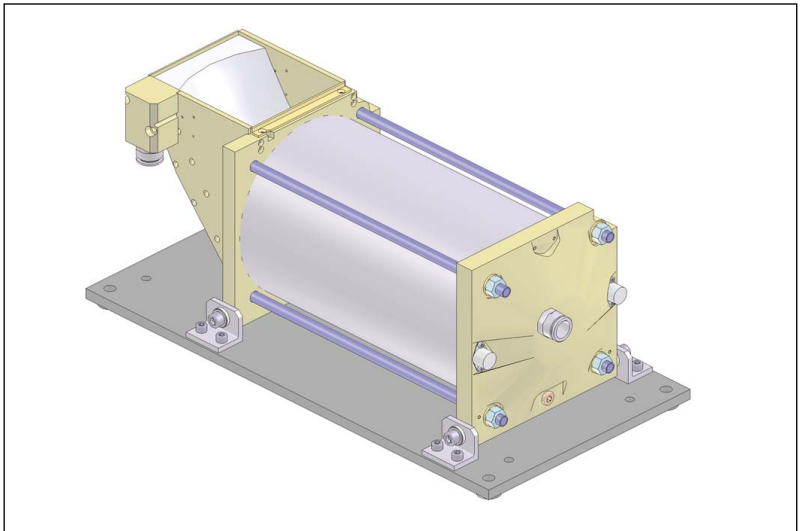


## Operating Manual

Translation of the original instructions



### Absorber C20/100 with water-cooling

NIR or CO<sub>2</sub>



**IMPORTANT!**  
**READ CAREFULLY BEFORE USE.**  
**KEEP FOR FUTURE USE.**

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## 1 Basic safety instructions

### Intended use

The absorber C20/100 is intended for installation and permanent integration into a laser system. The absorber converts the radiation of NIR- or CO<sub>2</sub>-lasers into heat, which is then dissipated into the cooling water that is flowing through. Please observe and adhere to the specifications and limit values given in chapter 9 „Technical data“ on page 17. Forms of use, other than the intended use described herein, are considered improper. For the safe use of the absorber, the information in this operating manual must be adhered to.

Using the absorber for use other than that described in this operating manual is prohibited strictly by the manufacturer. By usage other than intended, the absorber can be damaged or destroyed. This poses an increased health hazard up to and including fatal injuries. When operating the absorber, it must be ensured that there are no potential human health hazards.

The absorber does not ensure complete absorption of the laser radiation. Please keep in mind that there is a residual reflection (typically 0.5 % to 1 %). Please observe that, even with the use of the absorber, scattered radiation (**laser class 4**) can arise. Hence, the applicable safety regulations are to be observed and necessary protective measures must be taken.

### Observing applicable safety regulations

Please observe valid national and international safety regulations as stipulated in ISO/CEN/TR standards as well as in the IEC-60825-1 regulation, in ANSI Z 136 “Laser Safety Standards” and ANSI Z 136.1 “Safe Use of Lasers”, published by the American National Standards Institute, and additional publications, such as the “Laser Safety Basics”, the “LIA Laser Safety Guide”, the “Guide for the Selection of Laser Eye Protection” and the “Laser Safety Bulletin”, published by the Laser Institute of America, as well as the “Guide of Control of Laser Hazards” by ACGIH.

### Taking necessary safety measures

If there are people present within the danger zone of visible or invisible laser radiation, for example near laser systems that are only partly covered, open beam guidance systems or laser processing areas, the following safety measures need to be taken:

- Please wear **safety goggles** adapted to the power, power density, laser wave length and operating mode of the laser beam source in use.

- Depending on the laser source, it may be necessary to wear suitable **protective clothing** or **protective gloves**.
- Please protect yourself from direct laser radiation, scattered radiation as well as from beams generated from laser radiation (e.g. by using appropriate shielding walls).
- Please use beam guidance- or beam absorber elements which do not emit any hazardous particles as soon as they get in contact with laser radiation and which resist the beam sufficiently.
- Please install safety switches and/or emergency safety mechanisms which enable an immediate closure of the laser shutter.
- Please ensure a stable mounting of the absorber in order to prevent a relative motion of the absorber to the beam axis of the laser and thus to reduce the risk of scattered radiation.
- The absorber temperature is to be monitored with a temperature sensor.
- The cooling water flow rate is to be monitored.

### **Employing qualified personnel**

The absorber may only be operated by qualified personnel. The qualified personnel must have been instructed in the installation and operation of the absorber and must have a basic understanding of working with high-power lasers, beam guiding systems and focusing units.

