Assembly Instructions

cab
we identify more

fl⁺20R

Marking Laser

FL+

Assembly Instructions
for the following products

Family	Type
Marking Laser	FL+10R
	FL+20R
	FL+30R
	FL+50R

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Contents

1 **Introduction**

1.1 Notes

Important information and instructions are designated as follows:

Danger!
Draws attention to an exceptionally great, imminent danger to your health or life due to hazardous voltages.

Danger!
Draws attention to a danger with high risk which, if not avoided, may result in death or serious injury.

Warning!
Draws attention to a danger with medium risk which, if not avoided, may result in death or serious injury.

Caution!
Draws attention to a danger with low risk which, if not avoided, may result in minor or moderate injury.

Attention!
Draws attention to potential risks of property damage or loss of quality.

Note!
Advices to make work routine easier or on important steps to be carried out.

Environment!
Advices on protecting the environment.

▶ Handling instructions

▷ Reference to chapter, position, picture number or document.

∗ Option (accessories, peripherals, extras).

`Time` Viewed in the display / monitor.

1.2 Intended Use

- The device is solely intended to be used for marking suitable materials that have been approved by the manufacturer using the software „cablase".
  With it, the following operating conditions are exclusively permitted:
  - Using the device in laser marking systems complying with the conditions of laser class 1.
  - Using the device as laser marking system according to class 4. To operate lasers of laser class 4 is subject to declaration and requires the appointment of a laser protection officer in the company. Machine operators need to be instructed with regard to safety. This has to be documented and, on presentation, proof provided.

- The performance parameters have to be adapted to the properties of the materials to be marked.

- The device has to be operated with a certified extraction and filtering device designed for the respective application.

- The device is manufactured in accordance with the state of the art and certified safety regulations. However, danger to the life and limb of the user or third parties and/or damage to the device and other tangible assets can arise during use.

- The device may only be used for its intended purpose, in technically perfect order, being conscious of safety and danger with regard to the installation instructions..

- Any other use or use going beyond this shall be regarded as improper use. The user shall solely be liable for any damages resulting from unauthorized use.

- Intended use also includes observing the installation as well as maintenance instructions.

1.3   Safety Instructions

General

- The operator of the device shall ensure that the user has read and understood the installation instructions before the initial operation.

- The operator of the device is obliged to comply with the safety regulations and standards.

- Only perform the actions described in this installation instructions.
  Further work may only be carried out by qualified staff or service technicians.

- Improperly performed work or modifications to the device endanger the operational safety.

- Maintenance and repair work must solely be carried out by the manufacturer or skilled staff.

- The operating and maintenance instructions for the device must be strictly observed.

- It must be ensured that general maintenance work is solely carried out by staff having been instructed and being familiar with electrical hazards and protection against laser radiation.

Transport and Installation

- Transport of the device has solely to be carried out in its original packaging resp. an appropriate packaging that sufficiently protects the device.

- It is necessary to provide convenient protection against tipping over of the device or any other damage.

- Place of installation must be resilient and easily accessible according to the technical requirements.

> **! Attention!**
> - **Mechanical loads, vibrations and shocks may result in damages of the device or its components.**
> - **Improperly installed devices may result in damages and the loss of guaranteed quality.**

General Operating Conditions

- Only operate the device stationary and inside buildings.

- Only operate the device in a dry and dust-free environment and keep away from moisture (splashed water, fog, etc.).

- Do not operate the device near high-voltage lines.

- Loss of operational safety due to condensation.
  Avoid strongly fluctuating temperatures. The device has to be adapted to room temperature before putting into operation.

- Damages of the device due to heat accumulation.
  Provide sufficient supply of fresh air. Do not cover the ventilation slots.

> **⚠ Warning!**
> **Harmful effects on physical health and environment due to by-products set free in the laser processing**
> ▷ **Environment and health.**
> ▶ **Only operate the device with correctly installed extraction and filtering device.**

Electrical Safety

- The device is configured with a power supply for AC voltage from 100 V up to 240 V and have to be connected to power sockets with protective earth contact..

- Only connect the device to systems with protective extra-low voltage

- Switch off the device before disconnecting electrical connections to peripherals (PC, accessories).

- Only carry out actions described in this installation instructions.

- Improper interventions at electronic components and software may result in malfunctions.

- Maintenance and repair work must solely be carried out by the manufacturer or by skilled staff or service engineers having been authorized by the manufacturer.

- Parts of the housing and covers have solely to be disassembled by skilled staff.

- The operating and maintenance instructions for the device must be strictly observed.

- Standard operating procedures, regulations for electrical safety and local regulations at the place of installation must be strictly observed.

- Completely disconnect the device from the mains before starting maintenance work.

- Avoid touching electrical / electronic components. Capacitors may be charged and energized. Electrostatic charge may result in damages at circuits and electronic boards.

- Always switch off the device at the power switch.

- The device must in no case be operated in case of damaged components opened covers.

Danger!
Danger of life due to mains voltage.
▶ **Do not open or remove parts of the housing and covers.**

Laser Safety

The potential danger originating from accessible laser radiation is defined by the classification into laser classes.

Warning!

Hazards arise during operation of the marking laser due to laser radiation of class 4.

Laser radiation of Class 4 is very dangerous for the eye and skin. This also applies for even diffusely scattered laser radiation. The laser radiation may cause danger of fire and explosion.

- **The laser area shall be clearly identifiable and separated. Warning lights at the accesses of the area must be switched on during operation.**
- **Unauthorized persons must not have the possibility to get unintentional access to the laser area.**
- **The device is only allowed to be operated inside a closed room to prevent leakage of scattered radiation. Only authorized persons which are protected against radiation are allowed to stay in the area during operation.**
- **Secure access of the area by security gates or door contacts / safety switches (Laser shut down).**
- **Escape routes and emergency exits shall be provided and always be kept free.**
- **The laser shall only be operated in the presence of a laser safety officer.**
- **The laser must have an Emergency Stop button.**

Caution!

Hazards arise during the operation of the pilot laser due to laser radiation of class 2.

- **Accessible laser radiation is within the visible spectral range (400 nm up to 700 nm).**
  In the case of class 2 laser devices, the eye is not endangered if the impact of the laser radiation is limited to a maximum period of 0.25 s.
- **Do not look directly into the laser beam.**

Note!

For further information, accident prevention regulations and operating directives about all laser classes please refer to the valid guidelines.

Precautions	Laser class 1	Laser class 4
Technical precautions		
Safety housing	required	protected area
Safety interlock	at laser housing	Switch at access door of the protected area
Key switch	not required	required
Emission indicator	not required	required
Warning sign beam output aperture	not required	required
Organizational precautions		
Laser safety officer	not required	required
Protected laser area (room)	not required	required
Eye protection	not required	required
Instructions in safety precautions	not required	required

Table 1   Precautions for laser safety

1.4   Safety Signs

Different warning labels are attached to the device to make aware of potential hazards.

ℹ **Note!**

To identify potential hazards it is in no case allowed to remove or damage warning labels!

1

2

3

Laser beam egress point
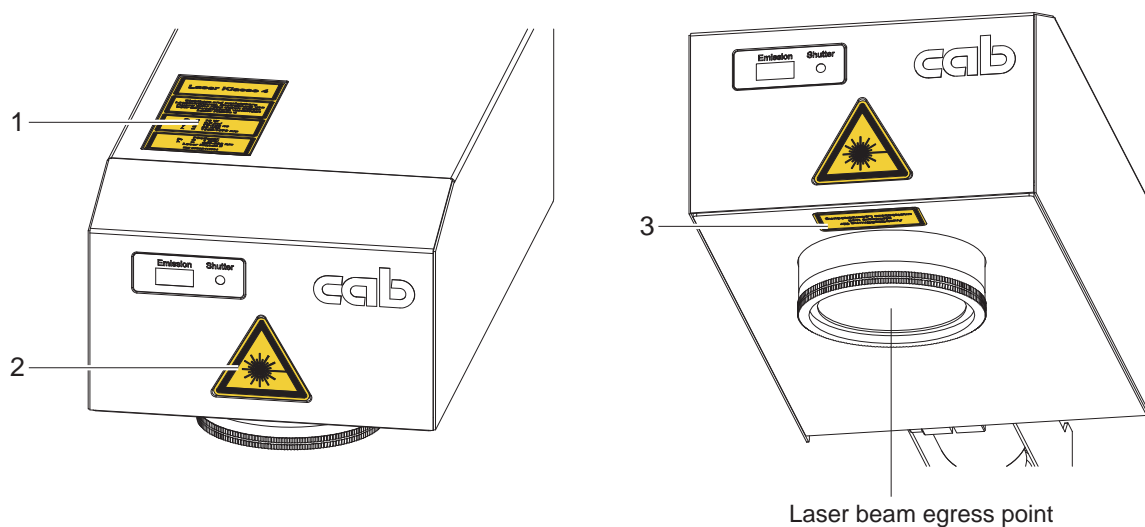
Figure 1   Safety signs

1	**Class 4 Laser Product** EN 60825-1/2008-05 **Visible and invisible Class 4 Laser radiation Avoid eye or skin exposure to direct or scattered radiation** EN 60825-1/2008-05 P₀ = max. 50 W E = max. 1 mJ t = 70-120 ns f = 80 kHz λ = 1055-1070 nm **Pilotlaser** P₀ = 1 mW λ = 630-680 nm **Class 2 Laser Product** EN 60825-1/2008-05	Class 4 Laser radiation of Class 4 is very dangerous for the eye and skin. This also applies for even diffusely scattered laser radiation. The laser radiation may cause danger of fire and explosion. ▶ Safety regulations for Class 4 must be strictly observed
		Pilot laser, Class 2 In the case of class 2 laser devices, the eye is not endangered if the impact of the laser radiation is limited to a maximum period of 0.25 s. ▶ Do not look directly into the laser beam.
2	(laser radiation warning symbol)	Laser radiation warning
3	**AVOID EXPOSURE LASER RADIATION IS EMITTED FROM THIS APERTURE**	Aperture for visible and invisible laser radiation emission

Table 2   Safety signs

1.5 Environment and Health

> ⚠️ **Warning!**
> **Harmful effects on physical health and environment due to by-products set free in the laser processing.**
> **Laser processing produces by-products being harmful to the environment and health. These hazardous substances may be carcinogenic and have effects that are damaging to the lung.**
> **The hazardous substances are particulate (dust / fine dust) or gaseous (smoke, gases).**
> ▶ **Only operate the device with a suitable, certified extraction and filtering device.**
> ▶ **Observe operator's manual for the extraction and filtering device.**
> ▶ **Check regularly the effectiveness of the extraction and filtering device.**
> ▶ **Correctly dispose of spent filters.**

Examples :

Processing of	Hazardous substances	Potential hazard
Ceramic	Aluminum oxide Magnesium oxide Calcium oxide Silicon oxide	Harmful to lungs
	Beryllium oxide	Highly toxic, carcinogenic
Silicon	Silicon and Silicon Oxide fragments	Harmful to lungs Risk of silicosis
Metal	Manganese (Mn) Lead (Pb)	Toxic
	Zinc (Zn) Copper (Cu)	Toxic (allergies)
	Chromium, (Cr) Nickel (Ni) Cobalt (Co)	Carcinogenic
	Aluminum (Al)	Harmful to lungs
	Beryllium (Be)	Risk of pulmonary fibrosis
Plastic	Cyanides Chlorine compounds	Toxic
	Polyvinyl chloride Formaldehyde	Carcinogenic, irritating to respiratory tract
	Benzenes	Carcinogenic
	Amines	Irritating to respiratory tract
	Isocyanate Acrylate	Irritating to skin (Allergies)
Paper and wood	Benzenes	Carcinogenic
	Esters Acids Alcohol	Irritating to respiratory tract

Table 3　　Potential hazards due to laser processing

1.6 Decommissioning and Return

▶ For decommissioning the device has to be disconnected from the mains and peripherals and be secured against unauthorized switching-on.

▶ Housing components and assemblies being contaminated with harmful substances must be cleaned by expert staff.

▶ Keep the device in the original packaging according to the general storage conditions.

Danger!
▶ **For decommissioning the device must be secured against unauthorized switching-on.**

Danger!
▶ **For the return it must be ensured that the device is not contaminated with by-products, i.e. substances being hazardous to health or environment.**

Note!
Use the original packaging for return or transport of the device. The original packaging may be obtained from the manufacturer.

1.7 Disposal

Devices not being used any more and ready for disposal have valuable and recyclable material that may be consigned to recovery.

▶ Make the parts available for recycling.

▶ According to legal regulations, assemblies being contaminated with hazardous substances shall be disposed of separately at suitable collection points.

The circuit board of the device is equipped with a lithium battery.

▶ Used batteries shall be disposed of at an appropriate battery collection point or at the public waste management organizations.

2.1 Scope of Delivery

The scope of delivery is described in the shipping documents of the consignment.

- Marking laser FL+ with lens
- Four feet including screws for mounting the control on a plane surface
- Power cable
- Patch cable
- CD cabLase Editor 5
- Software-Dongle USB cabLase Editor 5
- Assembly instructions
- Lens cover input side Ø47 or Ø75 (depending on the delivered lens)
- Lens cover output side Ø90 or Ø120 (depending on the delivered lens)
- ▶ Check delivery for completeness and faultless condition. Immediately contact the supplier in the event of discrepancies.

