

LASER ELECTRO-OPTICS AND ELECTRONICS COMPONENTS



www.eksmaoptics.com



EKSMA Optics is a manufacturer of precision laser components, used in high power lasers, laser systems and various other optical instruments. Utilizing more than 30 years of expertise in the fields of lasers and optics EKSMA Optics has proven experience providing custom solutions and also offering a wide range of catalogue products for fast off-the-shelf delivery.

Product range in this catalogue includes DKDP, BBO and KTP Pockels cells and their high voltage drivers with power supplies, laser diode drivers, laser synchronization modules, ultrafast electro-optical laser pulse picking systems and heaters of nonlinear crystals.

All components provided by EKSMA Optics are subject to quality testing and certification in Quality Control laboratory. Through stringent inspection procedures, quality control assessments and commitment to new advanced technologies, we are continuously improving and delivering exceptional quality.

EKSMA Optics is an ISO 9001:2015 certified company.



Ordering Information

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

CRYSTAL OUVENS

PRICES

Prices are indicated F.C.A. Vilnius, Lithuania and are exclusive of any taxes, duties or freight. Quantity as well as research application discounts are subject to quote. EKSMA Optics reserves the right to change prices without prior written notice.

PRODUCT DELIVERY TIME

Most of the standard products provided in catalogue are available for fast-off-the shelf delivery. Delivery time of the stock products can be estimated on the website. Estimated product delivery time is displayed on each product page. Search in our e-shop using product code.

If delivery term is indicated as "Request", please add the required items to the shopping cart and choose "Official Quotation". Our sales team will contact you soon and provide the estimated delivery time for the shopping cart.

Code	Product	Specifications	Item Price	Quantity	Total price
BBO-1001H	Beta Barium Borate - BBO Crystals	10; 10; 0.1; 29.2; 90; PBPB400-800 nm; Yes; Estimated delivery time from: 1-3 days	725 €	2	1450 €
S40-0199	Positioning Mount S40-0199 for Nonlinear Crystal Housing	0.12 kg; Estimated delivery time from: 1-3 days	165 €	1	165 €
Total delivery time: 1-3 days					
For EU customers attention: without valid VAT ID number quotations and purchase orders will be provided with extra 21% VAT (Lithuanian VAT).					
Sub-total:					1615 €
Total:					1615 €

SHIPPING

EKSMA Optics works with the biggest express freight carriers (UPS, DHL, FedEx). Other freight forwarders are available on request. If not specified by customer, the default freight forwarder is DHL or UPS (depending on the country). Final shipping costs are subject to quote depending on individual order. EKSMA Optics reserves the right to change the prices without prior written notice depending on freight forwarder's pricing. Shipping charges are prepaid and added as a separate item to the invoice.

CERTIFICATE OF ORIGIN

All items shown in this catalogue are of Lithuanian Origin (EU). Certificate of Origin is available under request.

ORDERING

Purchase orders to EKSMA Optics can be placed using our e-shop, by e-mail or by fax. Customs paperwork and fees if any applied must be handled by customers.

COMPANY DETAILS

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PAYMENT OPTIONS

Standard payment options include online credit card payments (using PayPal or PaySera services) or wire transfer.

WIRE TRANSFER DETAILS

Account number (IBAN)	LT16 7044 0600 0577 4220
Bank name	AB SEB Bankas
Bank address	Gedimino Ave. 12, LT-01103 Vilnius, LITHUANIA
SWIFT Code	CBVILT2X
Beneficiary	EKSMA Optics UAB

Please note that customer's bank transfer fee associated with payment service should be paid by customer.

RETURN POLICY

30 days customer satisfaction warranty covers all standard products. Please contact EKSMA Optics if you are not satisfied with the product to arrange a refund. EKSMA Optics does not cover any costs associated with shipping.

WARRANTY

All products are guaranteed to be free from defects in material and workmanship for a period of 1 year after delivery. EKSMA Optics does not assume liability from installation, labour or consequential damages.

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POCKELS
CELLSPOCKELS CELLS
DRIVERSHV POWER
SUPPLIESQ-SWITCHING
KITSULTRAFAST PULSE
PICKING SYSTEMSLASER DIODE
DRIVERSLASER SYNCHRONIZATION
MODULESCRYSTAL
OVENS

Pockels Cells

Pockels cell is used to change the polarization state of laser light when high voltage is applied to it. The key element of Pockels cell is electro-optical crystal, which produces or changes birefringence induced by the electric field. Induced birefringence or refractive index modification in the material by electric field is called electro-optic effect or Pockels

effect. Electro-optic effect is observed only in non-centrosymmetric crystals.

