Reliable Operation
99%+ of drivers perform
error-free for 10+ years

High Volume
15 000+ drivers manufactured

Exceptional Value
Exceptional value / cost ratio
amongst top competitors

Fast Customization
Sophisticated custom solutions
in a short period of time

In-House R&D
Custom design of electronics
hardware & software

Vast Experience
35+ years of laser electronics
design & manufacturing

Global Presence
Drivers operate in 60+
countries around the world

Renowned Clients
World-leading manufacturers
of industrial, medical
and scientific
lasers

EKSPLA
ELECTRONICS

Advanced electronics
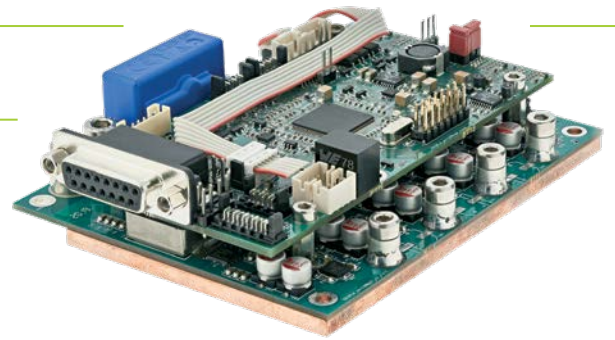technologies

2024 | **Rev#** 240115

Laser Diode Drivers

uniLDD

Made By
Laser Electronics Experts

Driver that can supply almost any middle- and high-power laser diode in continuous or pulsed operation mode.

uniLDD is a DC input power converter designed to supply CW or pulsed (QCW) current for the single emitter, bar, stacked laser diode or high power VCSEL in constant current mode. Using different software versions together with specific hardware sets, the uniLDD driver is adapted for different types of laser diodes and modes of operation. The driver is based on DSP technology assuring high specifications. Typical performance is presented in below illustrations.

Next optimizations are done while adapting according to customer requirements (current, voltage, cables...):

- **Firmware version (chosen from different 5 ready versions)**
- **Hardware components set**
- **Regulation loop frequency response analysis and PID constants defining**
- **Hardware and software settings**

One or two TEC control channels can be added as option. However, the price for the feature is reduction of maximal possible output current to laser diode since 2 or 3 output stages of total 5 are utilized for TEC supply.

uniLDD Main Features

- Best suitable for high-current and high-power applications
- Different firmware versions featuring CW, QCW, TEC control operation
- Hardware versions for CW, QCW, TEC control, Conductive cooling options
- At factory frequency response analysis is used to optimize performance to achieve stable operation with particular laser diode and connection cables combination
- High efficiency switching mode converter
- Multi-phase power stage for low current ripple
- Low current drift
- Parallel operation of two or more drivers to multiply output voltage
- "Voltage booster" layout option to extend output voltage to 200 V and more
- External storage capacitor option for long-pulse QCW operation
- Analog and digital (CAN*, RS232) control interfaces

  * For can communication at evaluation stage Ekspla's CAN-USB adapter is required.
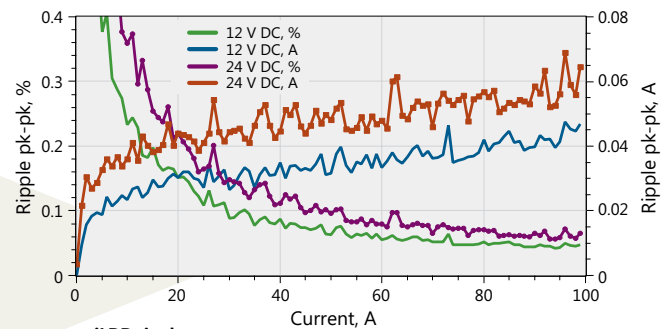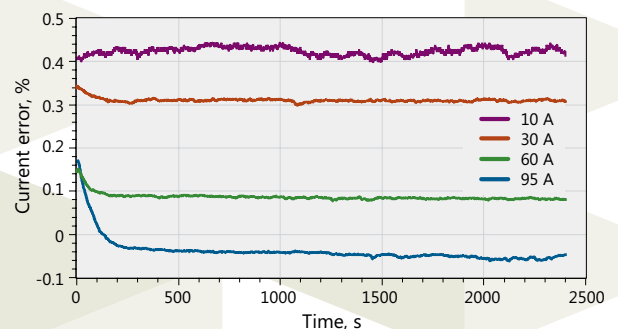

