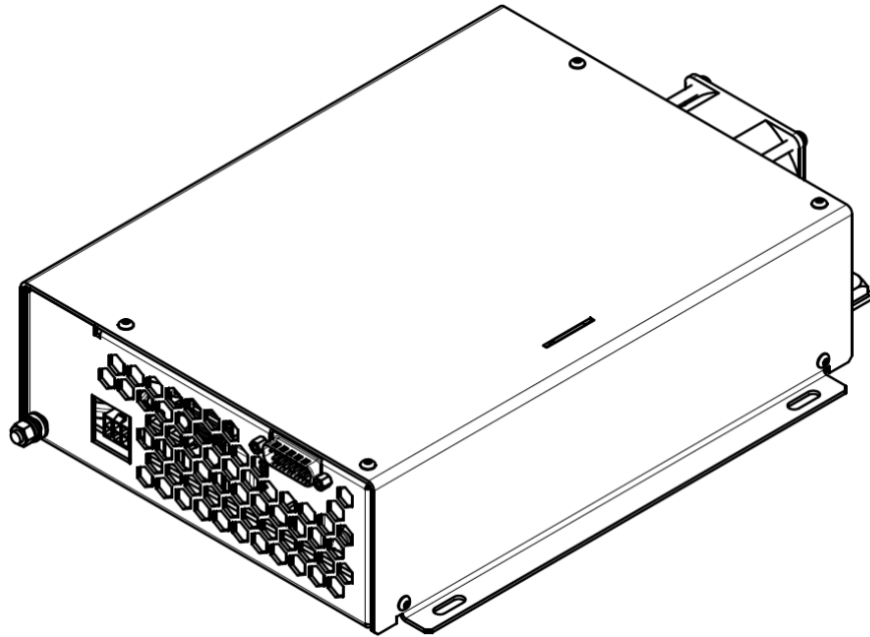


# PDD-300 pulsed diode driver

## User manual



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

**Important note.** Please measure output with adequate load only (diodes). Resistive load connected to the output won't destroy the driver but will severe distort its behavior.






## **Table of contents**



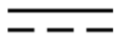




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## Warnings

	<b>Warning!</b> The equipment is CLASS I ME EQUIPMENT. To avoid the risk of electric shock, the equipment must be protectively grounded.
	<b>Warning!</b> 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.
	<b>Warning!</b> The equipment is not suitable for use in the presence of a flammable anesthetic mixture with air, oxygen, or nitrous oxide.

## Explanation of symbols

Symbol	Description
	Refer to the instruction manual before handling
IPX0	Particles: No data available to specify a protection rating Water: Non-protected
	Dangerous voltage
	Direct current
	Protective earth terminal
	The product shall not be disposed of with household waste
	The year and the month of the manufacturing
	The name and the address of the manufacturer
MAINS	AC power input of the device
LED + LED -	Output positive and output negative terminals of the device
INTERFACE	Interface (control) connector of the device

## Overview / Appearance

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PDD-300 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-300 has averaged output power up to 300W and maximum peak output power up to 5000W (depending on user defined  $I_{MAX}$  and  $V_{MAX}$ ), runs on common 100-240VAC 50/60Hz mains, so you don't need extra power supply for the drivers. More powerful series are [PDD-1600](#) and [PDD-1000](#).



The driver is fully compliant to 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-300 can be used in medical and aesthetic systems without any modifications.

## Cooling

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The PDD-300 contains a fan for active cooling. No additional cooling is required.