Typical applications of Pockels cells are Q-switching of laser cavity, laser cavity dumping, pulse picking, light coupling into and from regenerative amplifier, continuous wave laser beam chopping.

PCK

KTP POCKELS CELLS



PCK4

PCK series KTP Pockels cells developed at EKSMA Optics are based on specially grown high resistivity KTP crystals. KTP crystals have better optical homogeneity and higher damage threshold compared to RTP crystals. The outstanding feature is possibility to operate KTP Pockels cells at high duty cycles or even to keep at high voltage for the longer time.

FEATURES

- > More than twice smaller HV requirement comparing to double BBO Pockels cells
- > Operates at high duty cycles
- > Very low piezo-electric resonances
- > Standard apertures: 4×4, 6×6 and 8×8 mm

APPLICATIONS

- > Q-switching for high repetition rate lasers 1 kHz – 1 MHz
- > Pulse picking of high repetition rate lasers

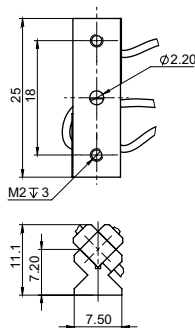
For drawings of other standard KTP Pockels Cells please visit www.eksmaoptics.com

SPECIFICATIONS

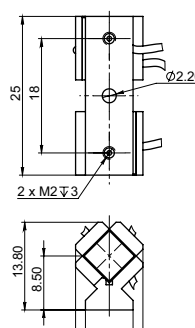
MODEL	PCK4	PCK4-O	PCK6	PCK6-O	PCK8-O
Clear aperture diameter, mm	3.5		5.5		7.5
Crystal size (W×H×L), mm	4×4×10		6×6×10		8×8×10
Quantity of crystals	2				
Half-wave voltage (@ 1064 nm), kV DC	<1.8		<2.5		<3.6
Capacitance, pF	4		<6		<8
Optical transmission, %	> 98				
Contrast ratio	>1:500				
Cell size, mm	Ø25.4×42.2	25×11.1×7.5	Ø25.4×42.2	25×13.8×10.6	25×16.6×13.4



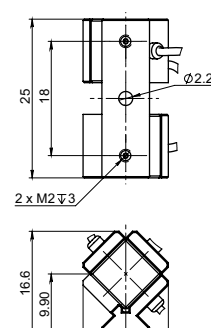
PCK6-O



PCK4-O



PCK6-O



PCK8-O

PC • D-compact • D-mini

KD*P POCKELS CELLS



D-compact/12



D-compact/9



PC12SR

KD*P (DKDP) is one of the electro-optical crystals used for Pockels cells. The most popular application of KD*P (DKDP) crystal based Pockels cell is Q-switching of laser cavity. DKDP Pockels cell can be used for lasers emitting in the range of 400 – 1100 nm. High energy and short output pulse formation during Q-switching of laser cavity process is realized with KD*P (DKDP) Pockels cell in the most of commercially available flashlamp pumped Nd:YAG and Ruby lasers, low repetition rate DPSS lasers like Nd:YAG, Nd:KGW, Nd:YLF, Nd:Glass and other lasers. Electro-optical KD*P (DKDP) crystals produced by EKSMA Optics have high damage threshold dielectric AR coatings (LIDT > 10 J/cm², 10 ns, 10 Hz, 1064 nm), feature long lifetime without degradation of the coatings and show reliable operation with pulsed high energy lasers.

PC12SR, PC20SR, D-compact and Mini series DKDP Pockels cells have AR-coated protective windows on both ends. Windows can be flat or wedged or in non-parallel, laser beam shift compensating configuration to eliminate etalon effects in the Pockels cell and laser cavity.

The rectangular shape PC5S, PC5D and PC10S DKDP Pockels cells are provided without protective windows and typically are used in hermetically sealed lasers.

DKDP Pockels cells provided with properly matched high voltage Pockels cell drivers allow the customers to expect the best results in their application.

EKSMA Optics offers wide range of HV drivers for the Pockels cells and power supplies for the drivers which are presented in the next chapter of this catalogue.