uniLDD ripple current.
12 V and 24 V DC power, 2 V junction + 10 MΩ series R load
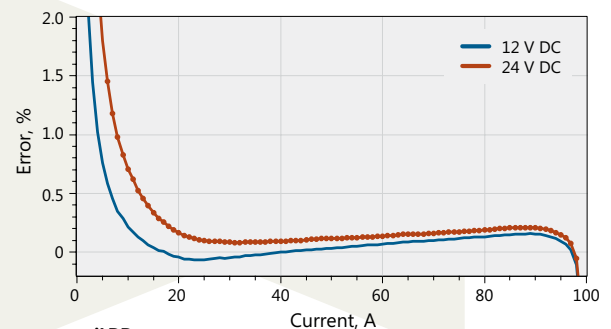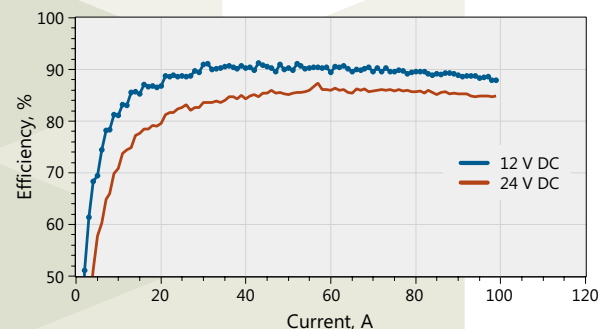

uniLDD current error.
12 V and 24 V DC power, 2 V junction + 10 MΩ series R load

uniLDD current drift.
From cold start for different currents

uniLDD efficiency.
12 V and 24 V DC power, 2 V junction + 10 MΩ series R load

uniLDD General Specifications

INPUT

Supply voltage, power stage	**12...90 VDC**
Supply voltage, control stage	**12...30 VDC**

PHYSICAL CHARACTERISTICS

Assembly dimensions
(L × W × H)

190 × 68 × 55 mm
(air cooled version)

130 × 90 × 30 mm
(conductively cooled version)

PROTECTIONS

Current transient protection and shut-down

Open circuit shut-down

Over temperature shut-down

Power **voltage brownout** shut-down

Interlock shut-down

AUXILIARY OUTPUTS

+5 V @ 200 mA

+15 V @ 100 mA

-15 V @ 100 mA

OUTPUT, CW mode

Diode compliance voltage	**1...55 V**	Up to 95% of power stage supply voltage. Can be extended using voltage booster layout
Max current	**50 – 120 A**	Can be extended above 120 A using parallel connection of several drivers
Current ripple	**0.1% pk-pk**	DC...100 kHz bandwidth, in ×0.5...×1 of max current range
Current drift	**< 0.2%**	Cold start, 8 h period, after 5 min. warm up
Bandwidth of $I_{programm}$ control input frequency	**> 10 kHz**	At minimal connection cable inductance

OUTPUT, OCW (Pulse mode)

Diode compliance voltage	**1...80 V**	Can be extended using voltage booster layout
Max pulse current	**160 – 360 A**	Can be extended above 360A using parallel connection of the drivers
Duty cycle	**≤ 20%**	
Current pulse raise, typical range	**10...50 µs**	@ minimal connection cable inductance and sufficient power stage voltage
Max RMS current	**100 A**	80 A for diode compliance voltage >28 V
Current pulse amplitude stability	**0.1% pk-pk**	In ×0.5...×1 of max current range
Current drift	**< 0.2%**	Cold start, 8 h period, after 5 min. warm up

OUTPUT, TEC control (if equipped)

Quantity of output channels	**1 or 2**	
Maximal output current	**25 A**	
Maximal output voltage	**25 V**	

ENVIRONMENT

Operating temperature	**0 to 40 °C**	De-rate current at higher temperature
Cooling	**Forced air or conductive**	Installed or external shared fan. Conductively cooled version available as option

NOTES:

Specifications are subject to change without prior notice.

Not all combinations of parameters are possible at the same time.

