FLD-mini flashlamp driver

User manual
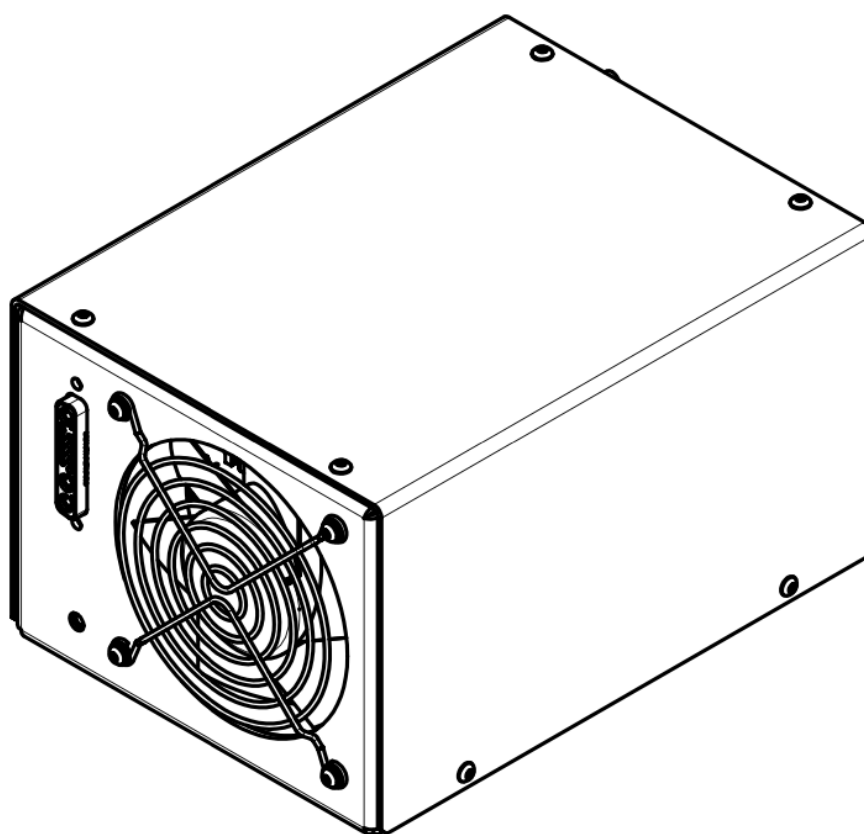
Description

FLD-mini is a miniature all-in-one flashlamp driver especially designed to driver solid-state lasers like flashlamp pumped Nd:YAG. Driver's major features are:
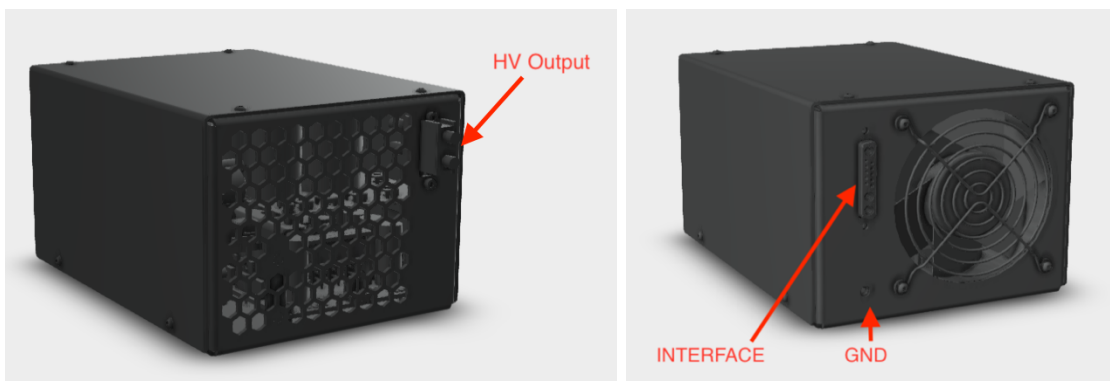
- 24VDC input
- Maximal output power –300W
- Maximal output voltage – 450V (base version), 500V (on request)
- Embedded 2mF capacitor bank
- Flashlamp triggering and simmering circuits

Base interface is RS-232 (RS-485 is available on request). Simple PC software is supplied together with the controller.

