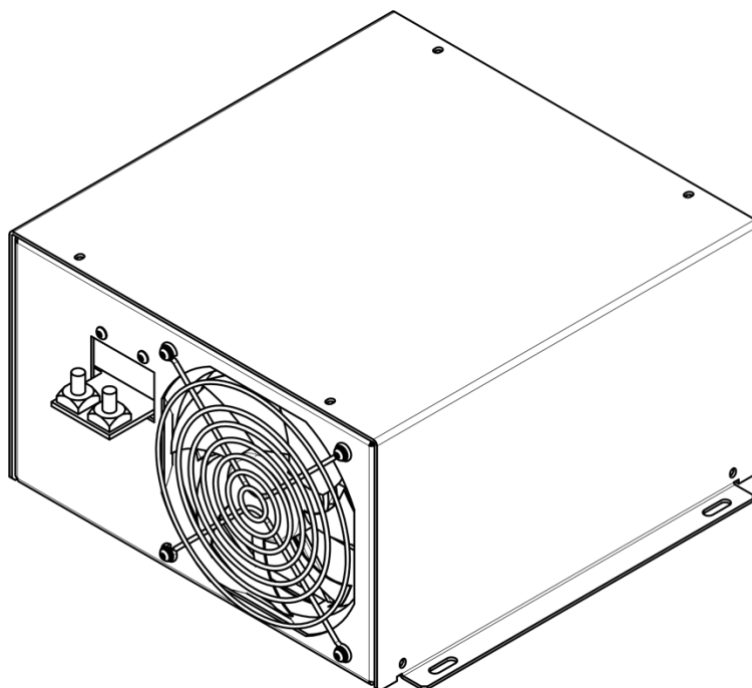


PDD-1600 pulsed diode driver

User manual



Warning! This equipment can be dangerous.
Please read this entire user manual carefully before operating the product.

Important note. Please measure the output with an adequate load only (diodes).
A resistive load connected to the output will not destroy the driver but will severely distort its behavior.



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Warnings



Warning! The equipment is CLASS I ME EQUIPMENT.
To avoid the risk of electric shock, the equipment
must be properly grounded.



Warning! There are no user-serviceable parts inside the device. Do
not attempt to repair the driver yourself. Do not open the enclosure,
due to the risk of electric shock from residual high voltage.



Warning! The equipment is not suitable for use in the presence of a
flammable anesthetic mixture with air, oxygen, or nitrous oxide.

Overview / Appearance

PDD-1600 is a high-power pulsed laser diode driver series. The modules are fast-switching, low-noise, accurate and efficient current sources for laser diodes. They were developed, first of all, for medical and medical aesthetic treatments, namely, for hair removal applications.

PDD-1600 has average output power up to 1600W and maximum peak output power up to 10kW (depending on user defined I_{MAX} and V_{MAX}), operates from a standard 100-240VAC 50/60Hz mains, so you don't need extra power supply for the drivers. Less powerful series are and [PDD-1000](#) and [PDD-300](#).



The driver is designed to be fully compliant with the latest versions of medical standards: IEC 60601-1:2005/AMD1:2012 for electrical safety and IEC 60601-1-2:2014 for EMC, so PDD-1600 can be used in medical and aesthetic systems without any modifications.

Cooling

The module contains a fan for active cooling. No additional cooling is required.

Contents of delivery

By default, the delivery package contains:

- PDD-1600 diode driver – 1pc
- INTERFACE cable – 1pc (50cm length)

Output cables are not usually supplied.

Customized delivery content is available on request.

Connections, signals, signal description



INTERFACE: 15-pin D-SUB Female

PIN (color)	DESIGNATION	DESCRIPTION
1 (green)	ENABLE	+5V TTL applied to this pin enables PDD. When 0V is applied to this pin, or if the pin is unconnected, the module is disabled. Once <i>Fault</i> has occurred, the module remains blocked until the fault cause is eliminated. After that, <i>disable</i> the module and <i>enable</i> it again.
2 (orange)	FAULT	If the module is enabled and a fault occurs, the module automatically stops operation and sets the <i>Fault</i> status (<i>Fault</i> loop is “closed”). Possible fault causes include: - overheating - mains voltage interruption - maximum pulse energy exceeded To clear the Fault state, <i>disable</i> the driver and then <i>enable</i> it again. During normal operation, the <i>Fault</i> loop is “open”. Maximum allowed current in the <i>Fault</i> loop is 50 mA.
3 (transparent)	PULSE 1	+5V TTL pulses must be applied simultaneously to pin 3 and pin 8 in order to obtain pulsed current from the PDD-1600. If 0V is applied to one of these pins, or if at least one of these pins is unconnected, no current will be generated by the PDD-1600.
4 (black)	PULSE 2 RETURN	Pulse 2 signal return
5 (yellow)	PULSE 1 RETURN	Pulse 1 signal return
6	N/C	
7 (blue)	CURRENT PROGRAM	Voltage applied to this pin sets output current. 0-10V DC are linear with 0- I_{MAX} .
8 (white)	PULSE 2	+5V TTL pulses must be applied simultaneously to pin 3 and pin 8 in order to obtain pulsed current from the PDD-1600. If 0V is applied to one of these pins, or if at least one of these pins is unconnected, no current will be generated by the PDD-1600.
9 (purple)	ENABLE RETURN	Enable signal return

