SITE PREPARATION

COMPex*Pro*®

02/2014

Part Number: D148975 [AA]
Document Code: B_CProRD_AA

GERMANY
Coherent LaserSystems GmbH & Co. KG
Hans-Böckler-Strasse 12
D - 37079 Göttingen, Germany

Tel.: +49 (551) 6938-0
Fax: +49 (551) 68691
eMail: salesgermanyGTG@coherent.com

U.S.A.
Coherent Inc.
5100 Patrick Henry Drive
Santa Clara, CA 95054 USA

Tel.: +1 (408) 764-4000
Fax: +1 (408) 764-4800
eMail: tech.sales@coherent.com

JAPAN
Coherent Japan Office
Tokyo MK Building
7-2-14 Toyo, Koto-Ku, Tokyo
135-0016, Japan

Tel.: +81 (3) 5635-8700
Fax: +81 (3) 5635-8701
Internet: http://www.coherent.co.jp

KOREA
Coherent Asia Korea
Eagle Town 1F,5F, 278-20,1
Seongsu 2ga-3 dong Seongdong-Gu,
Seoul, 133-832, Korea

Tel.: +82 (2) 460-7900
Fax: +82 (2) 460-7901

Internet: http://www.coherent.com

CONTENTS

TABLE OF CONTENTS

D148975_AA

1 INTRODUCTION

This Site Preparation Manual is a part of the instructions for use that accompany COMPex*Pro*® excimer laser devices. These instructions promote the intended safe and efficient use of the laser device and contain the information that needs to be known before starting work. Following these instructions should reduce the risk of injury to persons as well reduce the risk of damage, malfunction or inefficient operation of the laser device.

The instructions for use consist of more the one document. Each document has been prepared for a specific target group and will be made available to this group of persons by Coherent, their authorized representative or the laser unit manufacturer (system integrator).

The COMPex*Pro* instructions for use consists of the following separate documents:

– User Manual

– Site Preparation Manual.

– Interfacing Manual

– Service Manual

Installation, de-installation, servicing and detailed troubleshooting shall only be performed by correspondingly trained and instructed service personnel. Consequently, the target group for the Service Manual is strictly limited to skilled personnel that have successfully completed a dedicated Coherent advanced training course for COMPex*Pro* excimer laser devices.

The COMPex*Pro* excimer laser device can be used as a subsystem within a laser product (laser assembly or laser unit as defined in ISO 11145). Consequently, the laser device's instructions for use are to be used in conjunction with other instruction manuals that describe the complete system or further system elements. In addition, it is to be supplemented by the respective national rules and regulations for accident prevention and environmental protection.

1.1 The Site Preparation Manual

This manual describes the required environmental conditions and external supplies for the COMPex*Pro* excimer laser device.

1.1.1 Described Laser Devices

This manual describes the laser device versions COMPex*Pro* 50, COMPex*Pro* 102, COMPex*Pro* 110, COMPex*Pro* 201 and COMPex*Pro* 205 with running serial numbers of 20000 and above[a].

1.1.2 Intended Audience

The Site Preparation manual is intended for all persons that are to prepare the installation of the COMPex*Pro* laser device and/or integrate the laser device into a laser product or laser system

1.1.3 Availability and Use

The Site Preparation Manual must be made available to all persons that have been instructed to prepare, perform or assist with the installation and de-installation of the COMPex*Pro* laser device.

1.1.4 Numbering of Chapters, Pages and Instructions

The pages of this manual are numbered continuously. The page number appears in the lower outside corner of every page.

The chapters are numbered continuously. The name of the chapter appears in the upper outside corner of every even page. Each chapter ends with an even page number. Consequently, certain even pages at the ends of chapters will be intentionally left blank.

Each step within a procedure is sequentially numbered. Each procedure starts with the step number one.

D148975_AA

a. All laser device serial numbers consist of a device type identifier (e.g. GEP.1120129) and a running number (e.g. 20010)

1.1.5 Trademarks

The trademarks used in this manual are the properties of their respective owners and are used for identification purposes only:

– Coherent and the Coherent Logo are registered trademarks of Coherent Inc., USA

– COMPexPro, LAMBDA PHYSIK and NovaTube are registered trademarks of Coherent LaserSystems GmbH & Co. KG

– Gyrolok is a registered trademark of Hoke Inc., (USA).

– SERTO is a registered trademark of Gressel AG (CH).

– SHOCKWATCH is a registered trademark of Media Recovery, Inc., TX (USA)

In the following sections of this manual, no mention is made of patents, trademark rights or other proprietary rights which may attach to certain words. The absence of such mention, however, in no way implies that the words in question are exempt from such rights.

1.1.6 Cited Standards

Unless otherwise stated, all technical standards cited in this manual relate to the latest version of the standard that is applicable at the date of the publication of this manual.

In many cases, the international standards (ISO and IEC standards) have been adopted wholly or in part by national or regional standards authorities and are known locally under the designation assigned by this authority. For instance, the IEC 60825-1 has been adopted by the European Committee for Standardization as the standard EN 60825-1 and, in turn, by various national standards authorities as standards such as DIN EN 60825 (Germany) and BS EN 60825 (United Kingdom). The exact content, number and revision date of the national standard may, however, vary from that of the corresponding international standard. For further information, please contact the publisher of the respective national standard.

1.2 Safety

1.2.1 Laser Safety Classification

IEC-60825-1, FDA 21 CFR 1040.10 and 1040.11 and ANSI Z-136.1 indicate the requirements and procedures that are to be followed to ensure the safe use of laser products. These standards and regulations classify each laser product according to the potential hazards arising in its use. In each case, the laser class indicates the accessible emission limit (AEL), i.e. the maximum emission level that humans can access.

The lowest laser class is Class I and the highest is Class 4:

– Class I laser products are laser products that are safe under reasonably foreseeable conditions of operation.

– Class 4 laser products are laser products that permit human access to emission levels that represent an acute hazard to the eyes and skin from direct and scattered radiation.

Within this classification, the COMPex*Pro*, as a stand-alone laser device, is a Class 4 laser product. It must, consequently, be regarded as a potential hazard to the human operator. The laser beam must also be regarded as a potential fire hazard.

When a Class 4 laser device is integrated in a laser product that has been designed and engineered to prevent human access to laser emission exceeding Class 1 levels during normal operation, the laser product can be classified as a Class 1 laser product. Such a Class 1 laser product must have a protective housing and safety interlocks on all removable housing access panels. Laser operation shall only be possible when all access panels are in place and human access to hazardous levels of laser radiation (including scattered laser radiation) is prevented.

Wherever technically feasible, the product or system into which the laser device is integrated should be designed and engineered as a Class 1 laser product. Nevertheless, the high power laser device incorporated in such a laser product remains a Class 4 laser product. If access panels are removed and safety interlocks defeated (e.g. to perform servicing, adjustment or alignment work), there is the risk of exposure to Class 4 laser radiation.

The laser safety classification of the laser product into which the COMPex*Pro* is integrated is to be indicated by the laser product manufacturer (system integrator). For further information, please refer to the system integrator's documentation.

To assist with the alignment of the beam path, a laser product may be equipped with a Class 2 or Class 3R (IEC 60825-1) pilot or alignment laser. Such lasers are low power products (max. 5 mW for Class 3R) that emit laser radiation in the visible wavelength range from 400 nm to 700 nm, where the risk of eye injury remains low due to the blink reflex.

1.2.2 Safety Information

The Safety Chapter of the separate User Manual describes the physical hazards related to the excimer laser device, the means of protection against these hazards and the safety features incorporated in the design of the laser device.

The safety chapter in the User Manual must be read by all persons entrusted with any sort of work on the laser device. Never start to follow the procedures detailed in this manual unless you have read and fully understood the information in the Safety Chapter.

1.2.3 Signal Words and Symbols in this Manual

The COMPex*Pro* documentation may contain sections in which particular hazards are defined or special attention is drawn to particular conditions. These sections are indicated with signal words in accordance with ANSI Z-535.6 and safety symbols (pictorial hazard alerts) in accordance with ANSI Z-535.3 and ISO 7010.

1.2.3.1 Signal Words

Four signal words are used in the COMPex*Pro* documentation: DANGER, WARNING, CAUTION and NOTE.

The signal words DANGER**,** WARNING and CAUTION designate the degree or level of hazard:

DANGER
Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

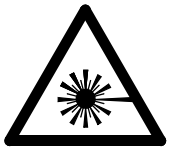
The signal word “NOTICE” is used when there is the risk of property damage:

NOTICE
Addresses practices not related to personal injury.

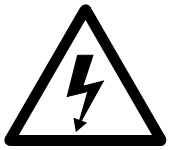
Messages relating to hazards that could result in both personal injury and property damage are considered safety messages and not property damage messages.

1.2.3.2 Symbols

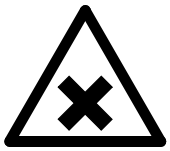
The signal words **DANGER**, **WARNING**, and **CAUTION** are always emphasized with a safety symbol that indicates a special hazard, regardless of the hazard level:



This symbol is combined with one of the signal words **DANGER**, **WARNING** or **CAUTION** to indicate a hazardous situation caused by laser radiation.



This symbol is combined with one of the signal words **DANGER**, **WARNING** or **CAUTION** to indicate a hazardous situation caused by electricity.



This symbol is combined with one of the signal words **DANGER**, **WARNING** or **CAUTION** to indicate a hazardous situation caused by harmful substances.

This symbol is combined with one of the signal words **DANGER**, **WARNING** or **CAUTION** to indicate a hazardous situation caused by general circumstances.

1.3 Terminology

1.3.1 Laser Terminology

The ISO 11145 (“Optics and Optical Instruments - Lasers and Laser Related Equipment - Vocabulary and Symbols”) contains a list of laser terminology (for more information, see the User Manual):

– Laser
  Consists of an amplifying medium capable of emitting coherent radiation with wavelengths up to 1 mm by means of stimulated emission.

– Laser Device
  A laser, where the radiation is generated, together with essential additional facilities that are necessary to operate the laser, e.g. cooling, power and gas supply.

To prevent misunderstandings, the COMPex*Pro* documentation strictly differentiates between “laser” and “laser device”. Thus “start laser device” means that the power is off and shall be turned on. To “start the laser” means to switch on the laser beam and start laser operation.

In addition to the terminology used by ISO 11145, IEC 60825-1 uses the term “laser product”. This term relates to any product or assembly of components which constitutes or is intended to incorporate a laser. In other words, the term “laser product” can be used in conjunction with any of the definitions contained in ISO 11145.

1.3.2 Designation of Sides

To prevent confusion or ambiguity, the sides of the COMPex*Pro* are designated according to their purpose or function. These designations, as used throughout this manual, are indicated in Figure 1.

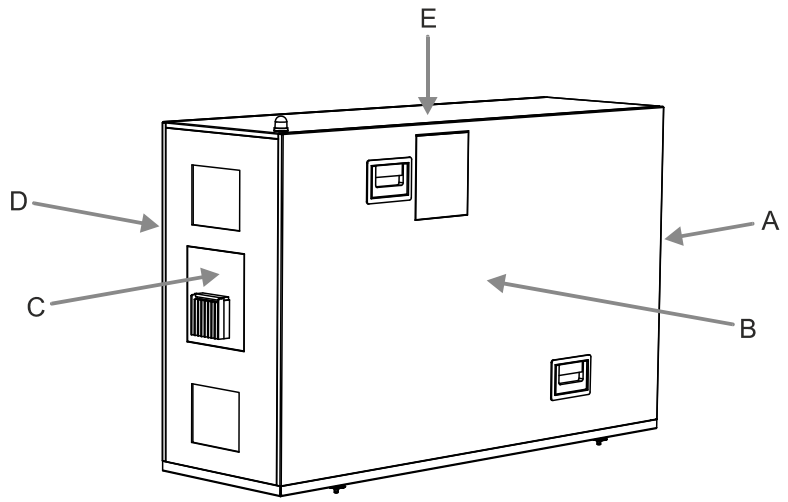


Figure 1: *Designation of the sides of the COMPexPro*

Key to Figure 1:

A Connection side
B Service side
C Beam exit side
D Rear side
E Top

1.4 Units of Measurements

In this manual, units of measurement are used according to the metric system and the international system of units (SI), e.g. meter, millimeter, square meter, cubic meter, liter, kilogram, bar, pascal.

Temperatures are primarily indicated in degrees celsius (°C).

The water hardness is indicated in parts per million (ppm; American Hardness).

D148975_AA

1.5 Feedback Regarding Documentation

If you have any comments regarding the documentation provided to you, please contact us.

When you contact us, please provide us with

– the document code

– the date of issue

– the page number, section number and, where applicable, the procedure step number

– a description of any errors

– a proposal for improvements

Feedback Address

E-mail	documentation@coherent.com
Post	Coherent LaserSystems GmbH & Co. KG Documentation Comments Hans-Böckler-Straße 12 D-37079 Göttingen Germany
Fax	+49 551 68691

2 TRANSPORT AND STORAGE

If the laser device is to be temporally stored before installation, the storage area has to meet the requirements specified in this section.

The means of packaging as well as the required procedures for unpacking, handling and internally transporting the laser device are described in detail in Chapter 7 on page 63.

NOTICE
Incorrect transportation and storage can cause serious damage! Always observe the conditions specified in this chapter when transporting or storing the laser device.

2.1 Climatic Requirements

The following climatic conditions must be maintained while transporting and during temporary storage of the laser device:

Air temperature	-20 °C to +50 °C (4 °F to 122 °F)[a]
Humidity	< 70% RH

a. Blow out all cooling water before transport and storage

The laser device can be transported by airfreight.

It is important that the units are not subjected to rapid changes in temperature or relative humidity.

2.2 Handling

The mechanical requirements of the laser device are such that the parameters specified in IEC 60721-3-1 and IEC 60721-3-2, class 2M1 (A through H), must be complied with during temporary storage as well as transportation.

2.3 Packaging

All COMPex*Pro* laser devices are delivered in a single rigid transport package, except for the COMPex*Pro* 200 series which is delivered with an additional package containing accessories. This section indicates the size and weight of the packages.

Laser device in container:

Dimensions (l × w × h)	1820 mm × 540 mm × 1030 mm (71.7 in × 21.3 in × 40.6 in)
Weight	
- 50 / 100 series	345 kg (760.6 lb)
- 200 series	395 kg (870.8 lb)

Accessories package (COMPex*Pro* 200 series):

Dimensions (l × w × h)	660 mm × 430 mm × 520 mm (26.0 in × 16.9 in × 20.5 in)
Weight	depending on configuration

The overall dimensions and weight of the unpacked laser device is indicated in Section 4.3 on page 26.

2.4 Floor Loads

NOTICE
All floors on the proposed transport route or at the proposed storage / installation location must be checked to ensure that they can withstand the weight of the laser device.

