LAMBDA PHYSIK
LASERTECHNIK

SITE PREPARATION
COMPex 100/200/300

(12/99)

Part Number: 263 743

U.S.A.
Lambda Physik Inc.
3201 West Commercial Blvd.
Lakeshore Business Center, Suite 110
Ft. Lauderdale, FL 33309, USA

Tel.: (9 54) 4 86-15 00
(8 00) EXCIMER
Fax: (9 54) 4 86-15 01
eMail: salesusa@lambdaphysik.com

GERMANY
Lambda Physik GmbH
Hans-Böckler-Strasse 12
D – 37079 Göttingen, Germany

Tel.: +49 / 551 / 69 38-0
Fax: +49 / 551 / 6 86 91
eMail: salesgermany@lambdaphysik.com

JAPAN
Lambda Physik Japan Co. Ltd.
German Industry Center

1-18-2 Hakusan
J-Yokohama 226, Midori-ku

Tel.: 04-59 39-78 48
Fax: 04-59 39-78 49

Marubun Corp.
Marubun Daiya Bldg.
8-1 Nihonbashi Odenmacho
Chuo-ku, Tokyo 103 Japan

Tel.: 03-36 39-98 11
Fax: 03-36 62-13 49

TABLE OF CONTENTS

1 System Description

1.1 Overview

Figure 1 and Figure 2 show the exterior design of a Lambda COMPex laser.

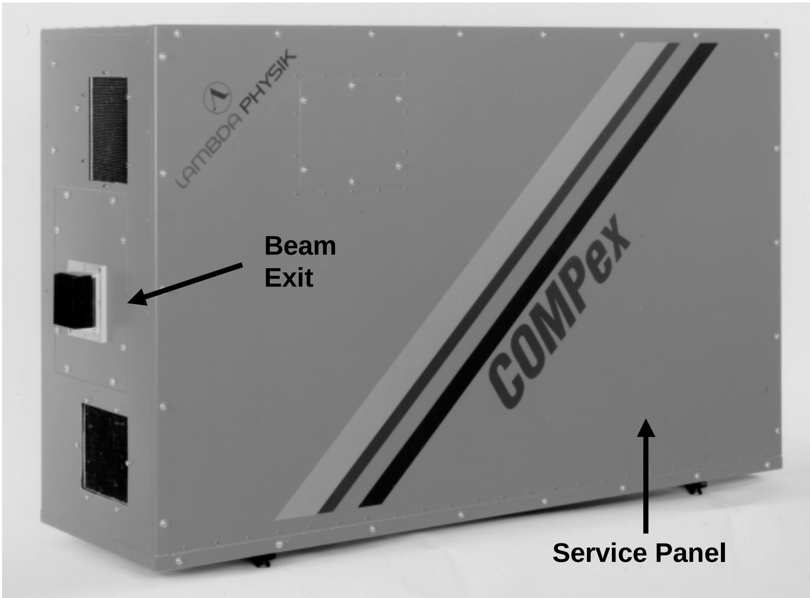


Figure 1: Front View

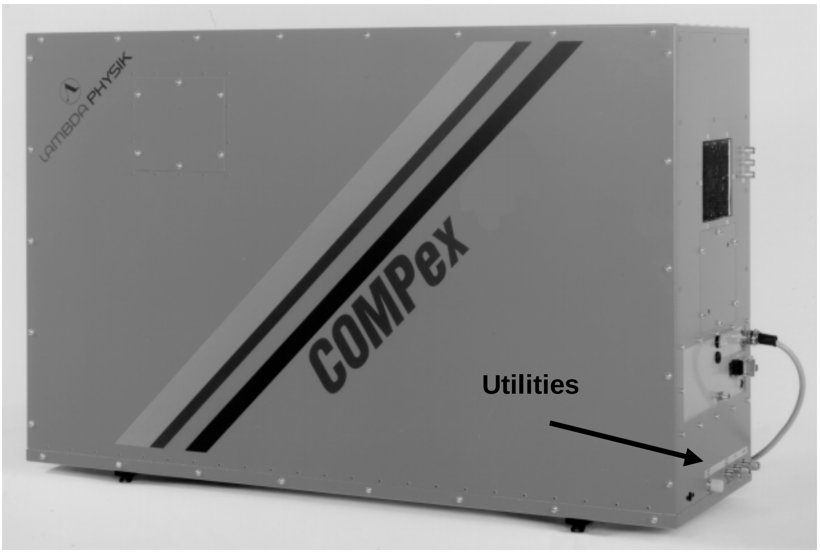


Figure 2: Rear View

1.2 COMPex Excimer Laser

When designing the new COMPex-series user friendliness and low foot print have been our major goals. Due to the strict modular design of the laser, all service and maintenance can be performed from one access side.

The COMPex-series is applicable for low to medium power requirements. All COMPex lasers are fitted with Lambda Physik's revolutionary NovaTube™ technology. The lasers are available in a multigas version which allows operation with all main wavelengths and in a fluorine version which optimizes the laser for the operation with ArF, KrF, and XeF (excludes XeCl-operation).

A handheld key-pad with function keys and LCD display is used to command the laser. For system integration all COMPex lasers offer a RS 232C remote interface.

The COMPex lasers are certified by the German TÜV with the GS certificate and meet the European CE-standard, a must since 1996. The aspect of electrical safety, radiation, EMI emission and susceptibility as well as pressure vessel regulation and x-ray emission certification are all fullfilled by these lasers.

1.3 The New Concept

Three technical innovations introduced with the COMPex are the metal ceramic technology NovaTube™, the on-site halogen generator Halo Safe™, and a new integrated high voltage power supply.

The compact power supply provides excellent voltage regulation (accuracy ≥ 99,9 %) leading to a significant improvement in laser output stability.

COMPex excimer lasers can be combined with the halogen generator Halo Safe™ from Lambda Physik. This combination provides a hazardfree alternative to the external halogen tanks and gas handling system that normally deliver the corrosive gas to the laser.

Figures 4 and 5 (Appendix) show the layout of the COMPex lasers 100 and 200/300.

1.4 The NovaTube™ Innovation

The essence of NovaTube™ is the elimination of contamination effects through careful design and material optimization. All laser tube components are assembled in a clean-room. Optimized electrode materials combined with an improved preionization scheme lead to minimum erosion of the electrodes. The superior Lambda Physik gas flow system allows stable operation of the laser even at a high repetition rate. These major improvements of the laser tube lead to a considerable increased laser tube lifetime and gas lifetime, too.

