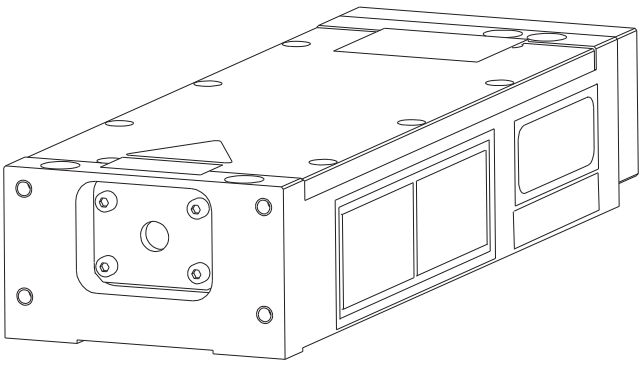
JENOPTIK

Disk Laser

JenLas® D2.x



Installation Instructions

JENOPTIK | Healthcare & Industry
JENOPTIK Laser GmbH
Goeschwitzer Str. 29
D-07745 Jena
(Germany)
☎ Service Department:
Phone: + 49 3641 65-2102
Fax: + 49 3641 65-2109
Email: laser.service@jenoptik.com
Internet: http://www.jenoptik-los.com

You can use the --> *5 Fax Form p. 16*, for your requests.
In the case of need, copy this form, fill it in and send it to the above address.

Documentation No.: 012236-025-98-02-2001-en
17th issue, January 2016
Subject to changes.

Dear user

Knowledge of the information provided by this Installation Instructions is absolutely necessary.
The specifications provided are an integral part of the Installation Instructions in hand.
Therefore, to fully exploit the capabilities of the system, please study this manual thoroughly and particularly observe the notes regarding its safe use.

The equipment is subject to changes due to ongoing product development.

This documentation is not included in any update service.

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JENOPTIK Laser GmbH
Goeschwitzer Str. 29
D-07745 Jena
(Germany)
Phone: + 49-3641-65 3053
Fax: + 49-3641-65 4011
E-mail: laser.service@jenoptik.com
Internet: http://www.jenoptik.com/solidstatelasers

Dear user

In this documentation, the following characters, symbols and pictograms are being used:

☞	Note
-->	Cross-reference to sections or illustrations of this manual
•	Operations to be performed
❑	Enumeration
Danger:	Warning

Warning symbols



Warning: Risk to human health in the case of non-observance.



Caution: Possible damage to the device.



Warning: Emission of visible and invisible laser radiation.



Caution: Components are sensitive to electrostatic discharge damage.

QUALITY MANAGEMENT
Certificate
Voluntary participation in regular monitoring according to ISO 9001

ENVIRONMENTAL MANAGEMENT
Certificate
Voluntary participation in regular monitoring according to ISO 14001

Supplements (further pertaining documents):

❑ Test Certificate of final inspection

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1 Safety Notes



Warning: Laser radiation!

- ❑ The Disk Laser may be installed and put into operation only by appropriately qualified and instructed personnel.
  Make sure the device is not used improperly.
- ❑ The device does **not contain any safety devices** such as shutters, emission warning lamps, emergency stop button, power switch, etc.
- ❑ **Never** look directly into the laser beam.
  Emitted visible and invisible laser radiation may cause irreversible skin and eye injury and result in changes to organic materials.
- ❑ Wear laser **protective eyewear** as per **EN 207** (Protection **DI L5**), while the laser is operated with uncovered optical path.
- ❑ Observe all relevant local and national safety regulations. The laser is a **Class 4 laser device** as per **EN 60825-1** (**IEC 60825-1**).
  Observe the relevant local safety regulations for the operation of laser devices (in Germany: **Regulations for the Prevention of Accidents BGV B2**).



- ❑ Make sure to avoid back reflections into the disk laser.
  This may result in destruction of the device and make void all warranty claims.
- ❑ Preclude creeping fats and oils from getting into the disk laser!



- ❑ You are not allowed to mechanically modify the device or loosen any screws.
  Non-observance can discharge additional laser radiation and will make void any liability and warranty claims.
- ❑ The **responsibility** for the combination of the device with components and units of other manufacturers solely lies with the **owner/operator**.



- ❑ Make sure to keep any objects away from the laser area, which do not conform to the intended use of the device.
- ❑ The Disk Laser must **not** be operated in explosion-risk areas. The device **does not meet the requirements of the EC Directive 94/9/EC**.
- ❑ During laser operation, substances that are harmful to human health may be generated in the form of aerosols, gases and/or dusts.