It is the responsibility of the customer to provide Coherent and/or the system integrator with:

– Accurate information regarding floor loading capabilities. This information is needed to determine the type of transportation to be used within the production facility.

– Elevator loading capacities. When elevator transport is intended, the loading capability of the elevator must be verified.

D148975_AA

2.5 Internal Transport

WARNING
Risk of crushing!
The heaviest laser device version together with its rigid transport packaging weighs approx. 395 kg (870.8 lb).
Prevent tipping or dropping during lifting and transportation.

When lifting and transporting the laser device and its components always follow all standard safety precautions and practices for the transportation and handling of heavy equipment. A suitable fork-lift truck or similar device is required to lift and transport the laser device. Ensure that the fork length and lifting capacity is sufficient to safely lift and transport the laser device in the respective packaging stage.

All passageways, corridors and access points along the transport route have to have sufficient clearances to enable the safe transportation of the laser device in the respective packaging stage. This is particularly important after the removal of the rigid transport packaging.

2.6 Temporary Storage

NOTICE
Always store the packaging containing the laser device under the conditions specified in Section 2.1. The laser device must never be stored in the open air nor in any structure that does not fully shield it from the elements.

The space allocated for temporary storage must be sufficient to store the laser device and accessories in the respective packaging. Take into account the packaging configuration (see Section 2.3 on page 12). Provision must be made to allow adequate access to remove the laser device and accessories when required.

3 SAFETY EQUIPMENT REQUIREMENTS

This chapter provides an overview of the safety equipment that is required to operate the laser device. This consists of personal protective equipment (see Section 3.1) and fixtures at the installation site (see Section 3.2).

Specifications listed in this chapter indicate maximum values required for ordering the safety equipment. They do not indicate performance values that can be typically attained under normal working conditions.

The specific hazards inherent to the laser device and the measures that are to be taken to minimize these hazards are discussed in detail in the Safety chapter of the separate User Manual.

3.1 Personal Protective Equipment

This section outlines personal protective equipment (PPE) that may be required during specific operational phases of a Class 4 excimer laser device or in case of an emergency. This includes the items listed below:

– Protective eyewear (see Section 3.1.1 on page 16)

– Skin protection (see Section 3.1.2 on page 17)

– Protective gloves (see Section 3.1.2 on page 17)

– Dust mask (see Section 3.1.3 on page 17)

– Hearing protection (see Section 3.1.4 on page 18)

The indicated subsections provide information on the basis of the hazards inherent to Class 4 excimer laser devices and commonly applied risk management procedures. Exact PPE requirements depend on local regulations and the conditions under which the laser device is operated, maintained and serviced.

3.1.1 Protective Eyewear

Laser Radiation

If work on open Class 4 laser equipment is necessary (e.g. alignment or servicing), everyone in the area of the laser shall be ordered to wear appropriate protective eyewear. The mandatory protective eyewear provides protection against direct radiation, reflected radiation and scattered radiation within the respective wavelength range.

Contact a manufacturer of protective eyewear for information about appropriate eyewear. The specifications required for ordering protective eyewear are indicated in the table below:

Laser Device	COMPex*Pro* 50	COMPex*Pro* 102	COMPex*Pro* 110	COMPex*Pro* 201	COMPex*Pro* 205
Laser class[a]	4	4	4	4	4
Temporal mode	Pulsed	Pulsed	Pulsed	Pulsed	Pulsed
Wavelength	193 nm to 351 nm	193 nm to 351 nm	193 nm to 351 nm	193 nm to 351 nm	193 nm to 351 nm
Max. repetition rate	50 Hz	20 Hz	100 Hz	10 Hz	50 Hz
Max. pulse energy	0.5 J	0.5 J	0.5 J	0.8 J	0.8 J
Max. average power	40 W	40 W	40 W	40 W	40 W
Pulse length	10 ns to 50 ns	10 ns to 50 ns	10 ns to 50 ns	10 ns to 50 ns	10 ns to 50 ns
Beam size	14 mm × 5 mm	24 mm × 10 mm	24 mm × 10 mm	24 mm × 10 mm	24 mm × 10 mm
Beam divergence	2 mrad × 1 mrad	3 mrad × 1 mrad	3 mrad × 1 mrad	3 mrad × 1 mrad	3 mrad × 1 mrad

a. according to IEC 60825-1

The laser protective eyewear shall be clearly labeled (e.g. with the optical density and wavelength) to ensure the proper choice of eyewear with a particular laser. To avoid confusion, keep laser protective eyewear separate from other safety glasses and other personal protective equipment. ANSI Z136-1 suggests color coding or some other form of distinctive identification of laser protective eyewear for situations when rapid eyewear identification is required.

Halogen Gases

Gas suppliers also usually specify that suitable safety glasses should be worn when handling equipment containing halogen gases. Such safety glasses are to be made of chemical resistant materials that are suitable for impact or particle hazards. For further information consult the halogen gas supplier's Material Safety Data Sheet (MSDS).

D148975_AA

3.1.2 Skin Protection / Protective Clothing

Laser Radiation

Although the skin can withstand a considerably higher radiation intensity than the eyes, tissue may be burned to a greater or lesser degree, depending on the radiation time and the irradiation intensity.

ANSI Z136-1 stipulates that when using excimer lasers operating in the ultraviolet range, the use of skin cover shall be employed if chronic (repeated) exposures are anticipated at exposure levels at or near the applicable maximum permissible exposure limit for the skin.

If there is the risk of harmful skin exposure, cover the skin e.g. by wearing suitable protective clothing and/or use “sun screen” creams. Most gloves will provide some protection against laser radiation. Tightly woven fabrics and opaque gloves provide the best protection. A laboratory jacket or coat can provide protection for the arms.

When choosing protective clothing, take into account that Class 4 lasers present a potential fire hazard. Protective clothing should, therefore, be made from materials that will not be ignited by the laser radiation.

Halogen Gases

Protective gloves are also required when exchanging the halogen filter or working on or with other equipment containing halogen gas. The type of gloves to be worn depends on the exact work to be performed and the gas mixture being used. Consult the appropriate Material Safety Data Sheet (MSDS) for more information. This MSDS will also specify any other protective clothing (e.g. chemical resistant aprons or suits) that should be worn when handling equipment containing halogen gas mixtures.

3.1.3 Dust Mask

The halogen filter in the laser device’s vacuum line contains impregnated activated carbon. When the halogen filter is used or handled correctly, there is no risk of hazardous dust being released. In the unlikely event of dusts being released, a dust mask with a suitable filter should be worn.

For further information, consult the institute responsible for occupational safety and health at the installation location (for example, NIOSH, National Institute for Occupational Safety and Health, in the USA).

3.1.4 Hearing Protection

Individual hearing protectors (e.g. ear defenders) should be worn when performing servicing work that requires operation of the laser device with an open housing. Make sure that individual hearing protectors are available for all persons that are working in the area of the open laser device. The type of hearing protection to be chosen depends on the operating environment and local regulations.

Depending on the overall noise level in the area of the laser device, further protective measures may be necessary. For further information consult the applicable occupational noise exposure regulations and directives.

3.2 Plant Requirements

This section describes the measures that are required to safely install and integrate the COMPex*Pro* into its working environment. It is the responsibility of the final user to ensure implementation according to local regulations and within the context of a risk management plan.

3.2.1 Beam Shielding

The entire beam path including the target area must be hermetically sealed by a suitable enclosure (see Section 1.2.1 on page 4). Threaded holes are provided at the beam exit aperture to enable mechanical attachment of the enclosure (see Section 5.5.1 on page 50). Use fastening elements that require tooling to facilitate their removal. Any removable elements of the enclosure, such as access panels, shall be equipped with interlocks that prevent operation of the laser system unless the respective element is properly secured.

3.2.2 Hardwired Interlock Circuit

The laser device has a provision for the connection of hardwired interlock signals (see Section 5.6.1 on page 53). Depending on locally applicable safety regulations and operator demands, the system integrator shall connect external detection devices and/or switches to the corresponding connections.

The EMS circuit within the laser device fulfills the requirements of performance level d according to ISO 13849-1. The external EMS circuit that is to be provided and connected by the user has to fulfill the requirements of at least the performance level d. Cables for the external EMS circuit should have an adequate wire cross section and be laid so that they are protected. The switches that are used shall not reduce the performance level of the overall circuit.

The external interlock circuit should be configured so that the SELV (separated extra low voltage) requirements regarding separation from circuits that carry dangerous voltages are complied with.

For further information about the interfacing of the laser device, please refer to the separate Interfacing Manual.

3.2.3 Laser Area Warning Signs

Make sure that the laser radiation warning lamp and warning labels on the laser device are clearly visible.

Appropriate warning signs according to locally applicable standards (e.g. IEC 60825-1) are required to indicate the boundaries of the laser enclosed area.

The customer is responsible for providing an external laser radiation indicator (e.g. warning lamp). This indicator has to be connected to the corresponding remote connector outputs (see Section 5.6.1 on page 53).

3.2.4 Fire Extinguisher

Always keep a fire extinguisher or provide an equivalent fire fighting system in the area of the laser device. The fire extinguisher or fire fighting system should be suitable for fighting “shock risk” classes of fire and be chosen according to local fire safety regulations. For further information, consult the fire safety officer that is responsible for the installation site.

3.2.5 Air Extraction System

To remain below the general industry permissible exposure limit for halogen gas even in a worst-case situation, the laser device exhaust has to be connected to a suitable air extraction system. Make sure that the exhaust is not connected to a system used to process breathing air (e.g. air conditioning or ventilating systems). Never operate the laser unless it is correctly connected to the air extraction system. For further information, please refer to Section 5.5 on page 49.

The fundamental design of the air extraction system (i.e. the edges, corners and transitions within the system) should ensure that no unnecessary air flow noises can occur.

Even when the laser device is switched off, preventative measures are necessary to ensure that no halogen gas escapes from the area of the laser device into the surrounding environment in a worst-case situation. To ensure that the specified exhaust flow rate is present at all times, a suitable monitoring system is required for the external exhaust system. The final user is responsible for the provision and installation of a suitable external exhaust monitoring system as well as providing the specified ventilation. In addition, the external exhaust system should also contain a smoke detector. We also recommend the inclusion of a halogen sensor.

Should an insufficient exhaust flow rate, smoke or excess halogen levels be detected, the complete system, including the laser device, has to be immediately switched to a safe state through a mechanism provided by the customer. This safety shutdown system has to be connected to the laser device through the corresponding two channel inputs of the Remote connector (see Section 5.6.1 on page 53). An appropriate signal indicating the cause of the safety shutdown can also be sent through the Remote connector.

The system integrator / system operator should carry out their own risk analysis of the air extraction system together with the required monitoring and safety shutdown devices. The design, implementation and operation of the air extraction system falls within the responsibility of the system operator.

3.2.6 Halogen Exposure Monitor

The design of the laser device is such that apart from the measures described in Section 3.2.5 no additional halogen exposure controls or protective devices are required for the laser device under normal operating and maintenance and servicing conditions.

Nevertheless, the instructions provided by halogen gas suppliers as well as generally applicable occupational safety and health regulations normally stipulate the use of additional exposure controls and personal protective equipment at sites where halogen gases are in use. Such instructions and regulations outline, for instance, requirements and procedures in case of an accidental release of a halogen gas mixture or when handling gas cylinders.

It is the responsibility of the final user of the laser device to incorporate the recommendations and instructions provided by the halogen gas supplier as well as locally applicable directives and regulations into the appropriate work instructions and risk management plan. For further information, consult the institute responsible for occupational safety and health at the installation location (for example, NIOSH, National Institute for Occupational Safety and Health, in the USA) and the gas supplier.

D148975_AA

3.2.7 Gas Supply Line Pressure and Flow Restrictors

The end user is responsible for the safe and correct installation of the external gas supply and handling system. The line pressure at the laser device's gas inlet connections shall never exceed 7 bar (abs.). In addition, the gas flow in each line shall also not exceed the specified upper limit of the flow rate range (see Section 5.2 on page 38). The end user, therefore, has to provide suitable control devices and fail-safe means of pressure and flow limitation to ensure that there is no risk of excess pressure or flow at the respective gas inlet connections.

3.2.8 Seismic Protection

If the laser device is to be installed in an area that is susceptible to seismic activity, appropriate protective devices have to be fitted (see Section 4.2.3 on page 25).

4 FACILITY REQUIREMENTS

This chapter provides the information required to select and prepare a suitable installation location and support surface for the laser device.

4.1 Operating Environment

4.1.1 Required Environmental Conditions

It is essential that the site chosen for the installation of the laser device meets the specified environmental conditions.

Air temperature	15 °C to 25 °C
Temperature change	2 °C / hour
Humidity	30% RH to 70% RH
Pressure change	< 10 mbar / hour
Altitude above sea level	< 2000 m
Pollution	class 9 or better (according to ISO 14644-1)
Recommended illumination[a]	more than 500 lx
Housing IP classification[b]	IP20

a. for operation with optional handheld keypad; according to DIN 5035, part 2 for precise machining
b. If the housing IP classification is not sufficient for the selected operating environment, an additional housing or filter system may be provided. In this case, ensure that adherence to the other operating requirements indicated in this section will not be affected.

4.1.2 Electro-Magnetic Compatibility

The laser device complies with the following standards regarding Electro-Magnetic Compatibility (EMC):

– IEC 61010-1 (Safety requirements for electrical equipment for measurement, control, and laboratory use)

– EN 61000-6-3 (Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments)

– EN 61000-6-2 (Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments)

4.2 Support Surface / Floor

4.2.1 Static Load

The locating surface must be capable of sustaining the weight of the fully configured laser device as indicated in Section 4.3. The weight of the laser device is borne by four feet (see Section 4.6.2 on page 32).

4.2.2 Surface Area

The floor surface area and height requirements for the installation of the laser device are indicated in Section 4.4 on page 28.

4.2.3 Seismic Protection

For installations in areas that are susceptible to seismic activity, the end user is responsible for appropriately securing the laser device within their facility. Alternatively, the system integrator is responsible if the laser device is to be installed as part of a system.

For the exact configuration of the protective devices, always follow local regulatory requirements and take into account the center of mass of the laser device (see Section 4.5 on page 30) and site vulnerability of the facility or plant (e.g. soil conditions and total system design). Provision is to be made for the following:

– anchors that prevent movement or overturning of the laser device during a seismic event.

– suitable strain relief devices for all supply lines. These are to control the risks through leakage or escape of gases, liquids and electricity etc. during a seismic event.

To allow seismic protection anchoring devices to be attached to the frame of the laser device, four through holes are provided at the bottom of the laser device (see Section 4.6.3 on page 34).

