Speedmarker FL
Operation Manual
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2 Introduction

The Speedmarker FL is a second generation high quality galvo laser marker. The Yb fibre laser source means the system has an extremely long life-cycle and minimal maintenance costs. The system is maintenance free apart from the filter pad and processing lens.

The combination of a high quality galvo scanner and a fibre laser produce highly precise marking results in short marking times.

This, together with the marking software and the available interfaces, provides a flexible and productive marking solution of the highest quality standards.

3 General Information

Strict compliance with the safety procedures described in this operation manual and exercising extreme caution when using the equipment are essential for avoiding and reducing the possibility of personal injury or damage to the equipment.

The Speedmarker FL is a Class 4 laser marker as per DIN EN 60825-1 “Safety of laser products”.

If the Speedmarker FL is being integrated as an OEM component in a system, the operator bears the sole responsibility for complying with the legal standards and safety guidelines.

The operator of the laser marking device is obliged to comply with the safety guidelines provided in the Employers Liability Insurance Association Regulations DIN EN 60825-1.

All information, illustrations, tables, specifications and diagrams contained in this operation manual have been carefully compiled according to the art current at the time of going to press. No liability is accepted with regard to errors, missing information and any resulting damage or consequential loss.

Trotec Produktions und Vertriebs Ges.m.b.H. reserves the right to update any of the information, illustrations, tables, specifications and diagrams contained in this operation manual with regard to technical developments at any time without notice.

Any software incorporated in this equipment should only be used for the purpose for which it was supplied by Trotec Produktion und Vertriebs Ges.m.b.H. It is strictly prohibited for the user to undertake any alterations, conversions, translations into another computer language or copies (except for any essential back-up copies).
Trotec Produktions und Vertriebs Ges.m.b.H. is not responsible for any personal injury or material damage, of either an indirect or specific nature, consequential loss, loss of commercial profits, interruption to business, or loss of commercial information resulting from the use of the equipment described in this manual.

### 3.1 General Instructions for Using the Operation Manual

The operation manual describes how to handle the device correctly and safely and guides you through the necessary steps for initial use. The operation manual also contains important information regarding system maintenance.

This operation manual must be read and followed carefully before commissioning and operating the device. Failing to observe individual points listed in this operation manual may result in personal injury and/or material damage to property!

This system may only be operated using devices and spare parts included in the scope of supply or the replacement or spare and tear parts list.

Ancillary devices must be calibrated to meet the safety and operational requirements of the base machine (please contact your dealer or the manufacturer with any queries).

The following symbols are used within this operation manual to aid understanding:

- **Caution:** Failing to observe this part of the operation manual could pose a particular risk for operating or maintenance personnel.

- **Caution:** This component is energised. These parts contain electrical safety instructions which must be carefully observed, particularly when undertaking maintenance or service work.

- **Caution:** These parts indicate that extreme care should be taken regarding the potential risks posed by the laser beam.

- **i** These are instructions or information regarding individual equipment components.
3.2 Intended Use

The Speedmarker FL is a Class 4 laser marker as per DIN EN 60825-1 “Safety of laser products”. It is intended for integration in systems and lines.

The Speedmarker FL is intended exclusively for laser marking using the supplied marking software.

The following points should also be observed as part of the intended use:

- only mark approved materials using suitable parameters
- perform maintenance and service according to the specifications in this operation manual
- use a suitable extraction system to remove fumes, dust or other reaction products
- the machine may only be operated by suitably trained individuals
- observe effective safety regulations and the procedures described in this operation manual

If the intention is to use the system for other applications, Trotec Produktions und Vertriebs Ges.m.b.H. should be informed in advance.
3.3 Warning Signs on the Device

The warning signs on the device indicate potential hazards and provide information regarding the laser device performance data.
3.4 Type Plate

The type plate contains information regarding the serial number, manufacturer, date of manufacture, connection values and consumption data. The type plate is located on the reverse side of the laser module.

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**trotec Laser**

Trotec Produktions- und Vertriebs Ges.m.b.H
Linzer Straße 156, 4600 Wels, Austria

**Serial No:**

- Model / Typ:
- Manufactured:

Input Power:
- Nominal Power:
- Lasertype:
- Wiring Diagram No:
- Laserdiode:

www.troteclaser.com

---

Enter the serial number, model and year of construction of the machine here. This data is important should the unit experience a fault and for ordering replacement parts.
4 Safety Instructions

4.1 Laser Classification

The laser safety class indicates the risk potential based on the level of accessible laser radiation.

The Speedmarker FL is a Class 4 product as per DIN EN 60825-1 and identified as such.

