Videojet 3140/3340/3640

Operating Instructions

Translation of the original instructions

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1 Preface

This manual...

...contains all information required for the safe operation, remedy of minor malfunctions and maintenance of the laser system. The operation manual is always enclosed with every laser system on a data carrier. This operation manual is intended for the **trained operation personnel** of the laser system.

This operation manual is subject to technical modifications for improvement or technical progress without notice.

Before starting your work carefully read the chapter »Safety Instructions«!

NOTICE

The printed safety instructions must be stored near the laser system, easily accessible for the operator!

Make sure that you have understood all notes. In case of any questions please contact Videojet Technologies Inc. directly.

Strictly follow the instructions!

If you need help...

...please contact Videojet Technologies Inc. at 1-800-843-3610 (for all customers within the United States). Outside the U.S., customers should contact their Videojet Technologies Inc. distributor or subsidiary for assistance.

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Caution Laser Radiation!

With open delivery system dangerous laser radiation of class 4 might be released!

This might cause severe burns of the eyes and the skin as well as damage to objects!

Thoroughly read this operation manual and strictly follow the safety instructions!

2 Safety Instructions

2.1 Symbols Used

⚠ DANGER

refers to an immediately impending danger. If the danger is not avoided, it could result in death or severe (crippling) injury.

⚠ WARNING

refers to a possibly dangerous situation. If it is not avoided, it could result in death or severe injury.

⚠ CAUTION

refers to a possibly dangerous situation. If it is not avoided, it could result in slight or minor injury. May also be used to warn of damage to property.

NOTICE

refers to handling tips and other particularly useful information. This does not signify a dangerous or harmful situation.

⚠ DANGER LASER RADIATION

refers to the emission of laser radiation and therefore to a possibly dangerous situation. Please comply exactly with the safety instructions! Failure to comply with the instructions could result in minor or major injuries to the eyes (blindness) or to the skin, together with damage to property.

2.2 Laser Classes

Laser classes 1, 2 and 4 according to EN 60825-1 are relevant for this laser system.

Laser radiation of class 1 is safe for the eye and does not result in any damage even in case of long-term intentional viewing. Also encapsulated high-power lasers are classified as class 1 systems if the hazardous laser radiation is not accessible in normal operation.

Laser radiation of class 2 is safe for the eye if natural defense mechanisms (blink reflex, turning the head) are not suppressed. Do not stare into the beam.

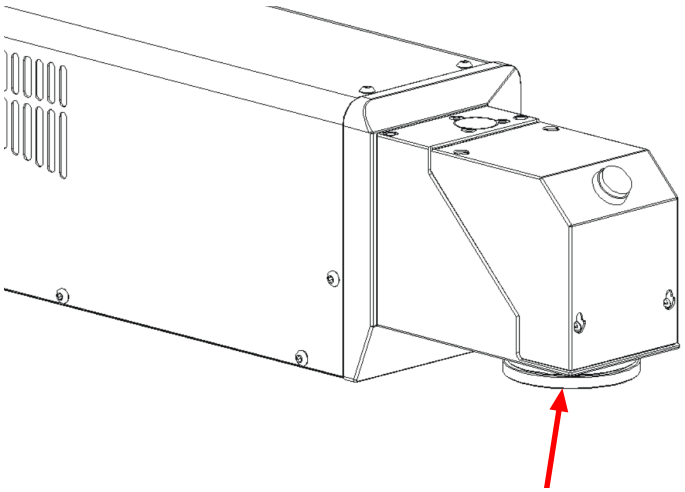
Laser radiation of class 4 is dangerous to the eye and the skin. Also diffusely reflected radiation can be hazardous. There may also be a risk of fire.

The Complete Laser System

The laser itself is classified as class 4 laser system according to EN 60825-1. Up to the beam outlet the **closed** laser system acts as a **class 1 laser system** in **normal operation**[1].

If the beam outlet including the object to be marked is shielded appropriately, the **complete, closed** laser system acts as a **class 1 laser system** in **normal operation**[1] and no additional protection is required for operation. The shielding prevents emerging of laser radiation or laser beam reflections.

The laser beam exits at the marking head through the focusing lens (arrow).



If a pilot laser is installed please note that this is a laser of class 2 and therefore the complete system with shielding is to be classified as class 2 if the shielding does not sufficiently attenuate the radiation of the pilot laser.

NOTICE

The shielding is not included in the scope of delivery!

⚠ DANGER LASER RADIATION

The beam path must always be closed, also if there is no product in front of the laser lens.

[1] Normal operation does not include service, maintenance nor repairs.

The Laser Source

As laser beam source (hereinafter called laser) a CO_2 laser in continuous wave operation is used. The laser itself is classified as class 4. It produces invisible (infrared) radiation which is extremely dangerous for the eye and dangerous for the skin.

The laser can be modulated with a frequency between 50 Hz and 20/25/160 kHz (10/30/60 W). The actual frequency depends on the application.

Optionally, a pilot laser can be installed emitting visible laser radiation of class 2. This laser radiation can damage the eye if it stares into the beam.

⚠ DANGER LASER RADIATION

As soon as the closed shielding or the housing of the laser are opened anywhere the complete laser system is set to class 4.

In that case appropriate measures have to be taken in order to protect people working in the laser area against excessive radiation! For information on appropriate safety measures we offer special training seminars, see also section »Maintenance and Service«.

⚠ CAUTION

... with modifications!

EN 60825, part 1, »Radiation safety of laser systems«, section 4.1.1 says:

If a modification by the user to a laser system previously classified in accordance with this standard leads to a change of its performance data and/or its intended use that person or organization performing the modification is responsible for a new classification and labeling of the laser system.

⚠ WARNING

The pilot laser can be used for simulation or adjustment without the CO_2 laser. Also in this case you must wear laser safety goggles for protection against CO_2 laser radiation.[a]

[a.] In this case the CO_2 laser is switched off via the software. Due to the laser safety regulations safety goggles must be worn.

2.3 Intended Use

The laser system **must only be used for the treatment of material surfaces**. The surfaces are locally heated by intensive class 4 laser radiation and are modified thereby. These systems are mainly applied for marking of product surfaces (dates, batch printing, serial numbers, etc.).

⚠ WARNING

The radiation produced by the laser system is of high energy and therefore improper use represents a danger to persons or objects!

The laser system must only be installed in production sites with restricted access.

Examples for Improper Use and the Resulting Risks

- **Never expose human beings or animals to laser radiation!**
  This might result in severe burns of eyes or skin.
- **Never expose flammable materials to laser radiation!**
  Always ensure appropriate shielding of the laser beam! Errors during marking on flammable materials (e.g. paper) might cause fires. Take suitable safety measures by installing e.g. smoke or fire detectors, extinguishers, or similar!

- **Never expose reflecting surfaces to laser radiation!**
  The reflected laser beam may cause the same dangers - in individual cases even greater dangers - as the original laser beam.
- **Never expose unknown materials to laser radiation!**
  Some materials are easily penetrated by the laser beam, although they seem to be opaque for the human eye.
- **Danger of explosion!**
  Make sure that the laser area is free of explosive materials or vapors!
- **For safety reasons arbitrary modifications or changes to the laser marking system are forbidden and result in loss of warranty!**
  If a modification made by the user to a previously classified laser system leads to a change of its performance data and/or its intended use that person or organization performing the modification is responsible for a new classification and labeling of the laser system. The person or organization is then regarded as »manufacturer«.
  In this case a new risk assessment is required.

2.4 Maintenance and Service

The maintenance tasks described hereinafter should only be carried out by especially trained personnel.

The service tasks are exclusively to be carried out by service personnel of Videojet Technologies Inc. or one of their representatives. During these works the laser system has to be operated in **class 4**. In Germany, the DGUV Regulation 11 » Laser Radiation« says that the responsible trade cooperative association and the authority responsible for occupational safety (Trade Supervisory Office) have to be given notice of class 3R, 3B or 4 laser systems before initial operation. Please make sure to comply with your local regulations.

NOTICE

Give notice of the laser system to the responsible trade cooperative association and the Trade Supervisory Office before initial operation.

Have a person responsible for the safety of the laser system trained as laser safety officer and inform the trade cooperative association in writing about this person if the system is operated in class 4 for maintenance purposes.

In order to facilitate safe performance of all necessary maintenance and service tasks without assistance and to ensure highest safety for the operating and maintenance personnel we offer special training seminars.

- **Training for technicians:**
  The trainee gains the knowledge required to perform all maintenance and service tasks at the laser system safely and professionally without assistance.
- **Combined training:**
  In addition to the knowledge gained during the training for technicians the person is trained as laser safety officer. This training is accepted by the trade cooperative association (see above).

Ask for free information material!

2.5 Safety Devices and Warning Lights

The complete laser system includes various safety devices and warning lights which shall prevent damage to people or objects. There must not be any alterations to safety devices nor warning lamps (see section "Laser Classes [▶ 7]")!

Safety Devices

Key switch	The key switch prevents operation of the laser system by unauthorized people. Make sure that the key is withdrawn and available to authorized personnel only!
Beam shutter	The beam shutter is located within the laser head and prevents the emission of laser radiation of class 4. If a pilot laser is used, the emission of visible laser radiation of class 2 is still possible.
Safety interlock (Interlock)	If the safety interlock is opened, the laser power supply module is deactivated and the beam shutter is closed. Thus no laser radiation of class 4 can be emitted. It is possible to continue using the pilot laser in this state. In that case no laser radiation higher than class 2 can be emitted.

Warning Lights

Red lights "Laser emission"	The red lights on the control panel of the supply unit and on the marking unit light up when the emission of laser radiation of class 4 is possible. The functioning of these lights is monitored. In case of malfunction the system cannot start the laser.
Additional warning lights	Additional lights can be connected as external emission displays (system-specific).

NOTICE

When installing the laser make sure that at least one of the warning lights is always visible.

2.6 Dangers to Eyes and Skin

The laser system produces class 4 laser radiation. This radiation is emitted in the infrared range and invisible to the human eye.

High irradiation causes an extreme local heating and burning of the tissue. The eyes are subject to special risks: High radiation intensity causes a local heating and burning of the cornea and thus a reduction or loss of sight!

⚠ DANGER LASER RADIATION

People within the area of the laser must wear suitable safety goggles against laser radiation while carrying out maintenance, adjustment or service work on lasers with open laser housing and/or open beam delivery system!

Never look directly into the laser beam!

Suitable safety goggles provide protection against direct, specularly reflected or diffusely scattered laser radiation. Suitable safety goggles are:

- designed for the **wavelength range** of a CO_2 laser of 10.6 µm (optional 9.3 or 10.2 µm). See ID label of the laser system.

  Careful with confusions!
  Safety goggles for other lasers, e.g. Nd:YAG lasers, do not provide adequate protection against radiation of a CO_2 lasers!
- designed for the **power range** of the laser. Values of maximum average power:

  Videojet 3140 : 10 W

  Videojet 3340 : 30 W

  Videojet 3640 : 60 W

  In individual cases these values might be exceeded by up to 50 %.

  For 60 W systems power values of up to 150 W are possible.
- designed for **continuous wave** operation.

The following values can be reached (no specification):

	W	maximum power density W/m²
at the beam outlet	10	1.3×10^6
	30	4×10^6
	60	8×10^6
in focus	10	4×10^9
	30	12×10^9
	60	16×10^9

The skin can withstand higher radiation intensities than the eye. However - depending on the radiation period and radiation intensity - the tissue is destroyed through burns. Therefore protect your skin by wearing adequate personal protective equipment! Avoid any exposure of your skin to the laser radiation! Avoid the laser beam coming in contact with your clothing!

If a pilot laser is installed it emits visible laser radiation of class2 in the wavelength range of 600 nm to 700 nm. The laser power is < 1 mW.

This laser radiation may cause damage to the eye when staring into the beam.

It is safe for the eye if natural defense mechanisms (blink reflex, turning the head) are not suppressed when unintentionally looking into the beam.

The bright laser light may cause startle reflexes and temporary visual disturbances due to glare. This must be kept in mind when carrying out safety-related tasks, e.g. working with machines.

2.7 Adjustment/Modification of the Marking Field

Via the software the marking field of the laser can be modified in such a way that the laser beam can possibly be directed to the shielding or onto other components or parts. Thus, surfaces exposed to irradiation can be damaged or destroyed.

⚠ DANGER LASER RADIATION

If, as a result of the modification, the laser beam becomes accessible the complete laser system is set to class 4 (see section "Laser class [▶ 7]").

⚠ WARNING

Fire and explosion hazard if there are flammable materials or explosive atmospheres within the area of the laser beam.

Appropriate safety measures must be taken if the laser is to be operated in explosive atmospheres.

A password is required for changing the marking field (if the password protection has been activated in the software). The password can be changed subsequently by a user authorized for the corresponding user level.

We explicitly point out that the person who will fulfil a modification of the marking field, will assume the full responsibility for any consequential damage and problems!

2.8 Noise Hazard

During the marking process high-frequency noises in the range of 70 to 80 dBA are produced.

NOTICE

Protect your ears and wear a suitable hearing protection.

2.9 Safety Information for Zinc Selenide Lenses

⚠ CAUTION

The laser scan lens consists of coated zinc selenide and contains an extremely small amount of the radioactive substance thorium. This applies to all CO_2 laser marking systems available on the market.

Zinc Selenide

This material contains components which are dangerous to health!

Zinc selenide is toxic when inhaled or ingested. Dust may lead to irritation of the eyes and the respiratory system. Do not eat, drink or smoke while handling zinc selenide. Wash hands thoroughly afterwards.

For detailed information see safety data sheet in the chapter "Appendix".

Thorium

Thorium is a potential health hazard when inhaled or ingested. The thorium layer is embedded within other layers within the lens. Thus no radioactive material can escape from the coating as long as the lens is intact. Avoid any surface scratches of the lens.

There is no danger of radiation during normal handling and cleaning of the optical system!

In case of a broken lens...

...do not inhale material particles! In case of breaking of the laser scan lens please collect the fragments wearing gloves (avoid raising dust when sweeping up the pieces), pack the fragments into a closed plastic bag and send them back to Videojet Technologies Inc. for disposal.

Maintenance of the Laser Scan Lens

Information concerning the maintenance of the laser scan lens can be found in section “Cleaning the Laser Scan Lens [▶ 42]” (see chapter "Maintenance").

Please contact us if further information is required.

2.10 Fire and Explosion Hazard

⚠ WARNING

The high output power of a class 4 laser can inflame various materials. Therefore, while performing maintenance and service work at the open laser housing and/or open beam delivery system, make sure that fire protection measures were taken before starting the works!

Paper (circuit diagrams, leaflets, posters on the walls, etc.), curtains which are not impregnated fire retardantly, wooden boards or similar flammable materials can easily be inflamed by **direct or reflected** laser radiation.

Make sure that the working area of the laser system is **free from containers with flammable or explosive solvents or cleaning agents!** Unintended exposure of a container to intensive invisible laser radiation might easily cause fires or explosions.

2.11 Electrical Safety

The laser system was designed in accordance with the general rules of technology including regulations EN 60950-1, EN 62368-1, EN 60204-1 and EN 60825-1.

⚠ DANGER

During works at the open laser housing alive components are accessible.

Make sure that rules and regulations for works on alive components are always observed!

All works at the open laser housing, especially at electrical components, must only be performed by specially trained personnel!

2.12 Decomposition Products

⚠ WARNING

When treating materials with laser radiation decomposition products are produced which are dangerous to health!

Through vaporization of materials fine dust and vapors are produced which might include hazardous decomposition products depending on type and composition of the respective materials.

A fume extractor according to the respective requirements which is equipped with special dust and activated charcoal filters **must** be installed to ensure that the decomposition products are removed from where they are produced.

When treating materials with laser radiation the national and relevant regulations for air purification at work must be observed. Those regulations can result in further, detailed requirements regarding the performance of the fume extractor or the air recirculation to the workplace.

This can be the case marking different plastics, e.g. POM (polyoxymethylene), ABS (acrylonitrile butadiene styrene), SAN (styrene acrylonitril copolymer), HDPE and LDPE (polyethylene), PAN (polyacrylonitrile), PBT (polybutylene terephthalate) or different tool steels, e.g. with chromium additions.

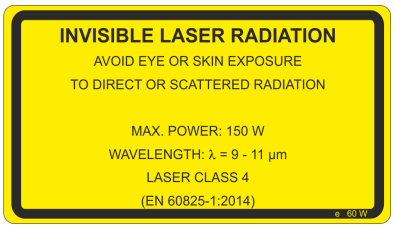
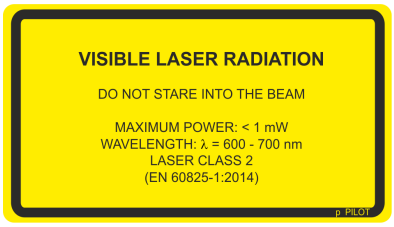
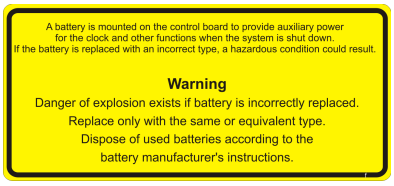
Marking those materials the formation of carcinogenic substances cannot be ruled out. This can result in the prohibition of the air recirculation to the workplace, i.e. the fume extraction system must lead the exhaust air outside into the atmosphere.

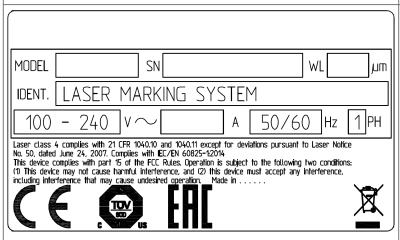
The company operating the system for treatment of material surfaces using laser radiation is responsible for meeting the local codes and regulations. Additionally, the safety instructions of the operating instructions must be observed.

Protect yourself and your colleagues against hazardous decomposition products!

A fume extractor also prevents contamination and gradual destruction of optical elements of the beam delivery system by dust particles. We offer different fume extractors as accessories.

2.13 Warning and Information Labels

Label/Symbol	Position
	on the marking head (front)
 	on the marking unit (the values vary depending on the model, see ID label of the laser system)
	on the marking unit (the pilot laser is optional)
	inside the housing cover of the supply unit
	on the back of the supply unit and on the marking unit (next to the supply line)

Label/Symbol	Position
	on the supply unit
	on the supply unit

3 Installation

3.1 Installation and Start-Up

Installation and start-up of the laser system requires extensive knowledge and experience. Therefore it should be accomplished by personnel of Videojet Technologies Inc. or one of their representatives only.

In order to facilitate quick and easy start-up please prepare the place of installation such that the system can be installed:

- Proceed as described in section "Unpacking [▸ 19]".
- Please provide all connections - as described in section "Installation Conditions" and in the documents you received upon order handling - prior to installation.

In case of questions please contact Videojet Technologies Inc..

NOTICE

The company operating the laser system is responsible for the safe use of the laser system, especially for meeting the local codes and regulations regarding the operation of laser systems and their components (beam protection, fume extractor, cooling, etc.).

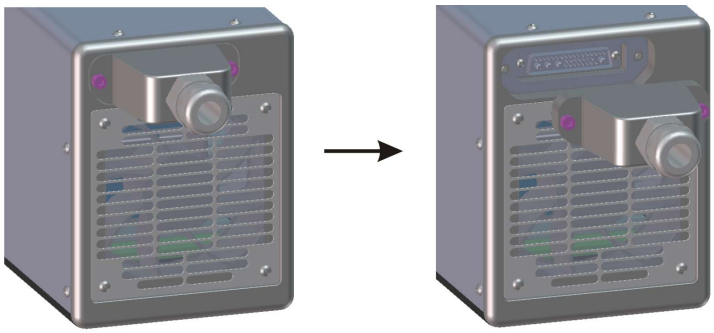
Videojet Technologies Inc. does not accept responsibility for any damage due to misuse of equipment, incorrect operation or negligence.

The supply unit is connected to the marking unit via a disconnectable supply line. The disconnectable supply line connector is mounted on the marking unit and it is fixed with two fixing screws.

Using high-quality connectors with gold-plated plug contacts a high number of mating cycles (minimum 200) is achieved. This corresponds to a normal industrial usage. An increased number of mating cycles may lead to wear.

NOTICE

When the supply line is to be disconnected/connected, the laser system must be completely switched off.



3.2 Transport and Storage

The laser system is a precision-made instrument and includes numerous electronic and optical components. Please avoid any mechanical stress (shock, vibrations, etc.) on the laser system. In case of questions concerning transport and storage please contact Videojet Technologies Inc..

Transport

⚠ CAUTION

Switch off the laser system before transport and disconnect mains connection!

Please make sure that the supply line ("umbilical") connecting marking unit and supply unit is not bent!

Do not use the umbilical to carry the laser system!

Wear safety shoes!

Storage

Store the laser system in a horizontal position protected against dust and humidity. Never expose the laser system or one of its components to direct sunlight! The storage temperature must not exceed +65 °C.

The laser system has to be protected against frost, which means that the storage temperature must not fall below 5 °C. The air humidity must be between 10 % to 90 %.

3.3 Unpacking

1. Open the packaging and remove the filling material.
2. Remove the individually packed components.
3. Check all parts for damage during transport.
   In case of damage please inform the forwarding agent and Videojet Technologies Inc. or their representative immediately in writing. Keep the packaging material and note damage on the inside and outside. Take pictures, if possible.
4. Transport the laser system and the components to the intended place of installation.
5. Protect the laser system and all components from dust and humidity until installation.