4.3 Physical Dimensions and Weight

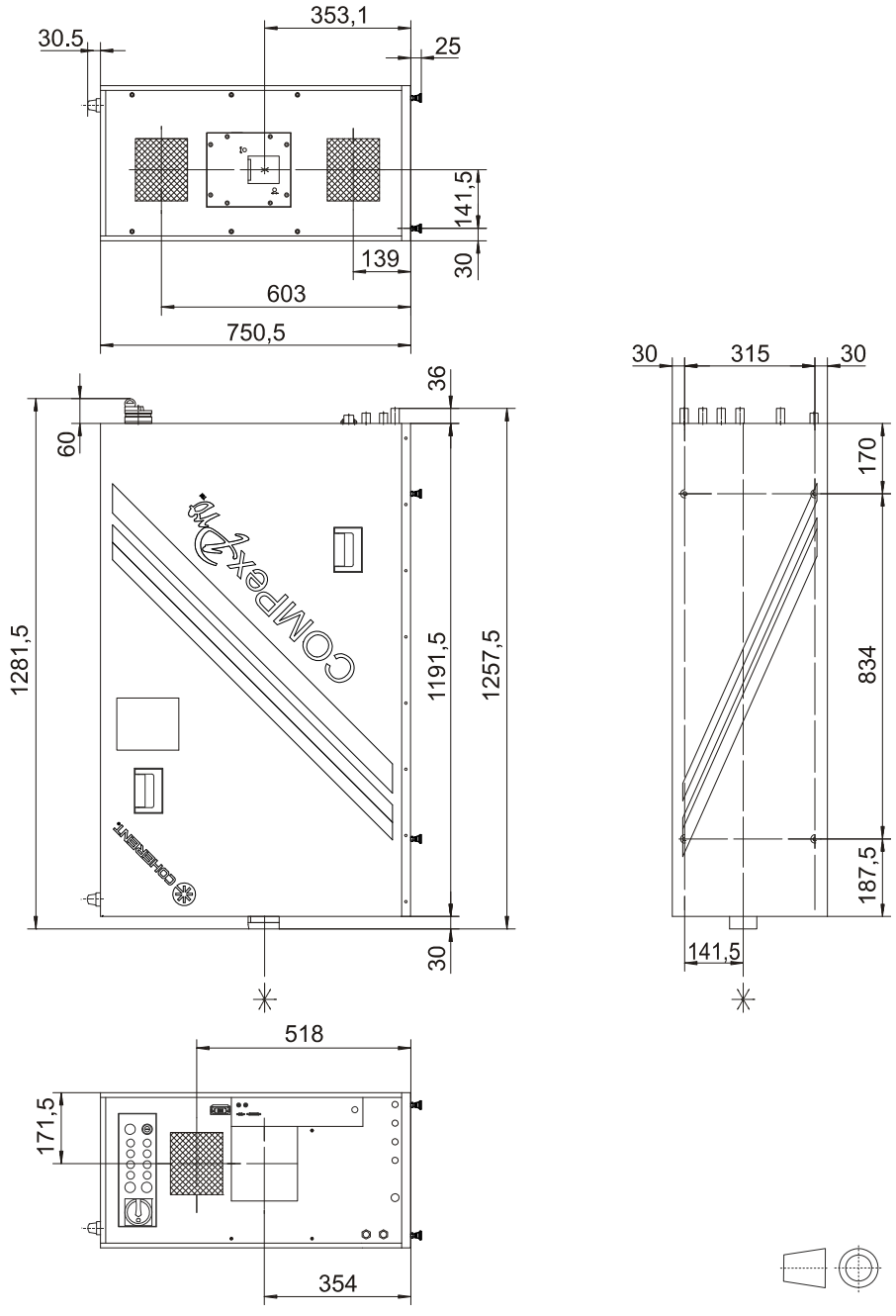


Figure 2: *Dimensions: COMPexPro 50 / COMPexPro 100*

Overall dimensions of laser device (l × w × h)	1282 mm × 375 mm × 793 mm (50.5 in × 14.8 in × 31.2 in)
Overall weight	270 kg (594 lbs)

D148975_AA

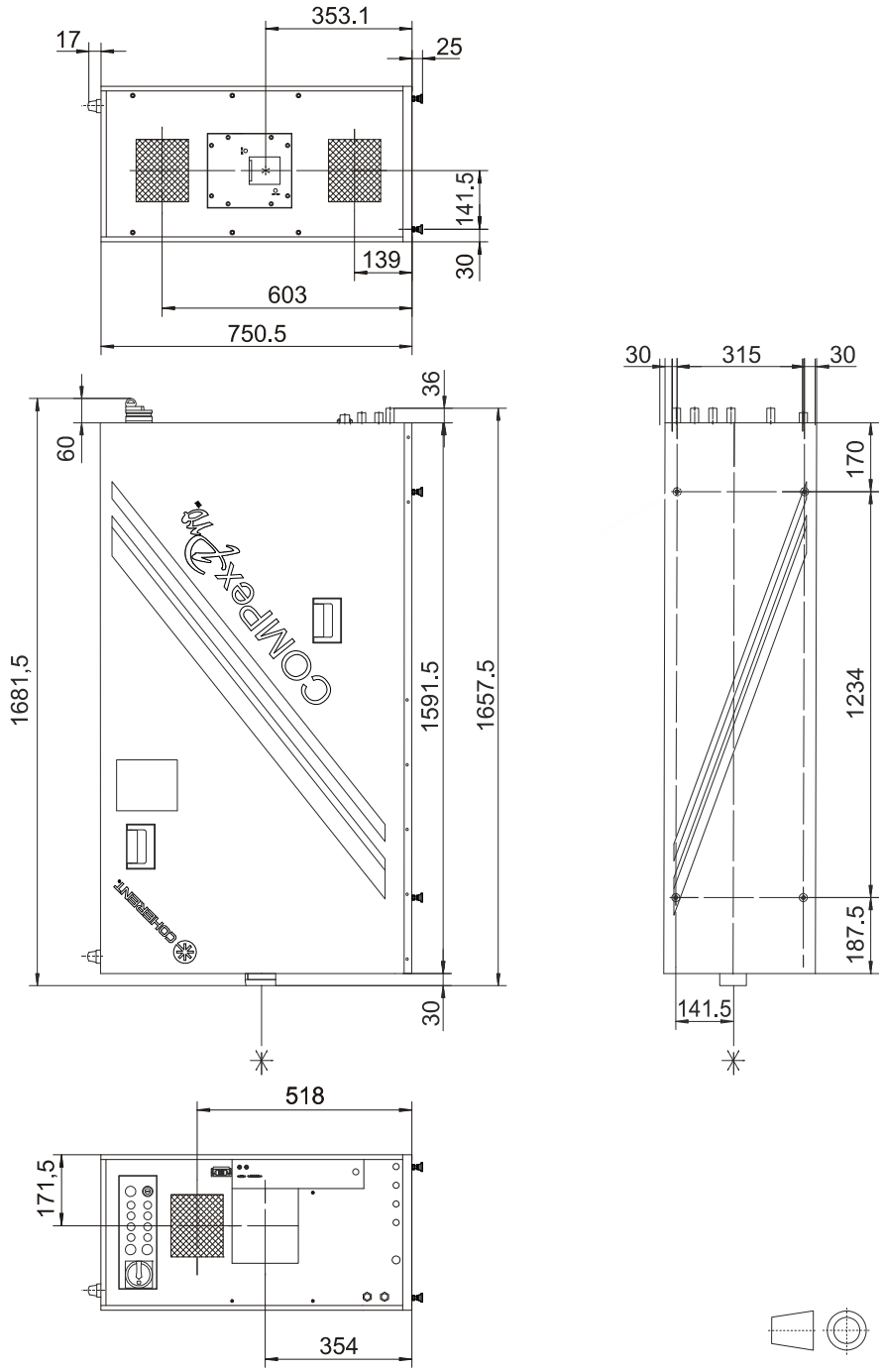


Figure 3: *Dimensions: COMPexPro 200*

Overall dimensions of laser device (l × w × h)	1682 mm × 375 mm × 793 mm (66.2 in × 14.8 in × 31.2 in)
Overall weight	325 kg (715 lbs)

D148975_AA

4.4 Space Requirements

The laser device must be located in sufficient space to allow the maintenance covers to be removed and installation and maintenance work to be performed.

Maintenance Area, 50 and 100 Series

The total floor area required for the installation of the COMPex*Pro* 50 or COMPex*Pro* 100 Series is 2500 mm × 1400 mm (98.5 in × 55.1 in). The plan of this area, which is designated the maintenance area, is indicated in detail in Figure 4.

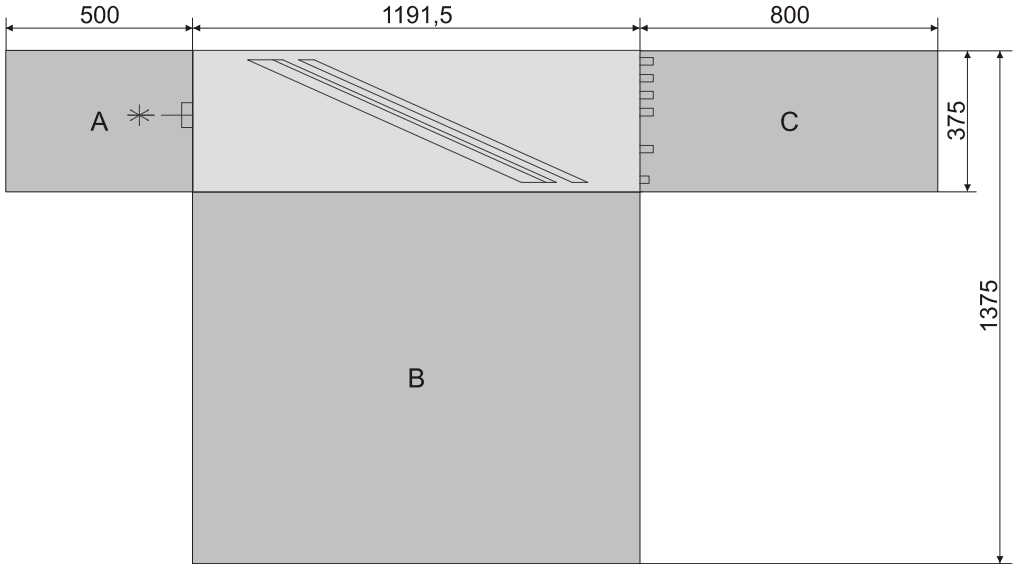


Figure 4: *Maintenance area: COMPexPro 50 / COMPexPro 100*

Position in Figure 4	Maintenance area	Dimensions B x T [mm]	Area [m^2]
	Device footprint	1191.5 x 375	0,45
A	Beam exit side	500 x 375	0,19
B	Service area	1191.5 x 1000	1,19
C	Connection side	800 x 375	0,30

D148975_AA

Maintenance Area, 200 Series

The total floor area required for the installation of the COMPex*Pro* 200 Series is 3000 mm × 1400 mm (118.1 in × 55.1 in). The plan of this area, which is designated the maintenance area, is indicated in detail in Figure 5.

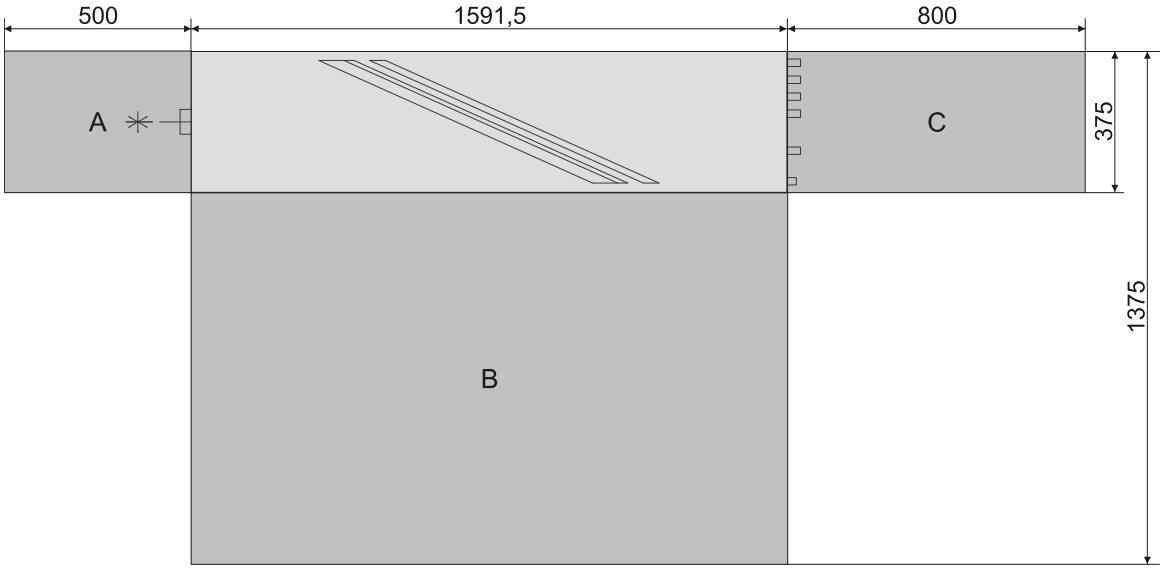


Figure 5: *Maintenance area: COMPexPro 200*

Position in Figure 4	Maintenance area	Dimensions B x T [mm]	Area [m^2]
	Device footprint	1591.5 x 375	0,60
A	Beam exit side	500 x 375	0,19
B	Service area	1591.5 x 1000	1,59
C	Connection side	800 x 375	0,30

Maintenance Height, All Models

All COMPex*Pro* laser devices require a maintenance height (height above base) of 1350 mm (53,2 in). When determining the necessary room height, take into account the required position of the main switch (see Section 4.6.3 on page 34).

