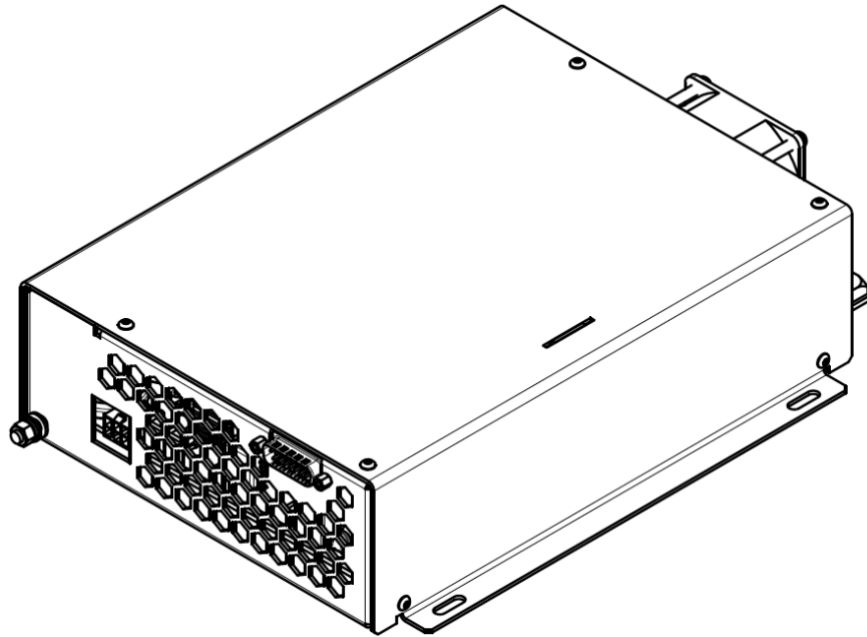


PDD-300 pulsed diode driver

User manual



Warning! This equipment may be dangerous.
Please read user manual before starting operations.




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.





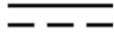




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Warnings

	Warning! The equipment is CLASS I ME EQUIPMENT. To avoid risk of electrical shock, the equipment must be protectively grounded.
	Warning! There is no user-serviceable parts inside the device. Do not self-repair the driver. Do not even open the enclosure, because of electrical shock risk with residual high voltage.
	Warning! Equipment is not suitable for use in presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.

Explanation of symbols

Symbol	Description
	Refer to 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 of the device
INTERFACE	Interface (control) connector of the device