1.5 The Halo Safe™ Innovation

The halogen generator from LAMBDA PHYSIK eliminates the need for handling toxious gases. This system generates ultra-pure halogen, eliminating the need for an external halogen bottle.

The generator is built-in an external cabinet.

The COMPex features the halogen generator, Halo Safe™ as an option.

2 Safety Aspects

Lasers and laser systems are classified according to their relative hazards, and these classifications can be found in the American National Standards for the Safe Use of Laser (ANSI Z 136.1-1986), FDA 21 CFR 1040.10 and 1040.11, and IEC-825. Within this classification, the COMPex excimer laser is a Class IV laser. It must be regarded as a potential hazard to the human operator and a potential fire hazard.

Observe the accident and safety precautions as established by professional associations and unions. In Germany:

„Unfallverhütungsvorschrift "Lasertrahlung" (VBG 93) der Berufsgenossenschaft der Feinmechanik u. Elektrotechnik"

Make sure that laser warning labels are fixed according to local safety regulations.

All installation work, maintenance, repair, modification and all other activities involving the COMPex laser system must only be carried out by authorized, fully qualified personnel.

WARNING:

Work on the electrical system and equipment must be carried out only by a skilled electrician or by instructed persons under the supervision and guidance of a skilled electrician and in accordance with electrical engineering rules and regulations.

Work on gas equipment must be carried out by specially trained personnel only.

A warning light can be connected to the COMPex laser to give a remote indication of the state of the laser. Signals indicate that the laser is emitting radiation.

It is possible to connect one external EMO (Emergency OFF Switch) to switch off the laser remotely, e. g., when the door of the laser room is opened.

2.1 Primary Safety Hazards

1. High intensity ultraviolet radiation of 157 nm, 193 nm, 248 nm, 308 nm and 351 nm.

   NOTE:
   Operating the laser at 157 nm causes spontaneous and stimulated emission of radiation in the range of 620 nm to 780 nm!

WARNING*:*
The ultraviolet radiation of an excimer laser represents a special source of danger since the radiation lies outside the visible range. Make sure that suitable protective eyewear is available for putting the laser into operation.

For further information see chapter 1.17.

2. The alignment laser emits radiation at a wavelength of 670 nm.

   Gases, including the toxic fluorine or hydrogen chloride.

   The MAK values according to the German publication:

„Technische Regel (TRGS 900) des Ausschuß für Gefahrstoffe des Bundesministeriums für Arbeit und Soziales“

   are as follows:

   Limits F_2:

   0.1 ppm (0.2 mg/m³)

   Limits HCl:

   5.0 ppm (7 mg/m³)

3. High voltage electricity, up to 32 kV.

   A 200 MΩ high voltage resistor on the main capacitors and the layout of the laser cabinet is used for protection.

2.2 Secondary Safety Hazards

1. Ozone may be generated by high intensity radiation at 193 nm and 157 nm.

The MAK values according to the German publication

„*Technische Regel (TRGS 900) des Ausschuß für Gefahrstoffe des Bundesministeriums für Arbeit und Soziales*“

are as follows:

Limit O_3:

0.1 ppm (0.2 mg/m³)

2. Ionizing radiation is generated by the HV switch used (thyratron).

   Limit Radiation:

   0.2 µSievert/h at 10 cm distance

2.3 Constructive Safety Features

The laser is equipped with the following constructional safety precautions, which protect against these safety hazards:

- The laser can only be switched on with the key switch. This prevents the laser from inadvertent or unauthorized starting. It cannot be operated with the key in OFF position and the key cannot be removed in ON position.
- COMPex lasers provide a connector („Remote Control“) at the rear panel, where electrical circuits for a warning light and an external interlock switch can be installed (the appropriate plug is enclosed in your tool box).

  The warning light signalizes that the laser is operating and therefore warn of the risk of laser radiation.

  The interlock switch shuts down the laser externally, e. g. if someone opens a door connected with the switch.
- All parts of the laser where laser radiation may possibly escape are marked with the appropriate adhesive danger signs (according to IEC 825).
- The beam exit at the laser housing can be closed by a manual operated beam shutter.
- Opening a service panel shuts off the high voltage by an interlock switch (no laser radiation).

- The EMI housing (*E*lectro*M*agnetic *I*nterference) encloses the HV parts of the laser to protect the surrounding against ionizing radiation and electromagnetic interference.

  A correct closed laser housing shields the surrounding completely against the ionizing radiation. The emission of ionizing radiation was checked by the German *Physikalisch Technische Bundesanstalt* (PTB). No detected radiation, above background radiation, with covers closed.

- Opening the EMI housing discharges the capacitors by a safety switch release.

- It is possible to purge the beam path of the laser continuously with nitrogen. A purging procedure has to be performed if the laser operates with ArF (wavelength: 193 nm) or F_2 (wavelength: 157 nm). A fully nitrogen purged beam path prevents the ozone production.

- A powerful ventilation system causes the continuous subpressure in the laser housing during laser operation. This technique prevents toxic gas from escaping into the ambient air in case of a leak.

3 Physical Dimensions

COMPex 100:

Laser (l∗h∗w)	≈ 1300 x 795 x 385 mm^3
Weight	250 kg
(Appendix Figure 4)	

COMPex 200/300:

Laser (l∗h∗w)	≈ 1700 x 795 x 385 mm^3
Weight	325 kg
(Appendix Figure 5)	

Vacuum Pump:

Length∗height∗width	230 x 450 x 240 mm^3
Height (filter included)	530 mm
Weight	23 kg

CAUTION*:*

Due to the weight of the laser, make sure that for installation appropriate means of transport (e. g. a forklift) are available.