FEATURES

- Low absorption and high deuteration material
- High damage threshold dielectric AR coatings for different laser wavelengths
- Customized Pockels cells available upon request

APPLICATIONS

- Q-switching of flashlamp pumped high energy and low repetition rate diode pumped lasers
- Pulse picking
- Laser cavity dumping



PC10S



PC5D



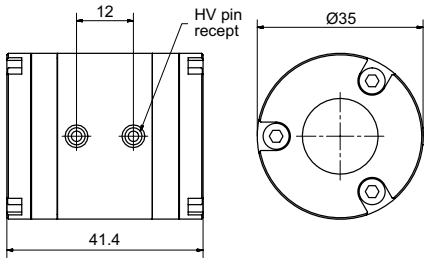
D-mini/9

SPECIFICATIONS

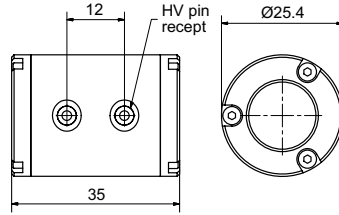
MODEL	PC20SR	PC12SR	D-compact/12	D-compact/9	D-mini/9	D-mini/8	PC10S	PC5S	PC5D
Clear aperture, mm	Ø 18		Ø 11		Ø 8	Ø 7	9.5 × 9.5		4.5 × 4.5
Quantity of crystals					1				2
λ/4 @ 1064 nm voltage, kV DC			< 3.4			< 2.5	< 3.4		< 1.7
Capacitance, pF	< 10		6			3	4	1.5	3
Optical transmission									> 97 % at 1064 nm
LIDT of AR coatings									> 1 GW/cm ² (10 J/cm ²), 1064 nm, 10 Hz, 10 ns
Contrast ratio									> 1:2000
Cell size, mm	Ø35×51	Ø35×41.4	Ø25.4×39	Ø25.4×35	Ø19×25.4	Ø19×19	22×18×33	18×14×25	23×16×52

Specifications are subject to change without advance notice.

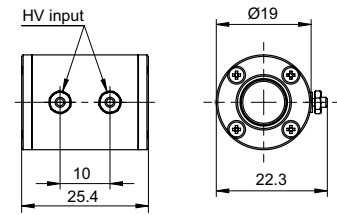
POCKELS CELLS



Outline drawing of PC12SR

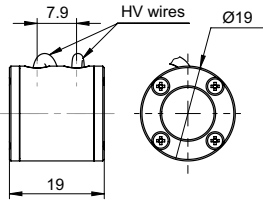


Outline drawing of D-compact/9

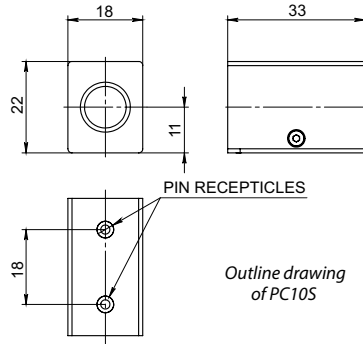


Outline drawing of D-mini/9

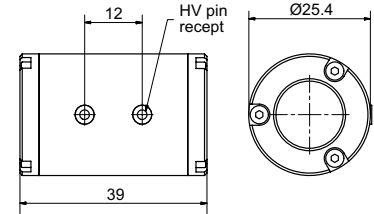
POCKELS CELLS DRIVERS



Outline drawing of D-mini/8



Outline drawing of PC105



Outline drawing of D-compact/12

HV POWER SUPPLIES

Q-SWITCHING KITS

RELATED PRODUCTS

PM1 mounting stage for Pockels cells of Ø25.4 mm

See page 8



HPR mounting stage for Pockels cells of Ø35 mm

See page 8



DPB series high voltage Pockels cell driver

See page 15



DQF Pockels cells driver for Q-switching of flashlamp pumped lasers

See page 18



ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

CRYSTAL OVENS

PCB

BBO POCKELS CELLS

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

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LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

CRYSTAL OVENS



PCB4D



PCB4S

BBO based Pockels cells can be useful at wavelengths from the UV to more than 2 μm. Low piezoelectric ringing makes these Pockels cells attractive for the control of high-power and high pulse repetition rate lasers. Fast switching electronic drivers properly matched to the cell are available for Q-switching, cavity dumping and other applications.

Pockels cells of PCB series are transverse field devices. Low electro-optical coefficient of BBO results in high operating voltages. The quarter-wave voltage is proportional to the ratio of electrode spacing and crystal length. As a result, smaller aperture devices have lower quarter-wave, however even for 2.5 mm aperture devices the quarter-wave voltage is as high as 4 kV @ 1064 nm.

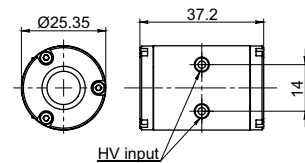
Double crystal design is employed to reduce required voltages and to allow operation in half-wave mode with fast switching times.

