Manual
SpeedMarker GS – 1000 Standalone
SpeedMarker GS

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TROTEC does not assume any liability for direct or indirect damage emerging from the application or use of the products, circuits or software here described. The device may be operated only by trained staff. Carefully read and follow the operating instructions before commissioning.

Also, TROTEC reserves the right to change every product described here without previous notice.

Please, read the paragraph 'Notes on troubleshooting' in the operating instructions of your device. If you cannot solve your problem, please, take down all device data (serial number, software version etc.) and call us from a phone near the active device.

In case of further enquiries or technical problems, please, contact your TROTEC dealer at the address given above.
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1. Introduction

By choosing the SpeedMarker GS you have decided for a high-quality galvo marking laser system. The application of a CO² laser source has become accepted in the industry owing to its high efficiency and power.

The combination of a high-quality galvo-scanner and a CO² laser provides short marking times with very precise positioning of the marking.

This, the marking software and the available interfaces merge into a flexible and productive marking solution that meets highest quality standards.

1.1. Scope

This manual describes the SpeedMarker GS with software-guided Z-axle.

Please, find specific entries on the available options in the chapter ‘Technical data’.

2. General information

Absolute observance of the safety procedures described in this manual and using the system with utmost care are essential to avoid or reduce risks of injury or damage.

The information, illustrations, tables, specifications and diagrams included in this manual have been prepared with due care according to the current state of the art. Any warranty for errors, missing information and resulting primary or secondary damage is excluded.

For the purposes of technological progress, Trotec Laser GmbH reserves the right to modify the information, illustrations, tables, specifications and diagrams included in this manual any time and without prior notice.

Any software included in this system may be used only for purposes intended by Trotec Laser GmbH. The user may not produce any updates, changes, conversions into other computer languages or copies except for a required backup copy.

Trotec Laser GmbH is not liable for direct, indirect or special damage to persons or property, consequential damage, loss of commercial profits, business interruption or loss of business information arising from using the system described in this manual.
2.1. Information on this manual

This manual describes how to safely and properly operate the system. Observe these safety notes and instructions and observe local accident prevention provisions and general safety regulations applying to the scope of use.

Before beginning any operations of the device, completely read the manual, especially the ‘Safety’ chapter and the included safety notes. Make sure that you have understood what you read. The manual is a part of the device. Always keep it near the device and any time accessible.

2.2. Explanation of icons

Important safety information in this manual is marked by icons. Always follow these instructions on working safety. In these cases, take extra care to avoid accidents or damage to persons or property.

**WARNING!**
Injury or death
This icon highlights notes that, when not observed, may cause danger to health, injury, permanent physical damage or death.

**ATTENTION**
Damage to property
This icon highlights notes that, when not observed, may cause damage, malfunction or failure of the system.

**WARNING!**
Hazardous electric current
This icon highlights dangerous situations emerging from electric power. Failure to observe the safety notes may cause severe injury or death. Use special care during maintenance and repair.

**WARNING!**
Dangerous laser beam
This icon highlights dangerous situations emerging from the laser beam. Failure to observe the safety notes may cause severe injury.

**INFO**
This icon highlights notes and information that should be observed for efficient and trouble-free operation of the device.
2.3. Limits of the system

2.3.1. Designated use

The SpeedMarker GS is intended only for laser marking with the provided marking software. More on materials you may learn from your responsible Trotec representative or our technical support.

2.3.2. Other limits

The system may be operated only with parts and original accessories provided by the manufacturer.

Operating the laser is permissible only when a suction system is applied that suits the processed material.

The operator is responsible for the choice and flawless function of the suction.

The system may be operated only under constant supervision.

A suitable fire extinguisher must be available near the system.

Observe the following additional notes:

- Engrave only approved materials using suitable parameters.
- Failure to observe the maker’s operation, maintenance and servicing instructions provided in these operating instructions excludes any warranty of the maker if a defect is found.
- The system may be operated, served and repaired only by staff acquainted with the intended area of application and the hazards of the device.
- Comply with applying safety regulations and procedures described in this manual.
- Use a suitable suction system to remove any vapours, dust or other reaction products.
- Additional devices should match the basic system - safety and operability must be maintained at all times (contact the dealer or factory).
- Using the system in other areas is considered unintended use. The manufacturer cannot assume any liability for resulting damage to persons or property.
2.4. Note on disposal

Do not dispose of the device in household waste! Dispose of electronic devices only at the local collecting points for electronic waste according to the directive on electrical and electronic waste system of the respective country!

If there are any other questions, please, contact your dealer who has sold you the device.

In case of dismantling, disassemble the system into its parts, using suitable tools. Sort the parts and dispose of them professionally. Observe legal provisions.
2.5. Type plate

The type plate with the CE-mark is located on the back.

Enter serial number, model and year of construction of the system here. These data are important for dealing with troubles in the device and for ordering spare parts.
2.6. EC declaration of conformity

EG-Konformitätserklärung
Im Sinne der EG-Maschinenrichtlinie 2006/42/EG, Anh. II 1. A

Hersteller
Trotec Laser Automation GmbH
Planckstraße 12
88677 Markdorf

In der Gemeinschaft ansässige Person, die bevollmächtigt ist, die technischen Unterlagen zusammenzustellen
Jochen Huber
Trotec Laser Automation GmbH
Planckstraße 12
88677 Markdorf

Beschreibung und Identifizierung der Maschine

Produkt / Erzeugnis  SpeedMarker GS
Typ  SpeedMarker GS
Serie / Nummer  SM-GS
Projekt Nummer  SM-GS
Handelsbezeichnung  SpeedMarker GS
Auftrag  SM-GS
Funktion  Laser Work Station zum Schneiden von Papier

Es wird ausdrücklich erklärt, dass die Maschine allen einschlägigen Bestimmungen der folgenden EG-Richtlinien entspricht.