4 Electrical Requirements

COMPex Model	230 V / 400 V version					
	Voltage	Frequency	Phases	Wires	Power Cons.	Current
COMPex102	230 V	50 / 60 Hz	1	3	1.5 kVA	6 A
COMPex110	230 V	50 / 60 Hz	1	3	3 kVA	13 A
COMPex120	230 V	50 / 60 Hz	1	3	3 kVA	13 A
COMPex201	230 V	50 / 60 Hz	1	3	1.5 kVA	6 A
COMPex205	230 V	50 / 60 Hz	1	3	3 kVA	13 A
COMPex301	230 V	50 / 60 Hz	1	3	2 kVA	7 A

COMPex Model	115 V / 208 V version					
	Voltage	Frequency	Phases	Wires	Power Cons.	Current
COMPex102	120 V	50 / 60 Hz	1	3	1.5 kVA	12 A
COMPex110	120 V	50 / 60 Hz	1	3	3 kVA	25 A
COMPex120	120 V	50 / 60 Hz	1	3	3 kVA	25 A
COMPex201	120 V	50 / 60 Hz	1	3	1.5 kVA	12 A
COMPex205	120 V	50 / 60 Hz	1	3	3 kVA	25 A
COMPex301	120 V	50 / 60 Hz	1	3	2 kVA	14 A

Cable:

The laser is equipped with a 3-wire, 5 m long cable.

The vacuum pump is connected to the laser head with a 3 m long wire and does not require an additional current supply.

Connector:

Schuko, PVC MER 125463 (for Germany)

5 Remote Control Interlock

The number and location of external interlock switches must be determined by the safety requirements at the laser installation site. Typically, each installation has a unique configuration.

The external interlock switches get connected to the laser by means of a the remote interlock connector. The remote interlock connector for COMPex lasers is situated on the rear panel of the laser itself.

The connector is an 4 pin EMI-filtered female connector. Pins 1 and 4 serve as connection for an external laser radiation lamp (24 VAC/100 mA max.) Pins 2 + 3 serve as connection for the remote interlock short circuit (Figure 3).

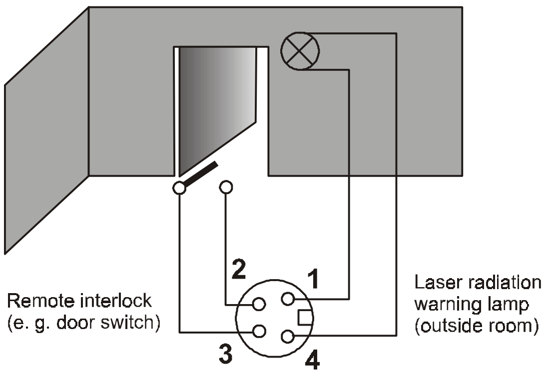


Figure 3: Remote Control Interlock

To ensure laser operation it is necessary to shorten pin 2 and 3 via a bridge (the appropriate plug is enclosed in your tool box) or an external switch. If not, the laser will shut down immediately with an interlock message.

6 Serial Interface (RS232C)

The laser can be controlled by an external PC system using the following interfaces

This connector is a 25 pole D-type female connector.

PIN	Signal	Specific.	Description
2	TXD	O, RS232	Transmit Data
3	RXD	I, RS232	Receive Data
7	GND		Signal Ground

Data format:

data bits	8
parity	no
stop bit	1
baud rate	9600 bps

7 Specification: External Trigger In and Sync. Out Signal

7.1 External Trigger In

It is possible to trigger the COMPex laser with an external source (trigger generator). This source has to be connected to the ‘EXT. TRIG.’ socket at the rear side of the laser. The specifications of this input are as follows:

Voltage:	+3.3 V.....+5 V
Impedance:	≥ 5 kΩ
Duration:	≥ 15 µs
positive slope	
Connector:	BNC

7.2 Sync. Out Signal

The trigger generator sends a pulse to the laser to fire.

At the same time a trigger pulse is send to the ‘SYNC. OUT’ BNC socket at the laser.

Voltage:	+3.3 V.....+5 V
Impedance:	≥1 kΩ
Duration:	15 µs
positive pulse	
Connector:	BNC

8 Cooling Water

The COMPex 102, COMPex 201 and COMPex 301 are fully aircooled. Installation of the water cooling is only required for the more powerful lasers COMPex 110 and COMPex 205.

CAUTION*:*
Do not use deionized water! (Danger of corrosion!)

NOTE:

- Suspended particles in the cooling water can cause sedimentation or even clog in the cooling circuit. Thus, the installation of a filter which is available in every installation store is strongly recommended.
- More than 1000 liters of water are consumed a day during intensive use of the excimer laser. Because of cost and environmental factors we recommend the installation of a water chiller.

For further information call Lambda Physik.

Specifications:

Temperature range (at water inlet)	5 - 20 °C (41°F - 68°F) for 100 % duty cycle
Flow	depends on the temperature of the water: 1 up to 5 l/min
Pressure	< 4 bar abs. (< 58 psi).
Heat transfer to water	≤ 1.5 kW
Connectors In /Out	10 mm Serto® The laser is connected to the water line by means of two ½ inch hoses (3 m length).

9 Gases

9.1 Gas Manufacturers

Recommended Gas Suppliers, Germany:

Spectra Gases GmbH

Ostheimer Allee 3-7
D - 64832 Babenhausen

Tel.: (06073) 6 20 01
Fax.: (06073) 6 20 08

AGA Gas GmbH

Postfach 201954
D - 20209 Hamburg

Tel.: (040) 42 10 50
Fax: (040) 42 105-342

Linde AG

Technische Gase, Seitnerstraße 70
D - 82049 Höllriegelskreuth

Tel.: (089) 74 46 10 72
Fax: (089) 74 46 16 59

Messer Griesheim GmbH

Industrial Gases Division, Fütingsweg 34
D - 47805 Krefeld

Tel.: (02151) 37 90
Fax: (02151) 37 91 15

Recommended Gas Suppliers, USA:

Spectra Gases, Inc.

277 Coit Street
Irvington, NJ 07111

phone: 201-372-2060
fax: 201-372-8551/0811

Air Products

Air Products + Chemicals Inc.
7201 Hamilton Blvd.
Ellentown, PA 18195

phone: 215-481-7728
fax: 215-481-7728

Recommended Gas Suppliers, Japan

Tomoe Shokai Co. Ltd.

1-1-25 Minami-Kamata
Ohta-ku, Tokyo 144 Japan

phone: 03-3734-1111
fax: 03-3739-1070

Iwantani Sangyo Ltd.

3-21-8 Nishishinbashi
Minato-ku, Tokyo 105 Japan

phone: 03-5405-5915
fax: 03-5405-5636

9.2 Gas Requirements

The active medium of an excimer laser is a mixture of a rare gas, a halogen and a buffer gas. The gases are mixed in the laser itself.