### **Conversions, modifications and repairs**

The absorber must not be modified, neither constructionally nor safety-related, without our explicit permission. The absorber must not be opened e.g. to carry out unauthorized repairs. Modifications of any kind will result in the exclusion of our liability for resulting damages.

### **Liability disclaimer**

The manufacturer and the distributor of the absorber do not claim liability for damages or injuries of any kind resulting from an improper use or handling of the absorber. Neither the manufacturer nor the distributor can be held liable by the buyer or the user for damages to people, material or financial losses due to a direct or indirect use of the absorber.

## 2 Symbol explanation

The following symbols and signal words indicate possible residual risks:



### DANGER

means that death or serious physical injuries **will** occur if necessary safety precautions are not taken.

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### WARNING

means that death or serious physical injuries **can** occur if necessary safety precautions are not taken.

---



### CAUTION

means that a slight physical injury **can** occur if necessary safety precautions are not taken.

---

### NOTICE

means that property damages **can** occur if necessary safety precautions are not taken.

---

The device itself or the packing bears the following symbols to indicate requirements and possible dangers:



Read and observe the operating instructions and safety guidelines before the start-up!



Do not reach in

Further symbols that are not safety-related:



With the CE marking the manufacturer guarantees that his product is in conformity with the EC guidelines.

► Call for action

### 3 Conditions at the installation site

- The absorber must not be operated in a condensing atmosphere.
- The ambient air must be free of organic gases.
- Protect the absorber from splashes of water and dust.
- Operate the absorber in closed rooms only.

### 4 Transport

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#### **NOTICE**

##### **Damaging/Destruction of the absorbers**

Hard impacts or dropping the absorber can damage the absorber.

Touching the parabolic mirror can lead to burn-in. Burn-in leads to damage to the parabolic mirror and increases the scattered radiation.

- ▶ Do not touch the parabolic mirror in the inlet aperture.
  - ▶ Handle the absorber carefully when transporting it.
- 

#### **NOTICE**

##### **Damage/destruction of the absorber caused by leaking or freezing cooling water**

Leaking cooling water can damage the parabolic mirror of the absorber. Transporting the absorber at temperatures near or below freezing and without emptying the cooling circuit completely can cause damage.

- ▶ Empty the lines of the cooling circuit completely using compressed air (max. 3 bar).
  - ▶ Close the connector plug of the cooling circuit with the included sealing plug.
  - ▶ To avoid contamination, please cover the inlet aperture with optical tape.
-



## 5 Install/remove the absorber

### 5.1 Install the absorber



#### DANGER

Serious eye or skin injury due to laser radiation

If the stability of the absorber is not guaranteed or if the absorber is not installed with the inlet aperture towards the laser beam, scattered or directed reflection of the laser beam will result.

- ▶ Install the absorber with the inlet aperture facing the laser beam.
- ▶ Install the absorber in a way that ensures, that the absorber can not shift or fall.

1. Align the absorber with the inlet aperture towards the laser beam. Observe the specifications in chapter 9 „Technical data“ on page 17.
- Do not touch the parabolic mirror in the entrance aperture.
2. Install the absorber with four M8 fixing screws in the  $\varnothing 8,4$  mm through holes.
3. Ensure a stable installation of the absorber.
- The absorber must not be able to move.

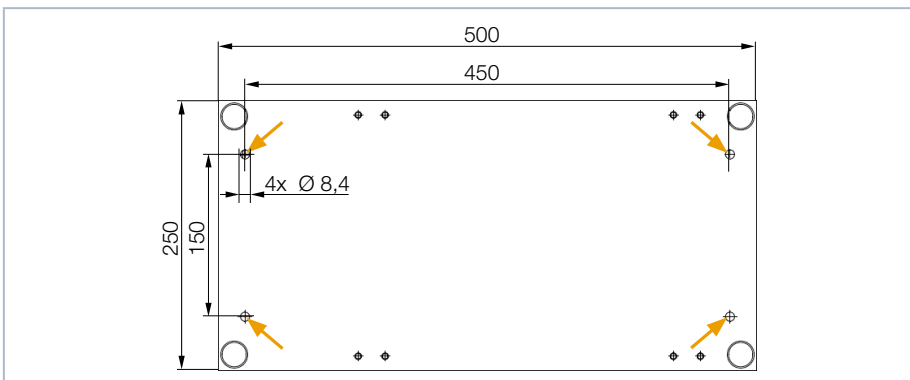


Fig. 5.1: Four through holes  $\varnothing 8.4$  mm (view from below)

## 5.2 Remove the absorber

Even when used as intended, parts of the absorber can become very hot. Temperatures above 70 °C can be reached.



