

LASER MARKING SYSTEMS



Operating Instructions

DFL *Ventus* Marker Standard Design Business *Fibre*

OEM Version

Laser Device Class 4

Mark your territory...

This product conforms to the requirements of the Machinery Directive 2006/42/EC.
The CE symbol is located on the type plate.

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We are constantly working on further developments.

Therefore, please understand that we must reserve the right to change the scope of the delivery in respect of the form, equipment and technology at any time.

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The manufacturer shall only be responsible for the safety characteristics of this device within the scope of the legally applicable regulations if it is operated by the user in accordance with the operating instructions and repaired by ACI Laser GmbH itself or someone appointed by and acting under the instructions of ACI Laser GmbH.

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1 Introduction

Dear customer,

Thank you for the confidence which you have shown in us by purchasing our quality product. We would like to wish you every success with the use of the devices.

Make yourself familiar with these operating instructions before starting use. The operating instructions tell you how to use your new devices correctly and safely, and take you step by step through the actions which have to be performed before using it for the first time.

You will find more detailed information on the enclosed CD-ROM.

2 Important Information

Our products are developed and manufactured under strict quality monitoring to give a long and fault-free service life.

This guarantees:

- highest quality and a long life,
- easy and safe operation,
- functional design,
- optimization for the intended purpose.

The **DFL Ventus Marker** is a state-of-the-art device. The EC Declaration of Incorporation and the EC Declaration of Conformity confirm that the manufacturer has complied with the relevant directives. The CE symbol is located on the type plate.

The laser marking device contains a class 4 laser according to DIN EN 60825-1 "Safety of Laser Devices".

Should the operating company integrate the device as an OEM component into an existing installation, it shall bear the sole responsibility for fulfilling the standards and directives. This includes, for example, fitting it into a laser protection hood or integrating it into a production line.

The company operating the laser marking device is **obliged** to implement the safety measures arising from DGUV no. 11 "Laser Radiation" and from DIN EN 60825-4 "Safety of Laser Devices".

Please read these operating instructions carefully from the beginning in order to avoid errors and risks.

Reference is made to residual hazards at the relevant places in the operating instructions. Please also take note of the warning notice stickers on the device.

2.1 Intended Use

- The operating company is obliged to appoint a laser safety officer in accordance with para. 6 of DGUV no. 11 "Laser Radiation" to ensure that the relevant safety guidelines and standards are observed.
- The **DFL Ventus Marker** marking system is intended to be used exclusively for marking applications in conjunction with the associated **Magic Mark** software. The performance parameters must be adapted to suit the properties of the materials to be marked.
- The laser marking device is intended for integration into installations or lines. Please contact the manufacturer for information about other possible applications.
- Usage for the intended purpose includes observance of these operating instructions, the instructions in the software manual and the warning stickers on the device.
- The supplier/manufacturer shall not be liable for personal injury or material damage resulting from improper use of the laser itself or the safety devices.

2.2 Improper Use

All other uses other than use for the intended purpose, including that with other control software, shall be deemed to be improper use.

The laser marking device must not be used by:

- persons who have not read or understood these operating instructions,
- persons who have not been instructed in the proper operation,
- persons who are under the influence of alcohol and or drugs, or
- persons whose alertness is impaired by medicines or other influences.

The laser marking device must not be used:

- if the required protective devices have not been provided according to para. 4 of DGUV no. 11 "Laser radiation",
- if protective/safety devices are bridged, defective or if they cannot reliably fulfil their function,
- if there is a suspicion that direct or leakage radiation can emanate.

2.3 Notices in the Document

Take note of the warning notices, take the specified actions and observe the prohibitions. A warning notice warns of a possible hazard and contains recommendations for preventing the hazard occurring. Key words indicate the type of hazard, symbols emphasize this visually.

Follow the stated measures for preventing hazards to the operator or tangible assets.

The following classification of dangers are used in these safety instructions:

DANGER

RISK OF DEATH OR SERIOUS INJURIES!

Indication of an imminent danger, which will result in death or serious injuries if the appropriate precautionary measures are not taken.

WARNING

DANGER OF INJURIES AND/OR RISK OF PROPERTY DAMAGE.

Indication of an immediately impending hazard which can cause serious injuries or property damage if the appropriate precautionary measures are not taken.

CAUTION

RISK OF PROPERTY DAMAGE.

Indication of a possible hazard which may cause damages of the equipment if the appropriate precautionary measures are not taken.

Additional information on working with the laser marking device and protection of the environmental are emphasised as follows:

NOTICE

Useful additional information and tips!

ENVIRONMENT

**Protect the environment!
Instructions for observing environmental protection regulations!**

2.4 Warranty

The manufacturer guarantees that the product does not have any manufacturing or material defects.

The warranty period shall be 12 months from the dispatch date in as far as no other contractual ruling has been made.

The scope of warranty is limited to the repair or replacement of the product supplied by the manufacturer.

The manufacturer is responsible for returning repairs under warranty to the customer, the customer is responsible for returning the device to the manufacturer.

The manufacturer does not accept any warranty,

- if the product has been damaged by incorrect handling or operation, or as a result of improper use,
- if seals on the device have been broken,
- for damage caused by use under unauthorized environmental conditions,
- for damage to the device if it is not returned in its original packaging,
- for damage to the fiber laser cable caused by incorrect handling, such as kinking or twisting,
- for consequential damage.

2.5 Technical Customer Service

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NOTICE

The laser device may only be maintained and repaired by the manufacturer. Any manipulations on the device or breaking the warranty seal will void any claims under warranty.

3 Safety

3.1 Basic Safety Instructions



The following safety instructions have fundamental importance for the use of the laser marking device, and for its care and maintenance. They must always be followed and are only stated centrally here.

Functional safety

In order to realise functional safety, the laser marking devices of ACI product group, **Business Fibre**, contain the safety module, "laser safety device" (hereinafter also referred to as SD). It is classed in category 3 and achieves performance level (PL) e according to the DIN EN ISO 13849-1 standard.

Characteristics according to DIN EN ISO 13849-1:

| | |
|---------------------|------------------|
| Performance level: | e |
| Category: | 3 |
| MTTF _d : | > 67 years |
| DC _{avg} : | mean (90% - 99%) |

Based on the useful life of the shutter module (swivelling diaphragm), this module must be replaced after 14 years, at the latest, in order to maintain performance level e.

Laser class

As an OEM component, the **DFL Ventus Marker** is a class 4 laser marking device according to DIN EN 60825-1 "Safety of Laser Devices":

- The accessible laser radiation is very dangerous to the eyes and skin.
- Even diffuse, scattered laser radiation can be dangerous if the accessible radiation exceeds the class 1 threshold.
- Improperly used laser radiation may lead to a risk of fire or explosion.

The following measures must be taken in order to be able to categorize the **DFL Ventus Marker** as a class 1 laser device (accessible laser radiation is harmless:

- Ensure that the entire beam path to the work piece is shielded beam-tight.
- Those parts of the screening which can be removed without tools must be fitted with safety switches which interrupt the beam path before the laser beam leaves the device.
- Viewing windows (e.g. in the enclosure or the screening) must be fitted with laser protection glass appropriate for the wavelength and the laser power class.

The guidelines stated in DIN EN 60825-4 "Safety of Laser Devices" and DGUV no. 11 "Laser Radiation" must be implemented if the accessible laser radiation cannot be reduced to below the class 1 threshold values when the device is integrated into the installation.

Emissions

- If the design of the installation prevents the requirements for class 1 laser devices being fulfilled, the area around the laser system must be protected by
 - adjustable walls,
 - light signals and
 - warning noticesso that adequate notice is given of the danger before the area is entered.
- Install a second emission warning light in the view of the operator. During operation, this signals that the beam catcher (shutter) arranged in the laser beam path is open. The shutter consists of a screen which can be swivelled into the beam path, so interrupting the laser process.
- Chemical and physical reactions during the laser marking can cause
 - gases,
 - vapours,
 - aerosols,
 - dusts,
 - mists or

- other reaction products

to be given off from the material surface.

These may be toxic, depending upon the material being processed.