## Contents of delivery

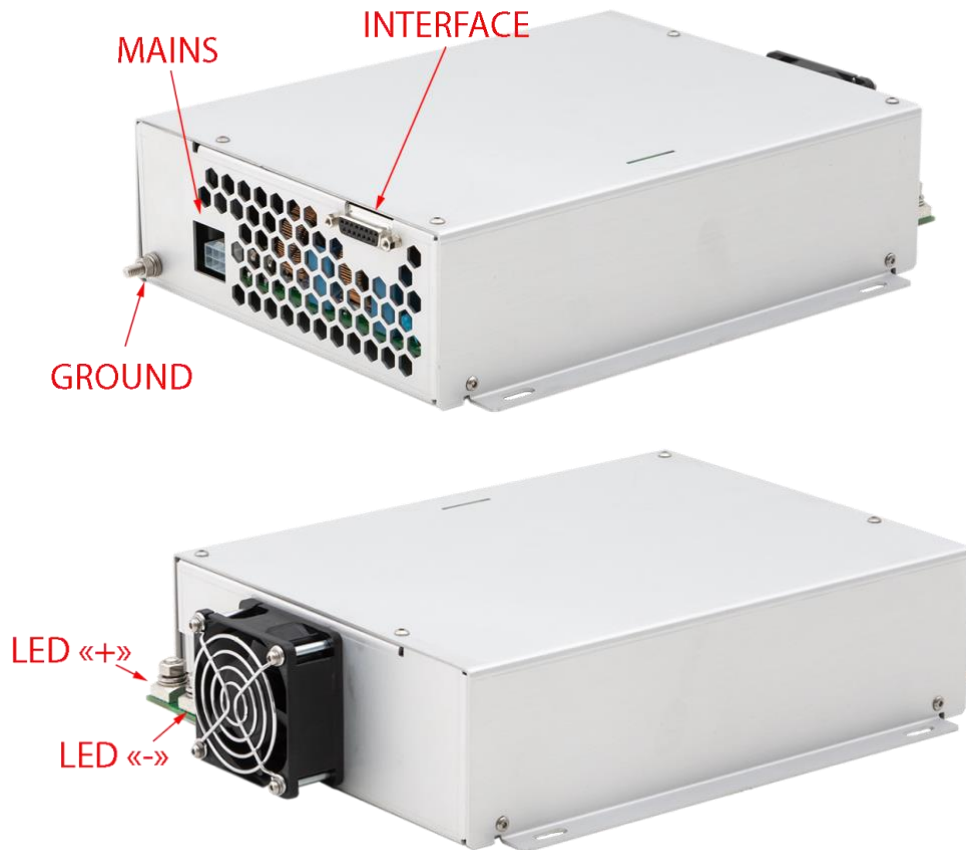
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By default, the delivery package contains the following parts:

- PDD-300 diode driver – 1pc
- AC input cable – 1pc
- Interface cable – 1pc
- Output leads – 2pcs

Customized cables are available on request.

## Connectors, pins, interface signals



### INTERFACE: 15-pin D-SUB Female

PIN (color)	DESIGNATION	DESCRIPTION
1 (green)	ENABLE	<p>+5V TTL applied to this pin enables PDD-300.</p> <p>When 0V is applied to this pin, or if the pin is unconnected, the module is disabled.</p> <p>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.</p>
2 (orange)	FAULT	<p>If the module is <i>enabled</i> 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:</p> <ul style="list-style-type: none"> <li>- <b>overheating</b></li> <li>- <b>mains voltage interruption</b></li> <li>- <b>maximum pulse energy exceeded</b></li> </ul> <p>To clear the <i>Fault</i> state, <i>disable</i> the driver and then <i>enable</i> it again.</p> <p>During normal operation, the <i>Fault</i> loop is “open”.</p> <p>Maximum allowed current in the <i>Fault</i> circuit is 50mA.</p>

<b>3 (transparent)</b>	<b>PULSE 1</b>	+5V TTL pulses must be applied simultaneously to pin 3 and pin 8 to obtain pulsed current from the PDD-300. 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-300.
<b>4 (black)</b>	<b>PULSE 2 RETURN</b>	Pulse 2 signal return
<b>5 (yellow)</b>	<b>PULSE 1 RETURN</b>	Pulse 1 signal return
<b>6</b>	<b>N/C</b>	
<b>7 (blue)</b>	<b>CURRENT PROGRAM</b>	Voltage applied to this pin sets the output current. 0-10V DC are linear with 0-I <sub>MAX</sub> .
<b>8 (white)</b>	<b>PULSE 2</b>	+5V TTL pulses must be applied simultaneously to pin 3 and pin 8 to obtain pulsed current from the PDD-300. 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-300.
<b>9 (purple)</b>	<b>ENABLE RETURN</b>	Enable signal return
<b>10, 11, 12, 13</b>	<b>N/C</b>	
<b>14 (red)</b>	<b>+15V DC AUXILIARY OUTPUT</b>	Auxiliary +15V DC output. Maximum output current 50mA.
<b>15 (white/blue)</b>	<b>INTERFACE RETURN</b>	Return of other Interface signals (namely Fault, Current program and +15V DC)