2006/42/EG  Richtlinie 2006/42/EG des Europäischen Parlaments und des Rates vom 17. Mai 2006 über Maschinen und zur Änderung der Richtlinie 95/16/EWG (Neufassung) (1)

Fundstelle der angewandten harmonisierten Normen entsprechend Artikel 7 Absatz 2

EN 61000-6-4:2007/A1:2011  Elektromagnetische Verträglichkeit (EMV) - Teil 6-4: Fachgrundnormen; Störaussendung für Industriebereiche

Markdorf, 25.08.2015

Ort, Datum

 Unterschrift

i.A. Jochen Huber
Elektrokonstruktion

1/1
3. Safety

3.1. Laser classification

The laser protection class characterizes the potential hazard posed by accessible laser radiation.

**The SpeedMarker GS is on:**
Class 2 marking system according to DIN EN 60825-1 ‘Safety of laser products’.

**The integrated laser is on:**
SpeedMarker GS class 4 according to DIN EN 60825-1 and marked as such.

---

**Class 2**

The accessible laser radiation of class 2 laser systems is not dangerous for the skin. Brief exposure of the eyes is also safe on account of its low power. In case of longer intensive exposure, the eye is protected by the natural eyelid closure reflex.

The SpeedMarker GS applies a class 2 pilot laser. To avoid irritations of the eyes, do not look directly into the active laser source.
Scattered reflections of the pilot laser are absolutely safe.

---

**Class 4**

With class 4 lasers, both direct radiation or indirect leakage radiation are hazardous and may cause injury of skin or eyes.
In addition, improper application of class 4 laser radiation on ignitable materials may cause risk of fire or explosion.
The operator is responsible to take necessary precautions to exclude inflammation or explosion of material exposed to the laser beam.

---

**Operation of class 4 lasers require the following precautions, among others:**

- The operator is obliged according to BGV B 2 ‘Laser radiation’ to name a trained laser protection officer for observing the relevant instructions
- The danger zone must be recognisably identified by warning lamps and signs.
- The danger zone must be protected against unauthorized entrance.
- Any operator of a class 4 laser system active in the danger zone has to wear goggles any time that are adapted to wavelength and power of the laser.
- Install an additional emission warning lamp, visible for the operators, that warns against issuing laser radiation.

Observing the above-mentioned items does not release the operator from complying with standards and directives applying to the operation of class 4 laser systems.
3.2. Safety regulations and directives

The following directives and regulations must be followed to avoid hazards during the operation of TROTEC laser systems:

- EN 60825-1 Sicherheit von Lasereinrichtungen Teil 1: Klassifizierung von Anlagen, Anforderungen und Benutzer-Richtlinien.
- EN 60950 Sicherheit von Einrichtungen der Informationstechnik.
- EN 61010-1 Sicherheitsbestimmungen elektrische Mess-, Steuer-, Regel- und Lasergeräte; Allgemeine Anforderungen.
- UL 60950 Standard for Safety for Information Technology System.
- UL 31011-1 Electrical System for Laboratory Use Part 1: General.

The general regulations and directives listed above may be locally, regionally or internationally different. Please, observe also any other directives applying to you.

In every case the customer is responsible for observing all safety standards because Trotec Produktions- und Vertriebs- GmbH has no power over the proper use of the device.

3.3. General safety notes

Every person assigned to installing, commissioning, operating, maintaining and servicing of the device has to be familiar with the contents of this manual, especially with the ‘Safety’ chapter.

We recommend that the operating company designs its own instructions adapted to the attested technological qualification of allocated staff and has compliance with the instruction/manual or participation in briefing/training confirmed in writing.
3.3.1. Safety awareness

- The system may only be operated by qualified and authorised service staff.
- Competence over individual activities at the device during operation must be clearly defined and controlled so that no ambiguities with regard to safety remain. Pay special attention to working at electrical systems that may be executed only by specially trained staff.
- Observe any shutdown procedures indicated in the manuals as required before commencing work related to installation, commissioning, setting up, operating, changing operating conditions and methods, maintenance, inspection or repair.
- Operate the system only with devices and spare parts included in delivery or stated in the spare and wear parts list.

3.3.2. Safety information for the operating company and/or service staff

- Refrain from any operation that may impair the safety of the system.
- The operator has to make sure that no unauthorised persons will operate the system (including activating blockage systems to prevent unauthorized use).
- Before commencing work, the operator shall check the system for visible damage or defects and report any changes that may affect its safety (including the operating performance) without undue delay.
- The operating company shall make sure that the system is only operated in flawless condition.
- The company shall give instructions and run controls to make sure that the area around the system is always clean and clear.
- No safety devices may be dismantled or deactivated (indicate hazards like serious burning, loss of eyesight). If safety devices have to be disassembled for setting up, repairing or maintaining, reassemble them right after maintenance or repair has been completed.
- Setting up, conversion, exchanging the workpiece, maintenance and inspection are restricted to trained staff and require the system to be switched off.
- A fire extinguisher must always be at hand because the laser beam can ignite inflammable material.
- Inflammable material may not be stored in the operating area or very close to the device.
- No unauthorised modifications or changes to the system. Note that unauthorised modifications or changes to the system are not permitted for safety reasons.
3.4. Safety notes laser

- Unprotected exposure to laser radiation includes the following hazards:
  - Eyes: Destruction of the cornea and the vitreous body
  - Skin: Burn
  - Clothes: Inflammation

- Never point the laser beam at people or animals.

- Do not tamper with protection switches and covers of the laser head nor deactivate them!

- Hence, never try to modify or disassemble the laser and do not try to commission a system that has been modified or disassembled!

- Using operation or calibration devices not shown here or applying other methods may cause exposition to harmful radiation.
3.5. Warnings and information signs

The warning and information signs are attached to the device at places where safety hazards may occur before commissioning or during operation. Pay special attention to the notes on these signs. Replace any lost or damaged signs immediately.