### **WARNING**

#### **Risk of burns – Hot surface**

**The absorber is very hot after operation. Touching the hot absorber can cause severe burns.**

- ▶ **Allow the absorber to cool for a adequate time before removing it. Make sure before touching the absorber that it is no longer hot.**

- 
1. After cooling down of the absorber unscrew 4 M8 fixing screws (see Fig. 5.1 on page 9).
  2. Remove the absorber from the laser system.
- Do not touch the parabolic mirror in the entrance aperture.

## 6 Connect cooling circuit



### DANGER

Fire hazard; Damage/Destruction of the absorber due to overheating

If there is no water cooling or a water flow rate which is insufficient, there is a danger of overheating, which can damage the absorber or set it on fire.

- ▶ Operate the absorber only with installed water cooling and sufficient flow.

### 6.1 Water quality

#### NOTICE

Damage/Destruction of the absorber due to different chemical potentials

The parts of the absorber which get in contact with cooling water consist of copper, brass or stainless steel. A connection of the absorber to aluminum pipes can lead to corrosion of the aluminum due to the different chemical potentials.

- ▶ Do not connect the absorber with a cooling circuit made of aluminium.

- The water-cooled absorber is made of copper and can be operated with tap water as well as demineralized water.
- Do not operate the absorber on a cooling circuit containing additives such as anti-freeze.
- Do not operate the absorber on a cooling circuit in which aluminum components are installed. Especially when it comes to the operation with high powers and power densities, it may otherwise lead to corrosion in the cooling circuit. In the long term, this reduces the efficiency of the absorber and the cooling circuit.
- Should the cooling fail, the absorber can withstand the laser radiation for a few seconds. In this case, please check the absorber as well as the water connections for damages and replace them if necessary.
- Large dirt particles or teflon tape may block internal cooling circuits. Therefore, please thoroughly rinse the system before connecting it.

## 6.2 Water pressure

Normally, 4 bar primary pressure at the entrance of the absorber are sufficient in case of an unpressurized outflow.

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**NOTICE**

**Damage/Destruction of the absorber due to overpressure**

- ▶ **The maximum permissible water pressure is 6 bar.**
- 

## 6.3 Humidity

- The absorber must not be operated in a condensing atmosphere. The humidity has to be considered in order to prevent condensates within and outside the absorber.

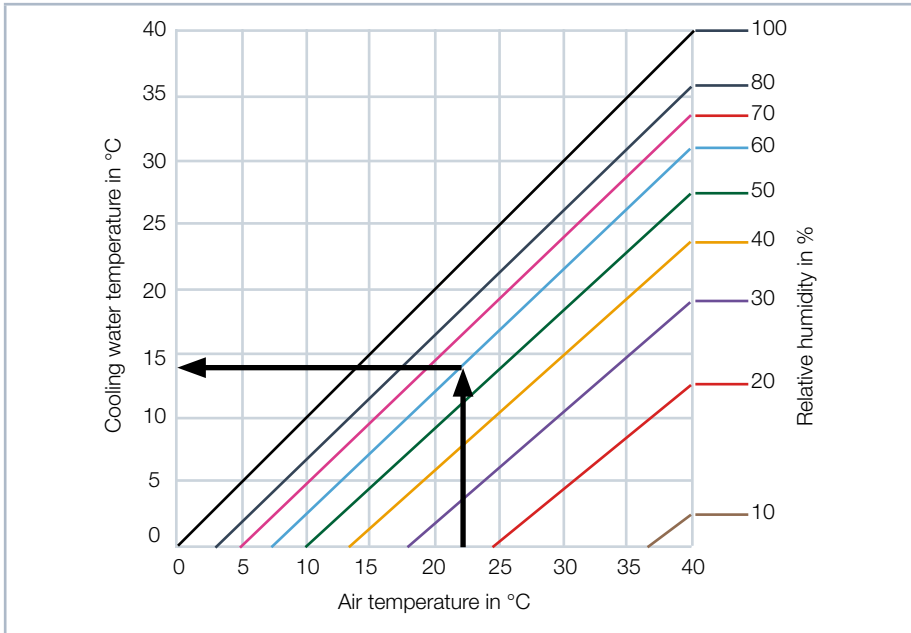
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**NOTICE**

**Damage/Destruction of the absorber due to condensing water**

**Condensation water inside of the absorber can lead to damage.**

- ▶ **The temperature of the cooling water must not be lower than the dew point (see Tab. 6.1 on page 13).**
-



Tab. 6.1: Dew point diagram

### Example

Air temperature: 22 °C

Relative humidity: 60 %

The cooling water temperature cannot fall below 14 °C.