Class 4

Class 4 lasers pose the risk of direct radiation and indirect stray radiation and may cause damage to both the skin and eyes. Class 4 lasers also pose a fire and explosion hazard if used improperly and the radiation strikes any flammable material. The operator is responsible for undertaking any necessary protective measures to entirely rule out the possible ignition or explosion of materials by the laser beam.

Class 4 lasers should be operated according to the following precautionary measures among others:

- The operator is obliged to appoint a trained Laser Protection Officer responsible for compliance with the relevant regulations.
- The danger zone must be identified by installing warning lights and warning signs outside the area.
- The danger zone must be secured against unauthorised access.
- The operator of a Class 4 laser system should always wear laser protection glasses suitable for the wave length and output of the laser within the danger zone.
- An additional emission warning light should also be installed in a position visible to the operator to warn them of any emerging laser radiation.

Compliance with the points above does not absolve the operator from meeting the relevant standards and guidelines for the operation of a Class 4 laser system.
Class 1
The accessible laser radiation of Class 1 laser systems does not pose any hazard for the skin or eyes.

In order to operate the Speedmarker FL as a Class 1 laser system, the following points must be observed:

- The entire course of the beam should be shielded to prevent radiation.
- Any covers providing access to laser areas which may be removed without using a tool should be fitted with suitable safety latches.
- Inspection windows in the housing have to be fitted with safety glass suitable for the laser output and the wavelength of the laser according to local regulations.

Class 2
The accessible laser radiation of Class 2 laser systems does not pose any hazard for the skin. Any short-term radiation of the eyes also poses no risk due to the low level output. In the event of longer, more intensive radiation, the eye is protected by the natural lid reflex.

The Speedmarker FL uses a Class 2 pilot laser. In order to prevent irritation of the eyes during operation, the operator should not look directly at the laser source.

Diffuse reflections of the pilot laser are entirely harmless.

4.2 Gases, Fumes and Dust

Depending on the materials being marked and the parameters selected, laser marking may generate gases, fumes, aerosols or dust. The toxicity of such by-products depends on the material.

The operator is responsible for ensuring a suitable extraction system is in place and for compliance with the relevant guidelines in order to protect individuals and the environment.

The operator must also ensure that gases, fumes or dust do not settle on the processing lens. Any dirt accumulating on the processing lens can lead to a loss of performance, poor marking results and damage to the device.
4.3 Safety Regulations and Directives

The following directives and ordinances must be observed to avoid hazards when operating TROTEC laser systems.

EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User’s Guide
EN 60950 Safety of Information Technology Equipment
EN 61010-1 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use; General Requirements
UL 60950 Standard for Safety for Information Technology Equipment
UL 31011-1 Electrical Equipment for Laboratory Use - Part 1: General
21 CFR 1040.10 Performance Standard for Light Emitting Products - Specific Laser Products
21 CFR 1040.11 Performance Standard for Light Emitting Products - Specific Purpose Laser Products

The general ordinances and directives listed above may differ according to locality, region or country. Therefore, always observe the directives applicable to you.

The customer is always responsible for carrying out all safety requirements as TROTEC Produktions und Vertriebs Ges.m.b.H. has no influence over the proper use of the machine.

The system integrator is responsible for observing the directives listed above when integrating our laser systems.
4.4 General Safety Instructions

Risk posed by the incorrect actions of untrained individuals!
The improper use of the machine can lead to injury and/or damage to the machine.

- Inform personnel about the machine’s function and any other risks and record this in the training records.
- Observe official regulations regarding the operation of machines and accident prevention regulations.

Risk posed by missing, faulty or bridged safety installations and machine components!
Faulty or missing safety installations and machine components can lead to death, injury and/or damage to the machine.

- Check carefully that safety installations and machine components are functioning properly and are fault free.
- The specified actions should be undertaken immediately if parts are faulty or defective.

Risk posed by incorrect operation (in particular in setup-mode)!
Setting and operating the machine with limited knowledge of its function can lead to injury and/or damage to the machine.

- Read and observe the operating and safety instructions before commissioning the machine!

Risk posed by incorrect operation by unauthorised individuals!
Setting and operating the machine with limited knowledge of its function can lead to injury and/or damage to the machine.

- Never leave the machine unattended while in operation.
- Turn off the machine at the main switch when not in use.

Risk posed by missing machine signage!
Making the wrong assumptions can lead to the risk that the machine is operated incorrectly.

- Replace missing machine signage.
Risk posed by non-repairable faults!
Any non-repairable fault may damage the machine.
  - Turn off the machine and call customer service!

