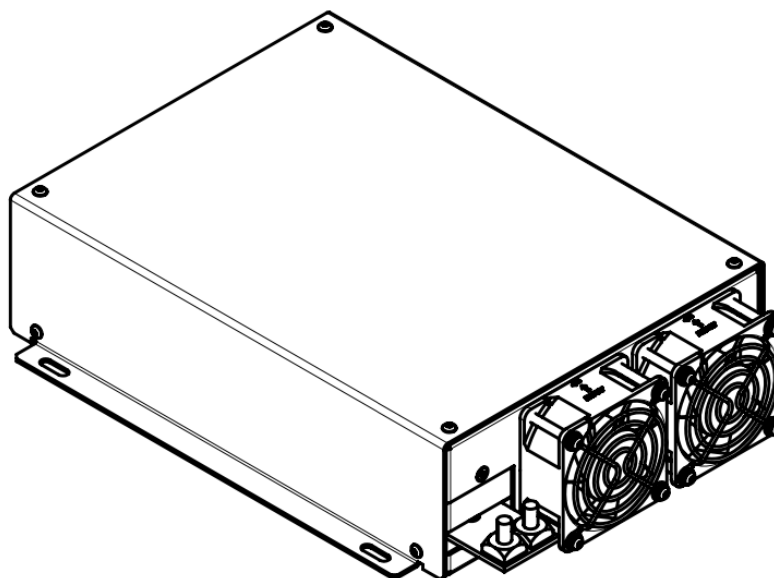


LDY-series laser diode driver

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 severely distort its behavior.



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Overview / Appearance

LDY is a series of high-power diode drivers primarily intended for pumping medical fiber lasers, first of all TFL (Thulium fiber laser). The driver supports pulse widths from continuous-wave (CW) operation down to 150 μ s.

CW output power up to 2000W, peak output power up to 5kW and more, fast rise and fall times (<150us for some models), high repetition rates (up to 2kHz) and availability of modifications with high output voltages (for serial connection of multiple diode modules) are the main features of the series.



Full compatibility to IEC 60601-1 (leakage currents, isolations, protections) and IEC 60601-1-2 (EMI, both conductive and radiated) allows to use modules in medical systems unattendedly.

In other aspects LDY inherits the interfaces and behavior of [LDD-series](#) (see also the [Comparison](#) section for further details).

Cooling

The module is cooled with embedded fans. No external cooling is required.

Contents of delivery

By default, the delivery package contains:

- LDY-series diode driver – 1pc
- AC INPUT cable – 1pc (>50cm length)
- INTERFACE cable – 1pc (50cm length)

Output cables are not usually supplied.

Customized delivery content is available on request.

Connections, signals, signal descriptions



AC INPUT: 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

LD OUTPUT (TO LASER DIODE): M6 studs

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

GROUND: M5 stud

Module should be grounded using this stud. It must be done before connecting module to the mains.

Grounding policy

By default both OUTPUT negative and INTERFACE return are internally connected to the chassis' ground. Diode's body interconnection with anode might result in potential troubles.

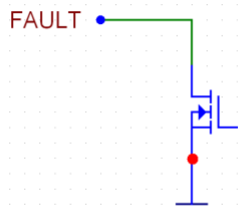
Modifications with floating output are available on request.

