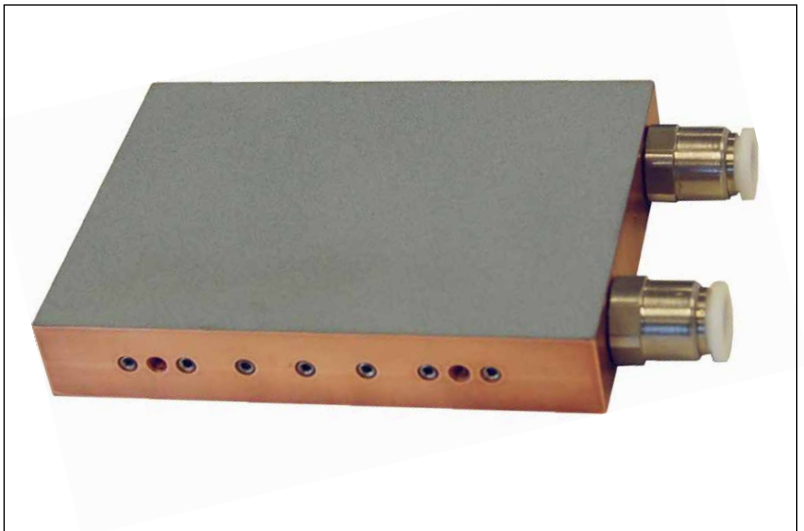


Operating Manual

Translation of the Original Instructions



Flat Absorber with water-cooling

NIR or CO₂

Contents

1	Basic Safety Instructions	4
2	Symbol Explanation	6
3	Install/remove the Flat Absorber	7
	3.1 Install the Flat Absorber	7
	3.2 Remove the Flat Absorber	8
4	Connect the water supply	9
	4.1 Water quality.....	9
	4.2 Connect the water supply.....	10
5	Operation	11
6	Dimensions	12
7	Technical Data	13
8	Product Disposal	14

1 Basic Safety Instructions

Intended Use

The Flat Absorber is intended for installation and permanent integration into a laser system. The Flat Absorber converts the radiation of NIR or CO₂-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 3 „Install/remove the Flat Absorber“ on Page 7. Forms of use, other than the intended use described herein, are considered improper. For the safe use of the Flat Absorber, the information in this operating manual must be adhered to.

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

The Flat Absorber does not ensure complete absorption of the laser radiation. Please keep in mind that there is a residual reflection (typically 3 % to 4 %). Please observe that, even with the use of the Flat 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

Personal protective equipment (PPE) is required when humans are present in a hazardous zone with uncovered visible or invisible laser radiation or particularly uncovered laser beam systems, beam guidance systems or processing areas. This holds true for any application of this equipment. During measurement procedures there is always an unavoidable risk of laser radiation through direct or reflected emissions. The applicable safety regulations are 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 sys-

tems or laser processing areas, the following safety measures must be taken:

- Please wear **safety goggles** adapted to the 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 or by attenuating the radiation to a harmless level).
- Please use beam guidance- or beam absorber elements which do not emit any hazardous particles when irradiated with laser radiation and which can withstand the beam sufficiently.
- Please install safety switches and/or emergency safety mechanisms which enable an immediate closure of the laser shutter.
- The Flat Absorber temperature is to be monitored with a temperature sensor.
- The cooling water flow rate is to be monitored.
- Please ensure a stable installation according to Chapter 3 „Install/remove the Flat Absorber“ on Page 7) at the designated locations in order to prevent a relative motion of the Flat Absorber to the beam axis, reducing the risk of scattered or directly reflected radiation.
- Connect the Flat Absorber to the on-site water supply according to Chapter 4 „Connect the water supply“ on Page 9 to ensure sufficient cooling of the Flat Absorber.

Employing Qualified Personnel

All users of the Flat Absorber must have been trained in the installation and operation of the Flat Absorber and they need to have a basic knowledge about the work with high power lasers, beam guidance systems as well as focussing units.

Modifications

The Flat Absorber must not be modified, neither constructionally nor safety-related, without our explicit permission. Modifications of any kind will result in the exclusion of our liability for resulting damages.