## 6.4 Water connections and water flow rate

Connection diameter	Recommended flow rate	Minimum flow rate
PE hoses 16 mm	15 – 30 l/min	8 l/min at 40 % of the max. laser power

## 6.5 Remove the sealing plugs of the water connections

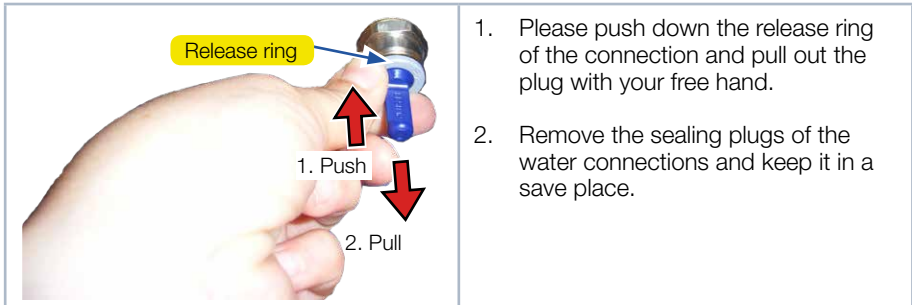


Fig. 6.1: Remove the sealing plugs of the water connections

## 6.6 Connect the water supply

The absorber is equipped with 2 ELSA push-in fittings for hose outer diameters of 16 mm.

1. Connect the 2 ELSA push-in fittings with the on-site water supply (see Fig. 6.2 on page 14).
2. Activate the on-site water supply.
3. Check whether the on-site water cooling is in operation.
- The absorber must feel cool to the touch.

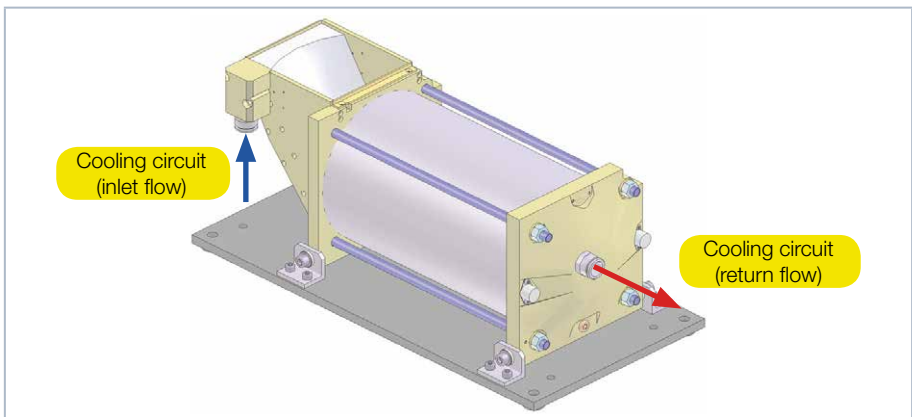


Fig. 6.2: Two ELSA push-in fittings

## 7 Operation

1. Please observe the safety instructions in chapter 1 „Basic safety instructions“ on page 5.



### **DANGER**

**Serious eye or skin injury due to laser radiation**

The absorber does not ensure complete absorption of the laser radiation. Please keep in mind that there is a residual reflection (typically 0,5 % to 1 %).

- ▶ Please observe the safety instructions in chapter 1 „Basic safety instructions“ on page 5.