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uniLDD Configuration Examples

CW

Fig.1
CW uniLDD conductively
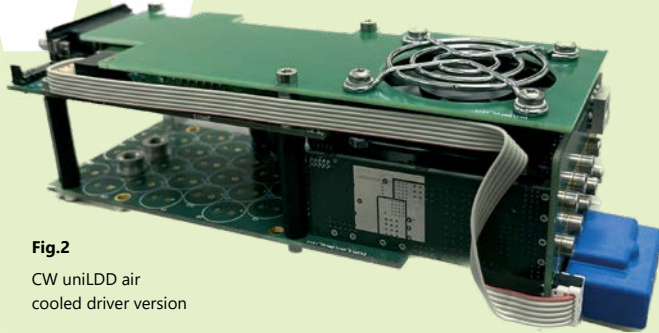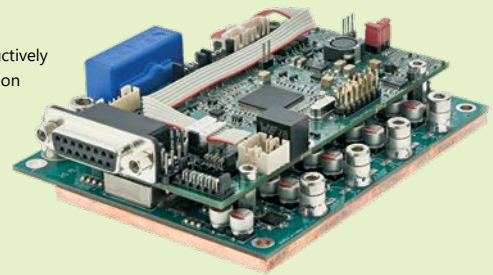cooled driver version

Fig.2
CW uniLDD air
cooled driver version

uniLDD-C-CW-30-100

Driver for CW mode operation
(conductively cooled)

Maximum current to laser diode	**100 A**
Maximum compliance voltage	**30 V**

*Voltage extension possible by customization
and current reduction.*

uniLDD-A-CW-25-75-1TEC

Driver for CW mode operation and one stage
bidirectional TEC control (air-cooled)

Maximum current to laser diode	**75 A**
Maximum compliance voltage	**25 V**
Maximum current to TEC	**25 A**
Maximum TEC voltage	**25 V**

uniLDD-A-CW-25-100

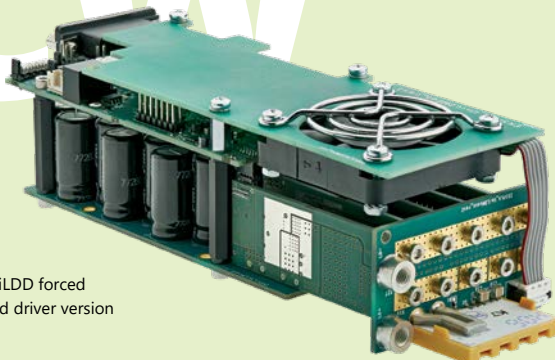Driver for CW mode operation (air-cooled)

Maximum current to laser diode	**100 A**
Maximum compliance voltage	**25 V**

*Voltage extension possible by customization
and current reduction.*

QCW

Fig.3
QCW uniLDD forced
air cooled driver version

uniLDD-A-QCW-80-360

Driver for QCW mode operation (air-cooled)

Maximum current to laser diode	**360 A**
Maximum compliance voltage	**80 V**

Hardware options rated 30, 60, 100 V

uniLDD-A-QCW-80-270-1TEC

Driver for QCW mode operation and one
channel bidirectional TEC control (air-cooled)

Maximum current to laser diode	**270 A**
Maximum compliance voltage	**80 V**

Hardware options rated 30, 60, 100 V

uniLDD-A-QCW-80-180-2TEC

Driver for QCW mode operation and two
channels bidirectional TEC control (air-cooled)

Maximum current to laser diode	**180 A**
Maximum compliance voltage	**80 V**

Hardware options rated 30, 60, 100 V

Pockels Cell Drivers

& HV Power Supplies

Range of drivers for Pockels cells are fast HV switches designed to load and unload capacitance of Pockels cell with several nanosecond edges.

Amplitude of output pulses to Pockels cell is about equal to HV supply voltage. Only exception is DP-FAM series drivers that allow to control the amplitude of each pulse by analog voltage input.

Design adaptation for particular OEM customer is possible and can include optimizing of mechanical design, output switch for voltage, repetition rate, rise/fall time and pulse duration lengthening etc.

Almost all the drivers can work in up to 5 MHz bursts. Range of DC/DC type HV power supplies is manufactured to provide a complete Pockels driving solution.