FEATURES

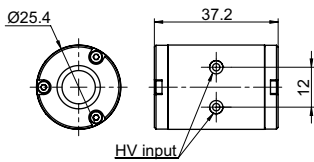
- Minimal piezoelectric ringing
- Very low absorption and suitability for high power laser applications
- Reliable design for operation up to 2 MHz HV pulse repetition rate
- Broad transmission rate from 200 to 2000 nm

APPLICATIONS

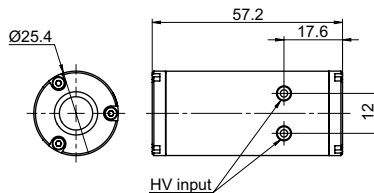
- High repetition rate Q-switching
- Pulse picking at up to 2 MHz rate
- Laser cavity dumping
- Pulses coupling into and from regenerative amplifier



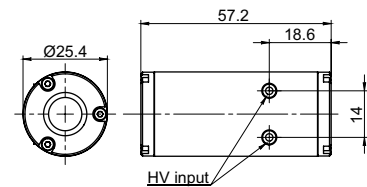
PCB6.3S outline drawing



PCB3S, PCB4S outline drawing



PCB3D, PCB4D outline drawing



PCB6.3D outline drawing

SPECIFICATIONS

MODEL	PCB3S	PCB3D	PCB4S	PCB4D	PCB6.3S	PCB6.3D	PCB8D
Clear aperture diameter, mm	2.5		3.5		5.8		7
Quantity of crystals	1	2	1	2	1	2	2
λ/4 voltage (@ 1064 nm), kV DC	<3.5	<1.8	<4.6	<2.3	<7.5	<3.8	<4.6
Capacitance, pF	4	6	3	6	6	<8	<8
Optical transmission, %	> 98		>97		>98		
Contrast ratio ¹⁾	>1:1000	>1:500	>1:1000	>1:500	>1:1000	>1:500	>1:500
Dimensions, mm	Ø25.4x37.2	Ø25.4x57.2	Ø25.4x37.2	Ø25.4x57.2	Ø25.4x42.2	Ø25.4x57.2	Ø35x64

¹⁾ Measured by crossed polarizers method.

All crystals are coated AR/AR @1064 nm.
Other antireflection coatings are available on request.
Damage threshold >5 J/cm² for 10 ns pulses at 1064 nm.

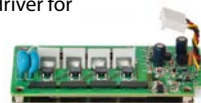
Specifications are subject to changes without advance notice.

RELATED PRODUCTS

PM1 mounting stage for Pockels cells of Ø25.4 mm
See page 8



DQ high repetition rate Pockels cell driver for Q-switching
See page 17

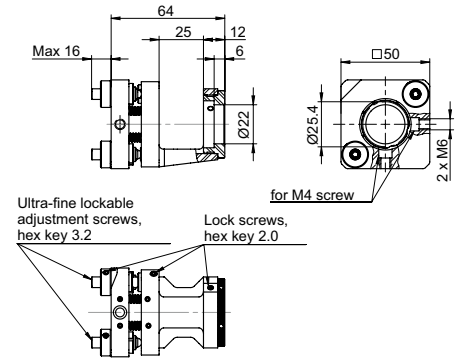


DPD cavity dumping & pulse picking Pockels cell drivers
See page 9



PM1

MOUNTING STAGE FOR POCKELS CELLS OF Ø25.4 mm



PM1 series mounting stage is designed for holding and positioning of Ø25.4 mm Pockels cells. The mount has ultra-fine thread lockable adjustment screws.

SPECIFICATIONS

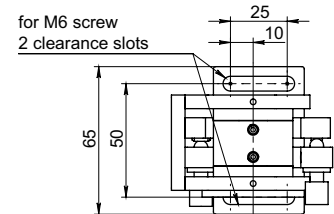
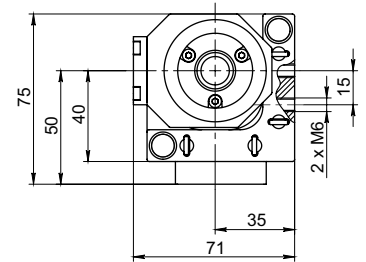
MODEL	PM1
Adjusting angles, tilt and tip	±3.5°
Rotation along Z-axis	180°
Adjustment screw thread	M6x0.25
Screw sensitivity	0.5 µm

HPR

MOUNTING STAGE FOR POCKELS CELLS OF Ø35 mm



HPR series mounting stage is designed for holding and positioning of Ø35 mm Pockels cells. HPR stages with fine or ultra-fine screws are available upon request.