Front view

CO₂ LASER
\[ P_{\text{max}} = 130 \text{ W cw} \]
\[ \lambda = 10600 \text{ nm} \]

CAUTION
VISIBLE LASER RADIATION
CLASS 2. WHEN OPENED
DO NOT STARE INTO BEAM

CAUTION
VISIBLE AND INVISIBLE LASER RADIATION
CLASS 4. WHEN OPENED AND SAFETY INTERLOCKS DEFEATED
AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

NEVER OPERATE THE LASER SYSTEM WITHOUT CONSTANT SUPERVISION.
EXPOSURE TO THE LASER BEAM MAY CAUSE ILLNESS OF COMBUSTIBLE MATERIALS WHICH CAN CAUSE SEVERE DAMAGE TO THE EQUIPMENT
Right view

Left view

CAUTION
VISIBLE AND INVISIBLE LASER RADIATION
CLASS 4. WHEN OPENED AND
SAFETY INTERLOCKS DEFECTED
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION

INPUT POWER
100-240VAC 50/60Hz

HAZARDOUS VOLTAGE INSIDE
DISCONNECT POWER BEFORE OPENING
3.6. Dangers

**Danger from misconduct**

Improper activities at the system may cause injury and/or damage of the system.
Inform staff about the system functions and residual risks and note in the training log.
Observe official regulations on system operation and prevention of accidents.

**Danger from missing, defective or bridged safety devices and system parts**

Inactive or missing safety devices and system parts may cause death, injury and/or damage of the system.
- Carefully check all safety devices and system parts for flawless and designated functioning.
- In case of any malfunction or defect, initiate immediate troubleshooting.

**Danger from faulty operation (especially when setting up)**

Consider the manual and safety notes before commissioning!

**Danger from faulty operation by unauthorized persons**

Adjusting and operating without proper knowledge of how the system functions may cause injury and/or damage to the system.
- Never leave the working system unattended.
- When not in use, switch off the main switch.

**Danger from detached label**

Danger of misapplication of the system may be caused by assuming wrong requirements.
- Replace any detached labels.

**Danger from irremediable fault**

An irremediable fault can lead to damage of the system.
- Switch the system off and contact the customer service!
**Danger from inferior spare parts or foreign parts**

Using inferior spare parts or foreign parts may affect the safety of the system and render the provided declaration of conformity (CE) invalid.

- Replace any wearing parts or broken system, safety or electric parts only with original spare parts.

**Danger from missing protective equipment**

- Always wear suitable working clothes.
- Wear safety goggles adapted to the laser (class 4).
- Use a suitable suction system.

**Danger from reaction products resulting from laser processing**

Laser marking requires a suitable suction system because gases, vapours and some other toxic by-products may issue.

In some cases, the reaction products may be conductive dusts. If they penetrate electrical installations, short circuits with people and damage to property may be the result.

**Danger from ignitable or explosive materials**

Class 4 laser radiation of the kind emitted by the built-in SpeedMarker FL may ignite materials or cause explosions. Make sure, among other things, that:

- The parameters are selected in such a way that the material is not excessively heated.
- The system is monitored, when needed.
- Any dust is safely sucked off and no inflammatory residues or rests may accumulate in the workroom.

### 3.7. Gases, vapours and dust

Depending on the processed materials and chosen parameters, laser marking may produce gases, vapours, aerosols or dust. With some materials, these by-products can be toxic.

The operator has to make sure that suitable suction is available and that the applying directives are observed to avoid danger to people or the environment. Details may be found in the directive VDI 2262 1...3 ‘Air conditions at the job’. 

In addition, the operator has to make sure that gases, vapours or dust do not accumulate on the optical system. Dirt on the optics may cause power loss, bad processing results and damage to the device.
4. Technical data

4.1. SpeedMarker GS dimensions

4.1.1. Interior (standard implementation)

Sketch 1: Top view
4.1.2. External dimensions

Sketch 2: Front view

Sketch 5: Outside view
4.2. Installation

Sketch 6: Installation
### Laser

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser</td>
<td>Pulsed CO₂ laser, maintenance-free</td>
</tr>
<tr>
<td>Wavelength</td>
<td>10.5 µm – 10.7 µm</td>
</tr>
<tr>
<td>Maximum pulse length</td>
<td>600 µs</td>
</tr>
<tr>
<td>Beam quality</td>
<td>$M^2 &lt; 1.2$</td>
</tr>
<tr>
<td>Power stability (after 2 minutes of warm-up)</td>
<td>Better than ± 5%</td>
</tr>
<tr>
<td>Power stability (after cold start)</td>
<td>Better than ± 7%</td>
</tr>
<tr>
<td>Cooling</td>
<td>Watercooled</td>
</tr>
<tr>
<td>Laser model</td>
<td>GS 100 OEM</td>
</tr>
<tr>
<td>Average output power</td>
<td>100 W</td>
</tr>
<tr>
<td>Peak pulse energy</td>
<td>190 mJ</td>
</tr>
<tr>
<td>Pulse repetition rates</td>
<td>0-100 kHz</td>
</tr>
<tr>
<td>Integrated pilot laser</td>
<td>✓</td>
</tr>
</tbody>
</table>

### Galvo system

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marking field [mm x mm]</td>
<td>From 250 x 250 to 500 x 500</td>
</tr>
<tr>
<td>Focal diameter</td>
<td>~ 200 µm – ~ 480 µm</td>
</tr>
<tr>
<td>Write speed (good/high writing quality)</td>
<td>220/150 cps</td>
</tr>
<tr>
<td>Positioning speed</td>
<td>9,000 mm/p.</td>
</tr>
</tbody>
</table>
### Workstation