INTERFACE (LDD/LDY-series CONTROL): 15 Pin "D"-Sub Female

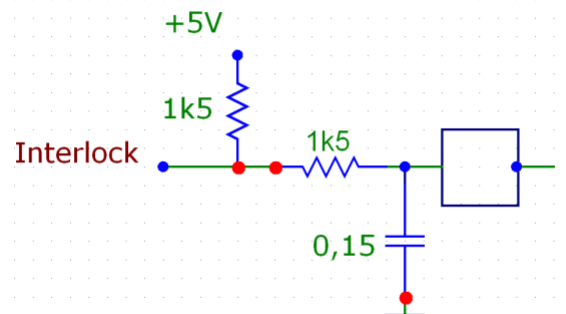
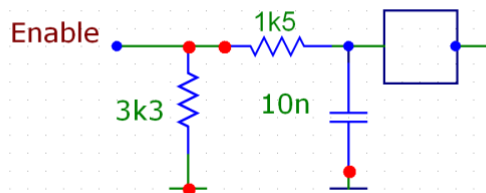
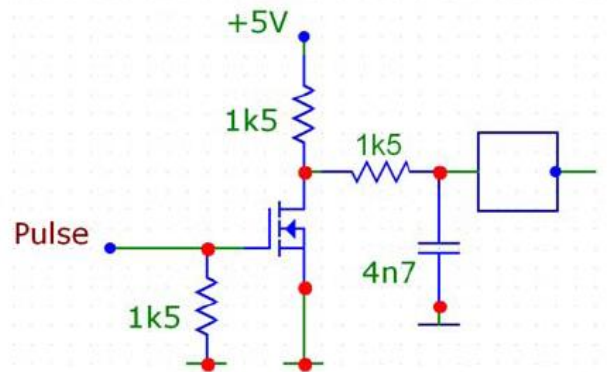
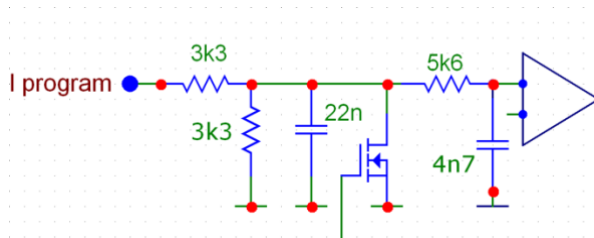
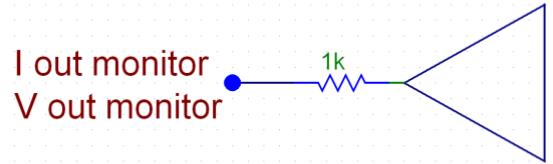
PIN (color)	DESIGNATION	DESCRIPTION
1 (green)	Enable	Apply +5V TTL on this pin to enable work of LDD/LDY. While 0V are applied to this pin or pin is unconnected module is disabled. Once <i>Fault</i> has occurred module is blocked till you eliminate the fault cause, then <i>disable</i> module and <i>enable</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"). In case of normal operations <i>Fault</i> loop is "opened". Maximum allowed current in <i>Fault</i> loop is 50mA.
3 (transparent)	Interlock	When <i>Interlock</i> loop is "opened" output is inhibited. You should "close" this loop to start operations (electrical resistance of "closed" loop should be below 100 Ohm level). Once <i>Interlock</i> has occurred module is blocked till you "close" <i>Interlock</i> loop, then <i>disable</i> module and <i>enable</i> it again.
4, 9, 15 (black)	Interface Return	Return 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 load. 0V at <i>PIN5</i> corresponds to 0V. 10V at <i>PIN5</i> corresponds to V_{MAX} .
6 (purple)	I OUT monitor	The voltage at this pin is a monitor signal proportional to the measured value of output current. 0V at <i>PIN6</i> corresponds to 0A. 10V at <i>PIN6</i> corresponds to I_{MAX} .
7 (blue)	I program	Voltage applied to this pin sets output current. 0-10V DC are linear with 0- I_{MAX} .
8 (white)	Pulse	Apply +5V TTL on this pin to enable work of LDD/LDY. While 0V are applied to this pin or pin is unconnected module is disabled.
10-12	–	Not used
13, 14 (red)	+12V OUT	Auxiliary 12 VDC output. Maximum current – 100mA.

* See also [Faults](#) section

INTERFACE CIRCUITS:



“Open collector” scheme, 50mA max



“Open collector” scheme, 100Ohm max

Safety

Warning! This equipment produces high voltages that can be very dangerous. Be careful around the device.

- During operation the protective covers of the equipment must be securely fixed in place, and all electrical connections must be properly attached.
- 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/LDY.

Casual contact could be fatal!

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

Operations

1. Connect LDD/LDY to the ground (*GROUND* stud).
2. Connect laser diode to the module (*LD "–"* and *LD "+"* studs)
3. *Disable* module, set *Pulse* off, set *I Program* signal to 0V
4. Apply power to the module
5. Set the desired value of output current (*I Program* signal)
6. *Enable* module
7. Use *Pulse* signal to on/off output current

To power down LDD/LDY

1. Set *Pulse* to 0V, then *Disable* module
2. Disconnect module from the mains

Faults

Module sets *Fault* state in the following cases:

- *overheating* (if the temperature of the module exceeds 70 ± 2 °C level).

To remove Fault status module must be cooled below 65 ± 1 °C temperature.

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

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

- *overcurrent* (if output current exceeds 105% of Current Program 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).