The operating company must therefore provide effective extraction. Information about this can be found, for example, in the VDI guideline 2262 1...3 "Air Quality in the Work Place".

- Please contact the manufacturer with regard to relevant accessories and protective equipment.

General

- Read the operating instructions and always keep them in an accessible place.
- Do not mark any easily flammable or combustible materials.
- The fiber laser cable can be damaged by incorrect handling.
Do not kink or twist cables, or roll them up too tightly.

Minimum kink radius 75 mm

Minimum loop length 1 m

Maximum distortion by 180 degrees

Initial start-up

- The ambient temperature must lie within the range of $> 15\text{ °C}$ and $< 35\text{ °C}$. The condensation temperature as a function of the momentary relative air humidity must be $< 20\text{ °C}$. You will find an instruction for estimating the momentary value in the appendix.
- Ensure that the relative air humidity does not exceed 85%.
- Never start the device immediately after large temperature changes. Condensation water may damage the device.
- Ensure that an adequate air supply can be provided at the location of the supply unit and that none of the vents are covered.
The vents must be clear and free of any residual packing material.
- Mount the laser head at the installation site in accordance with the regulations.
- Ensure that the shutter is active (closed) during the set up.

Safety

The main beam is simulated by a pilot laser.

The laser is not harmful to the skin. The eyes are protected by the natural blink reflex.

- Before starting up, always plug the fiber laser cable into the socket provided, before doing so remove the protective caps and any dirt.

Operation

- The laser marking device may only be operated by trained personnel. It is advisable to log both the initial training as well as the regular refresher courses.
- The device may only be operated when connected to an alternating voltage supply corresponding to the specifications on the type plate.
- The effectiveness of the protective conductor must be regularly checked and confirmed by an authorized skilled worker.
- If a defect occurs in the laser marking device, it must be disconnected from the power supply system and secured against being switched on again.

Maintenance/Care

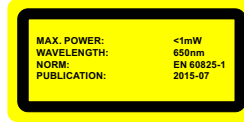
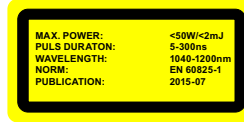
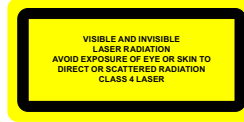
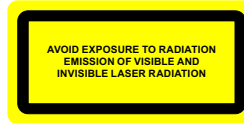
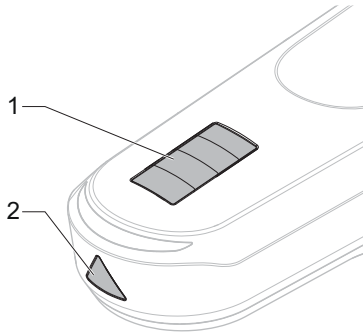
- Maintenance and repair work on the laser device may only be performed by the manufacturer.
- The device must be disconnected from the power supply system before the covers are removed.
- Do not touch the electrical/electronic components. Capacitors could still be charged and so be under voltage.

3.2 Labels at the Device

Warning notices

The warning notices on the device point out possible hazards from the laser and provide information about the basic performance data of the laser devices.

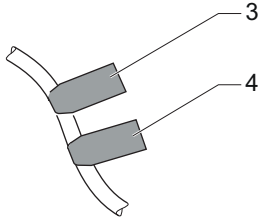
- On the top of the enclosure of the laser head (1):



- On the beam outlet cover (2):



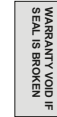
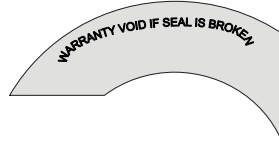
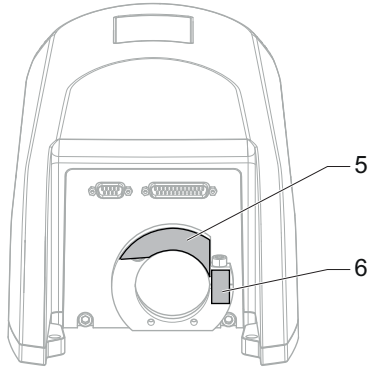
Safety



- On the fiber laser cable (3 and 4):

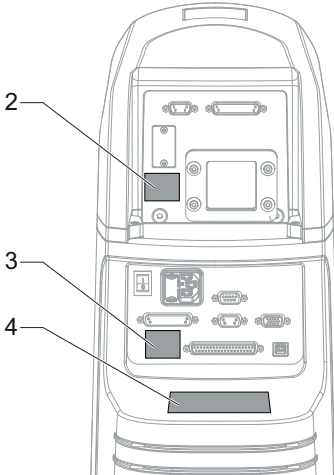
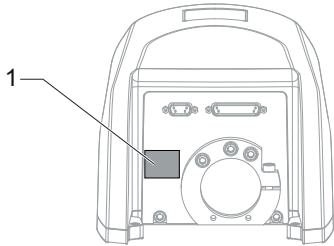


- On the rear side of the design variant 1 casing (5 and 6):



- For design variant 2, there are no warning signs attached on the rear of the housing.

Type plates



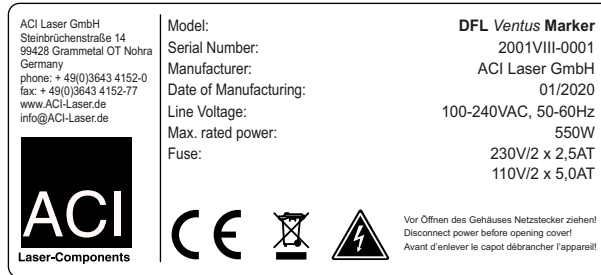
The type plates on the rear side of the laser head (1, design variant 1 and 2, design variant 2) and the supply unit (3 and 4) contain information about:

- serial number,
- manufacturer,
- date of manufacturing,
- operating voltage/frequency range,
- power consumption and
- fuse for the device.

Small type plate (1, 2 and 3)



Large type plate (4)



Description

4 Description

4.1 Overview

The **DFL Ventus Marker** consists of a laser head and a supply unit, which are connected by a fiber laser cable. The maximum distance is 3 m.

The laser head can be mounted directly on the supply unit or separately.

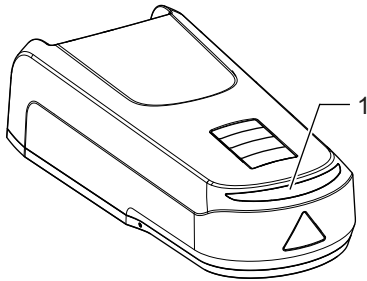
The following additional device features are optionally possible:

- FocusShifter
- internal camera
- external focus finder
- trim module

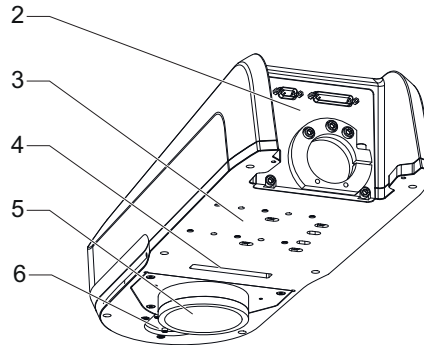
4.2 Views of the Device

Laser head view

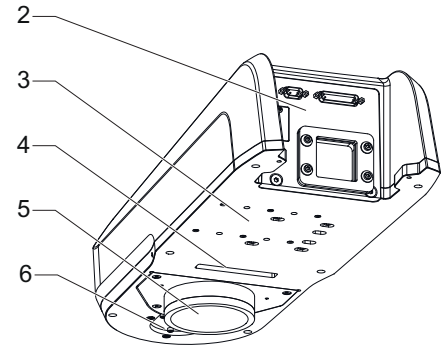
Front view



Rear view design variant 1



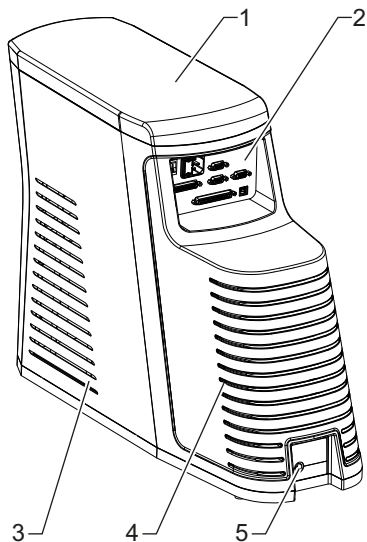
Rear view design variant 2



- (1) multi function display
- (2) interfaces
- (3) mounting surface
- (3) bolt-on point for the supply unit
- (5) objective (laser beam outlet)
- (6) focus finder

Description

Supply unit view



- (1) enclosure
- (2) interfaces
- (3) side ventilation slits (air inlet), on both sides
- (4) rear ventilation slits (air outlet)
- (5) fiber laser cable connection

4.3 Intended Purpose

The object of marking a work piece is to produce a marking with the following properties:

- durability,
- high contrast,
- high resolution,
- minimal stress on the material and minimal change in its properties.

