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 **OEM Tech**
LASER ELECTRONICS

LDD-SERIES PRODUCT MANUAL

CW / Pulsed OEM Laser Diode Driver Module

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LDD-Series Laser Diode Driver

User Manual



Warning! Improper use of this module may be dangerous.
Please read user manual before starting operations.

Important Note: Please measure output with adequate load only (diodes).
Resistive loads connected to the output won't damage the driver, but will
distort the driver behavior.



Overview / Applications

LDD-series laser diode drivers are intended for driving single-emitter laser diodes, as well as laser diode bars and arrays, in pulsed or CW mode.

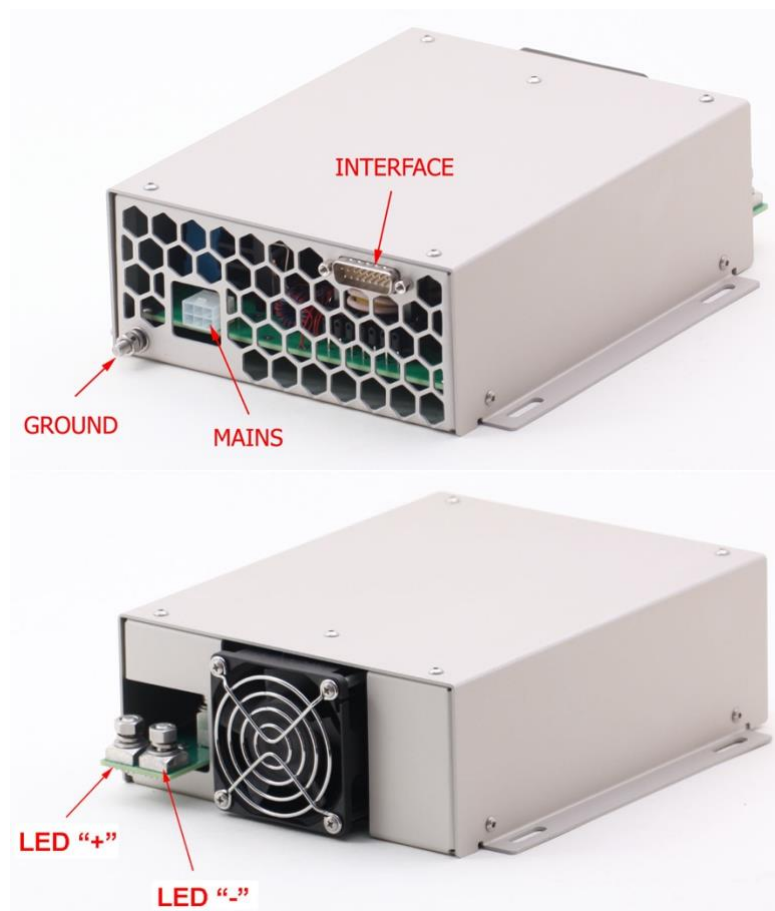
Input voltage, max. output power, max. output current, max. output voltage are available across a wide range (for further information see **Selection Chart** section).

The module is IEC 60601-1 Safety Compliant, and can be used for medical applications.

Cooling

The module contains a fan (fans) active cooling. No external cooling is required.

Appearance





Connections, Signals, Signal Descriptions

Mains: Molex 39-30-1060

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 (to Laser Diode): M6 studs

PIN (color)	DESCRIPTION
LED “+” (red)	To laser diode anode
LED “-” (blue)	To laser diode cathode

Ground: M5 Stud

The module must be grounded using this stud before connecting the module to the mains electrical supply.

Grounding Configuration

By default, both OUTPUT negative and INTERFACE return are internally connected to the chassis ground. Laser diodes with the anode connected to the case should not be used with the LDD-250.

Modifications with floating output are available on request.