10, 11, 12, 13	N/C	
14 (red)	+15V DC AUXILIARY OUTPUT	Auxiliary +15V DC output. Maximum output current 50mA.
15 (white/blue)	INTERFACE RETURN	Return of other Interface signals (namely Fault, Current program and +15V DC)

AC INPUT: Screw terminal



OUTPUT POSITIVE AND OUTPUT NEGATIVE: M6 studs

PIN (color)	DESCRIPTION
DIODE “+” (red)	To the laser diode stack anode
DIODE “-” (black)	To the laser diode stack cathode

LEDs:

LED1 (red) – lights, if driver sets a Fault state

LED2 (red) – lights when high voltage presents at inner buffer capacitor bank

GROUND: M5 stud

Module should be grounded using this stud.

Grounding should be done before powering the system.

Grounding policy

By default OUTPUT POSITIVE and OUTPUT NEGATIVE terminals are isolated from the chassis’ ground (i.e. output is floating).

Modifications with grounded anode or grounded cathode are available upon request.

Installation

- Only qualified personnel are allowed to install and connect the PDD-1600 into the customer's system.
- The PDD-1600 is intended only for diode-driving applications. The module should be used exclusively inside medical equipment that has means to isolate its circuits electrically from the supply mains on all poles simultaneously.
- Use six M6 threads at the bottom of the PDD-1600 to fix the module in your system. Refer to the [Dimensional drawing](#) section for their location.
- There is no preferred driver orientation; it can be mounted in the normal position, upside-down, or in other orientations as well.
- Connect the module to your system's protective ground using the provided M5 grounding stud.
- Connect AC INPUT, OUTPUT and INTERFACE cables according to their functions.
- Since the module is air-cooled, at least 50mm of free space should be provided at both the suction and pressure sides of the PDD-1600.

Operations

A typical operation sequence is given below:

1. Disable the driver using Enable signal (pins 1 and 9 of INTERFACE).
2. Set the desired output current with Current program signal (pins 7 and 15 of INTERFACE).
3. Apply AC power to the PDD-1600; wait 2-5s for the driver to start.
4. Enable the driver with Enable signal (pins 1 and 9 of INTERFACE).
5. Apply TTL pulses of the desired width to Pulse 1 and Pulse 2 signals (pins 3, 5 and 8, 4 of INTERFACE).
6. Disable the output after operations, then disconnect the driver from the mains.

Operation notes:

1. The proper sequence of the driver's start-up procedure is "power → enable → pulse". Any other sequence is considered incorrect.
2. A Fault state is set when a fault condition occurs, and the driver is enabled.
3. To clear the Fault state, the driver must be disabled and then enabled again.

Specifications

ELECTRICAL

INPUT	
Input voltage	100-240VAC 50/60Hz
Input current	<20A
OUTPUT	
Maximum output voltage (V_{MAX})*	50V by default (up to 100V on request)
Maximum output current (I_{MAX})*	200A by default (other on request)
Maximum peak power (P_{PEAK})*	Up to 10kW (other on request)
Output voltage (V)*	Recommended diode voltage: 70–100% of V_{MAX} Allowed diode voltage: 20–100% of V_{MAX}
Output current (I)*	Adjustable in 0–100% of I_{MAX} range with recommended diode voltage (70–100% of V_{MAX}) Adjustable in 10–100% of I_{MAX} range with allowed diode voltage (20–100% of V_{MAX})
Pulse width (t)*	From 1ms (limited with rise and fall times) to tens and hundreds of milliseconds (depends on the driver's modification, operating current and voltage), see also the formulas below
Maximum pulse energy (E_{MAX})*	500J
Rise and fall times	<1ms (10-90% level)
Maximum average output power (P_{AV})*	1600W
Pulse repetition rate (f)*	Limited with pulse energy and maximum average output power only
(*) The parameters aren't independent from each other. There are certain limitations: 1. $0.7 * V_{MAX} < V < V_{MAX}$ (recommended) 2. $I < I_{MAX}$	