Caution: Diode current!

The device has **no current limiter**.
Therefore, make sure the **maximum diode current** is not **exceeded**.
The safety notes contained in these installation instructions exclusively apply, if the parameters of the --> *Test Certificate* are complied with.
Improper use makes void any liability and warranty claims.

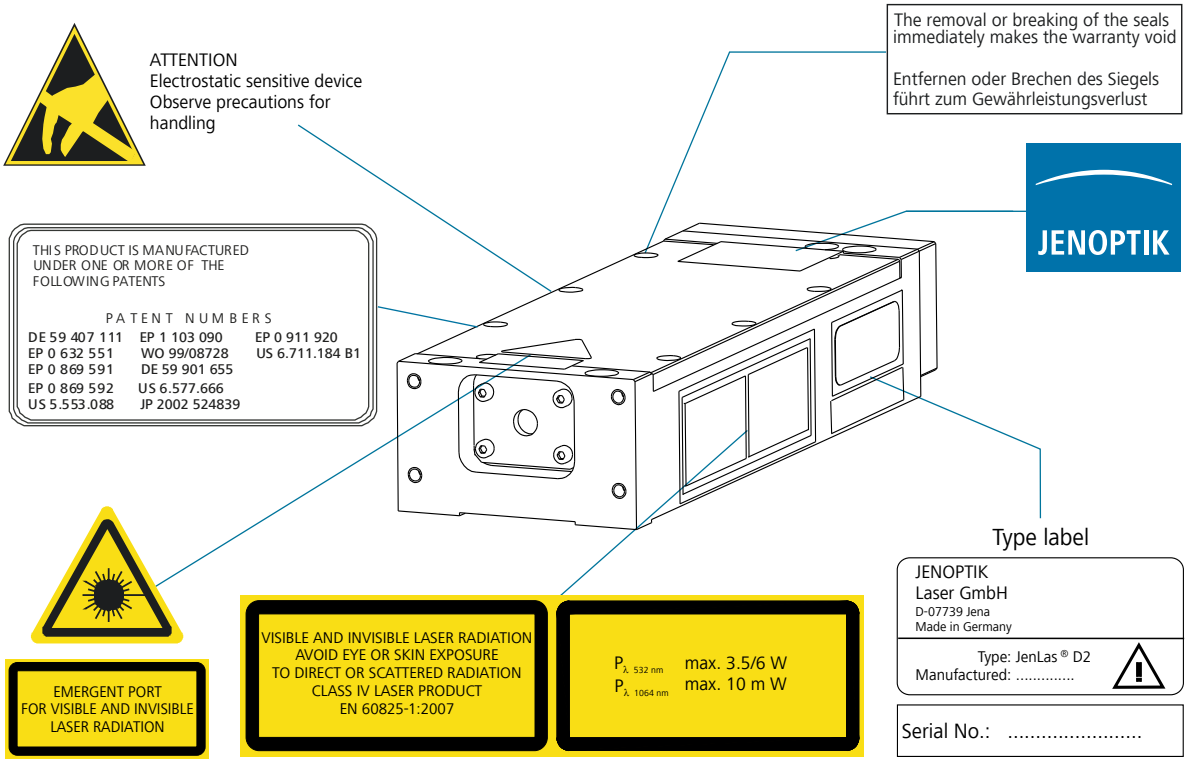
Caution: Flammability!

Do not expose explosive, flammable and/or combustible materials to the laser beam.

Caution: Accumulation of heat!

Ensure appropriate heat dissipation by a suitable cooling unit!

1.1 Warning labels and type label



- The parameter $P_{\lambda\ 532\ nm}$ max. depends on the version of the subassembly (see above).
- Removing the **Serial No.** makes void any warranty claims.

Fig. 1 Warning labels and type label

1.2 General

- ❑ The Disk Laser is available in two versions:
  $P_{\lambda 532\ nm} = 3$ W $P_{\lambda 1064\ nm} = 10$ mW and
  $P_{\lambda 532\ nm} = 5$ W $P_{\lambda 1064\ nm} = 10$ mW

The detailed Technical Data are given in your --> *Specifications*.
For the operating conditions (temperature, relative humidity, atmospheric pressure), refer to your --> *Specifications*.