Liability Disclaimer

The manufacturer and the distributor of the Flat Absorber do not claim liability for damages or injuries of any kind resulting from an improper use or handling of the Flat Absorber or the associated software. 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 the Flat 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.



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.

Further symbols that are not safety-related:



Here you can find useful information and helpful tips.

- ▶ Call for action

3 Install/remove the Flat Absorber

3.1 Install the Flat Absorber

Touching the Flat Absorber with bare hands can lead to contamination of the coated absorber surface and to the oxidization of the copper surfaces on the Flat Absorber. Only touch the Flat Absorber, especially the coated absorber surface, with protective gloves.



DANGER

Serious eye or skin injury due to laser radiation

If the stability of the Flat Absorber is not guaranteed or if the Flat Absorber is not installed with the coated surface (gray/black area) towards the laser beam, scattered or directed reflection of the laser beam will result.

- ▶ Install the Flat Absorber with the coated surface (gray/black area) facing the laser beam.
- ▶ Install the Flat Absorber in a way that ensures, that the Flat Absorber can not shift or fall.

1. To avoid contamination, wear protective gloves.
2. Align the Flat Absorber with the coated surface towards the laser beam. Observe the specifications in Chapter 7 „Technical Data“ on Page 13.
3. Install the Flat Absorber in the 2 threaded holes M4 on the long sides.
4. Ensure a stable installation of the Flat Absorber:
 - The Flat Absorber must not be able to move.

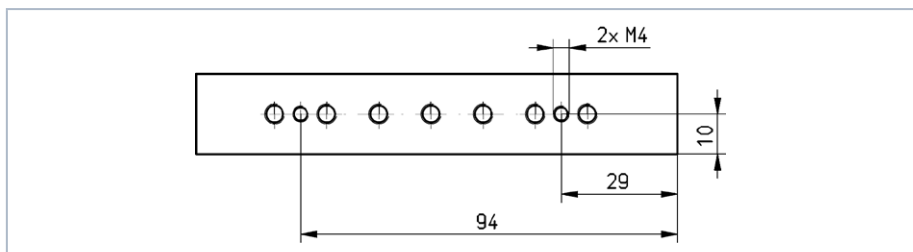


Fig. 3.1: Threaded holes M4

3.2 Remove the Flat Absorber

The touch of the Flat Absorber with bare hands can lead to contamination of the coated absorber surface and to the oxidation of the copper surfaces on the Flat Absorber. Only touch the Flat Absorber, especially the coated absorber surface, with gloves.

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



WARNING

Risk of burns – Hot surface

The Flat Absorber is very hot after operation. Touching the hot Flat Absorber can cause severe burns.

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

1. To avoid contamination, wear protective gloves.
2. After cooling down the Flat Absorber unscrew 2 M4 fixing screws on the long sides and remove the Flat Absorber from the laser system.

4 Connect the water supply

4.1 Water quality

- The water-cooled Flat Absorber is made of copper and can be operated with tap water as well as demineralized water.
- Do not operate the Flat Absorber on a cooling circuit containing additives such as anti-freeze.
- Do not operate the Flat 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 Flat Absorber and the cooling circuit.
- Should the cooling fail, the Flat Absorber can withstand the laser radiation for a few seconds. In this case, please check the Flat 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.

4.2 Connect the water supply

The Flat Absorber is pre-fitted with 2 ELSA push-in fittings for hose outer diameters of 10 mm.

1. To avoid contamination, wear protective gloves.
2. Connect the 2 ELSA push-in fittings with the on-site water supply.

NOTICE

Damaging/Destruction of the Flat Absorber

The water-cooled Flat Absorber is made of copper and can be operated with tap water as well as demineralized water.

- ▶ Do not operate the Flat Absorber on a cooling circuit in which aluminum components are installed.
- ▶ Do not operate the Flat Absorber without water cooling.
- ▶ For a sufficient cooling of the Flat Absorber, a minimum flow rate of 0.7 l/min/kW is required.
- ▶ Observe the requirements in Chapter 4.1 „Water quality“ on Page 9.

3. Activate the on-site water supply.
4. Check whether the on-site water cooling is in operation:
 - The Flat Absorber must feel cool to the touch.