Overview / Applications

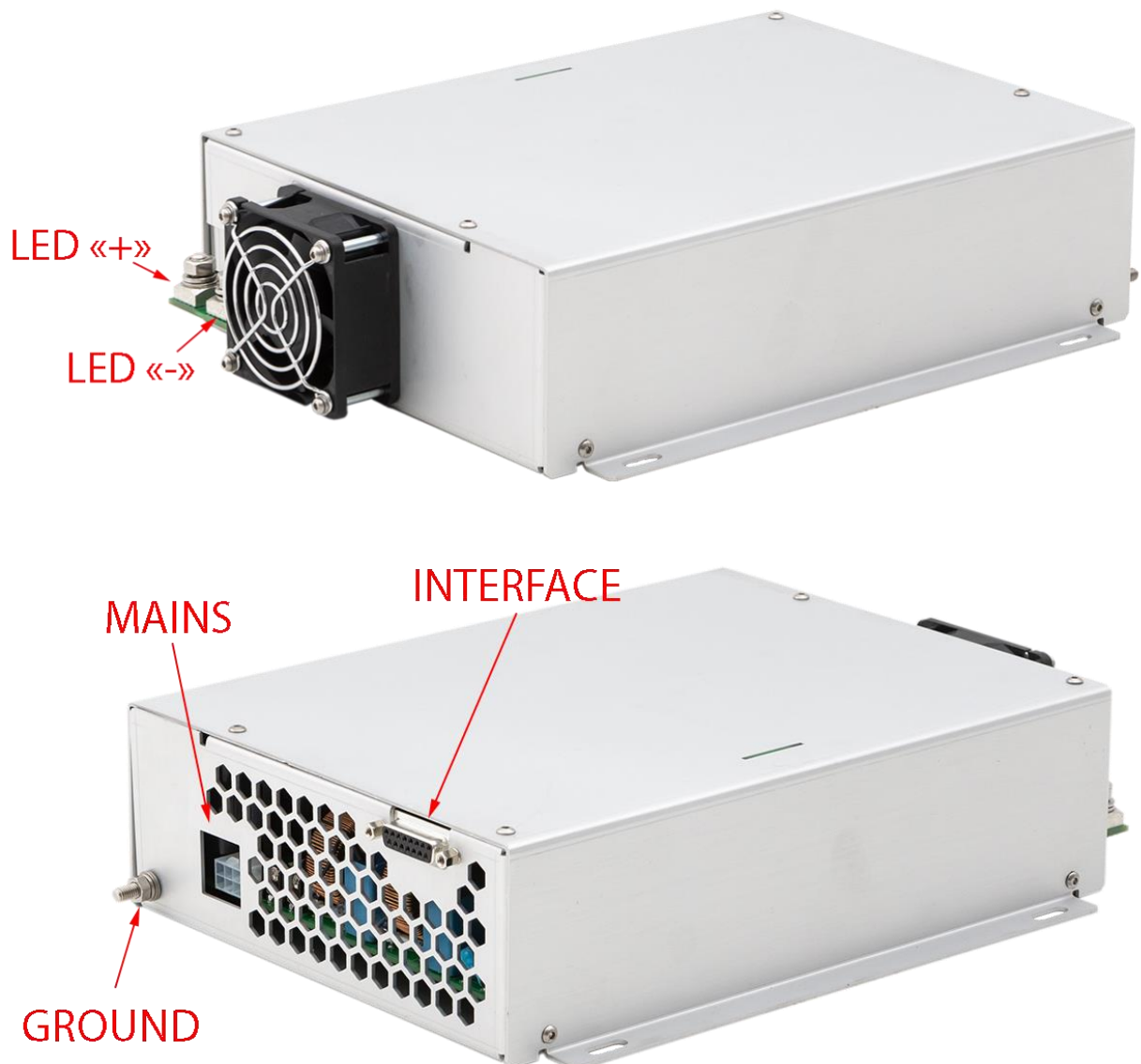
PDD-300 is a series of high-power pulsed diode drivers. Peak output power is up to 5kW (with user selectable I_{MAX} and V_{MAX}), averaged output power is up to 300W.

Driver was specially designed for direct diode hair removal application.
Driver's input is 100-240VAC.

Cooling

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

Appearance / Layout



Connectors / Pins / Interface signals

INTERFACE: 15-pin D-SUB Female

PIN (color)	DESIGNATION	DESCRIPTION
1 (green)	ENABLE	+5V TTL applied to this pin enable PDD. While 0V are applied to this pin or pin is unconnected module is disabled. Once <i>Fault</i> has occurred module is blocked till you eliminate fault cause, then <i>disable</i> module and <i>enable</i> it again.
2 (orange)	FAULT	If module is <i>enabled</i> and some trouble has occurred, module automatically stops operations and sets <i>Fault</i> status (<i>Fault</i> loop is “closed”). Fault can be caused by following reasons: - overheating - mains voltage interruption - maximum pulse energy exceeded To remove Fault state one should <i>disable</i> driver and <i>enable</i> it again In case of normal operations <i>Fault</i> loop is “opened”. Maximum allowed current in <i>Fault</i> loop is 50mA.
3 (transparent)	PULSE 1	+5V TTL pulse should be applied to pin 3 and to pin 8 simultaneously in order to obtain pulsed current from PDD-300. In cases if 0V is applied to one of these pins or at least one of these pins is unconnected, there will be no current from PDD-300.
4 (black)	PULSE 2 RETURN	Return of Pulse 2 signal
5 (yellow)	PULSE 1 RETURN	Return of Pulse 1 signal
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 pulse should be applied to pin 3 and to pin 8 simultaneously in order to obtain pulsed current from PDD-300. In cases if 0V is applied to one of these pins or at least one of these pins is unconnected, there will be no current from PDD-300.
9 (purple)	ENABLE RETURN	Return of Enable signal
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 POWER INPUT: Molex Minifit MF-6F type