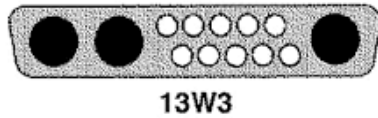Driver is forced air cooled with embedded fan.

Appearance

HV Output

INTERFACE   GND

Connections, signals, signal descriptions

INTERFACE: 13 pin mixed D-SUB connector of 13W3 type

24VDC power and all the control signals to be connected here.

13W3

PIN (color)	DESIGNATION	DESCRIPTION
1, 2 (black)	RS-232 GND	Controlling device to be connected here via RS-232 interface.
3 (orange)	RS-232 RX	
4 (blue)	RS-232 TX	
5 (green)	IDC	Door-interlock connection. Should be pulled to the ground to allow the operations.
6 (violet)	Fault	Indication of the internal failure of the module. Module rises Fault in the next cases: - Overheating - Unable to charge capacitors - Unable to trigger flashlamp - Other failures
7 (white/blue)	Synchro IN	Incoming synchronization pulses should be applied to this pin if module is run in external synchronization mode.
8 (white)	Synchro OUT	Synchro output signal coincided with pulse applied to the flashlamp (other on request))
9, 10 (black)	Interface Return	Common return of all interface circuits
A1 (yellow/green)	GND	Protective grounding to be connected here.
A2 (red)	24VDC	24VDC power supply to be connected here.
A3 (black)	24VDC return	Maximal current consumption 17A.

HV OUTPUT: Proprietary connector by OEM Tech

Flashlamp to be connected here.

Red wire – HV OUTPUT positive (to flashlamp anode)
Black wire – HV OUTPUT negative (to flashlamp cathode)

GND: M4 thread

Module should be grounded using this thread. It should be done before powering up the module.

Grounding policy

By default HV OUTPUT negative, 24VDC return and Interface return are interconnected to each other, but isolated from the chassis ground.

RS-232 interface is optically isolated.

Other grounding policies are available on request.

Specifications

ELECTRICAL

+24VDC INPUT:	
Input voltage	+24VDC
Current consumption	17A max
PULSE PARAMETERS:	
Max. voltage	450V, 500V *(user selectable)*
Max. discharge current	500A
Max. average power	300W
Min. pulse width, max. pulse width	50us-1000us
Max. rep. rate	1-30Hz
WIRE INSULATION NOTE:	
For flashlamp connections	Due to serial triggering with 10kV pulses additional insulation (e.g. with silicone tubing) or spacing (e.g. with spiral bundle hose) of L– wire is required
SIMMER PARAMETERS:	
Simmer current	500 mA (*100-800 mA on request*)
Max output voltage	300 V
Max output power	100 W
Open circuit voltage	1500 V
FLASHLAMP TRIGGERING PARAMETERS:	
Triggering method	Serial triggering with embedded transformer (*external triggering on request*)
Pulse energy / triggering voltage	~160mJ / 10kV negative to L– (*other on request*)
Triggering pulse width	~1 us
Restrike rate	A few Hertz (automatically adjusted)
COOLING	Forced air cooling with embedded fan
PROTECTIONS	From overheating of internal components
ENVIRONMENTAL:	
Operation temperature	0 … +40 °C
Storage temperature	-20 … +60 °C
Humidity	90%, non-condensing

MECHANICAL

Size (LxWxH)	As per dimensional drawing (see below)
Weight	Approx. 2.0 kg (w/o cables)