2.2 Overview
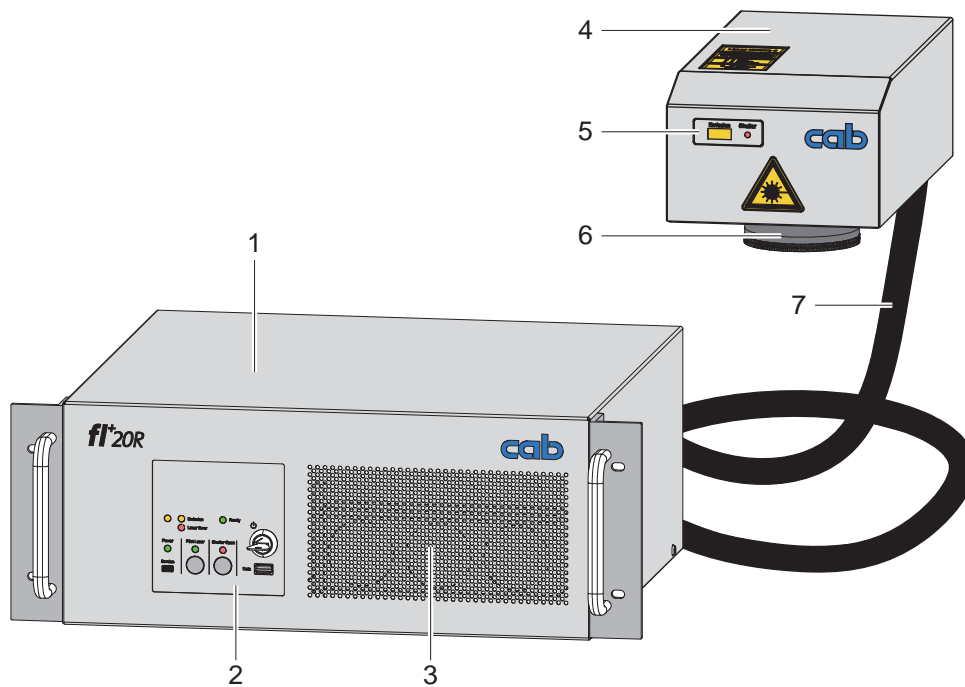
Figure 2   Overview FL+

1   Control
2   Operator control panel
3   Ventilation grill air supply

4   Scan head
5   Status display
6   Lens
7   Connecting cable
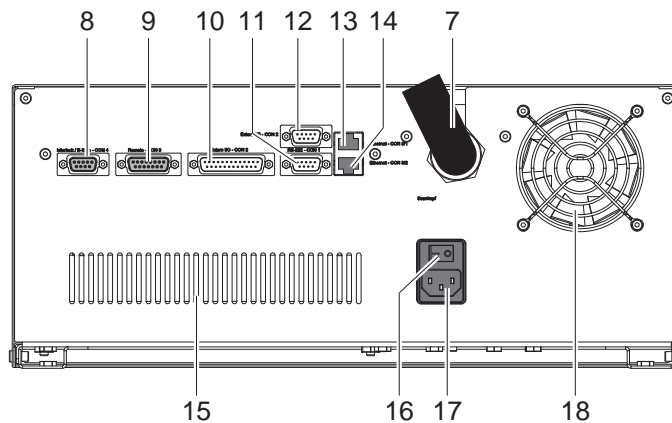
Figure 3   Back side of control

7   Connecting cable
8   Connection safety circuit and Emergency Stop (Interlock / E-Stop - CON4)
9   Digital interface hardware control (Remote - CON3)
10 Digital interface process control (External I/O - CON2)
11 Serial interface for connecting controlled axes, barcode scanner and the like (RS-232 - CON1)
12 Serial interface for connecting controlled axes, barcode scanner and the like (RS-232 - CON5)
13 Ethernet connection to network or local PC (Ethernet - CON8/1)
14 Ethernet connection for controlled axes, barcode scanner and the like (Ethernet - CON8/2)
15 Ventilation grill exhaust air
16 Power switch
17 Power supply jack
18 Ventilator

2.3 Unpacking and Setting-up

When delivered, the marking laser is fully assembled, i.e. control and scan head are linked with each other.

> **!** **Attention!**
> **Potential damage of the device.**
> ▶ **Do not bend the connecting cable, be aware of the minimum bending radius of 80 mm**
> ▶ **Consider the limited length of the connecting cable**
> ▶ **Do not pull at the connection of the connecting cable**
> ▶ **Do not place the scan head on the lens**

▶ Unpack the device and set it up.
  • Scope of delivery includes four feet to set up the devise on a plane surface. The feet can be screwed on the bottom side of the control.
  • The scan head has bores for the assembly on for example a stand.

> ⚠ **Warning!**
> **Danger of unfocused and hazardous laser radiation exposure without having assembled the scan head.**
> ▶ **Only operate the device with the scan head assembled on a fixed bracket.**

▶ After the scan head has been assembled remove the lens cover and keep it safe.
▶ Keep the packaging for a safe return in the event of repair or forward dispatch.

2.4   Integration and Assembly of Marking Laser

> **!** **Attention!**
> ▶ **To assemble the marking laser be aware of the maximum screw lengths and minimum bending radius of 80 mm ▷ Dimension drawings.**
> **Disregarding may result in destroying the device and shall entail the loss of warranty.**

> **!** **Attention!**
> **The connecting cable is not specified to be used in cable chain systems.**

Integrating the device into plants requires checking the assembly on the basis of the following criteria:

- Sufficient ventilation in assembled condition.

- Sufficient ventilation or cooling in case of integration into sealed control cabinets

- Easy access to the marking laser for service/maintenance

- Safe and vibration-free mounting

- Height adjustment of scan head to adapt to the material to be marked

- Do not install movable axes in the area of the marking laser that may result in damages at the device (protection against collision)

- Compliance with all conditions that apply to the operating environment ▷ Safety instructions, technical data.

> **i** **Note!**
> **Depending on the used lens, the application and tolerances, vary the focal length and, accordingly, the necessary position of the scan head.**
> ▶ **Provide for a jig to adjust the correct focal distance.**
> **Adjusting range min. +/-10 mm.**

> **i** **Note!**
> **For an easier integration the scan head may be separated from the control.**

2.5   Separation and Connection of Scan Head

> **!** **Attention!**
> ▶ **Before separating the connecting cable disconnect the device from the mains and make sure the device is placed in a clean, dry and dust-free environment.**
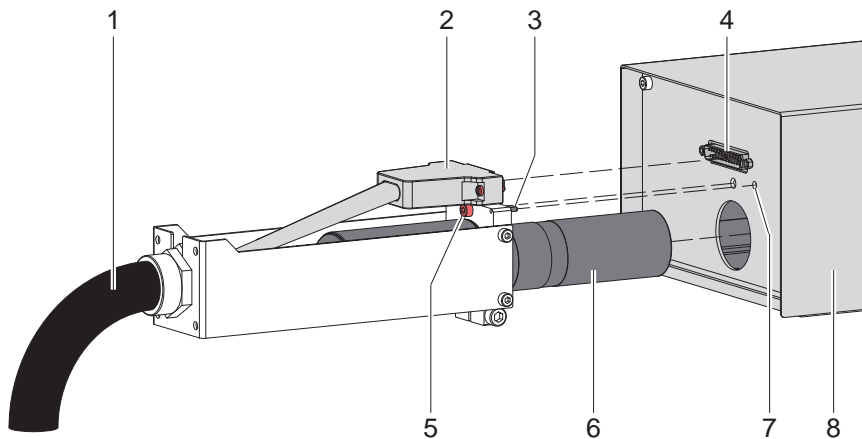
Figure 4   Separation and connection of scan head

Separation

▶ Release screw connections of connectors (2) and disconnect the plug (4).

▶ Release screw (5).

▶ Carefully draw collimator (6) with connecting cable (1) out of the scan head housing (8).

> **!** **Attention!**
> ▶ **Protect collimator and components being accessible by opening the scan head against dust, dirt, moisture and mechanical damage.**

Connection

▶ Proceed in reversed order for connection. Insert pin (3) into the bore (7).

2.6   Connection Mains Voltage Supply

Supply Voltage from the mains has to correspond to the specifications on the typeplate.

▶ Make sure the device is switched off.

▶ Plug power cable in grounded socket.

i **Note!**

▶ **Be aware of country-specific plug**

▶ **If necessary, exchange power cable with country-specific plug!**

2.7   Connection PC/Network

▶ Connect marking laser FL+ by means of the patch cable included in the scope of delivery to the PC or network.

i **Note!**

When delivered, the device is configured with the fixed IP address 192.168.1.11. A functional network connection is essential for all settings of the device.

After being switched on, the device, depending on the current configuration, connects as follows:

	Direct connection to local PC	Connection in a network (LAN)
Configured with fixed IP address: (when delivered)	The marking laser FL+ is immediately ready for a connection with cabLase Editor 5.	The marking laser FL+ is immediately ready for a connection with cabLase Editor 5, provided there is no address conflict. ▶ In the event of an address conflict establish direct connection to local PC and change IP address or switch to DHCP.
Configured for DHCP:	The marking laser FL+ is waiting for the assignment of an IP address via the DHCP server of the local PC. If no DHCP server is found and after a waiting time of up to 90 seconds an "automatic private network address" will be assigned. In this case, the address range 169.254.xxx.xxx. is used	PC and marking laser FL+ are waiting for the assignment of an IP address via the DHCP server.

Table 4   Possibilities of network connection

i **Note!**

Also refer to chapter "Change IP Address Settings".

2.8   Connection Safety Circuit and Emergency Stop

For the operation of the marking laser FL+ special safety installations are necessary whose extend depend on the specific use. The following conditions must be fulfilled:

• Connection of a safety interlock according to DIN EN 60825-1 at the ▷ Interface Interlock / E-Stop - CON4.

• Connection of an Emergency Stop at the ▷ Interface Interlock / E-Stop - CON4.

i **Note!**

Operation of the marking laser is only possible with activated safety interlock and not activated Emergency Stop.

3.1   Control Panel

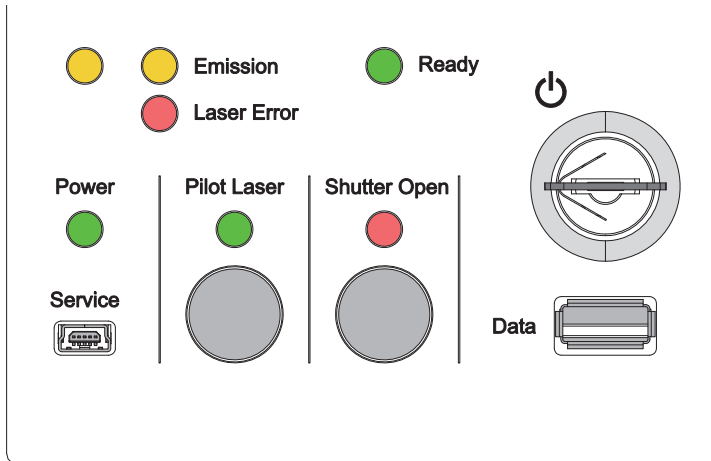The control panel allows to manually operate the device and informs about the device's status.
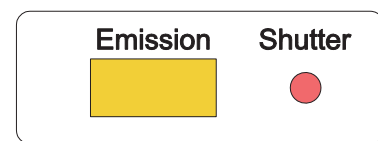

Figure 5   Control panel

Figure 6   Display scan head

Switch	Function	Remark
Key	Switch on/off laser source.	Turn key to position ⏻ to switch on/off. Key afterwards returns to initial position. ▶ Remove key to secure against unauthorized commissioning and to operate via Remote Interface CON3.

Button	Function	Remark
Pilot Laser	Switch on/off pilot laser.	The pilot laser can only be switched on, if the mechanical safety lock (shutter) in the laser's optical path is closed. The pilot laser is automatically switched off in the active laser operation.
Shutter Open	Switch on/off the mechanical safety lock in the laser's optical path.	The safety lock can only be opened with deactivated Emergency Stop and activated safety circuit.

LED	Function
Emission	Laser source switched on
Laser Error	Error function
Ready	Complete device including laser source ready for marking
Power	Mains voltage applied
Pilot Laser	Pilot laser switched on
Shutter Open	Safety lock opened **Attention ! - Possible laser radiation exposure out of the scan head**

Connection	Function
Service	Interface for system diagnosis via a cab remote service program. **Note :** Only persons being trained and authorized by cab are allowed to use this interface.
Data	Interface for removable media (max. 4 GB) with marking layouts / orders and is used as an extension of the laser's internal memory.

Table 5   Function of elements on the control panel

3.2 Marking Laser

Switch on

	Via control panel	**Via CON3**
Switch on voltage	Switch on power switch on the back of the control	
Switch on laser source	Activate key switch	Activate signal "Laser On/Off"
Open shutter	Press button "Shutter Open"	Activate signal "Open Shutter"

Table 6   Switch on marking laser

Reset in the event of an error

	Via control panel	**Via CON3**
Carry out reset	Press buttons "Pilot Laser" and "Shutter Open" for about 5 seconds, then turn key switch to ⏻ .	Activate signal "Reset"
	After a Reset the device is restarted and the laser control initialized. This may take up to 30 seconds!	

Table 7   Reset marking laser

Switch off marking laser

	Via control panel	**via CON3**
Close shutter	Press button "Shutter Open"	Deactivate signal "Open Shutter"
Switch off laser source	Deactivate key switch	Deactivate signal "Laser On/Off"
Switch off voltage	Switch off power switch on the back of the control	

Table 8   Switch off marking laser

Switch off laser source

	Via control panel	**via CON3**
Close shutter	Press button "Shutter Open"	Deactivate signal "Open Shutter"
Switch off laser source	Deactivate key switch	Deactivate signal "Laser On/Off"

Table 9   Switch off laser source

3.3 Pilot Laser

To simulate the marking process the scan head has integrated a pilot laser creating visible light with low intensity (laser class 2). For adjustments, the visible light can be projected into the marking plane, similarly to the beam of the marking laser, by using the optics of the scan head.

	Via control panel	**Via CON3**
Switch on pilot laser	Press button "Pilot Laser"	Activate signal "Pilot Laser On/Off"
Switch off pilot laser	Press button "Pilot Laser" again	Deactivate signal "Pilot Laser On/Off"

Table 10   Switch on and switch off pilot laser

3.4 PC and Software

ℹ **Note!**
To ensure the correct connection of the marking laser to the control program the device must be switched on at the power switch.

▶ Switch on PC
▶ Start marking software "cabLase Editor 5"

4.1   Recommended System Requirements PC

ℹ Note!

To setup and change device-specific settings a PC providing a valid network connection and a licensed installation of cabLase Editor 5 is required.

PC	IBM PC/AT compatible PC
Operating system	Microsoft Windows 7® Professional SP1 (32/64 Bit)
Processor	Intel Core i3-540, or higher
RAM	Min. 1 GB RAM, recommended > 2 GB
Hard disc	Memory requirements software 1 GB Recommended size of hard disc > 40 GB
Drives	CD ROM or DVD drive for software installation
Interfaces	Network card 10/100 MBit for connection laser PS2 / USB interfaces for mouse / keyboard USB 2.0 connection for dongle Optionally: USB 2.0 connection for storage medium Optionally: RS-232 interface for cab axis systems or cab LabelMarker
Software	cabLase Editor 5 Version 5.1.10.12 and higher
Monitor	SVGA, recommended resolution 1280 x 1024

Table 11   System requirements PC

ℹ Note!

To be able to carry out device-specific settings it is necessary to have a basic knowledge of how to work with the marking program cabLase Editor 5.

4.2   Installation of cabLase Editor 5

ℹ Note!

To be able to do the installation of the software it is necessary to have an advanced knowledge in working with the operating system and cabLase Editor.

For detailed information and instructions how to create marking programs ▷ refer to the enclosed software documentation

⚠ Attention!
- **To enable full function of the software cabLase Editor 5 requires an HASP-Dongle (licence). There is not connection to the marking laser possible without that dongle.**
- **The HASP dongle must not be connected to the USB interface at the time of installation.**

▶ Start PC.