### AC POWER INPUT: Molex Mini-Fit MF-6F type

6	5	4
3	2	1

<b>PIN (color)</b>	<b>DESCRIPTION</b>
<b>1, 4</b>	Pins 1 and 4 are interconnected inside the module
<b>2, 5</b>	Not used
<b>3, 6</b>	Pins 3 and 6 are interconnected inside the module

### OUTPUT POSITIVE AND OUTPUT NEGATIVE: M6 thread (8mm thread depth)

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

**GROUND: M5 stud**

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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

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- Only qualified personnel are allowed to install and connect the PDD-300 into the customer's system.
- The PDD-300 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 four M4 oval mounting slots at the bottom on the sides of the PDD-300 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-300.

## Operations

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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-300; 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:

- The proper sequence of the driver's start-up procedure is "Power -> Enable -> Pulse". Any other sequence is considered incorrect.
- When the driver is powered but disabled, the fan rotates slowly. Once the driver is enabled, the fan accelerates to a higher speed.
- A Fault state is set when a fault condition occurs, and the driver is enabled.
- To clear the Fault state, the driver must be disabled and then enabled again.

## Troubleshooting

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- In case of a mains voltage interruption, the output voltage drops. Once mains voltage is restored, the unit does not restart automatically. The driver must be enabled again to resume operation.

## Input fuses

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Designation	Type	Parameters	Suggested p/n
FU1, FU2	Fast (quick acting) High breaking capacity	Dimensions: 5x20 mm Voltage rating: 250 VAC Current rating: 10 A	Schurter 0001.1014

## **Pulse width limitations**

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The maximum pulse width that the driver can provide at its output is not fixed, but depends on the driver's modification, operating current, load voltage, and input voltage.

An approximate formula to estimate the maximum pulse width in a given regime is  $E_{MAX}=I*V*T_{MAX}$ , where  $T_{MAX}$  is a maximum pulse width the PDD-300 can provide with current I and voltage V at its output.  $E_{MAX}$  is the maximum extractable energy, which varies from ~200J in standard modifications to ~300J in long-pulse modifications.

Examples of pulse width limitations for different drivers and different loads are provided below. More detailed information can be requested from the manufacturer.

<b>P/N</b>	<b>Pulse width limitations</b>
PDD-300-100A-30V	Maximum pulse width – at least 65ms @ 100A, 30V, 220VAC input. Longer at lower output currents and voltages, and/or at lower input voltage.
PDD-300-150A-25V	Maximum pulse width – at least 35ms @ 150A, 25V, 220VAC input. Longer at lower output currents and voltages, and/or at lower input voltage.
PDD-300-100A-30V-LP	Maximum pulse width – at least 100ms @ 100A, 30V, 220VAC input. Longer at lower output currents and voltages, and/or at lower input voltage.
PDD-300-150A-25V-LP	Maximum pulse width – at least 55ms @ 150A, 25V, 220VAC input. Longer at lower output currents and voltages, and/or at lower input voltage.

Please contact the manufacturer for maximum pulse width estimations for other models and operating regimes.