- ❑ **Prior to start-up** of the device, make sure it is in perfect condition.
- ❑ Modifications and repairs of the device are subject to safety regulations and may only be performed by **JENOPTIK Laser GmbH**.
- ❑ **Strictly** observe all warning labels.
- ❑ Avoid external contamination of the beam exit window as this would result in the decrease of the available laser power.
  Burnt in dirt will make void any warranty claims.
- ❑ Disk lasers are very sensitive to overvoltage.
  Therefore, the fitter, the workbench and the used tools must be grounded for installation work.

- In inactive mode, absolutely make sure to provide ESD protection (ESD = electrostatic discharge) by shorting the connection terminals (if built in, by relay contact, otherwise by a short-circuit bridge).
- Prior to opening the packing, make sure the device has normalized to ambient temperature to avoid condensation.
  Keep a period of approximately 2 hours for temperature adjustment.
- Keep the original packaging for possible future relocation or transportation of the device. For storage and transport conditions, refer to your --> *Specifications.*

1.3 RoHS Directive

This product is RoHS compliant in accordance with Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

2 Installation

The mounting holes (**6** to **9** or **12**, Fig. 2), the sub-D connector (**5**), the electric terminals (**2**, **4**) and the optical beam exit aperture represent the interface to the user-specific use of the device.
Make sure to observe the --> *Safety Notes*, *p. 6*, to avoid any risk.

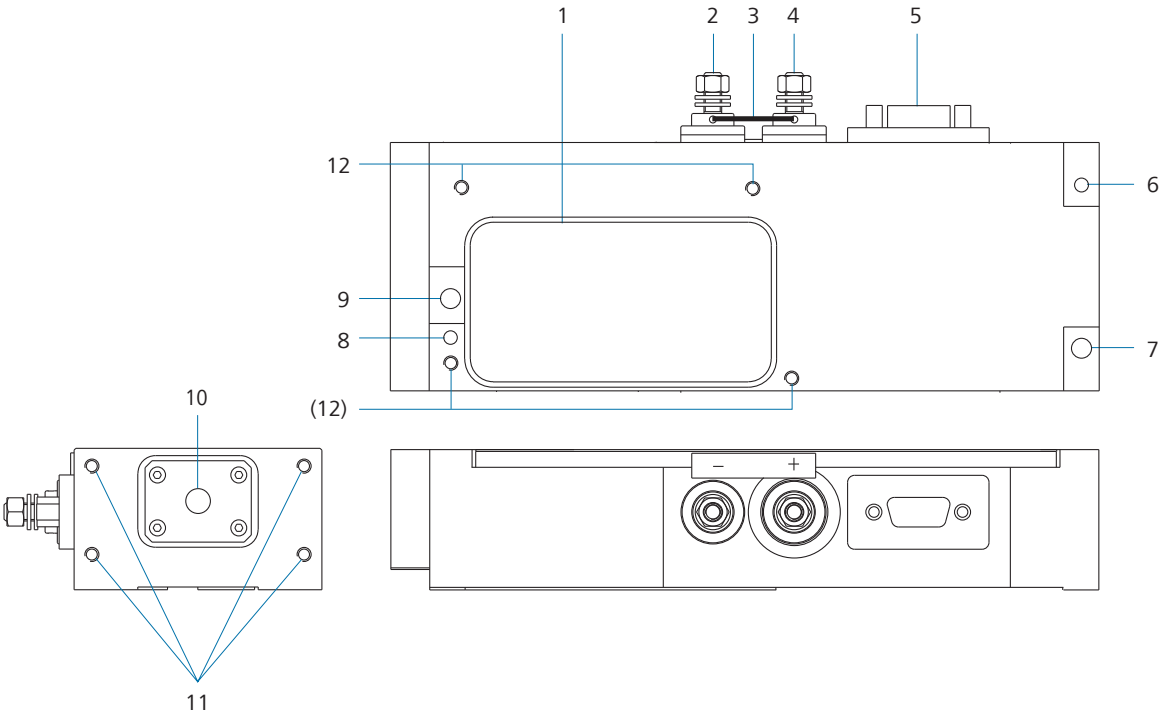


Caution: ESD protection!

Avoid any electrostatic discharge and observe the rules for ESD protection. The fitter, the workbench and the tools used must be grounded.



☞ Note:
The use of controls or adjustments or performance of procedures other than those specified in this manual may result in hazardous laser exposure. Non-observance may completely make void any warranty claims.