D148975_AA

4.5 Center of Mass

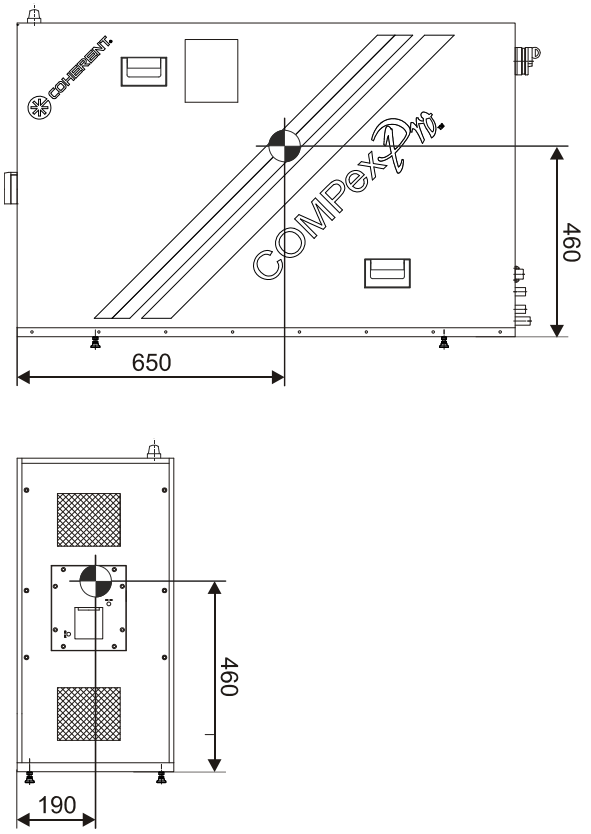


Figure 6: *Position of center of mass: COMPexPro 50 / COMPexPro 100*

D148975_AA

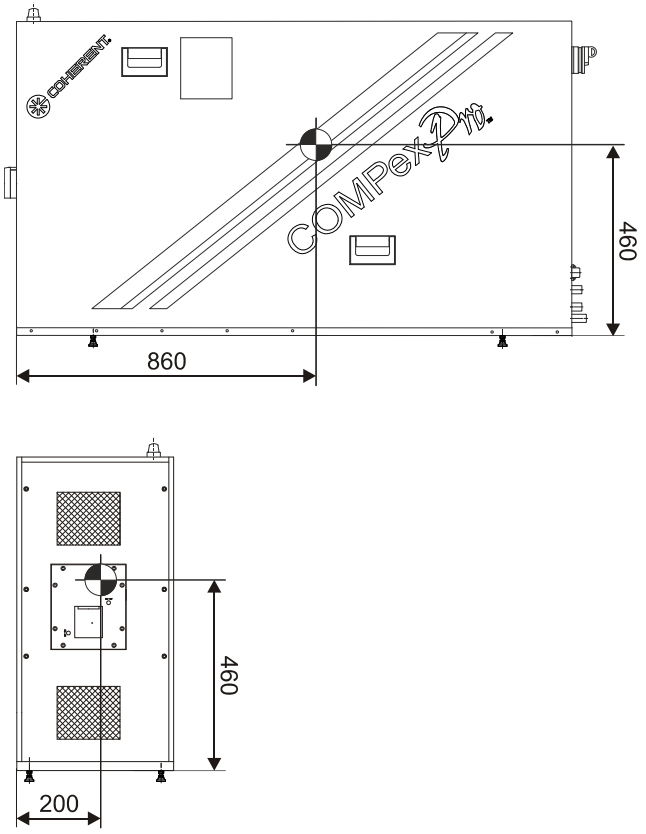


Figure 7: *Position of center of mass: COMPexPro 200*

4.6 Mechanical Interface

4.6.1 Beam Exit Position

The COMPex*Pro* is equipped with four height-adjustable feet (see Section 4.6.2). These enable the beam exit position to be vertically adjusted from 378 mm to 418 mm (14.9 in to 16.4 in) above the base (locating surface) of the laser device.

The exact position of the beam exit aperture is shown in Figure 8 (A).

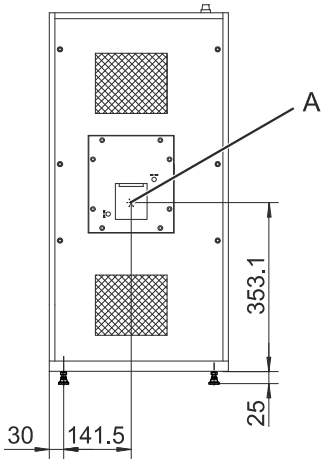


Figure 8: *Beam exit position*

The shutter plate at the beam exit position enables attachment of a beam delivery system (see Section 5.5.1 on page 50).

4.6.2 Foot Configuration

The laser device is equipped with four height-adjustable feet. The positions of the feet in relation to the footprint of the laser device and beam axis are shown in Figures 9 and 10.

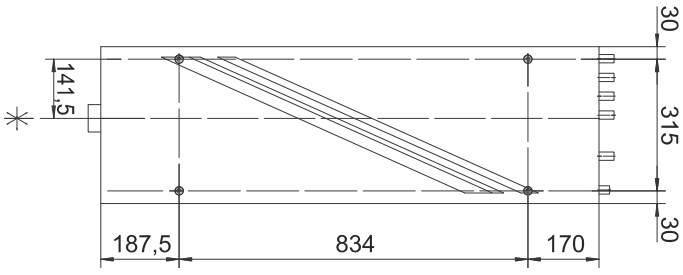


Figure 9: *Positions of feet (50 and 100 Series)*

D148975_AA

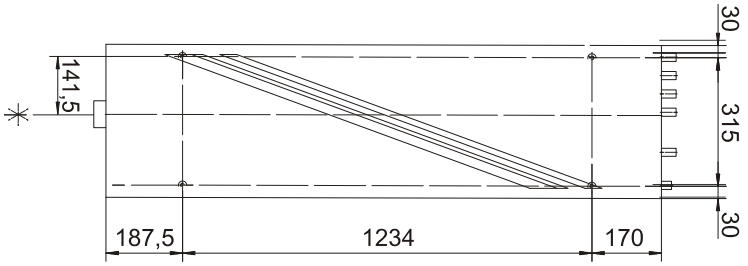


Figure 10: *Positions of feet (200 Series)*

The configuration of each of the feet is shown in Figure 11.

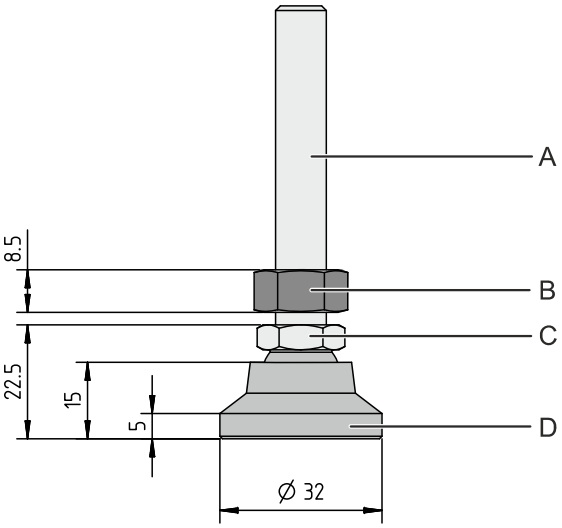


Figure 11: *Foot configuration*

Key to Figure 11:

A	Threaded rod	C	Adjustment nut
B	Counter nut	D	Foot

To compensate for permissible variations in the flatness of the floor, the four feet are height-adjustable within an adjustment range of 35 mm. Taking into account the minimum foot height of 31 mm, this means that the foot height adjustment range is from 31 mm to 66 mm (1.2 in to 2.6 in).

Each foot has a diameter of 32 mm. The shank of the foot has a size M10 thread.

4.6.3 Main Switch Position

According to EN 60204-1, the main switch has to be positioned between 0.6 m and 1.9 m above the level of the floor on which the operator is to stand (see Figure 12). Where possible, this distance is not to exceed 1.7 m.

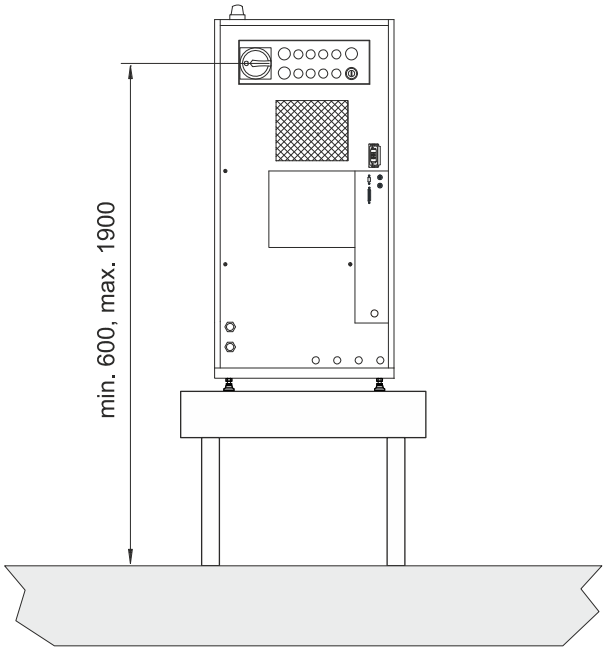


Figure 12: *Required main switch position*

The required position of the main switch is to be taken into account when choosing or configuring the supporting table or base for the COMPex*Pro*.

4.6.4 Anchoring Points

To allow anchoring devices to be attached to the frame of the laser device, four through 20 mm holes with M10 internal threads are provided at the bottom of the laser device. The maximum length that the screws can be turned into the threads is 15 to 20 mm.

Figure 13 indicates the positions of the holes (A) in relation to the beam exit position, sides of the housing and laser device feet (B). For further information about the location and configuration of the feet, please refer to Section 4.6.2.

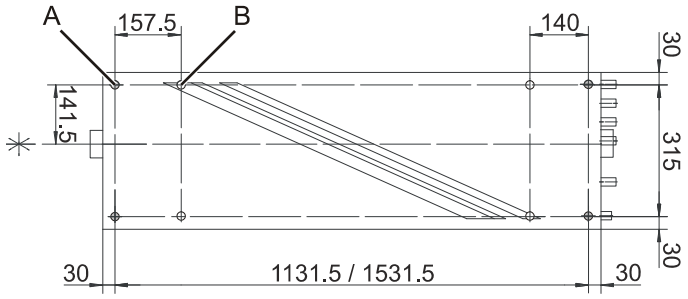


Figure 13: *Position of anchoring device location holes*

5 UTILITIES / CONNECTIONS

This chapter describes the utilities and connections that are required for the laser device at the installation site.

5.1 Overview

All external systems and devices are connected to one side of the COMPex*Pro*. This side is consequently referred to as the connection side (see Section 1.3.2 on page 8)

Regardless of the version, all COMPex*Pro* laser devices are equipped with the connections shown in Figure 14. Further information about these connections and the required utilities is contained in the indicated sections of this chapter.

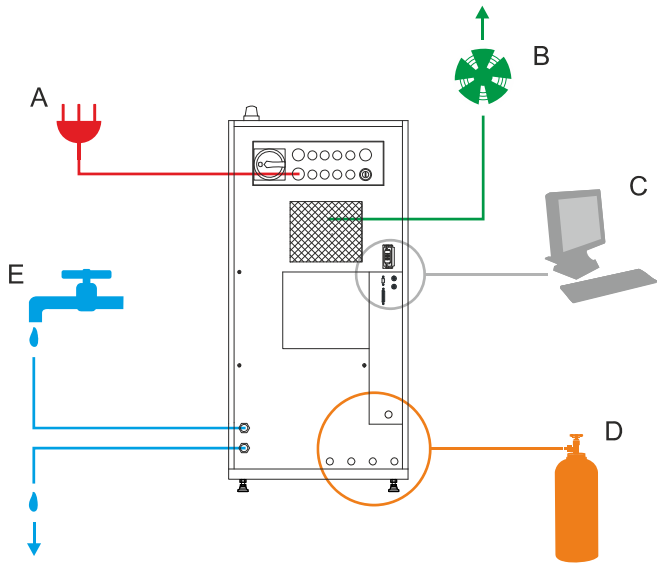


Figure 14: *Overview of connections*

Key to Figure 14:

A Electricity (see Section 5.3)
B Exhaust (see Section 5.5)
C Control and signal lines (see Section 5.6)
D Gases (see Section 5.2)
E Cooling water (see Section 5.4)

The exact connection and utility requirements depends on the version of the COMPex*Pro* and the wavelength it is to be operated at.

The available versions of the COMPex*Pro* together with their respective output wavelengths and maximum repetition rates are indicated in the table below:

COMPex*Pro* Version		Wavelength				Max. Repetition Rate
Type	Variant	193 nm	248 nm	308 nm	351 nm	
50	F	♦	♦	–	–	50 Hz
102	F	♦	♦	–	♦	20 Hz
	XeCl	–	–	♦	–	
110	F	♦	♦	–	♦	100 Hz
	XeCl	–	–	♦	–	
201	F	♦	♦	–	♦	10 Hz
	XeCl	–	–	♦	–	
205	F	♦	♦	–	♦	50 Hz
	XeCl	–	–	♦	–	

5.2 Gases

NOTICE
A) If the remaining gas cylinder pressure drops below a critical value, the humidity in the gas may significantly increase. Only use gas cylinders with a remaining pressure of more than 20% of the initial value.
B) COHERENT recommends using premix / halogen gas cylinders for max. one year and all other gas cylinders for max. two years.

The active medium in an excimer laser is a mixture of a rare gas, a halogen gas and a buffer gas. The required gas mixture depends on the type of laser and wavelength at which the laser is to be operated.

Two fundamental versions of each laser type are available:

– The F-version operates with a fluorine gas mixture at a wavelength of 193 nm, 248 nm or 351 nm[a]. The required gas mixture is supplied from a single premix gas cylinder.

– The XeCl-version operates at a wavelength of 308 nm. XeCl-lasers can either be supplied with a premix gas mixture or with the constituent excimer laser gases from separate gas cylinders.

The required version has to be indicated when the laser device is ordered. Fluorine gas mixtures cannot be used with the XeCl-version and XeCl cannot be used with the fluorine version.

a. Except for COMPex*Pro* 50 (see table in Section 5.1)

D148975_AA

Ensure that the appropriate excimer laser gas mixture is available for the wavelength that the laser is to be operated at.

In addition to the excimer laser gas mixture, Helium (He) is required to purge and fill the laser tube and gas lines when certain maintenance actions are being carried out.

Nitrogen (N2) is required to purge the beam path and optics when operating the laser device at 193 nm. At other wavelengths, the use of purge gas minimizes contamination and increases optics lifetimes.

As the quality of the gas is critical to ensure correct performance of the laser, only use gases corresponding with the specifications indicated in this section.

This section is subdivided as follows:

– Section 5.2.1 specifies the various premix gas mixtures.
– Section 5.2.2 (see page 40) specifies the inert gas.
– Section 5.2.3 (see page 41) specifies the single gases that can be used to supply 308 nm laser devices.
– Section 5.2.4 (see page 42) specifies the purge gas required for laser operation at 193 nm.
– Section 5.2.5 (see page 42) indicates the responsibility for the provision of a suitable external gas supply system.
– Section 5.2.6 (see page 43) describes the gas connections and supply lines.

5.2.1 Premix Gas

All F-version lasers (193 nm, 248 nm or 351 nm) have to be supplied with a premix gas mixture. XeCl-version lasers (308 nm) can be operated with a premix gas mixture.

This section provides an overview of the proportion of each of the constituent gases in the respective premix gas mixture. In each case, select the required premix gas according to the COMPex*Pro* version and wavelength that it is to be operated at.