Protect the environment!

Separate packaging material for recycling.

3.4 Installation Conditions

⚠ CAUTION

The laser system must not be subject to any mechanical stress (shock, vibrations, etc.) since this reduces the marking quality and can result in damaging the system.

Please consider upon installation that the supply line between supply unit and marking unit is not designed for continuous alternating bending. Make sure that no injuries can be caused by the installed supply line.

When installing the system the regulations of EN 60950-1 and EN 62368-1 must be observed.

Space Required

The standard dimensions of the laser system can be found in the drawings in the chapter "Appendix".

For systems manufactured according to special customer requirements this information can be found in the installation plan or the dimension and data sheets you received upon order handling.

Connections

The laser system requires a mains socket with a protective earthing connection. Information on the type, number and reference values of the connections can be found in the terminal diagrams you have received upon order handling.

⚠ WARNING

Only the delivered power connection cable must be used!

Check the cable regularly for damage. If the cable is damaged it must be changed immediately to avoid the risk of electrical shocks due to insufficient grounding.

Since the power connection cable is mounted to the supply unit, the power socket must be accessible and it must be possible to disconnect the mains connector from the power socket. If necessary, an appropriate switching device must be installed.

The power connection cable of the laser system is about 4.5 m long, make sure that the adequate power sockets are in range.

Ambient Conditions

Temperature range:	5 - 40 °C
Relative humidity:	10 - 90 %, non-condensing

NOTICE

To avoid condensation wait one hour before starting the system if the system was brought from a cold to a warm environment.

Make sure that there is no condensed water in the system.

The venting slots of the supply unit and of the marking unit must not be covered. Make sure that there is sufficient air supply (see also section "Cooling").

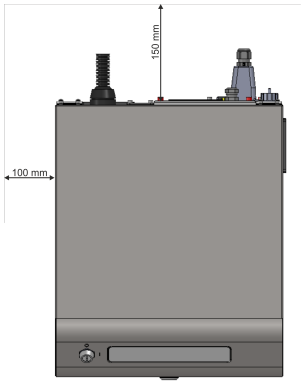
Setting Up

NOTICE

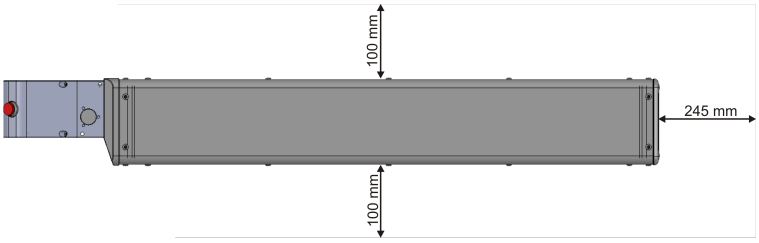
During setup, ensure there is free access to work space as well as free space around the cooling and ventilating components.

Also ensure that the connecting cables and the exhaust hose are optimally installed (protected).

Supply Unit



Marking Unit (applies to 10/30/60 W)



Mounting

For proper mounting there are metric holes in the bottom plate of the laser head as well as in the bottom plate of the supply unit.

See Drawings [▸ 91].

3.5 Cooling

The laser system is cooled by air. The internal cooling system is designed to supply sufficient cooling.

Make sure that the cooling air can be sucked in and blown out freely and that there is sufficient air exchange at the installation site to ensure heat dissipation.

3.6 Fume Extractor

In order to remove marking residues which might be dangerous to health a fume extractor must be installed.

The fume extractor is to be installed such that marking particles are sucked off directly at the place of the formation to prevent the accumulation of dust particles which gradually destroy optical components of the laser system. Make sure that there are no air leaks.

We offer fume extractors as accessories. If a fume extractor is part of the complete delivery please find further information in the enclosed operation manual of the fume extractor.

3.7 Interfaces of the Laser System

Network interface (standard)	Connection of a PC for controlling via Smart Graph software (connecting cable included in scope of delivery).
Optional interfaces:	
- TU430 (NAHDMI)	Connection of the Touch Display for controlling via TCS+ software. Electrical power is supplied by the switched-on laser system. **Caution:** No other devices may be connected to this interface. They could be damaged!
- CLARiTY (RJ45)	Connection of the CLARiTY Laser Controller. Electrical power for the CLARiTY Laser Controller must be proviced separately.
- Network interface	Connection of a browser-enabled device for controlling via TCS+ software.

I/O Customer interface

The general assignment of the customer interface can be found in chapter "Appendix".

The customer-specific assignment of the customer interface can be found in the data sheets you received upon order handling.

I/O Backplate with connectors

Interlock

The interlock circuit is used to safeguard the laser system. If one of the interlock switches connected to the interlock circuit opens the marking stops immediately. The marking cannot be continued until all interlock switches are closed and the START button is pressed.

An option is available for increasing the performance level of the interlock circuits.

Trigger

The laser system has one trigger input port to connect a light barrier for product detection. The trigger input port is supplied with +24 V.

Encoder

An encoder can be connected to the encoder interface for movement detection. The laser system provides +24 V for the encoder.

Fume extractor

Connection for a fume extractor.

Beacon

Connection for a beacon.

RS232

Connection for the control of the laser system.

3.8 Definition of the IP Address

When the laser system is delivered the following IP address is set:

Standard IP: 192.168.1.1

Subnet mask: 255.255.255.0

A different IP address can be configured via the software.

3.9 Shutdown

3.9.1 Temporary Shutdown

If the laser system is shut down temporarily (e.g. for the duration of a works holiday), the following work is to be carried out:

1. Save the data on the computer before switching the laser system off. A detailed description can be found in the manual of the marking software.
2. Switch the laser system off after the data backup, (see chapter »Operation of the Laser System«).
3. Secure the laser system against unauthorized startup by removing the key (key switch).
4. Clean the laser scan lens (see section »Cleaning the Laser Scan Lens).

3.9.2 Final Shutdown

⚠ WARNING

Ensure that all live parts are switched off and that work can be carried out safely on these parts.

If the laser marking machine is shut down permanently (e.g. for selling or disposal), the following work is to be carried out:

1. Carry out all work listed in section "Temporary Shutdown".
2. Disconnect the machine from the electric power supply.

In case of selling and transport

Package the machine according to the instructions in section "Transport and Storage [▶ 19]".

In case of disposal

Dispose of the components of the laser system in a manner that is safe and environmentally compatible. Observe all applicable legal and local regulations.

Please dispose of the components of the laser system separated for recycling of raw materials.

4 Description of the Laser System

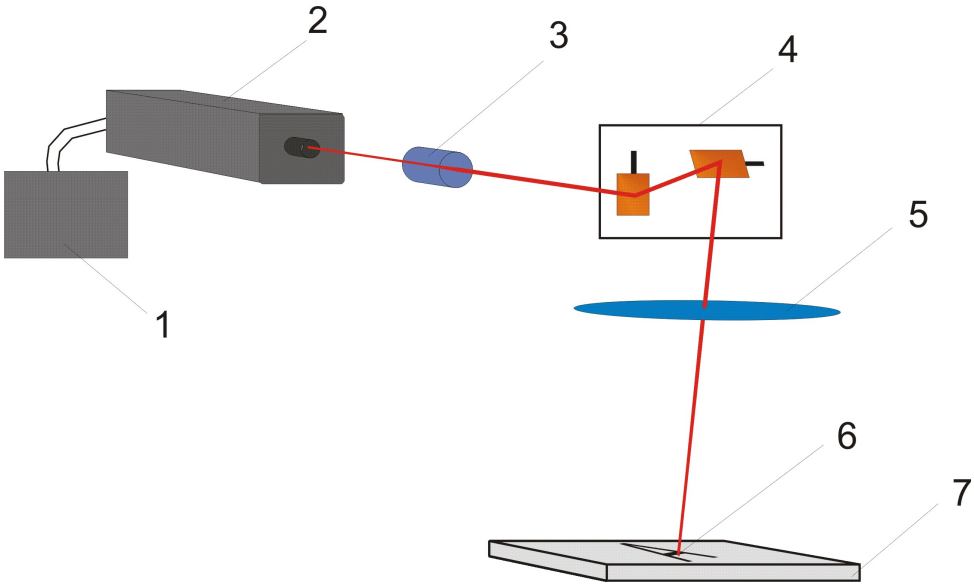
4.1 Function Principle of a Vector-Scanning Laser System

The laser (2) working in pulsed or continuous operation produces an infrared invisible laser beam with small diameter. The laser beam is expanded by means of two-lens telescope (3).

The expanded beam reaches the marking head (4) where two movable mirrors deflect it such that it passes over the lines of the opened template on the product. The lines are divided into vectors (X and Y coordinates). The line up of vectors produces a marking on the product, the laser »writes« on the product surface.

The calculation of vectors and the control of the laser is performed by the controller card in the supply unit (1).

The deflected laser beam is focussed onto the product surface (7) by a laser scan lens (5). Generally the marking is produced at the focus of the lens (6).



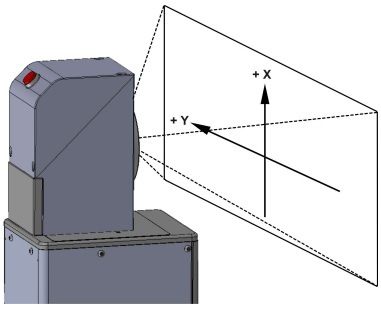
4.2 The Laser Beam Source

A sealed-off CO_2 laser serves as beam source for the laser system. Inside the laser source CO_2-molecules are stimulated by a high-frequency voltage to emit infrared laser radiation.

4.3 The Marking Head

Two movable mirrors are located inside the marking head. They deflect the laser beam vertically and horizontally according to the current template.

The X and Y axes of the coordinate system of the marking field are defined by the position of the marking head. A translation or rotation of the marking head also translates or rotates the axes of the coordinate system. X and Y axes in relation to the marking head are defined as displayed in the following figure:



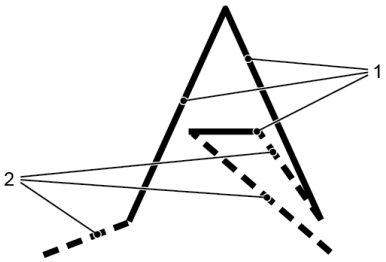
4.4 The Marking of the Product Surface

The marking of the product surface is performed by the effect of intense laser radiation on the product material.

The laser beam is focussed onto the product surface and heats up the topmost layer of the material, which causes a color change or a vaporization of the topmost dye layer.

The symbols and characters which shall be marked on the product are subdivided into vector strokes (1). Each vector stroke is again subdivided into smaller vectors.

When the laser beam jumps from one stroke to the next (2) the laser is switched off and the product is not marked.



4.5 The Laser Parameters

Parameters are used to adapt the laser system to different materials. These parameters have to be determined and adjusted for each application in order to achieve the best possible marking quality.

Determining the correct parameters requires profound knowledge and experience, because the parameters highly depend on the application and the material which shall be marked. In case of questions please contact us.

The parameters for individual materials are combined in parameter sets. Parameter sets can be generated and altered using the software. For detailed information on the parameters please refer to the manual of the marking software.

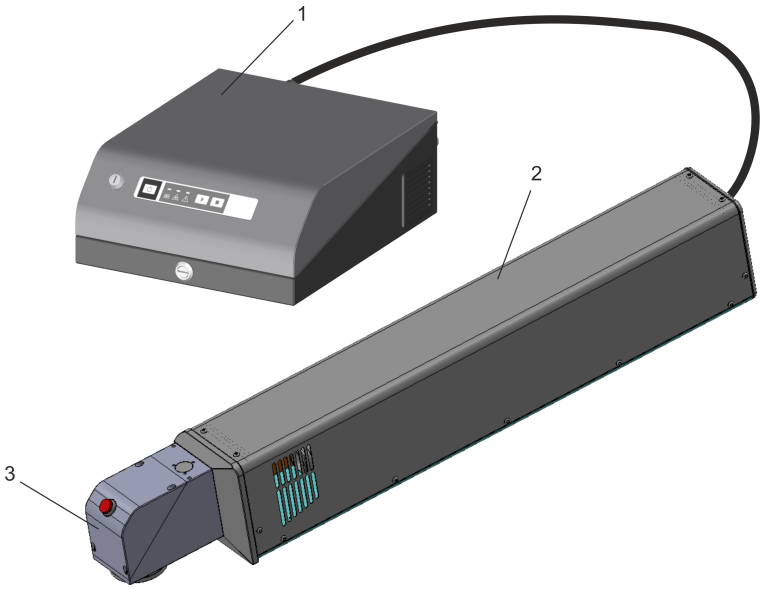
4.6 The Structure of the Laser System

The laser system consists of the supply unit (1) and the marking unit. The marking unit comprises the laser head (2) and the marking head (3). The supply unit is controlled via:

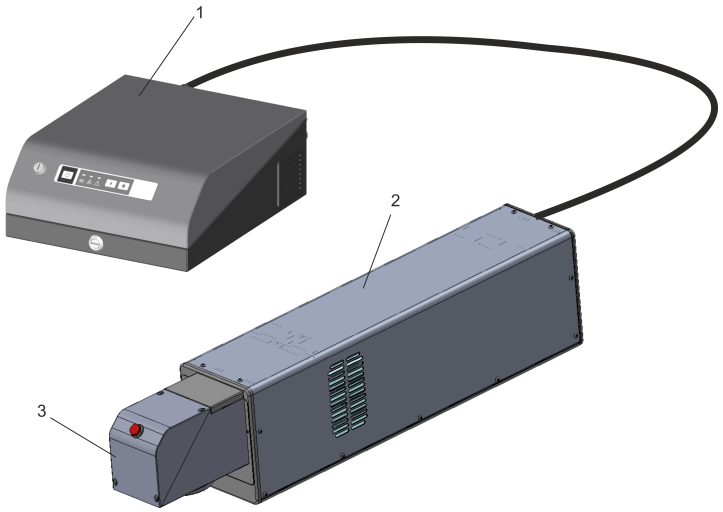
- Smart Graph software on a PC
- TCS+ software on the TU430 (Touch Display)
- CLARiTY Laser Controller
- TCS+ software on a browser-enabled device

Optionally, a beam turning unit can be installed between laser head and marking head.

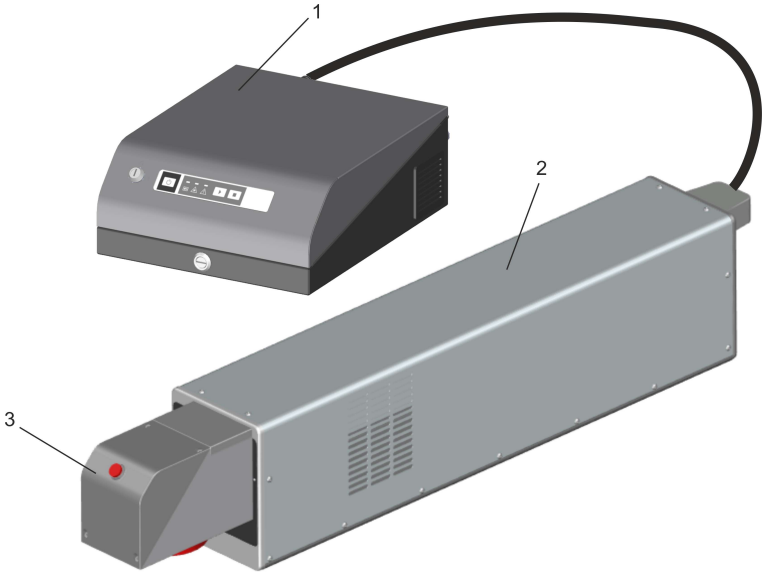
Videojet 3140



Videojet 3340



Videojet 3640



4.7 Technical Data

	Unit	Videojet 3140	Videojet 3340	Videojet 3640
Laser type		sealed-off CO_2 laser		
Excitation		RF		
Wavelength	µm			
• Standard		10.6	10.6	10.6
• Optional		9.3	9.3 or 10.2	9.3 or 10.2
Laser class		4		
Operating modes		• continuous wave (cw) • quasi-continuous 50 Hz to		
		20 kHz	25 kHz	160 kHz
Laser power typ.	W	10	30	60
Max. power consumption	kW	0.4	0.7	1.15
Input fuse	A	2 x T8A		-
Supply voltage	VAC	100 to 240 (autorange); 1-phase		
Mains frequency	Hz	50 / 60		
Ambient temperature	°C	5 - 40 (typical, depending on operation)		
Rel. humidity	%	10 - 90; non-condensing		
Dimensions	mm	W x D x H	W x D x H	W x D x H
• Supply unit		335 x 400 x 147	335 x 400 x 147	335 x 400 x 147
• Laser head		112 x 721 x 136	145 x 650 x 185	145 x 750 x 185
• SHC 60D		74 x 130 x 94	74 x 130 x 94	74 x 130 x 94
• SHC 100D/SHC 120C		96.5 x 176 x 116	96.5 x 176 x 116	96.5 x 176 x 116
• SHC 150C		-	105 x 185 x 125	105 x 185 x 125
Weight (typical)	kg			
• Supply unit		11.5	11.5	13
• Laser head (IP65)		13 (14)	19.1 (20)	26.5 (27)
• SHC 60D		1.4	1.4	1.4
• SHC 100D/SHC 120C		2.2	2.2	2.2
• SHC 150C		-	3.6	3.6
Sealing				
• Supply unit		IP54 (optional IP65)		
• Marking unit		IP54 (optional IP65)		
Marking speed[a]	mm/s	1 - 30,000		
Speed of production line	m/s	0 - 10		
Characters/Second[a]		2,000		2,100

	Unit	Videojet 3140	Videojet 3340	Videojet 3640
Focal length of laser scan lens • SHC 60D • SHC 100D/SHC 120C • SHC 150C	mm	64; 95; 127; 190; 254 63,5[b]; 85[b]; 100; 150; 200; 300; 351; 400 100; 150; 200; 300; 351; 400; 500; 600		
Focus diameter (min.)	µm	70 (depending on installed optics)		
Line width		depending on the material and the laser parameters		
Fonts		any standard font (special characters on demand for additional charge)		
Cooling		integrated air-cooling		
maximum distance marking unit - supply unit	m	3, 5 or 10 (others on demand)		
Min. bending radius of supply line	mm	150		
Interfaces		Network interfaces, I/O interfaces		
Control		• Windows-compatible PC with Smart Graph software under Windows • TU430 Touch Display • CLARiTY Laser Controller • browser-enabled device with TCS+ software under Windows		
Option: Pilot laser Laser class Laser power Wavelength	 mW nm	 2 < 1 630 - 670		

[a.] Any statements referring to marked characters or actual markings are typical values. These values highly depend on the material and may only be taken as a guideline. These are no specifications!

[b.] **Only 10/30 W**

Due to Videojet Technologies Inc.'s policy of continuous improvement, technical data is subject to change without notice.

4.7.1 Fuses

Name	Size in mm	Position
8 A / 250 V / T (time delay)	∅ 5 x 20	at the back of the supply unit, IP sealing must be removed, see I9 in section Elements on the Supply Unit (only 10/30 W)
13 A / 250 V	∅ 6.3 x 25.4	inside the mains plug (only for UK)

NOTICE

For 60 W laser systems:

In case of a short circuit the device uses the electrical protection of the building.

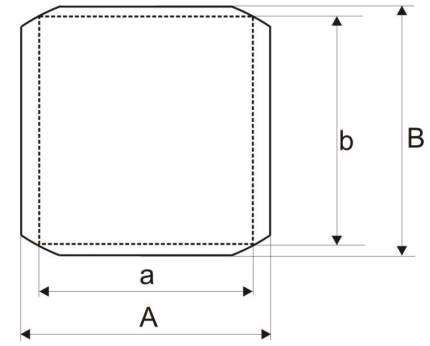
4.8 Working Distance and Marking Field

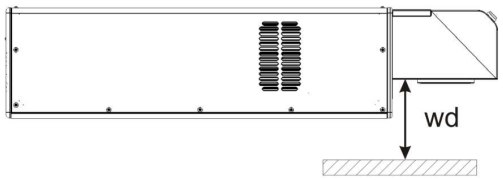
NOTICE

The actual marking field depends on the configuration of the system.

The actual working distance can deviate up to ± 10 % of the focal length.

This tolerance might be exceeded slightly in rare cases with the focal lengths F500 and F600.





Marking Head SHC 60D (all values in mm)

f	wd	A	B	a	b
64	67	44.7	44.7	32.2	41.9
95	96.5	66.3	66.3	47.8	62.3
127	125	88.7	88.7	63.9	83.2
190	182	132.6	132.6	95.6	124.5
254	236	177.3	177.3	127.8	166.5

Marking Head SHC 100D (all values in mm)

f	wd	A	B	a	b
63.5 [a]	89	30.8	38.2	21.8	27.0
85 [a, b]	89	47.1	62.6	33.3	44.2

f	wd	A	B	a	b
100	94	73.3	101.2	56.7	81.3
150	142	110.0	151.8	85.0	122.0
200	191	146.6	202.5	113.3	162.7
300	278	219.9	303.7	170.0	244.0
351	338	257.3	355.3	198.9	285.5
400	385	294.7	406.9	227.8	326.9

[a.] Only 10/30 W

[b.] The max. marking field size only is available, when the exhaust nozzle and the exhaust adapter are removed from the focussing module! In the case of using the exhaust nozzle, the marking field size is reduced to a circular area of 46 mm diameter!