Specifications

ELECTRICAL

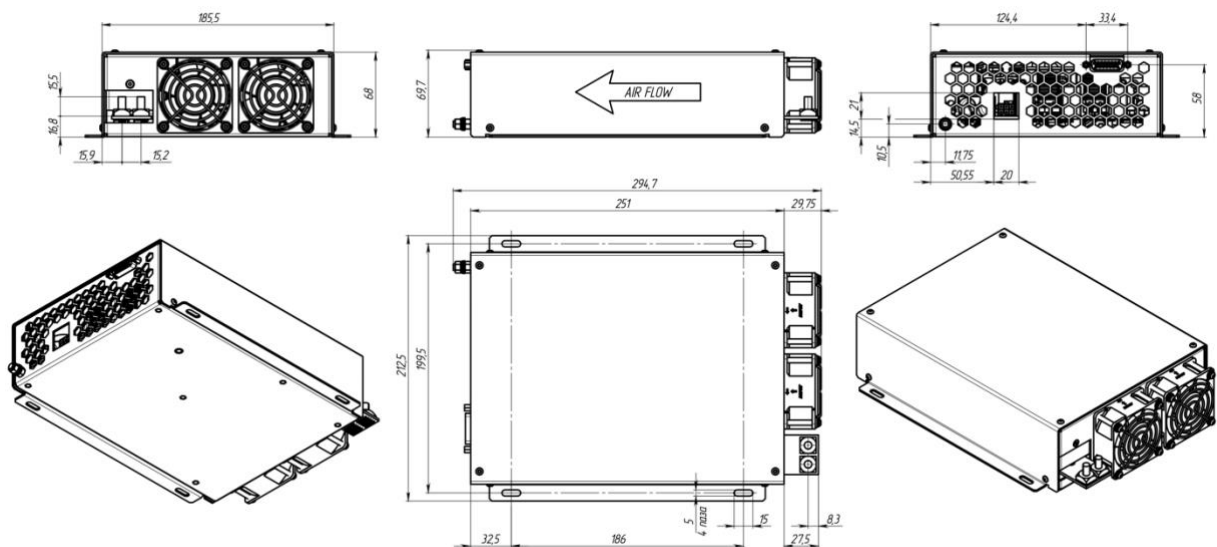
INPUT	
Voltage	100–240VAC, 50/60Hz or 200–240VAC, 50/60Hz (model dependent, see also How to order? section)
Max. current	Model dependent, 12A max
OUTPUT	
Regimes of operation	CW and pulsed
Max. CW output power (P_{MAX}) ¹	Selectable up to 2000W (peak output power might exceed P_{MAX} and can achieve 5000W and more)
Max. output current (I_{MAX}) ¹	Selectable up to 250A (higher on request)
Max. output voltage (V_{MAX}) ¹	Selectable up to 200V (higher on request)
¹ see also How to order? section	
Recommended diode voltage	70–100% of V_{MAX}
Allowed diode voltage	20–100% of V_{MAX}
Output current	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})
Efficiency	more than 85%
Rise/fall time	Model dependent, usually < 150us (10% to 90%)
Current accuracy	< 1% of I_{MAX}
Current overshoot	< 1% of I_{MAX}
Bias current	Yes, if pulses are formed not with the <i>Pulse</i> pin, but with the <i>Current Program</i> pin
SAFETY	
PFC value	> 0.98 (active)
Leakage current	< 150μA
Input/output isolation voltage	2500VAC (other on request)
Safety approvals (on request)	IEC 60601-1

EMC approvals (on request)	IEC 60601-1-2
COOLING	No external cooling is required
ENVIRONMENT	
Operation temperature	+10 ... +40°C
Storage temperature	-20 ... +60°C
Humidity	<90%, non-condensing