Gas mixture	see corresponding table
Purity	Excimer grade
Inlet pressure range	4.4 bar (abs) to 5.2 bar (abs)
Flow rate range	0.05 l/s to 0.5 l/s

COMPex*Pro* 50

193 nm (ArF)	248 nm (KrF)
0.13% F2 2.41% He[a] 4.51% Ar 92.64% Ne	0.13% F2 2.44% He[a] 3.42% Kr 94.01% Ne

a. He portion can be omitted and replaced by Ne

COMPex*Pro* 102 / COMPex*Pro* 110

193 nm (ArF)	248 nm (KrF)	308 nm (XeCl)	351 nm (XeF)
0.17% F2 5.33% Ar 16.50% He 78.00% Ne	0.12% F2 2.30% He[a] 3.03% Kr 94.55% Ne	0.13% HCl 0.03% H2 2.34% He[a] 1.88% Xe 95.62% Ne	0.18% F2 3.45% He[a] 0.46% Xe 95.91% Ne

a. He portion can be omitted and replaced by Ne

COMPex*Pro* 201 / COMPex*Pro* 205

193 nm (ArF)	248 nm (KrF)	308 nm (XeCl)	351 nm (XeF)
0.16% F2 2.97% He[a] 6.25% Ar 90.62% Ne	0.09% F2 1.68% He[a] 3.82% Kr 94.41% Ne	0.08% HCl 0.02% H2 1.56% He[a] 2.78% Xe 95.56% Ne	0.19% F2 12.83% He 0.45% Xe 86.53% Ne

a. He portion can be omitted and replaced by Ne

In addition to the premix gas line, an inert gas line is also required (see Section 5.2.2). A purge gas line is necessary when operating the laser at 193 nm. (see Section 5.2.4).

5.2.2 Inert Gas

All COMPex*Pro* laser devices have to be supplied with an inert gas. This is required to purge and fill the laser tube and gas lines when carrying out certain maintenance actions.

Type of gas	He
Purity	99.995%
Inlet pressure range	4.4 bar (abs) to 5.2 bar (abs)
Flow rate range	0.8 l/s to 3.0 l/s

5.2.3 Single Gases (308 nm Only)

XeCl-version lasers that operate at 308 nm can be supplied with either a premix gas mixture (see Section 5.2.1) or with single gases. In case of single gas supply, each of the constituent gases will be supplied through a dedicated supply line. The necessary quantity of each gas will automatically be taken from the appropriate gas cylinder during the automated gas filling procedure, The gases are mixed inside the laser tube. No additional external equipment is required to proportion or mix the gases ready for use.

The gas supply mode for XeCl-version lasers can be changed from single gases to premix and vice-versa through a password protected switching command.

Halogen

Hydrogen Chloride (HCl, H_2 in He)

Type of gas	4.5% HCl and 0.9% H2 in He
Purity	99.995%
Inlet pressure range	4.4 bar (abs) to 5.2 bar (abs)
Flow rate range	0.05 l/s to 0.5 l/s

Rare

Xenon (Xe)

Type of gas	Xe
Purity	99.999%
Inlet pressure range	4.4 bar (abs) to 5.2 bar (abs)
Flow rate range	0.05 l/s to 0.5 l/s

Inert

Helium (He)

Type of gas	He
Purity	99.995%
Inlet pressure range	4.4 bar (abs) to 5.2 bar (abs)
Flow rate range	0.8 l/s to 3.0 l/s

Buffer

Neon (Ne)

Type of gas	Ne
Purity	99.995%
Inlet pressure range	4.4 bar (abs) to 5.2 bar (abs)
Flow rate range	0.8 l/s to 3.0 l/s

5.2.4 Purge Gas

NOTICE
Risk of serious damage to the laser tube!
Nitrogen is only intended for purging the beam path and optics.
Never fill nitrogen into the laser tube or excimer laser gas supply lines.

Nitrogen (N2) is required to purge the beam path and optics when operating the laser device at 193 nm. This prevents the formation of ozone and ensures that the specified performance levels are attained. At other wavelengths, the use of purge gas minimizes contamination and increases optics lifetimes.

Type of gas	N2
Purity	99.999%
Flow rate range	8 l/min to 12 l/min

5.2.5 External Gas Supply System

The final user is responsible for providing an external gas installation that fulfils local gas safety regulations and the requirements of the locally applicable risk management plan. For further information, consult the gas supplier and the institute responsible for occupational safety and health at the installation location (for example, NIOSH, National Institute for Occupational Safety and Health, in the USA).

In addition to the safety aspects, the external gas system has to be configured to ensure that the required gas specifications exist at the respective laser device inlet valves. Section 6 on page 57 provides additional information about the preparation and safe operation the external gas supply system.

5.2.6 Gas Connections

The positions of the individual gas connections on the laser device are shown in Figure 15. The designation depends on the laser device version (F or XeCl).

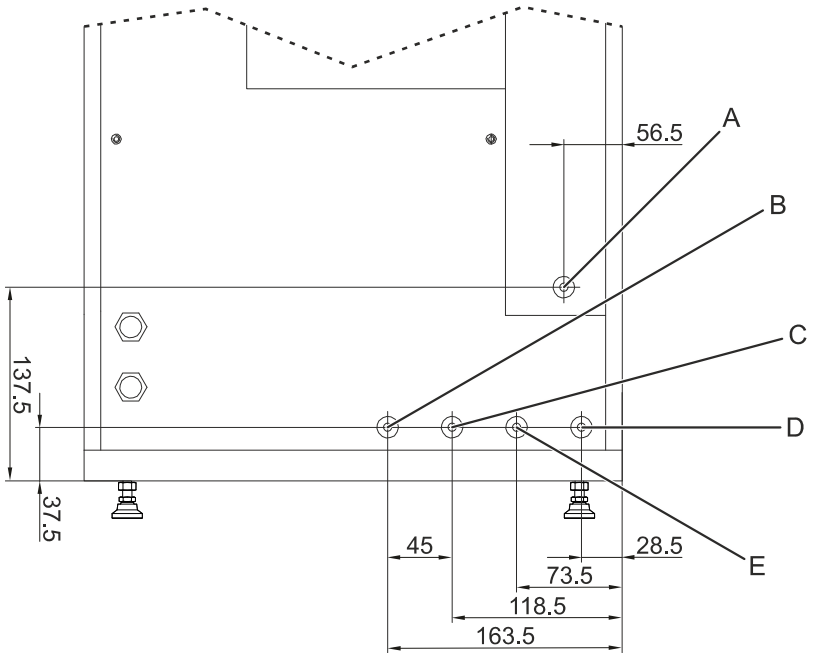


Figure 15: *Positions of gas connections*

Key to Figure 15:

	Premix gas operation	**Single gas operation (XeCl)**
A	Purge	Purge
B	Inert	Inert
C	Premix	Halogen
D	Not used	Buffer
E	Not used	Rare

For safety reasons, the premix / halogen supply line from an external gas cylinder should have a double wall tubing.

Specifications:

Gas connections	6 mm Gyrolok (male thread on laser device)
Gas lines	316 L stainless steel, electropolished inside, 6 mm outer diameter, degreased

Each gas line requires an overpressure restriction device that limits the line pressure at the connection to the laser device to 7 bar (abs.) in case of failure.

It is the responsibility of the customer to provide suitable control devices and fail-safe means of pressure and flow limitation to ensure that there is no risk of excess pressure or flow at the respective gas inlet connections. In addition, each gas supply line shall contain a suitable dedicated mechanical shut-off valve.

Gas connections that are not used have to be sealed off with the stainless steel caps that are supplied with the laser device.

5.3 Electricity

NOTICE
A) To prevent serious mains supply line damage, the mains supply line must be installed with strain-relief in a cable channel.
B) In certain areas, local regulations require a breaking capacity larger than 1.5 kA for 208 V or 230 V operation. In this case, a 16 A, characteristic C circuit breaker with a minimum breaking capacity of 10 kA has to be inserted in the mains power supply for the laser device.
C) If operation with an external transformer is necessary, make sure that the transformer is correctly connected to the mains power source. Otherwise, there is the risk of serious damage to the laser device.

The COMPex*Pro* has an internal mains transformer that enables connection to a local mains electrical supply corresponding with the following specifications:

Nominal voltage	104 VAC / 120 VAC / 208 VAC / 230 VAC
Voltage range	Nominal voltage ± 10%
Frequency	50 Hz / 60 Hz
Wires	2 + PE

The internal mains transformer is factory set according to the required local voltage and frequency.

D148975_AA

The other electrical specifications for the respective version and local voltage configuration are indicated in the following table:

Version	Voltage	Phases	Power	Full load amps	Machine OCP rating	Amp rating largest load	Short circuit current rating
50	104 VAC	1	1.5 kVA	15 A	12 A	12.5 A	10 kA
	120 VAC	1	1.5 kVA	13 A	12 A	12.5 A	10 kA
	208 VAC	2	1.5 kVA	7 A	16 A	12.5 A	1.5 kA
	230 VAC	1	1.5 kVA	6 A	16 A	12.5 A	1.5 kA
102	104 VAC	1	1.5 kVA	12 A	12 A	12.5 A	10 kA
	120 VAC	1	1.5 kVA	11 A	12 A	12.5 A	10 kA
	208 VAC	2	1.5 kVA	8 A	16 A	12.5 A	1.5 kA
	230 VAC	1	1.5 kVA	6 A	16 A	12.5 A	1.5 kA
110	104 VAC	1	3 kVA	24 A	12 A	12.5 A	10 kA
	120 VAC	1	3 kVA	22 A	12 A	12.5 A	10 kA
	208 VAC	2	3 kVA	15 A	16 A	12.5 A	1.5 kA
	230 VAC	1	3 kVA	13 A	16 A	12.5 A	1.5 kA
201	104 VAC	1	1.5 kVA	12 A	12 A	12.5 A	10 kA
	120 VAC	1	1.5 kVA	11 A	12 A	12.5 A	10 kA
	208 VAC	2	1.5 kVA	8 A	16 A	12.5 A	1.5 kA
	230 VAC	1	1.5 kVA	6 A	16 A	12.5 A	1.5 kA
205	104 VAC	1	3 kVA	24 A	12 A	12.5 A	10 kA
	120 VAC	1	3 kVA	22 A	12 A	12.5 A	10 kA
	208 VAC	2	3 kVA	15 A	16 A	12.5 A	1.5 kA
	230 VAC	1	3 kVA	13 A	16 A	12.5 A	1.5 kA

Connection to the mains power supply wall socket is provided through a 5 m long mains cable that is hard wired to the laser device. No mains plug is fitted.

The customer is responsible for obtaining and fitting a mains wall plug suitable for the applicable specifications indicated in this section. This plug shall be configured according to the locally applicable electrical standards (e.g. EN 61010-1) and be fitted by a qualified electrician.

The mains cable wiring depends on the nominal voltage indicated when ordering the laser device. Two wiring configurations are available:

Wiring for 104 V / 120 V:

Wire	Color	Type	Gauge
L	Black	S0	AWG12
N	White	S0	AWG12
PE	Green	S0	AWG12

Wiring for 208 V:

Wire	Color	Cross Section
L1	Brown	2.5 mm²
L2	Blue	2.5 mm²
PE	Yellow/Green	2.5 mm²

Wiring for 230 V:

Wire	Color	Cross Section
L	Brown	2.5 mm²
N	Blue	2.5 mm²
PE	Yellow/Green	2.5 mm²

The exact positions of the electrical connections on the laser device are shown in Figure 16.

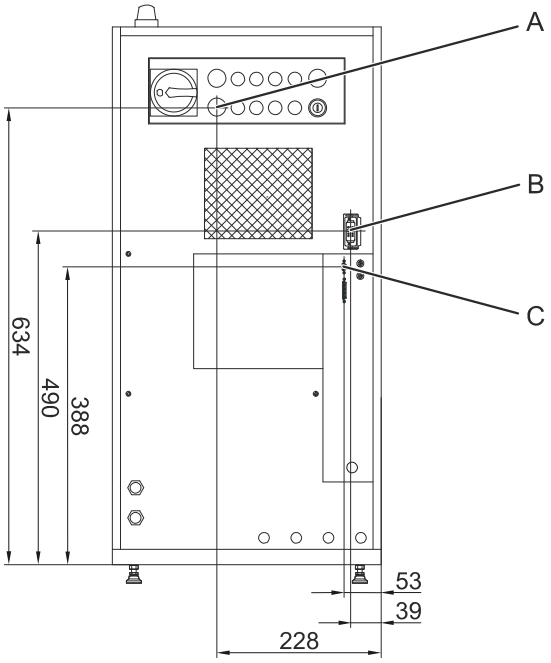


Figure 16: *Positions of electrical connections*

Key to Figure 16:

A Mains cable
B Remote connector (see Section 5.6.1 on page 53)
C COM1 connector (see Section 5.6.1 on page 53)

D148975_AA

5.4 Cooling Water

All COMPex*Pro* laser devices are fitted with cooling water connections which enable the laser tube to be cooled at higher repetition rates.

Under normal operating conditions:

– the COMPex*Pro* 102 and COMPex*Pro* 201 are fully air-cooled.

– the COMPex*Pro* 50 and COMPex*Pro* 110 require water cooling at repetition rates of 20 Hz and above.

– the COMPex*Pro* 205 requires water cooling at repetition rates of 10 Hz and above.

As an option, each COMPex*Pro* can be factory fitted with a built-in temperature stabilization facility that optimizes the gas temperature of the laser tube by regulation of the water flow.

As particles in the cooling water can clog the coolant circuit, the final user is to provide and maintain a fine line filter in the external cooling water supply line immediately in front of the shut-off valve for the laser device.

Do not use deionized water.

The cooling water specifications are listed below.

Water flow rate	1 l/min to 5 l/min
Water temperature at inlet	10° C to 20° C[a]
Static water pressure	2 bar to 4 bar
Dynamic water pressure drop (in/out)	2 bar to 4 bar
Heat transfer to water	< 1.5 kW
Electrical resistance	10 kΩ/cm to 100 kΩ/cm
Suspended particle size	< 200 µm
Hardness	< 100 ppm Ca
pH range	6.5 to 8

a. When setting the cooling water temperature, take into account the dew point. Set the inlet temperature of the cooling water in accordance with the ambient air temperature and relative humidity to prevent dew forming on the water lines in the laser device.

D148975_AA

Additives

When the laser device is cooled by a once-through cooling system, cooling water additives are not required.

If the laser device is to be operated in conjunction with a recirculating cooling water system, the following additives can be used:

Recommended additive:

- for corrosion protection and anti-freeze protection	Antifrogen N®
- for corrosion protection	10 ppm 1H-Benzotriazol

The locations of the cooling water connections on the laser device are indicated in Figure 17.