Marking Head SHC 120C (all values in mm)

f	wd	A	B	a	b
63.5 [a]	89	29.1	36.2	20.6	25.6
85 [a, b]	89	44.2	58.8	31.3	41.6
100	94	73.3	87.3	53.7	77.6
150	142	110.0	130.9	80.6	116.4
200	191	146.6	174.5	107.5	155.2
300	278	219.9	261.8	161.2	232.7
351	338	257.3	306.3	188.6	272.3
400	385	294.7	350.8	216.0	311.9

[a.] Only 10/30 W

[b.] The max. marking field size only is available, when the exhaust nozzle and the exhaust adapter are removed from the focussing module! In the case of using the exhaust nozzle, the marking field size is reduced to a circular area of 46 mm diameter!

Marking Head SHC 150C (all values in mm)

f	wd	A	B	a	b
100	89	66.7	100.1	47.1	81.6
150	139	100.1	150.2	70.7	122.4
200	189	133.4	200.3	94.3	163.2
300	286	200.2	300.5	141.5	244.8
351	341	234.2	351.6	165.6	286.5
400	393	285.9	402.7	202.1	346.3
500	480	355.6	500.9	251.4	430.7
600	576	439.8	601.0	329.1	555.4

5 Operating the Laser System

5.1 Operation of the Laser System

The laser system is built up modularly. Depending on the laser system installed in your premises there are several ways to generate a marking template and start the marking process.

The laser system can be operated via:

Smart Graph-Software

The Smart Graph software runs on your personal computer under Windows. It permits you to configure the laser system, create complex layouts, import logos, change fonts, create and edit laser parameters, etc.

Using the Smart Graph software you can transfer the created templates directly to the supply unit for marking.

TU430

The TCS+ software runs on the laser system and can be diplayed and controlled on the touch screen.

It permits you to easily create, edit, select and mark templates.

CLARiTY

Using the CLARiTY Laser Controller you can easily select and mark templates.

For creating and editing of marking jobs CLARiSOFT is required.

TCS+ Software

The TCS+ software runs on a browser-enabled device under Windows.

It permits you to easily create, edit, select and mark jobs.

Using a web browser you can connect to one or several laser systems. The active system is controlled via TCS+.

5.2 Marking Elements

The following elements must be defined in order to mark a product:

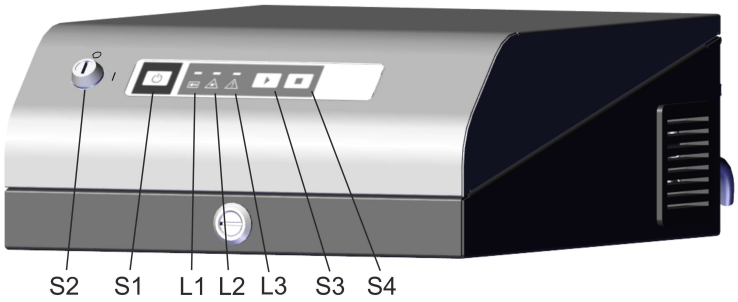
Marking contents	The marking content defines the layout of the marking, e.g. text elements, logos, serial numbers, fonts, etc.
Parameter set	Parameter sets adjust the laser system to the respective material of the product. A parameter set contains e.g. information on the laser power or the marking speed.
Product registration	The product registration contains all data necessary to detect the product and to trigger the marking process.
Positioning	The positioning data defines the positioning and the size of the marking on the product.

The combination of the four elements marking content, parameter set, product registration and positioning within a template offers the possibility to adapt the marking to different marking tasks in a very short period of time.

Examples:

- You want to mark a certain text on synthetic material instead of paper. Hence you change your parameter set from »paper« to »synthetic material«.
- You want to change the position of the marking on your product. For that you just change the positioning data directly in your template or in the user interface »Laser Operation« under »Marking settings«.

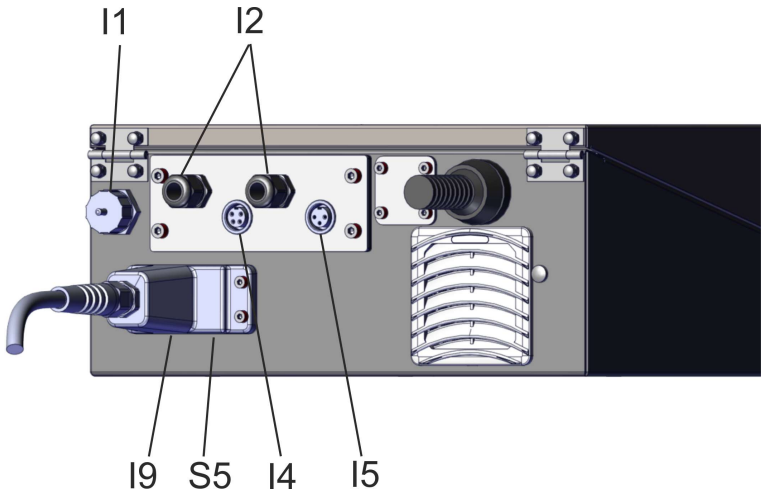
5.3 Elements on the Supply Unit



No.	Type	Function
S1	Push button POWER/STANDBY	switches the supply unit on. There are two LED indicators on the push button, left blue (STANDBY), right white (POWER, flashes during initialization, is on when the system is ready, is on during each marking process). If the supply unit is on this button switches the laser beam source an the control electronics off. **Attention:** The system is not separated completely from the power supply. For complete separation the main power switch must be used or the supply line must be disconnected.
S2	Key switch	applies the power supply for the laser beam source (position »I«). The marking process can be started. **Note:** Remove the key switch if switched off (position »0«) to protect the system from unauthorized operation!
S3	Push button START	With »START« the currently selected template can be marked. **Laser radiation is emitted!** **Make sure the safety instructions are observed.**
S4	Push button STOP	With »STOP« a marking process can be stopped.
	LED status indicators	
L1	Beam shutter closed -green-	is on when the shutter is closed.

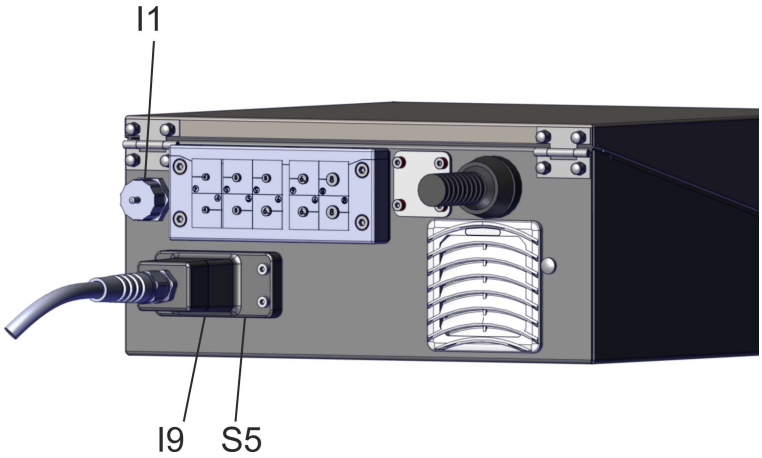
No.	Type	Function
L2	Emission -red-	is on when the key switch is in position »I « and the power is applied to the laser source. Simultaneously the red LED on the marking head lights up.
L3	Error -yellow-	flashes in case of malfunction.

Backview of the supply unit (standard)



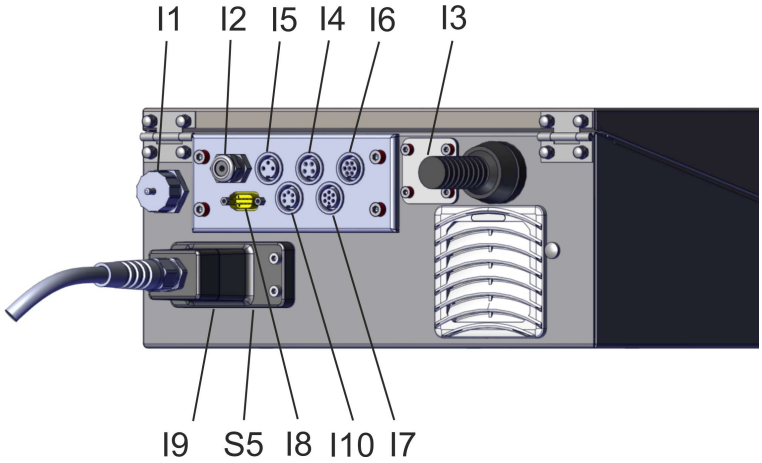
No.	Type	Function
I1	Socket	Connection for ethernet
I2	Socket	Cable feed through
I4	Socket	Connection for encoder
I5	Socket	Connection for product sensor
I9	Socket and fuse insert (only 10/30 W)	Mains cable connection and two fuses (T8A, behind the IP cover)
S5	Main power switch (only 10/30 W)	switches the mains of the laser system on and off. The switch is always on behind the cover. For complete separation the mains connector must be disconnected from the power socket.

Backview of the supply unit (optional)



No.	Type	Function
S5	Main power switch (only 10/30 W)	switches the mains of the laser system on and off. The switch is always on behind the cover. For complete separation the mains connector must be disconnected from the power socket.
I1	Socket	Ethernet connection
I9	Socket and fuse insert (only 10/30 W)	Mains cable connection and two fuses (T8A, behind the IP cover)

Backview of the supply unit (optional)

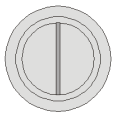


No.	Type	Function
I1	Socket	Connection for ethernet
I2	Socket	Cable feed through
I3	Socket	Connection for TU430 (NAHDMI) or CLARiTY (RJ45) **Caution:** No other devices may be connected to this interface. They could be damaged!
I4	Socket	Connection for encoder

No.	Type	Function
I5	Socket	Connection for trigger
I6	Socket	Connection for interlock
I7	Socket	Connection for beacon
I8	Socket	Serial Interface (RS232)
I9	Socket and fuse insert (only 10/30 W)	Mains cable connection and two fuses (T8A, behind the IP cover)
I10	Socket	Connection for fume extractor
S5	Main power switch (only 10/30 W)	switches the mains of the laser system on and off. The switch is always on behind the cover. For complete separation the mains connector must be disconnected from the power socket.

5.4 Switch-On/Off of the Laser System

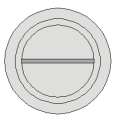
5.4.1 Switch-On

1. Make sure that the safety instructions are observed.
2. Switch on the fume extractor or use the possibility to let the system switch on the fume extractor by using a signal (see Inputs and Outputs (Galvanically Separated)).
3. 
   Make sure that the key switch is in the vertical position »0«.

   Plug the mains connector into the power socket.

   The blue LED on the push button »POWER/STANDBY « (S1) is on.
4. 
   Press push button »POWER/STANDBY« (S1).

   After approx. 10 seconds the white LED on the push button flashes. The flashing frequency and the brightness of the LED increases.

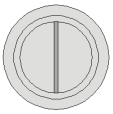
   The laser system is initialized. After that the system is ready for operation and the white LED is on.
5. 
   Switch on the key switch by turning it to the horizontal position »I«.

The red LED »Emission« (L2) on the supply unit and the red LED on the marking unit are on. The laser is ready.

6. 

The marking process can be started by pressing the push button »START« (S3) or via the user interface of the software.

5.4.2 Switch-Off

1. Stop the marking process. Press push button »STOP« (S4) if necessary.
2. 

Switch off the key switch by turning it to the vertical position »0«.

The red LED »Emission« (L2) on the supply unit and the red LED on the marking unit are off.

The white LED on the push button »POWER/STANDBY« (S1) is on.

3. 

Press push button »POWER/STANDBY« (S1).

Then the blue LED on the push button »POWER/STANDBY« is on.

4. To separate the system completely from the power supply, disconnect the mains connector from the power socket.
5. Switch off the fume extractor.

6 Maintenance

6.1 General Notes Concerning Maintenance

The time for maintenance of the laser system is very short. Please carry out maintenance works in the stated intervals.

The laser system is designed such that maintenance can be performed safely.

⚠ CAUTION

Maintenance has to be performed by instructed operating and maintenance personnel only!

For reasons of safety make sure that the main key is withdrawn and the mains is disconnected!!

Before cleaning the laser system and its environment, the laser system must be disconnected from the mains power supply.

Document the regular maintenance in the maintenance protocols in this chapter! In case of non-conformance with the maintenance plan Videojet Technologies Inc. reserves the right to limit the warranty!

NOTICE

Before carrying out the maintenance works at the optics, please note the following:

Acetone is not included upon delivery and has to be purchased via other companies. Open the following Internet page to order acetone in a quick and uncomplicated way: www.vwr.com/index.htm

When purchasing acetone make sure that you order acetone pro analysi (p.a. = highest purity grade).

6.2 Maintenance Plan

The maintenance intervals are laid out considering laser system use of approximately 10 hours of daily operation on a normal working environment.

If the time of daily use exceeds 10 hours of continuous operation or in case of above normal dusty/dirty environment please shorten the maintenance intervals accordingly. In case of questions please contact Videojet Technologies Inc. or one of their representatives.

All maintenance works are described in the following sections.

Maintenance Intervals	Measures
Monthly (more frequently when operated in dirty ambient conditions)	Check the laser scan lens for dust and dirt. Clean the laser scan lens in case of dust or stains. If installed: Check the filter mats of the supply unit. Exchange if necessary.
Monthly or when control lamp lights up	If installed: Exchange the filter bag inside the fume extractor (refer to manual of the fume extractor).
Every three months (more frequently when operated in dirty ambient conditions)	Carry out a visual inspection of the laser system. Clean if necessary. Check also the warning labels. They must be readable and positioned correctly. Check the product detector (light barrier). Clean or readjust if necessary. Check the fume extractor for air leaks.
Every six months	If installed: Exchange the charcoal filter inside the fume extractor (refer to manual of the fume extractor).

NOTICE

We recommend a professional check by our service engineers once a year (more often in a very dusty environment).

We offer special training seminars for maintenance and service personnel. In case of questions please contact Videojet Technologies Inc. one of their representatives.

6.3 Cleaning the Laser Scan Lens

The laser scan lens is located at the marking head. It may be contaminated by dust, floating particles in the air or other substances formed by the marking process. Contamination of the laser scan lens can lead to damage of the laser scan lens and gradually reduce the quality of the marking. Especially using higher laser power a contamination of the laser scan lens can result in damage to other components of the marking system. Therefore the lens has to be cleaned regularly.

Generally, just the outwardly facing side of the laser scan lens has to be cleaned, but check both sides for contamination and clean them, if necessary.

⚠ WARNING

The laser scan lens consists of coated zinc selenide. This material contains components which are dangerous to health!

Cleaning must only performed wearing latex protective gloves! In case of contact of the laser scan lens with the skin, wash the respective part of skin with water and soap immediately! Avoid any surface scratches of the laser scan lens! Do not inhale material particles! In case of breaking of the laser scan lens please pack the fragments into a closed plastic bag and send them back to us.

⚠ CAUTION

As with all optical components the laser scan lens is an object of highest precision and sophisticated design!

Slightest damage of the surface might (in the long term) result in unusability of the component or reduction of marking quality. Any contaminants must only be removed by means of optics cleaning paper and acetone.

Make sure that no contaminants enter the marking head while cleaning the laser scan lens!

To clean the laser scan lens you need:

- Optics cleaning paper
- Acetone
- Protective gloves

NOTICE

Wear suitable protective gloves during the complete procedure!

6.3.1 Disassembly of the Laser Scan Lens

⚠ DANGER

Before starting any work the laser system must be completely switched off.

1. Turn the key switch to position »0«. Remove the key to ensure that the laser system cannot be switched on.
2. Switch off the main switch.
3. Disconnect the mains connector.

The laser scan lens is in a bayonet socket which is unlocked by a quarter turn.

1. Turn the laser scan lens carefully by a quarter turn in counterclockwise direction. Do not touch the lens surface with your gloves!
2. Remove the laser scan lens from the marking head and place it on a clean surface.

For SHC 100C/120C/150C:

1. Remove the two fixing screws from the laser scan lens.
2. Remove the laser scan lens from the marking head.

6.3.2 Mounting the Laser Scan Lens

1. Insert the laser scan lens into the marking head.
2. Carefully turn the laser scan lens by a quarter turn in clockwise direction. Do not use any tools!

For SHC 100C/120C/150C:

1. Insert the laser scan lens into the marking head.
2. Mount the laser scan lens using the two fixing screws.

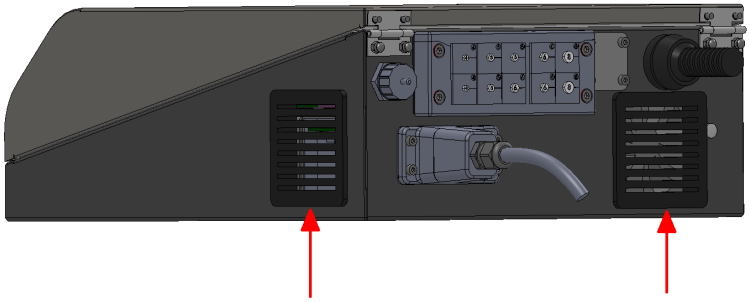
6.4 Exchange of the Filter Mats

⚠ DANGER

Before starting any work the laser system must be completely switched off.

To exchange the filter mats proceed as follows:

1. Open the grills at the side and at the back of the supply unit by inserting a narrow screw driver into the groove from below and levering carefully.



2. Remove the filter mats. Dispose of the mats according to the local regulations.
3. Insert new mats.
4. Close the grills.

6.5 Exchange of the Fuses

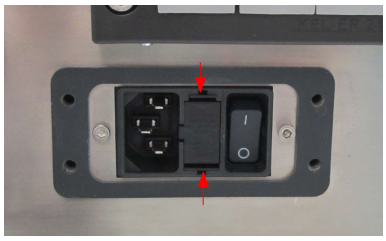
Only 10/30 W

⚠ DANGER

Before starting any work the laser system must be completely switched off.

To exchange the fuses proceed as follows:

1. Remove the cover at the back of the supply unit.
2. Apply pressure onto the holder of the fuse insert (see figure) and pull out the insert.



3. Remove the fuses from the fuse holder. Dispose of the fuses according to the local regulations.
4. Insert new fuses (2 x T8A) and refit the fuse holder.
5. Mount the cover.

6.6 Protocols for Maintenance, Repair and Replacement

It is strongly recommended that records are kept of maintenance, repair and replacement procedures.

The maintenance protocols specify the tasks and their intervals. The correct and timely maintenance can help to minimize malfunctions of the laser system.

You will also find forms to record the repairs and replacements. Copies can be made and used to keep an ongoing record of the procedures recommended throughout the life of the laser marking system.

Inspection and Cleaning of the Laser Scan Lens

Maintenance interval: **Monthly**

Carried out on: Date	**Carried out by:** Name

Inspection an Cleaning of the Filter Mats

(if installed)

Maintenance interval: **Monthly**

Carried out on: Date	**Carried out by:** Name

Exchange of the Pre-Filter of the Fume Extractor

(if installed)

Maintenance interval: **Monthly or when control lamp lights up**

Carried out on: Date	**Carried out by:** Name

Exchange of the Combined (Charcoal) Filter of the Fume Extractor

(if installed)

Maintenance interval: **Every six months**

Carried out on: Date	**Carried out by:** Name

Visual Inspection

Maintenance interval: **Every three months**

Carried out on: Date	**Carried out by:** Name

Update of the CMark Software

Version:	**Carried out on:** Date	**Carried out by:** Name

Repair and Replacement Protocol

Laser model: **Serial number:**

Date: **Carried out by:**	**Repair and Replacement Protocol**	**Comments (faults, etc.)**
Date: **Carried out by:**	**Repair or Replacement**	**Comments (faults, etc.)**
Date: **Carried out by:**	**Repair or Replacement**	**Comments (faults, etc.)**
Date: **Carried out by:**	**Repair or Replacement**	**Comments (faults, etc.)**

7 Malfunctions

7.1 Notes

In this chapter you will find a description of possible malfunctions, their possible causes and suitable measures for troubleshooting. The measures stated must be performed by trained and qualified operation and maintenance personnel only.

⚠ CAUTION

Tasks for troubleshooting going beyond the ones mentioned here must be performed by **specially trained personnel** only! Strictly follow the safety instructions!

7.2 Malfunctions Descriptions

Symptom	Causes/Measures
The laser system cannot be switched on.	• Check the plug. • Check the main switch. • Check the power supply, e.g. RCD (residual current protective device) • Only Videojet 3130/Videojet 3330/Videojet 3140/Videojet 3340: Check the fuses (for this remove the IP sealing at the back of the supply unit, I9, see section "Elements on the Supply Unit").
The system does not boot or booting takes very long.	• Please note that the booting process can take several minutes. • Check the size of the database, the booting time depends on that. • Note the booting time and report it to the service helpdesk.
The laser cannot be started.	• Check the interlock (must be closed). • Check for error messages. • Check the key switch (must be closed). • Check for an external STOP signal.