1 Contact surface for temperature control
2 Negative terminal (M5)
3 Short-circuit bridge
4 Positive terminal (M5)
5 D-Sub connector
6 Through bores for M4 guiding bolt
7 Through bore for M4 fastening bolt
8 Bore for locating pin (∅ 3.9 mm pre-drilled)
9 Through bore for M4 fastening bolt
10 Laser exit aperture
11 Threaded bores (M4, 6 mm deep) for mounting an additional optical element
12 Threaded bores (M4, 6 mm deep) for mounting a cooling unit with a Peltier element

Fig. 2 Disk Laser

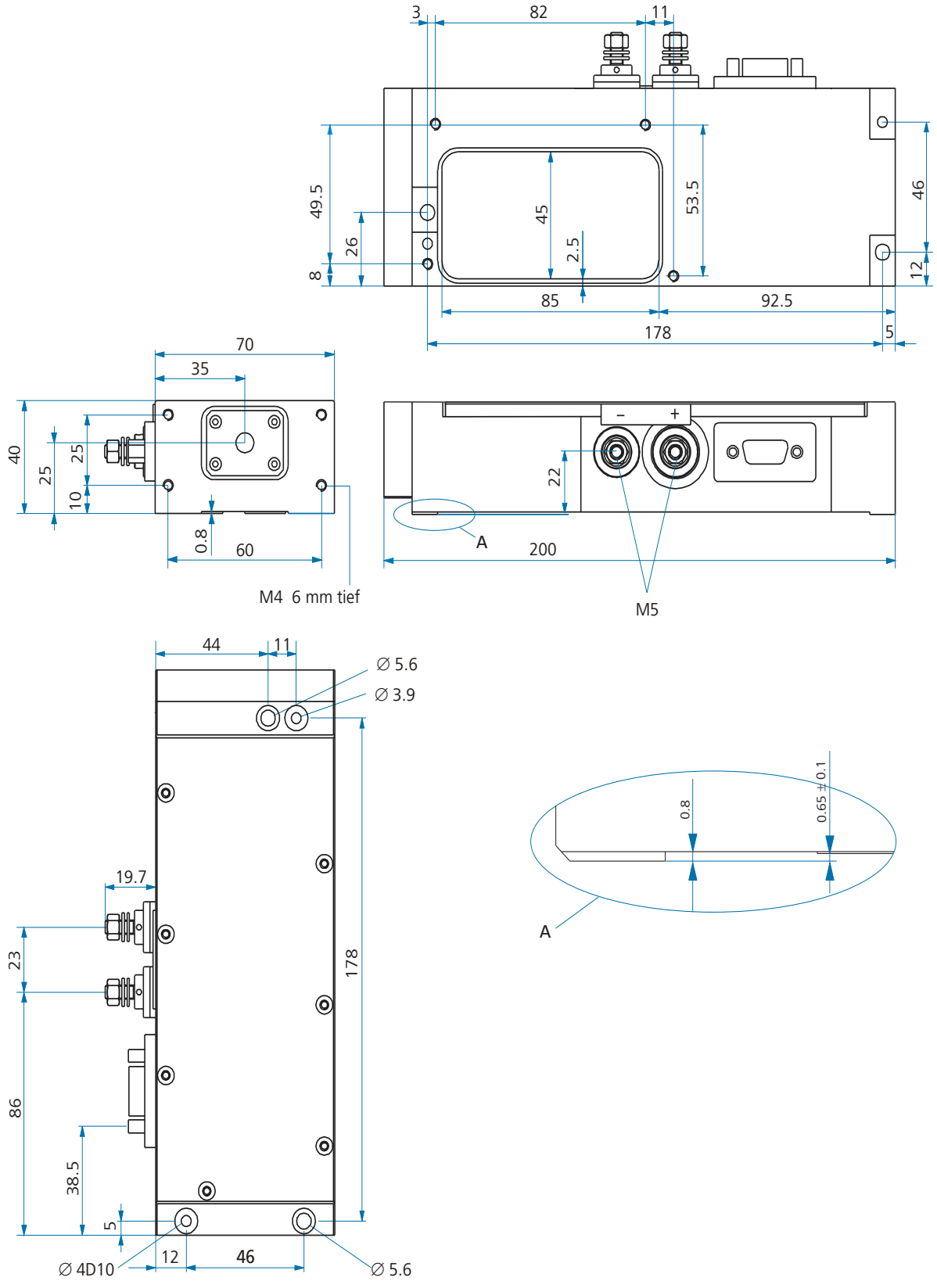


Fig. 3 Geometrical mounting dimensions

Caution: ESD protection!