2. Please monitor the absorber temperature with a temperature sensor.



### **DANGER**

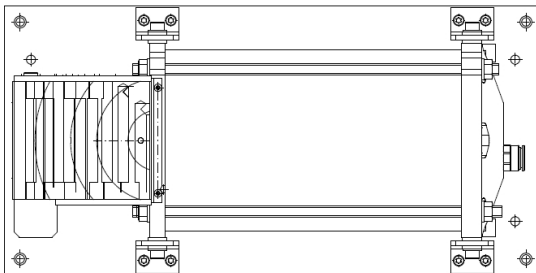
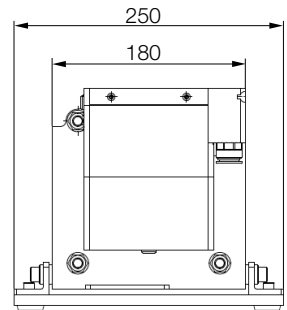
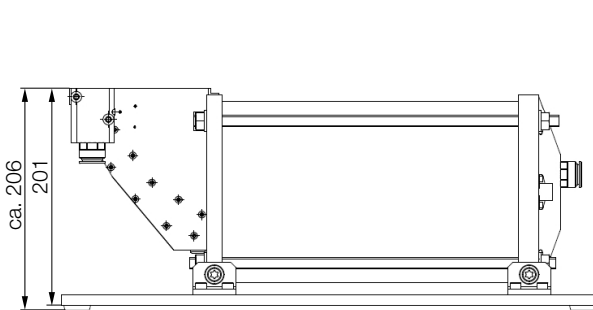
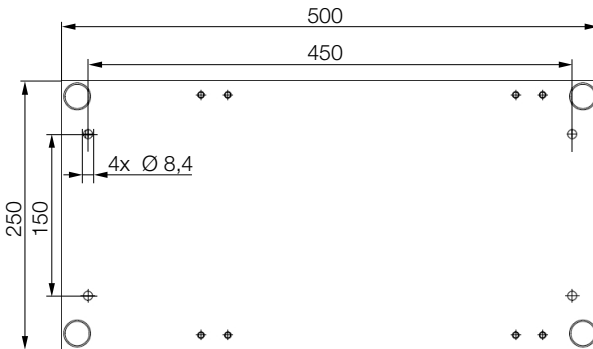
**Fire hazard due to glowing components**

In case of longer irradiation without cooling the absorber can overheat and start to glow in connection with temperatures of more than 1 000 °C.

- ▶ Do not keep flammable materials in the environment of the absorber.

3. Please monitor the flow rate of the cooling water.

## 8 Dimensions



All dimensions in mm (general tolerance ISO 2768-v)



## 9 Technical data

<b>Specifications</b>	
Max. laser power	20 kW
Max. power density	5 kW/cm <sup>2</sup>
Irradiation time	continuous
Wavelength range	800 – 1 100 nm (NIR) oder 10 600 nm (CO <sub>2</sub> )
Inlet aperture	100 mm
Beam Incidence	Vertically and centrally into the inlet aperture
	Maximum incidence angle deviation (divergence) ± 3°
	Maximum positioning offset ± 10 mm
The absorber temperature is to be monitored with a temperature sensor.	
<b>Water supply</b>	
Cooling water pressure	4 bar primary pressure with an unpressurized outflow, max. 6 bar
Minimum cooling water flow rate	8 l/min at 40 % of the max. laser power
Recommended cooling water flow rate	15 – 30 l/min
Cooling water temperature $T_{in}^{1)}$	Dew point temperatur < $T_{in}$ < 30 °C
<sup>1)</sup> Please contact PRIMES in advance in case you intend not to work within this specification.	
The cooling water flow rate is to be monitored.	
<b>Dimensions and Weight</b>	
Dimensions (L x W x H)	500 x 250 x 206 mm
Weight (approx.)	28,6 kg
<b>Connection</b>	
Connection for 2 ELSA push-in fittings	G 1/2 inch internal threads
2 ELSA push-in fittings	Hose outer diameter 16 mm

Environmental conditions	
Operating temperature range	10 – 40 °C
Storage temperature range	5 – 50 °C
Reference temperature	22 °C
Permissible relative humidity (non-condensing)	10 – 80 %

## 10 Storage

Please note before storing:

### **NOTICE**

**Damage/destruction of the absorber caused by leaking or freezing cooling water**

Leaking cooling water can damage the parabolic mirror of the absorber. Storing the absorber at temperatures near or below freezing and without emptying the cooling circuit completely can cause damage.

- ▶ Empty the lines of the cooling circuit completely using compressed air (max. 3 bar).
  - ▶ Even when the lines of the cooling circuit have been emptied, a small amount of residual water will remain in the absorber at all times. This may leak out and damage the parabolic mirror.  
Close the connector plug of the cooling circuit with the included sealing plug.
  - ▶ To avoid contamination, please cover the inlet aperture with optical tape.
-

## 11 Measures for the product disposal

Due to the Electrical and Electronic Equipment Act (“Elektro-G“) PRIMES is obliged to dispose PRIMES measuring devices manufactured after August, 2005, free of charge. PRIMES is a registered manufacturer in the German “Used Appliances Register“ (Elektro-Altgeräte-Register “EAR“) with the number WEEE-Reg.-Nr. DE65549202.

Provided that you are located in the EU, you are welcome to send your PRIMES devices to the following address where they will be disposed free of charge (this service does not include shipping costs):

PRIMES GmbH  
Max-Planck-Str. 2  
64319 Pfungstadt  
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