## Specifications

### ELECTRICAL

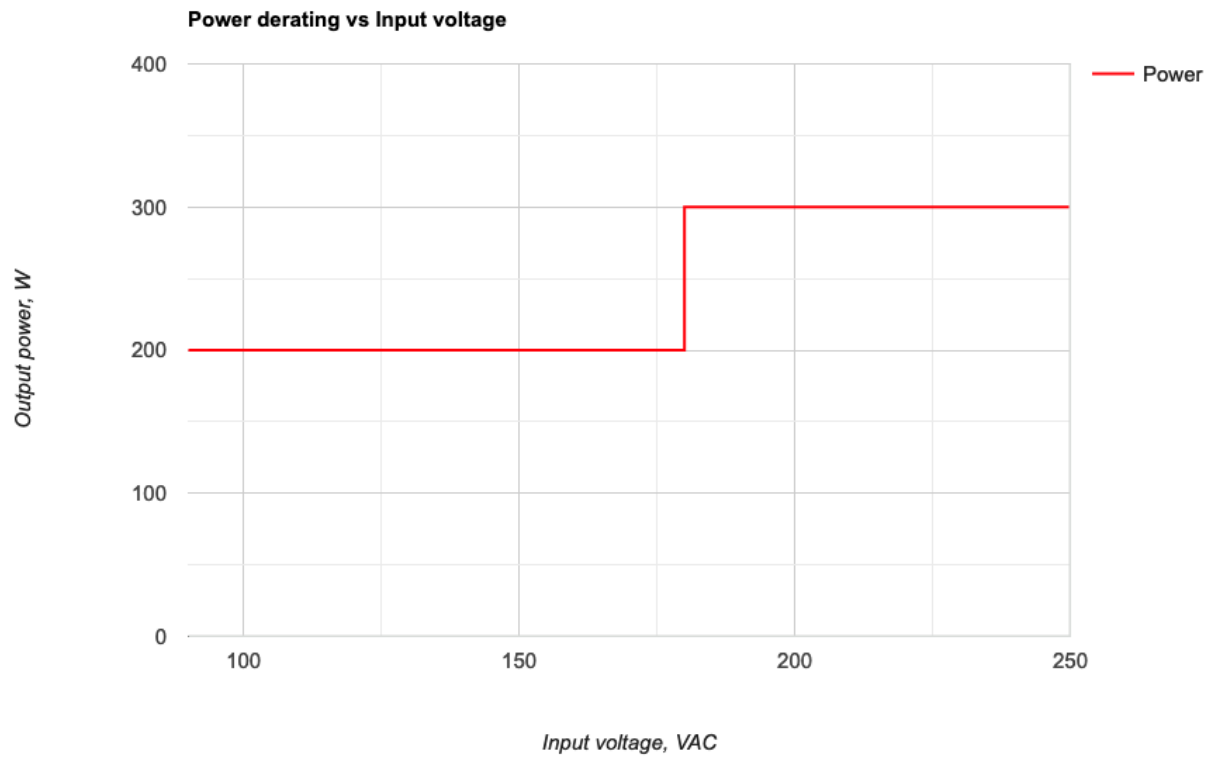
<b>INPUT</b>	
Input voltage	100-240VAC 50/60Hz
Input current	<5A, inrush current <10A
<b>OUTPUT</b>	
Maximum output voltage ( $V_{MAX}$ ) *	Up to 50V (user selectable)
Maximum output current ( $I_{MAX}$ ) *	Up to 200A (user selectable)
Peak power *	Up to 5kW
<i>(*) <math>I_{MAX} * V_{MAX}</math> shouldn't exceed the maximum peak power (5kW)</i>	
Minimum pulse width	1ms (limited with rise and fall times)
Maximum pulse width **	From tens to hundreds of milliseconds (depends on the driver's modification, operating current and voltage, see also <a href="#">Pulse width limitations</a> section)
Maximum pulse energy ( $E_{MAX}$ ) **	~200J in standard version (up to ~250J on request) ~300J in long-pulse version
<i>(**) In the given regime, i.e. with specified operating current (I), voltage (V) and pulse width (t), the pulse energy (E) can be calculated as <math>E=I*V*t</math>. Since the internal buffer capacitance of the PDD-300 is limited, the pulse energy is also limited (<math>E &lt; E_{MAX}</math>). Please contact the manufacturer for further details.</i>	
Rise and fall times	<1ms (10-90% level)
Maximum average output power	200W for 90-180VAC input 300W for 180-264VAC input
Output power deratings	See the next page
Pulse repetition rate	Limited with pulse energy and maximum averaged power only
Current accuracy	<1% of $I_{MAX}$
Current overshoot	<1% of $I_{MAX}$
<b>SAFETY</b>	Safety as per IEC 60601-1 EMC as per IEC 60601-1-2
<b>COOLING</b>	No external cooling is required
<b>ENVIRONMENT</b>	
Atmospheric pressure	70kPa to 106kPa
Operation temperature	0 ... +40 °C (see also derating curve)
Storage temperature	-20 ... +60 °C
Humidity	<90%, non-condensing