6	5	4
3	2	1

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

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

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

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
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 is allowed install and perform the connection of PDD-300 into customer's system
- PDD-300 is intended only for diode driving applications. The module should only be used inside the medical equipment, which has means to isolate its circuits electrically from the supply mains on all poles simultaneously
- Use four M4 mounting slits on the bottom side of 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 normal position, upside-down position or in other orientations, as well
- Connect the module to your system protective ground using provided M5 grounding stud
- Connect AC INPUT, OUTPUT and INTERFACE cables according to their functions
- Since module is air cooled, at least 50mm of free space should be provided both at the suction and pressure sides of PDD-300

Operations notes

1. The proper sequence of driver's start up procedure is 'power -> enable -> pulse'. Other sequences are considered as incorrect
2. When driver is powered but disabled, the fan rotates slowly; once driver is enabled, the fan will accelerate to a higher speed
3. Fault state is set when fault condition is met AND driver is enabled
4. To remove Fault state one should disable driver and enable it again

Troubleshooting

- In case of a mains voltage interruption, the output voltage drops down. Once the mains voltage is restored, the unit doesn't restart automatically and needs to be enabled again to resume the operations.

Input fuses

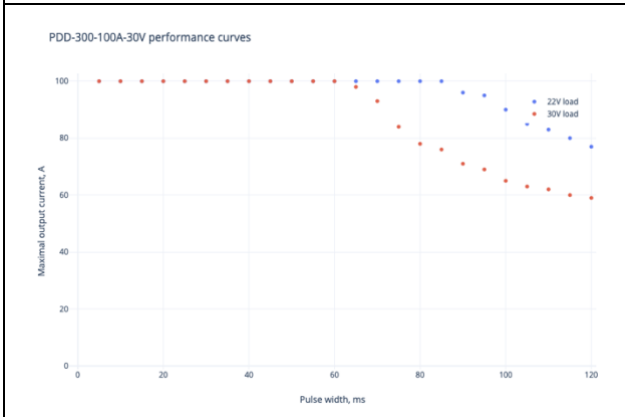
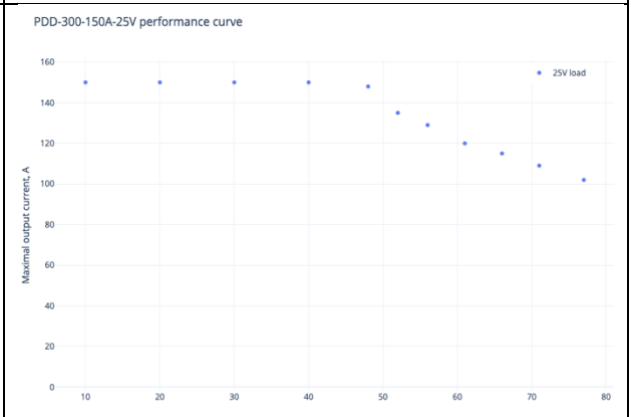
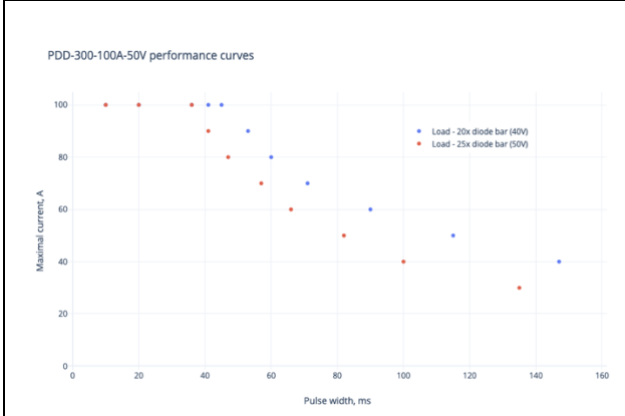
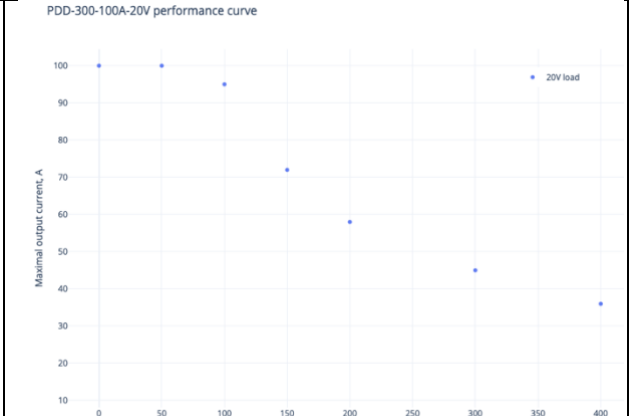
Designation	Type	Parameters	Suggested p/n
FU1, FU2	Fast (quick acting) High breaking capacity	Dimensions: 5x20 mm Voltage rating: 250 VAC Current rating: 10 A	Schurter 0001.1014