Symptom	Causes/Measures
No marking, although START has been pressed.	• Check the encoder. • Check the product detection. • Check the working distance. • Check the lens. Clean if necessary. • Check the power setting of the parameter set. • Is the correct product registration selected? • Check the total working time of the laser beam source. • Check the external STOP signal (if existing). • Error message "Shutter defect", exchange the shutter.
Lopsided marking.	• Check the laser position. • Check the template.
Shifted marking.	• Check the sensor position. • Check the product carrier for accuracy.
Stretched/shrunk marking.	• Check the encoder setting.
Faint marking.	• Has the product been changed (e.g. dimensions, material)? • Check the lens. Clean it if necessary. • Check the working distance. • Check the parameter set (power too low, speed to high). • Check the product (must be free from dirt, water, dust, oil, etc.). • Check the fume extractor (must be on and suitable for the application).
Incomplete marking.	• Check the product speed. • Check the lens. Clean or exchange if necessary. • Check the product (must be free from dirt, water, dust, oil, etc.). • Check the encoder. If it is slipping increase the tension of the encoder wheel.

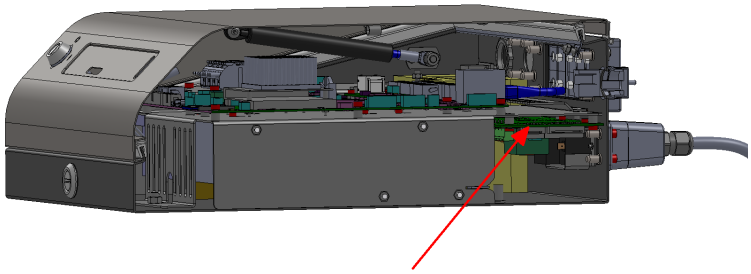
Symptom	Causes/Measures
Poor marking quality.	• Check for product or laser vibration. • Has the product been changed (e.g. dimensions, material)? • Check the lens. Clean it if necessary. • Check the working distance. • Check the parameter set (power too low, speed to high). • Check the product (must be free from dirt, water, dust, oil, etc.). • Check the fume extractor (must be on and suitable for the application). • Check the encoder. If it is slipping increase the tension of the encoder wheel.
Laser stops due to overtemperature.	• Clean filter(s) and system. • Is the ambient temperature within the specified limits (see product documentation)? • Is there enough space for the air intake? • Check the cooling system (if existing).

8 Appendix

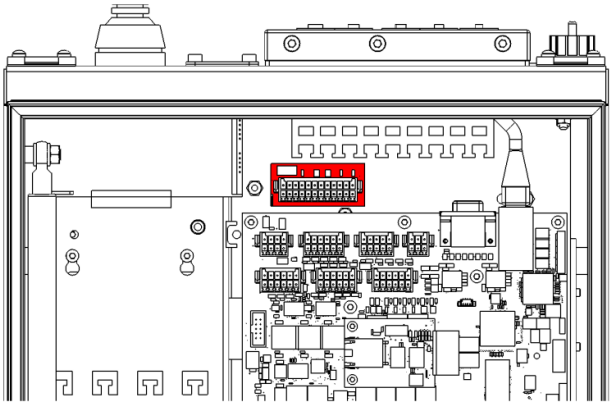
8.1 Safety Circuit of the Laser System (10/30 W)

The safety circuit is realized via connector X9 on the SPM/CPD board.

Position of the board in the laser system:



Position of X9:



The laser system can be ordered in 2 variants:

1. With safety circuit according to EN 13849-1, achieving performance level "d" for the interlock circuit.
2. With safety circuit according to EN 13849-1, achieving performance level "d" for the door circuit and performance level "e" for the emergency stop circuit.

Assignment Variant 1 (SPM)

NOTICE

Assignment Variant 1 guarantees performance level "d" according to EN13849-1 for the interlock circuit. Prerequisite is the correct wiring of the interlock circuit using appropriate safety switches and cables:

For the interlock switches positively opening contacts according to IEC60947-5-1 must be used (e.g. SCHMERSAL AZ 16-02ZVRK). The supply lines must have individually shielded cores (e.g. HELUKABEL LiY-TPC-Y (4x2x0.5 or 2x2x0.5) P# 21357 or 21355.

F1= 1A SloBlow Littlefuse 0154001

The MTTF calculation used for achieving performance level "d" is based on the following assumptions:
1) Number of operating hours/day = 21 (3 shift operation with 1 hour break)
2) Number of operating days/year = 310 (365 days minus sundays/holidays)
3) Cyle time in seconds = 28,800 (8 hours 3 shift operation with 1 cleaning cycle per shift)
4) Resulting average number of cycles per year = 813.75

Terminal	Signal	In/Output	Description
X9.1	24V_INT	Output	see X9.23 Default: Bridge to X9.23
X9.2	GND_INT	Output	-
X9.3	24V_LAS	Input	-
X9.4	GND_INT	Output	-
X9.5	24V_INT	Output	-
X9.6	-	Output	reserved
X9.7	24V_INT	Output	-
X9.8	-	Output	reserved
X9.9	GND_INT	Output	-
X9.10	-	Input	Bridge to X9.12
X9.11	GND_INT	Output	
X9.12	-	Output	Bridge to X9.10
X9.13	GND_LAS	Input	
X9.14	SHUTTERLOCK 1	Input	If one of the shutterlock circuits is opened, the beam shutter of the laser is closed immediately. Connect to X9.7 to close the shutterlock. Default: Bridge to X9.7
X9.15	INTERLOCK 2	Input	If one of the interlock circuits is opened, the laser power supply is switched off immediately. Connect to X9.19 to close the interlock. Default: Bridge to X9.19

Terminal	Signal	In/Output	Description
X9.16	SHUTTERLOCK 2	Input	If one of the shutterlock circuits is opened, the beam shutter of the laser is closed immediately. Connect to X9.5 to close the shutterlock. Default: Bridge to X9.5
X9.17	INTERLOCK 1	Input	If one of the interlock circuits is opened, the laser power supply is switched off immediately. Connect to X9.21 to close the interlock. Default: Bridge to X9.21
X9.18	-	Output	
X9.19	INTERLOCK 2	Output	Connect to X9.15 to close the interlock.
X9.20	-	Output	
X9.21	INTERLOCK 1	Output	Connect to X9.17 to close the interlock.
X9.22	-	Input	Bridge to X9.24
X9.23	INTERLOCK_RESET	Input	Connection for an external reset button to switch on the laser power supply after the safe state has been restored. The button must be connected between X9.1 and X9.23. Default: Bridge to X9.1
X9.24	-	Output	Bridge to X9.22

Wiring see Safety Circuit Variant 1 [▷ 83].

Assignment Variant 2

NOTICE

When using the safety circuit please observe that the door circuit as well as the emergency stop circuit must be connected with a double-pole switch.

Terminal	Signal	In/Output	Description
X9.1	24V_INT	Output	-
X9.2	GND_INT	Output	-
X9.3	-	Input	-
X9.4	GND_INT	Output	-
X9.5	24V_INT	Output	-
X9.6	RELEASE DOOR RELAY 1	Output	Extension to switch off additional relays if door circuit is opened. Using the contact extension no more than 50 mA per relay may be drawn. Flyback diodes must be used and the feedback circuits must be wired according to the sample wiring.
X9.7	24V_INT	Output	-
X9.8	RELEASE DOOR RELAY 2	Output	Extension to switch off additional relays if door circuit is opened. Using the contact extension no more than 50 mA per relay may be drawn. Flyback diodes must be used and the feedback circuits must be wired according to the sample wiring.
X9.9	GND_INT	Output	-
X9.10	DOOR FEEDBACK IN	Input	Feedback input for forceguided contacts of the extension relays. Default: Bridge to X9.12
X9.11	GND_INT	Output	
X9.12	DOOR FEEDBACK OUT	Output	Feedback output for forceguided contacts of the extension relays. Bridge to X9.10
X9.13	-	Input	
X9.14	DOOR 1 IN	Input	If one of the door circuits is opened, the beam shutter of the laser is closed immediately. Connect to X9.7 to close the door circuit. Default: Bridge to X9.7

Terminal	Signal	In/Output	Description
X9.15	EMERGENCY 2 IN	Input	If the emergency stop circuit is opened, the laser power supply is switched off immediately. Connect to X9.19 to close the emergency stop circuit and apply reset pulse to X9.23. Default: Bridge to X9.19
X9.16	DOOR 2 IN	Input	If one of the door circuits is opened, the beam shutter of the laser is closed immediately Connect to X9.5 to close the door circuit. Default: Bridge to X9.5
X9.17	EMERGENCY 1 IN	Input	If the emergency stop circuit is opened, the laser power supply is switched off immediately. Connect to X9.21 to close the emergency stop circuit and apply reset pulse to X9.23. Default: Bridge to X9.21
X9.18	RELEASE EMERGENCY RELAY 1	Output	Extension to switch off additional relays if emergency stop circuit is opened. Using the contact extension no more than 50 mA per relay may be drawn. Flyback diodes must be used and the feedback circuits must be wired according to the sample wiring.
X9.19	EMERGENCY 2 OUT	Output	Connect to X9.15 to close the emergency stop circuit.
X9.20	RELEASE EMERGENCY RELAY 2	Output	Extension to switch off additional relays if emergency stop circuit is opened. Using the contact extension no more than 50 mA per relay may be drawn. Flyback diodes must be used and the feedback circuits must be wired according to the sample wiring.
X9.21	EMERGENCY 1 OUT	Output	Connect to X9.17 to close the emergency stop circuit.
X9.22	EMERGENCY FEEDBACK IN	Input	Feedback input for forceguided contacts of the extension relays. Default: Bridge to X9.24

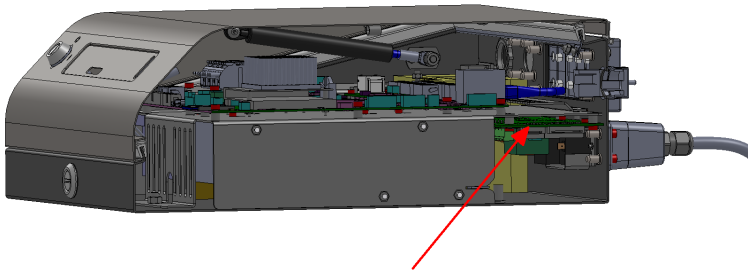
Terminal	Signal	In/Output	Description
X9.23	EMERGENCY RESET IN	Input	Connection to external reset for resetting the emergency stop when the safe state has been restored.
X9.24	EMERGENCY FEEDBACK OUT	Output	Feedback output for forceguided contacts of the extension relays. Default: Bridge to X9.22

Wiring see Safety Circuit Variant 2 [▶ 84].

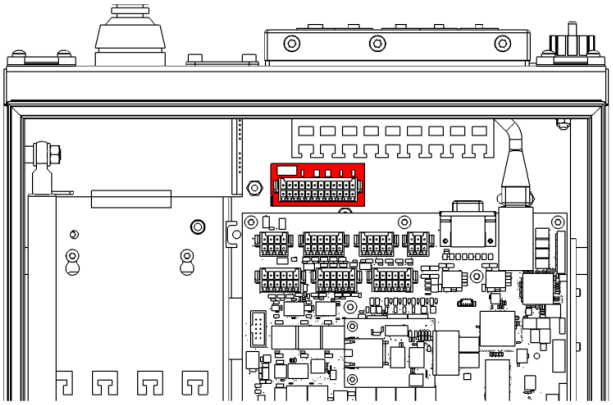
8.2 Safety Circuit of the Laser System (60 W)

The safety circuit is realized via connector X9 on the SPM board.

Position of the board in the laser system:



Position X9:



The laser system can be ordered in 2 variants:

1. With safety circuit according to EN 13849-1, achieving performance level "d" for the interlock circuit.
2. With safety circuit according to EN 13849-1, achieving performance level "d" for the door circuit and performance level "e" for the emergency stop circuit.

Assignment Variant 1 (SPM-16A)

NOTICE

Assignment Variant 1 guarantees performance level "d" according to EN13849-1 for the interlock circuit. Prerequisite is the correct wiring of the interlock circuit using appropriate safety switches and cables:

For the interlock switches positively opening contacts according to IEC60947-5-1 must be used (e.g. SCHMERSAL AZ 16-02ZVRK). The supply lines must have individually shielded cores (e.g. HELUKABEL LiY-TPC-Y (4x2x0.5 or 2x2x0.5) P# 21357 or 21355.

F1= 1A SloBlow Littlefuse 0154001

The MTTF calculation used for achieving performance level "d" is based on the following assumptions:
1) Number of operating hours/day = 21 (3 shift operation with 1 hour break)
2) Number of operating days/year = 310 (365 days minus sundays/holidays)
3) Cyle time in seconds = 28,800 (8 hours 3 shift operation with 1 cleaning cycle per shift)
4) Resulting average number of cycles per year = 813.75

Terminal	Signal	In/Output	Description
X9.1	24V_INT	Output	see X9.23 Default: Bridge to X9.23
X9.2	GND_INT	Output	-
X9.3	24V_LAS	Input	-
X9.4	GND_INT	Output	-
X9.5	24V_INT	Output	-
X9.6	-	Output	reserved
X9.7	24V_INT	Output	-
X9.8	-	Output	reserved
X9.9	GND_INT	Output	-
X9.10	-	Input	Bridge to X9.12
X9.11	GND_INT	Output	
X9.12	-	Output	Bridge to X9.10
X9.13	GND_LAS	Input	
X9.14	SHUTTERLOCK 1	Input	If one of the shutterlock circuits is opened, the beam shutter of the laser is closed immediately. Connect to X9.7 to close the shutterlock. Default: Bridge to X9.7
X9.15	INTERLOCK 2	Input	If one of the interlock circuits is opened, the laser power supply is switched off immediately. Connect to X9.19 to close the interlock. Default: Bridge to X9.19

Terminal	Signal	In/Output	Description
X9.16	SHUTTERLOCK 2	Input	If one of the shutterlock circuits is opened, the beam shutter of the laser is closed immediately. Connect to X9.5 to close the shutterlock. Default: Bridge to X9.5
X9.17	INTERLOCK 1	Input	If one of the interlock circuits is opened, the laser power supply is switched off immediately. Connect to X9.21 to close the interlock. Default: Bridge to X9.21
X9.18	-	Output	
X9.19	INTERLOCK 2	Output	Connect to X9.15 to close the interlock.
X9.20	-	Output	
X9.21	INTERLOCK 1	Output	Connect to X9.17 to close the interlock.
X9.22	-	Input	Bridge to X9.24
X9.23	INTERLOCK_RESET	Input	Connection for an external reset button to switch on the laser power supply after the safe state has been restored. The button must be connected between X9.1 and X9.23. Default: Bridge to X9.1
X9.24	-	Output	Bridge to X9.22

Wiring see Safety Circuit Variant 1 [▷ 88].

Assignment Variant 2 (SPM-16A-FASS)

NOTICE

When using the safety circuit please observe that the door circuit as well as the emergency stop circuit must be connected with a double-pole switch.

Terminal	Signal	In/Output	Description
X9.1	24V_INT	Output	see X9.23
X9.2	GND_INT	Output	-
X9.3	-	Input	-
X9.4	GND_INT	Output	-
X9.5	24V_INT	Output	-
X9.6	RELEASE DOOR RELAY 1	Output	Extension to switch off additional relays if door circuit is opened. Using the contact extension no more than 50 mA per relay may be drawn. Flyback diodes must be used and the feedback circuits must be wired according to the sample wiring.
X9.7	24V_INT	Output	-
X9.8	RELEASE DOOR RELAY 2	Output	Extension to switch off additional relays if door circuit is opened. Using the contact extension no more than 50 mA per relay may be drawn. Flyback diodes must be used and the feedback circuits must be wired according to the sample wiring.
X9.9	GND_INT	Output	-
X9.10	DOOR FEEDBACK IN	Input	Feedback input for forceguided contacts of the extension relays. Default: Bridge to X9.12
X9.11	GND_INT	Output	
X9.12	DOOR FEEDBACK OUT	Output	Feedback output for forceguided contacts of the extension relays. Bridge to X9.10
X9.13	-	Input	
X9.14	DOOR 1 IN	Input	If one of the door circuits is opened, the beam shutter of the laser is closed immediately. Connect to X9.7 to close the door circuit. Default: Bridge to X9.7

Terminal	Signal	In/Output	Description
X9.15	EMERGENCY 2 IN	Input	If the emergency stop circuit is opened, the laser power supply is switched off immediately. Connect to X9.19 to close the emergency stop circuit and apply reset pulse to X9.23. Default: Bridge to X9.19
X9.16	DOOR 2 IN	Input	If one of the door circuits is opened, the beam shutter of the laser is closed immediately. Connect to X9.5 to close the door circuit. Default: Bridge to X9.5
X9.17	EMERGENCY 1 IN	Input	If the emergency stop circuit is opened, the laser power supply is switched off immediately. Connect to X9.21 to close the emergency stop circuit and apply reset pulse to X9.23. Default: Bridge to X9.21
X9.18	RELEASE EMERGENCY RELAY 1	Output	Extension to switch off additional relays if emergency stop circuit is opened. Using the contact extension no more than 50 mA per relay may be drawn. Flyback diodes must be used and the feedback circuits must be wired according to the sample wiring.
X9.19	EMERGENCY 2 OUT	Output	Connect to X9.15 to close the emergency stop circuit.
X9.20	RELEASE EMERGENCY RELAY 2	Output	Extension to switch off additional relays if emergency stop circuit is opened. Using the contact extension no more than 50 mA per relay may be drawn. Flyback diodes must be used and the feedback circuits must be wired according to the sample wiring.
X9.21	EMERGENCY 1 OUT	Output	Connect to X9.17 to close the emergency stop circuit.
X9.22	EMERGENCY FEEDBACK IN	Input	Feedback input for forceguided contacts of the extension relays. Default: Bridge to X9.24

Terminal	Signal	In/Output	Description
X9.23	EMERGENCY RESET IN	Input	Connection for the external emergency stop reset button. When the safe state has been restored the power supply module of the laser switchen on by pushing this button. Connection of the button between X9.1 and X9.23.
X9.24	EMERGENCY FEEDBACK OUT	Output	Feedback output for forceguided contacts of the extension relays. Default: Bridge to X9.22

Wiring see Safety Circuit Variant 2 [▷ 89].

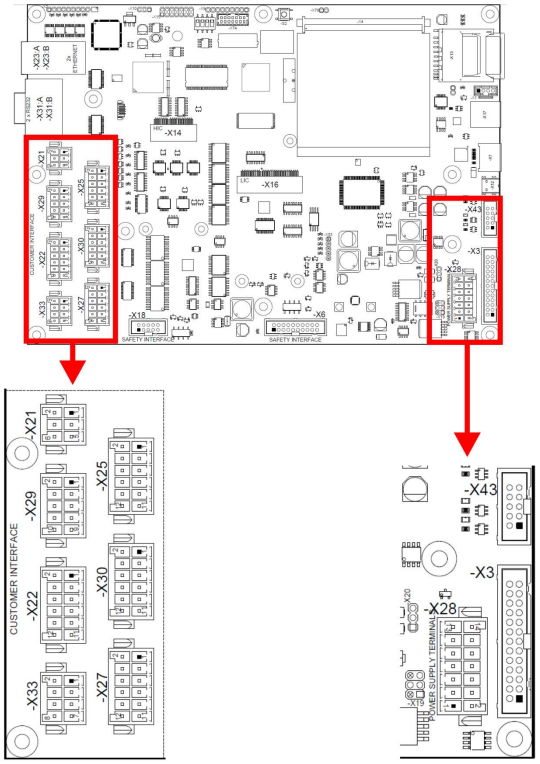
8.3 Assignment of the Customer Interface

NOTICE

All cables connected to the system must be shielded.

The shielding should be connected to the provided grounding rail.

The terminals of the customer interface are located on the control board in the supply unit of the laser system.



Description of the connectors

Connector	Description
X28	Power supply
X21	Fume extractor
X29	Laser control
X22	Laser control
X33	Internal signals
X25	Encoder/Product detector interface
X30	External job selection
X27	Laser control

Description of the bridges necessary for operation without external wiring

The following terminals are to be connected to 12 or 24 V for operation:

Bridge	Description
X29. 1-7	Input customer error
X27.7 - X33.3	reserved
X21. 1-2	Exhaust error
X21. 3-5	Filter full
X22. 3-11	reserved
X22. 7-9	Stop marking
X22. 9-11	reserved
X33. 1-8	External key switch
X33. 2-6	reserved
X25. 9-12	Trigger enable

Specification of the 12 outputs:

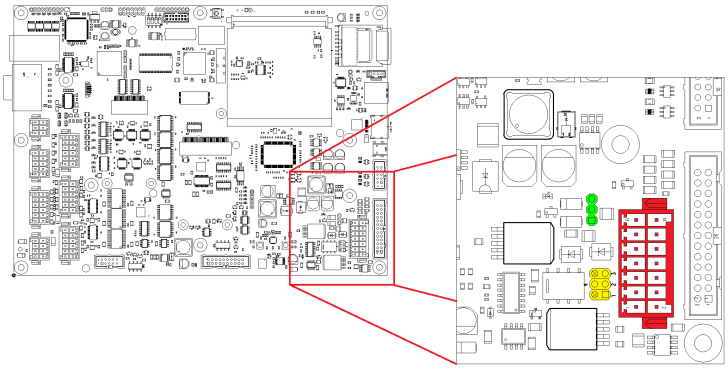
Rated voltage:	24 V/Push Pull (high and low activated)
Max. output current:	50 mA max. (short-circuit proof)

Specification of the 24 inputs:

Rated voltage:	24 V
Current input:	2.5 mA
Current threshold for LOW level:	<= 8.4 V
Current threshold for HIGHT level:	>= 9.4 V
Max. frequency:	200 Hz (except interface for encoder/product detector)

8.3.1 Power Supply Connector for the Customer Interface (Connector X28)

The power supply of the customer interface can either be supplied by the customer (opto-decoupled potential-free connection) or internally with 12 V or 24 V (non-isolated).