### MECHANICAL

Dimensions	See dimensional drawings below
Weight	Approx. 2.8 kg

## OUTPUT POWER DERATINGS

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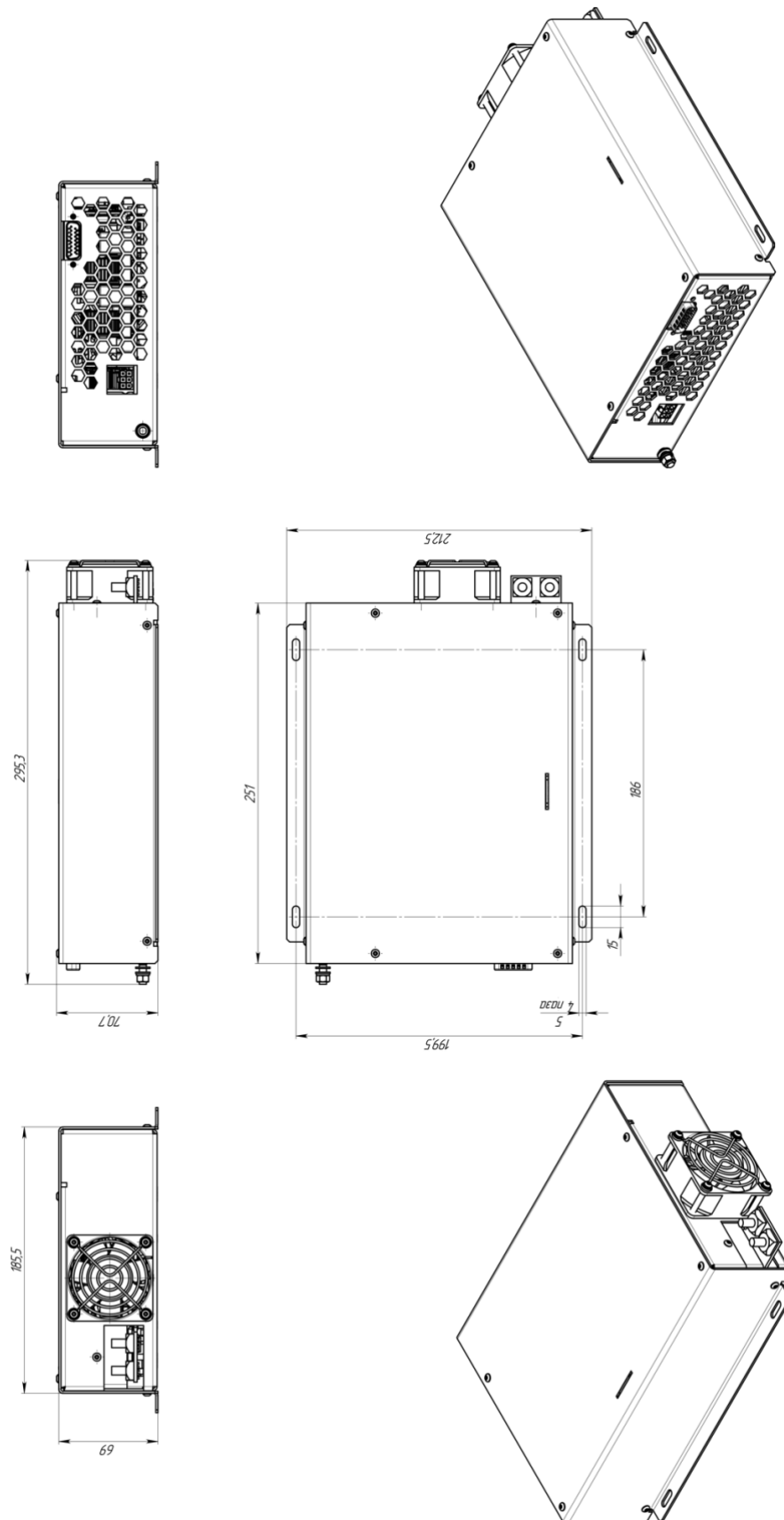
*Ambient temperature – 40 °C*