Pulse width limitations

Maximum pulse width, which the driver is able to provide at its output, isn't fixed, but depends on driver's modification, operating current, load voltage and input voltage.

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

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

<p style="text-align: center;">PDD-300-100A-30V</p>  <p>PDD-300-100A-30V performance curves</p> <p>Maximal output current, A</p> <p>Pulse width, ms</p> <p>22V load 30V load</p>	<p style="text-align: center;">PDD-300-150A-25V</p>  <p>PDD-300-150A-25V performance curve</p> <p>Maximal output current, A</p> <p>Pulse width, ms</p> <p>25V load</p>
<p style="text-align: center;"><i>Maximum pulse width - around 65ms at maximum current and voltage. Even longer at smaller currents and/or voltages</i></p>	<p style="text-align: center;"><i>Maximum pulse width - around 45ms at maximum current and voltage. Even longer at smaller currents and/or voltages</i></p>
<p style="text-align: center;">PDD-300-100A-50V</p>  <p>PDD-300-100A-50V performance curves</p> <p>Maximal current, A</p> <p>Pulse width, ms</p> <p>Load - 20x diode bar (40V) Load - 25x diode bar (50V)</p>	<p style="text-align: center;">PDD-300-100A-20V</p>  <p>PDD-300-100A-20V performance curve</p> <p>Maximal output current, A</p> <p>Pulse width, ms</p> <p>20V load</p>
<p style="text-align: center;"><i>Maximum pulse width - around 35ms at maximum current and voltage. Even longer at smaller currents and/or voltages.</i></p>	<p style="text-align: center;"><i>Maximum pulse width - around 100ms at maximum current and voltage. Even longer at smaller currents and/or voltages.</i></p>