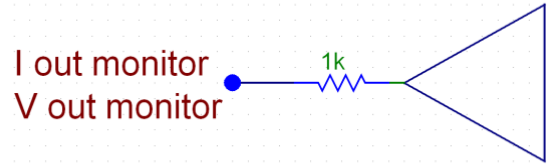
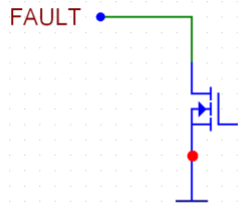
Interface (LDD-Series Control): 15 Pin “D”-Sub Female

PIN (color)	DESIGNATION	DESCRIPTION
1 (green)	Module Enable	Apply +5 V TTL on this pin to <i>ENABLE</i> the module. If 0V is applied to this pin, or if the pin is open, the module is <i>DISABLED</i> and the output cannot be enabled. If a <i>Fault</i> has occurred, the module is disabled until the fault is remedied. To reset the module, <i>DISABLE</i> the module and <i>ENABLE</i> it again.
2 (orange)	Fault *	If module is <i>ENABLED</i> and a fault has occurred, the module automatically stops operations and sets the <i>Fault</i> status (<i>Fault</i> loop is “closed”). In case of normal operations <i>Fault</i> loop is “opened”. Maximum allowed current in <i>Fault</i> loop is 50 mA.
3 (transparent)	Interlock	When <i>Interlock</i> loop is “open” the output is disabled. The interlock loop must be “closed” to allow operations. Electrical resistance of the closed loop must be less than 100 Ω. If the interlock opens during operation, the output is disabled until the <i>Interlock</i> loop is closed. Then the module must be <i>DISABLED</i> and <i>ENABLED</i> again.
4, 9, 15 (black)	Interface Return	Current return path of all interface circuits. This pin is connected to the GROUND stud.
5 (yellow)	V OUT monitor	The voltage at this pin is a monitor signal proportional to the measured value of voltage on the load. 0 V at <i>PIN5</i> corresponds to 0 V at load. Voltage at <i>PIN5</i> corresponds either to full voltage at load when $V_{MAX} < 10$ V, or to $\frac{1}{2}$, $\frac{1}{4}$, etc. of this voltage when $V_{MAX} < 20$ V, 40 V, etc.
6 (purple)	I OUT monitor	The voltage at this pin is a monitor signal proportional to the measured value of output current. 0 V at <i>PIN6</i> corresponds to 0 A. 10V at <i>PIN6</i> corresponds to I_{MAX} .
7 (blue)	I Program	Voltage applied to this pin sets the output current. An input voltage of 0 – 10 VDC is linear with 0 – I_{MAX} .
8 (white)	Output ON/OFF	Apply +5V TTL on this pin to switch ON the output current. If 0 V is applied to this pin, or if the pin is open, the output current is <i>OFF</i> . Digital output current modulation is achieved by applying a +5 V TTL signal to this pin. Maximum modulation rate is 1 kHz.
10-12	–	Not used
13, 14 (red)	+15V OUT	Auxiliary 15 VDC output. Maximum current 100 mA.