Main Features

- Low and high repetition rate models covering range from single pulse to 6MHz
- Up to 5MHz in burst
- Square pulse shape
- Controlled by an external trigger pulse
- Fast HV switching for both rise and fall edges
- Wide range of pulse durations
- Low jitter
- For BBO, RTP, KD*P, CdTe Pockels cells
- Designed for capacitive load

General Specifications

DRIVER series	PCD-UHR series	PCD-UHRS series
Maximal operating voltage	≤ 9.8 kV	≤ 3.6 kV
Maximal repetition rate	6 MHz	1 MHz
Minimal HV pulse duration	100 ns	15 ns
HV pulse duration extension with no principal limit using pulse regeneration technique	YES	NO
Triggering pulse duration requirement (for two-pulses triggering mode only)	≥ 20 ns	
Triggering pulse amplitude requirement	3.5 – 5 V (50 Ω input)	
Triggering pulse rise & fall time requirement	≤ 10 ns	≤ 5 ns
Maximal length of leads to Pockels cell	10 cm	
HV pulse delay	25 ns	30 ns
HV pulse jitter	< 100 ps	

EXTERNAL POWER REQUIREMENTS
HV supply: each model has particular recommendation
Low voltage supply: 24 VDC ±1V

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Product Range
Driver Selection Table [1]

Ekspla Electronics p/n	Rep-rate	Voltage	Rise / fall	Power [2]
	kHz	kV	< ns	W

High PRR unipolar output driver.

HV pulse duration 100 – 5000 ns.

Ekspla Electronics p/n	Rep-rate	Voltage	Rise / fall	Power
PCD-UHR-50-3.6	50	3.6	7	20
PCD-UHR-250-2.6-(C)	250	2.6	6	40
PCD-UHR-250-3.6-(C)	250	3.6	7	75
PCD-UHR-400-1.5-(C)	400	1.5	5.5	20
PCD-UHR-500-2.6-(C)	500	2.6	6.5	90
PCD-UHR-1000-1. 8-(C)	1000	1.8	6	80
PCD-UHR-2000-1.5-(C)	2000	1.5	7	120

High PRR unipolar output short-pulse driver.

HV pulse duration 100 – 5000 ns.

-(C) – driver can be made in any configuration – with aluminum housing or open frame

-C – driver in aluminum housing

Ekspla Electronics p/n	kHz	kV	< ns	W
PCD-UHRS-50-3.6	50	3.6	7	20
PCD-UHRS-250-3.6-(C)	250	3.6	7	75
PCD-UHRS-250-2.6-(C)	250	2.6	6	40
PCD-UHRS-500-2.6-(C)	500	2.6	6.5	90
PCD-UHRS-1000-1. 8-(C)	1000	1.8	6	80
PCD-UHRS-400-1.5-(C)	400	1.5	5.5	20

High PRR Cavity Dumping bipolar output driver.

HV pulse duration 100 – 5000 ns.

Ekspla Electronics p/n	kHz	kV	< ns	W
PCD-UHR-I-250-5.2-C	250	5.2	8.5	100
PCD-UHR-I-300-4.6-C	300	4.6	8	100
PCD-UHR-I-350-4-C	350	4	7.5	100
PCD-UHR-I-1000-3.0-C	1000	3	7.5	100

Ekspla Electronics p/n	kHz	kV	< ns	W
PCD-UHR-II-150-7.0	150	7	9.5	110
PCD-UHR-II-250-7.0-C	250	7	9.5	200
PCD-UHR-II-1000-4.0-C	1000	4	6	230
PCD-UHR-II-1000-3.8-C	1000	3.8	9.5	210

High PRR Cavity Dumping driver.

FULL BRIDGE configuration.

Ekspla Electronics p/n	kHz	kV	< ns	W
2PCD-UHR-II-300-3.4	300	3.4	<7	110
2PCD-UHR-II-500-3.4-C	500	3.4	<7	200
2PCD-UHR-II-1000-2.5-C	1000	2.5	<7	170
2PCD-UHR-II-2000-1.8-C	2000	1.8	<7	210
2PCD-UHR-II-2000-1.5-C	2000	1.5	<6	215

Ekspla Electronics p/n	kHz	kV	< ns	W
PCD-UHR-III-2000-3.4-C	2000	3.4	9.5	360
PCD-UHR-III-2500-3.1-C	2500	3.1	9.5	360
PCD-UHR-III-3000-2.6-C	3000	2.6	8.5	325

High PRR Cavity Dumping driver.

FULL BRIDGE configuration with output frequency doubling.

Encased version.