These requirements are optimally fulfilled by the **DFL Ventus Marker**.

The laser marking device is a highly-integrated marking system.

The device consists of two assemblies: the supply unit and the laser head.

The supply unit includes:

- main power pack
- laser excitation
- laser chiller
- control electronics

The laser head includes:

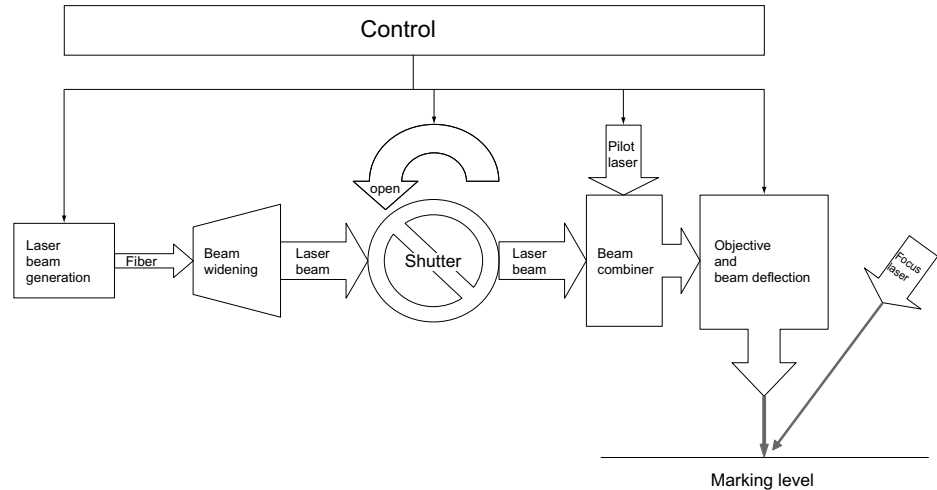
- beam shaping
- safety device (shutter)
- pilot laser lenses
- deflection unit

Description

In contrast to other comparable systems, the **DFL Ventus Marker** guarantees:

- The easiest integration into existing production lines because of its small dimensions and low weight.
- Increased operational safety by the elimination of complex water-air cooling units.
- Minimizing the down times and maintenance costs by replacing the complete functional unit during maintenance and service work.

4.4 Principle of Operation



The laser beam source integrated into the supply unit generates the laser radiation, which is transmitted to the laser head via a passive transport fiber. The laser beam generated in this way is widened in the laser head by a lens system, and then forms the working beam of the laser system. This working beam is combined with a pilot laser beam. The working beam and pilot laser beam reach the workpiece via the beam deflection and the focusing objective. A safety shutter integrated into the laser head enables the system to be installed for applications for laser protection class 1.

Fiber laser beam generation

The fiber laser is a special form of solid-state laser. The ytterbium-doped core of the glass fiber forms the active medium. The laser beam passed through the laser-active fiber is highly amplified on account of the long length.

The small cross-section of the fiber limits the peak pulse power of the laser. However, there are very high peak powers when short-duration pulses are generated. In order to prevent the destruction of the fiber, the power of the laser is automatically reduced to below the corresponding limit frequencies.

NOTICE

The marking software sets valid parameters for frequency and pulse width.

Laser Safety Device (SD)

The laser safety device (SD) is the central safety module of the laser marking devices of the ACI product group, **Business Fibre**. It meets the requirements for the safety feature according to the DIN EN ISO 13849-1 standard, performance level e.

The safety feature consists of the redundant control and continuous monitoring of the two output paths (diaphragm/shutter, protective relay) as well as continuous monitoring of the input paths (interlock circuits, ILK1 and ILK2). This ensures at all times that, in the event of error, emission of laser radiation due to opening of the interlock circuits is prevented.

Opening the interlock circuits will immediately cause the diaphragm to swivel into the beam path, thus interrupting the laser process.

Description

In the event of the following errors:

- exceeding the defined time period of 200 ms upon opening or closing the diaphragm,
- short circuit or interruption of the interlock circuits,
- exceeding the defined time period of 150 ms upon switching the two interlock circuits,
- overvoltage or undervoltage in the SD power supply,
- internal SD error

in addition to closing the diaphragm, the protective relay is switched off, thus disconnecting the entire laser marking device from the power supply. Only the laser electronics continues to be supplied with power, thus allowing communication with the user application; hence, display or analysis of the error cause.

A system that was switched off due to an error can be put into operation again only by switching it off and on again, provided that the error cause has been removed.

The SD checks all safety-relevant features upon switching on the laser marking device. Only in the absence of errors will the protective relay be activated, thus starting up the laser marking device. If the SD detects errors in the instant of switching on, then these will also be forwarded to the user application via the laser electronics.

4.5 Technical Data

| | | |
|--------------------------|--|--|
| Laser device | Diode-pumped fiber laser (Yb:fiber) | |
| | Operating mode: | pulsed |
| | Wave lengths: | 1064 nm \pm 5 nm |
| | Laser power (maximum): | 20 W - 70 W, system dependent |
| | Beam quality M ² : | < 1.3 to < 3.7, system dependent |
| | Peak power (maximum): | 9 kW - 20 kW, system dependent |
| | Pulse energy (maximum): | 0.7 mJ - 1.3 mJ, system dependent |
| | Pulse repetition rate: | 1 kHz - 1 MHz, system dependent |
| | Number of adjustable pulse forms/-lengths: | 25 - 40, system dependent |
| | Pilot laser: | 650 nm, 1 mW |
| | Laser class: | 4 |
| | Performance level: | e |
| Connection values | Power supply: | 85 - 264 VAC/10 A/50 - 60 Hz |
| | Power consumption (typical): | 300 - 600 W |
| | Power consumption (maximum): | 600 - 1000 W |
| Interfaces | Power supply connection: | cold device socket with micro fuse |
| | PC interface: | USB 2.0 |
| | Interlock connection: | - dual-circuit interlock - SD-Ready |
| | Laser control interface for: | - ready-to-operate message/fault alarm - external shutter warning light |

Description

- 8 digital inputs
- 8 digital outputs
- differential inputs for "Marking on the fly"

Scan unit

Scanning speed: < 10 m/sec

Focusing objectives (optional)

F-Theta 100

Spot diameter⁽¹⁾: 25 µm
Marking field size: 60 mm x 60 mm
Focus shift: ± 5 mm (when using the FocusShifter)
Focus distance⁽²⁾: 132 ± 3 mm from lower edge of scan unit

F-Theta 163

Spot diameter⁽¹⁾: 35 µm
Marking field size: 110 mm x 110 mm
Focus shift: ± 14 mm (when using the FocusShifter)
Focus distance⁽²⁾: 200 ± 3 mm from lower edge of scan unit

F-Theta 254

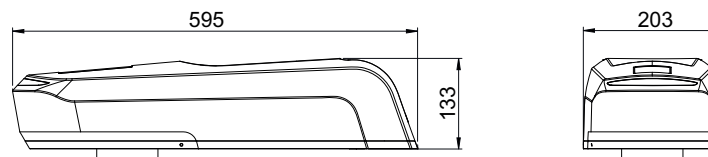
Spot diameter⁽¹⁾: 50 µm
Marking field size: 180 mm x 180 mm
Focus shift: ± 35 mm (when using the FocusShifter)
Focus distance⁽²⁾: 327 ± 6 mm from lower edge of scan unit

(1) Deviations may occur with different materials.