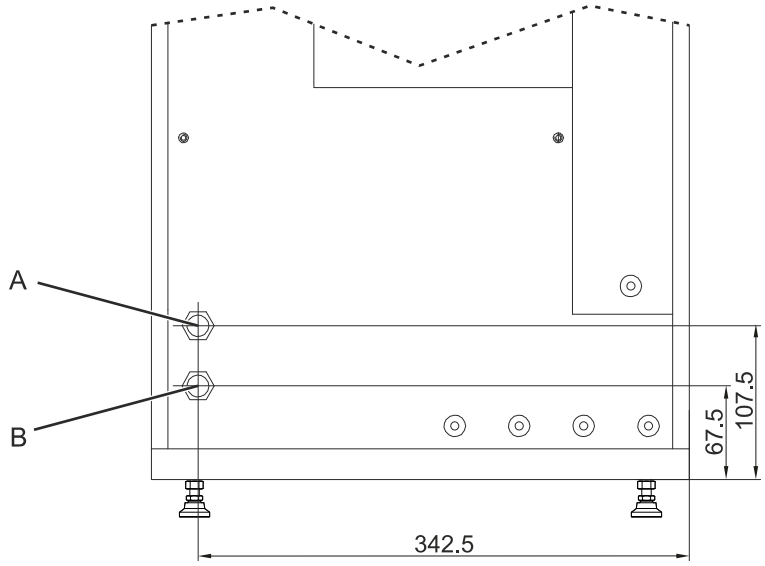


Figure 17: *Positions of cooling water connections*

Key to Figure 17:

A Cooling water inlet B Cooling water outlet

Specifications:

Water connector size	½” (outer diameter) pipe
Supplied water lines	two ½” (inner diameter) hoses, length: 3 m (118.1 in)

D148975_AA

5.5 Air Intake / Exhaust

Except for the laser tube at higher repetition rates (see Section 5.4), all components in the laser device are cooled by ambient air.

To ensure an adequate supply of cooling air, the laser device has to be situated in the specified maintenance area (see Section 4.4 on page 28). This area has to comply with the specified environmental conditions (see Section 4.1.1 on page 23).

The laser device has two air intakes on the beam exit side (see Figure 18, A) and a central exhaust outlet with moderate flow rate on the connection side (B).

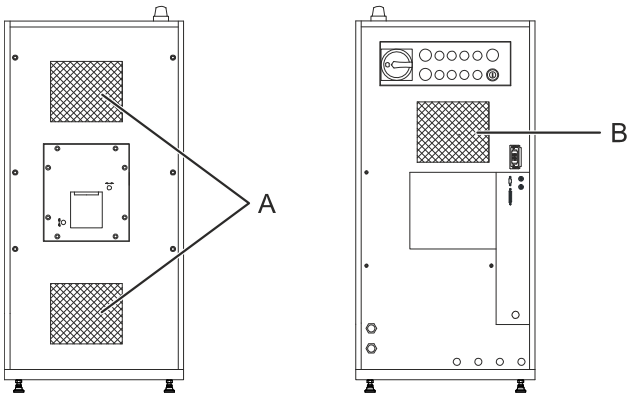


Figure 18: *Location of air intake and exhaust*

WARNING
harmful gas hazard!
Permanently connect the laser device exhaust to an appropriate ventilation system. Make sure that the exhaust is not connected to the ducting of systems that are used to process breathing air (e.g. air conditioning systems).

Under normal operating conditions, the exhaust air does not contain harmful gases or by-products. With certain failure scenarios, however, the exhaust air may contain small concentrations of halogen gas or ozone. Consequently, the laser device has to be connected to an appropriate fume extraction or industrial ventilation system. A 3 m (118.1 in) long exhaust hose and the required attachment fittings are supplied with the laser device.

D148975_AA

The exhaust specifications are indicated below.

Air flow rate	200 m³/hour to 300 m³/hour
Air intake temperature	15 °C to 25 °C
Heat transfer to air	< 1 kW
Max. exhaust length	4 m (157.5 in)[a]
Exhaust diameter	150 mm (5.9 in)

a. An additional blower is required if the max. length is exceeded

When planning the external exhaust system, always take into account the plant requirements indicated in Section 3.2.5 on page 19.

Make sure that the air flow in the area of the laser device is sufficient to continually replace the quantity of air that is extracted through the exhaust. Depending on the size and configuration of the room containing the laser device, it may be advisable for the user to provide forced ventilation and/or an air flow monitoring system.

5.5.1 Beam Delivery System

A guiding system is required to deliver the laser beam from the beam exit of the laser device to the processing station. The beam delivery system is to be configured in accordance with the layout of the final customers's fabrication facility. For laser devices purchased together with a beam delivery system, please refer to the beam delivery system documentation for further information.

The exact position of the beam exit from the laser device is indicated in Section 4.6.1 on page 32.

To connect the beam delivery system with the laser device's beam exit, the beam delivery tube is to be mounted on the beam shutter using the four 10 mm M4 threaded holes provided.

The dimensions and hole pattern of the shutter plate are shown in Figure 19. The shutter is manufactured from aluminum alloy (AlMg3).

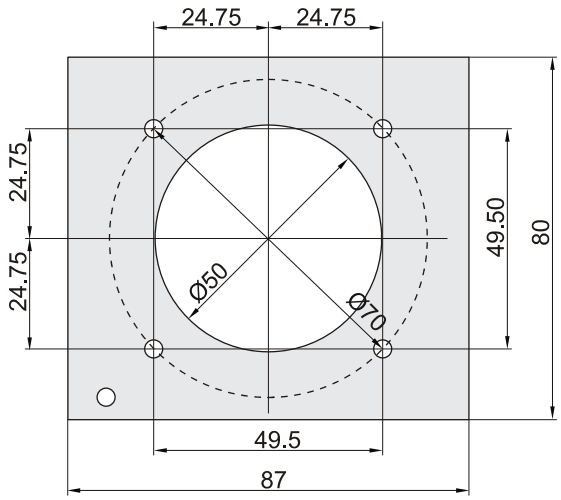


Figure 19: *Mechanical interface of the beam shutter*

The responsibility for the correct and sufficient connection of the laser beam exit to an appropriate beam delivery system lies entirely with the supplier of the final equipment assembly.

The entire beam path of Class 4 lasers, including the target area, should be hermetically sealed by an enclosure equipped with interlocks that prevents operation of the laser system unless the enclosure is properly secured. The beam path shall, insofar as possible, be free of specularly reflective surfaces and materials which would be combustible if irradiated by the beam.

The supplier of the final equipment assembly should ensure after installation of the beam delivery system that no laser radiation exceeding maximum permitted exposure (MPE) values arises at the connection between the laser device and the beam delivery system. Measurements in accordance with statutory requirements must be carried out by an authorized body to ensure that the MPE-values are not exceeded.

5.6 Control and Signal Lines

Figure 20 shows the layout of the connections on the connector panel.

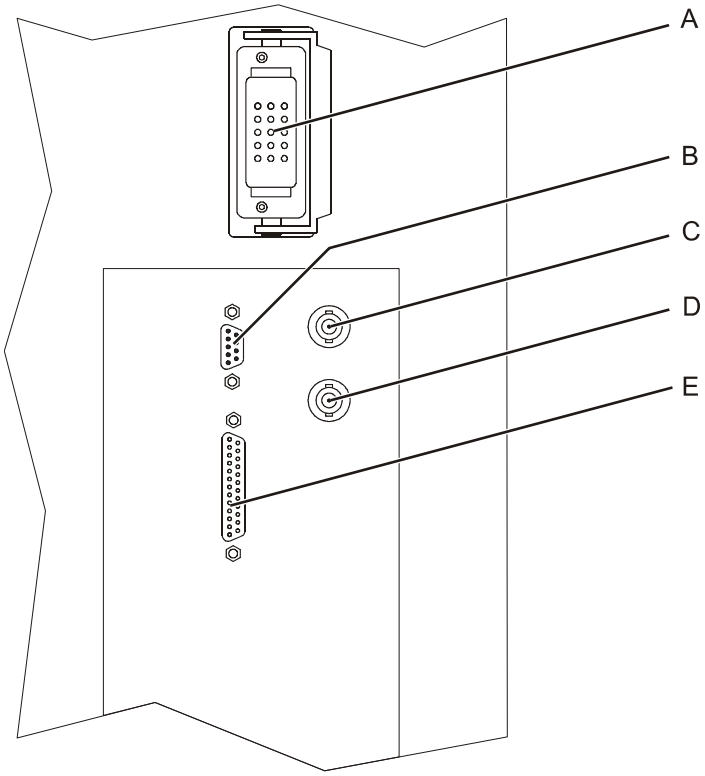


Figure 20: *Layout of connector panel*

The table below contains a key to Figure 20 and provides an overview of the configuration of the control and signal connections. The gender of the connector (where indicated) relates to the chassis part on the laser device and not the connector on the cable. The cables have to be provided with the corresponding plugs.

Pos.	Designation	Type	Purpose	Further information
A	Remote	15 pin Harting, female	Safety connections	Section 5.6.1
B	COM1	9 pin sub D, male	Serial interface for input/output of operating modes and parameters	Section 5.6.1
C	Sync Out	BNC	Output of synchronization signal	Section 5.6.5
D	Trigger In	BNC	Input of external trigger signal	Section 5.6.4
E	COM2	25 pin sub D, female	Serial interface (handheld keypad configuration) for input/output of operating modes and parameters	Section 5.6.3

As a positioning guide, Figure 16 on page 46 shows the exact locations of the Remote and COM1 connectors.

The following subsections provide an overview of the control and signal lines. For detailed information about pin configurations, signal definitions and commands/signals used please refer to the separate Interfacing Manual.

5.6.1 Remote Connector

The Remote connector is a 15 pin Harting HAN 15D female connector that enables the laser device to be connected to external emergency shutdown circuits (see Figure 21).

Pin Assignment and Connections

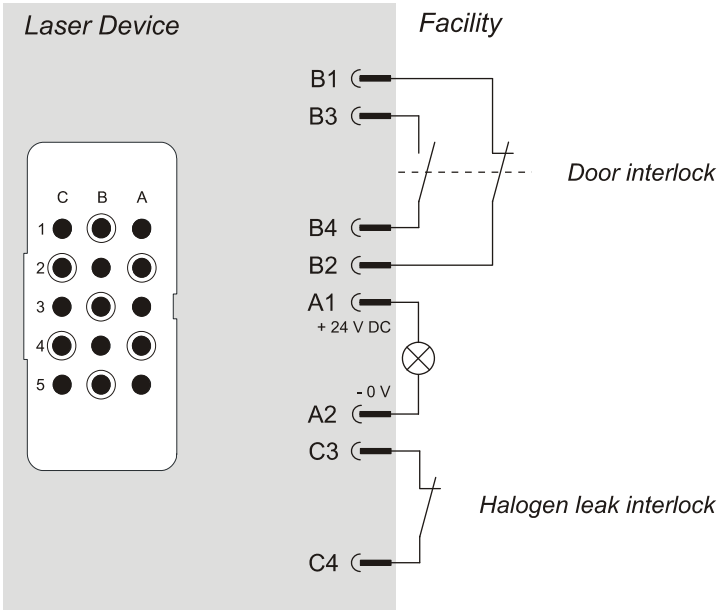


Figure 21: *Remote connector pin assignment and connections*

Signal	Pins	Type	Purpose	Specifications
Laser radiation warning lamp	A1 + A2	Output	External warning lamp that lights when laser radiation is being emitted	24 V DC
Emergency Stop	B1 + B2	Input	ISO 13849-1 performance level d connection. B3 and B4 have to be open and B1 and B2 have to be closed to enable the emission of laser radiation	Potential-free contacts
	B3 + B4	Input		
Halogen leak interlock	C3 + C4	Input	Contact has to be closed if there is no external halogen leak	

The laser device is shipped with a dummy plug that enables laser operation during setup and troubleshooting operations. Do not use this plug for normal laser operation. The specifications in this section enable the system operator to obtain the necessary components to safely connect the laser device to the facility's external emergency shutdown circuits.

Tools and Materials Required for Connection Plug Assembly

- 1 × Crimp terminal HAN-15D, 15+PE, male, 10A
  (Harting part no.: 09 21 015 3001; see Figure 22, A)
- 6 × Crimp contacts HAN-D, male 1 mm^2, silver plated
  (Harting part no.: 09 15 000 6102; B)
- 1 × Hood, metal M25, size 10A (Harting part no.: 19 20 010 0546; D)
- 1 × Brass cable gland, SKINTOP, MS-M M25X1.5
  (Lappkabel part no.: 53112030; C)
- 1 × Crimping tool (incl. pin locators) (Harting part no.: 09 99 000 0021)
- 1 × Pin removal tool (Harting part no.: 09 99 000 0052)

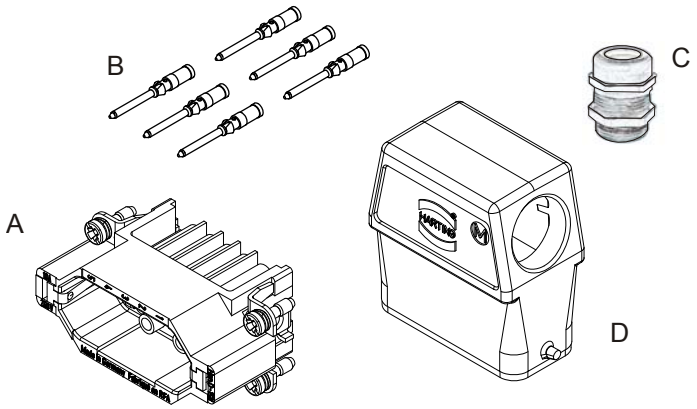


Figure 22: *Components required for remote connector*

5.6.2 Serial Interface (COM 1)

COM 1 is a 9 pin Sub-D, male serial interface (standard RS232C). It can be switched by the user through a pushbutton on the handheld keypad to enable the connection of one of the following:

– a diagnostics computer,

– an external computer control system (remote computer) that uses the current protocol (see separate Interfacing Manual),

– a control system designed for an earlier version of the COMPex, COMPex*Pro* or LPX series laser device (backward compatibility). With this setting, not all commands offered by the current laser control software will be supported. In addition, as the status code table has changed, status codes sent by the laser device may not be recognized or correctly interpreted by the external control system.

Alternatively, this port can be deactivated by the user to prevent the input of conflicting commands.

5.6.3 Serial Interface (COM 2, Terminal)

COM 2 (Terminal) is a 25 pin Sub-D, female serial interface (standard RS232C). It is configured for the connection of the handheld keypad supplied as standard with the laser device. If required, an external computer can be connected to this terminal instead of the handheld keypad. This computer has to use the same protocol as the handheld keypad (see separate Interfacing Manual).

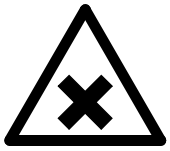
5.6.4 Trigger In

TRIG. IN is a BNC socket that enables the laser be triggered from an external source (trigger generator).

5.6.5 Sync. Out

SYNC. OUT is a BNC socket that enables the output of a signal that informs an external device that a trigger signal (either internal or external) has just been given.