You need different gas mixtures for operating a COMPex on different wavelengths:

Gas Mixture	Wavelength
Ar, He, F_2 and Buffer (Ne [1])	193 nm
Kr, He, F_2 and Buffer (Ne)	248 nm
Xe, He [2], HCl, H_2 and Buffer (Ne)	308 nm
Xe, He, F_2 and Buffer (Ne)	351 nm
F_2 , He and Buffer (He)	157 nm

Normally COMPex is prepared for operating at one wavelength only.

It is possible to operate COMPex on different wavelengths if the COMPex is prepared for multigas-operation.

Make sure that the appropriate gas mixture(s) is/are available. Time of delivery: 4 - 6 weeks.

For low duty cycle applications that consistently use the same laser wavelength, a premix gas bottle operation can be recommended. In this case one cylinder of premix gas and another one with inert gas (Helium) for flushing is required.

Using our new halogen source Halo Safe™ reduces gas installation.

[1] Lambda Physik is the owner of US Patent # 4,393,505. This patent covers neon as a buffer gas to enhance excimer laser performance.

[2] Lambda Physik is the exclusive licensee under US Patent # 4,340,968. This patent covers hydrogen as an additive to improve Xenon chloride laser performance.

9.3 Pressure Regulators

Pressure regulators are delivered by gas manufacturers. Lambda Physik recommends pressure regulators which operate up to 5 bar (abs.) minimum. The joints for the gas pipes have to be provided with Gyrolok™-fittings for 6 mm pipe diameter. Stainless steel regulators are required for halogen gases. (For details see chapter "Gases Required")

9.4 Gas Cabinets

Gas cylinders, especially those containing fluorine and hydrogen chloride gas mixtures are in principal a safety hazard because of the risk of leakage. In order to diminish this risk safety gas cabinets are available. Please contact the gas manufacturers for further information.

CAUTION*:*
Especially for halogen gases a maximum of cleanness is required for the gas tubings.

Connections and Tubing:

Gas Connections:	6 mm Gyrolok™
Gas Tubing:	stainless steel 316 L, degreased and inside electropolished, 6 mm outer diameter

NOTE:

The fluorine supply line, using the external gas bottle, is recommended to be a double wall tubing.

9.5 Gases Required

The performance of the excimer laser depends on:

- quality of the gases used
- tightness of the gas installation
- cleanness of the gas equipment

Gas purity and gas mixture have a decisive influence on :

- pulse energy of the laser
- laser power
- gas lifetime
- energy and pulse-to-pulse stability

A halogen filter is built into the laser and will fully absorb the halogen during the gas filling process. There is no toxic gas released to the vacuum pump or laser exhaust.

Fluorine (only required without the optional halogen generator)

Type of gas	5 % F_2 / 95 % He mix
Purity of Helium	99.995 %
Purity of Fluorine	for excimer laser, HF-free
Pressure regulator	3.5 < p < 5 bar abs.
Flow	0.3 < flow < 3 l/s
RCS*)	10 l, 28 bar 400 psi

Hydrogen Chloride (in a gas mixture)

Type of gas	5 % HCl/1 % H_2 in He
Purity of the mixture	99.995 %
Pressure regulator	3.5 < p < 5 bar abs.
Flow	0.3 < flow < 3 l/s
RCS*)	10 l, 100 bar, 1400 psi

Argon

Purity	99.995 %
Pressure regulator	3.5 < p < 5 bar abs.
Flow	0.8 < flow < 3 l/s
RCS*)	50 l, 200 bar, 2800 psi

Krypton

Purity	99.99 %
Pressure regulator	3.5 < p < 5 bar abs.
Flow	0.8 < flow < 3 l/s
RCS*)	10 l, 100 bar, 1400 psi

Xenon

Purity	99.99 %
Pressure regulator	3.5 < p < 5 bar abs.
Flow	0.8 < flow < 3 l/s
RCS*)	2.5 l, 50 bar, 700 psi

Neon[1]

Purity	99.995 %
Pressure regulator	3.5 < p < 5 bar abs.
Flow	0.8 < flow < 3 l/s
RCS*)	200 l, 200 bar, 2800 psi

Helium (flushing gas for the laser tube)

Purity	99.995 %
Pressure regulator	3.5 < p < 5 bar abs.
Flow	0.8 < flow < 3 l/s
RCS*)	200 l, 200 bar, 2800 psi

Nitrogen (purge gas for the beam path)

Purity	99.999 % or boil off
Pressure regulator	2 < p < 2.5 bar abs.
Pressure regulator (for halogen source)	6.5 ≤ p < 7 bar abs.
Flow	1< flow •12 l/min)
RCS*)	50 l, 200 bar, 2800 psi

**) RCS = Recommended Cylinder Size expressed as internal water volume and initial pressure.*

!

Note:
Buy only as much gas as required for one year, especially F_2 and HCl, because these gases decay in the cylinders by wall reaction.

[1] Lambda Physik is the owner of US Patent # 4,393,505. This patent covers neon as a buffer gas to enhance excimer laser performance.

9.6 Optimum Gas Mixture (November 1996)

COMPex 102 COMPex 110	Wavelength	Pressure [mbar]	Gas	Pressure [%]	Total Pressure [mbar]
	ArF (193 nm)	100 160 2340 400	F_2/He Ar Ne He	0.17/3.16 5.33 78.00 13.33	3000
	KrF (248 nm)	80 100 3120	F_2/He Kr Ne	0.12/2.30 3.03 94.55	3300
	XeCl (308 nm)	80 60 3060	HCl/H_2/He Xe Ne	0.13/0.02/2.35 1.87 95.63	3200
	XeF (351 nm)	120 15 3165	F_2/He Xe Ne	0.18/3.46 0.45 95.91	3300
	F_2 (157 nm)	80 2620	F_2/He He	0.15/2.81 97.04	2700

COMPex 201 COMPex 205	Wavelength	Pressure [mbar]	Gas	Pressure [%]	Total Pressure [mbar]
	ArF (193 nm)	100 200 2900	F_2/He Ar Ne	0.16/2.96 6.25 90.63	3200
	KrF (248 nm) f. COMPex 201	60 130 3120	F_2/He Kr Ne	0.10/1.71 3.93 94.26	3310
	KrF (248 nm) f. COMPex 205	60 130 3210	F_2/He Kr Ne	0.09/1.68 3.82 94.41	3400
	XeCl (308 nm)	60 100 3440	HCl/H_2/He Xe Ne	0.08/0.02/1.57 2.78 95.55	3600
	XeF (351 nm)	130 15 2855 300	F_2/He Xe Ne He	0.20/3.74 0.45 86.52 9.09	3300
	F_2 (157 nm)	90 2710	F_2/He He	0.16/3.05 96.79	2800