Ekspla Electronics p/n	kHz	kV	< ns	W
2PCD-UHR-III-4000-1.7-C	4000	1.7	10.5	360
2PCD-UHR-III-6000-1.3-C	6000	1.3	9	350
2PCD-UHR-500-3.4-C	500	3.4	7	150
2PCD-UHR-1000-2.4-C	1000	2.4	6.5	180
2PCD-UHR-2000-1.6-C	2000	1.6	6	130

High voltage Cavity Dumping driver.

HV05Wm HV power supply is included.

Ekspla Electronics p/n	kHz	kV	< ns	W
PCD-UHV-4.2	10	4.2	6	5
PCD-UHV-5.5	5	5.5	7	5
PCD-UHV10-3	8.6	3	10.5 / 9.5	5
PCD-UHV10-2.5	9.8	2.5	12 / 10.5	5

1) All specifications correspond to Pockels cell capacitance 6pF. **2)** HV Power consumption, the same heat to be removed by cooling.

Driver Selection Table [1]

Ekspla Electronics p/n	Rep-rate	Voltage	Rise / fall	Power [1]
	kHz	kV	< ns	W
PCD-UHV-C	10	4.2	6	5
	5	5.5	7	5
	kHz	kV	< ns	W
PCD-UHV10-C	3	8.6	10.5 / 9.5	5
	2.5	9.8	12 / 10.5	5
	kHz	kV	< ns	W
PCD-FAM-250-2.5	250	2.5	26 / 13	60
PCD-FAM-500-2.5	500	2.5	26 / 13	120

High voltage Cavity Dumping driver with HV05Wm HV power supply included.

Encased version.

Fast amplitude modulation driver.
Each pulse can have individual amplitude in full range 0.1 to 2.5kV according to analog input control signal.

1) All specifications correspond Pockels cell capacitance 6pF. **2)** HV Power consumption, the same heat to be removed by cooling.

Pockels Cell Drivers

PCD-UHR, PCD-UHRS
series open frame OEM driver

PCD-UHR...C, PCD-UHRS...C
series OEM driver in aluminum housing

PCD-UHR-III,
2PCD-UHR-III series driver

HV Power Supplies

Product Range

Ekspla Electronics p/n	Output Power	Maximal Voltage – Standard Options
	W	kV
HV-200	200	1.8, 2.6, 3.6, 4.0
HV-400	400	
HV-2x200	2 × 200	±1.5, ±2.0, ±2.6, ±3.6
	W	kV
HV-170	170	1.8, 2.6, 3.6
HV-2x85	2 × 85	±1.5, ±1.8
	W	kV
HV05Wm	5	1.8, 2.8, 4.0, 4.4, 5.0
HV05Wm-CAN [1]		
HV40Wm	40	1.3, 1.8, 2.5, 3.6, 4.0
HV40Wm-CAN [1]		
HV80Wm	80	1.8, 2.6, 3.1, 3.6, 4.0
HV80Wm-CAN [1]		
HV120Wm	120	1.8, 2.6, 3.1, 3.6
HV120Wm-CAN [1]		
HV2x60Wm	2 × 60	±1.4, ±2.0, ±2.6, ±3.6
HV2x60Wm-CAN [1]		

Encased HV Power Supply

Powering 48 V;
Voltage range 0 – Umax. Auxiliary output 24 V.
CAN, RS232, trimmer analog (option) control.

Encased HV Power Supply

Powering 24 V.
Voltage range 0.4×Umax – Umax.
Trimmer and CAN control.

Open frame (PCB) HV Power Supply

Powering 24 V.
Voltage range 0.4×Umax – Umax.
"-CAN" with CAN control, other trimmer control. [1]

**Contact Ekspla
for more details
and quotation**

1) For CAN communication at evaluation stage Ekspla's CAN-USB adapter is required.

Laser Synchronization Modules and Pulse Delay Generators
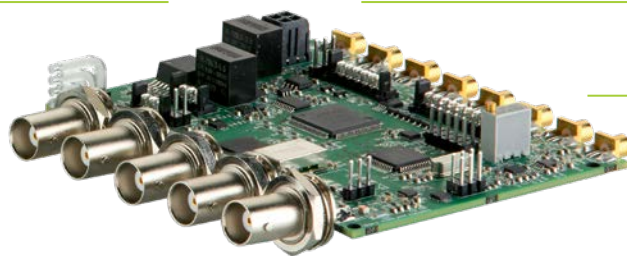
SY4000

Pulse synchronization module with delay generator is designed to create up to 8 delayed output pulse sequences precisely synchronized to internal or external clock.