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside dimensions (BxT)</td>
<td>800 x 500 mm²</td>
</tr>
<tr>
<td>Doorway (BxH)</td>
<td>800 x 475 mm²</td>
</tr>
<tr>
<td>Door</td>
<td>Electric door drive</td>
</tr>
<tr>
<td>Maximum parts size (BxT)</td>
<td>500 x 500</td>
</tr>
<tr>
<td>Maximum parts height</td>
<td>275 mm to 25 mm</td>
</tr>
<tr>
<td>Depending on the writing field</td>
<td>From 250 x 250 to 500 x 500</td>
</tr>
<tr>
<td>Maximum load</td>
<td>1 KG</td>
</tr>
<tr>
<td>Machining table</td>
<td>Metal honeycomb grid or plastic grid</td>
</tr>
<tr>
<td>Axles</td>
<td>Software-controlled Z-axle</td>
</tr>
<tr>
<td>Traversing range, Z-axle</td>
<td>0000 mm</td>
</tr>
<tr>
<td>Colour</td>
<td>RAL 3002, RAL 7016, RAL 7035</td>
</tr>
</tbody>
</table>

**Tolerance of the dimensions: 1%**

### Control

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>Separate industrial PC as a 19&quot; subassembly with 3HE 4 GB RAM, HDD 250 GB, DVD ROM, Windows® 7 operating system</td>
</tr>
<tr>
<td>Interfaces</td>
<td>USB, Ethernet</td>
</tr>
<tr>
<td>Application software</td>
<td>SpeedMark</td>
</tr>
</tbody>
</table>
### Options/accessories

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Software</strong></td>
<td>DirectMark printer driver: Marking as easy as printing, whatever software used</td>
</tr>
<tr>
<td><strong>Extended I/O interface</strong></td>
<td>Additional inputs and outputs, 24 V DC</td>
</tr>
</tbody>
</table>
| **Additional optional accessories** | • Pedal switch for efficient and user-friendly control  
                                     • Suction systems  
                                     • Water cooling systems  
                                     • Feed rolls |

### Dimensions/installation/laser safety

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (B x H x T)</td>
<td>1000 x 2400 x 1400 mm³</td>
</tr>
<tr>
<td>Weight (with laser)</td>
<td>450 kg</td>
</tr>
</tbody>
</table>
| Ambient conditions             | Ambient temperature from +5 to +35 °C  
                                 relative air humidity up to 85%  
                                 No condensation                                                                  |
| Power supply                   | 230 V AC, 16 A, 50/60 Hz, 1/N/PE                                         |
| Power input                    | Up to 3000 W                                                            |
| Protective class               | IP20 (laser plug-in unit)                                               |
| Laser class                    | CDRH Laser safety  
                                 Laser class 2  
                                 CE tested |

### 5. Transport, packaging and storage

#### 5.1. Safety notes
WARNING
During transport, loading or unloading there is a risk of injury from parts falling down.

ATTENTION
The device can be destroyed or broken by improper transport.

Hence, the following safety notes are to be observed:

- Always move the device with utmost care.
- Observe the centre of gravity during transport (danger of tilting).
- Protect the devices against slipping sideways.
- Move as carefully as possible.
- Avoid any vibrations.
- For overseas transports, pack the device tightly and corrosion-proof.
- Stabilise the device with straps and ropes and keep enough distance to other objects.
- Do not place or store heavy objects on the device or its components.
- Best transportation temperature
  Min. temp. 10 °C
  Max. temp. 40 °C

5.2. Scope of supply (factory configuration)

- 1x SpeedMarker GS
- 2x Key for the SpeedMarker GS
- 2x Key for the industry PC
- 2x Key for the laser rack
- 1x CD with marker software
- 1x Windows backup
- 1x lens cleaning set
- 1x Allen key set
- 1x IEC plug
- 1x Suction connector cable (option)
- 2x connecting hose for water cooling (option)
5.3. Transporting and unloading

Unless differently agreed by contract, the device is delivered in a packaging box.

The SpeedMarker GS may be carried only in the original box.

**ATTENTION**

The packaging box can slip, tilt or drop during transportation. Always stabilise the packaging box. Observe its centre of gravity.

**ATTENTION**

Unload the packaging box with a forklift matching the weight of the LWS.

5.4. Inspection after delivery and damage report

Check any received delivery immediately for completeness or damage in transit. If any damage is visible, do not accept the delivery or only under reservation. Record the extent of the damage on the transport documents or the delivery note of the carrier. Send a complaint: Complain about any not immediately recognised damage right after detection because compensation claims can be asserted only within the applying complaint terms.
5.5. Unpacking the system

The system may be unpacked only by trained staff.

To avoid tipping over and wooden parts falling down, open the packaging box carefully. 2 people should remove the packaging box.

1. Place the box vertically on a level ground (use a suitable forklift).
2. Remove vertical straps.
3. Remove cover and put it aside.

5.5.1. Transportation protection

On unpacking the device from the wooden envelope, remove the edge protection from the front of the system and the protective foam of the door mechanism. The protective foam is located above and below the door weight.

*Interior protection of the door mechanism*
5.6. Storage

Keep all packages closed till installation.

Store packages only under the following conditions:

- The storage place must be dry, free of dust, acid substances, vapours or ignitable substances.
- Store in a storeroom or pack with sufficient cold weather protection.
- Avoid any vibrations.
- Storage conditions:
  - Storage temperature: +0 to +40°C
  - Relative humidity of the air: up to 85%
- Avoid high temperature variations.
- Take special care when packing and storing electronic components.
- If extended storage is intended, lubricate all uncoated system parts. Regularly control the general state of all parts and the packaging.

5.7. Local carriage

Carry the device standing upright, avoiding any strong vibrations.

1. Switch the system off with the main switch.
2. Disconnect the mains cable.
3. Remove the suction.
4. Remove the water cooler.
5. Slightly lift the system with a suitable forklift.
6. Relocate and place on a level clean ground.
7. Readjust the system after carrying and run a first commissioning of the electrical system and a function test.