▶ Log in as administrator. The user needs to have local administrator rights to carry out the installation.

▶ Insert CD "cabLase Editor 5" into CD drive.

▶ Start CD.

▶ Open menu "Installation".

▶ Start installation of cabLase Editor 5.

▶ Follow instructions on the screen.

▶ Connect the dongle to a free USB interface after having installed the software successfully.
  The dongle is automatically recognized. All software functions are available.

4.3 Starting cabLase Editor 5

▶ Start cabLase Editor 5.

Figure 7   Icon cabLase Editor 5

After the start of the program the following message may appear:

Figure 8   Windows security alert

> **!**
>
> **Attention!**
> **For cabLase Editor 5 laser access the communication with all networks must be allowed.**
> ▶ **Enable access in all check boxes.**
> ▶ **Click "Allow access".**

The main window which is displayed after having started the marking program cabLase Editor 5 is divided into the following areas:

• 1 - Laser devices and currently opened layouts

• 2 - Object list

• 3 - Layout

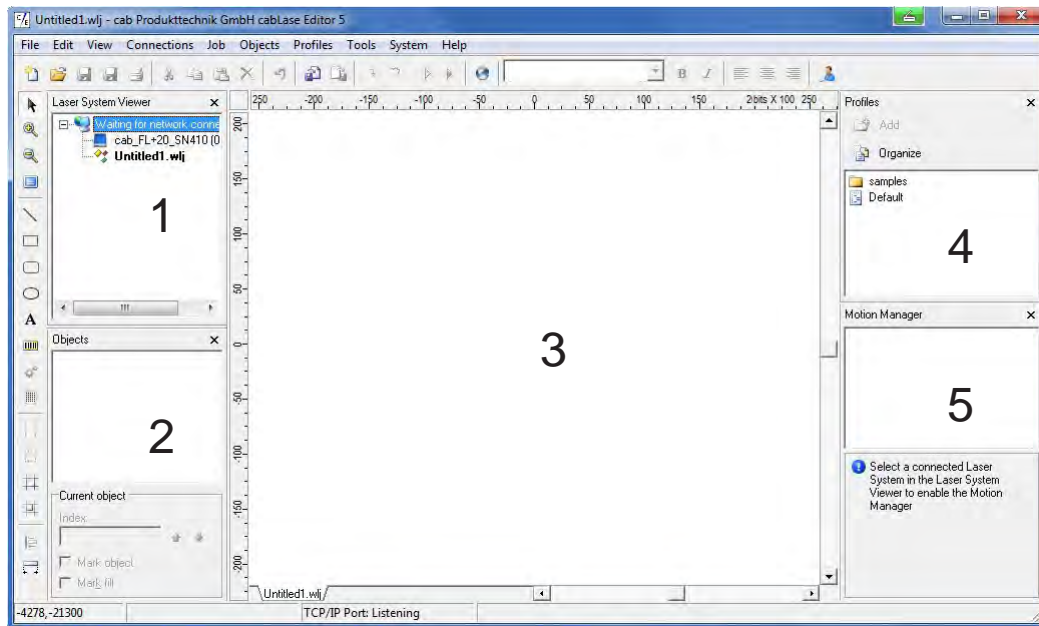• 4 - Profiles with marking parameters

• 5 - Motor manager

Figure 9   Main window cabLase Editor 5

i **Note!**
The layout of the main window shown above may differ from that of the screen and depends on the settings in the menu "View".

4.4   Selection of Network Adapter

cabLase Editor 5 supports several network adapters installed in the local PC.

ℹ **Note!**

In the event that there are more network adapters available, connection sequence for the network adapter under Windows shall be so that the laser marker FL+ is the first to be connected! ▷ Documentation Windows

Example Windows 7

▶ Select "Control panel > Network and sharing center > Change adapter settings".

▶ Select menu "Advanced > Advanced settings".

▶ Select under "Connections" the connection that is used for connecting the FL+.

▶ Use the arrow keys next to the window to move the connection selected to the top line.
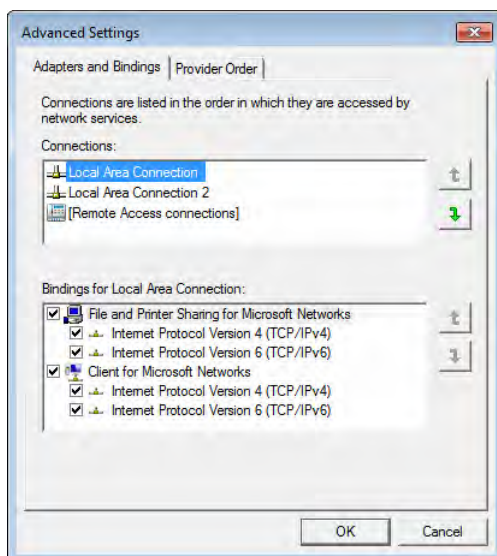
▶ Click on "OK".

Figure 10   Priority setting of the network adapter

The network connection connected to the device must be set as default in cabLase Editor 5.

▶   Select "Connections > Manage" in the main menu bar.

▶   Select the tab "Network adapters".
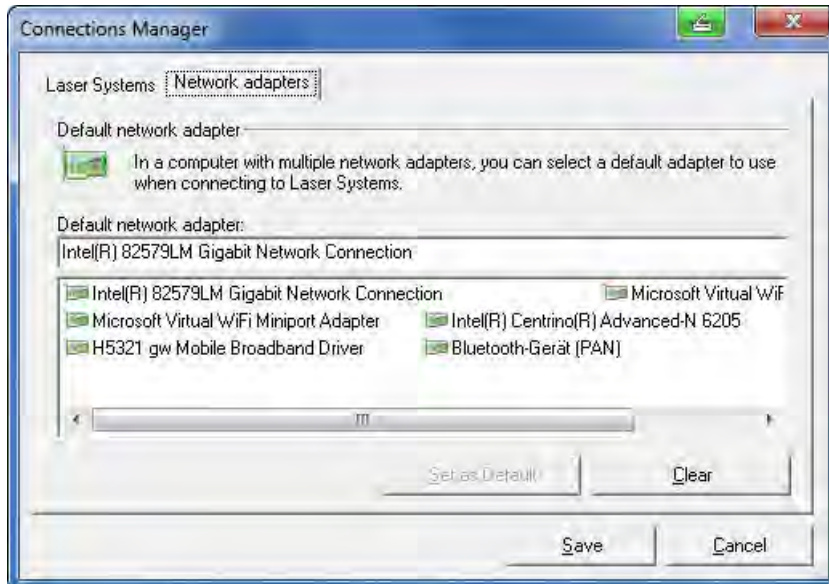

Figure 11   Selection of network adapter

▶   Select the network adapter to which the FL+ is connected.

▶   Click on "Set as default".

Note!

If the subnets are incompatible the marking laser FL+ adds an temporary IP address to the default PC network adapter. Once the PC is restarted this temporary address will be deleted.

4.5 Set up Manual Connection of the FL+ with cabLase Editor 5

ℹ **Note!**
Before connecting cabLase Editor 5 with the marking laser FL+ a network connection must be created.

ℹ **Note!**
Make sure that the marking laser FL+ has been switched on at the power switch!

After having started the software the message "Searching for laser devices" under the window "Laser System Viewer" is displayed.
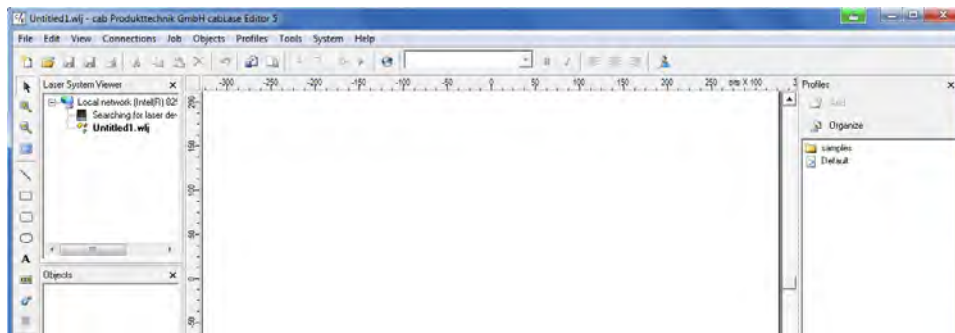
Figure 12   Search for laser devices

▶ Right-click within the window "Laser System Viewer", select the marking laser FL+ detected in the network and click on "Connect".
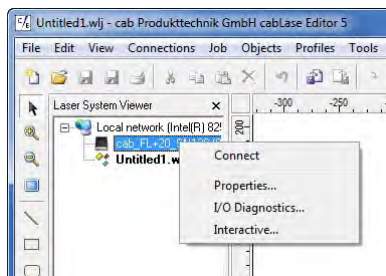

Figure 13   Connecting the laser device

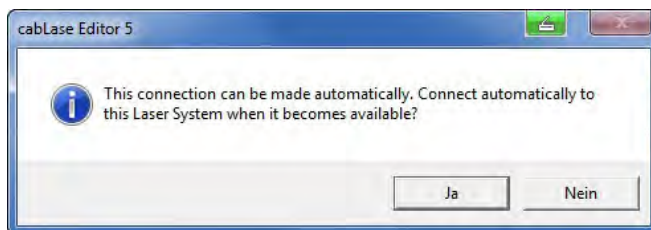This is followed by a query to set up an automatic connection:

Figure 14   Query automatic connection

▶ Select the method to connect required.

ℹ **Note!**
Setting up the automatic connection can be carried out even later.

This is followed by transmitting the configuration settings of the marking laser FL+ to the local PC. The downloading status is shown in the "Pending connections viewer".
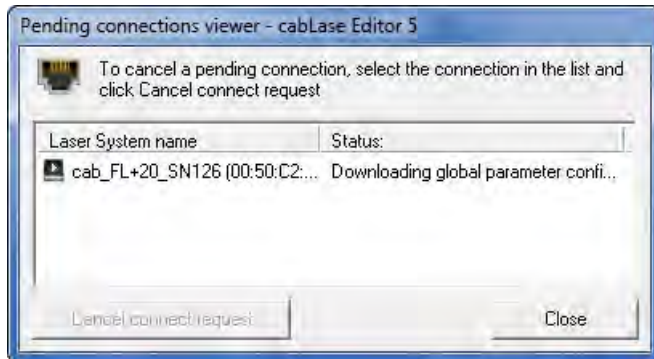
Figure 15   Pending connections viewer

The following icons are used to show different states of connection:

Symbol	Status
	Available in the network
	Not available in the network
	Connected to local installation cabLase Editor 5
	Invalid firmware or license
	PC software incompatible

Table 12   States of connection

Moving the mouse cursor over the laser device detected shows its status of connection:
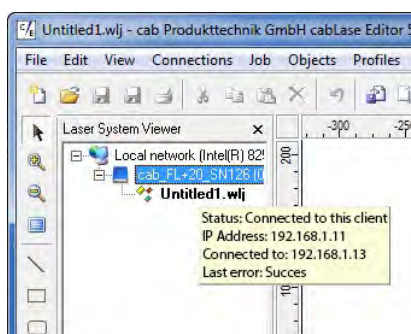
Figure 16   Display status of connection

ℹ   **Note!**
Click on "Disconnect" to close an active connection.

4.6 Set up Automatic Connection of the FL+ with cabLase Editor 5

▶ Select menu "Connections" > Manage". This is followed by the input/output window:
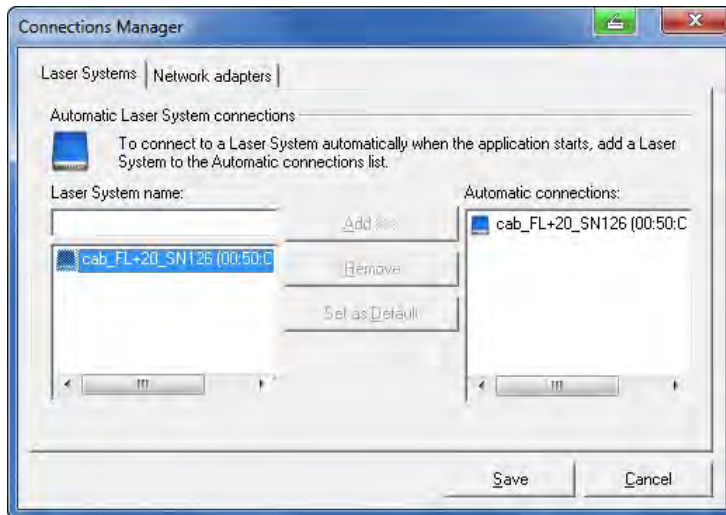
Figure 17   Set up automatic connection

The left windows shows all marking lasers FL+ available in the network, each with their respective MAC addresses.

▶ Click on the marking laser FL+ to be connected:
The marking laser selected is highlighted in blue.

▶ Click on "Add".
The marking laser is added to the list "Automatic connections".
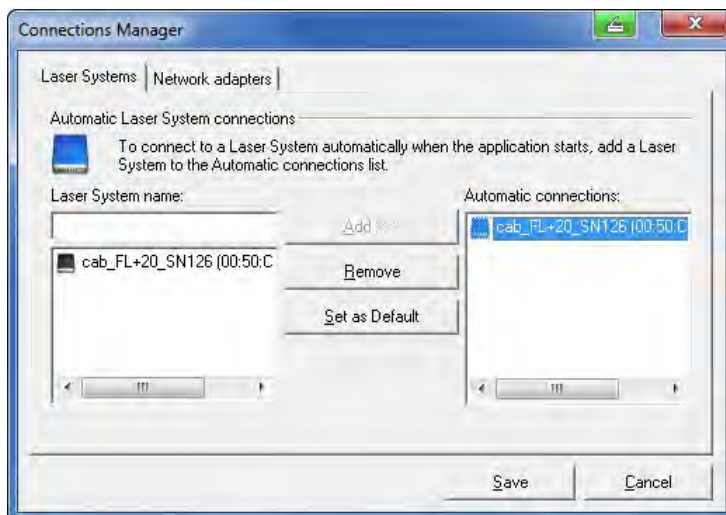
Figure 18   Set marking laser as default

▶ Select the marking laser required in the list "Automatic connections" and confirm by clicking on "Set as default".
Selection is confirmed by a check mark in the PC icon.

▶ Click on "Save" to confirm the settings selected.

ℹ   **Note!**
When starting the software, cabLase Editor 5 now always set up automatically connection with the marking laser FL+ selected.