Risk posed by using inferior spare parts or parts of other manufacturers!
The use of inferior spare parts or parts produced by other manufacturers impairs the safety of the machine and invalidates the Declaration of Conformity (CE) supplied with it.
  - Wear parts or damaged mechanical, safety or electrical components should be replaced by original spare parts.

Risk posed by missing protective equipment!
  - Wear the appropriate workwear.
  - Wear safety glasses suitable for the laser. (Laser Class 4)
  - Use a suitable extraction system.

Risk posed by laser marking reaction products!
A suitable extraction system must be used when laser marking due to the possible generation of gases, fumes and any other partially toxic by-product.

In individual cases, the reaction products may consist of static dust. If this enters any electrical systems it can cause short circuits leading to personal injury and material damage.

Risk posed by flammable or explosive materials!
Class 4 laser radiation such as that emitted by the Speedmarker FL may ignite materials or cause explosions. Among others it should be ensured that:
  - Parameters are selected so that the material does not overheat
  - The system is monitored if necessary
  - Dust is extracted safely
  - There is no accumulation of any flammable residues or remnants in the workspace.
5 Before Commissioning

- Read the operation manual and ensure it is accessible at all times.

- The ambient air temperature must be between +15°C und +35°C and the relative air humidity not exceed 90% (non-condensing).

- A laser system consists of high quality electrical and optical components. Mechanical stresses, vibrations and impacts must always be avoided.

- If the system has been subject to significant temperature variations, it must be brought back to room temperature before being commissioned.

- Sufficient air must be supplied to both 19" modules of ventilated systems. The accumulation of heat due to covered ventilation slots or filter pads can damage the system.

- Assemble the device at the point of installation according to the instructions.

- The operating personnel must read and understand the operation manual, in particular the chapter on “Safety Instructions”. It is recommended that the operator compiles with in-house instructions regarding safety and operation and that the receipt of these instructions/operation manual and the participation in briefings/training courses is confirmed in writing.

- Laser marking may generate gases, fumes and other reaction products on the surface of the material. The operator must therefore use an effective extraction system.
5.1 Scope of Supply (Standard Configuration)

- Cable set (1 long cable (W203) + 1 short cable (W503))
- Bridging plug (green) for external emergency stop (X11)
- Bridging plug (black) for external panel (X31)
- 2 keys each for the PC and laser module
- CD with marking software (incl. SamLight dongle)
- CD with system backup
- Lens cleaning kit
- Allen key set
- IEC connectors for the PC and laser module

The monitor, keyboard and mouse are not included in the standard scope of supply.

**Return:**
The system should be returned and transported in the original packaging.
5.2 Unloading, Inspection and Reporting Faults

In the event of transportation damage or incomplete delivery:

- Record all details in writing immediately.
- Note all claims on the transportation documents.
- Photograph any damage.
- Send report to TROTEC.

After unloading:

- Inspect the machine and machine components for transportation damage.
- Check the delivery for completeness.
- Remove all transport packaging.

On delivery the marking head is firmly attached to the laser module using the fibre optic cable. The fibre optic cable is enclosed with the jumper cables in a black protective tube for protection. Avoid any unnecessary **stretching or bending** of the fibre optic cable. This could damage the fibre optic cable.

The lens unit should only be uncovered following installation. The lenses are high quality optical components which must be kept clean in order to ensure optimum marking results. Never touch the lenses with bare fingers!
6 Technical Data

6.1 General Description

All electronic components are integrated in the machine. All necessary connectors are located on the reverse side of the laser module and PC.

6.2 Laser Module Dimensions
6.3 Marking Head Dimensions
6.4 Data Sheet

**Laser**
- Laser: Pulsed Yb fibre laser, maintenance free
- Laser output: 10, 20, 30 and 50 watt
- Wave length: 1064 nm ± 8
- Pulse length: 110ns
- Ventilation: Air-conditioned

**Galvo Scanner**
- **Work areas**
<table>
<thead>
<tr>
<th>F-100</th>
<th>Standard: F-160</th>
<th>F-254</th>
<th>F-420</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 x 70 mm</td>
<td>120 x 120 mm</td>
<td>190 x 190 mm</td>
<td>310 x 310 mm</td>
</tr>
</tbody>
</table>
- **Focus diameter**
  | ~ 27 µm | ~ 45 µm | ~ 68 µm | ~ 112 µm |
- **Positioning Speed**
  10m/s for F=160 mm
- **Marking Speed**
  640 cps per 1 mm single stroke
- **Operating distance**
  134.6mm 211.6mm 361.6mm 562.6mm