(2) The exact value for distance is stated in the parameter file supplied with each device.

Dimensions and weight

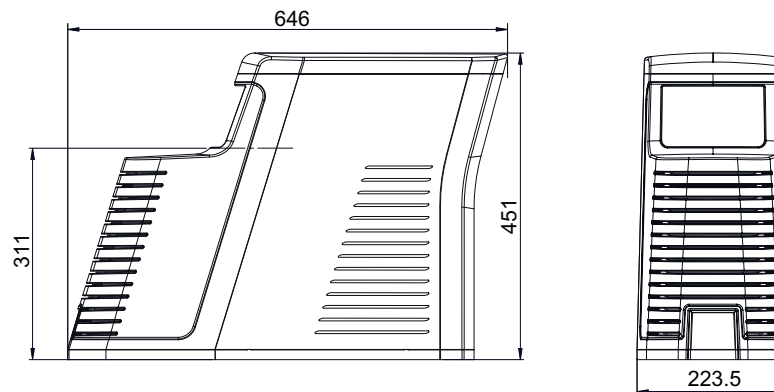
Laser head



Length x width x height: 595 mm x 203 mm x 133 mm

Weight: 9 kg

Supply unit



Length x width x height: 646 mm x 224 mm x 451 mm

Weight: 26 kg

Description

Operation and storage conditions

| | |
|------------------------|---------------------------------|
| Operating temperature: | 25 °C ± 10 °C |
| Storage temperature: | 10 °C - 50 °C |
| Air humidity: | 30% - 85%, without condensation |

4.6 Scope of Delivery

- Laser head,
- supply unit,
- fiber laser cable of a length of 3 meters,
- 2 supply cables (25-pin sub-D, 9-pin sub-D),
- power cable,
- connecting cable for USB 2.0,
- 37-pin sub-D housing to wire the laser control interface,
- 9-pin sub-D housing to wire the interlock connection,
- CD ROM with marking software,
- operating manual,
- software manual.

NOTICE

Check that the delivery is complete and undamaged. Please contact our service department if you have any queries.

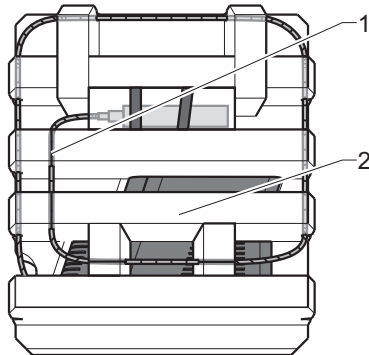
5 Installation

5.1 Unpacking

The laser marking device is delivered in a packaging which meets UPS "falling regulations".

From the inside outwards:

- laser device **DFL Ventus Marker** with the components: laser head, supply unit and fiber laser cable,
- foam grid,
- vacuum-tight, welded aluminium foil with desiccant,
- inner carton,
- foam corners,
- outer carton with accessories included in the scope of delivery.



1. Open the outer carton.
2. Remove the laser marking device in its packing material and put it down in a safe place.
3. Open the top of the inner carton. When doing so, watch the labelling!
4. Open the foil packing and pull it off.
5. Carefully remove the fiber laser cable (1) from the foam grid (2) and lay it aside.

CAUTION

The fiber laser cable can be damaged by incorrect handling.

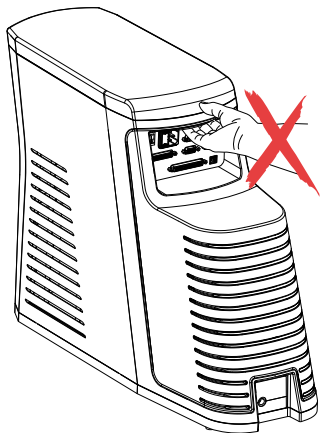
Do not kink or twist cables, or roll them up too tightly.

Minimum kink radius 75 mm

Minimum loop length 1 m

Maximum distortion by 180 degrees

Installation



6. Remove the foam grid.
7. Place the laser head and the supply unit on a flat surface.

CAUTION

Do not hold the supply unit by the edge above the interfaces.

8. Remove the accessories and place them down.
9. Check the scope of delivery for completeness.

NOTICE

Store the packaging material in a safe place in case the device has to be returned to the manufacturer under warranty for maintenance and repair work.

In such a case repack the laser marking device into its original packaging in the reverse order and seal it securely.

5.2 Mechanical Installation

The special design of the **DFL Ventus Marker** enables it be attached optionally either to the laser head on the supply unit or directly in a system. The distance to the supply unit is a maximum of 3 meters.

CAUTION

The fiber laser cable can be damaged by incorrect handling.
Do not kink or twist cables, or roll them up too tightly.

| | |
|-----------------------|-------------|
| Minimum kink radius | 75 mm |
| Minimum loop length | 1 m |
| Maximum distortion by | 180 degrees |

WARNING

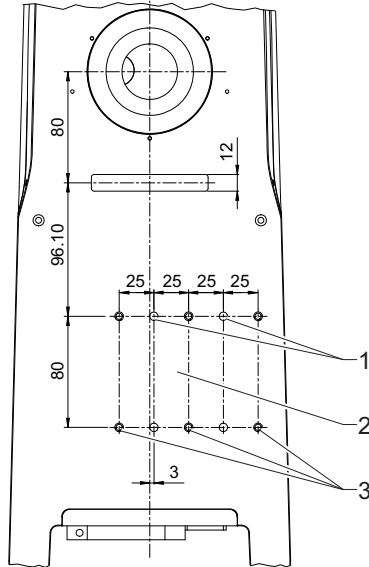


RISK OF PERSONAL INJURIES AND MATERIAL DAMAGE FROM LASER RADIATION!

All safety-related devices must be installed and their effectiveness proven before the system is started up. The acceptance must be performed by the laser safety officer and recorded in writing.
For safety reasons, the laser must not be activated until all the above-mentioned conditions have been fulfilled.

Installation

Assembly of the laser head to the plant



The mounting surface (2) on the underside of the laser head is used to attach it mechanically to a system.

The position of the bore holes (measured in mm) for

- M6 fixing screws (3) with washers/ tooth lock washers
- dowel pins (1) $\varnothing 6$ H7

can be seen in the drawing on the left.

In each case it is attached by four screws and two pins.

NOTICE

The above-mentioned standard parts are not included in the scope of delivery. Take note of the maximum screw depth of 8 mm.

The length of the bearing surface on the system side should be at least 100 mm.

⚠ CAUTION

RISK OF DAMAGING THE OBJECTIVE!

Depending on the mounting position of the laser head, the objective must be protected against dirt by suitable measures, for example by installing an extraction unit!

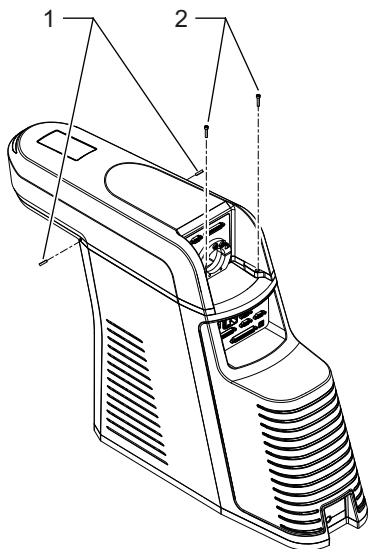
⚠ CAUTION

RISK OF DAMAGING THE OBJECTIVE!

Leave the protective cover on the objective throughout the entire installation.