4.7   Changing the IP Address

> **Attention!**
> **Incorrect settings of the IP address may result in losing connection and only might be restored by changing the settings at the local PC**

▶ Select and right-click within the window on the marking laser FL+ detected and click on "Default settings".
▶ Select "Network".

Figure 19   Setting the IP address

▶ Select under mode "Address type: Manually configured" and enter the IP address to be used.

4.8   Configuration Marking Laser and Lens

ℹ **Note!**

To carry out configuration and calibration of the marking laser the user has to be logged in with local administrator rights.

cabLase Editor 5 supports two kinds of configuration:

- **Active configuration**

Applies laser and lens configurations from the active, connected marking laser

- **OFFLINE configuration**

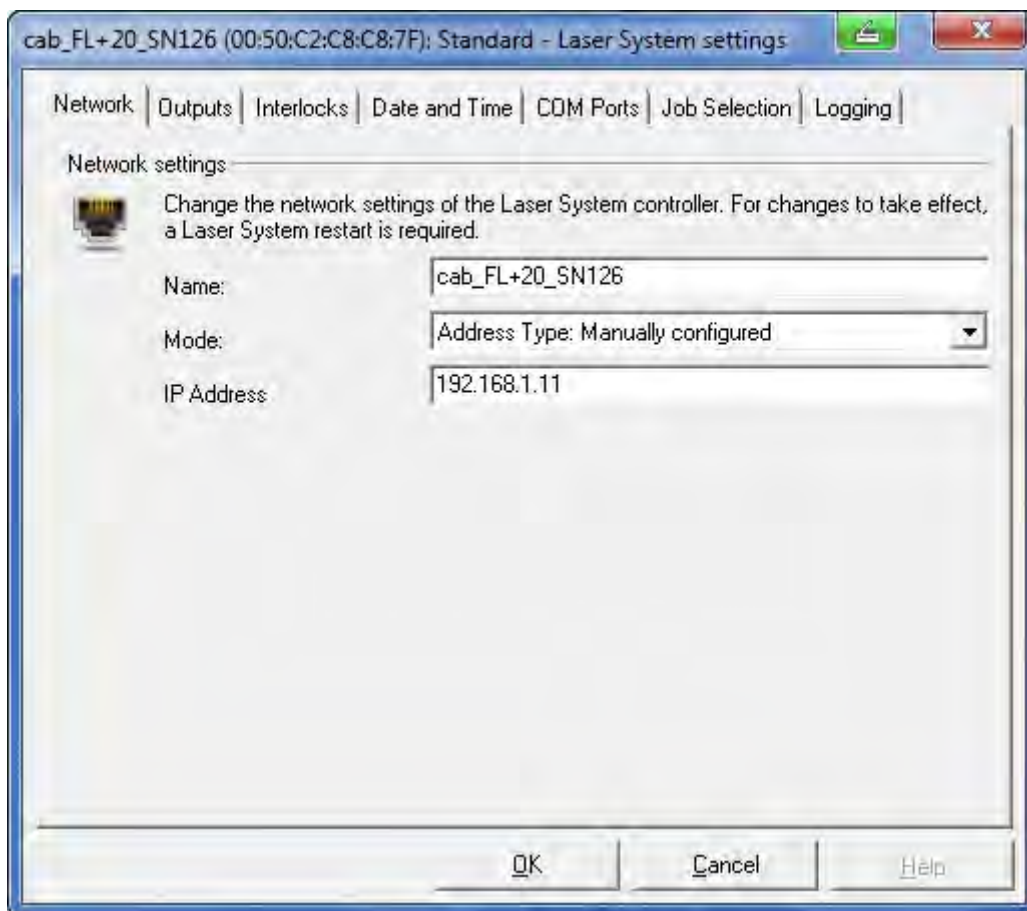Provides all necessary laser and lens configurations to cabLase Editor 5, if there is no active connection to the device.

⚠ **Attention!**
For a proper function, all configurations for the active and OFFLINE configuration must be identical.

Selecting the configuration
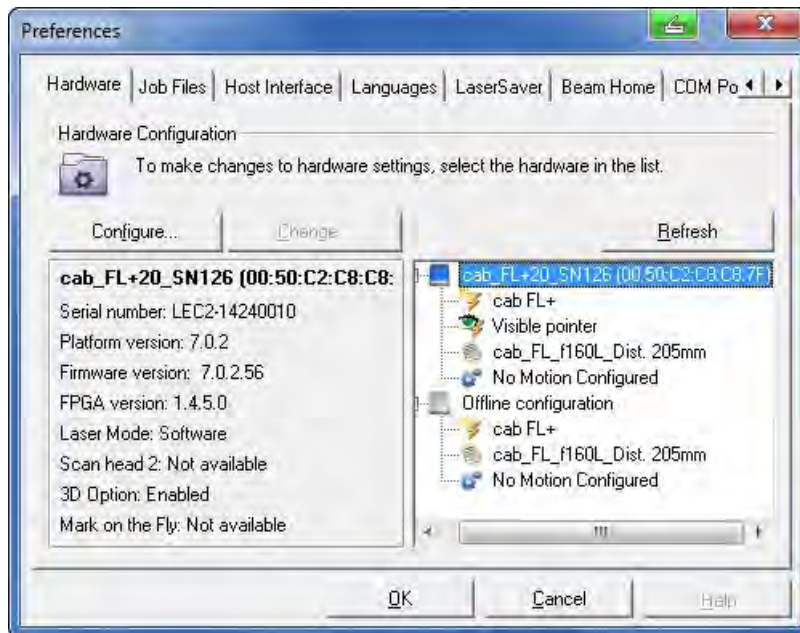
Figure 20   Configuration window

▶ Select in the main menu bar "System > Preferences".
▶ Select "Hardware".
▶ Select either the active or OFFLINE configuration in the right window.
▶ Adapt both of the configurations in the same way to the hardware.

ℹ **Note!**

Lens configuration depends on the plano-spherical lens used. When generating layouts, especially in the OFFLINE mode, particular car shall be taken to use in each case the correct laser and lens configuration. The wrong selection may result in a wrong scaling and distortion of the print image.

ℹ **Note!**

In general, correct marking laser default configuration does not need to be changed.

ℹ **Note!**

**All lens configurations marked with (*) show that a default configuration has been changed.
This can also be shown after the calibration of the marking field.
▷ Documentation Software "Correction of Mechanical Alignment Tolerances".**

4.9   Settings for Stand-Alone Operation

The marking laser FL+ provides the ability to mark jobs without data transmission from the PC (stand-alone operation). In this case, a higher-level control (e.g. PLC) completely handles the operation of the marking laser FL+. For this purpose, the "Remote Command API" (Application Programming Interface) and "COM Automation Server" (▷ Scope of delivery software) are available and additionally allow access to stored data via the "Job Select" signal.

To operate the marking laser FL+ in the stand-alone operation job files and laser character fonts need to be saved in binary format in the memory of the FL+ controller and called via subroutine or system explorer.

i   **Note!**

Editing and modifying is only possible with *.wlj files.

When transmitting data into the memory of the marking laser FL+, these are automatically converted via cabLase Editor 5 into binary *.dat job files.

The laser system explorer can be used to copy available *.dat files from the marking laser FL+ to a local PC.

4.9.1   Storing *.wlj files to the Memory of the Laser

The example requires two job files on the PC, named 1.wlj and 2.wlj.
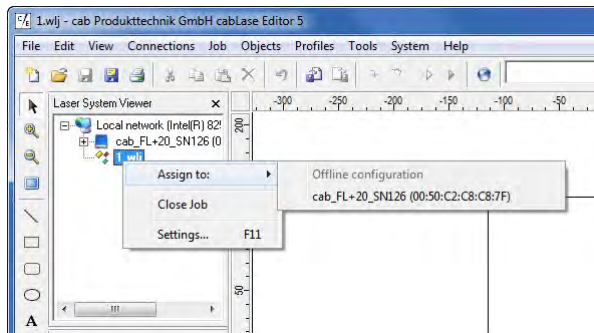
Figure 21   Selection destination data storage

▶ Right-click within the window "Laser System Viewer" on an opened job.

▶ Select via "Assign to" the active marking laser FL+ as destination for data storage.

▶ Copy the job via "Save to marking laser"Job into the memory of the marking laser.
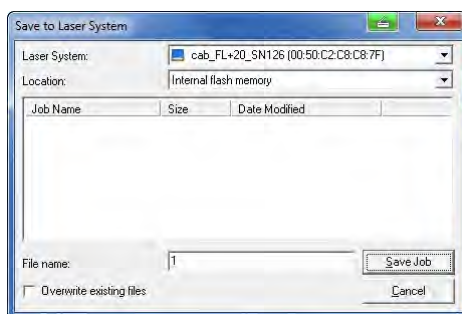
Figure 22   Setting file name

▶ Fix a name for the file and click on "Save job".
The example files are converted into binary *.dat job files and stored as 1.dat, respectively 2.dat in the memory of the marking laser. However, these data are a lot larger than the original *.wlj files.

i   **Note!**

To call marking layouts stored in the internal memory via digital coding, the input "Job Select" on CON2 of the marking laser FL+ needs to be activated!

Access via "Remote Command API" and "COM Automation Server" is always possible.

4.9.2 Managing *.dat files

Figure 23   Calling the system explorer

▶ Click within the window "Laser System Viewer" on active device and select "Explore...".
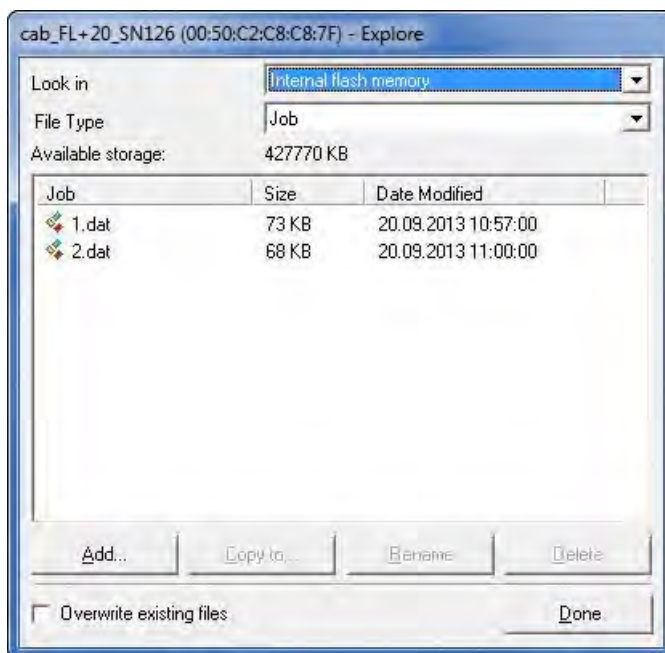
Figure 24   Display list job files

▶ Select "Internal flash memory" and type of file "Job" to show stored .dat files.
▶ Select "Copy to..." to copy files from the marking laser FL+ to the local PC.
▶ Select "Add.." to copy .dat files already available on the local PC to the marking laser FL+.

4.9.3   Storing Laser Font files

The following example uses text objects in the job files called 1.wlj and 2.wlj, respectively 1.dat and 2.dat created with the with the Arial font type. This font type needs to be loaded into the memory of the laser.
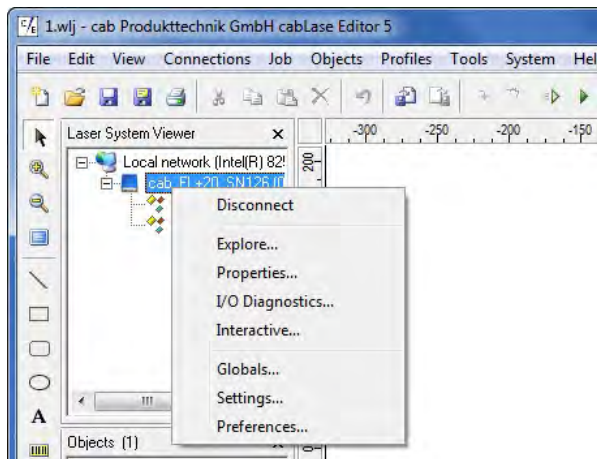
Figure 25   Calling the system explorer

▶   Click within the window "Laser System Viewer" on active device and select "Explore...".
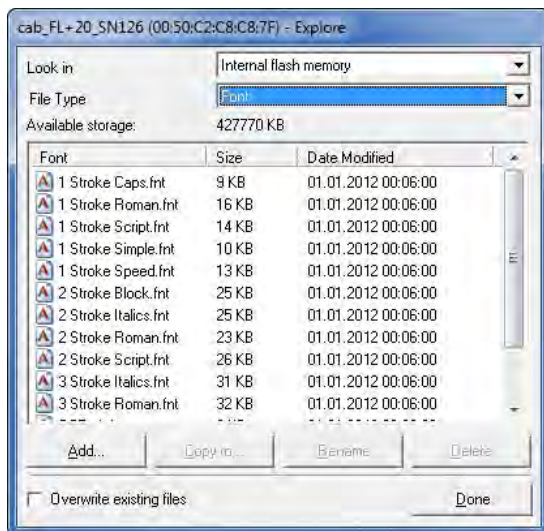
Figure 26   Display list font files

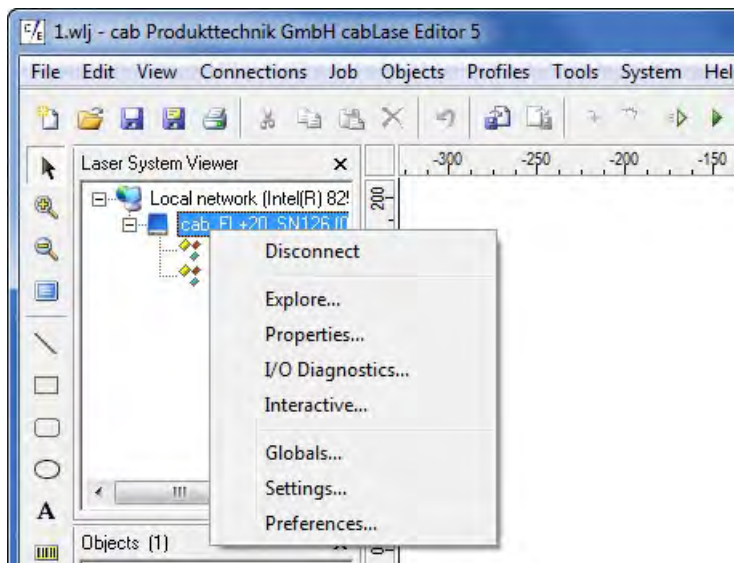▶   Select "Internal flash memory" and type of file "Font" to show laser fonts available.
▶   Select "Add..." to copy laser font from the local PC to the marking laser FL+.
▶   Select "Copy to..." to copy laser front from the marking laser FL+ to the local PC.