**Control**
- **Computer**
  Separate industrial PC as 19” unit with 3HE Intel® chipset, CPU Celeron M440, 1 GB RAM, HDD 250GB SATA, DVD R/W, Windows XP operating system
- **Interfaces**
  USB, Ethernet, RS232, digital I/O’s (24V DC)
- **Application software**
  SpeedMark or SamLight

**Dimensions**
- **Dimensions**
  Marking head: 120 x 138 x 528 (W/H/D)
  Laser module: 482.6 x 140 x 686 (W/H/D) (equivalent to 3HE, 19” compatible)
  PC: 19” module with 3HE
- **Weight**
  Marking head: approx. 8 kg

**Assembly**
- **Environmental conditions**
  Ambient temperature +15 to +35°C.
  Relative air humidity max. 90%.
  No condensation
- **Power supply**
  1/N/PE AC 100 - 240 V 50/60 Hz
- **Power consumption**
  < 500 W

**Optional Extras**
- Barcode scanner
- Extended warranty
- Various Class 2 laser work stations
- Focus finder

**Laser Safety**
- **Laser class**
  CDRH laser safety
  Laser Class 4
  CE tested
7 Installation

7.1 Installation Location

The installation location must:

- have a non-fluctuating power supply
- be vibration free
- have sufficient air supply for the laser module and PC

7.2 Mechanical Installation

7.2.1 Installation of the Marking Head

The correct, stable and reproducible alignment of the marking head in relation to the workpiece to be marked is a prerequisite for faultless marking results. The marking head should therefore be installed with appropriate care.

Mounting

The marking head may be mounted either from the top using the supplied brackets or from below using the hole pattern on the base plate. The brackets may be assembled in various positions on the marking head base plate. The brackets may be disassembled if they are not required.

The marking head should be secured tightly. The whole system should not be subject to any vibrations during operation. In order to avoid damaging the lens, keep the protective cap on the lens during installation.

The following diagram illustrates the hole pattern for the brackets. The marking head is secured using the two outermost through holes 6.6 mm in diameter (designed for M6 screws).
The following diagram illustrates the marking head hole pattern when used for direct installation without the brackets.

**Alignment**

The focal plane of the Speedmarker FL lies parallel to the marking head base plate. When installing the marking head it is therefore important to ensure that the marking head base plate is aligned as parallel as possible to the intended processing plane. Otherwise uneven results will be produced on the marking field as a result of the changing focal position.

In order to adjust the focal position, the distance between the object to be marked and the marking head may be altered. Clearance holes 6 mm in diameter are located adjacent to the M6 threaded holes in the marking head base place in order to aid the precise alignment of the marking head.

**Fibre Optic Cable**

The marking head is connected to the actual laser source in the laser module via an approx. 2.1 m long fibre optic cable. The fibre optic cable is enclosed with the jumper cables in a black protective tube for protection. In order not to damage the filaments, do not bend the cable by a radius of more than 66 mm. The tube should also not be subject to any mechanical stresses.

If necessary, the cable and the fibre optic cable may be disconnected from the marking head. As this will expose sensitive optical surfaces, this may only be performed by trained service personnel.
Laser Module and PC

The laser module and the PC should be located next to or directly above one another if possible in order for the modules to be connected to one another with the cables provided.

When installing in a control cabinet or rack, ensure there is sufficient ventilation. Both the laser module and the PC require a sufficient supply of air. The air should be sucked in from the front and blown out at the rear.

When installing the laser module, also ensure the minimum radius of curvature of the fibre optic cable (black tube) is not exceeded on the rear side.
7.3 Electrical Installation

Following the mechanical installation of the marking head, laser module and PC, the components must be connected to one another electrically.
(The laser module and marking head are already connected to one another on delivery.)
The peripherals (power supply, external control and safety signals, etc.) are then connected via the laser module and PC interfaces.

All connectors are clearly identified in order to facilitate the electrical installation. The connector marked X43 belongs to the socket with the same denotation.

The connector denotations are also coded. The last digit of the connector denotation identifies the respective hardware components. Therefore:

- X ...1 Laser module
- X ...2 Marking head
- X ...3 PC

7.3.1 Overview - Marking Head Interface (Reverse Side)

The cables are already connected to the marking head on delivery.

The fibre cable should only be disconnected from the marking head by trained service personnel.
Before working on the system, remove the power plug!
7.3.2 Overview - PC Interface (Reverse Side)

Connectors X93 and X103 are joined directly to one another via a short cable.

Connector X53 is joined to X51 on the laser module using the cable supplied.

Connector X83 is connected to the cable from the laser module. This cable leads from the laser module via the black tube to X82 on the marking head.

The monitor, mouse and keyboard must also be connected to the PC. (Monitor, mouse and keyboard are not normally included in the scope of supply.)

