooled. It is equipped with seals on the holders.

- **When fitting and removing the laser lamp, ensure that these seals are not damaged.**
- **Replace damaged seals.**

- Carry out the fitting of the new laser lamp in the reverse order of the removal.
- Carry out a test run before closing the housing.

DANGER

Danger to life due to electric shock

Electric shock can result in fatal injuries.

- **Do not touch the welding laser system during the test run.**
- **After the test run, switch off the welding laser system again.**
- **Pull out the mains plug.**

- To do so, insert the mains plug into a socket intended for this.
- Switch on the welding laser system using the key switch (Illustration 7, 2).
- For approx. 2 minutes, check the leak-tightness of the laser cavity.
- Switch off the welding laser system using the key switch.
- Pull out the mains plug.

- If no water leaks on the laser lamp, proceed with the installation.
- If water leaks, check the seals on the laser lamp and replace them if necessary.

7 Disposal

7.1 Environmental Protection

INFORMATION

Environmental pollution through substances hazardous to water

These substances can pollute the soil and ground water or enter the sewer system.

- **For all work**
- **Observe that, in particular during on and with the welding laser system, observe the statutory obligations for the avoidance of waste and proper recycling / disposal.**
- **Comply with the relevant, valid statutory regulations when disposing of consumable or replacement materials during the maintenance or the decommissioning of the welding laser system. installation, repair and maintenance work, substances hazardous to water such as lubricating greases and oils, emulsions and petrol -containing liquids must not pollute the soil or enter the sewer system.**
- **Observe that these substances must be stored, transported, collected and disposed of in suitable containers.**

7.2 Oil and Oil-containing Waste, Lubricating Greases

Oil and oil-containing waste as well as lubricating greases represent a potentially high risk to the environment. Their disposal is, therefore, carried out by specialist companies.

- Bring this waste to the internal company waste management that then passes it on to the specialist companies.

7.3 Plastics

- Sort the used / processed plastics as far as is possible.
- Dispose of plastics in accordance with the statutory requirements.

7.4 Metals

- Separate the used / processed metals as far as is possible.
- Have the metals disposed of by an authorized company.

7.5 Electrical and Electronic Scrap

Electrical and Electronic Scrap

Devices with this logo on the packaging or on the device itself must be disposed of separately. These devices must not be disposed of in the normal household waste.

You are responsible for ensuring that all electrical or electronic waste is disposed of at the appropriate locations.

7.6 Scrap

- Check which materials can be sent for recycling and then arrange for this to happen.

Detailed descriptions of the individual system components can be found in the relevant instruction manuals in the Annexes.

8 Annexes

- Declaration of Conformity
- General Assembly Drawing
- Parts List with Spare Part Recommendation / Identification
- Protocols and Measurement Results
- Circuit Diagram + Parts List
- Software
- Components Supplier Documentation

8.1 Declaration of Conformity

- Copy of the signed Declaration of Conformity –

EC Statement of Conformity

The manufacturer

Siro Lasertec Laserservice und Vertrieb GmbH
Rastatter Strasse 6
75179 Pforzheim

hereby state that the equipment cited below meets the relevant underlying safety and health provisions of the EC directive based on in its planning and construction as well as the design that we are marketing.
This statement no longer applies when changes are made to the equipment without our input.

Description:	Manual laser welding machine for use in residential areas and in industrial environment
Type of product:	Laser welding machine (OEM-version, Laser Class 4, EN 60825-1:2014)
Model:	SL10
Trade name:	SL10
Manufacturing year:	2025
Serial number:	_____

Relevant EC directives:

EC machine directive	2006/42/EC
EC directive on electromagnetic compatibility	2014/30/EU

Applied harmonized standards, in particular:

EN ISO 12100:2010	Safety of machinery - General principles for design
EN ISO 11553-1:2008	Safety of machinery - Laser processing machines
EN 60204-1:2006+A1:2009	Safety of machinery - Electrical equipment of machines
EN 60825-1:2007	Safety of laser products - Part 1
EN 60825-4:2006+A1:2008+A2:2011	Safety of laser products - Part 4
EN 61000-6-2:2005	Electromagnetic compatibility (EMC) - Part 6-2
EN 61000-6-4:2007+A1:2011	Electromagnetic compatibility (EMC) - Part 6-4
EN 61000-3-2:2006+A1:2009+A2:2009	Electromagnetic compatibility (EMC) - Part 3-2
EN 61000-3-3:2008	Electromagnetic compatibility (EMC) – Part 3-3

Date / manufacturer signature: May 13, 2025 .....

Data on the signatory:

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8.2 General Assembly Drawing

8.3 Parts List with Spare Part Recommendations / Identification

8.4 Protocols and Measurement Results

8.5 Circuit Diagram + Parts List

8.6 Software

8.7 Component Supplier Documentation

Component	Company	Documentation