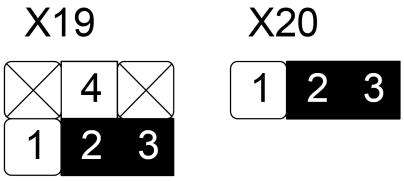


The jumpers X19 (yellow) and X20 (green) are used for configuration.

Potential-free configuration

For the potential-free configuration (power supply by the customer) the jumpers must be set as follows:

External supply +12 V to +24 V (potential-free):



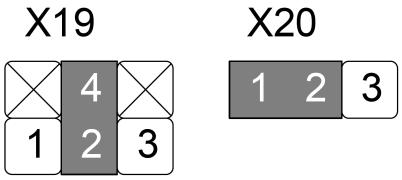
The external supply of 12 or 24 V +/- 10 % max. 50 W is to be connected to X28.7 (+) and X28.8 (-).

Non-isolated configuration

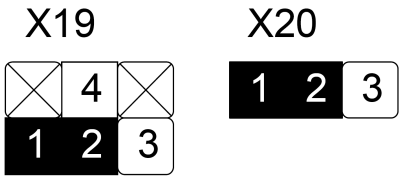
For the non-isolated configuration (internal power supply) the jumpers must be set as follows.

In this case X28.7 and X28.8 are not connected.

Internal supply +12 V (non-isolated):



Internal supply +24 V (non-isolated):



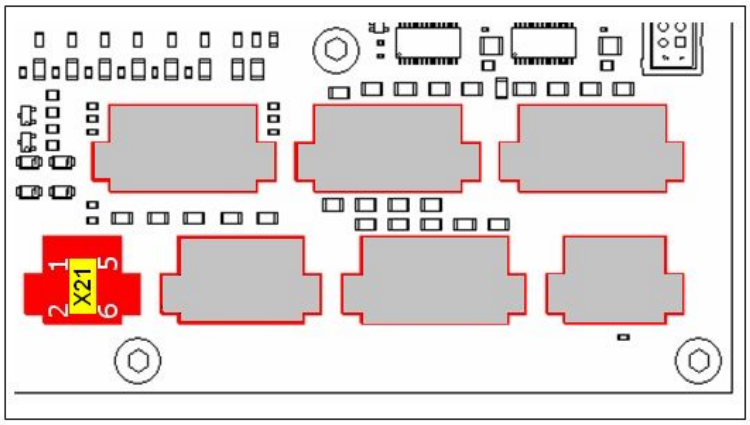
⚠ CAUTION

If the customer interface is supplied internally, the load must not exceed 250 mA.

Connector X28: Power Supply

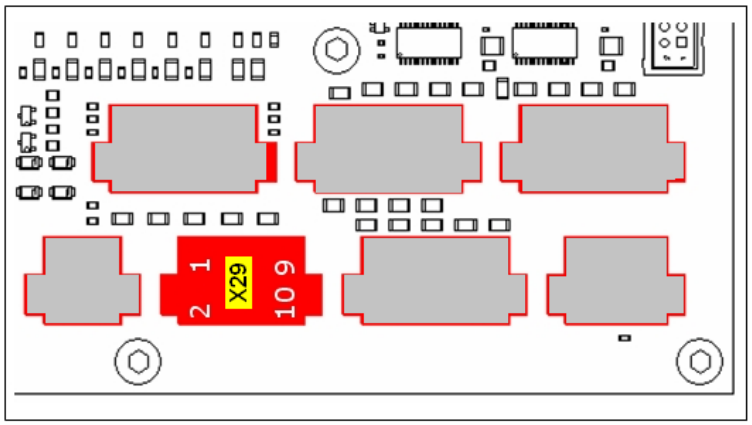
Terminal	Signal	Description
X28.1	RESERVED	reserved for internal purposes
X28.2	RESERVED	reserved for internal purposes
X28.3	EXT_STARTUP	The system can be booted remotely by applying here a pulse of X28.5. No other connections allowed! If X28.3 and X28.5 are bridged permanently the system boots automatically after switching mains on.
X28.4	RESERVED	reserved for internal purposes
X28.5	PWR_INT	Connection to X28.3
X28.6	RESERVED	reserved for internal purposes
X28.7	EXTERNAL_POWER_SUPPLY +	12 - 24 V supplied by customer
X28.8	EXTERNAL_POWER_SUPPLY -	GND supplied by customer
X28.9	RESERVED	reserved for internal purposes
X28.10	RESERVED	reserved for internal purposes
X28.11	RESERVED	reserved for internal purposes
X28.12	RESERVED	reserved for internal purposes
X28.13	RESERVED	reserved for internal purposes
X28.14	RESERVED	reserved for internal purposes

8.3.2 Assignment of Connector X21 Fume Extractor



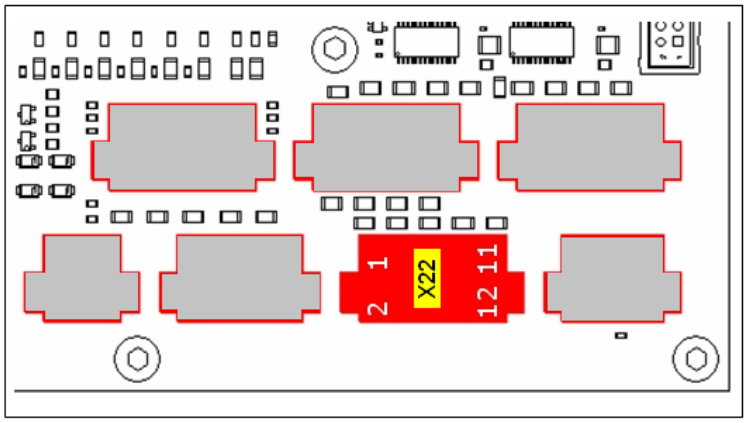
Terminal	Signal	In/Output	high/low	Description
X21.1	EX-HAUST_ER-ROR	Input	low	The system is stopped immediately if an error of the fume extractor oc-curs during the marking process.
X21.2	EXHAUST_ON	Output	high	This signal is set if the fume extractor is to be switched on.
X21.3	FILTER_FULL	Input	low	The system is stopped immediately if the filter of the fume extractor is full during the marking process.
X21.4	GND_CI	Output		
X21.5	24 V_CI	Output		Power supply
X21.6	GND_CI	Output		

8.3.3 Assignment of Connector X29 Laser Control



Terminal	Signal	In/Output	high/low	Description
X29.1	ERROR_STATUS_CUSTOMER	Input	low	Connected to 24 V. The signal is used to evaluate error conditions.
X29.2	ERROR	Output	low	The system is stopped immediately if an error occurs during the marking process.
X29.3	ERROR_CONFIRM	Input	high	Input for external error confirmation.
X29.4	SYSTEM_READY	Output	high	SYSTEM_READY is set as soon as the system completed the boot sequence and is ready to be controlled via the customer interface. Deactivated in Service Mode.
X29.5	reserved	Input		
X29.6	ACK_JOB_SELECTION	Output	high	Low: Job selection complete. High: Job selection not completed yet.
X29.7	+24V_CI	Output		
X29.8	GND_CI	Output		
X29.9	+24V_CI	Output		
X29.10	GND_CI	Output		

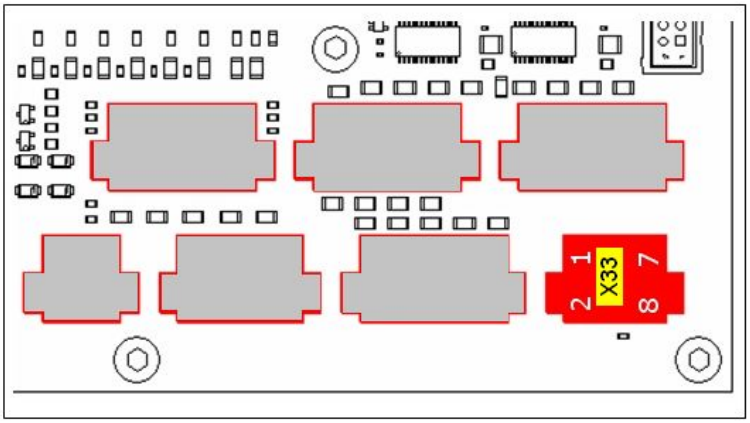
8.3.4 Assignment of Connector X22 Laser Control



Terminal	Signal	In/Output	high/low	Description
X22.1	reserved	Input		reserved for internal purposes
X22.2	LASER_READY	Output	high	This signal is set as soon as the key switch is closed and the laser source was initialized successfully. If high, the system accepts start signals for starting a marking process.
X22.3	reserved	Input	falling edge	reserved for internal purposes
X22.4	MARKING	Output	high	This signal is set during the marking process.
X22.5	START_MARKING	Input	high	This signal starts the marking process, if STOP_MARKING is not active.
X22.6	READY_TO_MARK	Output	high	This signal is set as soon as all necessary data and START signal have been received (waiting for trigger).
X22.7	STOP_MARKING	Input	low	This signal stops the marking process and prevents START_MARKING if active.
X22.8	SHUTTER_CLOSED	Output	high	This signal is set if the beam shutter is closed.
X22.9	reserved	Input		reserved for internal purposes
X22.10	GND_CI	Output		

Terminal	Signal	In/Output	high/low	Description
X22.11	+24V_CI	Output		
X22.12	GND_CI	Output		

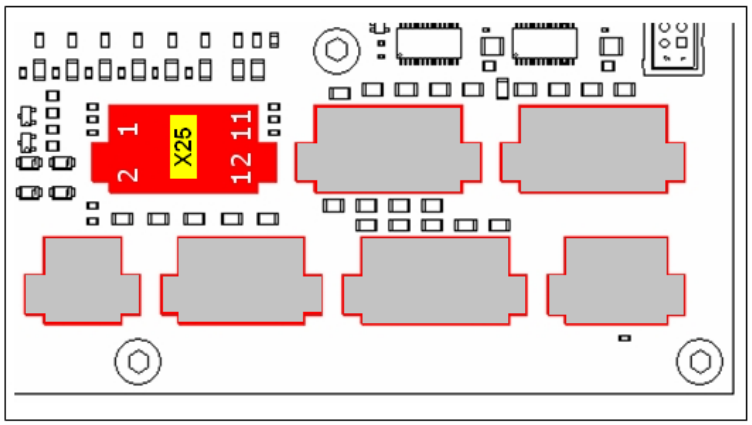
8.3.5 Assignment of Connector X33 Internal Signals



Terminal	Signal	In/Output	Description
X33.1	EXT_KEY	Input	External input for key switch
X33.2	reserved	Output	
X33.3	reserved	Output	
X33.4	reserved	Input	
X33.5	NC		-
X33.6	reserved	Input	
X33.7	NC		-
X33.8	EXT_KEY	Output	External output for key switch

Input X33.1 must be potential-free from output X33.8.

8.3.6 Assignment of Connector X25 Encoder/Product Detector



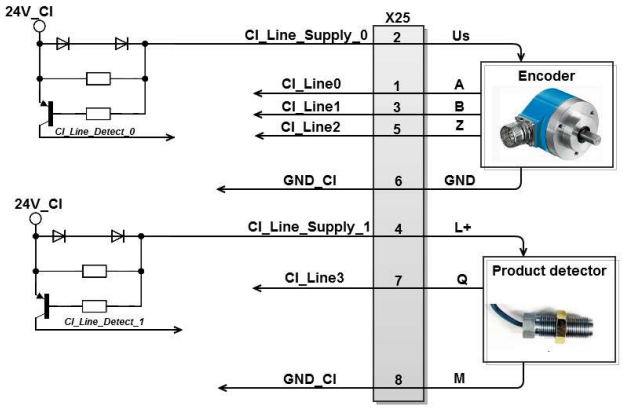
Terminal	Signal	In/Output	Description
X25.1	CHA	Input	Input for track 1 of encoder
X25.2	CI line supply 0	Output	24 V for encoder
X25.3	CHB	Input	Input for track 2 of encoder
X25.4	CI line supply 1	Output	24 V for trigger
X25.5	IN_ENC_IDX	Input	Input for index track of encoder
X25.6	GND_CI	Output	GND
X25.7	TRG	Input	Input trigger (product detection)
X25.8	GND_CI	Output	GND
X25.9	TRG_EN	Input	Trigger enable (bridge to X25.12)
X25.10	GND_CI	Output	GND
X25.11	reserved	Output	
X25.12	24 V CI	Output	Voltage supply 24 V (bridge to X25.9)

The encoder and the product detector are to be connected as shown in the figure below.

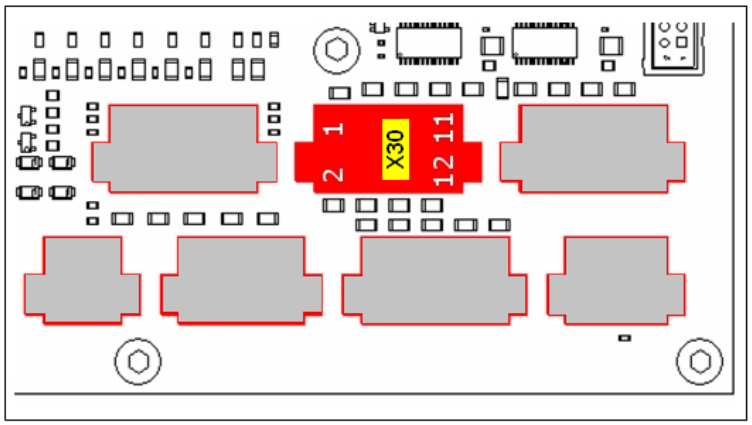
min. pulse length	2 µs
min. load	20 mA

NOTICE

If both tracks of the encoder are used the value for pulses per rotation must be doubled in the product registration.

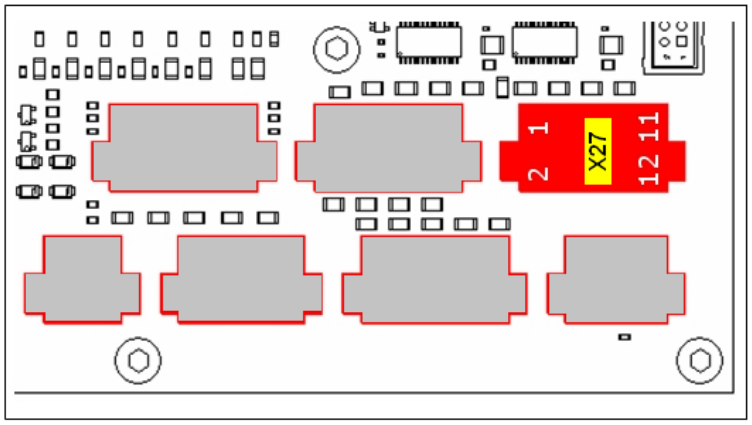

24V_CI
X25
Cl_Line_Supply_0
2
Us
Encoder
Cl_Line0
1
A
Cl_Line1
3
B
Cl_Line2
5
Z
Cl_Line_Detect_0
GND_CI
6
GND
24V_CI
Cl_Line_Supply_1
4
L+
Product detector
Cl_Line3
7
Q
Cl_Line_Detect_1
GND_CI
8
M

8.3.7 Assignment of Connector X30 External Job Selection



Terminal	Signal	In/Output	high/low	Description
X30.1	JOB_SE-LECT_BIT_0	Input	high	Input for bitmask Bit 0
X30.2	JOB_SE-LECT_BIT_1	Input	high	Input for bitmask Bit 1
X30.3	JOB_SE-LECT_BIT_2	Input	high	Input for bitmask Bit 2
X30.4	JOB_SE-LECT_BIT_3	Input	high	Input for bitmask Bit 3
X30.5	JOB_SE-LECT_BIT_4	Input	high	Input for bitmask Bit 4
X30.6	JOB_SE-LECT_BIT_5	Input	high	Input for bitmask Bit 5
X30.7	JOB_SE-LECT_BIT_6	Input	high	Input for bitmask Bit 6
X30.8	JOB_SE-LECT_BIT_7	Input	high	Input for bitmask Bit 7
X30.9	JOB_SE-LECT_STROBE	Input	rising edge	Strobe signal "read bit-mask"
X30.10	GND_CI	Output		
X30.11	24V_CI	Output		
X30.12	GND_CI	Output		

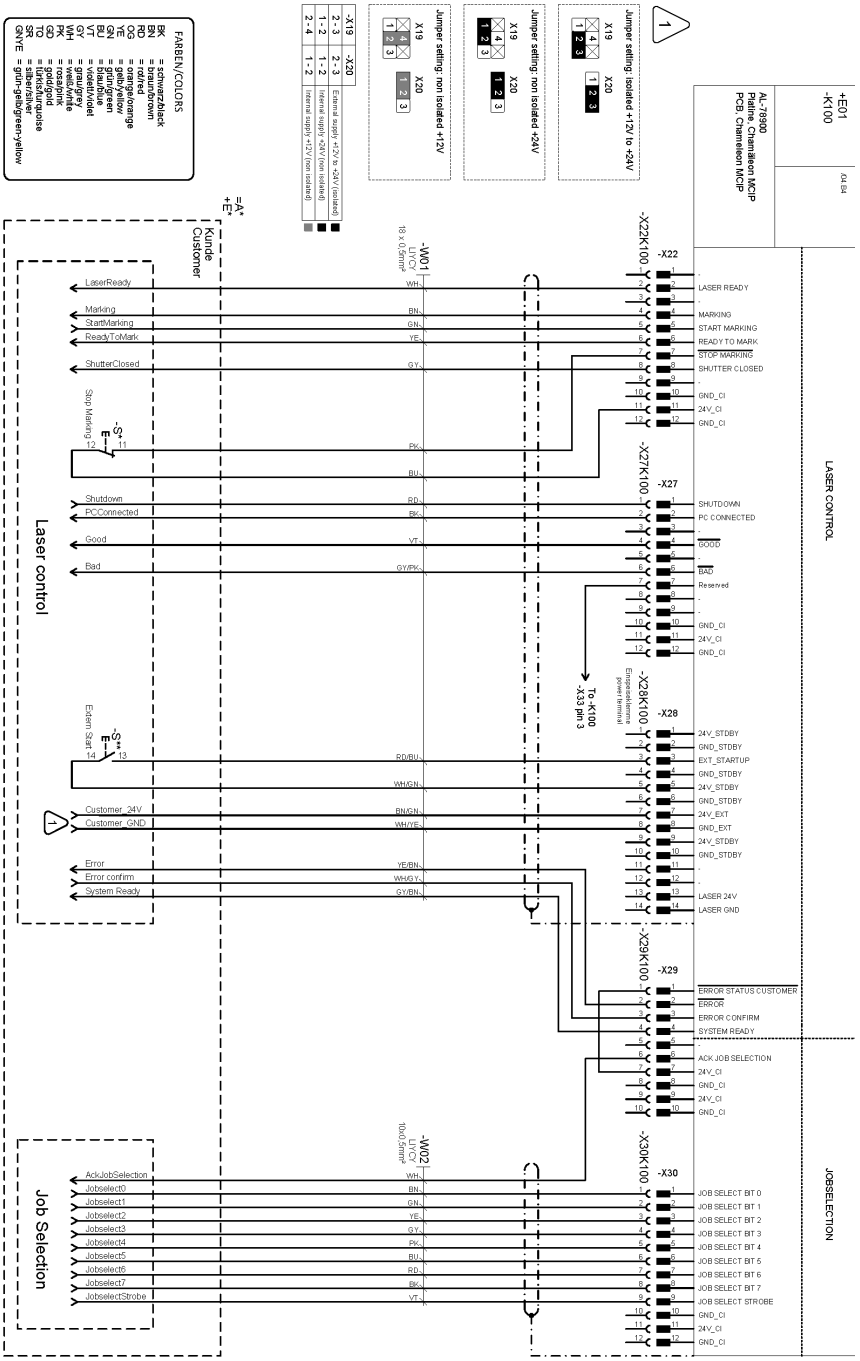
8.3.8 Assignment of Connector X27 Laser Control