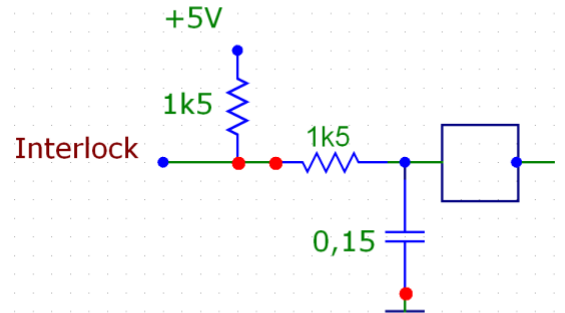
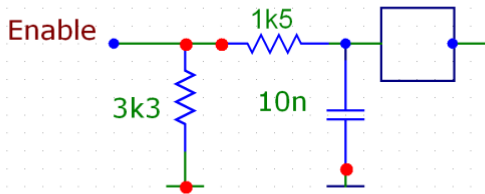
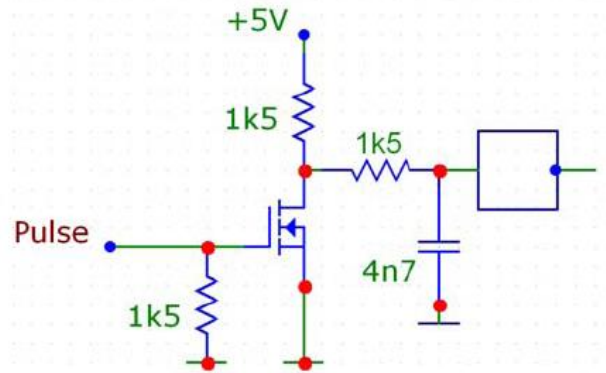
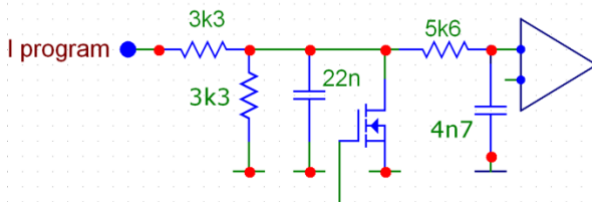
* see also **Faults** section



Interface Circuits:



“Open collector” scheme, 50mA max



“Open collector” scheme, 100Ohm max



Safety

Warning! This module produces high voltages that can be very dangerous. Exercise extreme caution when using the module.

- During operation the protective covers of the equipment must be securely fixed in place and all electrical connections must be properly attached.
- The module is designed to be installed inside a properly grounded metal enclosure. It is the customer's responsibility to ensure that personnel and users are prevented from accidentally contacting the LDD module when it is operating.

Casual contact could be fatal!

- Disconnect the module from the power source before making or changing electrical or mechanical connections.
- **Do not remove the case or protective covers!** There are no user serviceable parts inside this module.

Operations

To connect the LDD Module and set the laser diode drive current:

1. Connect LDD to the ground (*GROUND* stud).
2. Ensure the INTERLOCK connection is open (pin 3)
3. Connect laser diode to the module (*LED “-”* and *LED “+”* studs). Exercise caution and use safe ESD practices to avoid accidental damage to the laser diode or the LDD driver.
4. Set Module Enable to *DISABLE* (pin 1); set *Output OF/OFF* to *OFF* (pin 8); set *I Program* signal to 0 V (pin 7)
5. Apply the mains power to the module.
6. Close the INTERLOCK connection.
7. Set Module Enable to *ENABLE* (pin 1).
8. Switch on the output current by applying +5 V Output ON/OFF.
9. Set the desired value of output current (*I Program* signal)
10. *Enable* the LDD module by applying +5 V to pin 1

To power down the LDD module and remove the laser diode:

1. Switch off the output current by applying 0 V at pin 8, then *DISABLE* the module by applying 0 V at pin 1.
2. Open the Interlock connection (pin 3)
3. Set Module Enable to *DISABLE* .
4. Disconnect the laser diode. Exercise caution and use safe ESD practices to avoid accidental damage to the laser diode or the LDD driver.
5. Disconnect module from the mains electrical supply.



Faults

The module sets the *Fault* state in the following cases:

- *overheating* (if the temperature of the module exceeds $70^{\circ}\text{C} \pm 2^{\circ}\text{C}$).

To remove Fault status module must be cooled below $65^{\circ}\text{C} \pm 1^{\circ}\text{C}$ temperature.

- *overvoltage* (if voltage on the load exceeds 110% of V_{MAX} level).

Most causes of such fault are load type mismatch and load absence.

- *overcurrent* (if output current exceeds $1.05 I_{\text{MAX}}$ level)
- *incorrect I Program* (if input voltage set point exceeds 10.5V level)
- *incorrect start-up sequence* (if the *Enable* signal is set before connecting module to the mains, module sets the *Fault* state)

Once *Fault* has occurred you should eliminate the Fault cause, then restart the module (*DISABLE* module and *ENABLE* it again).