Note: the PC COM4 interface is not connected prior to delivery!

7.3.3 Power Supply

IEC connectors are located on the reverse side of the laser module and PC for the connection of the supplied IEC power cords.

Before putting the system into operation, it is essential to check whether the laser module is configured to the available supply voltage and frequency.

The configuration of the laser module is given on the type plate or warning sign above the IEC connector.

The laser module is fitted with different main fuses depending on the configured supply voltage:

- 115V AC: 1 X 6.3 A “T” speed/time-delay
- 230V AC: 2 x 4 A “T” speed/time-delay

The main fuses are located behind the cover, immediately adjacent to the IEC connector.

The same main fuse is used for all supply voltages on the PC.
7.3.4 Overview - Laser Module Interface (Reverse Side)

Before the laser marker can be put into operation, the external safety circuits and the external start and stop signals must be connected.

When making these connections, the operator must ensure that all safety circuits comply with the respective valid national standards and guidelines for the use of laser devices. Otherwise the device may cause personal injury or material damage.

The following connectors are available on the laser module:

- **X11 – Emergency Stop / Interlock / ext. Messages**
  The X11 connector enables the connection of external safety circuits, additional emergency stop circuits and external warning lamps.

  If no external emergency stop circuit is connected, the supplied connector must be used with the bridging devices. In this case, only the emergency stop button on the front of the laser module is active. The precise pin configuration of the plug is provided in 7.3.5.

  The maximum load of each of the digital 24V outputs on the interface X11 is 100 mA. A short circuit of the outputs must be avoided as it will damage the respective inputs.

  The digital 24V inputs (pin 14 and pin 15) should only be controlled by isolated contacts with the 24V pin 13. The input of signals with any other reference potential could result in damage to the respective inputs.

- **X31 – External Panel**
  The connector X31 may be used to connect an external control panel such as that located on the front of the laser module.

  If no external panel is connected, the supplied connector must be used with the bridging devices.
• **X51**  
  Laser control. This is connected to **X53** on the PC.  
  Only use the original cable supplied.

• **X61 – Extraction System**  
  This connector is used to control, start and stop a Trotec extraction unit.  
  Only use the original cable supplied.

• **X71 – Start / Stop**  
  The **X71** connector may be used to send start and stop signals via an external controller or receive a signal from the laser. The pin configuration is provided in 7.3.5

  “Busy” is a laser output which can be set as required using a script.

  “Stop” is an external input used to interrupt all running laser programs immediately. It is not necessary to monitor these inputs in a script.

  “Start” is an external input which may be monitored in the software in order to trigger a marking process. If the monitoring of the signal is not active within a script, the input will have no effect on the program sequence.

  For the “Start” and “Stop” Signal external 24VDC are needed.
7.3.5  Interface Pin Configurations

X11 – Emergency Stop / Interlock / ext. Messages

<table>
<thead>
<tr>
<th></th>
<th>24V</th>
<th>0V</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency stop circuit 1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Emergency stop circuit 1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Interlock cover lid circuit 1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Interlock cover lid circuit 2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Isol. contact. Emergency Stop (closed if emergency open)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Input external Abort (24V)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Input external Reset (24V)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Output lamp System On (24V)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Output lamp Laser Busy (24V)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Output lamp System Ready (24V)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Output lamp Sum Alarm (24V)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Output lamp Shutter (24V)</td>
<td></td>
</tr>
</tbody>
</table>

X31 – External Panel

<table>
<thead>
<tr>
<th></th>
<th>Internal</th>
<th>external</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency stop circuit 1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Key switch</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Abort</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Reserve_input_0</td>
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<tr>
<td>5</td>
<td>Reserve_input_1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Output lamp System On (24V)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Output lamp Laser Busy (24V)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Output lamp System Ready (24V)</td>
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<tr>
<td>9</td>
<td>Output lamp Sum Alarm (24V)</td>
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<tr>
<td>10</td>
<td>Output lamp Shutter (24V)</td>
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X71 – Start / Stop

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<tr>
<th></th>
<th>Internal</th>
<th>external</th>
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<tbody>
<tr>
<td>1</td>
<td>Start</td>
<td>Stop</td>
</tr>
<tr>
<td>2</td>
<td>GND Start</td>
<td>GND Stop</td>
</tr>
<tr>
<td>3</td>
<td>Stop</td>
<td>Stop</td>
</tr>
<tr>
<td>4</td>
<td>Busy (max. 24V, 100mA)</td>
<td>Busy (max. 24V, 100mA)</td>
</tr>
<tr>
<td>5</td>
<td>Start</td>
<td>Stop</td>
</tr>
<tr>
<td>6</td>
<td>GND Start</td>
<td>GND Stop</td>
</tr>
</tbody>
</table>
8 Commissioning