ⓘ   **Note!**

Default directory for laser font files installed on the local PC is: c:\marker\marker\fonts.
Further information about converting TrueType fonts into laser fonts ▷ Documentation software.

❗   **Attention!**

For using the newly installed fonts the laser system must be re-initialized with one of the following methods:

- **Switch off and on the laser system.**
- **Carry out reset by the control panel ▷ 3.2 on page 18.**
- **Carry out reset by the external control via CON3 - Pin10.**

4.10 Automation with cabLase Editor 5

ℹ **Note!**
To create the below showcase program it is necessary to have a basic knowledge in the marking software cabLase Editor 5.

ℹ **Note!**
Refer to the enclosed software documentation for detailed descriptions about programming and creating marking programs.

ℹ **Note!**
Refer to the description of interfaces for more information about automation and use of interfaces.

For the automation of marking applications (integration into automation systems) each job to be handled can be initialized for a correct communication.

▶ Select and right click on the layout to set the automation parameters and then open "Default settings".

▶ Carry out settings under "External start" and "Repeat process".

4.10.1 Settings "External Start"

▶ Select between "Mark immediately" and "Wait for an external start signal".

ℹ **Note!**
Setting "Wait for and external start signal" activates the query of the input signal "Start Process" at the external interface I/O (CON2 - Pin14).

When selecting "Wait for external start signal" a window opens to set the parameters for the start signal.
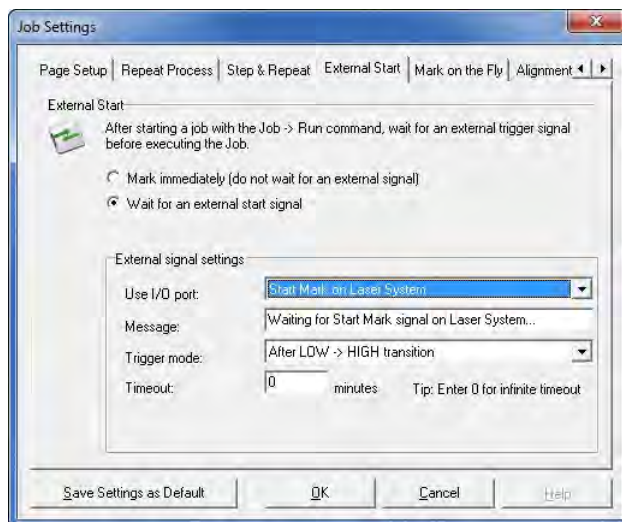
Figure 27   Settings "External start"

• Use I/O port :   Remains unchangeable on „Start process on I/O port"

• Message :   Freely definable

• Trigger mode :   Set to "After LOW -> HIGH transition".

• Timeout :   Delay between start signal and execution of the marking job

4.10.2 Settings "Repeat Process"

This window is used to set the process flow in the cyclic operation mode.

Figure 28   Settings "Repeat process"

Setting	Description
FOR OPERATION FROM THE CONSOLE	Starting each cycle via software
Prompt operator between each cycle, and run indefinitely	Continuous operation
Prompt operator between each cycle, and stop the process after ... cycle(s)	Operation with defined number of cycles
AUTOMATION ONLY	One single start of the job via software Start of every single cycle via automation control
Do not prompt between cycles, and run indefinitely	Continuous operation
Do not prompt between cycles, but stop after ... cycle(s)	Operation with defined number of cycles
Save Job after every cycle	Saving jobs with current values of variable fields (counter or date fields) to be able to continue with updated values when calling again.

Table 13   Settings "Repeat process"

▶ Select one of the setting under "AUTOMATION ONLY" for the automated operation.

5.1 RS-232 Interfaces CON1, CON5

The device is equipped with two serial interfaces.

The interfaces have each a SUB-D connector, 9 pole.

ℹ️ Note!
The interfaces can only be used via customer-specific programming with the "COM Automation Server" or "Remote Command API" (▷ Scope of delivery software) and are not supported in cabLase Editor 5.
The interfaces are used for data transmission from and to peripherals such as turning axes, linear NC lifting axes or barcode scanners.
The devices are connected depending on the configuration of the periphery.

⚠️ Attention!
Each of the serial interfaces provide a voltage of 5 VDC at pin 9 for external devices. Maximum current at both of the interfaces must not exceed a total of 500 mA.

Pin 1   Pin 5
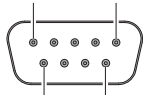
Pin 6 Pin 9

Figure 29   Serial interfaces CON1 and CON5

Pin	Signal CON1 / CON5
1	-
2	RxD
3	TxD
4	-
5	GND
6	-
7	-
8	-
9	5 VDC for external devices

Table 14   Pinout CON1 and CON5

Parameter	Values
Baud rate	110,300,600,1200,2400,4800,9600, 19200,38400,56000,57600,115200
Data bits	8
Parity	no
Stop bits	1
Handshake	-

Table 15   Parameters CON1 and CON5

ℹ️ Note!
For programming with "COM Automation Server" and "Remote Command API" the serial interfaces are assigned the following names:
COM1 : CON5
COM2 : internal interface to access all data of the laser source
COM3 : CON1

5.2   External Interface I/O CON2

For the integration into higher-level control procedures the device is equipped with an I/O Interface allowing to individually program eight in- and outputs for example via cabLase Editor 5. The interface has a SUB-D connector, 25 pole.

Pin 1   Pin 13

Pin 14   Pin 25

Figure 30   External interface I/O

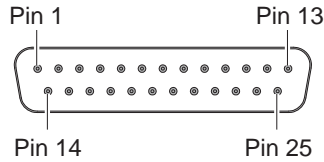| Pin	Signal	Name	Description	Activation / active
1		FP24V	Internal operating voltage +24 V, Si T 500 mA to supply external devices will be switched off at emergency stop	Note : Using the internal +24V (Pin 1) supplying the inputs requires to connect Pin 1 with Pin 12 and Pin 13 with Pin 25.
2	⟲▸	Ready to Mark	Marking job is loaded, device is waiting to start marking	Contact Pin 2 / Pin 12 closed Contact closed during laser control initialization
3	⟲▸	Busy	Marking job is running	Contact Pin 3 / Pin 12 closed Contact closed during laser control initialization
4	⟲▸	User Out1	Individually programmable	Contact Pin 4 / Pin 12 closed
5	⟲▸	User Out2	Individually programmable	Contact Pin 5 / Pin 12 closed
6	⟲▸	User Out3	Individually programmable	Contact Pin 6 / Pin 12 closed
7	⟲▸	User Out4	Individually programmable	Contact Pin 7 / Pin 12 closed
8	⟲▸	User Out5	Individually programmable	Contact Pin 8 / Pin 12 closed
9	⟲▸	User Out6	Individually programmable	Contact Pin 9 / Pin 12 closed
10	⟲▸	User Out7	Individually programmable	Contact Pin 10 / Pin 12 closed
11	⟲▸	User Out8	Individually programmable	Contact Pin 11 / Pin 12 closed
12		24V extern	External operating voltage +24V, Si T3A	
13		GND	0 V internal	
14	⟲◂	Start Process	Start of marking according to settings made in the software	Connect to +24V between Pin 14 and Pin 25
15	⟲◂	Job Select	**Active :** Job data are loaded from an internal file and can be opened via binary coding by using the digital inputs ▷ Storing job files for the stand-alone operation **Inactive :** Job data are loaded from the PC	Connect to +24V between Pin 15 and Pin 25
16	⟲▸	Error	Error message of the control	Contact Pin 16 / Pin 12 closed Contact closed during laser control initialization
17	⟲◂	User In1	Individually programmable	+24V between Pin 17 and Pin 25
18	⟲◂	User In2	Individually programmable	+24V between Pin 18 and Pin 25
19	⟲◂	User In3	Individually programmable	+24V between Pin 19 and Pin 25
20	⟲◂	User In4	Individually programmable	+24V between Pin 20 and Pin 25
21	⟲◂	User In5	Individually programmable	+24V between Pin 21 and Pin 25
22	⟲◂	User In6	Individually programmable	+24V between Pin 22 and Pin 25
23	⟲◂	User In7	Individually programmable	+24V between Pin 23 and Pin 25
24	⟲◂	User In8	Individually programmable	+24V between Pin 24 and Pin 25
25	⟲◂	GND extern	Common potential for all inputs, 0V external	

Table 16   Pinout external interface I/O

Digital Inputs
- conform to IEC/EN 61131-2 (Type 1)
- Operating voltage: 24 V DC (18..30 V)
- Switching logic: PNP switching
- Low level „0": < 5 V DC
- High level „1": > 15 V DC
- Input current per channel: 3.4 mA (at 30 V DC)
- Galvanic isolation: 0.5 kV
- Reverse polarity protection: yes
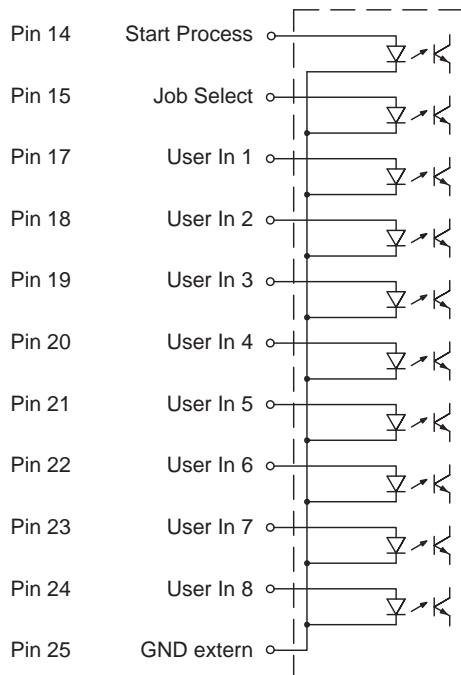- ESD protection: up to 2.5 kV (Human Body Model)

Digital Outputs
- conform to IEC/EN 61131-2
- Operating voltage: 24 V DC (18..30 V)
- Switching logic: PNP switching
- Output current per channel: 600 mA (overload protection)
- Total output current: 3 A
- Galvanic isolation: 0.5 kV
- Short-circuit protection: yes
- Reverse polarity protection: yes
- ESD protection: up to 2 kV (Human Body Model)

Pin 14	Start Process
Pin 15	Job Select
Pin 17	User In 1
Pin 18	User In 2
Pin 19	User In 3
Pin 20	User In 4
Pin 21	User In 5
Pin 22	User In 6
Pin 23	User In 7
Pin 24	User In 8
Pin 25	GND extern

Figure 31   Connecting inputs

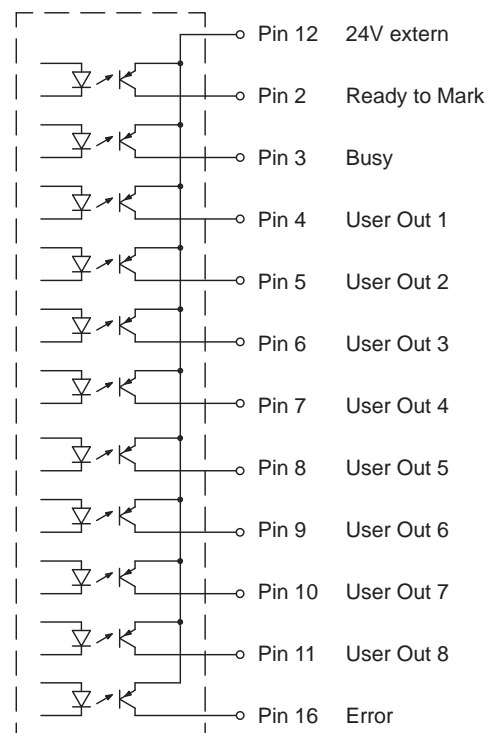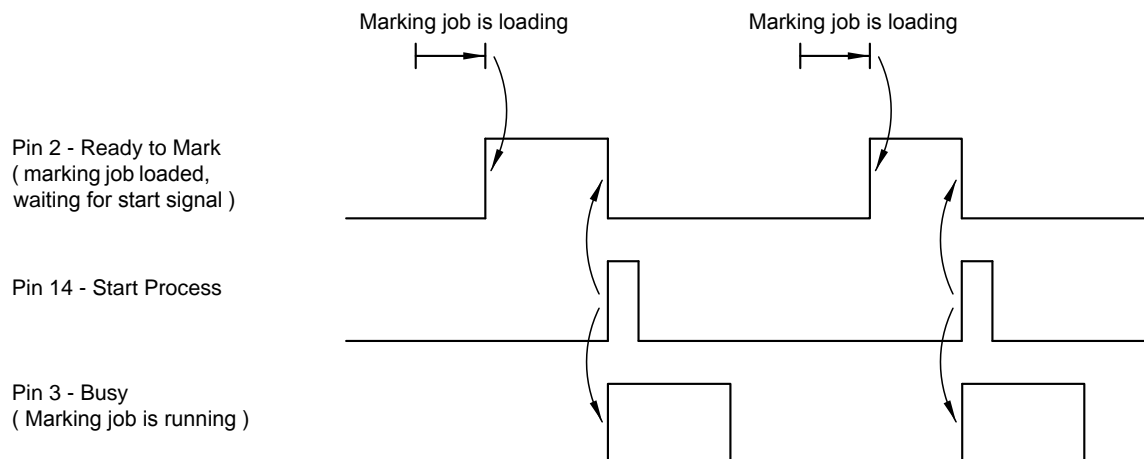| Pin 12 | 24V extern |
Pin 2	Ready to Mark
Pin 3	Busy
Pin 4	User Out 1
Pin 5	User Out 2
Pin 6	User Out 3
Pin 7	User Out 4
Pin 8	User Out 5
Pin 9	User Out 6
Pin 10	User Out 7
Pin 11	User Out 8
Pin 16	Error

Figure 32   Connecting outputs

! **Attention!**
Loss of function!
Do not connect Pin 12 with external 0 V (GND).

Signal diagram job control

Marking job is loading   Marking job is loading

Pin 2 - Ready to Mark
(marking job loaded,
 waiting for start signal)

Pin 14 - Start Process

Pin 3 - Busy
(Marking job is running)

Figure 33   Signal diagram

5.3 Remote Interface CON3

The Remote Interface CON3 is used to control the hardware of the FL+.
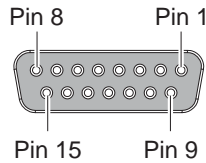
The interface has a SUB-D connector, 15 pole.