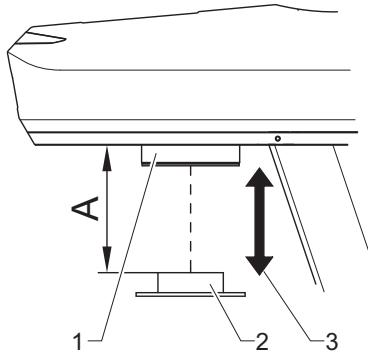
Assembly of the laser head to the supply unit

1. Take off the enclosure from the supply unit.
2. Put on the laser head.
3. Fixate the laser head by hand tightening the two setscrews (1).
4. Screw in the two screws (2).



Installation

Focusing



NOTICE

A defined distance between the objective of the scan head and the work piece must be set in order to focus the laser beam optimally on the surface of the work piece.

The distance (A) between the lower edge of the scan unit (1) and the surface of the work-piece (2) depends upon the type of objective used:

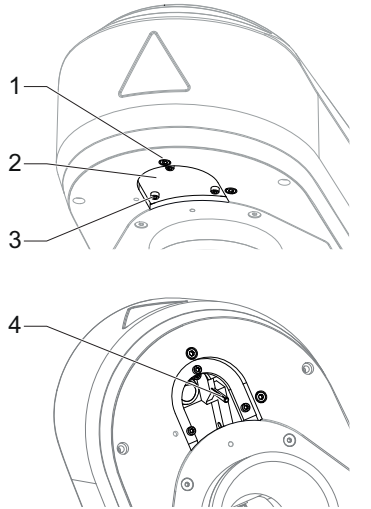
- F-Theta 100: $A = 132 \pm 3 \text{ mm}$
Marking field size: 60 mm x 60 mm
Focus shift (when using the FocusShifter): $\pm 5 \text{ mm}$
- F-Theta 163: $A = 200 \pm 3 \text{ mm}$
Marking field size: 110 mm x 110 mm
Focus shift (when using the FocusShifter): $\pm 14 \text{ mm}$
- F-Theta 254: $A = 327 \pm 6 \text{ mm}$
Marking field size: 180 mm x 180 mm
Focus shift (when using the FocusShifter): $\pm 35 \text{ mm}$

NOTICE

The exact value for distance (A) is stated in the parameter file supplied with each device!

The availability of a suitable height adjustment (3) is a useful aid when focusing.

Adjusting the focus finder



If focus finder and pilot laser do not coincide, the focus finder can be readjusted with the aid of the two adjustment screws (1).

If the lens has been changed, the focus finder must be adjusted accordingly:

1. Remove the 3 screws (3) and remove the protective window (2), under which the focus finder is accessible.
2. The position of the focus finder can be changed by means of the sleeve (4) in 3 latching steps. The steps are matched to the available lenses.
3. Insert the protective window (2) again and fasten with the screws (3).
4. Fine-tune with the two adjustment screws (1).

Installation

Connecting the fiber laser cable

Connect the laser head to the supply unit by the fiber laser cable.

CAUTION

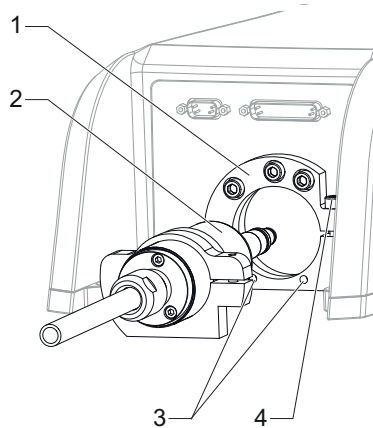
The fiber laser cable can be damaged by incorrect handling.

Do not kink or twist cables, or roll them up too tightly.

Minimum kink radius 75 mm

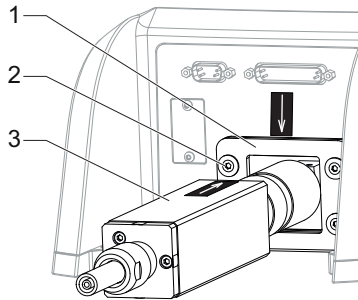
Minimum loop length 1 m

Maximum distortion by 180 degrees



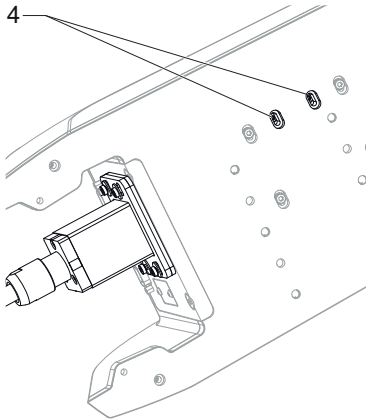
Plugging the fiber laser cable into the laser head (design variant 1):

1. Loosen the screw (4) on the mounting ring (1) and remove the blind plug.
2. Insert the fiber laser cable connector (2) so that the 2 guide pins engage into the drill holes (3).
3. Tighten the screw (4) on the mounting ring (1).



Plugging the fiber laser cable into the laser head (design variant 2):

1. Loosen the 4 screws (2) on the frame with sealing gaskets (1).
2. Insert the fiber laser cable connector (3), align the markings with each other.
3. Secure the connector by screwing in the 2 clamping screws (4) on the underside of the laser head.
Do this by progressively screwing in the clamping screws alternating between them.
4. Retighten the 4 screws (2) on the frame with sealing gaskets (1).



5.3 Marking Software Installation

- Minimum hardware requirements**
- PC with 64 bit operating system Windows 7 or 10,
 - CD ROM drive,
 - 1 free USB 2.0 interface,
 - monitor with 1280 x 1024 pixels,
 - keyboard, mouse.

If necessary, you will receive this additional information from the manufacturer.

Installation

1. Start the PC.
2. Ensure that the above-mentioned operating system is installed on your PC.
3. Insert the CD labelled with **Magic Mark** into your CD drive.
4. Open the **Magic Mark** folder in Explorer with a double click.
5. Start the Setup file with a double click.
6. Follow the instructions of the installation program.
The **Setup Complete** message appears when the installation has finished.
7. Confirm by pressing the **ENTER** key.
8. Restart the PC.

NOTICE

You will find detailed instructions for configuring the marking system in the Software Manual.

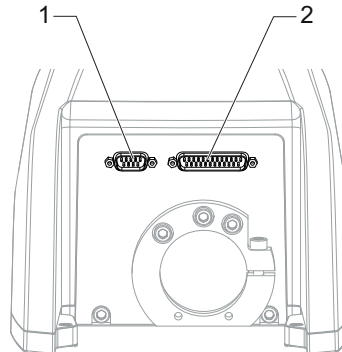
5.4 Electrical Installation

5.4.1 Interfaces

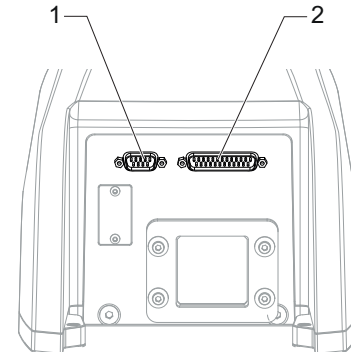
| ⚠ WARNING | |
|---|---|
|  | DANGER OF INJURIES AND/OR RISK OF PROPERTY DAMAGE! The device interfaces may only be connected to the plant by an electrician in cooperation with a laser safety officer! |

Laser head interfaces

Design variant 1



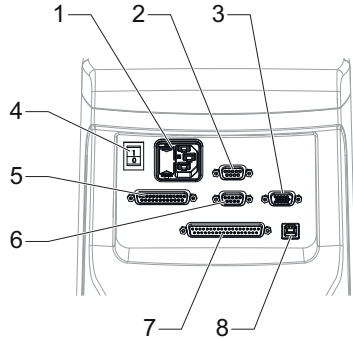
Design variant 2



- (1) supply cable connection 2 (to the supply unit)
- (2) supply cable connection 1 (to the supply unit)