8.1 Installation Inspection

In order to ensure the unit is installed correctly, the following points should be checked:

- Ensure the power supply corresponds to the correct connection values and suitable fuses have been used.
- Has the mechanical and electrical installation been performed correctly and completely?
- Check the mechanical and electrical installation for completeness and the correct input voltages.
- Ensure that the optical components are free from dust and dirt.
- Have the protective covers been removed from the focusing objective lens?
- Check the environmental conditions against the technical specification.
- Are you familiar with the laser safety regulations?
- Have all laser safety measures been fulfilled? The system may then only be switched on once all provisions for complying with laser safety have been checked by an authorised individual and confirmed to have met the standards.

8.2 Marking Software

The marking software is already installed on the supplied PC and backup CD. It is also included in the setup on the accompanying software CD.

For information on using the software, please read the accompanying software handbook.
8.3 Operating Controls

1. Main switch
2. System ready – control lamp
3. Shutter – control lamp
4. Laser busy – control lamp
5. Emergency stop – button
6. Error reset – button
7. Key switch
8.4 Switching On/Off

1. Press the master switch 1 on the laser module.
2. The switch is illuminated in green and the two status lamps on the marking head also illuminate in green (shutter closed).
3. Put the key in the key switch 7 (vertically) and turn 90° to the right.
4. Press the “Error reset” button to reset the system to its normal state.
5. System ready 2, Shutter 3 and the two status lamps (red) on the marking head should now be illuminated. The laser is now ready to start marking.
6. Start the PC. (The mains switch is located on the front behind the right hand cover. When operating the system for the first time it may be necessary to check the master switch on the reverse side of the PC. In its normal state this can remain in the “On” position.)
7. Now start the marking software on the PC.

If an error occurs, the “Error Reset” button illuminates. Pressing this button acknowledges the error and the system is then ready to continue operating.

We recommend using only the key switch 7 to pause the laser. To completely turn off the laser, the main switch 1 must be set to O.
8.5 Emission Indicator

The laser system is fitted with an emission indicator. If the system is switched on or the safety lock is open, there is usually a possibility that laser radiation will be emitted. This is signalled by a separate indicator and/or an illuminated “Shutter” switch.

The emission lamps or illuminated shutter switch signal that:

- **Emission indicator off** – device dead
- **Emission indicator yellow** – shutter closed, no laser output
- **Emission indicator red** – shutter open, discharge of laser output possible
8.6 Focusing

It is absolutely essential to maintain the correct focal distance for every laser marking process. Only when in focus will the laser beam achieve the power density necessary for permanent and clearly legible marking.

Prior to any marking it is therefore necessary to set the correct focal distance between the marking head and the workpiece. An incorrect focal distance is the most common cause of poor or even indistinguishable markings.

The focal distance (A) is measured between the lower edge of the galvo head (B) and the upper surface of the workpiece (C). The correct focal distance depends on the lens used (focal length).

<table>
<thead>
<tr>
<th>Lens</th>
<th>Focal distance (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-100</td>
<td>~134.6 mm</td>
</tr>
<tr>
<td>F-160</td>
<td>~211.6 mm</td>
</tr>
<tr>
<td>F-254</td>
<td>~361.6 mm</td>
</tr>
</tbody>
</table>
9 Integration / Connection

9.1 Switching Sequences

Switching sequence diagrams are provided for various standard processes which indicate the interplay of the individual signals.

**Standard power-up process**

```
Mains on
Emg. stop 1
Emg. stop 2
Reset
ICL1
ICL2
Pc
Key switch
Error
System ON
System ready
Shutter
```
Emergency stop

Mains on

Emg stop 1

Emg stop 2

Reset

ICL1

ICL2

PC

Key switch

Error

System ON

System ready

Shutter
ICL (Interlock Cover Lid)

- Mains on
- Emg stop 1
- Emg stop 2
- Reset
- ICL1
- ICL2
- Emission
- PC
- Key switch
- Error
- System ON
- System ready
- Shutter
10  Maintenance

10.1  General Maintenance

Before any maintenance work takes place, ensure that the power supply has been switched off and the system is de-energised.

All maintenance work must be carried out according to the safety regulations.

In order to ensure the maximum availability and lifetime of the system, we recommend you regularly check the filter system and ventilation and keep the surrounding area clean. A visual inspection of the lenses is likewise recommended before switching on the system.