Pin 8   Pin 1

Pin 15   Pin 9

Figure 34   Remote Interface

Pin	Signal	Name	Description	Activation / active
1		FP24V	Internal operating voltage +24 V, max. 500 mA to supply external devices will be switched off at emergency stop	Note : Using the internal +24V (Pin 1) supplying the inputs requires to connect Pin 1 with Pin 7 and Pin 8 with Pin 15.
2	⊖►	Power	Mains voltage applied	Contact between Pin 2 and Pin 7 closed
3	⊖►	Shutter Open	Shutter is open	Contact between Pin 3 and Pin 7 closed
4	⊖►	Emission	Laser source is switched on ▶ Keep to the special safety instructions for the operation under laser class 4	Contact between Pin 4 and Pin 7 closed
5	⊖►	Error	There is an error occurred in the control	Contact between Pin 5 and Pin 7 closed
6	⊖►	Laser Ready	Control and laser source are switched on and ready for marking	Contact between Pin 6 and Pin 7 closed
7		24V extern	External operating voltage +24V, Si T3A	
8		GND	0V internal	
9	⊖◄	Job Select Register	**active :** User In/Out 1 to User In/Out 4 at CON2 are used as digital inputs/outputs 1 to 4 in cabLase **inactive :** User In/Out 1 to User In/Out 8 at CON2 are used as digital inputs/outputs 5 to 12 in cabLase **Note:** Supplying Pin 9 is only evaluated for the initialization of the marking laser (Switch on and Reset)! When the signal is inactive User in 1 to 8 can be used to select layouts but objects inside a layout cannot be selected.	+24V between Pin 9 and Pin 15
10	⊖◄	Reset	Reset the marking laser **Note :** The restart after reset and initialization of the laser control may take up to 30 seconds!	+24V between Pin 10 and Pin 15
11	⊖◄	Laser On/ Off	**Active :** Switch on laser source Conditions for switching on: Emergency Stop not active, shutter closed **Inactive :** Switch off laser source	+24V between Pin 11 and Pin 15
12	⊖►	Pilot Laser is On	Pilot laser is switched on	Contact between Pin 12 and Pin 7 closed
13	⊖◄	Open Shutter	Requirements to open shutter Conditions for opening: Emergency Stop not active, interlock closed	+24V between Pin 13 and Pin 15

Pin	Signal	Name	Description	Activation / active
14	⊙―	Pilot Laser On/Off	**Active :** Switch on pilot laser Conditions for opening: Emergency Stop not active, shutter closed **Inactive :** Switch off pilot laser	+24V between Pin 14 and Pin 15
15		GND extern	Common potential for all inputs, 0V external	

Table 17   Pinout Remote Interface

Digital Inputs

- conform to IEC/EN 61131-2 (Type 1)
- Operating voltage: 24 V DC (18..30 V)
- Switching logic: PNP switching
- Low level „0":   < 5 V DC
- High level „1":   > 15 V DC
- Input current per channel: 3.4 mA (at 30 V DC)
- Galvanic isolation: 0.5 kV
- Reverse polarity protection: yes
- ESD protection: up to 2.5 kV (Human Body Model)

Digital Outputs

- conform to IEC/EN 61131-2
- Operating voltage: 24 V DC (18..30 V)
- Switching logic: PNP switching
- Output current per channel: 600 mA (overload protection)
- Total output current: 3 A
- Galvanic isolation: 0.5 kV
- Short-circuit protection: yes
- Reverse polarity protection: yes
- ESD protection: up to 2 kV (Human Body Model)

Pin 9   Job Select Register
Pin 10   Reset
Pin 11   Laser On/Off
Pin 13   Open Shutter
Pin 14   Pilot Laser On/Off
Pin 15   GND extern

Figure 35   Connecting inputs

Pin 7   24V extern
Pin 2   Power
Pin 3   Shutter Open
Pin 4   Emission
Pin 5   Error
Pin 6   Laser Ready
Pin 12   Pilot Laser in On
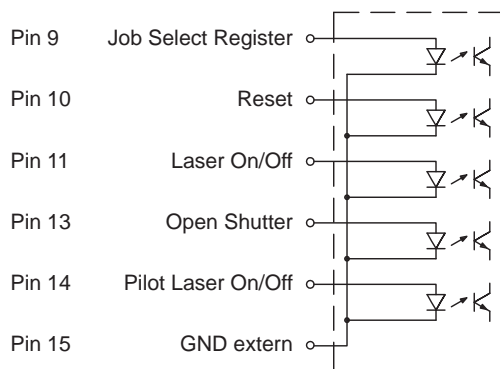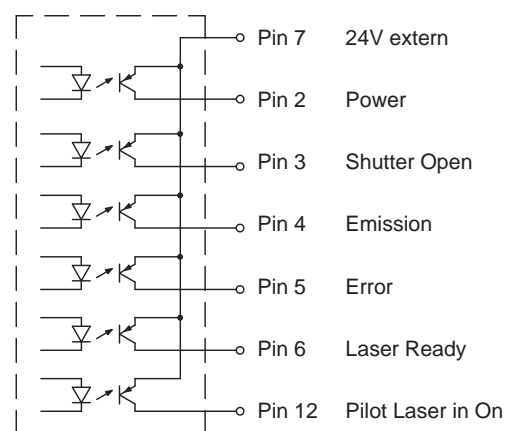
Figure 36   Connecting outputs

! **Attention!**
Loss of function!
Do not connect Pin 7 with external 0 V (GND).

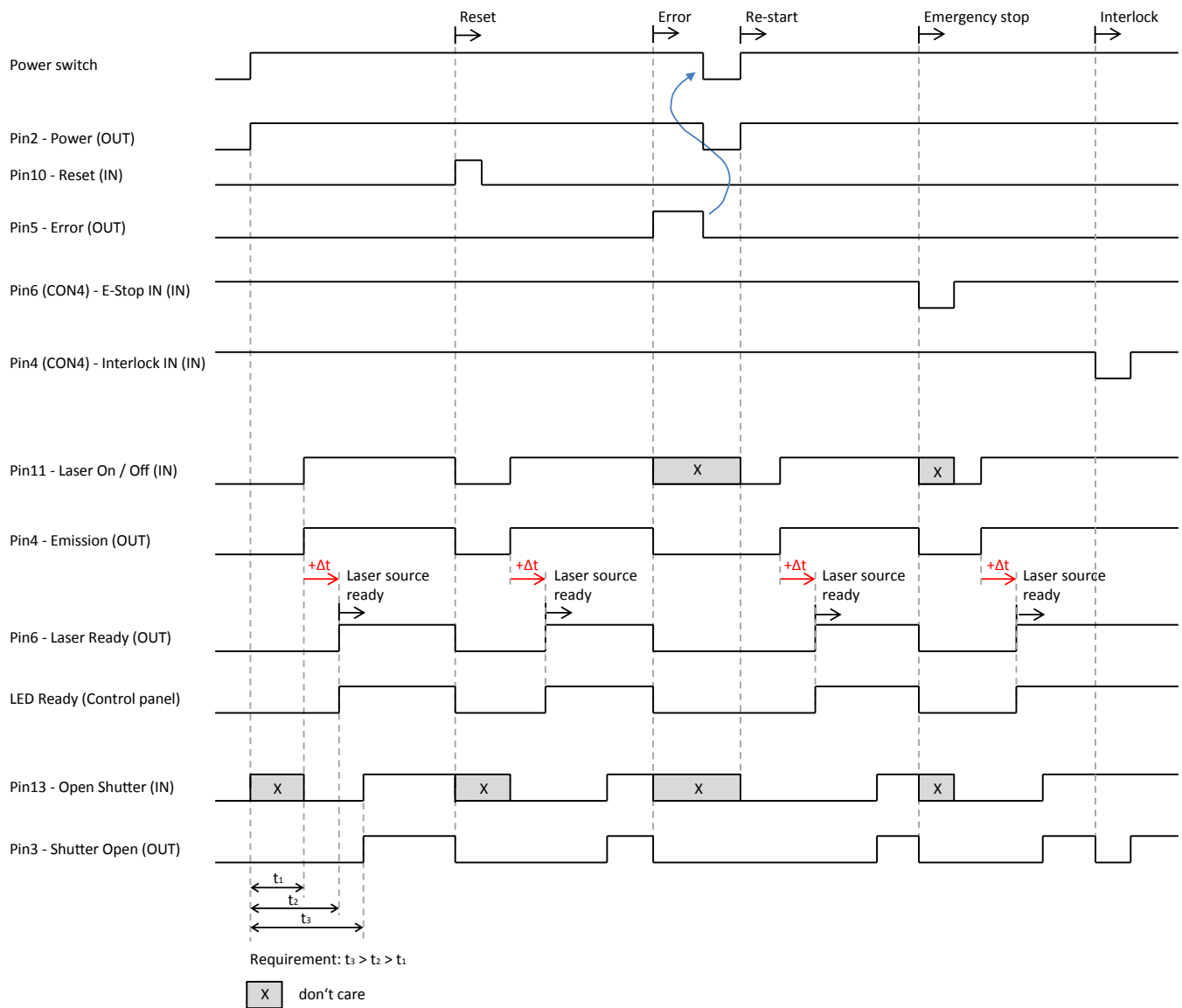**Signal diagram remote interface**

Figure 37   Signal diagram remote interface

5.4   Interlock / E-Stop Interface CON4

The Interlock / E-Stop interface is used to integrate the marking laser into external safety circuits and to connect an external Emergency Stop.
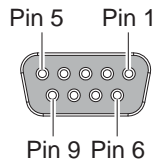The interface has a SUB-D connector, 9 pole.

Pin 5   Pin 1

Pin 9 Pin 6

Figure 38   Interlock / E-Stop interface

Note!

There is no marking possible without having connected the inputs Interlock In (Pin 4) and E-Stop In (Pin 6).

Pin	Signal	Name	Description	Activation / active
1		FP24V	Internal operating voltage +24 V, max. 500 mA	
2	○►	E-Stop signaling contact connection A	Status of Emergency Stop relay' Device ready for operation when signal active	Contact between Pin 2 and Pin 7 is open, if the Emergency Stop is not activated, i.e. the Emergency Stop relay is not current fed
3	○►	Interlock Signaling contact connection A	Status of Interlock-Relay' Device ready for operation when signal active	Contact between Pin 3 and Pin 8 is open, if the safety circuit is closed, i.e. the Interlock relay is current fed
4	○◄	Interlock IN	Interlock relay Connection for safety switch Device ready for operation when signal active	+24V between Pin 4 and Pin 9
5		GND INT	0 V intern	
6	○◄	E-Stop IN	Emergency Stop relay Connection for Emergency Stop Device ready for operation when signal active	+24V between Pin 6 and Pin 9
7	○►	E-Stop signaling contact connection B	Status of Emergency Stop relay' (return circuit)	▷ Pin 2
8	○►	Interlock signaling contact connection B	Status of Interlock relay' (return circuit)	▷ Pin 3
9		GND EXT	Common GND potential for Interlock IN and E-Stop IN	

Table 18   Pinout Interlock / E-Stop interface

Functional description of Emergency Stop circuit

The laser source is switched off via Emergency Stop interface in the event of sudden danger.

• For switching on the laser source the Emergency Stop circuit must be closed.
  A voltage of +24V between PIN 6 PIN 9 must be applied.

• Opening the Emergency Stop circuit results in the laser source being switched off.

• The internal device control remains active at opened Emergency Stop circuit.

• When the Emergency Stop circuit is closed again the laser source remains switched off and has to be switched on again.

• To restart the laser source via remote interface the signal "Laser ON/OFF" (CON3 - PIN 11) must first be deactivated and then activated again.

• In the event of using the digital outputs User Out 1 to User Out 8 at CON2, their switching states will be reset after opening the Emergency Stop Circuit.
  The outputs return to their former states after closing the Emergency Stop Circuit and switching on the laser source via interface CON3 or at the operating panel.
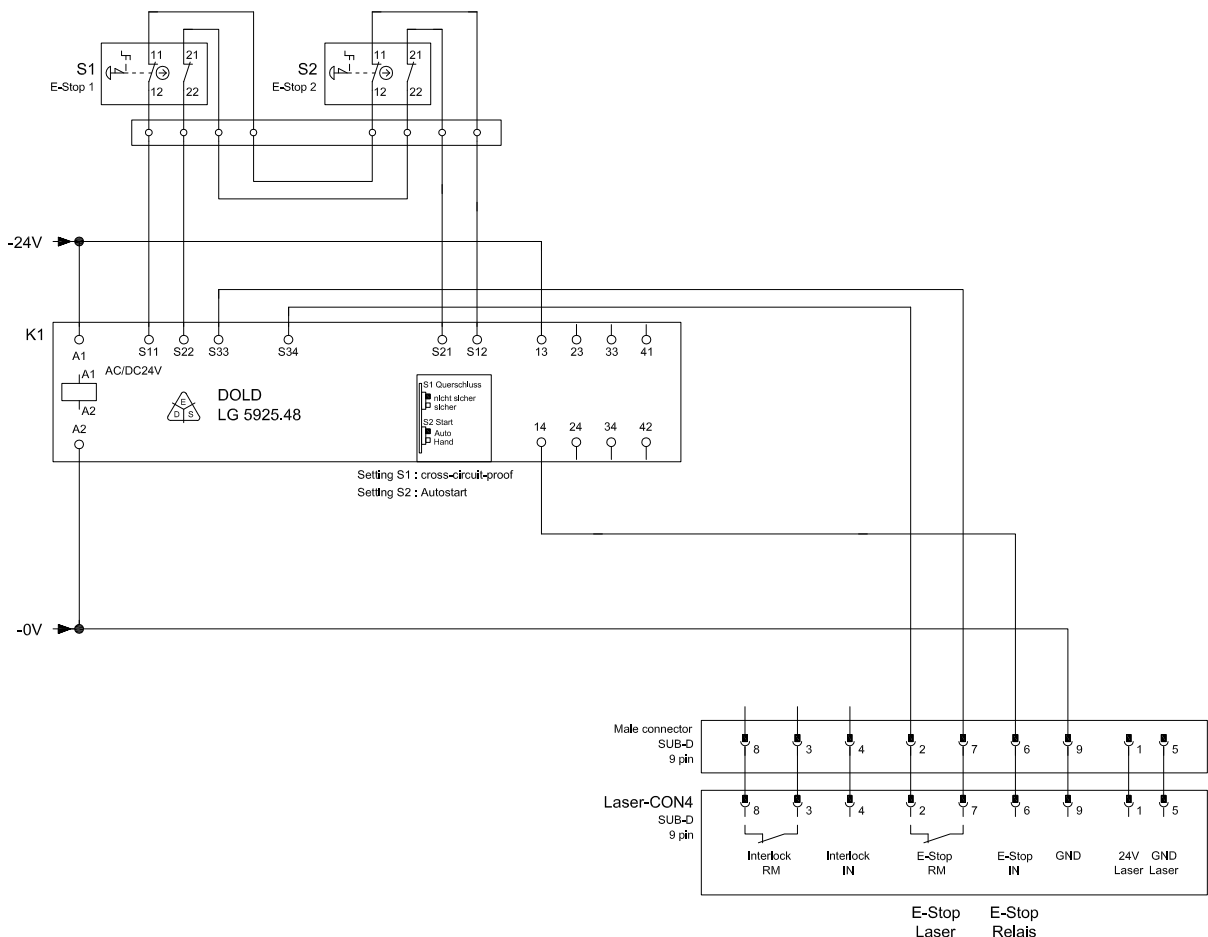
Example for an Emergency Stop circuit

Figure 39   Example for an Emergency Stop circuit

Functional description of Interlock circuit

Via mechanical safety lock (shutter) in the marking laser the Interlock circuit allows to cut off the emission of laser radiation. Control is made via external safety switches monitoring covers, service and set-up.