Specification

ELECTRICAL SPECIFICATION

INPUT	
Voltage	100-240 VAC or 200-240 VAC, 50/60 Hz (model dependent, see Selection Chart section)
Max. current	Depends on modification, 12 A max
OUTPUT	
Max. output power (P_{MAX}) ^{1,2}	Selectable in 150-1500 W range (see Selection Chart section on page 13)
Max. output current (I_{MAX}) ^{1,2}	Selectable in 5A-100 A range (see Selection Chart section on page 13)
Max. output voltage (V_{MAX}) ^{1,2}	Selectable in 2V-150 V range (see Selection Chart section on page 13)
	¹ $I_{MAX} * V_{MAX} \leq P_{MAX}$ ² Up to 2000W, 150A, 200V on request
Recommended/allowed diode voltage	Recommended 70% to 100% of V_{MAX} Allowed 20% to 100% of V_{MAX}
Output current adjustment range	0%-100% of I_{MAX} with recommended diodes (70% to 100% of V_{MAX}) 10% to 100% of I_{MAX} with allowed diodes (20% to 100% of V_{MAX})
Efficiency	more than 80%
Rise/fall time	< 1 ms (10% to 90% full current) < 500 us on request
Current regulation accuracy	< 1% of I_{MAX}
Current value error	< 1% of I_{MAX}
Current overshoot	< 1% of I_{MAX}
INTERFACE	
Connector	15 Pin "D"-Sub Female
Current program	analog, 0-10 V
Current monitor	analog, 0-10 V
Voltage monitor	analog, see Interface description
SAFETY	
PFC value	> 0.98 (active)
Leakage current	< 150 μ A
Input/output isolation voltage	4000 VAC
Safety approvals (on request)	IEC 60601-1 or IEC 60950-1
EMC approvals (on request)	IEC 60601-1-2 or EN 55011/CISPR 11



COOLING	No external cooling is required
ENVIRONMENT	
Operation temperature	0 ... +40 °C
Storage temperature	-20 ... +60 °C
Humidity	90%, non-condensing



Part number

Typical order code is **LDD-XXXX-YYY-ZZZ**

where **XXXX** – max. output power (in Watts),

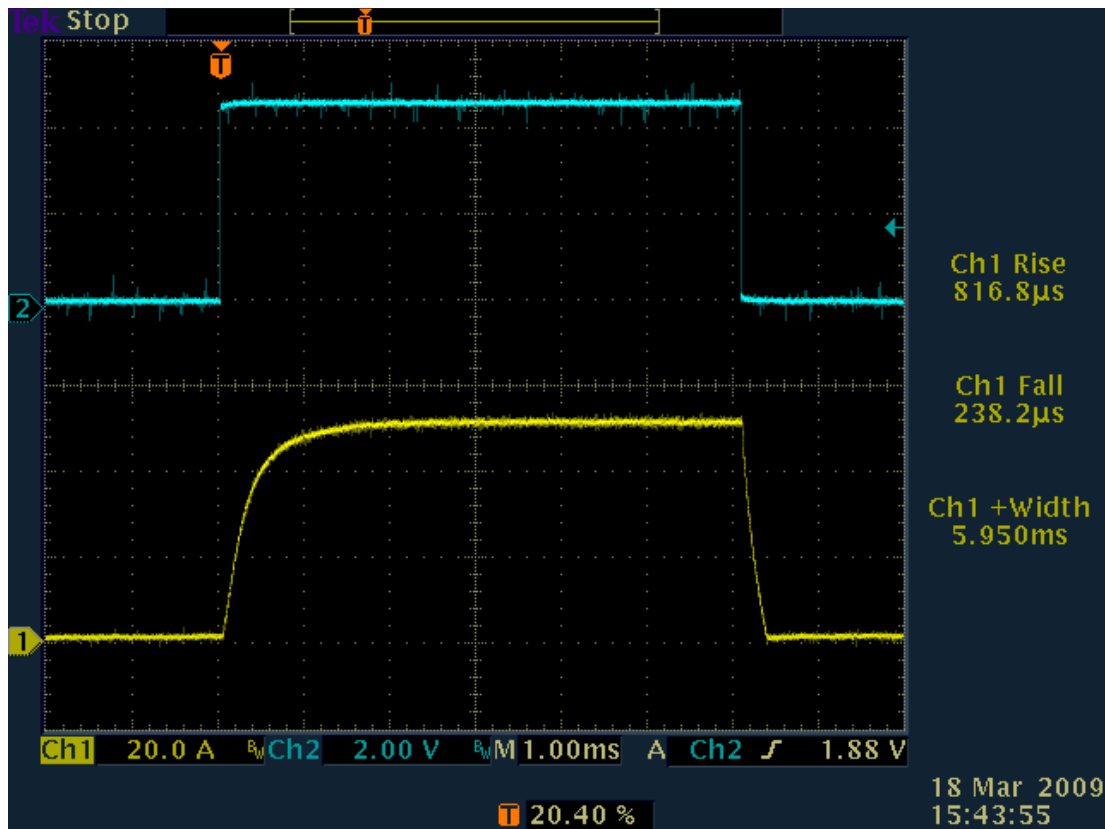
YYY – max. output current (in Amps).