Avoid any electrostatic discharge and observe the rules for ESD protection. The fitter, the workbench and the used tools must be grounded.

- Mount the subassembly to an appropriate cooling unit with Peltier cooling element by means of the screws (**6**, **7**, **9** or **12**, *Fig. 2, p. 9*).

The contact surface of the cooling unit must be sufficiently flat and clean.
The cooling capacity of the cooling unit depends on the operating mode.
For this, refer to --> *Specifications.* Dimension the cooling unit in such a way that no overheating can occur.

Refer to --> *Fig. 3, p. 10* for information on the dimensions and the location of the threaded holes to be cut into the cooling unit for fastening the subassembly.

- Screw the three threaded bolts provided into the cooling unit, and carefully attach the laser device.

☞ Note:
To improve thermal transfer, we recommend the use of a thin, solvent-free heat-conductive film.
The use of a commercial heat-conductive paste is not allowed, as its creeping behavior as well as evaporating solvent may destroy the module.

- Put the delivered spring onto each fastening bolts. The two thin springs have to be inserted into the bores (**6**, **7**, **9**, *Fig. 2, p. 9*).
  Then, screw down the device by means of the nuts (Max. torque: **10 cNm** for **6**, **7**; **40 cNm** for **9**).
- To secure the mounting position, drill dowel bore (**8**) into the cooling unit (approx. **6 mm** deep) to a diameter of **4 mm**. Then, secure the units by dowels.

When you mount an additional optical element to the front surface of the device, make sure that its weight does not exceed 500 g (Center of mass: max 150 mm in front of the front surface).

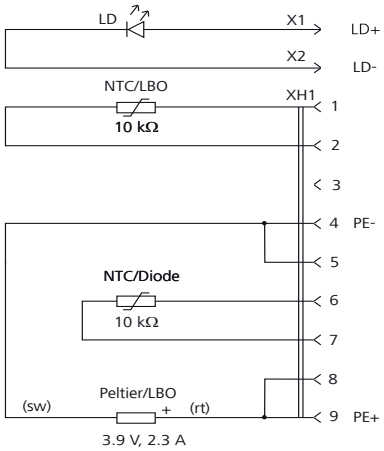


Fig. 4 Pin assignment

- Wire the connecting cable to the sub-D connector as illustrated in the ob-ove-mentioned scheme.

- Connect the connection cable to the 9-pin Sub-D connector (**4**).
  Secure the cable by fastening the slotted screws of the connector by means of a torque-controlled screwdriver adjusted to **0.6 Nm** (60 Ncm).

☞ Important:
The use of normal screwdrivers or other tools is not permissible.
Make sure to prevent any impact and tensile load to this connector independent of the direction of action.

- The diode current is supplied to the master system through terminals (M5) (**1**, **3**). Fasten the M5 nuts by means of a torque-controlled screwdriver adjusted to **2.5 Nm** (250 Ncm).

☞ Important:
When connecting the cable, make sure the wires are **correctly polarized**, as already low back voltages may lead to irreversible damage.
The use of an open-end wrench or of other radially acting levers is not permissible. Make sure to prevent any impact and tensile load to these terminals independent of the direction of action.

The diode current supply must meet the following requirements:

❑ Make sure that current and voltage spikes cannot affect the device, neither during operation nor when switching the diode current supply ON/OFF. This also refers to indefinite states (e.g. cable break, power failure, etc.).
Even very short current or voltage spikes may destroy the disk laser.

☞ Very important:
It is not allowed to solder the connection cable to the high-power diode laser.

❑ The cables must be arranged in such a way, that no induction is generated and thus oscillations are avoided.

When the device is switched off, the device must be short-circuited to provide ESD protection (relay contact).



Caution: Diode current!
The device has **no current limiter.** Therefore, make sure the **maximum diode current** is not **exceeded**.

☞ Note:
Use a current supply module with current limiting.

The safety notes contained in these installation instructions exclusively apply, if the parameters of the --> *Test Certificate* are complied with.
Improper use makes void any liability and warranty claims.
The measurement of the diode temperature and the LBO crystal is based on an integrated temperature sensor (NTC; 10 kΩ).
The NTC resistance/temperature data is shown in --> *Appendix*, *p. 15*.
The nominal temperature of the LBO crystal is adjusted through a Peltier element with the following parameters:

I_{max} (A)	U_{max} (V)	Pc_{max} (W)
2.3	3.9	5.2

The temperature regulation should not be faster than 15 K/min.