• Laser source and pilot laser can be switched on regardless of the interlock circuit status.

• In the event of the interlock circuit not being closed (not connected to +24 VDC between PIN 4 and PIN 9), the shutter can not be opened. As a result there is no marking possible!

Example for an Interlock circuit
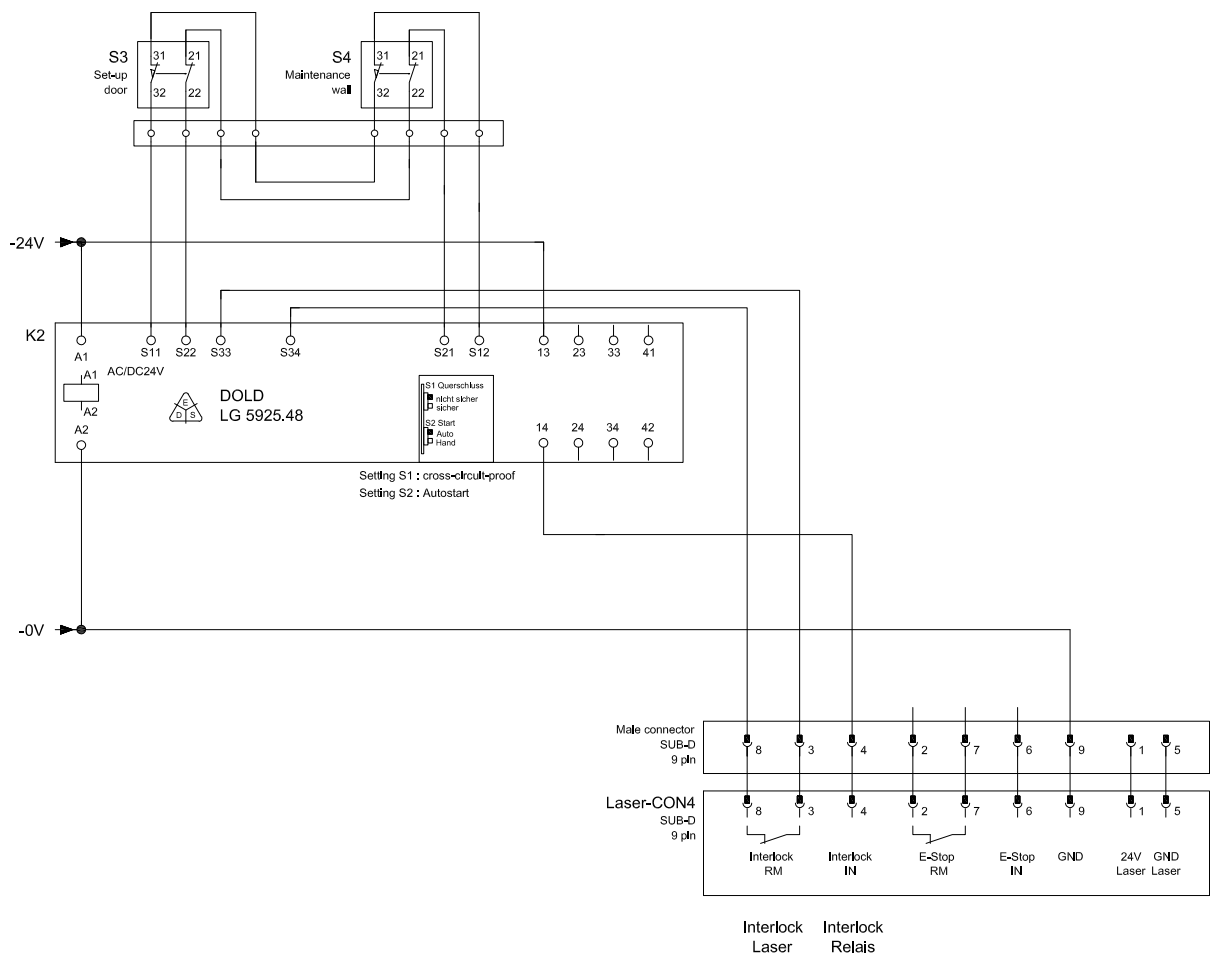

Figure 40   Example for an Interlock circuit

6.1   General Maintenance

The marking laser FL+ is very carefully developed and offers maintenance-free components. However, errors may occur as a result of external causes for reasons of normal wear.

Note!

All kind of repair and maintenance work shall solely be carried out by cab Produkttechnik GmbH & Co. KG or authorized staff.

Tampering or modifications of any kind to the device by a third party will render all warranty claims.

Danger!
Danger of life due to mains voltage.
▶ **Completely disconnect the device from the mains before starting repair and maintenance work. However, excluded are all times when maintenance work is carried out such as inspection of the safety devices where the device needs to be switched on.**

Note!
▶ **Follow chapter on safety instructions.**

Monthly maintenance works
Inspecting and cleaning the lens protective glass
Inspecting and cleaning the louvers
Inspecting the safety signs

Table 19   Repair and maintenance plan

Attention!
▶ **Follow descriptions in the corresponding manuals for repair and maintenance work at devices necessary for operating the marking laser (such as extraction and filtering device).**

6.2   Cleaning the Lens Protective Glass

Attention!
▶ **Never touch glass surfaces with bare fingers.**
▶ **Never clean glass surfaces using tools or hard objects.**
▶ **Never remove dust and dirt particles from the surface compressed air.**
▶ **Never wipe on the glass surface using a dry cloth or paper.**
▶ Remove dust using a small bellows.
▶ To remove coarse dirt solely use lens cleaning paper together with isopropanol with an optical cleanliness of 99 %.
▶ Drop some of the isopropanol on the lens cleaning paper, but do not touch the moistened side.
▶ Slowly move the lens cleaning paper towards one direction over the surface of the protective glass(1).
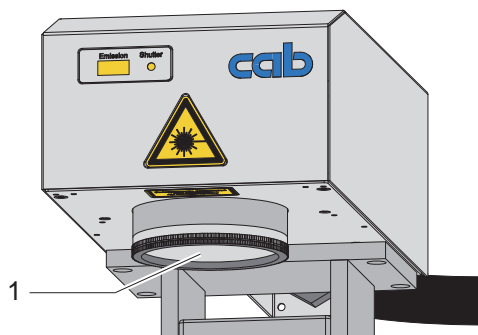▶ Repeat this step using a new lens cleaning paper until the surface is completely cleaned.

Figure 41   Cleaning the lens protective glass

6.3 Exchanging Lens and Lens Protective Glass

Lens	Name of item	Art.-No. protective glass
F-Theta 100.1	Protective glass	5525034.001
F-Theta 160.1		
F-Theta 254.1		
F-Theta 420.1	Protective glass	5527407.001

Table 20   Protective glass

> **!** **Attention!**
> ▶ **Always use cotton gloves.**
> ▶ **Never touch surfaces of the objective lens.**

Exchanging the protective glass

▶ Turn the lens (2) counter-clockwise and remove it from the bracket (1) in the scan head.
▶ Turn the ring (5) counter-clockwise and with this remove it from the lens (2).
▶ Remove the protective glass (4) if necessary from the rubber lip (3) in the lens.
▶ Check the new protective glass on cleanliness and clean it, if necessary.
  ▷ Cleaning the lens protective glass
▶ Place the new protective glass (4) centrically into the ring (5) an screw it from below to the lens (2).
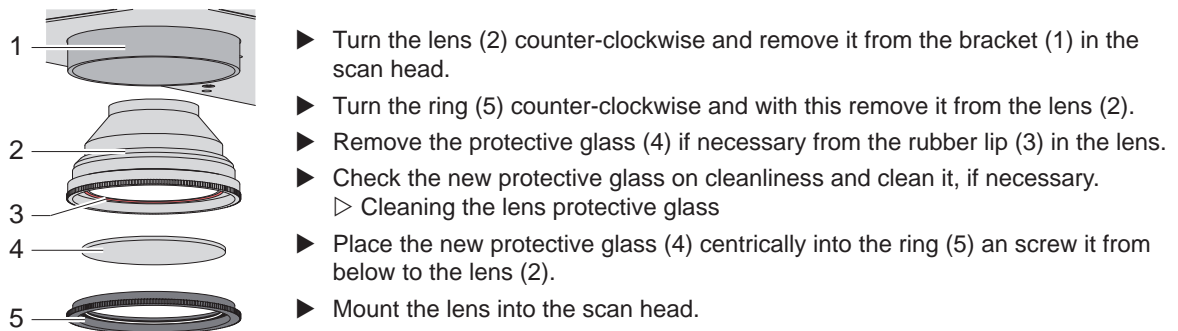▶ Mount the lens into the scan head.

Figure 42   Exchanging the protective glass

Exchanging the lens

▶ Turn the lens (2) counter-clockwise and remove it from the bracket (1) in the scan head.
▶ Place the lens covers included in the scope of delivery of the FL+ on both sides of the lens that has been removed.
▶ Remove the lens covers from the new lens.
▶ Mount the new lens into the scan head.
▶ Adjust the settings to the new lens in cabLase Editor 5.

6.4 Troubleshooting

Error / error message	Possible cause	Elimination
Error message when loading marking program	Connecting cable not properly installed	Check cable connections and connectors on proper installation
	Control switched off	Switch on control
	Software not properly installed	Reinstall software
Device can not be started	Connecting cable is not properly installed	Check cable connections and connectors on proper installation
	Supply voltage is missing	Check supply voltage from the mains
No laser beam	Safety lock (Shutter) closed	Open, respectively release shutter Check safety circuit.
	Laser not in focal position	Check working distance
	Wrong laser parameters	Check laser parameters in the program on suitability
Insufficient laser power	Laser not in focal position	Check working distance
	Wrong laser parameters	Check laser parameters in the program on suitability
Missing characters	Dirty protective glass	Clean or replace protective glass
Status display Laser Error lights up	Malfunction or overheating of the device	Refer to cab customer service
No emission display after having switched on laser source	System failure	Restart the device (reset) Refer to cab customer service
No marking	Material not laser-markable	Use another kind of material

Table 21   Troubleshooting

6.5 Service

! **Attention!**
  ▶ **Refer to Chapter Troubleshooting in the event of an interruption of operations.**
  ▶ **In the event of not being able to eliminate the interruption of operations you are asked to refer to authorized service staff.**

i **Note!**
All kind of repair and maintenance work shall solely be carried out by cab Produkttechnik GmbH & Co. KG or authorized staff.

i **Note!**
Tampering or modifications of any kind to the device by a third party will render all warranty claims.

6.6 Customer Service

For more information or for eliminating an interruption of operations the cab customer service is available. For addresses and local partners ▷ refer to page 2.

i **Note!**
To give quick and expert support you are asked to keep ready type and serial number stated on the type plate of the control and scan head.

Marking laser		FL+10R	FL+20R	FL+30R	FL+50R
		Ytterbium fiber laser, pulsed, air-cooled			
cw output power max.	W	10	20	30	50
Puls energy	mJ	0,5	1		
Wave length	nm	1064			
Beam quality M2		<1,8			
Pulse width	ns	90-120	80-120		
Pulse frequency	kHz	20-80	2-200		
Fiber coupling	m	4,5	2,5		
Scan head					
Mounting		horizontal/vertical			
Marking speed	mm/s	~5000			
Pilot laser					
Wave length	nm	650			
cw output power	mW	<1			
Electronics					
Processor 32 bit clock rate	MHz	600			
Main memory (RAM)	MB	256			
Data memory (Flash)	MB	512			
Extensions (Flash)		USB memory stick			
Dimensions and weight		**Rack 4RU 19"**			
Control unit HxBxT	mm	178x420x420			
weight	kg	16			
Scan head HxBxT	mm	110x170x330			
weight	kg	7			
Control panel					
Key switch		Laser source ON/OFF			
Push button	pilot laser	ON/OFF			
	shutter open	OPEN/CLOSE			
Indicator	emission	Laser source active			
	laser error	Laser source error			
	ready	Laser source ready			
	power	Power supply ON			
	pilot laser	ON			
	shutter open	Safety lock open			
Connector	service	USB mini			
	data memory	USB			
Operating data		**FL+10R**	**FL+20R**	**FL+30R**	**FL+50R**
Operating voltage/frequency		100-240 VAC - 50/60 Hz			
Power		ON/OFF			
Power consumption	standby W	65			
	max. W	150	175	200	250
Temperature / humidity	operation	5-40 °C/10-85 % not condensing			
	stock	0-60 °C/20-80 % not condensing			
	transport	–25-60 °C/20-80 % not condensing			
Approvals		CE, FCC class A, ICE S3			
Performance level		d			
Laser safety class EN60825-1					
	laser source	Class 4			
	pilot laser	Class 2			

Plano-spherical lens		100.1	160.1	254.1	420.1
Working distance	mm	141±2	202±4	302±4	541±10
Marking field	mm	69x69	112x112	180x180	290x290
Spot diameter	µm	~25	~35	~50	~85
≙ Resolution	dpi	1000	725	500	300

Table 22   Technical data

| Software	
Software	cabLase Editor 5
Characters	
Fonts	All TrueType fonts installed in Windows, filled or as outline, laser specific single, double and triple line fonts. All fonts can be freely scaled and „wobbled".
Alignment	Any alignment and direction of rotation, circular arc marking
Character spacing	Stretching and compressing
Graphics	
Graphic elements	Lines, circles, rectangles, polygones; Hatching of all filled surface elements
Graphic formats	PLT, DXF, BMP, JPG, PCX, WMF, EPS, TIF; All graphic elements can be scaled, moved, rotated, grouped or mirrored. Special tools are available to align the objects.
Barcodes	
Linear Barcodes	Interleaved 2/5, Code 39, Code 93, Code 128 / Codabar, EAN, UPC
2D-Codes	Data Matrix, ECC200, QR-Code
	All codes are variable in height, module width and ratio. Optionally: check digits, inverted codes
Additional features	
Serial number, time, date	
Variable fields	
Insertion of graphic data out of Windows programs	
Programmable laser parameters	
Storage of process and parameter files	
Control of digital in- and outputs	
Control and monitoring of additional axes, e.g. lifting, rotary and linear axes	