## Dimensional drawings

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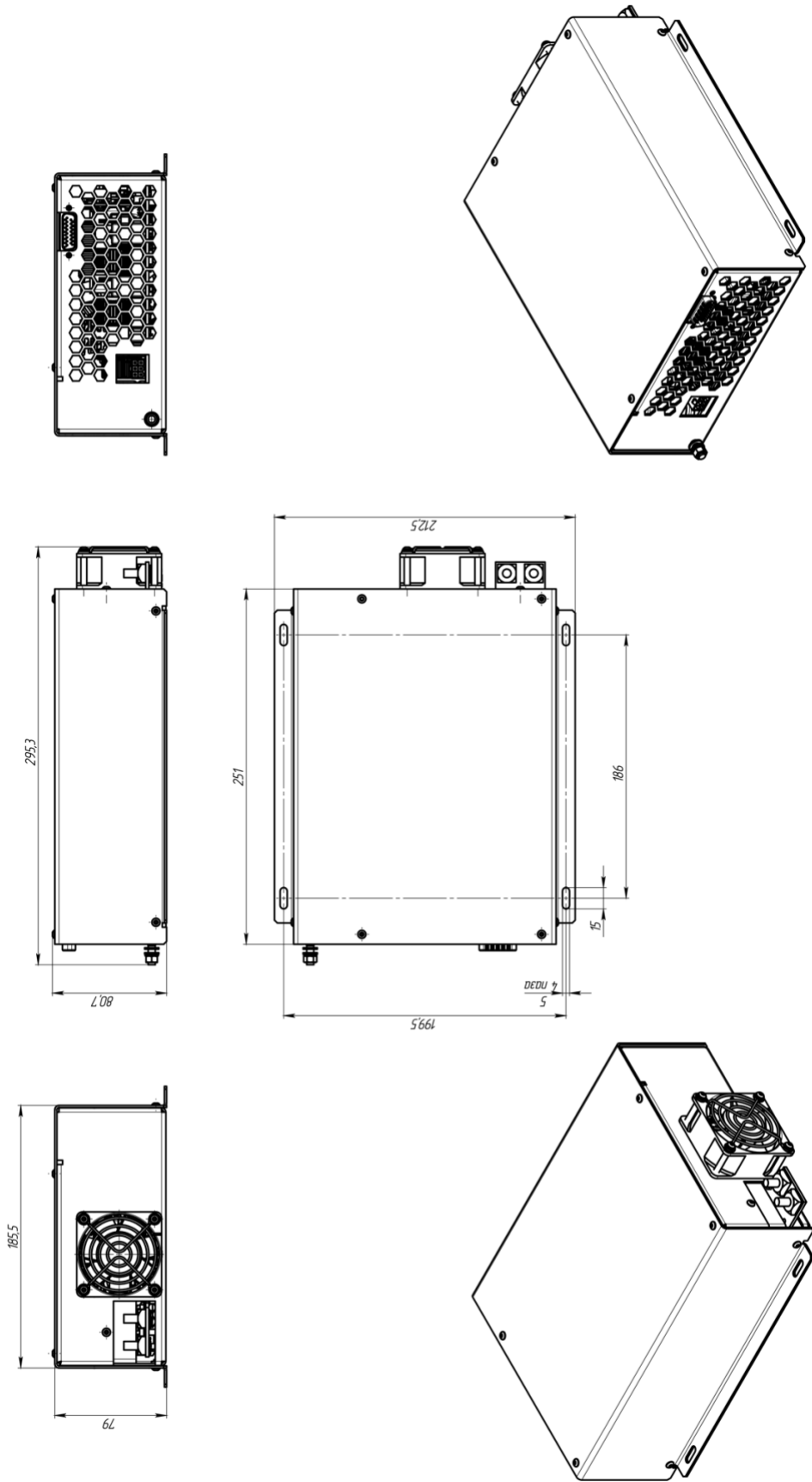
### STANDARD VERSION

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# LONG-PULSE VERSION

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## How to order?

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PDD-300-XX-YY-[LP], where

XX means maximum output current  $I_{MAX}$  (user selectable up to 200A, even higher current is available on special request)

YY means maximum output voltage  $V_{MAX}$  (user selectable up to 50V, other on request)

[LP] means optional long-pulse modification (see also [Pulse width limitations](#) section to better understand the driver's performance).