6 EXTERNAL GAS SYSTEM



WARNING
Harmful gas hazard!
The COMPex*Pro* laser device is supplied with a gas mixture that contains a small portion of halogen gas.
This gas mixture is harmful by inhalation and irritating to the eyes, respiratory system and skin.
Never inhale the halogen gas mixture. Avoid eye or skin contact.

CAUTION
High quantities of nitrogen may cause asphyxiation!
Keep gas cylinders in a well ventilated place.
Do not breathe the gas.

This chapter describes the recommended external facilities for the laser gases and preparation of the gas supply lines.

The COMPex*Pro* excimer laser device needs a mixture of laser gases in order to generate the laser beam. Additional gases are required to purge the beam path and allow certain maintenance procedures to be performed. The exact specifications of the gases required by the laser device are indicated in Section 5.2 on page 38.

In addition to inherent safety considerations (e.g. prevention of spillage and leaks), the purity of the supplied gases is an important issue. Any impurities in the gases will impede laser performance by lowering the output power, disturbing the uniformity of the beam and reducing the lifetime of the laser optics.

The most harmful impurities have been identified as water vapor and hydrocarbons. These impurities can be introduced through a poorly designed and set-up external gas supply and distribution system. Selection of appropriate components for the gas supply system and expert installation are, therefore, crucial for reliable and satisfactory laser operations.

6.1 Planning and Installation

The responsibility for the safe and correct installation of the external gas supply and handling system lies entirely with the final user of the laser device.

The exact configuration of the external gas supply and handling system depends on local requirements and regulations. To ensure safe and correct installation, appoint an approved gas installation expert to plan, install, test and prepare the external gas system.

The external gas system has to be configured to ensure that the gas specifications detailed in Section 5.2 on page 38 exist at the respective inlet valve of the laser device.

Gas Lines

The amount of gas lines required for each specific installation can be taken from the overview in Section 5.1 on page 37. The location, type and size of the corresponding gas connections on the laser device are indicated in Section 5.2.6 on page 43. Keep all gas lines as short as possible (max. 40 m[a]).

The halogen gas line should be 316 L stainless steel, electropolished inside, degreased. For safety reasons the halogen gas supply line from the external gas cylinder should have a double wall tubing. The minimum gas line diameter is 6 mm or 0.25 inch (outer diameter). The type of tubing should be seamless. Only use gaskets that are approved by the gas supplier.

For the rare, buffer, inert and purge gas lines, 316L stainless steel lines with a minimum outer diameter of 6 mm or 0.25 inch is also recommended.

Each gas supply line shall contain a suitable dedicated mechanical shut-off valve. For further information, please contact the gas supplier.

All gas lines and connections should be properly labelled.

Gas Fittings

The customer is responsible for providing and fitting the appropriate female gas line connectors (6 mm Gyrolok). All connectors have to be fitted according to the “Hoke Gyrolok Assembly Instructions”. Please refer to the Hoke website or contact your local Hoke representative for further information about the selection and installation of suitable gas fittings.

Gas Cylinders

Depending upon the gas mixture and consumption (see Section 5.2 on page 38), Coherent recommends gas cylinder sizes of 10 or 50 liters. A typical 10 liter gas cylinder has a gas volume of 1350 liters and weighs 15 kg when full. A typical 50 l gas cylinder has a gas volume of 6900 liters and weighs 65 kg when full.

a. The max. length of a gas line depends on the gas line diameter and gas cylinder pressure. Longer gas lines require a larger gas line diameter and/or higher gas cylinder pressure. Ensure that the length and diameter of the gas line in conjunction with the gas cylinder pressure enable the specified gas flow rate to be attained.

To prevent accidents with the gas cylinders:

– Do not drop, drag or allow cylinders to collide violently.

– Use a proper hand truck for moving.

– Ensure that the valve protection cap is in place.

– Store cylinders upright and firmly secured in a cool dry and well ventilated area of noncombustible construction, with a temperature not exceeding 52 °C (125 °F).

– Never allow flames, sources of heat or ignition and flammable gasses or liquids to come into contact with cylinder.

For shipping requirements, restrictions and regulations please contact the laser gas supplier.

Gas Cabinets

The risk of leakage from gas cylinders, particularly the halogen gas mixture, is a potential health hazard. To minimize this hazard, Coherent recommends the use of safety gas cabinets. Please contact the laser gas supplier for more information.

Pressure Regulators

Pressure regulators have to be installed in the gas supply lines. Suitable pressure regulators are supplied by gas manufacturers. Coherent recommends pressure regulators which are designed to operate well within the pressure range of the respective gas (see Section 5.2 on page 38).

NOTICE
Halogen gas mixtures corrode most metals. In addition, unsuitable pressure regulators can cause impurities in the laser gas mixture. Always use stainless steel pressure regulators that are suitable for use with halogen gas mixtures. Consult the pressure regulator supplier to ensure the suitability of the pressure regulator.

Pressure and Flow Restrictors

Suitable control devices and fail-safe means of pressure and flow limitation have to be provided to ensure that there is no risk of excess pressure or flow at the respective gas inlet connections. The line pressure at the connection to the laser device shall never exceed 7 bar (abs.) even in case of failure. In addition, the gas flow in each line shall also not exceed the specified upper limit of the flow rate range (see Section 5.2 on page 38).

Environmental Air Quality

End users should check with their local air quality control authority for locally applicable standards and regulations regarding a potential discharge of Fluorine (F_2) or Hydrogen Chloride (HCl) into the atmosphere.

Provided that the maintenance instructions indicated in the User Manual are observed, no further environmental requirements are foreseen for the excimer laser device.

6.2 Cleaning and Testing

During installation, take care to ensure that all gas lines remain completely free of oil and grease. It is essential that no contamination be present on the walls of the tubing. Hydrocarbon contamination from even a finger print may degrade laser performance.

Use suitable leak testing procedures to ensure that the acceptable leak limit of ≤ 1 x 10^{-8} mbar l/s (≤ 1 x 10^{-6} Pa l/s) is not exceeded.

After assembly and leak testing, remove all moisture from the gas lines. Following this, completely flush and check the cleanliness of the gas lines (e.g. using helium). Make sure that there are no excess levels of contaminants such as oxygen, nitrogen, carbon compounds and water in the gas lines.

D148975_AA

6.3 Passivation

Any clean metal surface exposed to normal atmosphere can form oxides and other compounds. Passivation is the process in which halogen reacts with these surfaces to form a stable layer which will not undergo further reaction with halogen.

Only the premix line / halogen line needs to be passivated. The passivation process has to be performed after the gas distribution system has passed the leakage and cleanliness checks (see Section 6.2) and before the laser device is commissioned. It generally consists of repeatedly filling the gas line to operating pressure with the halogen gasmixture, allowing the halogen in the gas mixture time to react and evacuating the line. The exact procedure depends on influencing factors such as the configuration of the external gas system, available tools and materials and the timeline of the installation. For further information, please contact Coherent Service.

6.4 Certification

The user should retain the certification of all materials used in the construction of the gas lines. These should be available for inspection by personnel from Coherent or the system integrator upon request.

All test results documenting the checks for cleanliness and leaks should be maintained by the user and be available for inspection by personnel from Coherent or the system integrator upon request.

7 MOVING AND UNPACKING

This chapter describes the internal transport and unpacking of the COMPex*Pro* excimer laser device. After following all procedures detailed in this chapter, the laser device is ready for connection at the installation location.

To ensure that the laser device is moved and unpacked safely and that no damage occurs, strictly adhere to the requirements in this chapter. In addition, ensure that the requirements for transport and storage are complied with (see Section 2 on page 11).

7.1 Safety Guidelines

WARNING
Risk of crushing!
The heaviest version of the COMPex*Pro* laser device weighs approx. 395 kg (870.8 lb) together with its rigid transport packaging and appprox. 325 kg (715 lbs) without packaging. Prevent tipping or dropping during lifting and transportation.

When externally or internally moving the laser device and its components, always follow all standard safety precautions and practices for the transportation and handling of heavy equipment. Always use appropriate lifting equipment.

NOTICE
Risk of damage through shocks and excess vibration!
Shocks and excess vibration can damage sensitive and precision components of the laser device, including the laser device's feet. Avoid sudden shocks, especially when the laser device is attached to the base plate of the rigid transport packaging.

Ensure that the COMPex*Pro* laser device is transported carefully, regardless of the packaging stage.

D148975_AA

NOTICE
Risk of damage through excess tilting!
Keep the laser device as horizontal as possible during transportation and installation. If tilting is necessary, ensure that the maximum permissible tilting gradients are not exceeded. Only tilt for short periods.

The maximum permissible tilting gradients are 5° around the beam axis and 20° longitudinally (see Figure 23).

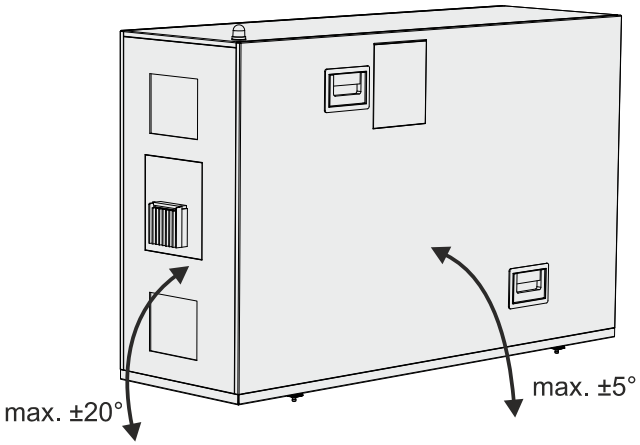


Figure 23: *Permitted tilting gradients during transport*

Avoid vibrations when the laser device is tilted.

7.2 Transport Packaging

This section describes the means of packaging of the COMPex*Pro* to ensure safe shipment and delivery in the required condition.

NOTICE
Always retain the transport packaging to ensure optimum protection of the laser device during sub sequent shipment.

The size, weight and configuration of the transport packaging is indicated in Section 2.3 on page 12.

Each COMPex*Pro* laser device has two-stage transport packaging:

– rigid transport packaging and

– anti-static (polyethylene) inner cover .

D148975_AA

The rigid transport packaging (see Figure 24) fully encapsulates the laser device and inner cover. It consists of a plywood base pallet (B) and plywood upper panels (A) at the sides, front rear and top.

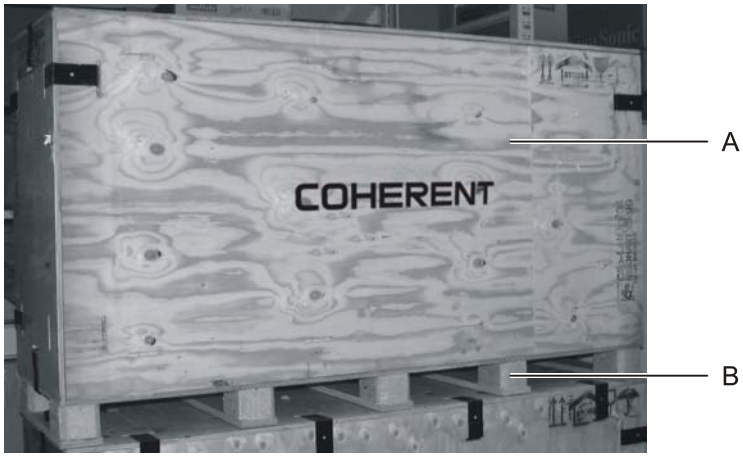


Figure 24: *Rigid transport packaging*

The base pallet has two shock absorbing buffers (see Figure 25). The laser device feet are placed in the locating holes (A) so that the laser device is secured in position when the rigid packaging is closed.

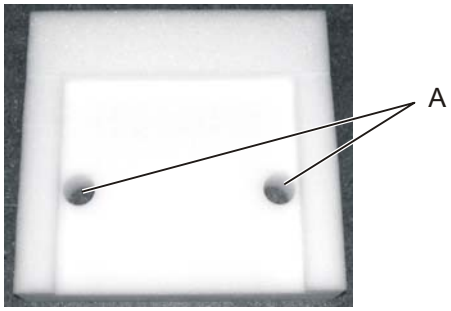


Figure 25: *Shock absorbing buffers*

The laser device is to be stored in the rigid transport packaging. Remove the anti-static inner cover immediately prior to installing the laser device.

7.3 Transport / Lifting With Rigid Packaging

WARNING
Risk of crushing!
The heaviest version of the COMPex*Pro* laser device in its rigid transport packaging weighs approx. 395 kg (870.8 lb).
Prevent tipping or dropping during lifting and transportation.

A suitable fork lift truck or similar device is required to lift the laser device. Ensure that the fork length and loading capacity is sufficient to safely lift the laser device in its packaging. The dimensions and weight of the packed laser device are indicated in Section 2.3 on page 12.

The laser device can be lifted longitudinally from the side. Set the forks as far apart as possible to safely lift the laser device.

7.4 Initial Inspection of Delivery

Purpose

Check that no damage has occurred to the laser device during transportation and that the shipment is complete.

To monitor the handling of the laser device during transportation, two Shockwatch indicators are fixed to the rigid transport packaging (on the long side and face of the packaging). These turn to red when subject to excess shocks.

Tools and Materials

- None

Initially Checking the Laser Device Packaging

1. Ensure that none of the Shockwatch indicators on the rigid transport packaging have turned to red.
2. Inspect for visible signs of damage to the rigid transport packaging.

Checking the Contents of Shipment

3. Check the contents of the shipment against the packing list provided.
4. Sign the delivery note.

If any parts are missing, immediately contact Coherent. The contact address is indicated on the reverse side of the cover sheet of this manual.

D148975_AA

Damaged Deliveries

If the initial inspection of the delivery indicates mishandling or tipping of the laser device during transport, proceed as follows:

- Do not refuse the shipment.
- Make a corresponding notation on the delivery receipt document.
- If there are visible signs of damage, leave the laser device in the original transport packaging and request immediate inspection from the carrier within three days of delivery. Take photographs of the damage.
- If there are no visible signs of damage to the packaging, remove the packaging and check for visible signs of damage to the laser device.
- If there are signs of damage to the laser device, immediately contact Coherent for further inspection and rectification. Take photographs of the damage.

7.5 Remove Rigid Packaging

Purpose

Remove of the top and side panels from the rigid transport packaging.

At the end of this procedure the laser device remains attached to the base pallet and is protected by the inner cover.

Tools and Materials

- Suitable fork-lift truck
- Clip removal tool (provided)
- Screwdriver for removal of clip removal tool

Preparation

1. Using the fork-lift truck or appropriate device, move the laser device to the location where it is to be unpacked.
2. Set down the laser device in the unpacking location.

Removing the Rigid Packaging

NOTICE
The original packaging is needed to re-ship the laser device. Remove and store the removed packaging in such a way that no parts are lost or damaged.