ZZZ – max. output voltage (in Volts)

The product of YYY and ZZZ shouldn't exceed XXXX...

Examples: LDD-250W-100A-2V or LDD-1500W-50A-30V

Typical output

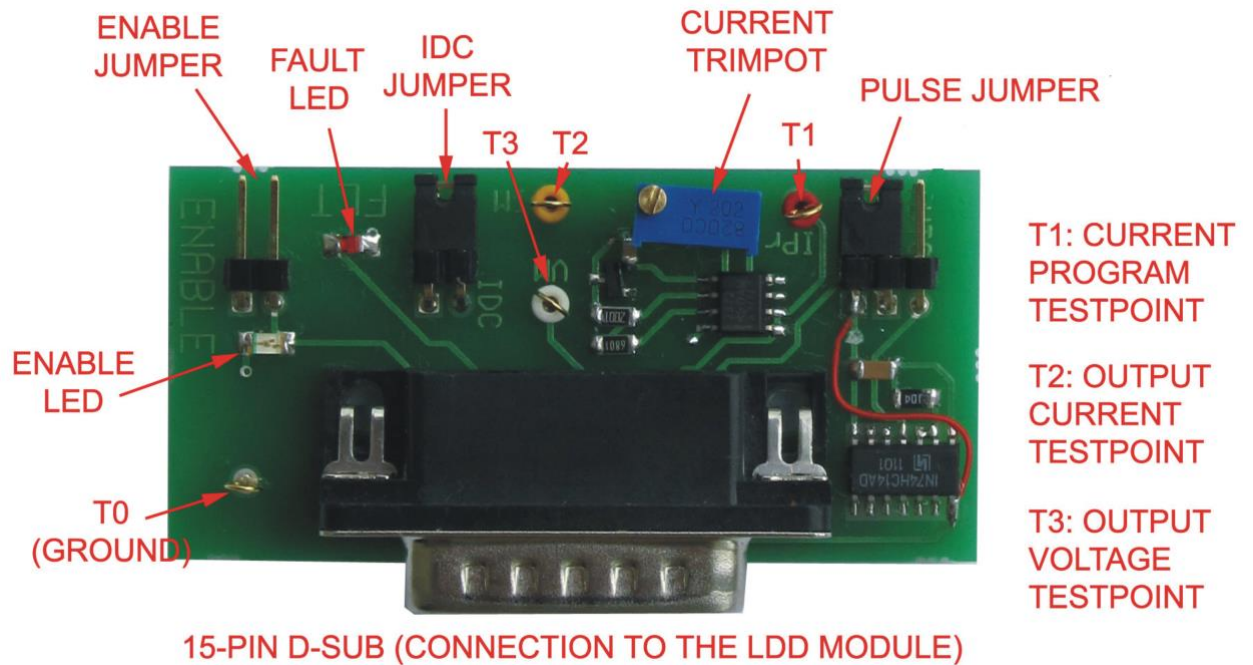


Yellow curve depicts output current, cyan curve depicts inverted *PULSE* signal
Timescale is 1 ms/div



Accessories

Stand-alone PCB (ordering code –STA) makes stand-alone operations possible. Nothing but this PCB is needed.