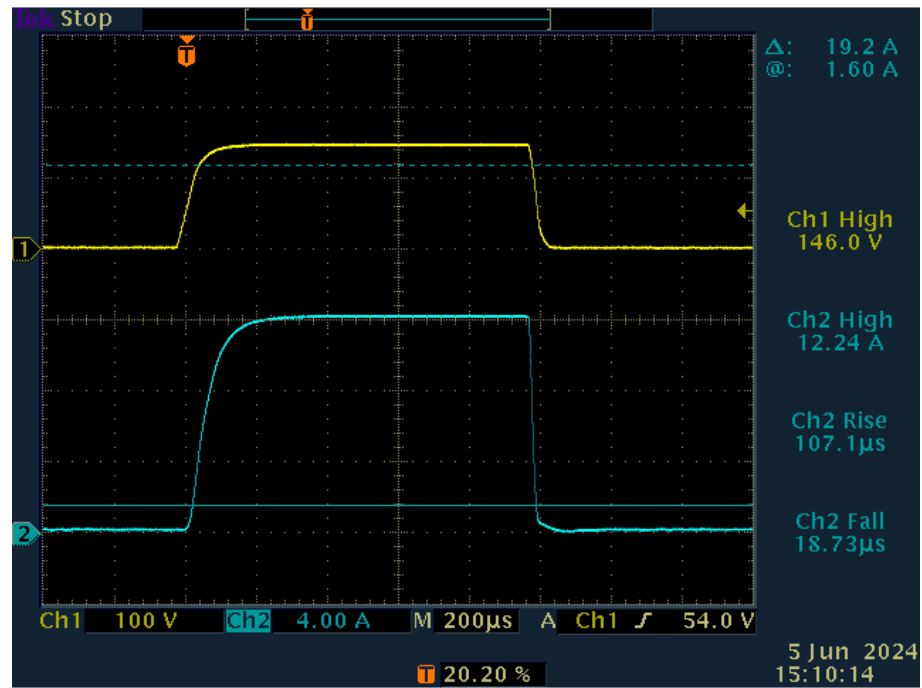
MECHANICAL

Dimensions	See also the dimensional drawing below
Weight	Approx. 2.9kg

Dimensional drawing



Output oscillograms



LDY-1500-15A-150V driver run in 12A/150V regime

How to order?

Typical order code is LDY-XXXX-YYYY-ZZZZ, where:

- XXXX – maximum CW output power (P_{MAX} in Watts)
- YYYY – maximum output current (I_{MAX} in Amps)
- ZZZZ – maximum output voltage (V_{MAX} in Volts)

Notes:

- We recommend picking I_{MAX} and V_{MAX} values as close as possible to your diode's operating current and voltage in order to utilize completely the output power of the device and to ensure its optimal performance.
- The product of I_{MAX} and V_{MAX} can exceed P_{MAX} and, in dependence on model, can achieve 5000W and more.
- Drivers with P_{MAX} up to 1000W can have wide range AC input (100-240 VAC, 50/60 Hz), drivers with P_{MAX} higher than 1000W can have only 200-240 VAC, 50/60 Hz input.
- Since the maximum pulse width and pulse repetition rate depend on virtually every parameter above (input voltage, I_{MAX} , V_{MAX}) we recommend discussing your needs with the manufacturer at the moment of ordering.

Examples (some standardized modifications):

P/N	Description
LDY-1500-15A-150V	Max. CW output power (P_{MAX}) – 1500W Max. output current (I_{MAX}) – 15A Max. output voltage (V_{MAX}) – 150V Input voltage – 200-240VAC Other parameters: • Rise time <150us
LDY-1500-230A-25V	Max. CW output power (P_{MAX}) – 1500W Max. output current (I_{MAX}) – 230A Max. output voltage (V_{MAX}) – 25V Input voltage – 200-240VAC Other parameters: • Max. pulse width with I_{MAX} current and V_{MAX} voltage – 5ms • Rise time <250us

Other modifications are available upon request.

Comparison with LDD-series

The [LDD-series](#) and the LDY-series are very similar, but there are some differences between them. The comparison is given in the table below:

Parameter	LDY-series	LDD-series
General comparison	[+] Newer, more technological product	[–] Older, less technological product
End of life	[=] No	[=] No
Price	[+] Slightly more expensive	[–] Slightly cheaper
Regulations	[+] Medical-grade product from the box	[–] General-purpose diode driver. Compliance to medical standards is available on request
Rise time	[+] Faster	[–] Slower
Modifications	[–] Only a few standard models are available. Compact low-power versions are unavailable	[+] Many standard models are available. Compact low-power versions are available