10.2  Cleaning the Lenses

This system is fitted with high quality optical components, which under normal operating conditions are maintenance free for their lifetime. However, it may be necessary to clean output lenses, e.g. the scanner flat field lens (f-theta objective) if it becomes covered in dust or fumes.

Never touch the optical components with your fingers! Oily or dirty hands may damage the lens surfaces.

Do not use any tools or hard objects to clean the surfaces. Scratches cannot be repaired.

Laser optics are highly sensitive and their surfaces are not as hard as traditional glass. They can also be easily damaged by cleaning. It is therefore necessary to ensure that any dirt is removed using a suitable suction device and that the surrounding area is cleaned regularly.
Small bellows should be used to remove dust.

Do not use compressed air as it contains small quantities of oil and water.

To remove larger pieces of dirt, only use a lens cleaning cloth with high proof (min. 98%) alcohol.

Do not dip the cleaning cloth in the cleaning solution. This contaminates the solution and makes it unusable. Place drops of the solution on the cloth!

Apply the cleaning solution carefully in order to avoid scratching the surface of the lens.

Do not wipe the lens with a dry cloth. Do not touch the reverse side of the cloth. Dirt and sebum on the fingers can be transferred to the lens by the cloth and cause damage.

Distribute the cleaning fluid carefully using small circular motions. Start at the centre of the lens and move outwards to the edge. Keep moving the cloth until the entire surface is clean. Do not exert any pressure on the lens.
10.3 Replacing the Filter Pad

This laser system is fitted with a ventilation system. A filter pad is used to protect the electronic components from dust and dirt in the ambient air. This filter pad should be checked and replaced at regular intervals in order to ensure optimum cooling.

The filter pad is located behind the ventilation slots on the front of the laser module or PC.

Laser module filter pad:

PC filter pad:
11 Transportation and Storage

11.1 Transportation Conditions

- When transporting outside, always transport in a covered vehicle or one with sufficient weather-proofing.
- Protect the machine against transportation damage using straps and inserts, and leave sufficient distance between other transported items.
- Ambient temperature for transportation:
  - Min. temp. 10 °C
  - Max. temp. 40 °C
- Handle the machine and machine components with care.
- Do not place any heavy loads on the machine or machine components.
- Avoid heavy impacts.
- Take particular care when transporting electronic components.

11.2 Storage Conditions

- Store the machine and machine components in a dry location.
- Protect the machine and machine components against scratches.
- Take particular care when packing away electronic components.
- When storing for a long period of time, preserve bare metal parts (e.g. apply oil).
- Ambient temperature for storage:
  - Min. temp. 10 °C
  - Max. temp. 40 °C

11.3 Storage Location

Storage room or boxed with sufficient weather-proofing. The storage location must be free from corrosive elements, fumes and flammable materials.
## 12 Troubleshooting

This chapter should assist maintenance personnel with the identification and resolution of operational faults based on error messages and symptoms.

**Maintenance and repair work should only be carried out by Trotec Produktions und Vertriebs Ges.m.b.H. or one of its authorised personnel under observation of the safety regulations.**

### 12.1 Problem Resolution

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error message on loading the program</td>
<td>Plug or cable installed incorrectly</td>
<td>Check the plug and cable are installed correctly</td>
</tr>
<tr>
<td>Laser power supply switched off</td>
<td></td>
<td>Turn on main switch</td>
</tr>
<tr>
<td>Software not installed correctly</td>
<td></td>
<td>Re-install software</td>
</tr>
<tr>
<td>Software terminated irregularly</td>
<td></td>
<td>Restart PC</td>
</tr>
<tr>
<td>Laser will not switch on</td>
<td>Plug or cable installed incorrectly</td>
<td>Check the plug and cable are installed correctly</td>
</tr>
<tr>
<td>Laser power supply switched off</td>
<td></td>
<td>Turn on main switch</td>
</tr>
<tr>
<td>Faulty fuse in laser power supply</td>
<td></td>
<td>Replace fuse</td>
</tr>
<tr>
<td>Status lamps on marking head remain green</td>
<td>Interlock circuit not closed</td>
<td>Check interlock circuit. If no interlock circuit is connected, use bridging connector X11.</td>
</tr>
<tr>
<td>No laser beam</td>
<td>Laser not in focus</td>
<td>Check working distance</td>
</tr>
<tr>
<td></td>
<td>Shutter closed</td>
<td>Open shutter - if not possible check interlock circuit</td>
</tr>
<tr>
<td></td>
<td>Incorrect laser parameters</td>
<td>Check the parameters in the program. Use suitable parameters for the material and application</td>
</tr>
<tr>
<td>Insufficient laser output</td>
<td>Laser not in focus</td>
<td>Check working distance</td>
</tr>
<tr>
<td></td>
<td>Incorrect laser parameters</td>
<td>Check the parameters in the program. Use suitable parameters for the material and application</td>
</tr>
<tr>
<td>Missing symbols</td>
<td>Focusing lens dirty</td>
<td>Clean focusing lens</td>
</tr>
<tr>
<td></td>
<td>Surface of the material dirty</td>
<td>Clean material surface</td>
</tr>
<tr>
<td>Other faults</td>
<td></td>
<td>Contact TROTEC Support</td>
</tr>
</tbody>
</table>
### 12.2 Possible Error Messages