CAUTION

Use the packaging box, incl. door protection, for long-distance transports.

6. Overview

6.1. General construction of the SpeedMarker GS

The SpeedMarker GS consists of the following components and units
SpeedMarker GS

Front view:

1. Laser protection screen
2. Door
3. Waste drawer
4. Levelling feet (castor option)
5. Operating panel
6. Monitor, keyboard and mouse
7. Emergency-off calliper
8. Start calliper

Right view:
Left view:

1. Servicing door
2. Flashing

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Rear view:

- Connection for the suction pipe

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Rear wall</td>
<td>6</td>
<td>Network connection</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>2</td>
<td>Flashing</td>
<td>7</td>
<td>Mains connection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Head suction</td>
<td>8</td>
<td>Suction interface</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Table suction</td>
<td>9</td>
<td>Connection water cooling IN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Surface suction</td>
<td>10</td>
<td>Connection water cooling OUT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.2. Processing area

The processing area is closed during the laser process.

6.2.1. General structure of the Z-axle

The axis system is designed as a servo drive with integrated brake. It can be positioned about the laser software for adjusting the focus. For higher precision, the Z-axis has been designed as a spindle shaft.

The laser structure is mounted above a baseplate on the Z-axis. The axe is limited by two electric delimiter switches. The reference or initialization travel is performed in positive direction to the upper delimiter switch.
6.3. Supply connections

At the back of the SpeedMarker GS are supply connections:

- The power cable can be connected about a IEC plug-in connector
- The table, surface and head suction are connected via plugs with a nominal bore of 80 mm
- The optional network connection is available via a jack RJ45
- The water cooling is connected about the couplings IN and OUT
- The D-Sub jack provides an option to connect the interface cable for the suction

<p>| | | | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Table suction</td>
<td>2</td>
<td>Surface suction</td>
<td>3</td>
<td>Head suction</td>
</tr>
<tr>
<td>4</td>
<td>Network connection</td>
<td>5</td>
<td>Mains connection</td>
<td>6</td>
<td>Suction interface</td>
</tr>
<tr>
<td>7</td>
<td>Connection water cooling OUT</td>
<td>8</td>
<td>Connection water cooling IN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4. Control elements

The electrical and electronic control is housed in three 19" plug-in units -

- System control
- Laser control
- Industrial PC

6.4.1. System control

The system control controls the door, the automated mode and the safety.

The LCD displays fault alarms.

1 Main switch
2 LCD
6.4.2. Laser control

The laser control controls the laser head and the laser source.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>System ready</td>
</tr>
<tr>
<td>2</td>
<td>Shutter control</td>
</tr>
<tr>
<td>3</td>
<td>Laser active</td>
</tr>
<tr>
<td>4</td>
<td>Laser main switch</td>
</tr>
<tr>
<td>5</td>
<td>Emergency off</td>
</tr>
<tr>
<td>6</td>
<td>System alarm</td>
</tr>
<tr>
<td>7</td>
<td>Key switch</td>
</tr>
</tbody>
</table>

6.4.3. Industrial PC

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PC protective flap</td>
</tr>
</tbody>
</table>
6.5. Protection devices

The SpeedMarker GS has the following protection devices:

- Main switch
- Emergency off switch
- Safety switch in the protective door
- Safety switch in the servicing doors
- Flow switch for suction
- Observation window made of laser protection screen
- Safety shutter flap in the laser
- Cover panels

Do not tamper with the circuit breakers and protective caps of the laser head nor disable them. All safety and protection devices must be mounted and fully functioning before commissioning.

6.5.1. Main switch

The main switch is located at the side, in the base of the system.

This main switch switches the whole system powerless. Also, the laser is switched off.
6.5.2. Emergency-off switch

Emergency-off switches are found on the front of the SpeedMarker GS and in the laser control.

The purpose of the emergency off system is

- first priority: Preventing hazards to the operating staff.
- second priority: Averting damage or destruction of system and material

The emergency-off switch immediately switches the electric circuit powerless. The laser beam is interrupted by the shutter flap. All movements are stopped. The trigger of the emergency-off function is indicated by a fault alarm.

6.5.2.1. Emergency-off confirmation - procedure

1. **Unlock emergency-off**
   - Press the emergency-off switch to unlock.

2. **Confirm emergency-off**
   - Press the ON calliper on the keyboard of the SpeedMarker 1300

3. **Confirm laser fault**
   - Press the ON calliper on the keyboard of the SpeedMarker 1300
   
   OR: Press of ‘System alarm’ calliper on the laser control

Keyboard: ON calliper

Emergency-off

Start calliper

System alarm
6.5.3. **Safety switch at the protective door**

The closed position of the door is checked by two safety switches. If the door is open, no marking is possible. The pilot laser is still active.

6.5.4. **Safety switch at the servicing doors**

Each servicing door on the right and left side of the system is checked by two safety switches. If a door is open, no marking is possible. The pilot laser is still active.

6.5.5. **Laser protection glass**

The observation window in the front door is made of laser protection glass compliant with DIN EN 201. The glass consists of a special material adapted to the laser model and the laser radiation absorbed. Exchange the screen in case of damage or discoloration.

6.5.6. **Water cooling flow control**

The water cooling must be active so that the safety control of the system can be shielded. Without active water cooling, the source of the laser beam may be damaged.

6.5.7. **Safety shutter flap in the laser**

If a safety circle is opened in the laser system, the safety shutter flap in the laser blocks at once. For safety purposes, this disruption is performed by safe construction elements. The laser is mechanically blocked. An error message is displayed.

6.5.8. **Cover panels**

The cover panels protect against the laser.

---

**ATTENTION**

All cover panels must be present and tightly screwed on.
6.6. Operational controls

Operational controls on the front side.