The SY4000 module is a timing generator dedicated to the synchronization of laser components: AOM drivers, Pockels cell drivers, laser diode and flash lamp drivers, detectors, data acquisition systems, etc.

SY4000 Synchronization module and pulse delay generator encased

Photo detector or electrical signal can be used as input source to be synchronized with. Generator gives possibility to create different sequences like delayed triggering, or any delayed precisely timed series. Particularly, Ekspla recommend using SY4000 to create sets of pulses to control PCD-UHR series pockels cell drivers with one, two or 4 triggering inputs.

Encased Version

Preserves all specifications as SY4000 in additionally communication ports RS232, USB, LAN, WLAN are added. Powering from mains 90…264 V, 50–60 Hz or 12 V DC. Power consumption less than 15 W. Ideal solution for your lab and/or evaluation before switching to OEM version.

SY4000 Main Features

- Compact design
- OEM (single board) and encased options
- 8 independent output channels
- Ultra-stable internal clock 0.2 ppm (optional)
- Precise delay control in range 2 ns to 150 ms
- 25 ps timing resolution
- Hi-accuracy synchronization to external pulse train
- DAC output
- Both 50 Ω and differential outputs present
- Measurement of
  – Optical clock frequency
  – Triggering frequency
  – Delay
- Frequency divider
- Frequency divider for photodetectors

SY4000 General Specifications

PULSE GENERATION	
Channel modes	Single shot, burst, normal, duty cycle, frequency divider
Delay range	0 to 150 ms
Negative delay	-150 ms
Pulsewidth	2 ns to 150 ms
Resolution	25 ps
Accuracy	25 ps + 0.000001 × delay
Time base	100 MHz, 0.2 ppm
Jitter	< 30 ps
Burst mode	1 to 65535

EXTERNAL TRIGGER	
Rate	DC to 20 MHz
Thershold	1.3 V
Input level	LVTTL, TTL
Slope	rising
Jitter	< 100 ps RMS
Delay	< 13 ns; < 70 ns

INTERNAL GENERATOR	
Mode	Duty cycle
Rate	50 ns to 100 sec
Resolution	10 ns; 300 ps
Accuracy	5 ns + 0.000001 × period
Jitter	100 ps RMS
Burst	0 ... 65535

OUTPUTS	
Output level	2.5 V, 4 V
Impedance	50 Ω
Slew rate	1.5 V/ns

COMMUNICATIONS

CAN, RS232, USB, LAN, WLAN

OPERATING REQUIREMENTS

Power requirements
12 V DC, 500 mA

DIMENSIONS
(not including connectors)

OEM board (W × D × H)
100 × 77 × 20 mm

Encased version (W × D × H)
105 × 86 × 85 mm

EKSPLA ELECTRONICS

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Temperature Controller with Oven for Nonlinear Crystals
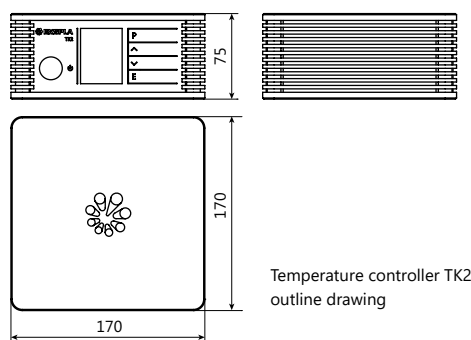
TK2 & KK1

TK2 and KK1 is high temperature set (up to 200 °C) consisting of thermocontroller TK2 and crystal oven KK1.

TK2 has two independent outputs and can control two KK1-30 ovens simultaneously. Controller is equipped by LAN and USB computer control interfaces.

The nonlinear crystal is mounted into adapter before insertion into oven KK1. Such design facilitates handling and replacement of the crystal. The non-linear crystal can be sealed with fused silica windows in order to provide extra protection. The standard adapters are 30 and 50 mm length with apertures of 3×3, 4×4, 5×5, 6×6 mm ... 12×12 mm size. Oven is delivered with one, customer's specific size of adapter. Adapters for different sizes can by ordered separately.

Separately you can purchase adapter for KK1 mounting on tilt stage.