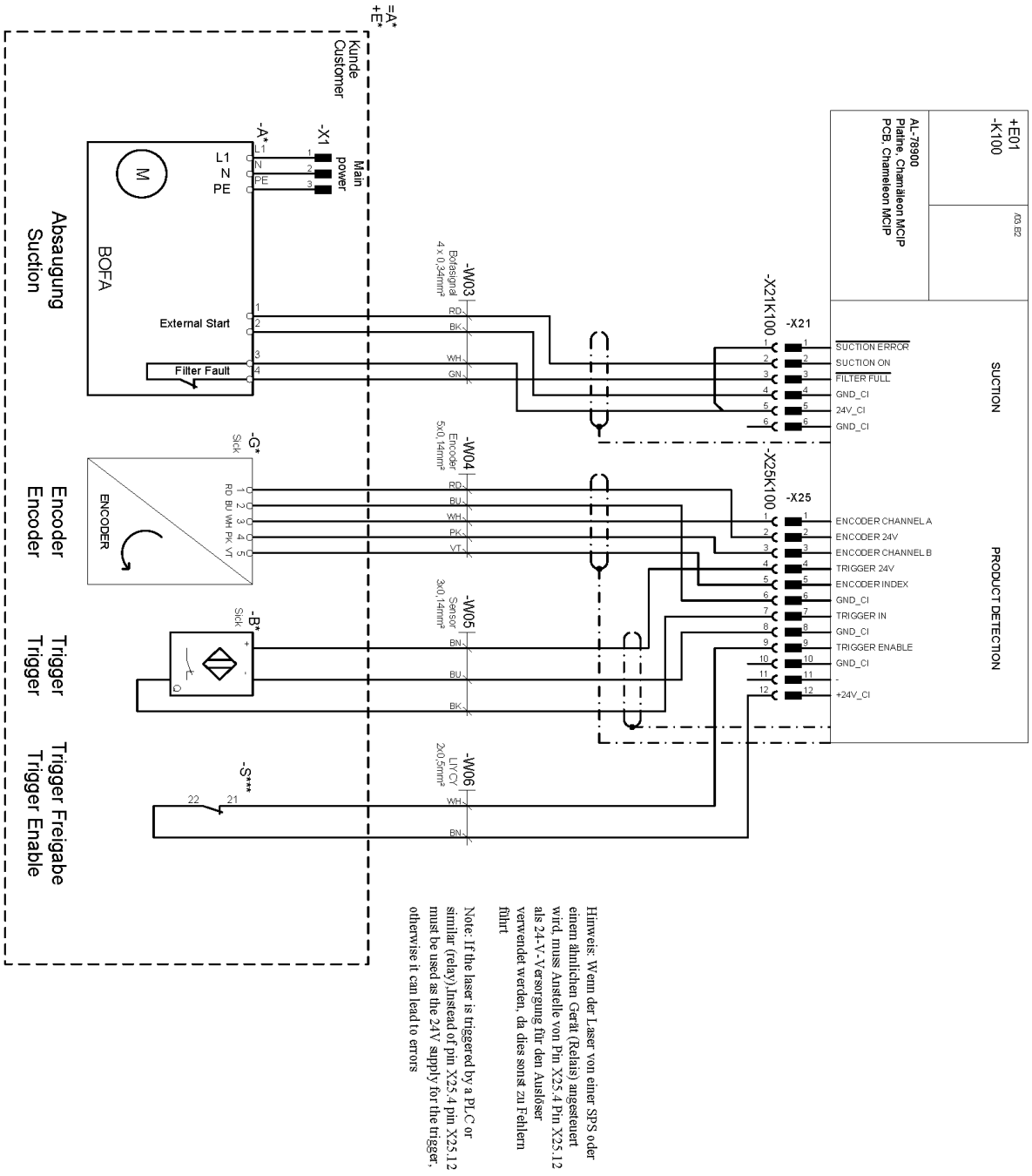
Terminal	Signal	In/Output	high/low	Description
X27.1	SHUTDOWN	Input	high	If this input is set to "high" the system is shut down.
X27.2	PC_CON-NECTED	Output	high	Is set as soon as a PC is connected.
X27.3	reserved	Input	high	
X27.4	GOOD	Output	high	Indicates that the last marking has been car-ried out without warning or error message. This output is reset by the next trigger signal.
X27.5	reserved	Input	high	
X27.6	BAD	Output	high	Indicates that the last marking was not com-pleted due to a warning or error message. This output is reset by the next trigger signal.
X27.7	reserved	Input	low	Connected to X33.3
X27.8	reserved	Output	high	
X27.9	reserved	Input	high	
X27.10	GND_CI			
X27.11	24V_CI			
X27.12	GND_CI			

8.4 Wiring Examples 10/30 W

8.4.1 Laser Control/Job Selection



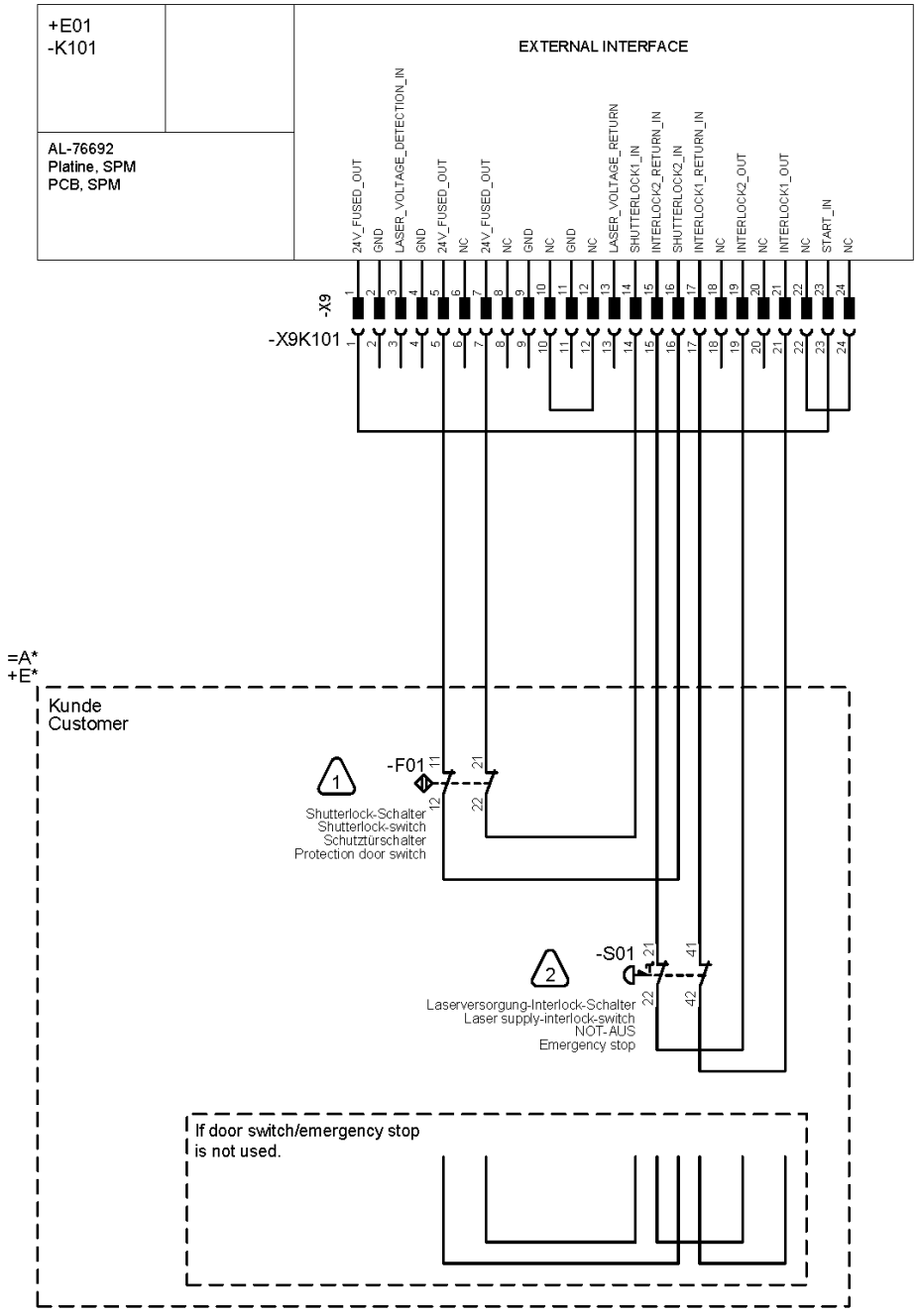
8.4.2 Fume Extractor/Encoder/Trigger



8.4.3 Safety Circuit Variant 1

System response:

1. Shutterlock open.
2. Interlock open.



8.4.4 Safety Circuit Variant 2

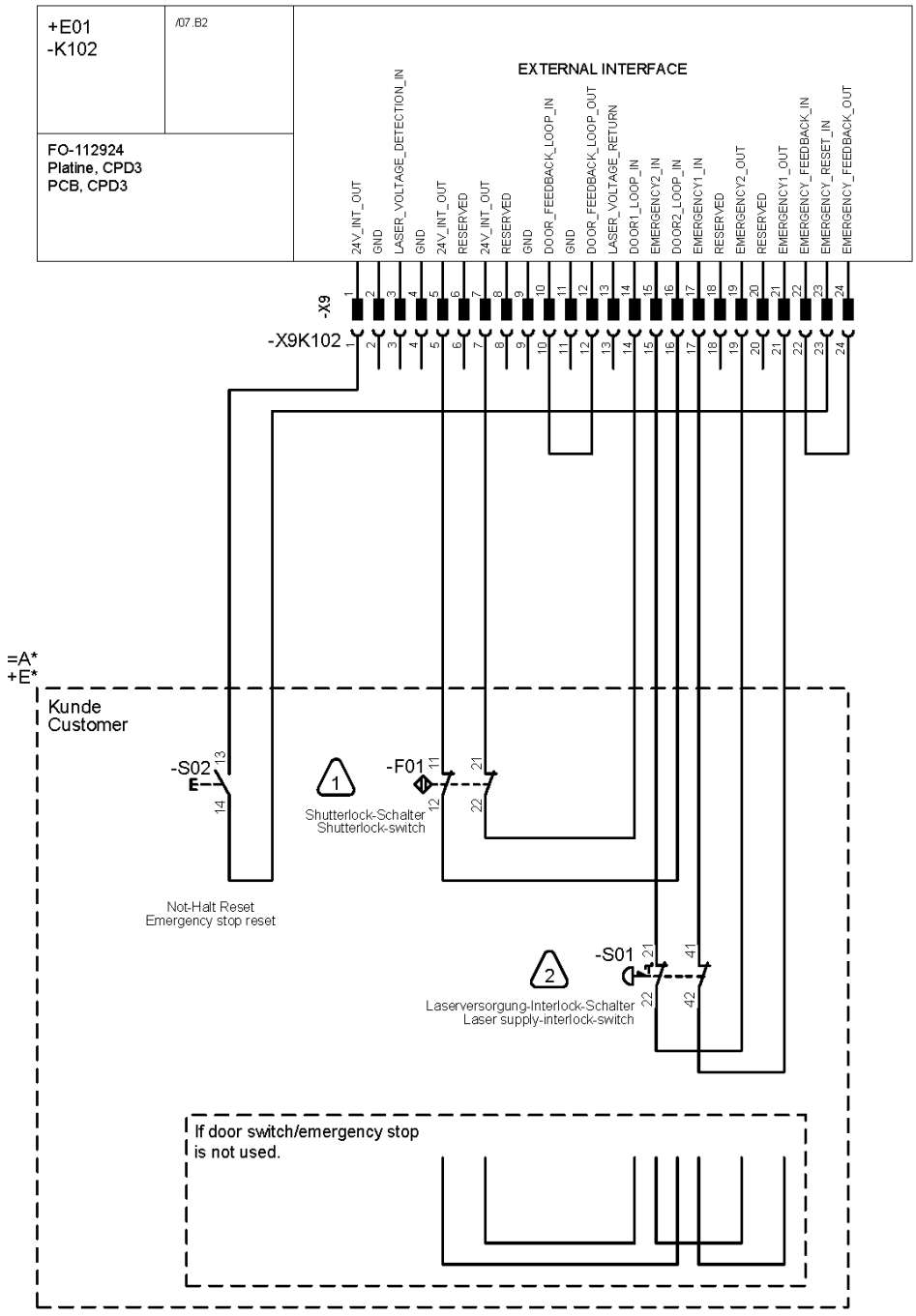
1. Door circuit performance level "d".

   System response: Shutterlock open. Message: Door circuit open.

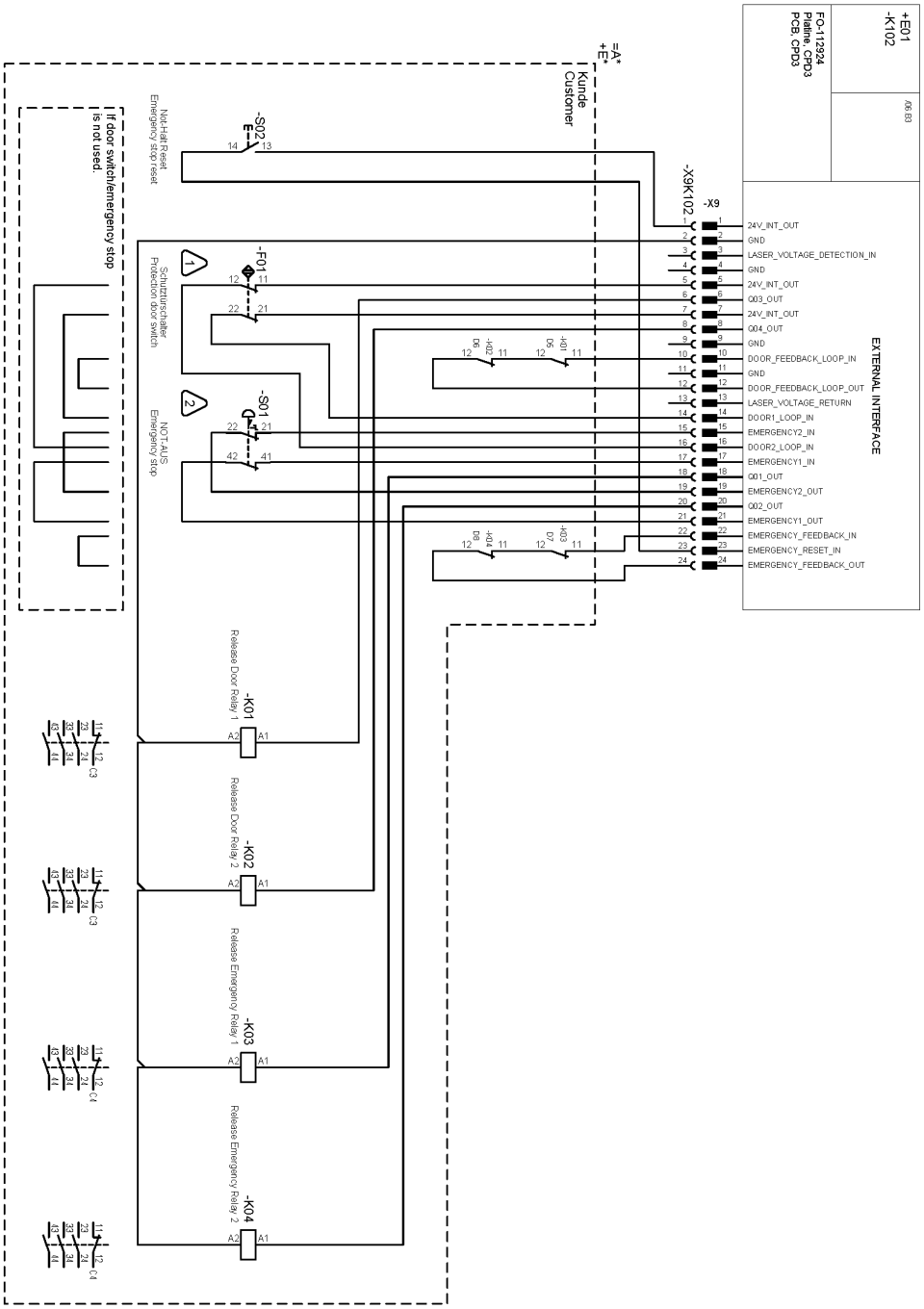
2. Emergency stop performance level "e".

   System response: Interlock open. Message: Emergency stop open.

   Emergency stop must be reset with S02 after the safe state has been restored.

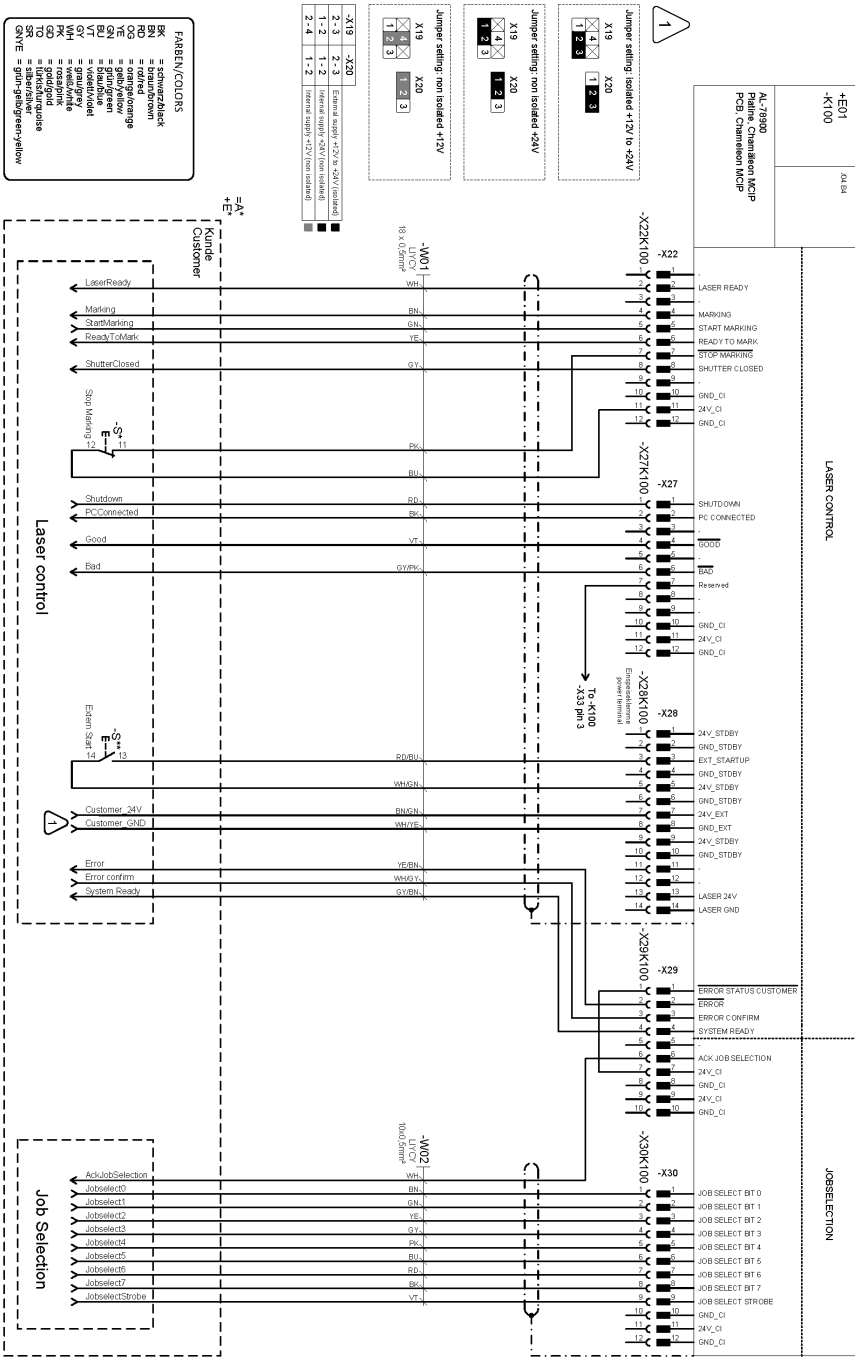


Safety Circuit (extended)