3. Unscrew and remove the clip removal tool (see Figure 26, A) from the rigid transport packaging.

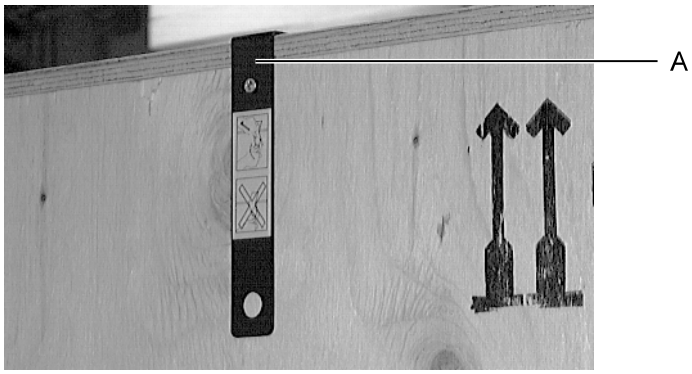


Figure 26: *Location of clip removal tool*

CAUTION
Risk of injury through incorrect use of the clip removal tool!
The transport packaging clips are under tension.
Do not use excess force to remove.
While levering off, use the other hand to restrain movement.

4. Working from the top downwards, remove the clips from the rigid transport packaging. Push the clip removal tool into the recess on the clip, press against the clip to control movement and lever off (see Figure 27).

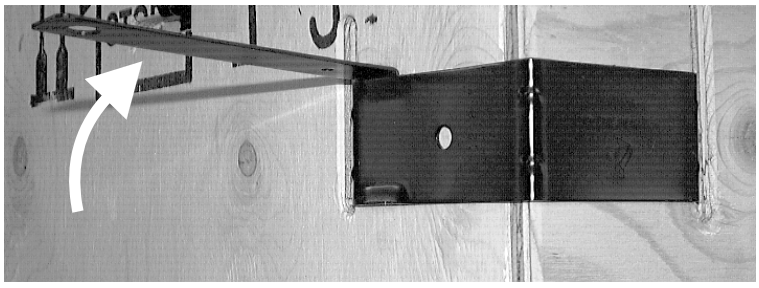


Figure 27: *Removing the clips*

5. When the corresponding clips have been removed, remove the top, front, rear and side panels of the packaging.

D148975_AA

Storing the Transport Packaging

6. Stack the disassembled panels of the rigid transport packaging and accessory packaging onto the base pallet.

   When stacking, ensure that the outer cover does not become contaminated or damaged and that the inside surfaces of the panels cannot become contaminated.

7.6 Transport / Lifting Without Rigid Packaging

WARNING
Risk of crushing!
The heaviest version of the COMPex*Pro* laser device weighs appprox. 325 kg (715 lbs) without packaging.
Prevent tipping or dropping during lifting and transportation.

NOTICE
Risk of contaminating or damaging the laser optics!
To avoid the formation of condensed water, ensure that the max. permissible temperature gradient (5 °C/h) is maintained while moving the laser device from the storage area.

Ensure that all passageways, corridors and access points have sufficient clearances. Pay particular attention to the clearences required to turn the laser device. The dimensions of the laser device are indicated in Section 4.3 on page 26.

A suitable lifting device is required to lift and transport the laser device.

NOTICE
incorrect lifting can cause serious damage to the the laser device!
Use lifting points as far apart as possible to safely lift the laser device.

When using a fork lift truck, always transport or lift the laser device together with the base pallet. Ensure that the fork length and/or the loading capacity are sufficient to safely lift the laser device.

When using a crane, position the lifting harness or belt as near to the laser device's feet as possible.

7.7 Remove Anti-Static Inner Cover

Purpose

Remove the anti-static inner cover from the laser device and unpack the accessories.

Tools and Materials

- Knife for cutting sealing tape

Preparation

1. Move the laser device and accessories to the installation area.

Removing the Inner Covers

NOTICE
The original packaging is needed to re-ship the laser device. Store the removed packaging in such a way that no parts are lost or damaged.

2. Remove the tape that seals the anti-static inner cover onto the laser device and lift the anti-static inner cover off the laser device.
3. Take the accessories out of the packaging and carefully clean them as required.

8 QUICK REFERENCE / CHECK LIST

This section provides quick reference tables and a check list to ensure that the installation site is correctly prepared and the required utlities are obtained prior to installlation of the laser device. The tables provide the specifications for all available versions and possible configurations of the COMPex*Pro* laser device. For ease of use, delete the lines in the tables that do not apply to your laser device.

To prevent unnecessary delays during installation, please complete the pre-installation checklists in Section 8.1 and return them (by fax, email attachment or post) to the appropriate address indicated below.

EUROPE
Coherent LaserSystems GmbH & Co. KG
Hans-Böckler-Strasse 12
D - 37079 Göttingen, Germany

Tel.: +49 (551) 6938-345 / 306
Fax: +49 (551) 6869-358
eMail: ServiceGTG@coherent.com

U.S.A.
Coherent Inc.
5100 Patrick Henry Drive
Santa Clara, CA 95054, USA

Tel.: 1 (8 00) EXCIMER
+1 (408) 764-4090
Fax: +1 (503) 914-1490
eMail: cscfl@coherent.com

JAPAN

Coherent Japan Office
Tokyo MK Building
7-2-14 Toyo, Koto-Ku, Tokyo
135-0016, Japan

Tel.:+81 (3) 5635-8700
Fax:+81 (3) 5635-8701

KOREA
Coherent Asia Korea
Eagle Town 1F,5F 278-20, Seongsu 2ga-3dong
Seongdong-Gu, Seoul, 133-832, Korea

Tel.: +82 (2) 460-7900
Fax: +82 (2) 460-7901

8.1 Pre-Installation Check Lists

8.1.1 Laser Gases

8.1.1.1 Premix Gas Supply (All Wavelengths)

Premix	Requirements	Checked		Remarks
		Yes	No	
- Gas mixture[a]				See Section 5.2.1 on page 39
- Purity	Excimer grade			
- Inlet pressure range	4.4 bar (abs) to 5.2 bar (abs)			
- Flow rate range	0.05 l/s to 0.5 l/s			

a. Enter appropriate gas mixture values from applicable table in Section 5.2.1

Inert	Requirements	Checked		Remarks
		Yes	No	
- Type of gas	He			See Section 5.2.2 on page 40
- Purity	99.995%			
- Inlet pressure range	4.4 bar (abs) to 5.2 bar (abs)			
- Flow rate range	0.8 l/s to 3.0 l/s			

8.1.1.2 Single Gas Supply (Option for 308 nm Only)

Halogen	Requirements	Checked		Remarks
		Yes	No	
- Type of gas	4.5% HCl and 0.9% H2 in He			See Section 5.2.3 on page 41
- Purity	99.995%			
- Inlet pressure range	4.4 bar (abs) to 5.2 bar (abs)			
- Flow rate range	0.05 l/s to 0.5 l/s			

D148975_AA

Rare	Requirements	Checked		Remarks
		Yes	No	
- Type of gas	Xe			See Section 5.2.3 on page 41
- Purity	99.999%			
- Inlet pressure range	4.4 bar (abs) to 5.2 bar (abs)			
- Flow rate range	0.05 l/s to 0.5 l/s			

Buffer	Requirements	Checked		Remarks
		Yes	No	
- Type of gas	Ne			See Section 5.2.3 on page 41
- Purity	99.995%			
- Inlet pressure range	4.4 bar (abs) to 5.2 bar (abs)			
- Flow rate range	0.8 l/s to 3.0 l/s			

Inert	Requirements	Checked		Remarks
		Yes	No	
- Type of gas	He			See Section 5.2.3 on page 41
- Purity	99.995%			
- Inlet pressure range	4.4 bar (abs) to 5.2 bar (abs)			
- Flow rate range	0.8 l/s to 3.0 l/s			

8.1.2 Purge Gas

Purge	Requirements	Checked		Remarks
		Yes	No	
- Type of gas	N2			See Section 5.2.4 on page 42
- Purity	99.999%			
- Flow rate range	8 l/min to 12 l/min			

8.1.3 Electrical Power Supply

Mains supply configuration	Requirements		Checked		Remarks
			Yes	No	
Nominal voltage[a]	104 VAC / 120 VAC / 208 VAC / 230 VAC				See Section 5.3 on page 44
Voltage range	Nominal voltage ± 10%				
Frequency[b]	50 Hz / 60 Hz				
Wires	2 + PE				
Phases[c]	104 VAC connection	1 phase			
	120 VAC connection	1 phase			
	208 VAC connection	2 phases			
	230 VAC connection	1 phase			

a. Indicate applicable local mains voltage
b. Indicate applicable local mains frequency
c. Check as applicable

Power[a]	Requirements	Checked		Remarks
		Yes	No	
COMPex*Pro* 50	1.5 kVA			See Section 5.3 on page 44
COMPex*Pro* 102	1.5 kVA			
COMPex*Pro* 110	3 kVA			
COMPex*Pro* 201	1.5 kVA			
COMPex*Pro* 205	3 kVA			

a. Check as applicable

D148975_AA

Current rating[a]	Requirements		Checked		Remarks
			Yes	No	
104 VAC connection					See Section 5.3 on page 44
Short circuit current rating	10 kA				
Amp rating largest load	12.5 A				
Machine OCP rating	12 A				
Full load amps	COMPex*Pro* 50	15 A			
	COMPex*Pro* 102	12 A			
	COMPex*Pro* 110	24 A			
	COMPex*Pro* 201	12 A			
	COMPex*Pro* 205	24 A			
120 VAC connection					
Short circuit current rating	10 kA				
Amp rating largest load	12.5 A				
Machine OCP rating	12 A				
Full load amps	COMPex*Pro* 50	13 A			
	COMPex*Pro* 102	11 A			
	COMPex*Pro* 110	22 A			
	COMPex*Pro* 201	11 A			
	COMPex*Pro* 205	22 A			
208 VAC connection					
Short circuit current rating	1.5 kA				
Amp rating largest load	12.5 A				
Machine OCP rating	16 A				
Full load amps	COMPex*Pro* 50	7 A			
	COMPex*Pro* 102	8 A			
	COMPex*Pro* 110	15 A			
	COMPex*Pro* 201	8 A			
	COMPex*Pro* 205	15 A			
230 VAC connection					
Short circuit current rating	1.5 kA				
Amp rating largest load	12.5 A				
Machine OCP rating	16 A				
Full load amps	COMPex*Pro* 50	6 A			
	COMPex*Pro* 102	6 A			
	COMPex*Pro* 110	13 A			
	COMPex*Pro* 201	6 A			
	COMPex*Pro* 205	13 A			

a. Check as applicable

D148975_AA

8.1.4 Cooling Water

Cooling Water	Requirements	Checked		Remarks
		Yes	No	
Water flow rate	1 l/min to 5 l/min			See Section 5.4 on page 47
Water temperature at inlet[a]	10° C to 20° C			
Static water pressure	2 bar to 4 bar			
Dynamic water pressure drop (in/out)	2 bar to 4 bar			
Electrical resistance	10 kΩ/cm to 100 kΩ/cm			
Suspended particle size	< 200 µm			
Hardness	< 100 ppm Ca			
pH range	6.5 to 8			

a. Take into account the ambient air temperature and relative humidity. Ensure that no condensation (dew) occurs

8.1.5 Air Intake / Exhaust

Laser Ventilation	Requirements	Checked		Remarks
		Yes	No	
Air flow rate	200 m³/hour to 300 m³/hour			See Section 5.5 on page 49
Air intake temperature	15 °C to 25 °C			
Max. exhaust length	4 m (157.5 in)[a]			
Exhaust diameter	150 mm (5.9 in)			

a. An additional blower is required if the max. length is exceeded

Exhaust Monitoring	Requirements / Recommendations	Checked		Remarks
		Yes	No	
Flow monitor	Required in external exhaust			See Section 3.2.5 on page 19
Halogen sensor	Recommended in external exhaust			
Smoke detector	Required in external exhaust			

D148975_AA

8.1.6 Space Requirements

Maintenance Area	Requirements	Checked		Remarks
		Yes	No	
COMPex*Pro* 50 / 100 Series				See Section 4.4 on page 28
Maintenance area (l × w)	2500 mm × 1400 mm (98.5 in × 55.1 in)			
Maintenance height	1350 mm (53,2 in)			
COMPex*Pro* 200 Series				
Maintenance area (l × w)	3000 mm × 1400 mm (118.1 in × 55.1 in)			
Maintenance height	1350 mm (53,2 in)			

8.1.7 Environmental Conditions

Operational Conditions	Requirements	Checked		Remarks
		Yes	No	
Air temperature	15 °C to 25 °C			See Section 4.1 on page 23
Temperature change	2 °C / hour			
Humidity	30% RH to 70% RH			
Pressure change	< 10 mbar / hour			
Altitude above sea level	< 2000 m			
Pollution	class 9 or better (according to ISO 14644-1)			
Recommended illumination[a]	more than 500 lx			
Housing IP classification[b]	IP20			

a. for operation with optional handheld keypad; according to DIN 5035, part 2 for precise machining
b. If the housing IP classification is not sufficient for the selected operating environment, an additional housing or filter system may be provided. In this case, ensure that adherence to the other operating requirements indicated in this section will not be affected.

Transport / Storage Conditions	Requirements	Checked		Remarks
		Yes	No	
Air temperature	-20 °C to +50 °C (4 °F to 122 °F)[a]			See Section 2.1 on page 11
Humidity	< 70% RH			

a. Remove cooling water before transport and storage

D148975_AA

8.2 System Specifications

8.2.1 Overall Dimensions and Weight

COMPex*Pro* 50 / 100 Series

Overall dimensions of laser device (l × w × h):	1282 mm × 375 mm × 793 mm (50.5 in × 14.8 in × 31.2 in)
Overall weight	270 kg (594 lbs)

COMPex*Pro* 200 Series

Overall dimensions of laser device (l × w × h):	1682 mm × 375 mm × 793 mm (66.2 in × 14.8 in × 31.2 in)
Overall weight	325 kg (715 lbs)

8.2.2 Packaging Dimensions and Weight

Laser Device in Container

Dimensions (l × w × h)	1820 mm × 540 mm × 1030 mm (71.7 in × 21.3 in × 40.6 in)
Weight	
- 50 / 100 series	345 kg (760.6 lb)
- 200 series	395 kg (870.8 lb)

Accessories Package (COMPex*Pro* 200 Series)

Dimensions (l × w × h)	660 mm × 430 mm × 520 mm (26.0 in × 16.9 in × 20.5 in)
Weight	depending on configuration

8.2.3 Heat Transfer

Heat transfer to water	< 1.5 kW
Heat transfer to air	< 1 kW

D148975_AA

LIST OF FIGURES

INDEX

Numerics

A

B

C

D

E

F

G

H

I

D148975 [AA]

L

M

P

R

S

T

V

W

D148975 [AA]