COMPex 301	Wavelength	Pressure [mbar]	Gas	Pressure [%]	Total Pressure [mbar]
	ArF (193 nm)	70 140 2690 600	F_2/He Ar Ne He	0.10/1.90 4.00 76.86 17.14	3500
	KrF (248 nm)	70 100 2930 600	F_2/He Kr Ne He	0.10/1.79 2.70 79.19 16.22	3700
	XeCl (308 nm)	60 70 3570	HCl/H_2/He Xe Ne	0.08/0.02/1.52 1.89 96.49	3700
	XeF (351 nm)	120 15 2965 600	F_2/He Xe Ne He	0.16/3.08 0.40 80.14 16.22	3700
	F_2 (157 nm)	90 2710	F_2/He He	0.16/3.05 96.79	2800

10 Air Intake and Exhaust

The laser has one central air exhaust. The exhaust air does under normal operating conditions not include any toxic gases or by-products. Nevertheless, for certain failure scenarios the exhaust air may include halogen gas or ozone in a small concentration and shall be treated accordingly. An effective protection is only guaranteed if the hose is lead to an appropriate ventilation.

CAUTION:

Lead the exhaust of the laser and the vacuum pump into an appropriate exhaust.
Make sure that the exhaust of the laser and the vacuum pump is not connected to the duct system of systems used for the processing of breathing air (e. g. air conditioning or ventilating systems).

Specifications:

Air Flow	≈200 m³/h (≈100 cfm)
Diameter	150 mm Hose length 3 m max. If the distance to the ventilation is more than 5 m, an additional blower has to be installed.
Heat transfer to exhaust	<1 kW

11 Vacuum Pump

Cable:

The vacuum pump is connected to the laser by a 2 m long vacuum hose. The voltage supply is provided by a 3 m long cable which is attached to the laser.

NOTE:

The vacuum pump is a dry-running pump.

Clearance between the vacuum pump and adjacent walls should be no less than 10 cm of free space in order to ensure sufficient air flow for cooling. Ambient temperatures must not exceed 40 °C.

The user should provide a flexible 3/4“ hose for the attachment of the pump exhaust to the main ventilation.

CAUTION:

Lead the exhaust of the vacuum pump into an appropriate exhaust.
Make sure that the exhaust of the vacuum pump is not connected to the duct system of systems used for the processing of ambient air (e. g. air conditioning or ventilating systems).

12 Beam Exit Position

The laser has the beam exit at the left front side with respect to the service panel (Figure 4, 5 Appendix). The laser is equipped with height-adjustable feet (Figure 6 Appendix). Therefore, the beam exit can be varied up to 40 mm in the vertical position.

13 Maintenance / Installation Area

The required space for the installation is represented in the maintenance area (Figure 7 and 8 Appendix).

The installation and connection of the gas lines need a space of at least. 0.8 m at the back side of the laser.

To access the optical modules for maintenance min. 0.5 m space in front of the laser must be available.

For service actions which can be done by removing the service panel a distance of min. 1 m from the laser is required.

14 Transport and Storage Conditions

Temperature range	-20 ...50 °C
Max. temperature gradient	5 °C/h
Ambient air pressure	650...1070 mbar
Max. pressure gradient	75 mbar/h
Humidity	< 70 % RH

15 Operational Environmental Conditions

Temperature laser	5 - 25 °C
Max. temp gradient (after warm up)	5 °C/h
Altitude	0 ... 2000 m above sea level
Humidity	30 - 70 % RH

CAUTION

Make sure that the air is free of dust, oil, organic particles, corroding substances and photochemical decompositables or depositable compounds.
It is required to protect the beam path and the laser optics with a purgable shield at critical environmental conditons.

Cleanliness	class 10,000 or better

16 Specifications (April 96)

All specifications are subject to change without notice in order to provide the best product possible. All data given, except F_2, are measured with an energy monitor and optimized gas mixtures.

16.1 COMPex 100

	Type of Laser	F_2	ArF	KrF	XeCl	XeF	Units
Wavelength		157	193	248	308	351	nm
Pulse Energy [1)]	COMPex 102 (Multigas)	10	200	300	200	150	mJ
	COMPex 102 (F-Version)	10	200	350	---	150	mJ
	COMPex 110 (Multigas)	10	200	300	200	150	mJ
	COMPex 110 (F-Version)	10	200	350	---	150	mJ
Max. Rep. Rate	COMPex 102	20	20	20	20	20	Hz
	COMPex 110	50	100	100	100	100	Hz
Average Power [2)]	COMPex 102 (Multigas)	0.2	4	6	4	3	W
	COMPex 102 (F-Version)	0.2	4	7	---	3	W
	COMPex 110 (Multigas)	0.4	12	25	20	12	W
	COMPex 110 (F-Version)	0.4	12	30	---	12	W
Pulse Duration	COMPex 102	---	25	30	20	25	ns, FWHM
(nominal)	COMPex 110	---	25	30	20	25	ns, FWHM
Beam Dimensions [3)]	COMPex 100 series	24 x 5-10	24 x 5-10	24 x 5-10	24 x 5-10	24 x 5-10	mm² (V x H)
Beam Divergence [3)]	COMPex 100 series	3 x 1	3 x 1	3 x 1	3 x 1	3 x 1	mrad (V x H)