$$3. V * I < V_{MAX} * I_{MAX} = P_{PEAK} < 10kW$$

$$4. V * I * t < E_{MAX}$$

$$5. V * I * t * f < P_{AV}$$

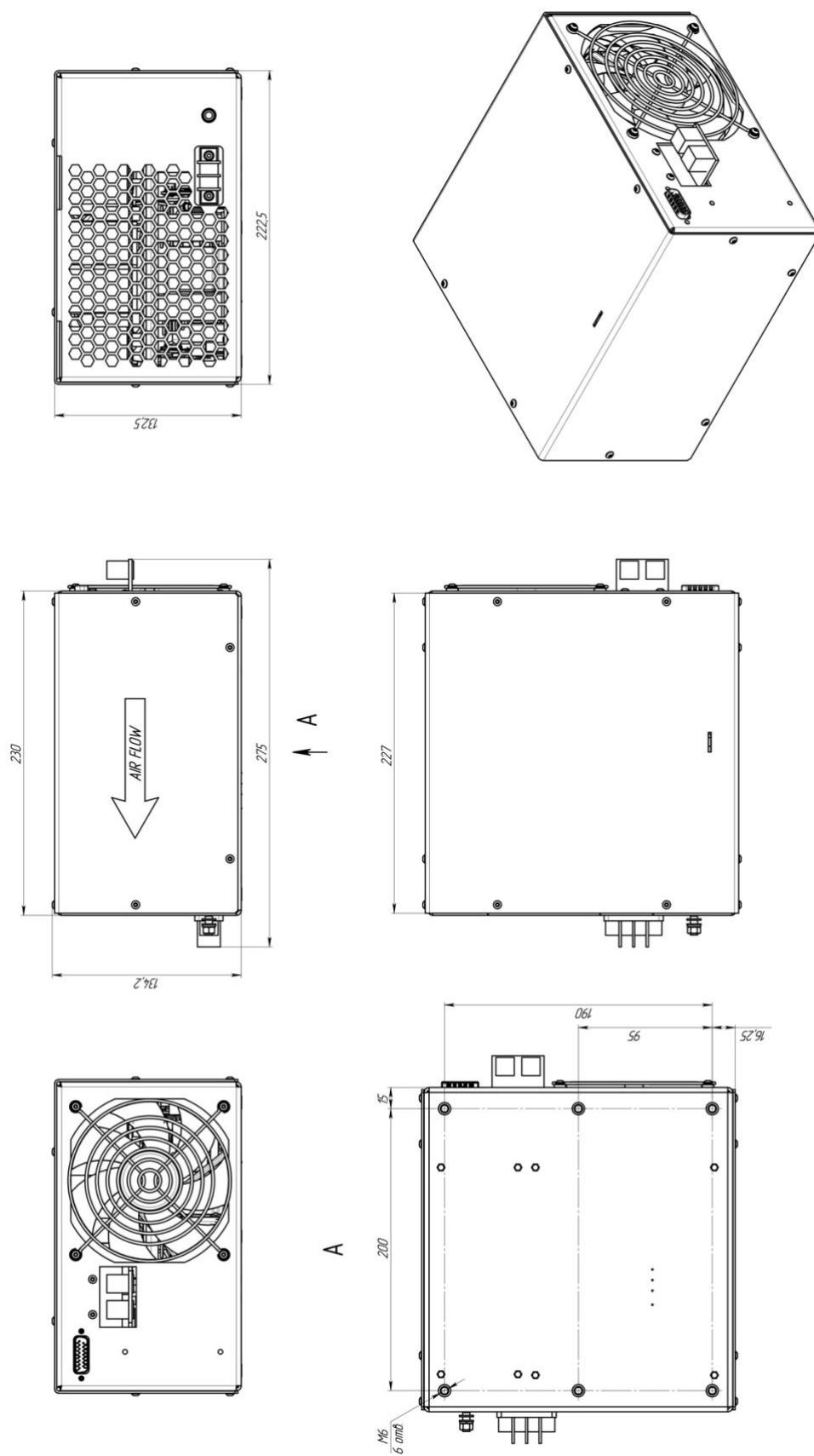
For further details, please contact the manufacturer or use the [online calculator](#) on our website to calculate the average output power and pulse energy.

Current accuracy	<1% of I _{MAX}
Current overshoot	<1% of I _{MAX}
REGULATIONS	Safety as per IEC 60601-1 EMC as per IEC 60601-1-2 RoHS compliant
COOLING	No external cooling is required
ENVIRONMENT	
Operation temperature	+10 ... +40 °C
Storage temperature	-20 ... +60 °C
Humidity	<90%, non-condensing

MECHANICAL

Dimensions	See also the dimensional drawing below
Weight	Approx. 5kg

Dimensional drawing



How to order?

PDD-1600-XXXX-YYYY, where:

- XXXX denotes the maximum output current I_{MAX} (user-selectable up to 200A; even higher current is available on special request).
- YYYY denotes the maximum output voltage V_{MAX} (user-selectable up to 100V, other on request)

Examples (some popular modifications):

P/N	Description
PDD-1600-200A-50V	100-240VAC input 200A/50V output 1600W average output power

Other modifications are available upon request.

Appendix 1 – Accessories, Remote control assembly

Remote control assembly (ordering code – LDD-RC) allows to use [LDY-series](#), [LDD-series](#), [PDD-series](#) diode drivers in the laboratory, both in CW and pulsed regimes.



More details can be found on the product page ([link](#)).