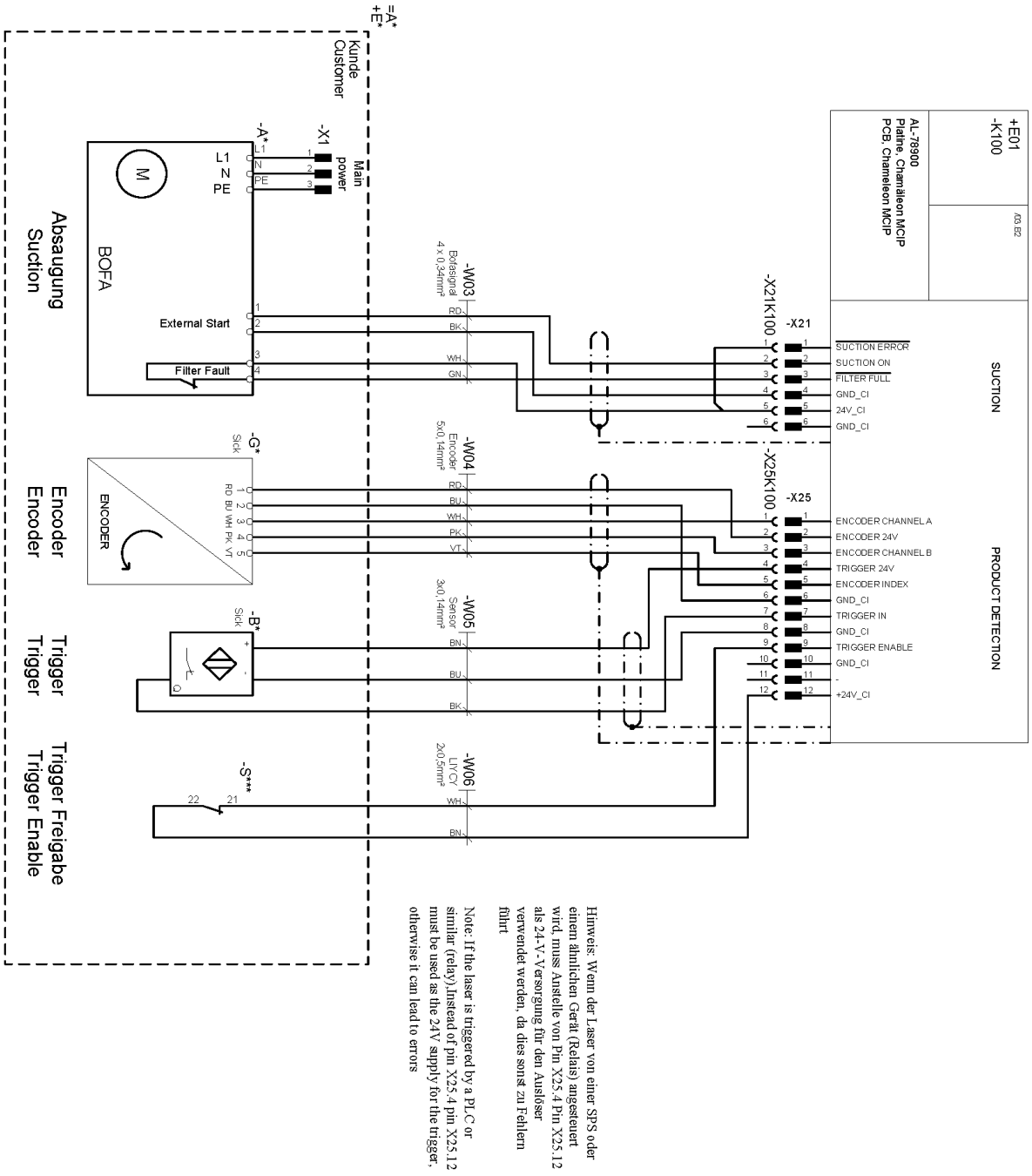


8.5 Wiring Examples 60 W

8.5.1 Laser Control/Job Selection



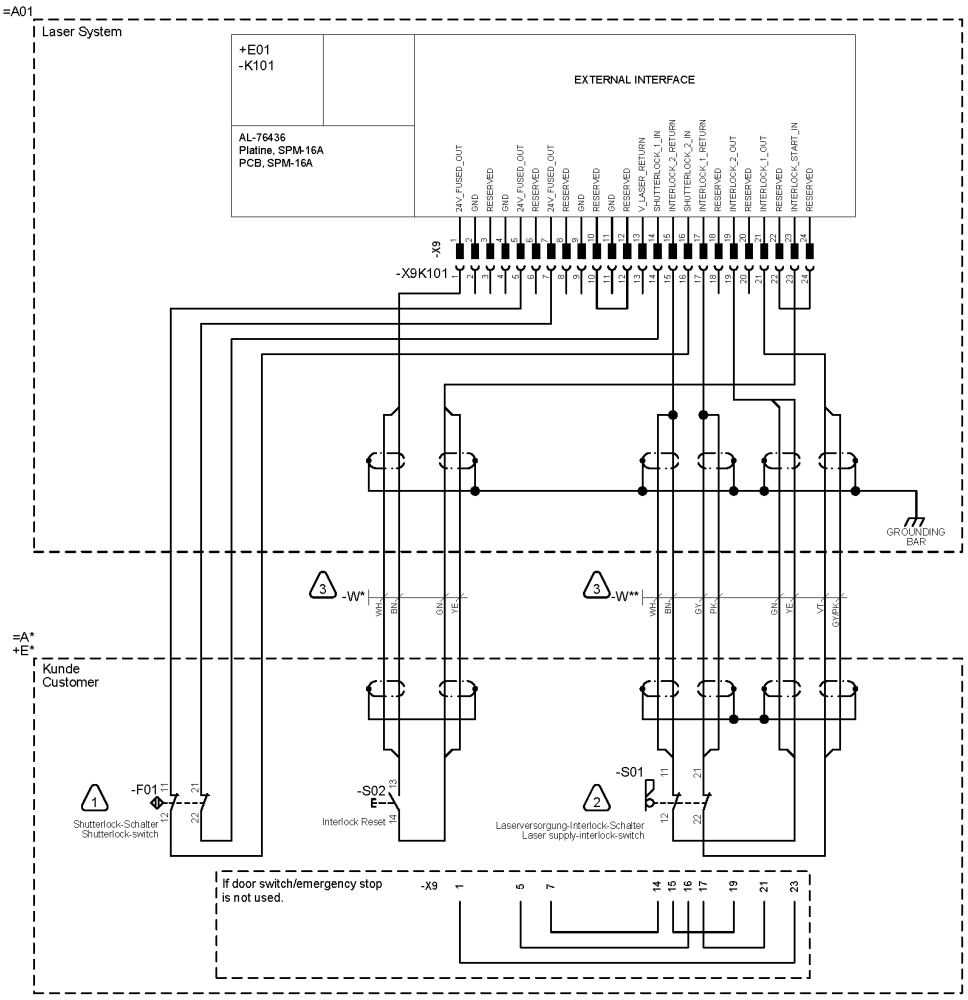
8.5.2 Fume Extractor/Encoder/Trigger



8.5.3 Safety Circuit Variant 1

System response:

1. Shutterlock open.
2. Interlock open.



8.5.4 Safety Circuit Variant 2

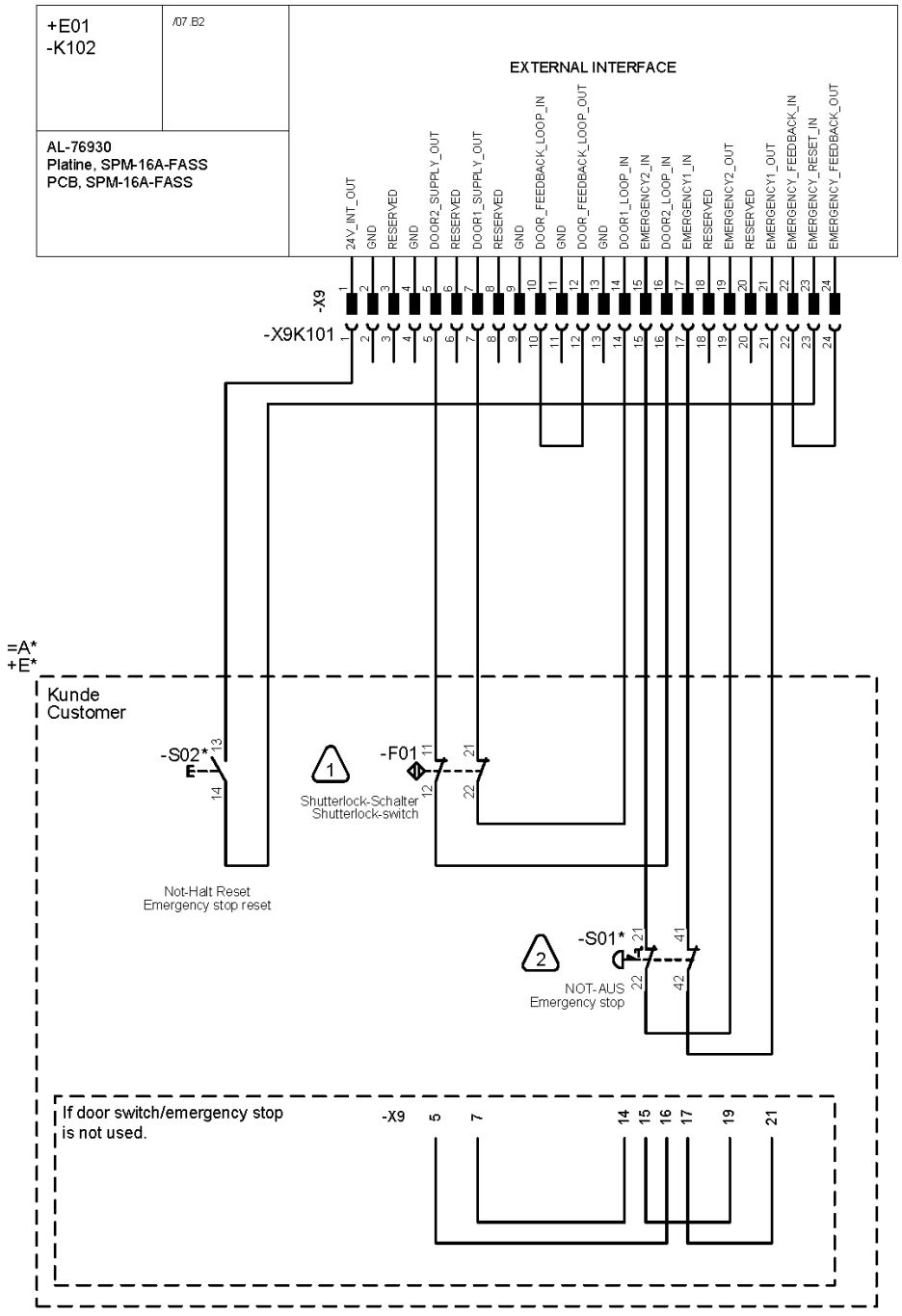
1. Door circuit performance level "d".

   System response: Shutterlock open. Message: Door circuit open.

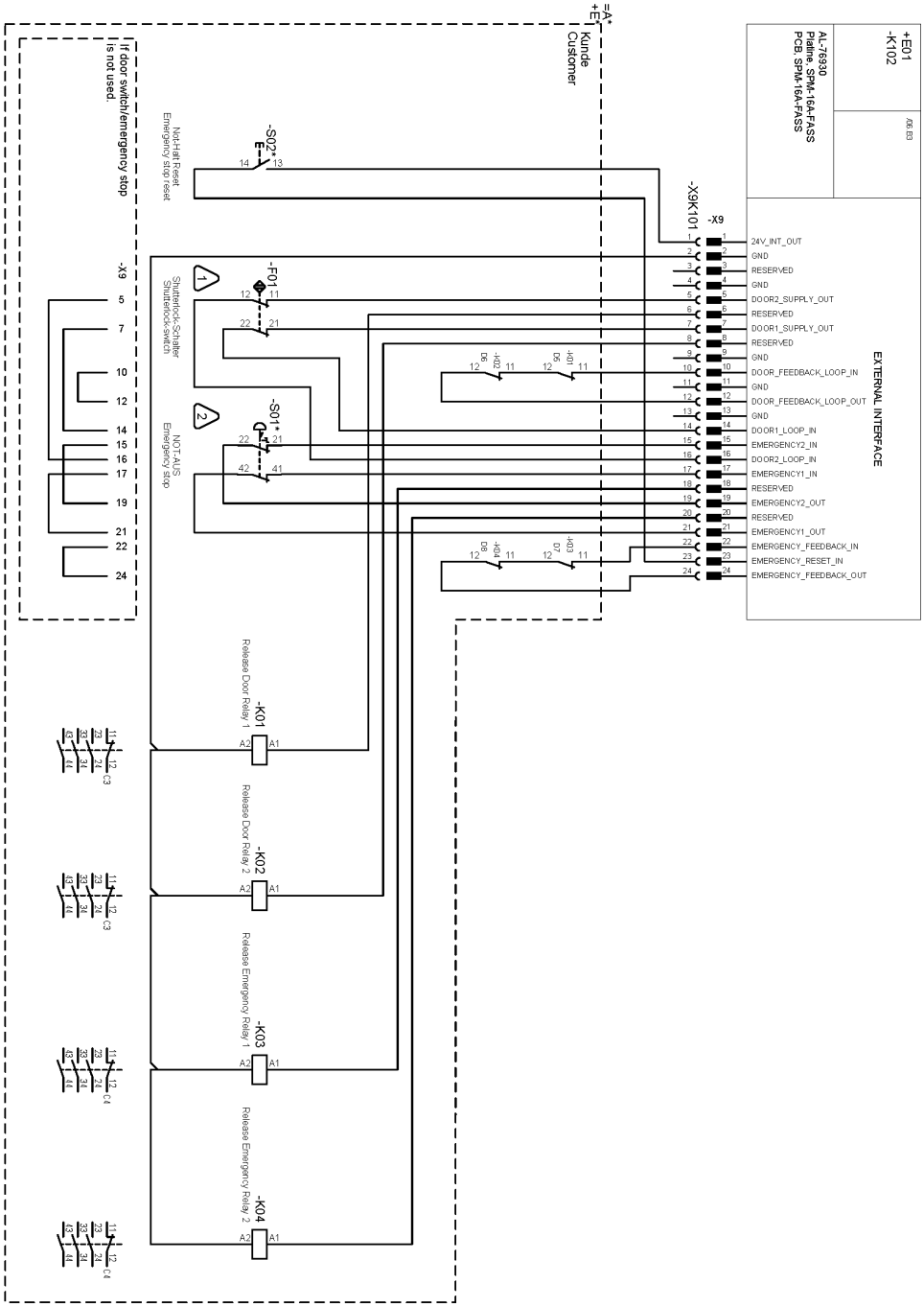
2. Emergency stop performance level "e".

   System response: Interlock open. Message: Emergency stop open.

   Emergency stop must be reset with S02 after the safe state has been restored.

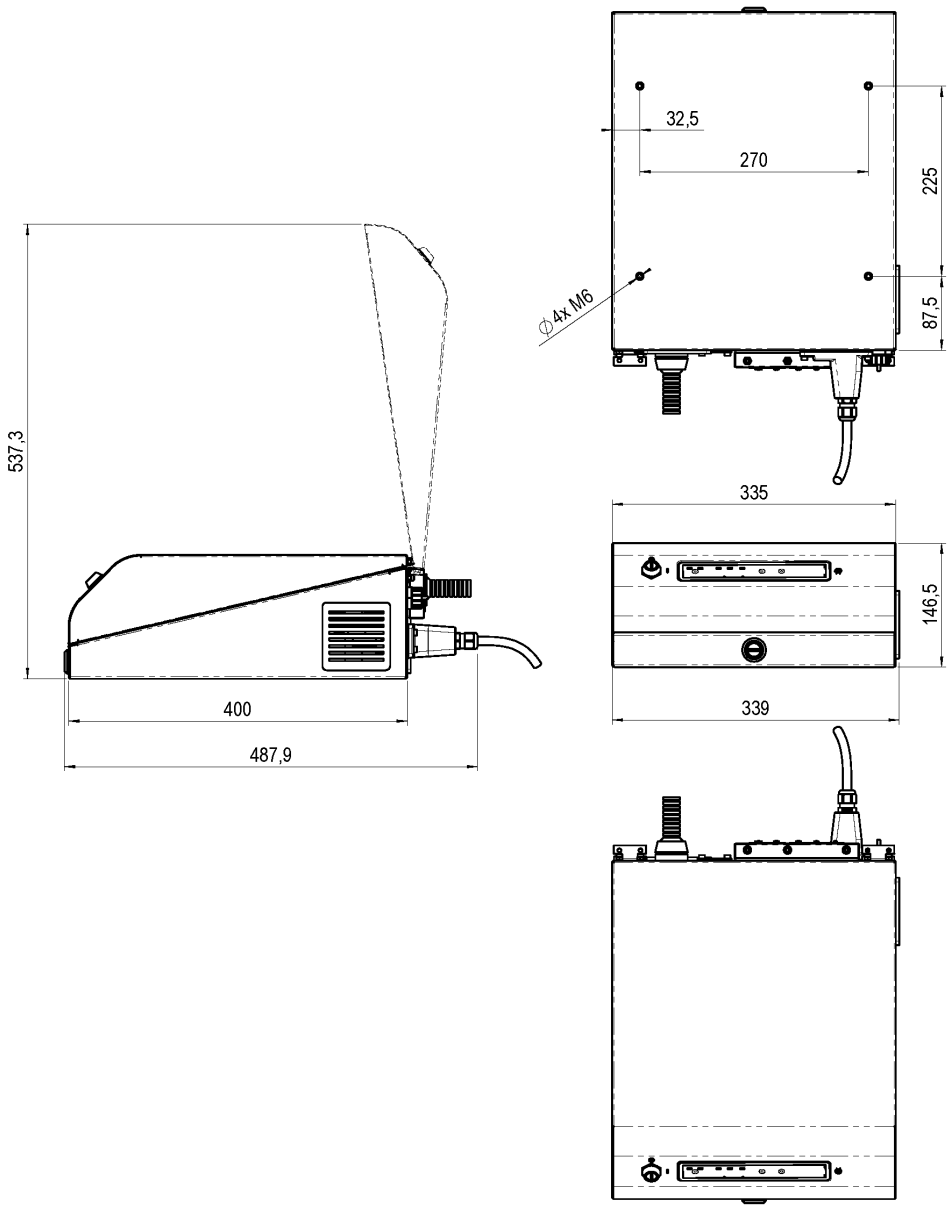


Safety Circuit (extended)