Caution: Temperature adjustment!



Before applying the diode current, the LBO temperature and the diode temperature must be adjusted according to the specifications of the --> *Device Card*.
Make sure that the constancy of LBO temperature and diode temperature complies with your --> *Specifications*.
To achieve stable output parameters of the thin disk laser we recommend to keep the LBO temperature stable within < 0.2K and the diode temperature within < 0.5K.

- Finally, disconnect the short-circuit bridge (**3**, *Fig. 2, p. 9*) between the connecting terminals and keep it for future use.

Warning: Laser radiation!



The Disk Laser has **no ON/OFF switch**.
Laser radiation is instantly emitted when diode current is supplied.

☞ Note for relocation and transport

- Before disconnecting the device electrically, insert the short-circuit bridge (**3**).
- For relocation or transport, please use the original packaging. Make sure to close the folding bag after the device was inserted.
- For storage and transport conditions, refer to your --> *Specifications.*

3 Technical Data

Feature	Operating data	Limit values as per EN 60825-1
Laser	Disk laser	
Laser Class	4 as per EN 60825-1:2007	
Wavelength	532 nm ± 1 nm	
Output power	3/5 W (cw)	10 W (cw)
Power stability (rms)	< 3 %	
Beam quality	M^2 typ. 5, coupling into 50-µm fiber is possible	
Beam size	< 2 mm	
Divergency	< 2 mrad	
Polarization	> 1 : 100	
Orientation	horizontal (parallel to groundplate)	
Ellipticity (beam cross-section)	< 1:1.5	
Beam position at exit	± 0.5 mm	
Beam direction	± 3 mrad	
Pointing stability	< 0,1 mrad	
Operating mode	Pulsed mode from 1 ms pulse length to cw (amplitude modulation up to 20 kHz possible)	
Ambient conditions Temperature range Relative humidity Atmospheric pressure	 + 5 °C ... + 40 °C < 90 %, no condensation 700 ... 1060 hPa	
Storage and transport conditions Temperature range Relative humidity Atmospheric pressure Mechanical load examined accordingly DIN 15010109 Noise Single shocks Continuous shocks	 - 20 °C ... + 70 °C 0 ... 90 %, no condensation 700 ... 1060 hPa 9 ... 500 Hz; 3 g 30 g/18 ms 10 g/6 ms	
Nominal temperature range of diodes	+ 20 °C ... + 35 °C	
Nominal temperature range of LBO	+ 25 °C ... + 40 °C	
Enclosure Protection	IP 41	
Electrical connection	2 V, typ. 18 A, ≤ 24 A (at diode laser, 3 W) 2 V, typ. 22 A, ≤ 26 A (at diode laser, 5 W) max. 3.9 V, 2.3 A (Peltier, LBO)	
Input power	< 60 VA	
Maximum current for nominal power	see --> *Test Certificate*	
Performance of operating processes	in compliance with VDE 0100	
Dimesnsions (L x W x H)	200 x 70 x 40 mm	
Weight	approx. 1.8 kg	

4 Appendix

NTC resistance temperature values

Type EPCOS G560, 10kΩ @ 25°C / 77 F, Toleranz $\Delta T \leq \pm 1.0$°C / 34 F (range 0°C / 33 F to 40°C / 104 F)

Approximation formula:

$$R(T) = R_{25}\, e^{B\left(\frac{1}{T + 273.15\ K} - \frac{1}{T_R + 273.15\ K}\right)}$$

T in °C

B = 3450 K

R_{25} = 10.0 kΩ

T_R = 25°C

T [°C]	R_nom [kΩ]	R_min [kΩ]	R_max [kΩ]
0	27.94	27.36	28.52
5	22.47	22.05	22.88
10	18.19	17.89	18.48
15	14.81	14.60	15.02
20	12.14	11.99	12.28
25	10.00	9.900	10.10
30	8.284	8.186	8.383
35	6.899	6.804	6.994
40	5.774	5.684	5.864
45	4.856	4.772	4.940
50	4.103	4.024	4.181

5 Fax Form

To
JENOPTIK Laser GmbH
Goeschwitzer Str. 29
Service Department:
Fax: + 49-3641-65 4011

Our Ref.: ..... Your Ref.: .....
Pages (incl. cover page): ..... Date: .....

Message
(with brief description of faults JenLas® D2.x):

Sender: .....
Company: .....
Address: .....
Telephone: ..... Fax No.: .....

Signature: .....