Below is a list of possible errors which may be detected by the system. These will appear in the software as messages on the display.

The Reset signal (X11) or the reset button on the laser module are used to acknowledge an error. In order for the system to be reset, the error or the corresponding input signal must be acknowledged.

**System errors which cannot be reset or which indicate a hardware error should only be resolved by Trotec Produktions und Vertriebs Ges.m.b.H. trained service personnel.**

<table>
<thead>
<tr>
<th>Error message</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Card off line</td>
<td>Software has lost connection to the TLC2 controller</td>
</tr>
<tr>
<td>Scanner not connected</td>
<td>No connection to the galvo</td>
</tr>
<tr>
<td>Scanner X error</td>
<td>The galvo X-axis has identified an error</td>
</tr>
<tr>
<td>Scanner Y error</td>
<td>The galvo Y-axis has identified an error</td>
</tr>
<tr>
<td>Signal cable not connected</td>
<td>No connection to the marking head</td>
</tr>
<tr>
<td>External abort</td>
<td>External abort signal identified on X11</td>
</tr>
<tr>
<td>External stop</td>
<td>External stop signal identified on X11</td>
</tr>
<tr>
<td>Voltage error (15V)</td>
<td>+/- 15V power supply not functioning correctly</td>
</tr>
<tr>
<td>Voltage error (24V)</td>
<td>24V power supply not functioning correctly</td>
</tr>
<tr>
<td>Laser power supply error</td>
<td>Faulty laser source power supply</td>
</tr>
<tr>
<td>Shutter error</td>
<td>Shutter has not reached intended position</td>
</tr>
<tr>
<td>Cover connector opened during marking</td>
<td>ICL1 and ICL2 were opened during the marking process</td>
</tr>
<tr>
<td>External sum alarm</td>
<td>External error signal identified on X11</td>
</tr>
<tr>
<td>System locked by key switch</td>
<td>Key switch on laser module locked</td>
</tr>
<tr>
<td>Laser temperature</td>
<td>Laser source overheated</td>
</tr>
<tr>
<td>Laser power</td>
<td>24 V power supply outside the permissible tolerance zone</td>
</tr>
<tr>
<td>Laser not ready for emission</td>
<td>e.g. key switch not activated</td>
</tr>
<tr>
<td>Laser back reflection</td>
<td>Back reflection of the laser beam</td>
</tr>
<tr>
<td>Laser system error</td>
<td>Laser power supply voltage is too high or too low</td>
</tr>
<tr>
<td>Emergency stop button</td>
<td>Emergency stop button activated</td>
</tr>
<tr>
<td>Error</td>
<td>+/-15V monitoring</td>
</tr>
<tr>
<td></td>
<td>24V laser monitoring</td>
</tr>
<tr>
<td></td>
<td>24V monitoring</td>
</tr>
<tr>
<td></td>
<td>Shutter temperature</td>
</tr>
<tr>
<td></td>
<td>Required shutter position</td>
</tr>
</tbody>
</table>
13 EU Declaration of Conformity

The manufacturer
TROTEC Produktions u. Vertriebs GmbH.
Linzer Strasse 156,
A-4600 Wels, Upper Austria,
AUSTRIA

hereby declares that the following product

TROTEC 8019 Speedmarker FL
Model N° 8019 Speedmarker FL 10/20/30/50

conforms to the following directives:

- Machinery Directive 2006/42/EC
- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC

The following harmonised standards have been applied in the design and construction of this product:

- EN 60335-1/2007 Safety of household and similar electrical appliances
- EN 55014-1/2006 Electromagnetic compatibility
- EN 55014-2/1997
- EN 60204-1/2007 Safety of Machinery – Electrical Equipment of Machines
- EN 60825-1/2007 Safety of laser products
- EN 60950/2006 Information technology equipment. Safety. General requirements including office machines
- EN 55022/2008 u. EN 55024/2003 Electromagnetic compatibility

Wels, 3rd November 2009
Trotec Produktions u. Vertriebs Ges.m.b.H