6.6.1. Light-emitting diodes in the keyboard field

The light-emitting diodes on the operation panel have the following significance:

<table>
<thead>
<tr>
<th>Power</th>
<th>The power supply of the SpeedMarker GS is on</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>The control of the SpeedMarker GS is on, emergency off is shielded</td>
</tr>
<tr>
<td>Laser – laser</td>
<td>The marking laser is active</td>
</tr>
<tr>
<td>Error</td>
<td>A fault has been detected and is not yet confirmed</td>
</tr>
<tr>
<td>Auto</td>
<td>The automatic mode is active</td>
</tr>
</tbody>
</table>
6.6.2. SpeedMarker 1300 keyboard field

<table>
<thead>
<tr>
<th>Confirmation after turning on, emergency-off or fault</th>
<th>Key switch</th>
<th>Mode of operation: automatic or manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON Calliper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No function</td>
<td>Lighting</td>
<td>Turning the lighting in the processing space on or off</td>
</tr>
<tr>
<td>Drive Z axle up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z axle up</td>
<td>Open door</td>
<td>Opening the protective door</td>
</tr>
<tr>
<td>Drive Z axle down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z axle down</td>
<td>Close door</td>
<td>Closing the protective door</td>
</tr>
<tr>
<td>No function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No function</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.6.3. Emergency-off calliper and automatic button

Emergency-off of the SpeedMarker GS in case of danger (PC is still powered)

For starting the process in the automatic mode
7. **Installation**

7.1. **Installation environment**

- The ambient temperature should range from +15 °C to +35 °C and the relative humidity should not exceed 85% (not condensing).
- If the system has been exposed to significantly varying temperatures, recover the ambient temperature before commissioning.
- A laser system consists of high-quality electric and optical components. Avoid any mechanical load, vibrations or impacts.
- Maintain sufficient air supply at the two 19" plug-in units. Heat build-up because the airing slots or filter mats are blocked entails damage of the system.

7.2. **How to install the SpeedMarker GS**

1. Remove all packaging materials.
2. Remove all transportation locks.
3. The system must stand **upright**.
4. Make sure that the laser protection screen is unscathed.

7.2.1. **Electric supply of the laser control**

1. Check whether the mains voltage and frequency are correct.
2. Check whether the power cable and mains plug are undamaged, exchange, if necessary.
3. Make sure that the main switch of the system controller is in position "OFF".
4. Connect the power cable at the back of the SpeedMarker GS.

**INFO**

The correct input voltage is stated on the warning label above the power connector.

The laser control is equipped with a main fuse that depends on the configured voltage.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Fuse Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 V AC</td>
<td>1 X 6.3 A “T” speed/time-delay</td>
</tr>
<tr>
<td>230 V AC</td>
<td>2 x 4 A “T” speed/time-delay</td>
</tr>
</tbody>
</table>

The main fuses are located behind the cover, adjacent to the IEC power connector. The same fuse is used for all supply voltages at the PC.

8. **Commissioning**
WARNING

Improper operation may cause serious injury or damage. Therefore, only authorised staff instructed in adequate operation of the system and acquainted with all safety regulations may work at the system.

8.1. Before commissioning

Check the following items before commissioning:

- Check the electric installation for completeness and correct input voltage.
- Make sure that the optical components are not covered by dust or dirt.
- Have you removed the protective cap in the focusing objective?
- Check whether the ambient conditions match the technical specification.
- Are you familiar with the laser safety instructions?
- Have all laser safety precautions been taken?
- The system may be switched on only if all laser safety precautions have been controlled and approved by authorised staff.

8.2. SpeedMark software

The software is pre-installed on the PC and, if necessary, may be re-installed from the provided CD any time.

Instructions or specific information about the software are available in the software manual.
8.3. Switch on/off

How to switch the SpeedMarker GS on:

1. Switch on the main switch (1) at the system control by turning it 90° to the right.

2. Switch the main switch ‘I/O’ (2) at the laser control on. Now the switch lights up green.

3. Enter the key vertically into the key hole (8) and turn 90° to the right.

4. If required – unlock the emergency-off switch at the front. (See ‘Confirm emergency-off’ in the ‘Emergency-off switch’ chapter)

5. The industrial PC automatically switches on.
   It may also be manually started by the tilting switch behind the PC protective flap (9) at the front side of the industry PC.

If the SpeedMarker is used for the first time, check whether the main switch (10) on the back of the PC is switched on.
This switch may be permanently switched on.

6. Select a mode of operation (Manual or Auto) with the key-operated switch ‘Manual/Auto’ at the operating panel.

7. Start the software (SpeedMark) at the PC.

8. Now the SpeedMarker GS is ready for operation.

- If an error occurs, press the ON calliper on the operating panel or the System Alarm calliper (7) on the laser control.
- If the safety door is opened during a marking process, the laser beam is blocked and the System Alarm calliper (7) lights up. Press the System Alarm calliper (7) to continue marking.
- To pause the laser, use only the key-operated switch (8) of the laser control.
Switch SpeedMarker GS off

1. Close the software in the PC.
2. Shut the operating system of the PC down.
3. Switch the I/O main switch (2) in the laser control into the ‘O’ position.
4. Switch the SpeedMarker main switch GS (1) in the system control off by turning it 90° to the left.
5. Now the SpeedMarker GS is switched off.
8.4. Manual operation

In this mode of operation, all functions can be manually initiated. Select the mode at the operating control panel using the key-operated switch. This mode is intended for system checks and laser tests. The laser is only active if the protective door is closed. The protective door can be also opened and closed by hand.

The functions are:

- Open and close the protective door.
- Move the Z-axle by hand.
- Initiate the laser process.

8.4.1. Protective door

The ‘Open protective door’ and ‘Close protective door’ callipers help open and close the protective door.

8.4.2. Software-controlled Z-axle

The UP and DOWN callipers shift the Z-axle in manual mode.