1) measured at low repetition rate

2) measured at max. repetition rate

3) typical value, FWHM

16.2 COMPex 200/300

	Type of Laser	F_2	ArF	KrF	XeCl	XeF	Units
Wavelength		157	193	248	308	351	nm
Pulse Energy [1)]	COMPex 201 (Multigas)	16	400	600	400	300	mJ
	COMPex 201 (F-Version)	16	400	650	---	300	mJ
	COMPex 205 (Multigas)	16	400	600	400	300	mJ
	COMPex 205 (F-Version)	16	400	650	---	300	mJ
	COMPex 301 (Multigas)	16	650	900	600	500	mJ
	COMPex 301 (F-Version)	16	650	1000	---	500	mJ
Max. Rep. Rate	COMPex 201	10	10	10	10	10	Hz
	COMPex 205	40	50	50	50	50	Hz
	COMPex 301	10	10	10	10	10	Hz
Average Power [2)]	COMPex 201 (Multigas)	0.15	4	5	3.5	3	W
	COMPex 201 (F-Version)	0.15	4	6	---	3	W
	COMPex 205 (Multigas)	0.7	15	25	20	15	W
	COMPex 205 (F-Version)	0.7	15	30	---	15	W
	COMPex 301 (Multigas)	0.15	6	9	6	5	W
	COMPex 301 (F-Version)	0.15	6	10	---	5	W
Pulse Duration	COMPex 201	---	20	25	25	20	ns, FWHM
(nominal)	COMPex 205	---	20	25	25	20	ns, FWHM
	COMPex 301	---	25	25	25	20	ns, FWHM
Beam Dimensions [3)]	COMPex 200 series	24 x 6-12	24 x 6-12	24 x 6-12	24 x 6-12	24 x 6-12	mm² (V x H)
Beam Dimensions [3)]	COMPex 300 series	30 x 8-15	30 x 8-15	30 x 8-15	30 x 8-15	30 x 8-15	mm² (V x H)
Beam Divergence [3)]	COMPex 200/300 series	3 x 1	3 x 1	3 x 1	3 x 1	3 x 1	mrad (V x H)

1) measured at low repetition rate

2) measured at max. repetition rate

3) typical value, FWHM

17 Recommendations

Safety

As a standard on laser safety we recommend the publication:
“Safety with Laser and other Optical Sources“; D.H. Sliney and M.L. Wolbarsht; Plenum Press, New York, London.

Safety Glasses

Make sure that appropriate safety glasses for the UV-spectral range are available. For USA and Canada all eyewear has to meet or exceed ANSI 136.1 (1993) requirements. For Germany and the European Union all eyewear has to meet or exceed EN 207 and therefore the CE standard. For other regions the eyewear has to meet or exceed regional and/or local requirements.

Gas Cabinets

Please be aware of the fact that gas cylinders, especially those which contain fluorine and hydrogen chloride gas mixtures are in principal a safety hazard because of the risk of leakage. In order to diminish this risk safety gas cabinets are available. Please contact the gas manufacturers for further information.

Table

Depending on the model, the laser weighs up to 325 kg. Therefore a stable support or suitable table is necessary. However, the vibration-cushioned laser tables commonly used for continuously operated lasers are not required for the operation of a COMPex excimer laser.

Energy Meter

Single pulses can be measured with a pyroelectric joule meter.

For further information please call:

Coherent Auburn Group,
Bld.1: 2301 Lindbergh St.,
Auburn, CA 95602-9595

fax: (916) 823-9550
phone: (916) 888-5107

or:

Coherent GmbH,
Dieselstrasse 5b,
D - 64807 Dieburg, Germany

fax: +49 6071 968-499
phone: +49 6071 968-0

Energy Meter Display

In order to display the detector signal during measurements we recommend the read out unit of Coherent or a simple oscilloscope, e. g. TEK 2213.

For the installation procedure the equipment of our service engineer includes a detector.

The oscilloscope has to be provided by the customer.

For further information please call Coherent (Address see above).

Power Meter

Thermopile power meters are suitable for measuring the average power output.

For higher demands we recommend the FIELDMASTER or LABMASTER of Coherent.

For further information please call Coherent (Address see above)

Alignment

For alignment procedures Lambda Physik offers Diode Laser (670 nm) and alignment mechanics. These tools are adapted to all COMPex lasers which include dielectrically coated rear mirror optics.

Unstable Resonator Optics

Unstable resonator optics allow generation of a low divergent laser beam of high focusability. For further information please call Lambda Physik.

Tools

A tool kit which includes all necessary parts for routine operation is provided free with the laser.

Water Temperature Regulation

For the high power models water cooling is required.

A water temperature regulation for gas temperature stabilization is available as an option. This device improves the long term output stability of the laser especially for the operation with ArF gas mixture.

For further information please call Lambda Physik.

Water Filters

Suspended particles in the cooling water can cause sedimentation or even clog in the cooling circuit.

Therefore, we recommend the installation of a filter which is available in every installation store.

Please contact Lambda Physik for more information.

Cooling

More than 1000 liter water are consumed a day during intensive use of the excimer laser. Due to cost and environmental factors we recommend the installation of a closed cycle heat exchanger.

Please contact Lambda Physik for more information.

18 Checklist

- The laser system is delivered by a forwarding company. Please see the order confirmation for the planned date of delivery.
- Even with the most careful packing, damages during transport can not be excluded. Therefore, please check after receiving if the content is complete and undamaged.
- Before you finally contact our service department for the installation of the laser system, please check the following:

  ☐ support/table

  ☐ gases (see section 1.9), term of delivery:
  4-6 weeks!

  ☐ power supply (see section 1.4)

  ☐ water supply (see section 1.8)

  ☐ air intake and exhaust (see section 1.10)

  ☐ exhaust vacuum pump (see section 1.10)

  ☐ safety (see section 1.2)

  ☐ appropriate protective eyewear (see section 1.17)

CAUTION*:*

Due to the weight of the laser, make sure that for installation appropriate means of transport (e. g. a forklift) are available.

19 Telephone Advice

U.S.A.
Lambda Physik Inc.
3201 West Commercial Blvd.
Ft. Lauderdale, FL 33309, U.S.A.

Tel.: (9 54) 4 86- 15 00
(8 00) EXCIMER
Fax: (9 54) 4 86- 15 01
eMail: salesusa@lambdaphysik.com

GERMANY
Lambda Physik GmbH
Hans-Böckler-Strasse 12
D - 37079 Göttingen, Germany
Tel: +49 / 551 / 69 38 - 0
Fax: +49 / 551 / 6 86 91
eMail: salesgermany@lambdaphysik.com

JAPAN
Lambda Physik Japan Co. Ltd.
German Industry Center
1-18-2 Hakusan
J-Yokohama 226, Midori-ku

Tel.: 04-59 39-78 48
Fax: 04-59 39-78 49

Marubun Corp.
Marubun Daiya Bldg.
8-1 Nihonbashi Odenmacho
Chuo-ku, Tokyo 103 Japan