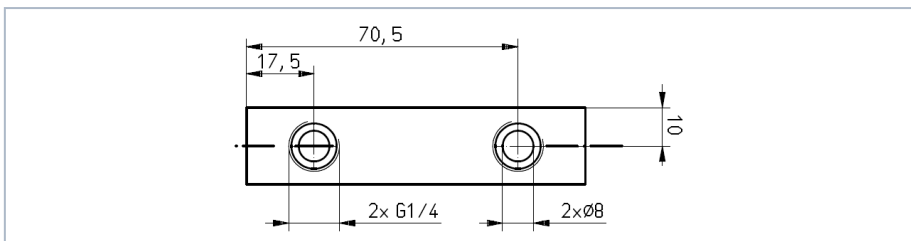


Fig. 4.1: 2 ELSA push-in fittings in the G 1/4 inch threaded holes

5 Operation



DANGER

Serious eye or skin injury due to laser radiation

The Flat Absorber does not ensure complete absorption of the laser radiation. Please keep in mind that there is a residual reflection (typically 3 % to 4 %).

- ▶ **Observe the Safety Instructions in Chapter 1 „Basic Safety Instructions“ on Page 4.**
-

The Flat Absorber temperature is to be monitored with a temperature sensor.
The cooling water flow rate is to be monitored.



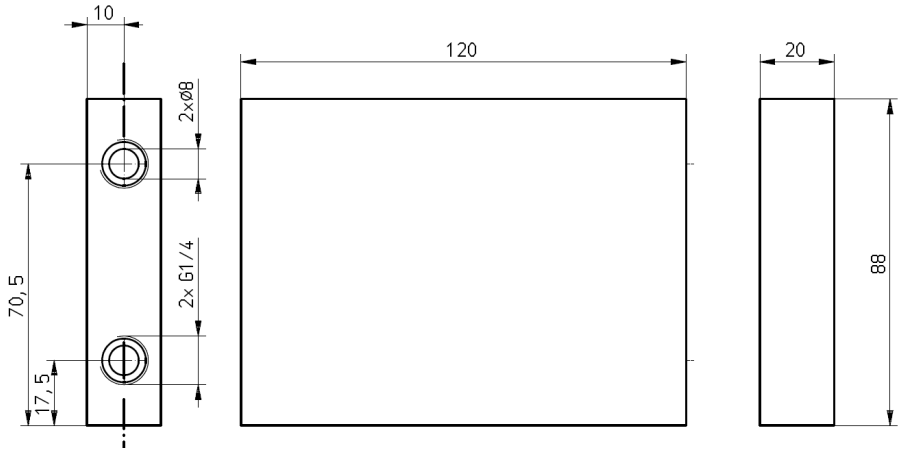
DANGER

Fire hazard due to glowing components

In case of longer irradiation without cooling the Flat Absorber can overheat and start to glow in connection with temperatures of more than 1000 °C.

- ▶ **Do not keep flammable materials in the environment of the Flat Absorber.**
-

6 Dimensions



All dimensions given in mm

7 Technical Data

Specifications	
Maximum Power Density	1.0 kW/cm ²
Maximum Laser Power	10 kW
Beam Incidence	Maximum incidence angle deviation ± 5 mrad
Water supply	
Minimum Flow Rate	0.7 l/min/kW (Recommendation 1.0 l/min/kW)
Minimum Water Pressure	4 bar
Water Quality	Operation with tap water
	Operation also possible with demineralised water
Water circuit	No use of additives in the cooling circuit
	Do not operate in a cooling circuit where aluminum components are installed
The Flat Absorber temperature is to be monitored with a temperature sensor.	
The cooling water flow rate is to be monitored.	
Dimensions and Connection	
Irradiation Area	120 × 88 mm
2 ELSA push-in fittings	Hose outer diameter 10 mm
Versions	
NIR	Radiation from 1030 to 1060 nm wavelength
CO ₂	Radiation with 10,6 μ m wavelength

8 Product Disposal

Provided that you are located in the EU, you are welcome to send your Flat Absorber to PRIMES Germany, where it will be disposed of free of charge (this service does not include shipping costs).

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