Appendix 1 – Accessories, Remote control assembly

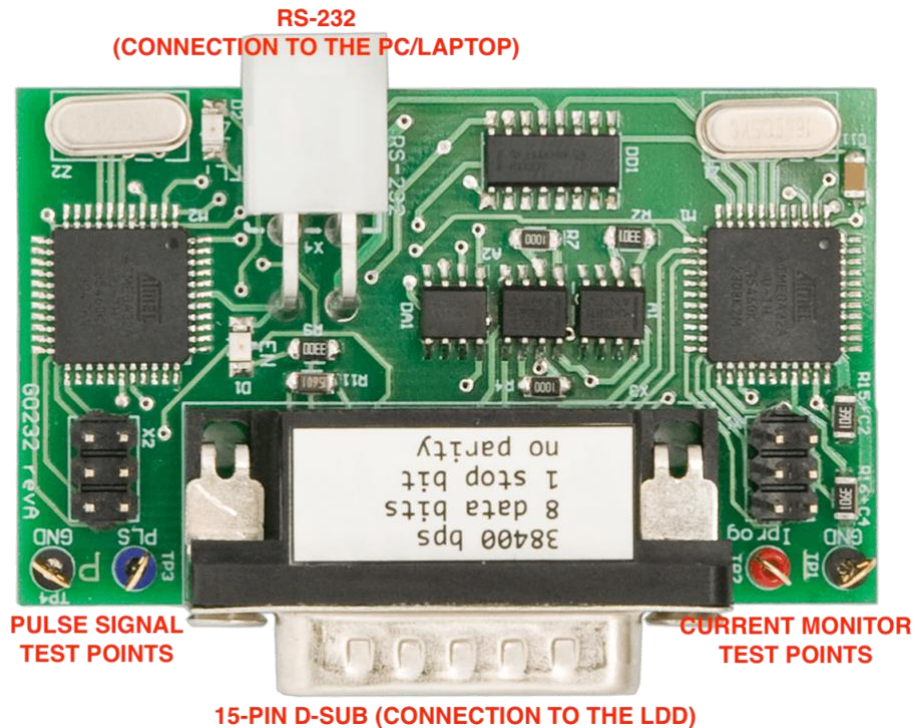
Remote control assembly (ordering code – LDD-RC) allows to use [LDY-series](#), [LDD-series](#), [PDD-series](#) diode drivers in the laboratory, both in CW and pulsed regimes.



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

Appendix 2 – Accessories, RS-232 interface PCB

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



Dimensions: 64x38x17mm

RS-232 connection parameters: 38400 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 (\r\n or \n)

List of available commands:

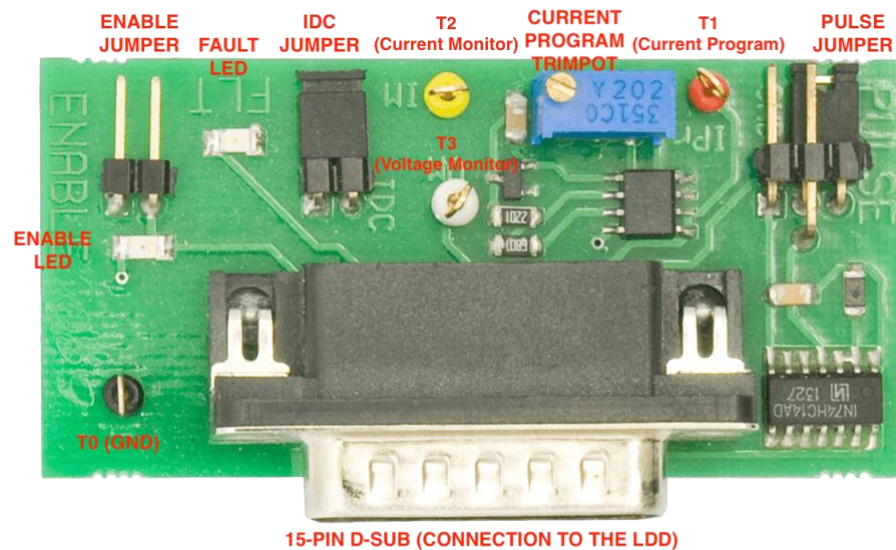
- c/C – set/get current (A)
- u/U – set/get continuous/pulsed mode (“1” – CW; “0” – pulsed)
- p/P – set/get pulse width (ms)
- f/F – set/get repetition rate (Hz)
- r/R – set/get start (“1” start, “0” stop)
- o – makes certain quantity of pulses and stops
- ? – acquire all set parameters
- Y– current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

Example:

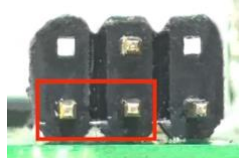
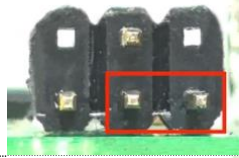
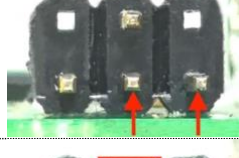
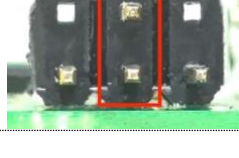
- u 1 \n c 50 \n r 1

Appendix 3 – Accessories, Stand-alone PCB

Stand-alone PCB (ordering code – STA) makes stand-alone operations possible. No additional equipment is needed for test run of LDD/LDY.



PULSE JUMPER STATES DESCRIPTION

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

Dimensions: 64x30x17mm