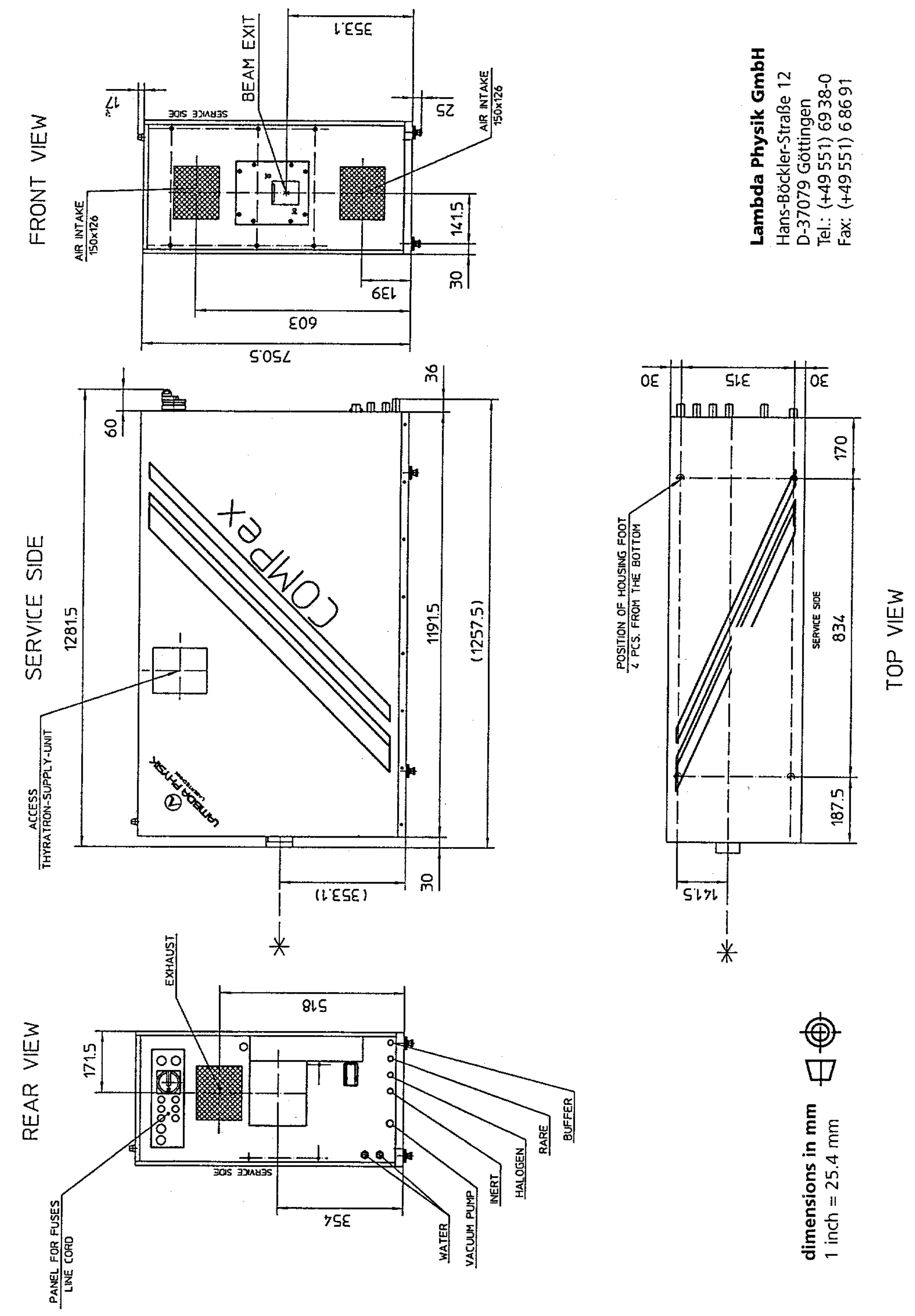
Tel.: 03-36 39-98 11
Fax: 03-36 62-1349

Appendix

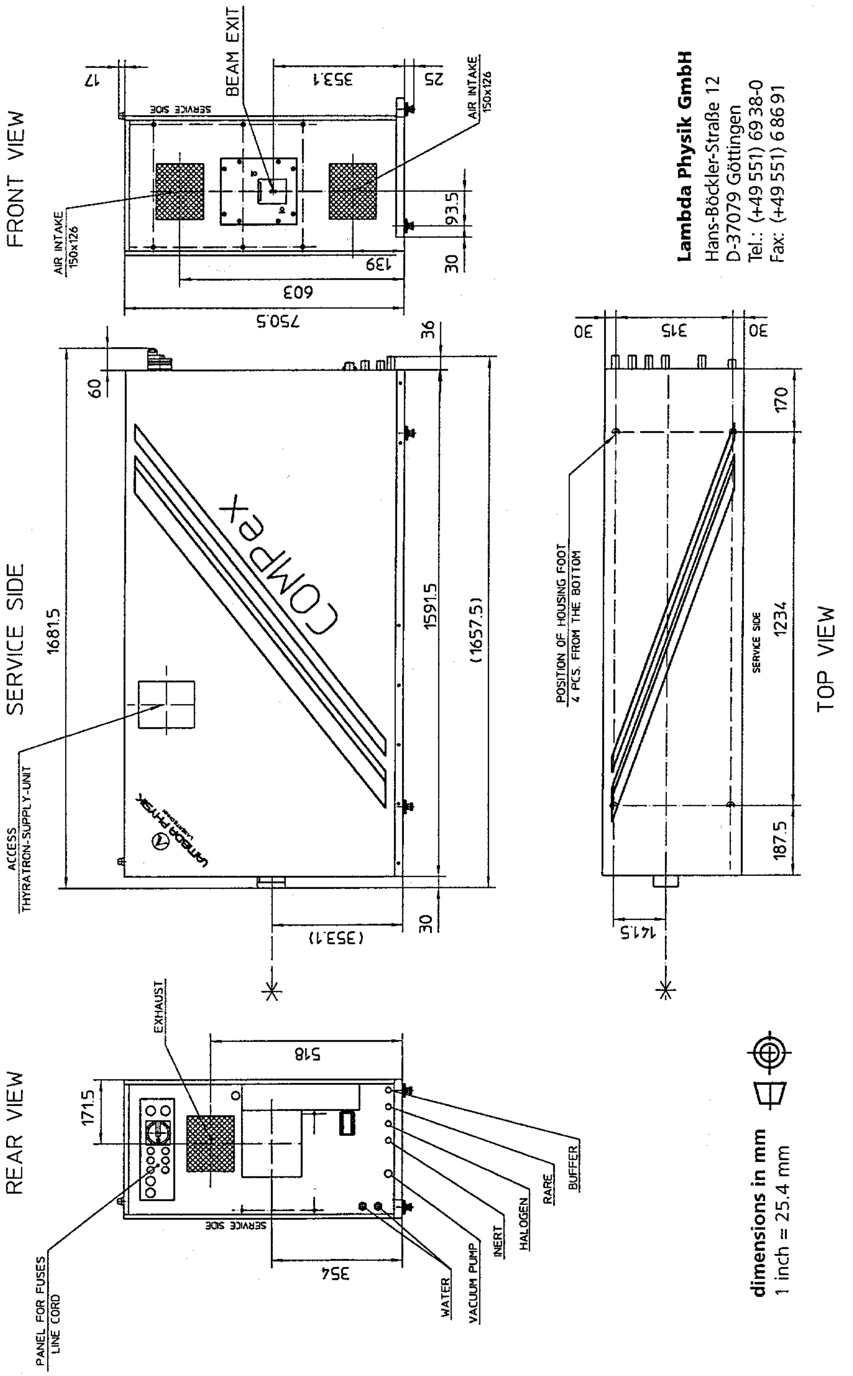
Figure 4: Physical dimensions COMPex 100
Figure 5: Physical dimensions COMPex 200/300
Figure 6: Foot dimensions of the COMPex
Figure 7: Maintenance area COMPex 100
Figure 8: Maintenance area COMPex 200/300