- The Z-axle is delimited by the delimiter switch.
- Make sure that the moving laser structure does not collide with the workpiece.
- Turning the SpeedMarker GS on has to be followed by a reference travel. The travel can be either manually started by the marking software or automatically by starting the software.
- In automatic mode, the Z-axle is controlled by the laser PC.

**CAUTION**

Danger of squeezing when the axis is moving.
8.5.  Automatic operation

In this mode, all functions are automatically performed. Select the mode at the operating control panel with the key-operated switch. This mode of operation is intended for an automatic production process.

8.5.1.  Running the automatic mode

INFO
The key-operated switch is in AUTO position and the automatic mode has been activated by the control software in the laser PC.

1. Start automatic execution with the Start calliper.
2. The protective door closes.
3. The marking process runs automatically.
4. The marking process finishes.
5. The protective door opens.
6. Press the Start calliper to start a new marking process.
8.6. Focus

Maintaining the correct focal distance is a requirement for every laser marking. The laser beam obtains the power density required for permanent and well readable markings only in the focal point.

**ATTENTION**

Working on mechanical components entails danger of injury.

Hence, adjust the correct focal distance between marking head and workpiece before marking. A wrong focal distance is the most frequent cause for blurred or not properly visible markings.

Adjust the position of the laser along the Z axle until the desired marking result is achieved.

The focal distance (A) is measured between the lower edge of the galvo head (B) and the surface of the workpiece (C). The right focal distance depends on the selected size of the marking cell.

<table>
<thead>
<tr>
<th>Marking cell format</th>
<th>Focal distance (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 x 250 mm</td>
<td>~301.5 mm</td>
</tr>
<tr>
<td>500 x 500 mm</td>
<td>~610.0 mm</td>
</tr>
</tbody>
</table>

- The marking head can be moved up or down by pressing the callipers at the operating panel.

8.7. Positioning the workpiece

**ATTENTION**

Working on mechanical components includes a danger of injury.

The pilot laser indicates the margins of the marking cell when the ‘Begrenzung Abfahren’ (Show boundaries) function is called up in the marking software.

Shift the workpiece under the laser until the correct marking position is achieved.
9. Maintenance

9.1. Safety notes

**ATTENTION**

- Improper maintenance may cause serious injury or damage. Only authorised and instructed staff acquainted with the operation modes of the system may maintain the system, taking all safety regulations into account.
- Make sure that the power supply is switched off and the system is turned powerless before commencing maintenance.
- Do not use inflammable or explosive agents for cleaning. Risk of fire or explosion.
- No containers with inflammable or explosive liquids may be present in the processing space.

9.2. Maintenance schedule

<table>
<thead>
<tr>
<th></th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Laser</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protective screen</td>
<td>Check, clean at need</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guide rail for door counterbalance</td>
<td></td>
<td></td>
<td>Clean every six months</td>
<td></td>
</tr>
<tr>
<td>Whole operating range – general cleaning</td>
<td>Clean</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual inspection of the laser protection screen</td>
<td>Check, exchange at need</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Checking the functioning of all emergency-off systems</td>
<td></td>
<td></td>
<td>Checking</td>
<td></td>
</tr>
<tr>
<td>Visual inspection of the protective door cable</td>
<td></td>
<td></td>
<td>Every six months Check, exchange at need</td>
<td></td>
</tr>
<tr>
<td>Filter mat of the laser control and industrial PC</td>
<td></td>
<td></td>
<td>Check, exchange at need</td>
<td></td>
</tr>
<tr>
<td><strong>Suction system</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pocket filter</td>
<td>According to the operating instructions of the suction system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filter mat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activated carbon filter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Water cooling</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pocket filter</td>
<td>According to the operating instructions of the water cooling system</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**INFO**

To warrant perfect availability and service life of the system we recommend to check the filter systems and airings on a regular basis and to keep the working environment clean. Visual inspection of the optics is recommended before turning the system on.
9.3. Servicing

9.3.1. Cleaning the optics

INFO
Laser optics are highly sensitive and their surface is not as hard as customary glass. Very easily they may be broken when cleaning. Hence, it is worthwhile to avoid dirt by applying suitable suction devices and by regularly cleaning the environment.

ATTENTION

- Never touch optical components with your fingers! Oily or dirty hands can damage the lens surfaces.
- Use only soft lintless cloth or cleaning paper and a suitable solvent to clean the laser optics. Remove heavy dirt only with lens-cleaning cloths and highly concentrated (at least 98%) alcohol.
- Do not dip cleansing cloths into the cleaning agent. This contaminates the agent and makes it unusable. Drip the agent onto the cloth!
- Use the cleaning agent carefully to avoid scratches on the lens or screen surface.
- Do not use any tools or hard objects to clean surfaces. Scratches are not remediable.
- Use small bellows to remove dust.
- Compressed air is not suitable because the compressed air contains tiny amounts of oil and water.
- Distribute the cleaning agent carefully, moving in light circles. Start in the centre of the lens and work towards the edge. Keep the cloth moving until the complete surface is cleaned.

Do not press on the lens surface.
9.3.2. How to exchange the filter mat at the laser plug-in unit and industrial PC

This laser system is equipped with an air cooling. A filter mat is used to protect the electronic parts from dust and dirt in the ambient air.

This filter mat should be checked and exchanged at regular intervals to guarantee perfect cooling.

The filter mat is located behind the airing slots in the surface of the laser plug-in unit or the PC.

Filter mat in the laser plug-in unit

Filter mat at the PC

9.3.3. Observation window

The observation window is made of special plastic. To avoid damage, use only clean water and perhaps a bit of washing-up liquid for cleaning. Use a soft cloth, not to scratch the surface.

ATTENTION

Petrol, alcohol, acetone, solvents or similar cleaning agents will damage the laser protection screen. Exchange damaged screens immediately.

Avoid scratching. Exchange scratched screens immediately.
10. Faults

This chapter should enable the maintenance staff to troubleshoot faults, using error messages and symptoms.