Examples (some popular modifications):

P/N	Description	Certificates
PDD-300-100A-30V	100-240VAC input, 100A/30V output, standard version maximum pulse width >65ms @ 100A, 30V, 220VAC	IEC 60601-1:2005 + A1: 2012 IEC 60601-1-2:2014
PDD-300-150A-25V	100-240VAC input, 150A/25V output, standard version maximum pulse width >35ms @ 150A, 25V, 220VAC	
PDD-300-100A-30V-LP	100-240VAC input, 100A/30V output, long-pulse version maximum pulse width >100ms @ 100A, 30V, 220VAC	On demand
PDD-300-150A-25V-LP	100-240VAC input, 150A/25V output, long-pulse version maximum pulse width >55ms @ 150A, 25V, 220VAC	IEC 60601-1:2005 + A1: 2012

Other modifications are available upon request.

## Environmental protection

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PDD-300 should not be disposed of with household waste.

Please dispose of the PDD-300 in accordance with the applicable legislation on the management of electronic waste in your country.

## Name and address of the manufacturer

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OEM Tech Sp. z o. o.  
st. Stepinska 22/30 – #234  
00-739, Warsaw, Poland

## Electromagnetic environment – Guidance

Standard: IEC 60601-1-2:2014

Environment of intended uses: Professional Healthcare Facility Environment

Emission test	Limit	Electromagnetic environment - Guidance
Conducted emission	CISPR 11, Group 1, Class A	Device uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
Radiated emission	CISPR 11, Group 1, Class A	
Harmonic current emissions	IEC 61000-3-2, Class A	Device is directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Voltage fluctuations and flicker	IEC 61000-3-3	

Immunity test	Compliance level	Electromagnetic environment - Guidance
Electrostatic Discharge (IEC 61000-4-2)	Contact Discharge: $\pm 8$ kV Air Discharge: $\pm 2$ kV, $\pm 4$ kV, $\pm 8$ kV, $\pm 15$ kV	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Radiated RF EM field (IEC 61000-4-3)	80-2700 MHz; 1kHz AM 80 %; 3 V/m	Portable and mobile RF communications equipment should be used no closer to any part of the device, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.  <b>Recommended separation distance:</b> $d = 1.2\sqrt{P}$ for 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ for 800 MHz to 2,7 GHz where $P$ is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and $d$ is the recommended separation distance in meters (m).
Proximity fields from RF wireless communications equipment (IEC 61000-4-3)	385 MHz; Pulse Modulation: 18 Hz; 27 V/m 450 MHz, FM $\pm 5$ Hz deviation: 1 kHz sine; 28 V/m 710, 745, 780 MHz; Pulse Modulation: 217 Hz; 9 V/m 810, 870, 930 MHz; Pulse Modulation: 18 Hz; 28 V/m 1720, 1845, 1970 MHz; Pulse Modulation: 217 Hz; 28 V/m 2450 MHz; Pulse Modulation: 217 Hz; 28 V/m; 5240, 5500, 5785 MHz; Pulse Modulation: 217 Hz; 9 V/m	Portable and mobile RF communications equipment should be used no closer to any part of the device, including cables, than the recommended separation distance 30 cm.
Electrical fast transients / bursts (IEC 61000-4-4)	Power lines: 2 kV; 100 kHz repetition frequency Signal lines: 1 kV; 100 kHz repetition frequency	Mains power quality should be that of a typical environment.
Surges (IEC 61000-4-5)	L-N: 1kV at 0°, 90°, 180°, 270° L-PE, N-PE: 2 kV at 0°, 90°, 180°, 270°	Mains power quality should be that of a typical environment.
Conducted disturbances induced by RF fields (IEC 61000-4-6)	0.15-80 MHz; 1kHz AM 80 %; 3 Vrms, 6 Vrms in ISM	Portable and mobile RF communications equipment should be used no closer to any part of the device, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.

		<p><b>Recommended separation distance:</b>  <math>d = 1.2\sqrt{P}</math> for 150 kHz to 80MHz  <i>where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).</i></p>
<b>Rated power frequency magnetic fields (IEC 61000-4-8)</b>	30 A/m, 50 Hz	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
<b>Voltage dips / Voltage interruptions (IEC 61000-4-11)</b>	0% $U_T$ for 0.5 cycle at 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315° 0% $U_T$ for 1 cycle at 0° 70% $U_T$ for 25/30 cycles at 0° 0% $U_T$ for 250/300 cycles 0°	Mains power quality should be that of a typical environment. If the user of the device requires continued operation during power mains interruptions, it is recommended that the device is powered from an uninterruptible power supply or battery.