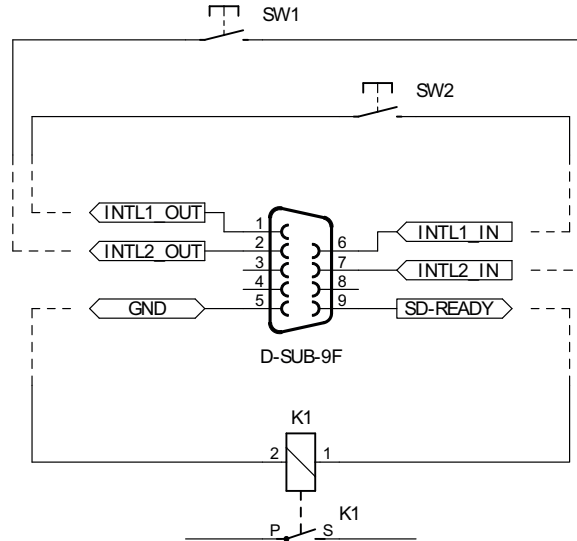
Installation

Supply unit interfaces



- (1) power input module with cold device plug socket and micro fuse drawer
- (2) interlock connection
- (3) optional trim module
- (4) power switch
- (5) supply cable connection 1 (to the laser head)
- (6) supply cable connection 2 (to the laser head)
- (7) laser control interface, 37-pin, sub-D, panel socket as an interface to the plant
- (8) USB 2.0 interface used for communication between control PC and laser marking device

Interlock connection



Interlock circuit 1 and 2

Pin 1, pin 6 INTL1_OUT, INTL1_IN
external interlock circuit 1

Pin 2, pin 7 INTL2_OUT, INTL2_IN
external interlock circuit 2

In order to integrate the laser marking device into an external, dual-channel, safety circuit, 2 potential-free independent safety switches must be wired between pin 1/6 and pin 2/7 (see image).

To this end, it must be ensured (mechanically) that both switches reliably within a period of 150 ms.

Alternatively for the use of potential-free safety switches, it is possible to use a safety relay based on Performance Level e with appropriate wiring in accordance with the manufacturer's specifications.

Please use a shielded, four-wire cable with a wire cross-section of at least $4 \times 0.5 \text{ mm}^2$ to connect the interlock circuits and connect the diaphragm located on the plug connector of the laser marking device to connector housing and earth (pin 5).

Pin 9 **SD-READY**
24 V, max. 100 mA, short-circuit proof

Pin 5 **GND**
Reference for SD-READY

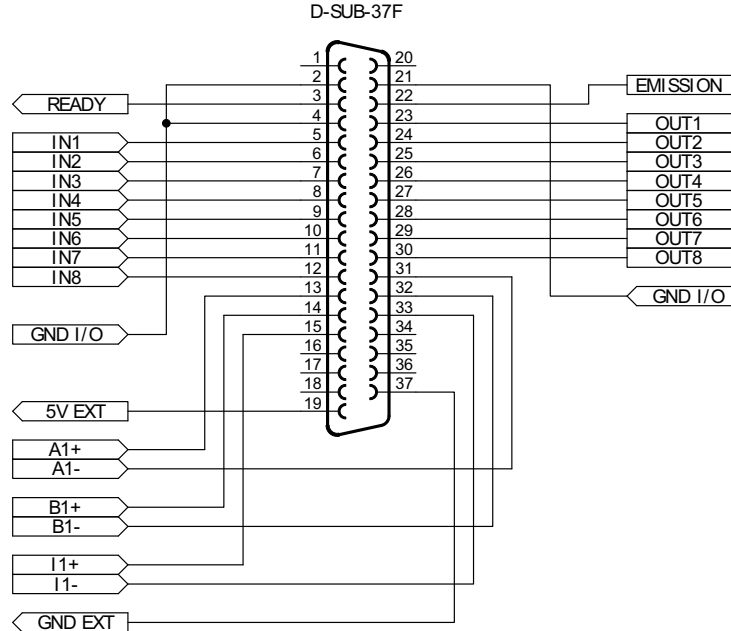
When the laser safety device (SD) is ready for operation, pin 9 carries 24 V against pin 5. Connecting a suitable indicator light or a switching element allows readiness for operation and absence of errors in all safety-relevant components to be signalled to the user, respectively the overriding control.

For connection, please use a shielded, two-wire cable with a wire cross-section of at least $2 \times 0.5 \text{ mm}^2$ and connect the diaphragm located on the plug connector of the laser marking device to connector housing and earth (pin 5).

If possible, the end points of connected cables should also be connected to earth, respectively earth potential (protective conductor).

Laser control interface



The laser control interface is a 37-pin, 2-row sub-D panel socket. Depending upon the application case, the laser control interface may be wired by the user.



External emission light

Pin 22 **EMISSION**
24 V, max. 200 mA, fused by poly fuse.

Pin 22 carries 24 V when the shutter is open.
The connected emission warning light signals danger from laser radiation.

|  WARNING | |
|--|---|
|  | <p>DANGER OF INJURIES AND/OR RISK OF PROPERTY DAMAGE FROM LASER RADIATION!</p> <p>Wiring this output is specified for operation in accordance with a class 4 laser.</p> |

Laser ready

Pin 3 **READY**
24 V, max. 200 mA, fused by poly fuse.

This output produces a summation signal of all possible error states. The output is set when all components function within normal parameters and the laser is ready for operation.

This signal can be processed both optically and electronically. This output is an essential aid, particularly for use in production lines.

Inputs and outputs

Pin 5 to 12 **IN1 to IN8**
24 V, 3.5 mA
Control inputs for PLC connector

Pin 23 to 30 **OUT1 to OUT8**
24 V, max. 0.5 A

electronically protected, short-circuit proof, inductive loads may be connected. There is an internal freewheel diode.

Pin 2, 4, 21

GND I/O

Reference for all 24 V inputs and outputs as well as READY and EMISSION

The inputs can be queried during a marking cycle and so start a marking job. The freely programmable outputs can, for example, be used to indicate the end of an inscription. Please refer to the software manual for information concerning the processing of signals by the marking software.

NOTICE

Current limitation: There is a common limit to the current for all outputs. If the maximum permissible current (0.55 A) is exceeded, all the outputs are switched off (see page 56, Overload I/O).

Connections for the optional encoders (Marking on the fly)

Pin 13, Pin 31

A1+, A1-

Pin 14, Pin 32

B1+, B1-

Pin 15, Pin 33

I1+, I1-

Differential encoder inputs, level 1.5 V

Pin 19, Pin 37

5V EXT, GND EXT

Encoder power supply, 5 V, max. 100 mA, fused by poly fuse, The supply voltage is switched on by software.

Optional trim module

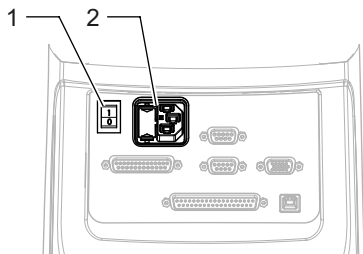
Reserved slot for an optional trim module

For function description and detailed information, please refer to the operating manual for the trim module.

Installation

5.4.2 Connection

Power connection



1. Ensure that the device power switch (1) is switched off.
2. Connect the supplied power cable to the power input module (2) of the supply unit.
3. Connect the power cable to an earthed socket.

Connection between the laser head and the supply unit

Connect the laser head to the supply unit by the supply cables.

Connection with the PC

1. The marking software must be installed.
2. Connect the USB interface of the laser marking device to the PC.

NOTICE

The laser control interface must be correspondingly wired.

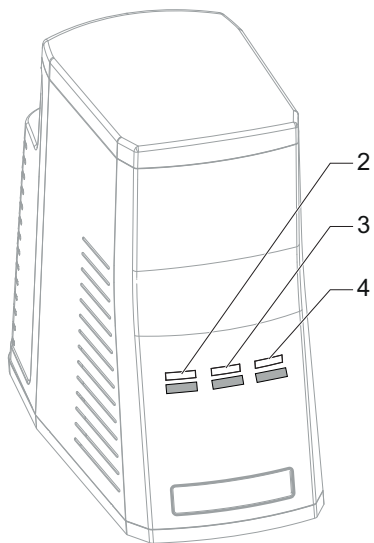
5.5 Checking the Installation



RISK OF PROPERTY DAMAGE.
Perform the following tests to avoid material damage.

Please check the following points again before you bring your laser system into operation.