20 Figures

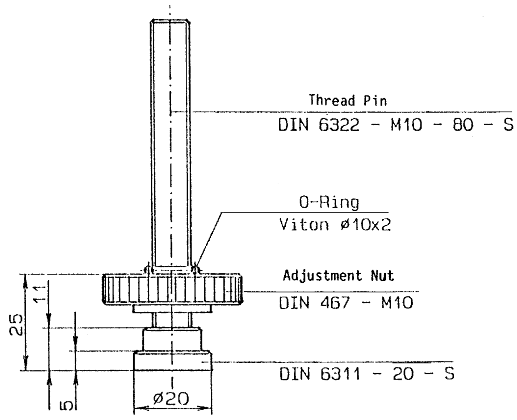
20.1 Figure 4: COMPex 100 (10/96)



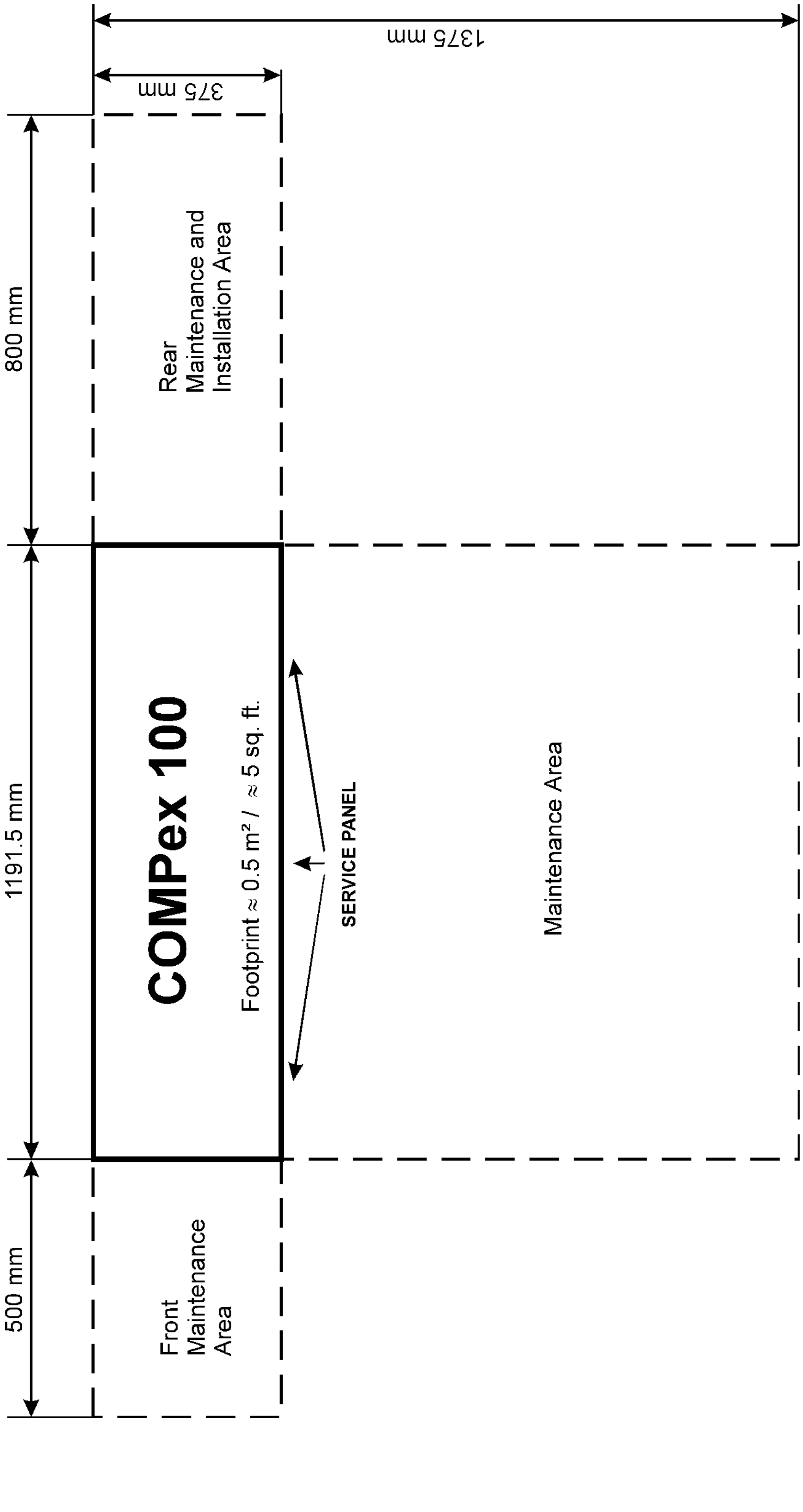
20.2 Figure 5: COMPex 200/300 (10/96)



20.3 Figure 6: Height-Adjustable Feet



20.4 Figure 7: Maintenance Area COMPex 100



20.5 Figure 8: Maintenance Area COMPex 200/300