**ATTENTION**

Improper fault remedy may cause serious injury or damage. Only authorised and instructed staff acquainted with the operation modes of the system may maintain the system, taking all safety regulations into account.

**INFO**

Move or start functions of the device only if no fault is present and all devices are ready for operation. This is the initial requirement for the SpeedMarker GS. If this requirement is not given during the operation, the laser cell is blocked.

Confirm the fault with the ON calliper in the keyboard field.

### 10.1. Troubleshooting

A fault causes the Error LED on the keyboard field to blink. The present fault can be read on the display.

<table>
<thead>
<tr>
<th>Most important fault messages</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency-off fault occurred</td>
<td>Unlock emergency-off switch and switch on control voltage</td>
</tr>
<tr>
<td>Protective door fault occurred</td>
<td>Restart protective door in manual mode; the door may be hard to move; adjust door mechanically</td>
</tr>
<tr>
<td>Fault of the outputs occurred</td>
<td>Electronic outputs of the system control have been overloaded; switch system off and on</td>
</tr>
</tbody>
</table>
# 10.2. Faults, causes and remedy

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser plug-in unit cannot be switched on</td>
<td>SpeedMarker switched off</td>
<td>Switch main switch on</td>
</tr>
<tr>
<td></td>
<td>Key-operated switch at laser control in vertical position or absent</td>
<td>Attach key-operated switch at laser plug-in unit and turn into horizontal position</td>
</tr>
<tr>
<td></td>
<td>Mains plug of the LWS not properly installed</td>
<td>Check mains plug of the SpeedMarker for proper installation</td>
</tr>
<tr>
<td></td>
<td>Wrong or no power supply of the SpeedMarker</td>
<td>Check the 230/110 V of the SpeedMarker power supply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mains plug of the laser plug-in not properly installed</td>
<td>Check mains plug of the laser plug-in for proper installation</td>
</tr>
<tr>
<td></td>
<td>Fuse in the laser mains connection defective</td>
<td>Replace fuse</td>
</tr>
<tr>
<td>For optional hatch:</td>
<td>Emergency-off switch has been pressed</td>
<td>Release emergency-off switch</td>
</tr>
<tr>
<td>SpeedMarker cannot be switched on</td>
<td>Emergency-off switch has been pressed</td>
<td>Release emergency-off switch</td>
</tr>
<tr>
<td></td>
<td>Mains plug of the LWS not properly installed</td>
<td>Check mains plug of the SpeedMarker for proper installation</td>
</tr>
<tr>
<td></td>
<td>Wrong or no power supply of the LWS</td>
<td>Check the 230/110 V of the SpeedMarker power supply</td>
</tr>
<tr>
<td>Error message when loading the programme</td>
<td>Connector or cable not correctly installed</td>
<td>Check connectors and cables for proper installation</td>
</tr>
<tr>
<td></td>
<td>Laser supply switched off</td>
<td>Switch main switch on</td>
</tr>
<tr>
<td></td>
<td>Software incorrectly installed</td>
<td>Reinstall software</td>
</tr>
<tr>
<td></td>
<td>Software freeze</td>
<td>Reboot PC</td>
</tr>
<tr>
<td>No laser beam</td>
<td>Laser out of focus</td>
<td>Check operating distance</td>
</tr>
<tr>
<td></td>
<td>Shutter is closed</td>
<td>Open shutter – check interlock circuit if shutter cannot be opened</td>
</tr>
<tr>
<td></td>
<td>Wrong laser parameters</td>
<td>Check parameters in the programme. Set parameters suitable for material and application</td>
</tr>
<tr>
<td>Insufficient laser power</td>
<td>Laser out of focus</td>
<td>Check operating distance</td>
</tr>
</tbody>
</table>
### 10.3. System faults

Below is a list of system fault messages indicated by the software on screen.

Use the confirmation signal (X11) or the System Alarm calliper to confirm a fault alarm.

Fault alarms that cannot be confirmed or hardware faults may be remedied only by Trotec laser-trained service engineers.

<table>
<thead>
<tr>
<th>Fault alarm</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Card of f 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 abscissa is in error</td>
</tr>
<tr>
<td>Scanner Y error</td>
<td>The ordinate is in error</td>
</tr>
<tr>
<td>Signal cable not connected</td>
<td>No connection to the laser head</td>
</tr>
<tr>
<td>External abort</td>
<td>External abnormal termination signal at the X11</td>
</tr>
<tr>
<td>External stop</td>
<td>External stop signal at the X11</td>
</tr>
<tr>
<td>Voltage error (15V)</td>
<td>+/-15 V problem with the power supply</td>
</tr>
<tr>
<td>Voltage error (24V)</td>
<td>24 V problem with the power supply</td>
</tr>
<tr>
<td>Laser power supply error</td>
<td>Problem with the laser power supply</td>
</tr>
<tr>
<td>Shutter error</td>
<td>Protective door is not in the correct position</td>
</tr>
<tr>
<td>Cover connector opened during marking</td>
<td>ICL1 and ICL2 opened while marking</td>
</tr>
<tr>
<td>External sum alarm</td>
<td>External fault signal at the X11</td>
</tr>
<tr>
<td>System locked by key switch</td>
<td>Key at the laser control in locked position</td>
</tr>
</tbody>
</table>
## 11. Dismantling

**ATTENTION**

Dismantling entails increased risk of injury. Absolutely wear protective clothes (goggles, safety shoes, gloves etc.)

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**ATTENTION**

The system must be completely powerless.

### 11.1. How to dismantle

1. Remove all workpieces from the system.
2. Press the emergency off button.
3. Shut the laser PC down.
4. Switch the main switch off.
5. Remove the suction.
6. Remove the water cooling.
7. Disconnect electric supplies.

**INFO**

Disassemble the system with suitable tools into its parts. Pay attention to springs.

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Observe the notes on disposal!