- Have the mechanical and electrical installations been performed correctly and completely?
- Are all the cables plugged in correctly, in particular the connecting cables between the laser head and the supply unit?
- Has the fiber laser cable been laid according to specifications?
- Does the fuse for the device correspond to the available operating voltage (110 V: 5 A, 2 x or 220 V: 2.5 A, 2 x)?
- **Have you removed the protective cover from the focusing objective?**
- Is the focusing objective clean and dust-free?
- Do the environmental conditions meet the requirements (temperature, air humidity)?
- Are all the vents open?
- Is there an adequate fresh air supply to the laser device?
- Are you familiar with the essential laser protection regulations? Have all the laser safety measures been taken?
- Has the laser safety officer accepted the installation?



| Multi function display of the laser head | Supply unit function indicator | Condition | Meaning |
|--|--|----------------|---|
| Dark blue | Power Dark blue flashig | Offline | Laser initialising |
| Dark blue | Power Dark Blue | Offline | Device switched on, Software not started or no communication |
| Dark yellow | Power Dark Blue | Off | Communication exists, Laser not activated |
| Dark green with pale yellow flash | Power Dark Blue | On (not ready) | Laser activated, not yet ready for operation |
| Dark green | Power Dark Blue Ready orange | On (ready) | Laser activated, ready for operation |
| Dark green with pale yellow light running down on both sides | Power Dark Blue Ready orange Emission yellow | Emission | Device runs |
| Pale yellow flashing | --- | Warning | Warning, but device continue to run |
| Bright red flashing | Power Dark Blue | Error | Fault, device disabled, all power levels switched off electronically, see Troubleshooting |

6.2 Starting the Laser Marking Device

NOTICE

Keep to the switching sequence on each start.

1. Start the control PC.
2. Wait until the operating system has completely loaded.
3. Switch on the device power switch.

NOTICE

The interlock circuits must be open when switching on the device.

Follow the Windows installation instructions during the initial commissioning.
The main power pack supplies the supply voltages required.
The laser is not yet ready for operation.

4. Start the marking software.
The laser and scanner control, and the galvanometer are then initialized.

NOTICE

**The marking software starts in demo mode if it is not possible to communicate with the laser marking device.
The same happens if the software is started before the marking device.
You will find more detailed information on the software manual.**

6.3 Handling

The laser marking device is operated via the marking software.

All operating sequences are controlled from the control PC via the laser control interface.

All the parameters are exclusively entered on the keyboard of the control computer.

NOTICE

Detailed information for using the marking software is contained in the software manual provided.

6.4 Fault Finding

6.4.1 General Faults

| Problem/Fault | Possible cause | Elimination |
|---|--|--|
| Error message when loading the marking software | Marking software incorrectly installed | Reinstall the software. |
| No communication | USB cable incorrectly connected | Check whether the cable is plugged in correctly. |
| | No supply voltage | Check whether your laser is supplied with power. |

Operation

| Problem/Fault | Possible cause | Elimination |
|--------------------------------|--|---|
| Laser cannot be started | Cable incorrectly plugged | Check that the cable is seated properly. |
| | Interlock circuits closed | Open the interlock circuits (must always be open upon system start-up). |
| | SD error | Start the marking software and check status / error reports in the status bar, respectively in the message window, to receive detailed information. |
| No laser beam | Shutter closed | Check whether all safety switches are locked. Check whether the shutter is opened in your marking job. |
| | Defocusing | Check the focus position by changing the distance between focusing objective and work piece. |
| | Incorrect laser parameters | Check your laser parameters, they may not be suitable for the work piece to be marked. |
| | Fiber laser cable (BDO) not or incorrectly plugged | Check the assembly and laying of the fiber laser cable. |
| | Supply cable not mounted | Plug in the supply cable. |
| Laser power too low | Defocusing | Check the focus position by changing the distance between focusing objective and work piece. |
| | Incorrect laser parameters | Check your laser parameters, they may not be suitable for the work piece to be marked. |

| Problem/Fault | Possible cause | Elimination |
|----------------------------------|---|--|
| Laser does not pulse | Incorrect laser parameters | Check the laser parameter settings, the laser may be working in cw operation. |
| Laser switches off automatically | Environmental conditions do not meet the specifications | Check the environmental conditions. Keep to the environmental conditions required. |

NOTICE

Please contact our Technical Customer Service in the first instance if the fault cannot be eliminated as described above.

6.4.2 Specific Faults

The **Magic Mark** marking software monitors the laser device for possible faults and provides the user with status messages about the state of individual system components.

The messages are displayed in the **Messages** system windows on the monitor.

| Status/Error | Trigger | Message | Evaluation per software |
|---|---------------------|--|-------------------------|
| Error +/-15V, <13V >-13V | Head Control | ERROR 15V | Display |
| Error +/-15V, <13,5V >-13,5V | Head Control | WARNING 15V | Display Warning |
| Interlock circuits closed during the starting process | Laser Safety Device | SD WARNING interlock closed during startup | Display Warning |
| Interlock circuits open during current labelling | Laser Safety Device | SD WARNING interlock opened during operation | Display Warning |
| Shutter fault | Laser Safety Device | SD shutter ERROR | Display + Cut Off |

Operation

| Status/Error | Trigger | Message | Evaluation per software |
|-----------------------------|---------------------|---------------------------------|-------------------------|
| Interlock fault | Laser Safety Device | SD interlock ERROR | Display + Cut Off |
| SD undervoltage | Laser Safety Device | SD ERROR internal under-voltage | Display + Cut Off |
| SD error | Laser Safety Device | SD internal ERROR | Display + Cut Off |
| Error +12V, <10V | Laser Interface F | WARNING +12V | Display Warning |
| Error +12V, <9V | Laser Interface F | ERROR +12V | Display + Cut Off |
| Error -12V, >-10V | Laser Interface F | WARNING-12V | Display Warning |
| Error -12V, >-9V | Laser Interface F | ERROR-12V | Display + Cut Off |
| Error 24V, <22.5V | Laser Interface F | WARNING 24V | Display Warning |
| Error 24V, <22.0V | Laser Interface F | ERROR 24V | Display + Cut Off |
| Overload I/O | Laser Interface F | ERROR Overload I/O | Display + Cut Off |
| Laser over temperature | Laser Interface F | ERROR Over temp. Laser | Display + Cut Off |
| BDO not plugged | Scan Head F | ERROR BDO | Display + Cut Off |
| Laser head over temperature | Scan Head F | ERROR Overtemp. Shutter | Display + Cut Off |
| Galvo error Z | Scan Head F | ERROR Ready Z | Display |

An overview of the further possible messages and their meaning can be found in the software manual.

7 Maintenance and Repair

7.1 Care

Perform the following care activities on the device at regular intervals.

- Clean the objective.
- Clean the ventilation slits of the covers.

| | |
|--|---|
|  WARNING | |
|  | DANGER OF INJURIES AND/OR RISK OF PROPERTY DAMAGE. Ensure that the power plug has been pulled out before starting the cleaning tasks! |

Cleaning the objective

A dirty objective reduces the transmission of the laser radiation. This leads to a reduction of the laser power on the work piece. The dirt can burn into the surface and damage the focusing objective. A protecting glass is therefore fixed in front of the objective by means of a threaded ring.

NOTICE

The warranty does not cover any damage caused by inadequate or improper cleaning.

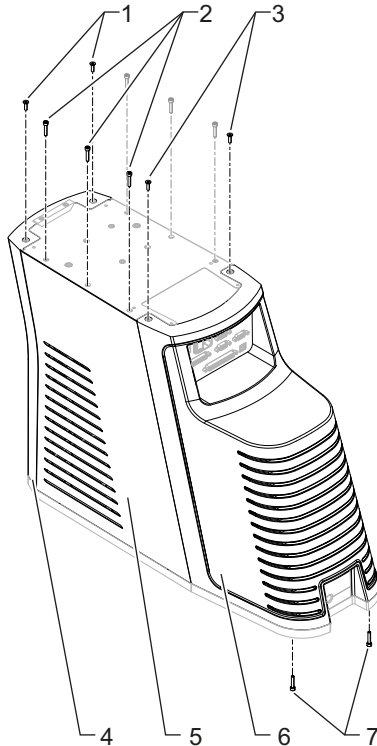
Make a regular visual inspection of the focusing objective/protecting glass. Clean the protecting glass if any dirt is found (and the objective if necessary). Only cleansers which are authorized for high-quality optics may be used for this purpose.