Specifications

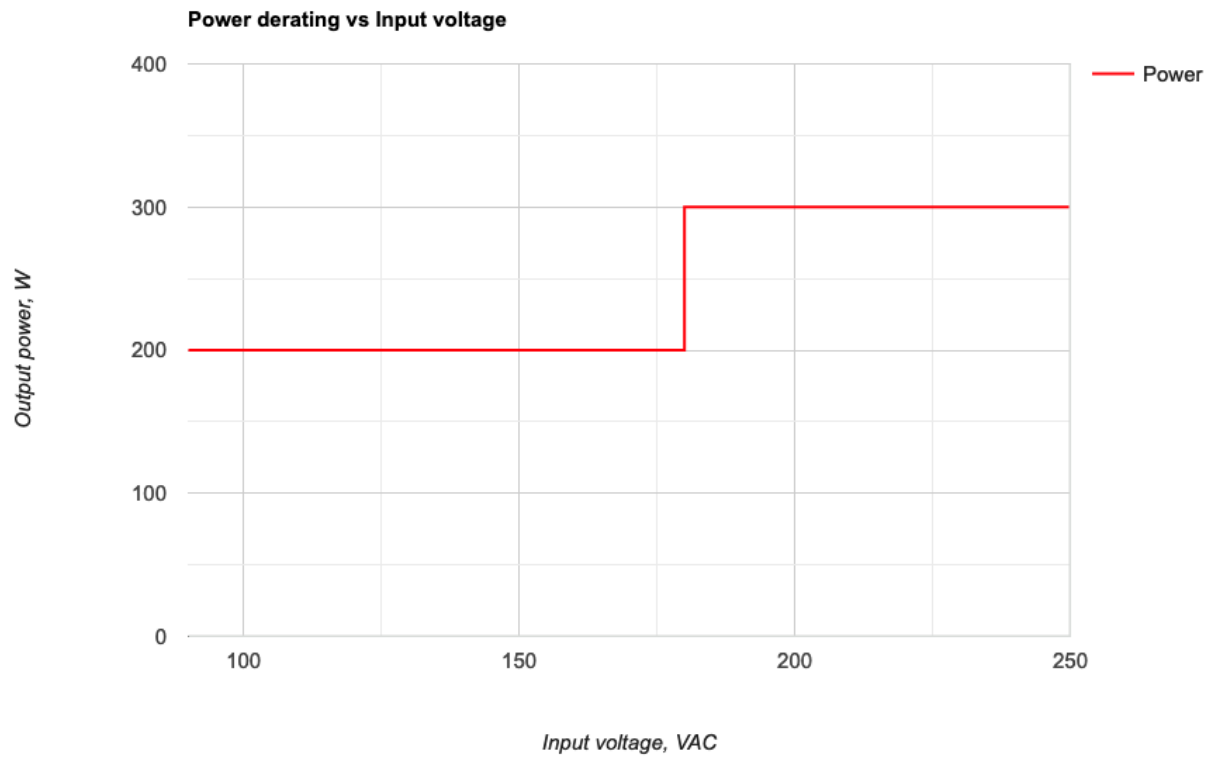
ELECTRICAL

INPUTS	
Input voltage	100-240VAC 50/60Hz
Input current	<5A, inrush current <10A
OUTPUT	
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>(*) $I_{MAX} * V_{MAX}$ shouldn't exceed 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 driver's modification, operating current and voltage, see also <i>Pulse width limitations</i> section)
Maximum pulse energy (E_{MAX}) **	~200J in standard version (up to ~250J on request) ~300J in long pulse version
<i>(**) In given regime, i.e. with given operating current (I), voltage (V) and pulse width (t), pulse energy (E) can be calculated as $E=I*V*t$. Since internal buffer capacitance of PDD-300 is limited, pulse energy is also limited ($E < E_{MAX}$). Please contact the factory for further details.</i>	
Rise and fall times	<1ms (10-90% level)
Average output power	200W for 90-180VAC input 300W for 180-264VAC input
Output power deratings	See 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}
SAFETY	Safety as per IEC 60601-1 EMC as per IEC 60601-1-2
COOLING	No external cooling is required
ENVIRONMENT	
Atmospheric pressure	70 kPa to 106 kPa
Operation temperature	0 ... +40 °C (see also derating curves)
Storage temperature	-20 ... +60 °C
Humidity	90%, non-condensing