DIMENSIONAL DRAWING
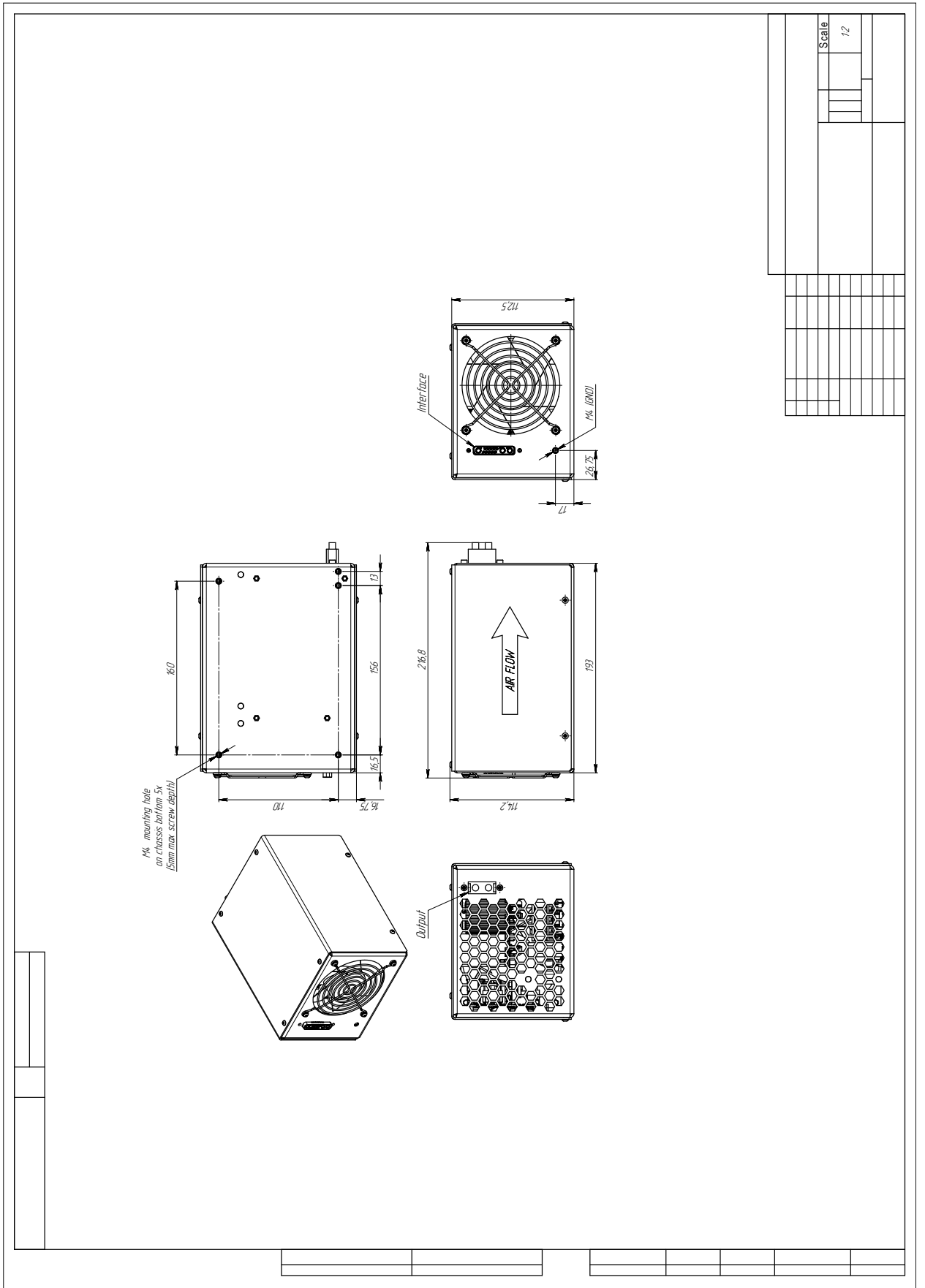
Software description
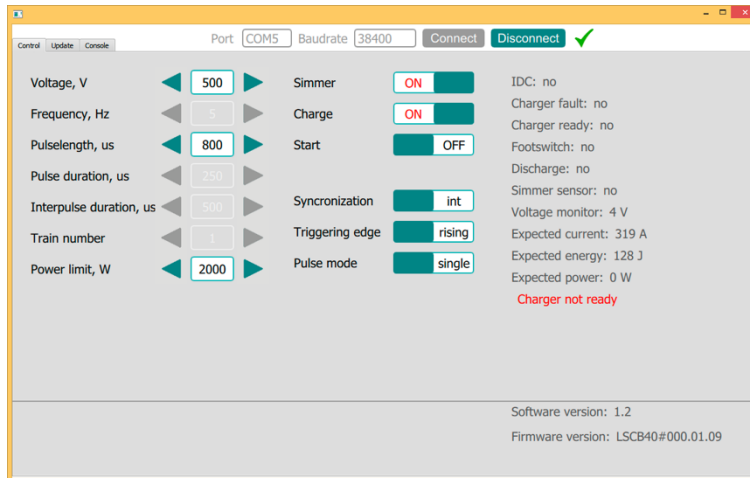
Voltage – sets the desired output voltage (V)