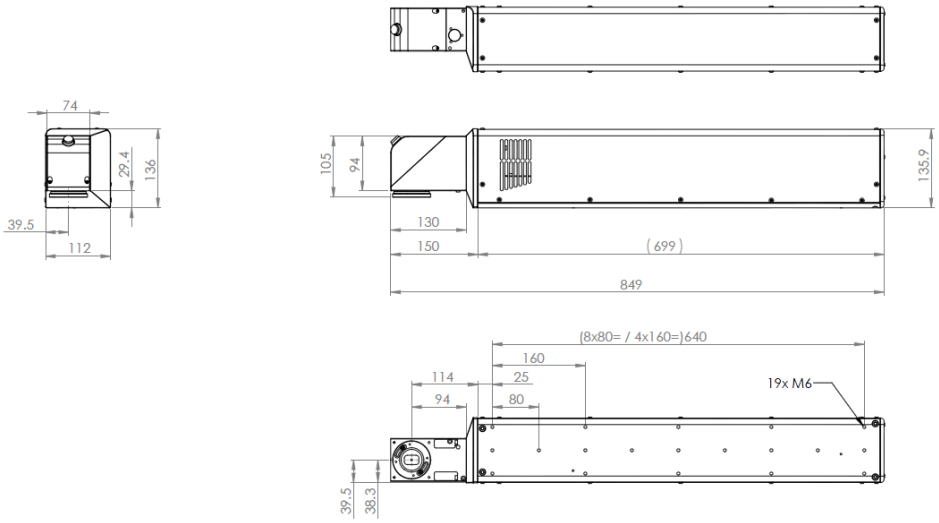
8.6 Drawings

Supply Unit

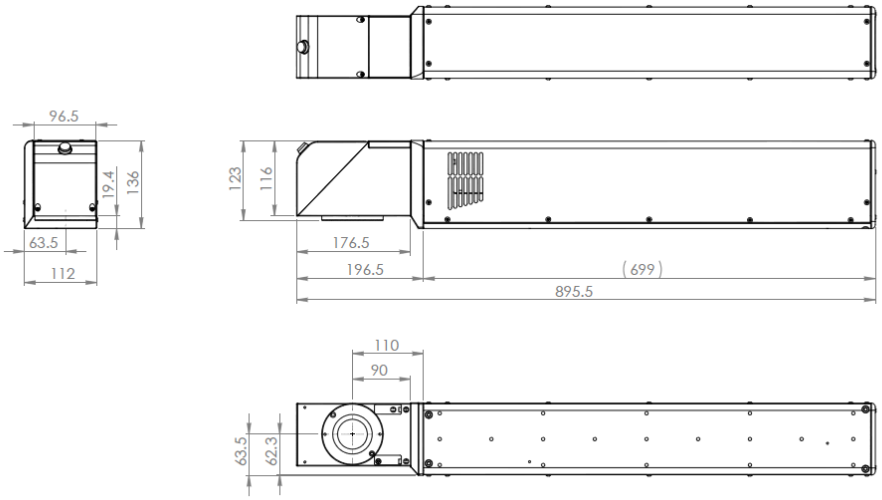


Marking Unit (Laser Head and Marking Head) Videojet 3140

with SHC 60D

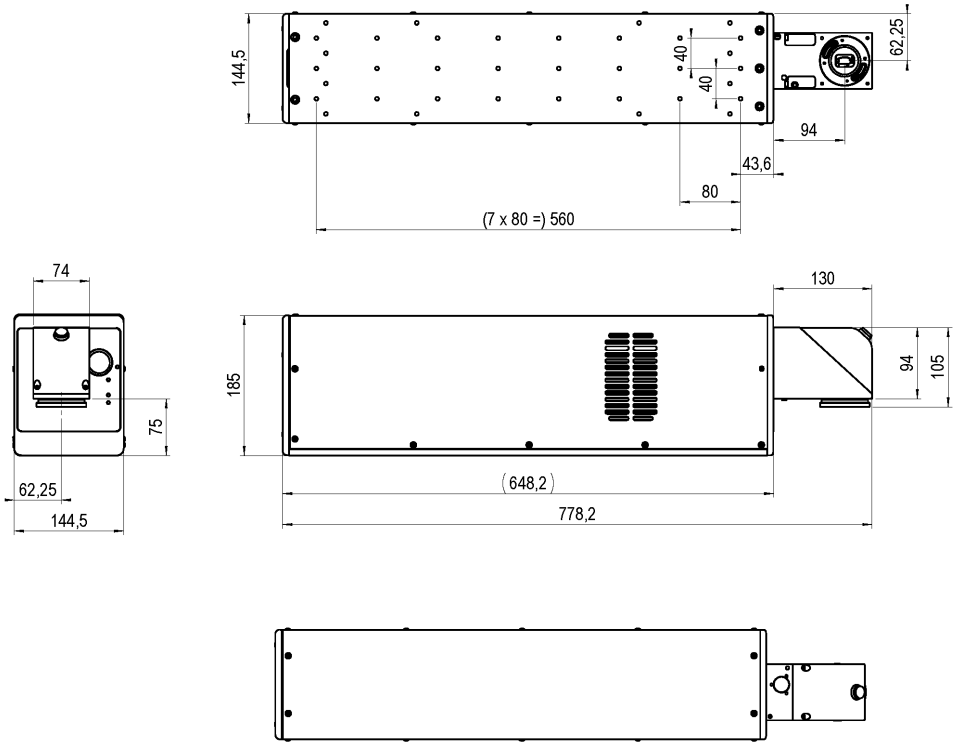


with SHC 100D/SHC 120C

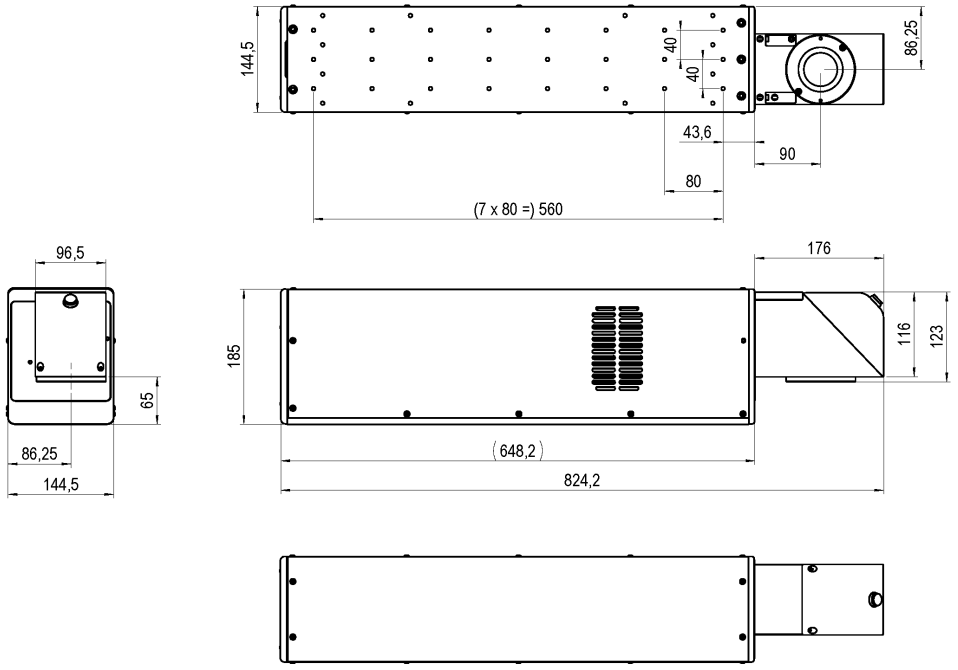


Marking Unit (Laser Head and Marking Head) Videojet 3340

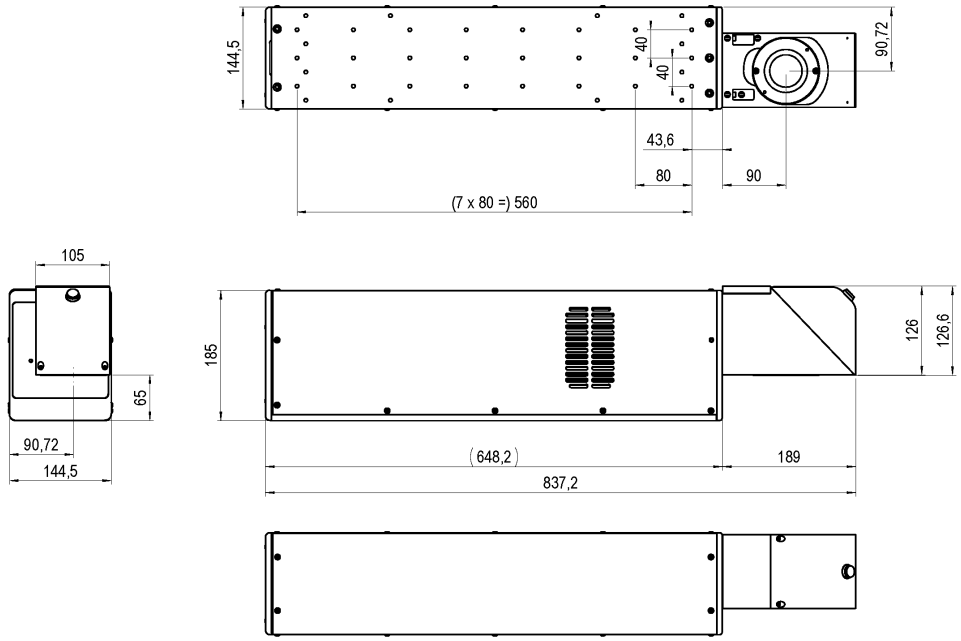
with SHC 60D



with SHC 100D/SHC 120C

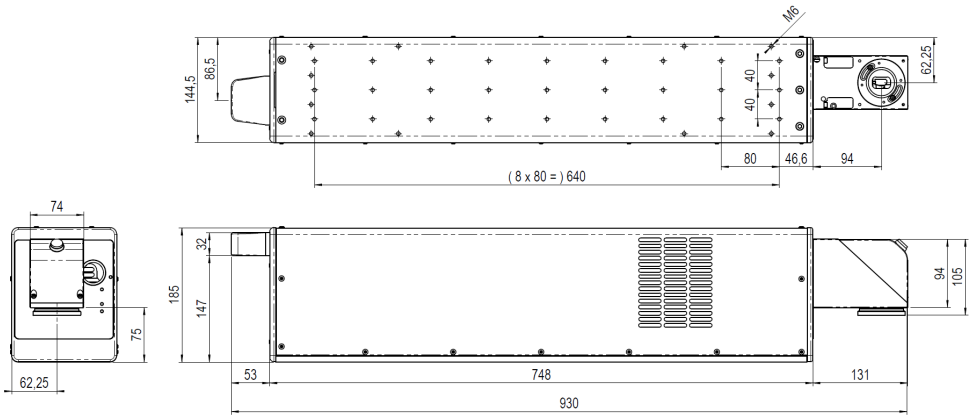


with SHC 150C

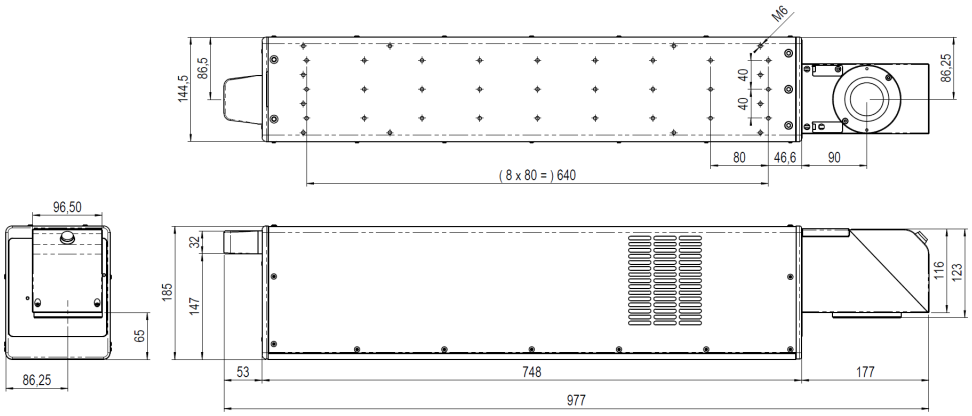


Marking Unit (Laser Head and Marking Head) Videojet 3640

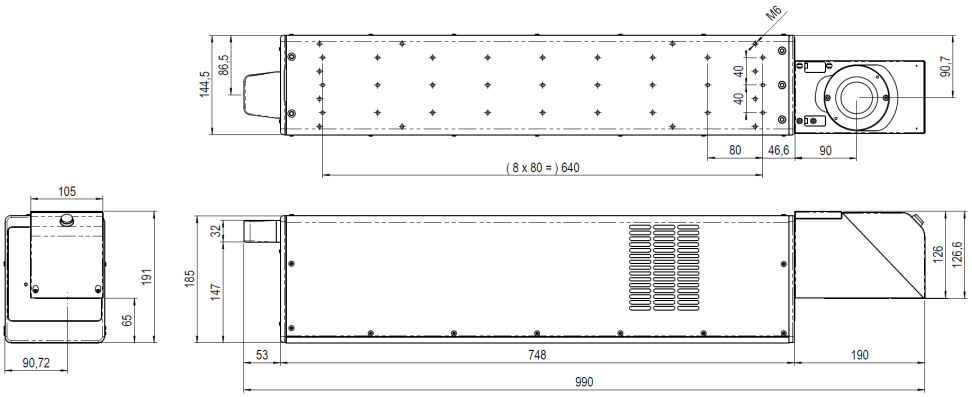
with SHC 60D



with SHC 100D/SHC 120C

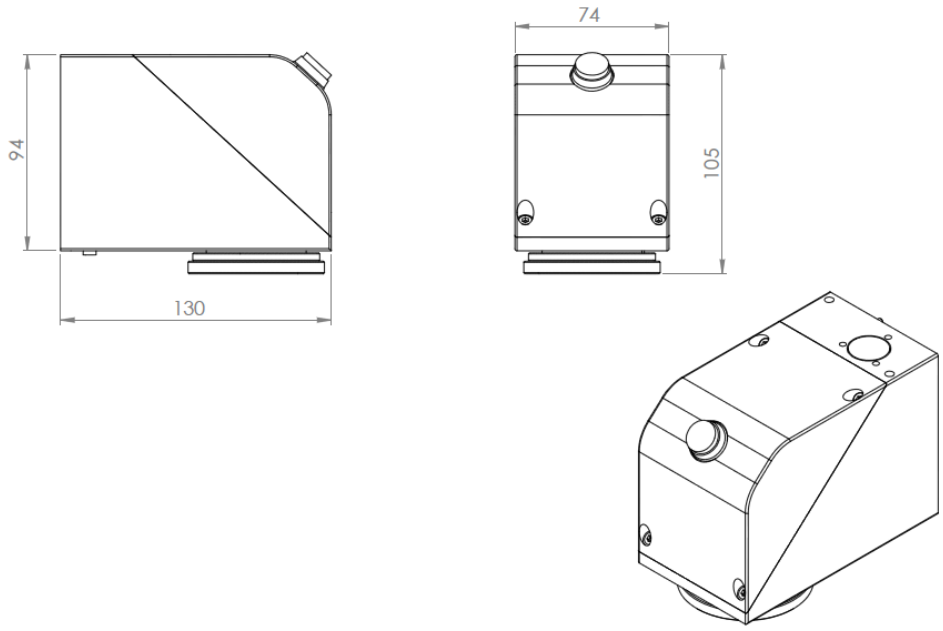


with SHC 150C

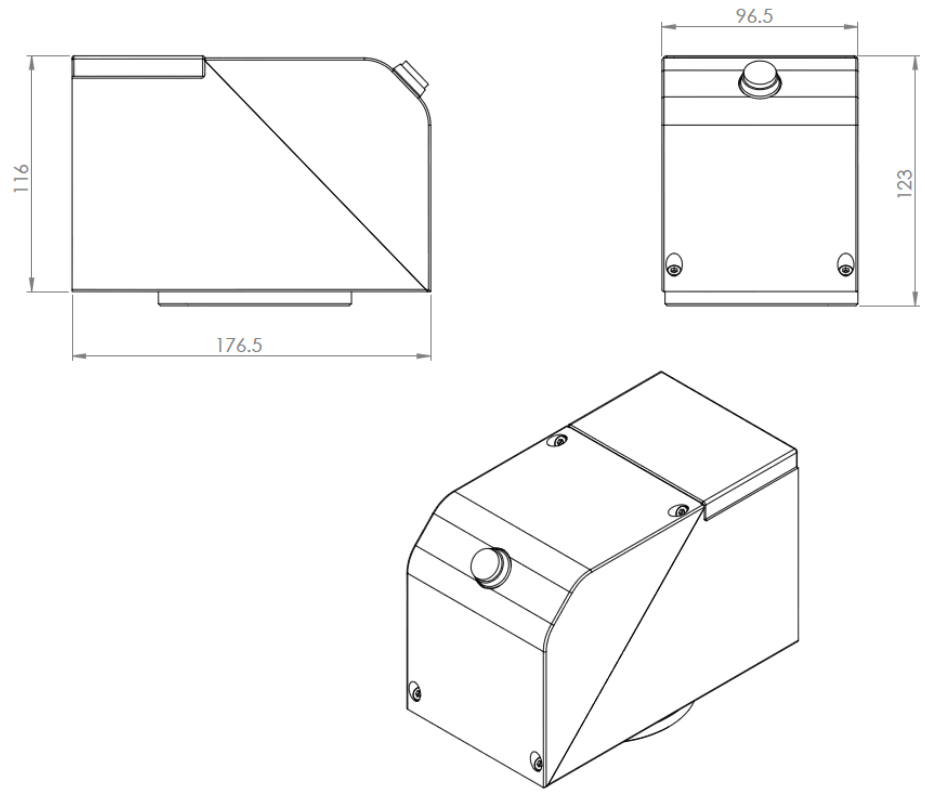


Marking Head

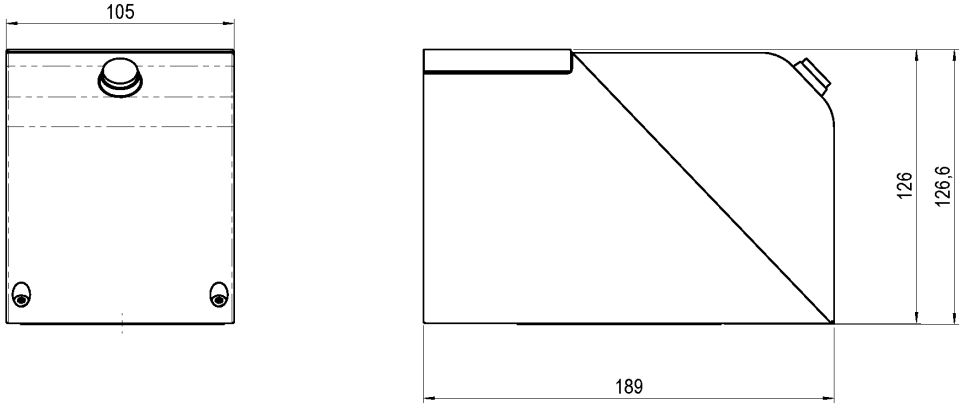
SHC 60D

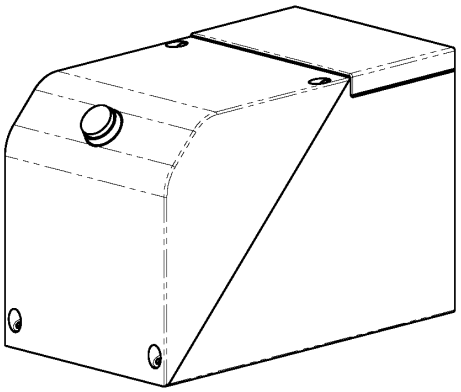


SHC 100D/SHC 120C



SHC 150C





8.7 Safety Data Sheet Zinc-Selenide (ZnSe)

Material Safety Data Sheet **II-VI Deutschland**

Revision Date: 21.08.2001

1. Product identification

Trade name of the product:	Zinc Selenide (ZnSe-)-Optic with AR- (Anti-Reflection-) Coating for 10.6 µm
CAS-No.:	1315-09-9
Synonyms:	Raytran ZnSe, Kodak Irtran-4
Form:	Solid Optical Element
Chemical family:	Inorganic chemical belonging to the II-VI compound group

2. Hazardous ingredients

Material components:	atomic	CAS-Number
Zinc	50 %	7440-66-6
Selenium	50 %	7782-49-2
Coating ingredients:		
Zinc Selenide	N/A	1315-09-9
Thorium Fluoride	N/A	13709-59-6

3. Physical properties

Boiling point, 760 mm HG	:	sublimes
Melting point	:	1525 °C
Specific gravity (H_2O=1)	:	5.27 g cm^{-3}
Vapor pressure	:	N/A
Vapor density (Air = 1)	:	N/A
Solubility in H_2O, % by WT	:	insoluble
% Volatiles by volume	:	N/A
Appearance & odor	:	yellow / transparent / solid / odorless

4. Flammability and explosive properties

Flash point (test method) : not flammable and not explosive

5. Health hazard data

Threashold limit value

Material	*Limit*
Zinc oxide fumes	5 mg/m^3
Zinc oxide dust	10 mg/m^3
Selenium and compounds	0.2 mg/m^3

Threshold value of the amount of inhaled particles that can be handled by the body of persons who permanently deal with this material job related:

For Thorium Fluoride Dust with 1 µm Particle Size
(This value is getting higher significantly with bigger particles.
Particles bigger than 20 µm can not be inhaled any more.) 136 mg

Threshold value of the amount of inhaled particles that can be handled by the body of persons who does not deal with this material job related:

For Thorium Fluoride Dust with 1 µm Particle Size
(This value is getting higher significantly with bigger particles.
Particles bigger than 20 µm can not be inhaled any more.) 3 mg

Effects of overexposure:

ZnSe - Effects are not known, but some Zinc and Selenium can be formed, such as: Zinc Oxide - Chills and fever. Selenium and Compounds - Acute exposure might produce sternal pain, cough, nausea, pallor, coated tongue, gastro-intestinal disorders, nervousness and/or conjunctivitis. A garlic odor of the breath or sweat may occur.

Thorium - eventually cancer producing, because of its radio activity. But no impact has been recognized through inhalation of less than 270 - 540 mg/year. One assumes that from this point the risk enlarges linear to the inhalation. The exposure through the continuing contact with a lens for 2000 hours/year is less than the exposure that occurs when your teeth are x-rayed two times, you make a trans-continental flight or fume 1/3 of a cigarette/day. Inorganic Fluorides - normally an irritant and toxic. Inhaling can be the cause for irritations of the respiratory tract and the mucosa, asthma attack, increased salivation, thirst, sweating, vomitus and colic.

6. Reactivity data

Stability:	stable
Conditions to avoid:	extreme heat greater than 500 °C could result in decomposition
Materials to avoid	strong acids, strong bases
Hazardous decomposition products:	Selenium / Oxides of Selenium / Zinc Oxide
Hazardous polymerization:	will not occur
Conditions to avoid:	N/A

7. Spill or Leak Procedures

Steps to take in case material is released or spilled: N/A

8. Special Protection Information

Type of respiratory protection required:

NIOSH approved respiratory with fume type cartridge

Ventilation:

In case of vaporization leave the room and allow the dust to settle. Clean all surfaces if the room has ventilation, allow for several air changes. Locate exhaust near location of ZnSe processing or use if failure by melting is likely.

9. Special Precautions

Handling and storage precaution:

If material is to be machined, ground or polished, processes should be done wet so as to minimize dust which could result in inhalation. Good work practices such as keeping hands clean and not letting slurry splash significantly should be followed so that transferal to mouth by contamination on the hands or clothing followed by ingestion will not occur. Wash hands and face thoroughly after handling material and before eating.

If parts are dropped or otherwise broken, sweep up pieces which may have sharp edges as one would clean up broken glass and safely TRANSFER TO DISPOSAL CONTAINER: large pieces may have salvage value.

References for material safety and threshold limit values:

1. "Dangerous Properties of Industrial Materials" Richard J. Lewis, Sr., 1992, 8th Edition
2. "TLVs Threshold Limit Values for Chemical Substances and Physical Agents in the Work-room Environment with Intended Changes for 1981" American Conference of Industrial Hy-gienists
3. 1998 "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices" edited by the American Conference of Industrial Hygienists
4. Zinc Selenide Material has been found not toxical in a study about toxical limit values by Toxikon. This test was initiated on January 7th, 1993 by II-VI, according to the prescription "Federal hazardous substances Act. 16CFR, Part 1500.3, January 1990."
5. International Commission on Radiological Protection, ICRP Publication 71, "Age-dependant Doses to members of the Public from Intake of Raionuclides: part 4 Inhalation Dose Coef-ficients", 1996
6. International Commission on Radiological Protection, ICRP Publication 26, "Recommenda-tions of the International Commission on Radiological Protection", 1977
7. This information has been taken from the Material Safety Data Sheet of our distributor. The datasheet has been generated carefully. However we will take no liability for the content, no matter which legal ground is given.

Details of the Manufacturer and the Distributor

Address of the manufacturer:

II-VI Incorporated
375 Saxonburg Blvd.
Saxonburg, Pennsylvania 16056
USA

Address of the distributor (please call here for further information):

II-VI Deutschland GmbH
Im Tiefen See 58
64293 Darmstadt

Tel.: 06151-8806-29 / Fax: 06151-8966-67

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