MECHANICAL

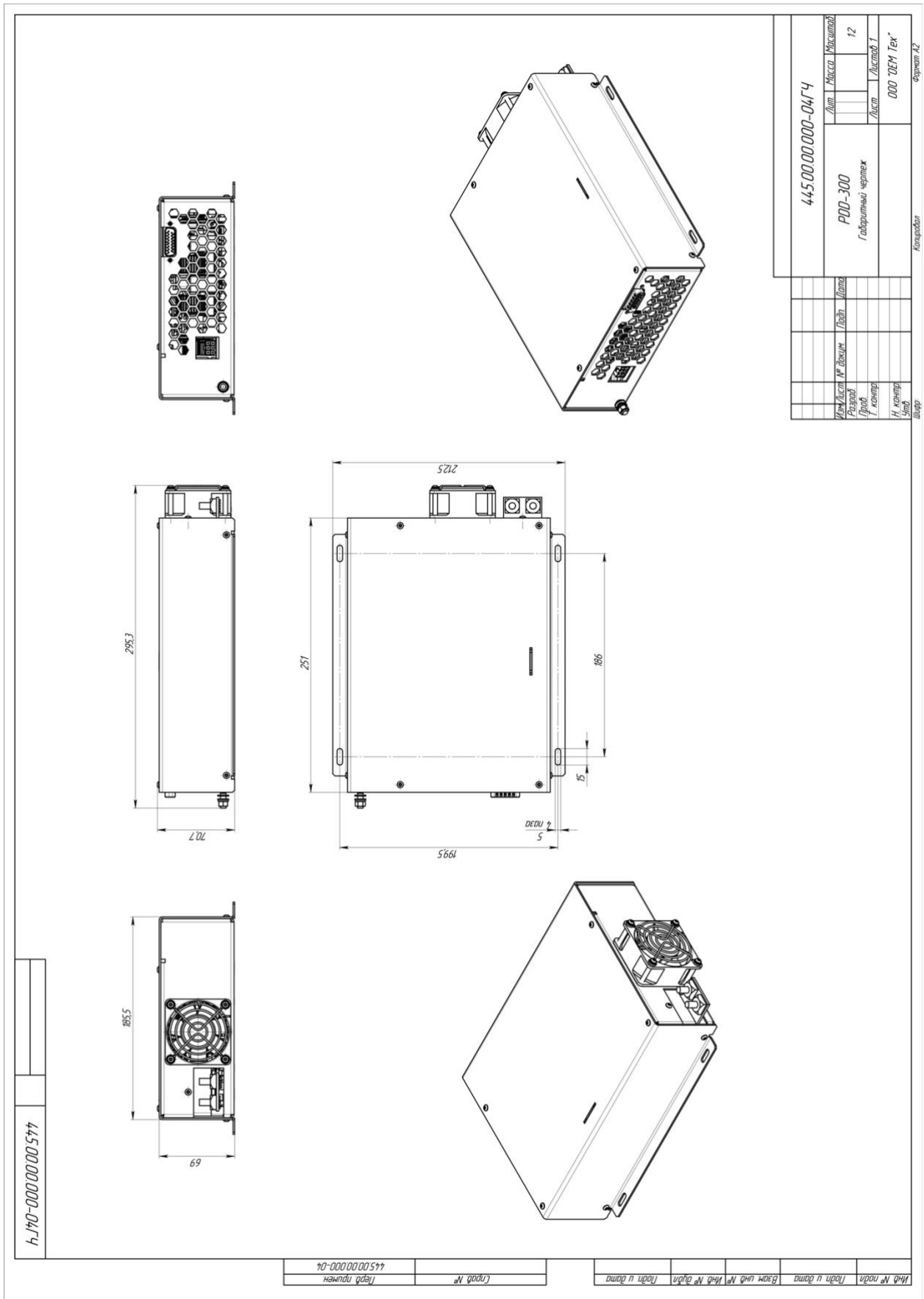
Dimensions	See dimensional drawings below
Weight	Approx. 2.8 kg

OUTPUT POWER DERATINGS



Ambient temperature – 40 °C

Dimensional drawing (standard version)