8.1 Control
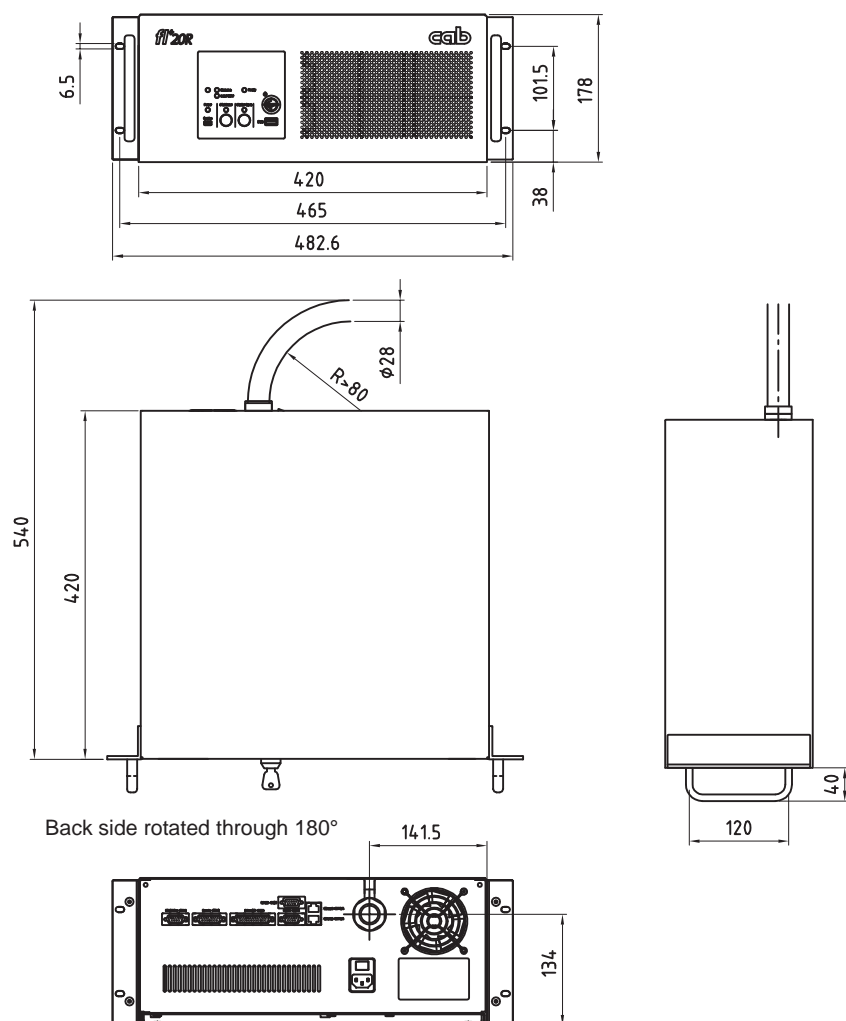
Figure 43   Dimensional drawing control
Refer to the cab website for a 3D model as .stp file
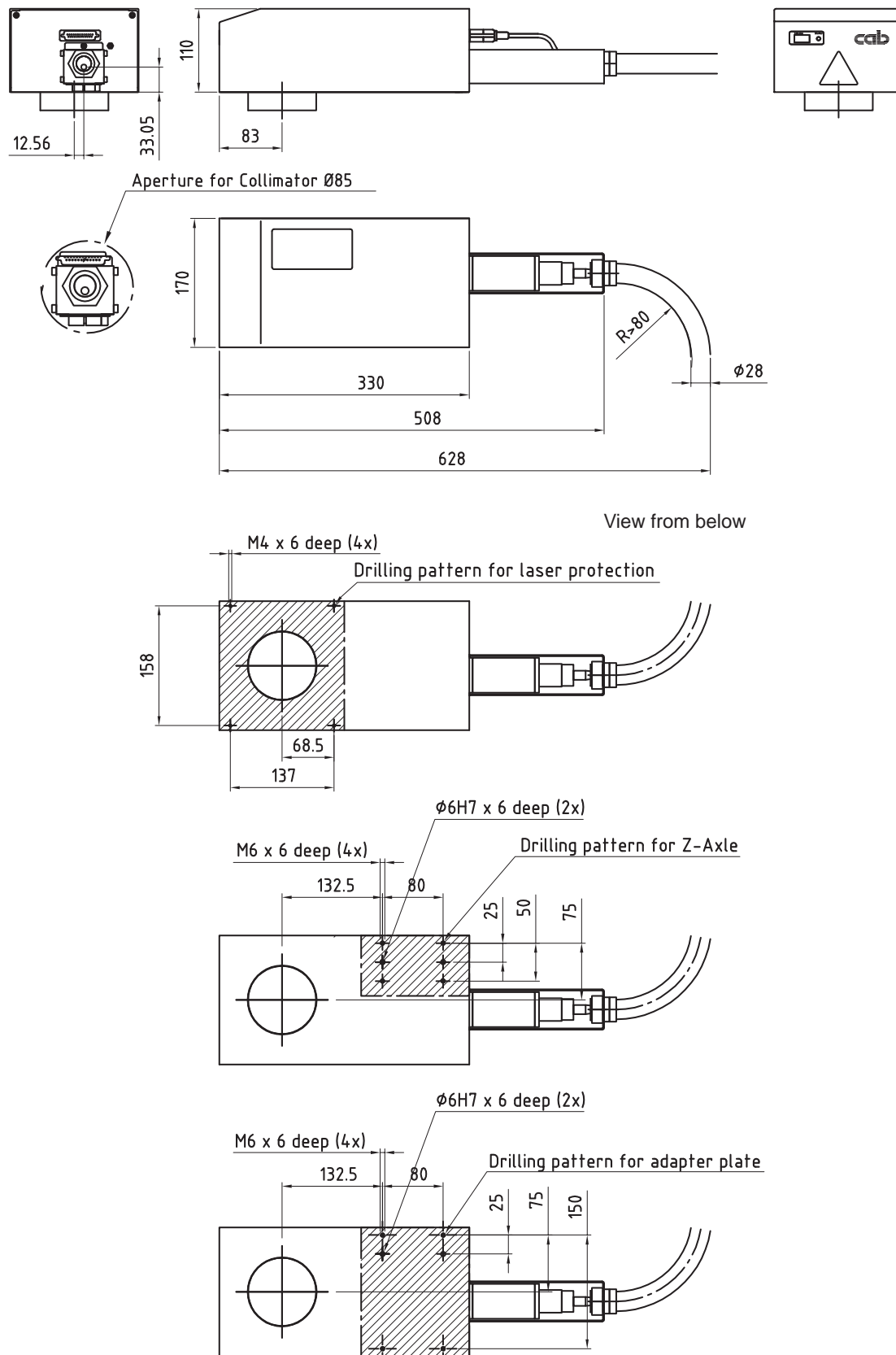
8.2   Scan Head

Aperture for Collimator Ø85

View from below

M4 x 6 deep (4x)

Drilling pattern for laser protection

Φ6H7 x 6 deep (2x)

M6 x 6 deep (4x)

Drilling pattern for Z–Axle

Φ6H7 x 6 deep (2x)

M6 x 6 deep (4x)

Drilling pattern for adapter plate

Figure 44   Dimensional drawing scan head
                 Refer to the cab website for a 3D model as .stp file

8.3 Lenses

The marking lasers of the FL+ series are available with different plano-spherical lenses.
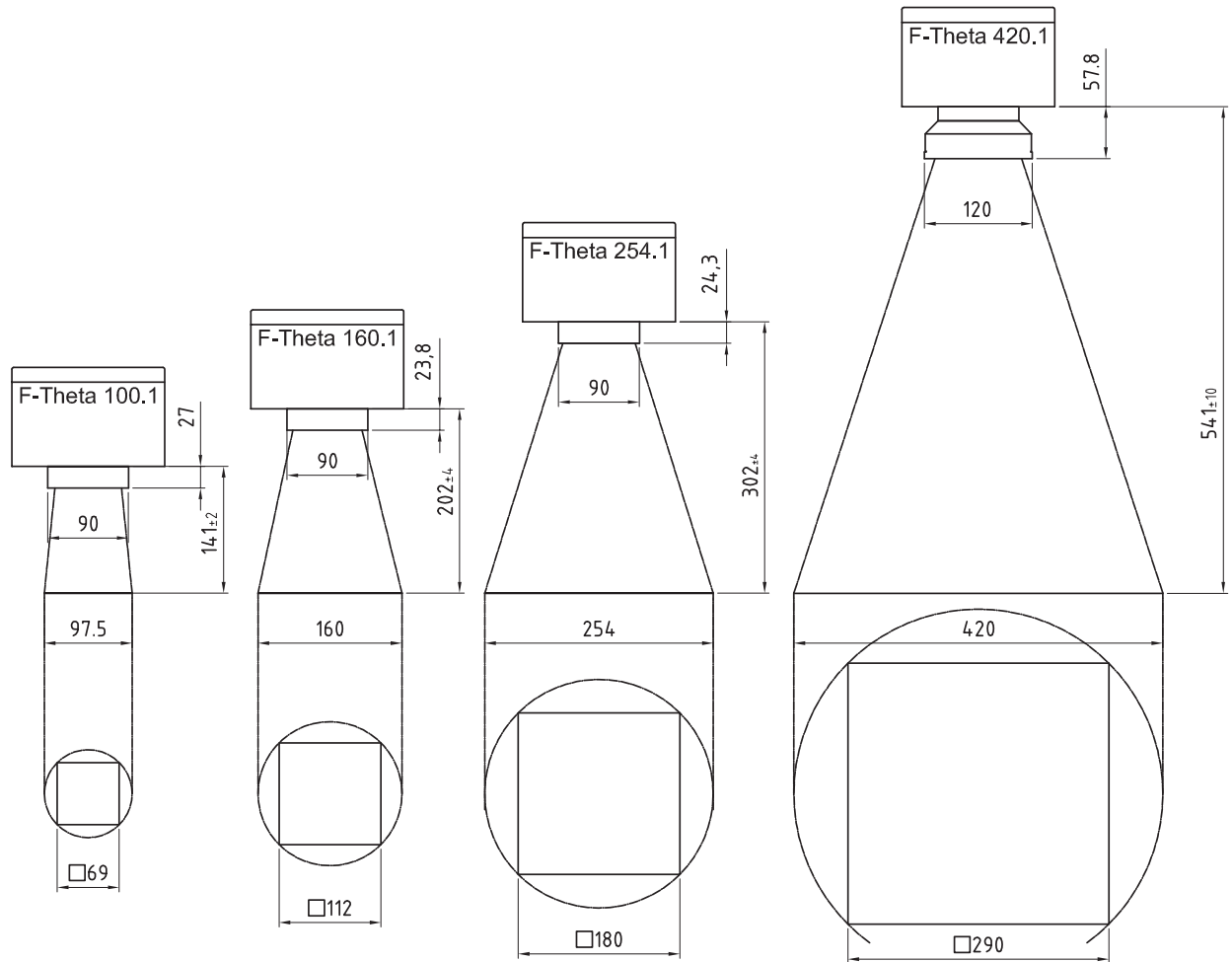
Figure 45   Lenses, working distances and marking field

9.1 Declaration of Incorporation
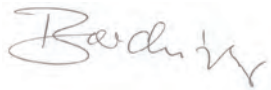
Declaration of Incorporation

We declare herewith that the following „partly completed machinery" as a result of design, construction and the version put in circulation complies with the essential requirements of the **Directive 2006/42/EC on machinery** :

Annex I, Article 1.1.2, 1.1.3, 1.1.5, 1.2.1, 1.2.4.1, 1.2.4.3, 1.5.1, 1.5.8, 1.6.3, 1.7

The „partly completed machinery" additionally complies with the Directive 2014/30/EU relating to electromagnetic compatibility.

In the event of any alteration which has not been approved by us being made to any device as designated below, this statement shall thereby be made invalid.

Device:	**Marking Laser**
Type:	**FL+10R, FL+20R, FL+30R, FL+50R**
Applied EU Regulations	Applied Standards
Directive 2006/42/EC on machinery	• **EN ISO 12100:2010**
	• **EN ISO 13849-1:2008**
	• **EN ISO 11553-1:2008**
	• **EN 60825-1:2007**
	• **EN 60950-1:2006 +A11:2009+A12:2011+A1:2010+A2:2013**
Person authorised to compile the technical file :	**Norbert Schulmeister** **cab** Produkttechnik GmbH & Co KG Wilhelm-Schickard-Str. 14 D-76131 Karlsruhe
Signed for, and on behalf of the Manufacturer :	**Karlsruhe, 23.06.2017**
cab Produkttechnik GmbH & Co KG Wilhelm-Schickard-Str. 14 D-76131 Karlsruhe	**Klaus Bardutzky** **Company Management**

The product must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive on machinery
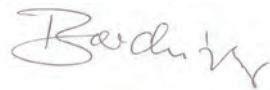
The documents according annex VII part B from the incomplete machinery are created and will commit to state agencies on request in electronic kinds.

9.2   EU Declaration of Conformity

EU Declaration of Conformity

We declare herewith that as a result of the manner in which the device designated below was designed, the type of construction and the devices which, as a result have been brought on to the general market comply with the relevant fundamental regulations of the EC Rules for Safety and Health. In the event of any alteration which has not been approved by us being made to any device as designated below, this statement shall thereby be made invalid.

Device:	**Marking Laser**
Type:	**FL+10R, FL+20R, FL+30R, FL+50R**
Applied EU Regulations	Applied Standards
Directive 2014/30/EU relating to electromagnetic compatibility	• **EN 61000-3-2:2006+A1:2009+A2:2009**
	• **EN 61000-3-3:2008**
	• **EN 61000-6-2:2005**
	• **EN 61000-6-4:2007+A1:2011**
Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment	• **EN 50581:2012**
Signed for, and on behalf of the Manufacturer : **cab** Produkttechnik GmbH & Co KG Wilhelm-Schickard-Str. 14 D-76131 Karlsruhe	**Karlsruhe, 23.06.2017** **Klaus Bardutzky** **Company Management**

9.3   FCC

NOTE : This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. The equipment generates, uses, and can radiate radio frequency and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user may be required to correct the interference at his own expense.

① Headquarter and fabrication in Germany

② to ⑦ International subsidiaries

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