Temperature controller TK2 outline drawing

Oven KK1
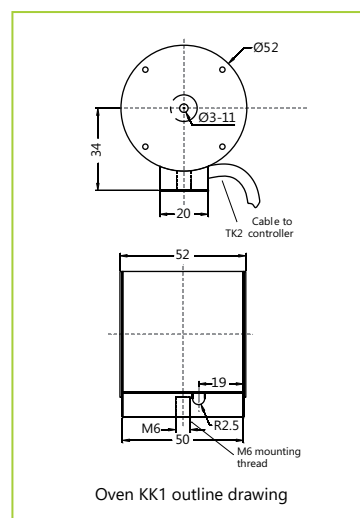
Oven KK1 outline drawing

Adapter H4 for KK1 mounting on tilt stage

General Specifications

Model	TK2 + KK1-30	TK2 + KK1-50
Quantity of ovens possible to connect to one controller TK2	2	1
Temperature tuning range	RT-200 °C	
Maximum crystal dimensions	12×12×30 mm	12×12×50 mm
Temperature tuning step	0.05 °C	
Accuracy	± 0.5 °C	
Long-term stability	± 0.05 °C	
Control interfaces	LAN, USB	
Mains	90 – 264 V, 47 – 63 Hz	
Power consumption	< 50 W	
Oven dimensions, Dia×D	Ø52×52 mm	Ø52×72 mm

Specifications are subject to changes without advance notice.

# Nonlinear Crystal Oven with built-in Thermocontroller

TK8

TK8 is compact oven with built-in thermocontroller for nonlinears crystals to keep them at stabilized temperature in range 30...80 °C.

The crystals with aperture up to 15×15 mm and length up to 20 mm can be mounted. TK8L and TK8XL ovens are designed for crystal length up to 30 mm and 50 mm accordingly. Each oven is made exactly for specific crystal aperture size, so it cannot be used for different size crystals.

Crystal oven can be used in two ways. First one is autonomic operation. This case temperature is preset in advance and stored in internal controller. There is enough to connect DC power 12...24 V to keep crystal at preset temperature. LED indicator on top of oven shows that crystal temperature is reached preset value. Temperature setting can factory preset or customer can set it himself using CAN-USB converter (sold separately) and CanBrowser software. Another way of operation gives possibility change crystal temperature any time as needed using CAN interface.

On request we can manufacture ovens for crystals with aperture up to 60×60 mm or even larger.
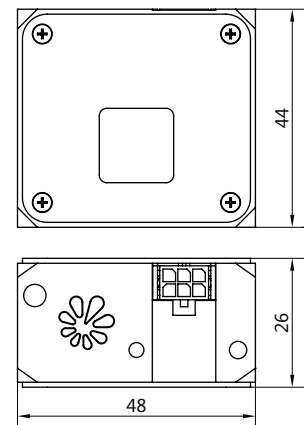
TK8 dimensions

MOUNT FOR CRYSTAL OVENS

Mount for fine tuning of TK8 crystal ovens angle.
The tuning range is ± 2.5°.

General Specifications

Model	TK8	TK8L	TK8XL
Maximum crystal dimensions	15×15×20 mm	15×15×30 mm	15×15×50 mm
Temperature range	30 – 80 °C		
Temperature stability	± 0.2 °C		
Power consumption	<6 W	<6 W	<9 W
Control interface	CAN		
Crystal center position above pad	16 mm		
Dimensions, W×H×D	48×44×26 mm	48×44×36 mm	48×44×56 mm

Specifications are subject to changes without advance notice.

EKSPLA ELECTRONICS

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About Ekspla Electronics

Team of developers and manufacturers of specific electronic devices with cutting-edge parameters and bullet proof reliability continues operation under the new name – Ekspla Electronics.

Product's design embodies 35+ years of experience in manufacturing and R&D of serial and custom laser systems. Up to date, laser electronics created by our team of enthusiastic engineers, has been the heart and soul of 15 000+ laser systems.

99%+ of sold products perform fails-free throughout 10+ years' period under the most demanding conditions. Our exclusive area of expertise – devices for solid state pulsed lasers.

Ekspla Electronics experience includes custom adaptation and high volume manufacturing for laser developers and manufacturers.

Our clients – world-leading manufacturers of industrial, medical and scientific lasers whose systems are installed in 60+ countries and 80+ top universities worldwide.

Ekspla Electronics products are implemented in the world's most sophisticated laser systems developed for CERN, NASA, ELI, Max Planck Institutes, Cambridge University, Massachusetts Institute of Technology and other renowned scientific institutions.