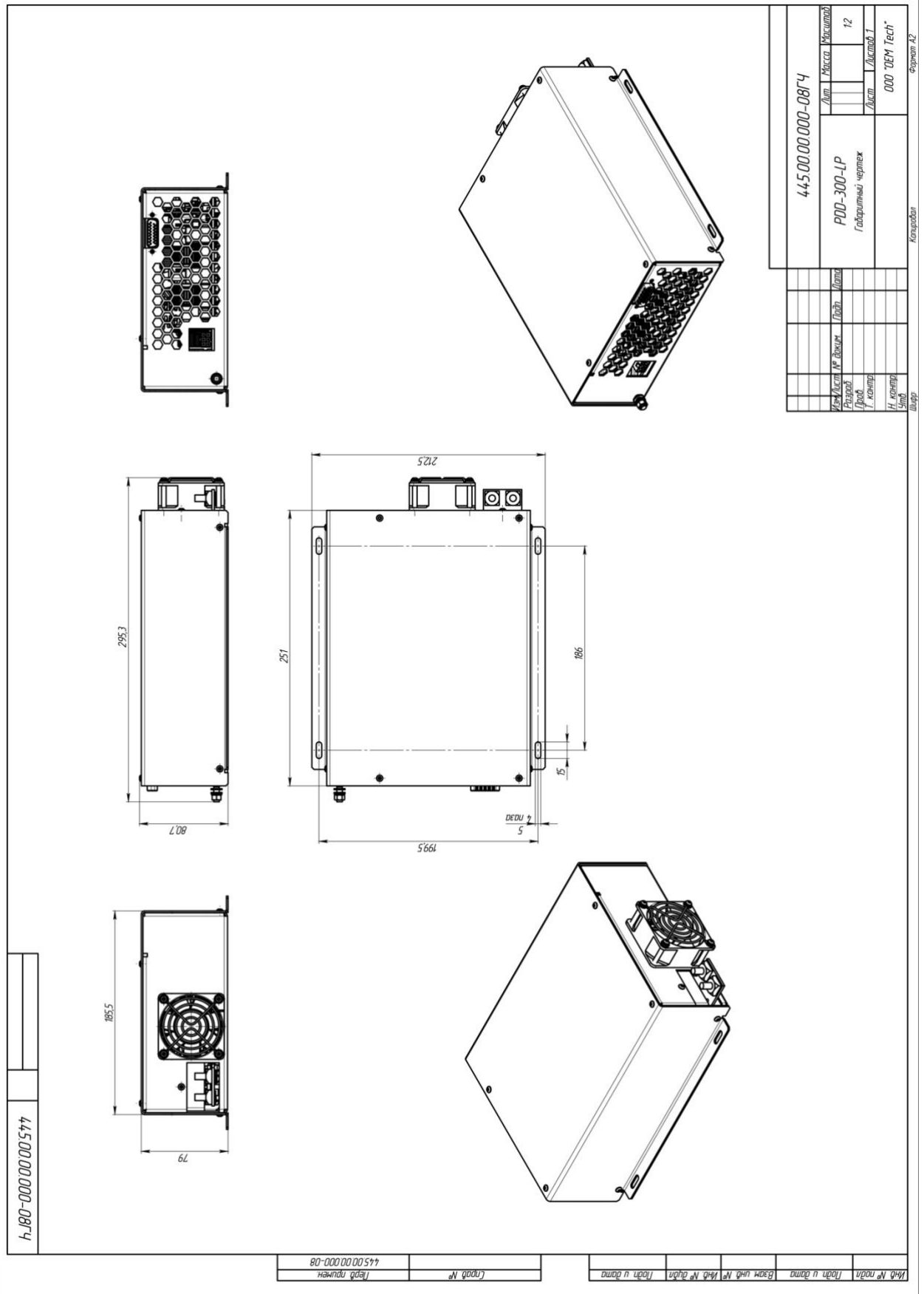


445.00.00.000-0474

445.00.00.000-0474		Лист	Масштаб
P00-300		Лист	12
Габаритный чертеж		Лист	Листов 1
		ООО "ДЕУ Тек"	

Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и
Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и
Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и	Инд № мод/и

Dimensional drawing (long pulse version)



How to order?

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, 230VAC	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 >45ms @ 150A, 25V, 230VAC	
PDD-300-100A-30V-LP	100-240VAC input, 100A/30V output, long pulse version maximum pulse width >100ms @ 100A, 30V, 230VAC	On demand
PDD-300-150A-25V-LP	100-240VAC input, 150A/25V output, long pulse version maximum pulse width >65ms @ 150A, 25V, 230VAC	On demand

Other modifications are available upon request.

Cables are ordered and purchased separately.

PDD-300-CABLES	A set of cables for PDD-300. Includes: - AC input cable – 1pc - Interface cable – 1pc - Output leads – 2pc	-
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Environmental protection

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

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

Name and address of the manufacturer

OEM Tech O.O.O.
Odoevskogo 129
220018 Minsk, Belarus

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: ± 8 kV Air Discharge: ± 2 kV, ± 4 kV, ± 8 kV, ± 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. Recommended separation distance: $d = 1.2\sqrt{P}$ 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 ± 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>Recommended separation distance: $d = 1.2\sqrt{P}$ for 150 kHz to 80MHz 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).</p>
<p>Rated power frequency magnetic fields (IEC 61000-4-8)</p>	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.
<p>Voltage dips / Voltage interruptions (IEC 61000-4-11)</p>	<p>0% U_T for 0.5 cycle at 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°</p> <p>0% U_T for 1 cycle at 0°</p> <p>70% U_T for 25/30 cycles at 0°</p> <p>0% U_T for 250/300 cycles 0°</p>	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.