PULSE JUMPER STATES DESCRIPTION

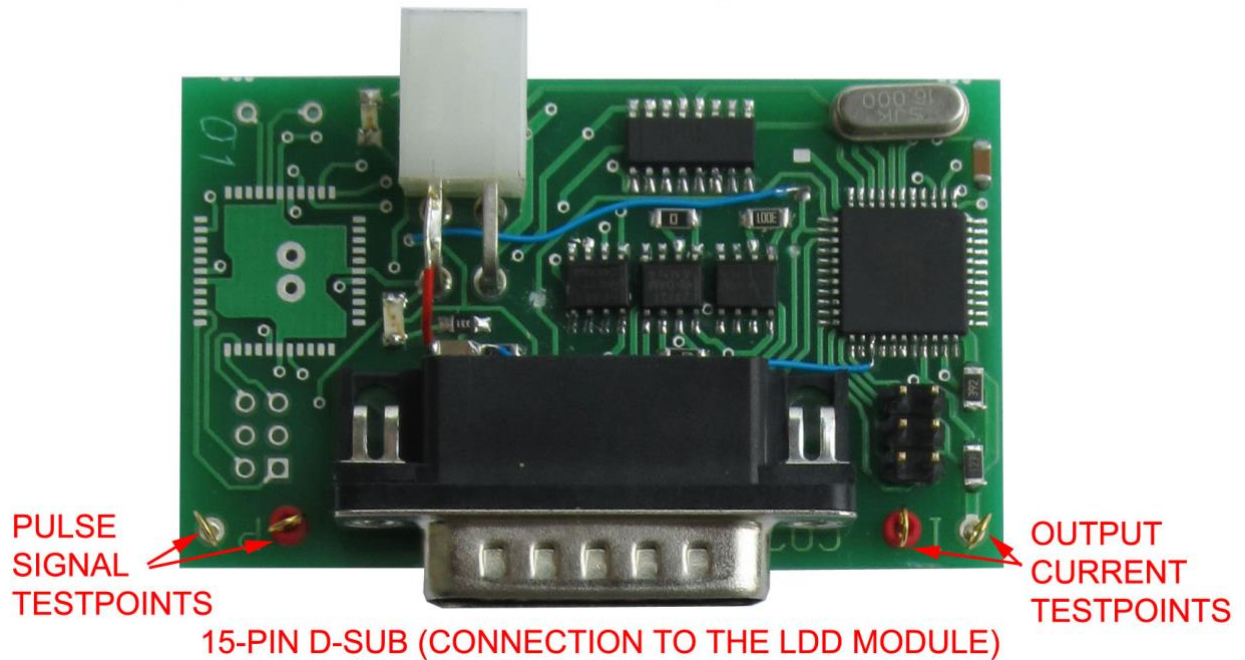
	Pulse is ON
	Pulse is OFF
	Pulse is driven by external generator
	Pulse is driven by internal generator

Dimensions: 64x30x17mm



RS-232 interface PCB (ordering code –RS232) provides possibility to control the laser diode driver via machine RS-232 interface.

**4-PIN MOLEX MINIFIT
(CONNECTION TO THE COMPUTER)**



Dimensions: 64x38x17mm

RS-232 connection parameters: 115200 bps, 8 data bits, 1 stop bit, no parity.