- Never attempt to remove particles of dirt from the surface with compressed air.
- Use a suitable lens cleaning paper and ethanol of optical purity standard.
- Moisten one side of the cleaning paper. Do not touch the moist side under any circumstances.
- Draw the paper slowly in one direction over the protective glass/focusing objective.
- Remove any ethanol residue with a dry paper if necessary.
- Repeat the procedure until the surface is completely clean. Use a new cleaning paper each time.

NOTICE

Suitable cleansers can be obtained from the manufacturer.

Cleaning the ventilation slits



Cleaning the ventilation slits regularly is a prerequisite for faultless operation of the device. Remove the two side covers and the rear cover to clean the ventilation slits on the supply unit.

NOTICE

**Air is sucked in through the side air slits.
If ambient air is heavily polluted, we recommend inserting and regularly changing filter mats in the side covers.
Suitable filter mats can be obtained from ACI Laser GmbH.**

1. Take off the enclosure.
2. Remove the two fixing screws (3) from the top of the supply unit and the two screws (7) from the bottom.
3. Pull the rear cover off the device.
4. Remove the three screws (2) from each of the two side covers (5).
5. Remove the side covers.
6. Remove the 2 fixing screws (1) and remove the front cover (4) from the device. Watch out for the cable, remove it if necessary.
7. Clean the ventilation slits of the cover with a dry or slightly damp cloth. Do not use any solvent for cleaning them.
8. Ensure that the covers are completely dry before reclosing the device.
9. Remount the covers in the reverse order.

NOTICE

**Slide the cover onto the device so its fits exactly.
Screw the fixing screws in hand tight.**

10. Check the electrical connections before bringing the device back into operation.

7.2 Maintenance, Repair

The laser device does not contain any parts which can be maintained or repaired by the user.

All maintenance and repair work must be performed exclusively by the manufacturer. The right to claim under warranty is lost as soon as third parties work on or modify the device.

The manufacturer has suitable test benches and routines to maintain your laser system optimally.



RISK OF PROPERTY DAMAGE.

During the warranty period, use the original packaging exclusively when dispatching the defective device.

Maintenance intervals

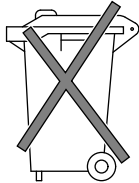
- Seek advice from the Customer Service of the manufacturer as to when your laser marking device should undergo maintenance. This depends on the specific use and duration.
- In order to maintain Performance Level e, the shutter assembly (swivel shutter) must be replaced no later than 14 years.

8 Scrap Disposal

ENVIRONMENT

Protect the environment!

For a fee, the customer will accept return of the laser device and dispose of it properly in a manner that is environmentally compatible.



Environmentally sensible disposal of electrical and electronic equipment!

Electrical and electronic equipment contains valuable materials that should be supplied to recycling or recovery.

Please dispose of electrical and electronic equipment at qualified collecting points separate from municipal waste.

9 Appendix

9.1 Saturation Vapour Pressure as a Function of the Temperature

| t [°C] | p _d [mbar] |
|--------|-----------------------|
| 15 | 17.04 |
| 16 | 18.17 |
| 17 | 19.36 |
| 18 | 20.63 |
| 19 | 21.96 |
| 20 | 23.37 |
| 21 | 24.86 |
| 22 | 26.42 |
| 23 | 28.08 |
| 24 | 29.82 |
| 25 | 31.66 |

| t [°C] | p _d [mbar] |
|--------|-----------------------|
| 26 | 33.60 |
| 27 | 35.64 |
| 28 | 37.79 |
| 29 | 40.04 |
| 30 | 42.42 |
| 31 | 44.91 |
| 32 | 47.54 |
| 33 | 50.29 |
| 34 | 53.18 |
| 35 | 56.22 |

To estimate the condensation temperature T_k , you need:

- T_u ambient temperature
- T_c internal temperature of the laser marking device = 20°C = const
- φ air humidity

Example calculation ($T_u = 25\text{ °C}$, $\varphi = 0,65\%$)

Proceed as follows:

1. Determine the saturation vapour pressure p'_d ($p'_d = 31,66\text{ mbar}$) in the table for $t = T_u$
2. Calculate the vapour pressure $p_d = \varphi * p'_d$ ($p_d = 0.65\% \times 31.66\text{ mbar} = 20.58\text{ mbar}$)
3. Determine the value $t = T_K$ ($T_K = 18\text{ °C}$) associated with p_d in the table = 20.63 (nearest value).

The following applies as a rule:

For $T_k < T_c$ or $T_k < 20\text{ °C}$

there is no risk of condensation on the laser components.

9.2 EC Declaration of Incorporation

This is to declare that the partly completed machine, based on its design and type of construction and in the version put on the market by us, conforms to the following fundamental requirements as defined in Directive 2006/42/EC on machinery.

Anhang I, Artikel 1.1.2, 1.1.3, 1.1.5, 1.1.6, 1.1.1, 1.2.4.1, 1.3.2, 1.5.1, 1.5.2, 1.5.8, 1.6.3, 1.7

In addition, this partly completed machine conforms to the provisions set forth in Directive 2014/30/EC on electromagnetic compatibility and Directive 2011/65/EU on hazardous substances (RoHS) and the harmonized standard EN 50581:2012.

In the event of any alteration to the partly completed machine or the intended purpose which has not been approved by us, this statement shall thereby be made invalid.

Device:

Marking laser

Type:



Applied EC directives and standards:

Directive 2006/42/EC on machinery

EN ISO 12100:2010

EN ISO 13857:2008

EN 349:1993+A1:2008

EN 60204-1:2006+A1:2009

EN ISO 13849-1:2015

EN 60825-1:2015-07

Representative for compiling technical documents:

Mirko Wunderlich, Steinbrüchenstraße 14, 99248 Grammetal OT Nohra

Signed on behalf of the manufacturer by:

Nohra, 2019-02-01



ACI Laser GmbH

Steinbrüchenstraße 14, 99428 Grammetal OT Nohra

Mirko Wunderlich

Geschäftsführer

Commissioning is prohibited until it has been determined that the machine which the device is to be installed complies with the provisions of the directive on machinery.

The manufacturer is obligated to send the specific documentation for the partially completed machine to the appropriate national authority in electronic form on request.

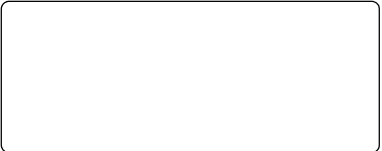
Declaration of Conformity according to the Electromagnetic Compatibility Directive 2014/30/EC on the following page.

9.3 EC Declaration of Conformity

We herewith declare that the machine described below, by virtue of its design and construction and moreover in the type brought onto the market by us, conforms to the relevant safety and health requirements of the applicable EU Directives.
In the event of any alteration to the device or the intended purpose which has not been approved by us, this statement shall thereby be made invalid.

Device:
Type:

Marking laser



Applied EC directives and standards:
Electromagnetic Compatibility Directive 2014/30/EC
Directive 2011/65/EU on Hazardous Substances (RoHS)

EN 55016-2-1:2014-12
EN 55016-2-3:2014-11
EN 61000-3-2:2015-03
EN 61000-3-3:2014-03
EN 50581:2012

Representative for compiling technical documents:
Signed on behalf of the manufacturer by:

Mirko Wunderlich, Steinbrüchenstraße 14, 99248 Grammetal OT Nohra
Nohra, 2019-02-01

ACI Laser GmbH
Steinbrüchenstraße 14, 99428 Grammetal OT Nohra

Mirko Wunderlich
Geschäftsführer

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Operating Instructions for **DFL Ventus Marker Standard Design**
Business Fibre

Article number: 10001631
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