Frequency – sets the desired repetition rate of flashes (Hz)

Pulse length – sets the desired pulse width (us)

Charge – turns capacitor charging module on and off

Simmer – turns simmer supply on and off

Start – enables and disables flashes at HV output

Synchronization – select synchronization mode – **Internal synchronization** / **External synchronization**

In **Internal synchronization mode** flashes are defined by internal MCU

In **External synchronization mode** flashes are defined by external signal applied to SYNC IN signal of INTERFACE connector

Triggering edge – in **External synchronization mode** defines the triggering edge of synchronization signal – either rising edge or falling edge

IDC – status of Door Interlock (IDC signal of INTERFACE connector) – flashes are prohibited if IDC loop is open

Charger fault – internal fault status of the capacitor charging power supply

Charger ready – Ready signal of the capacitor charging power supply

Discharge – status of discharge resistors

Voltage monitor – the actual voltage on the embedded capacitor bank

Expected current – the calculated current through the flashlamp (calculations are based on Voltage and Flashlamp impedance K0 values)

Expected energy – the calculated flash energy (calculations are based on Voltage, Flashlamp impedance K0 and Pulse length values)

Expected power – the calculated power through flashlamp (calculations are based on Voltage, Flashlamp impedance K0, Pulse length and Frequency values)

Lamp impedance K0 – value from flashlamp d/s

RS-232 protocol description

RS-232 connection parameters: 38400 bps, 8 data bit, 1 stop bit, no parity

Command format is: {command} {data (optionally)} {end-of-line}

- Command is 1 or 2 character long (see list below)
- Data is ASCII-string, command and data must be separated with space (space symbol)
- End-of-line symbols are \n or \r\n

List of available commands:

- v – sets the desired output voltage (in volts, example «v 300»)
- p – sets the desired pulse width (in us, example «p 250»)
- f – sets the desired pulse repetition rate (in hz, example «f 0.5»)
- V, P, F – return the corresponding set points

- x – sets the synchronization mode («x 0» – internal, «x 1» – external)
- t – sets triggering edge in external synchronization mode («t 0» – rising, «t 1» – falling)
- X, T – return the corresponding set points

- s – turns the simmer supply on and off («s 1» – on, «s 0» – off)
- c – turns the capacitor charging module on and off («c 1» – on, «c 0» – off)
- r – enables / disables the output («r 1» – enables)
- S, C, R – returns the corresponding value set point

- h – sets maximal power limit (in watts, example «h 1000»)
- H – returns the corresponding set point
- !i – sets maximal current limit (in amps, example «!i 1000»)
- !I – returns the corresponding set point
- !k0 – sets flashlamp impedance used for calculations (in VA$^{-1/2}$, example «!k0 28»)
- !K0 – returns the corresponding set point

- mV – voltage monitor (volts)
- mF – returns fault state (0 – no fault, 1 – fault)
- mR – returns ready state (status of the capacitor charging module, 0 – not ready, 1 – ready)
- mI – returns IDC state (0 – open, 1 – closed)
- mS – returns simmer sensor state (0 – off, 1 – on)
- mD – returns state of embedded discharging resistors (0 – no discharge, 1 – discharging)
- mJ – returns error code
- mP – returns expected power (watts)
- mC – returns expected current (amps)
- mE – returns expected energy (jouls)

Presets

Parameter	Minimum (*)	Maximum (*)	Increment (*)	Default value (**)
Output voltage, V	100	V_{MAX}	1	200
Pulse width, us	50	1000	1	200
Rep. rate, Hz	1	30	0.1	1
K0, VA$^{-1/2}$	5	50	0.1	20
Power limit, W	100	300	1	300

(*) Other values are available on request
(**) Might be set in accordance with your application (if known)

Operations

1. Before starting the operations please check if the states of the following commands match your application and re-set their values if necessary:

Parameter	Comment
x	internal or external synchronization
t	(in external synchronization mode) external synchronization trigger edge
!k0	impedance of your flashlamp
h	output power limitation

2. Set main parameters – v, p, f
3. Enable capacitor charger – c
4. Trigger flashlamp/flashlamps – s
5. Enable flashes – r

   To shut down the driver:
1. Disable flashes – "r 0"
2. Disable simmer – "s 0"
3. Disable the capacitor charger – "c 0"
4. Then remove 24VDC power from the driver