Command format is: {command} {data (optionally)} {end-of-line}
command is 1 character long (see list below),
data is ASCII-string of adjusting value.
each command ends with end-of-line symbols ($\backslash r \backslash n$ or $\backslash n$)

List of available commands:

- c/C – set/get current (A)
- u/U – set/get continuous/pulsed mode (“1” – CW; “0” – pulsed)
- p/P – set/get pulse width (ms)
- f/F – set/get repetition rate (Hz)
- r/R – set/get start (“1” start, “0” stop)
- o – makes certain quantity of pulses and stops
- ? – acquire all set parameters
- Y– current monitor
- V – voltage monitor
- Z – fault state monitor (“1” means fault)
- M – all monitors
- e – echo off/on

Example:

- u 1 $\backslash n$ c 50 $\backslash n$ r 1

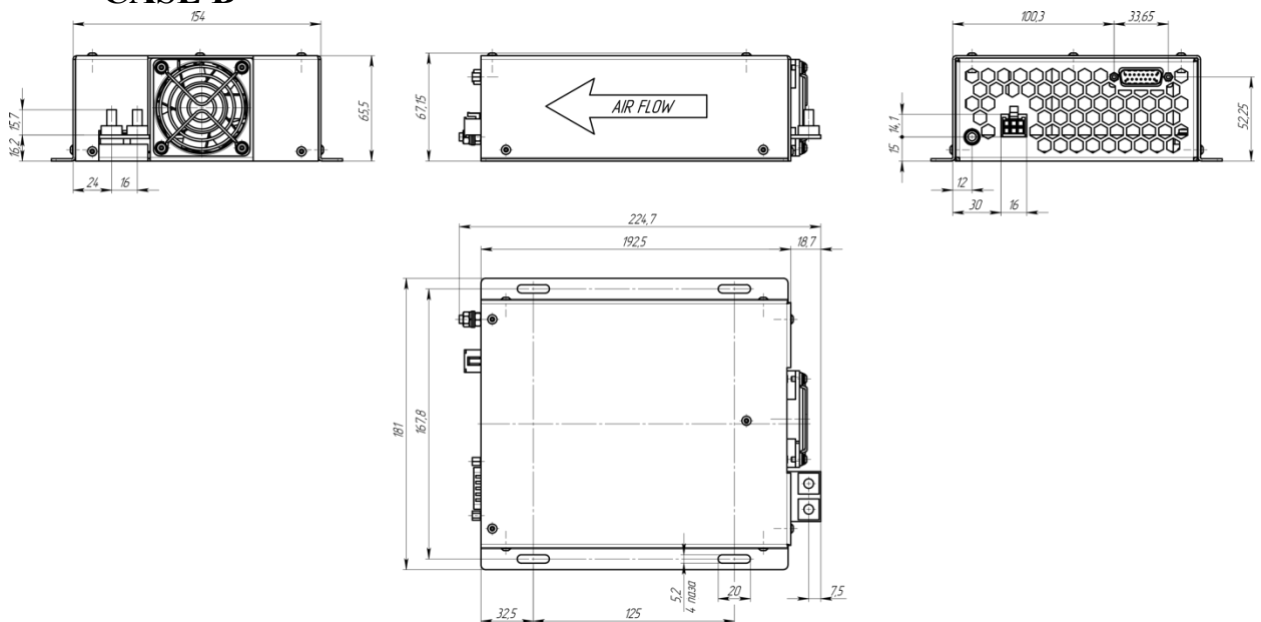


LDD-series selection chart

Name	Max.power *	Max.current (I _{MAX}) *	Input voltage	Case
LDD-150	150 W	5 – 75 A	100-240 VAC	B
LDD-250	250 W	10 – 100 A	100-240 VAC	B
LDD-400	400 W	10 – 100 A	200-240 VAC	B
LDD-600	600 W	10 – 100 A	100-240 VAC	C
LDD-1000	1000 W	10 – 100 A	100-240 VAC	C
LDD-1500	1500 W	10 – 100 A	200-240 VAC	C

* Modifications up to 2000 W and/or 150 A are available on request

CASE B



CASE C