SPECIFICATIONS

MODEL	HPR-35
Suitable for pockels cells housing diameters, mm	Ø35
Adjusting angle along X and Y axis, deg	9
Rotating angle along Z-axis, deg	20
Beam high above breadboard, mm	50
Adjustment screw thread	M6x0.5
Screw sensitivity	1.5 µm

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

CRYSTAL OVENS

Pockels Cells Drivers

DPS • DPD • DPBX • DP-SP

CAVITY DUMPING & PULSE PICKING POCKELS CELL DRIVERS



OEM version
of DPS/DPD series
Pockels cell driver



Encased version
of DPS/DPD series
Pockels cell driver

FEATURES

- › Fast HV rise/fall time < 6 – 9.5 ns
- › HV pulse amplitude up to 7 kV
- › Pulse repetition rate up to 1 MHz
- › Output pulse jitter < 50 ps if trigger pulse rise time < 0.5 ns

DPD series Pockels cell drivers are designed for wide range of applications and operating modes – pulse selection, Q-switching, cavity dumping, CW beam chopping, burst modes, etc.

Different versions of the drivers are designed for variations of output voltage, repetition rate and rise/fall time of HV pulses. Those three parameters are mutually dependent: higher voltage means longer rise/fall time and higher repetition rate is limited by voltage. However, all drivers can operate at 1 MHz and even higher repetition rate in burst mode not exceeding specified average power. Connection diagram can be PUSH-PULL configuration using stand-alone driver for one Pockels cell.

Most of our DPS/DPD/DPBX/DP-SP series units are available in two versions: “open frame” which is ideal for OEM manufacturers incorporating drivers in their own laser systems or “Encased” in aluminum housings. Encasing of Pockels cell driver in aluminum housing helps to solve two problems: shields both humans and electronics from high voltage impact from operating Pockels cell driver, and protects driver itself from accidental potentially harmful external contact – ensuring safe operation of the driver. The Encased option is especially handy for researchers and custom product manufacturers who use these drivers during their own systems build-up.

Standard range drivers (unipolar and bipolar) operate safely with HV pulse duration from 100 ns to 5 μ s. Moreover, HV pulse duration can be extended to infinity using pulse regeneration technique.

Short pulse drivers (DP-SP series) feature safe operation with HV pulse duration from 15 ns to ~1 μ s. However, pulse regeneration technique does not work with short pulse drivers.

Short pulse DP-SP series drivers can be used for single pulse selection in pulse picker applications for higher repetition rate lasers generating up to 60 MHz pulse trains. While standard drivers can be used for single pulse selection in pulse picker applications for lasers generating up to 17 MHz pulse trains. Pulse picking applications with lasers emitting up to 100 MHz pulse trains require two drivers in Full Bridge configuration.

Operation control of all our drivers can be made by two trigger (sync) pulses (Fig. 1) or by single trigger pulse (Fig. 2) whereas rising edge of trigger pulse turns ON high voltage to Pockels cell and falling edge of the same trigger pulse turns high voltage OFF.

DPS drivers have fixed 1 trigger pulses (sync) control. DPD drivers have fixed 2 trigger pulses (sync) control. Thus the choice of driver with 1 (DPS) or with 2 (DPD) trigger pulses control must be made by customer before ordering process. While DP-SP and DPBX series drivers have switchable 1 or 2 trigger pulses control.



Fig. 1. Control timing charts
for two-pulses controlled drivers



Fig. 2. Control timing charts
for single pulse controlled drivers

PULSE REGENERATION TECHNIQUE

Gives possibility to operate push-pull drivers very long output pulse. Pulse regeneration technique does not work with short-pulse (DP-SP) drivers. Pulse regeneration technique diagram is shown in Fig. 3

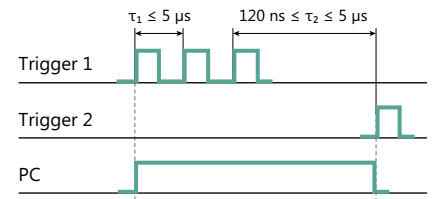


Fig 3. Principle pulse regeneration diagram

GENERAL SPECIFICATIONS OF DPS/DPD/DPBX/DP-SP DRIVERS 1)

DRIVER MODEL	DPS/DPD	DPBX	DP-SP
Maximal HV operation voltage	up to 5.2 kV	up to 7.0 kV	up to 3.6 kV
HV pulse rise time (Fig. 5)	< 6 – 8.5 ns	< 6 – 9.5 ns	< 6 – 7 ns
HV pulse fall time (Fig. 6)	< 6 – 8.5 ns	< 6 – 9.5 ns	< 6 – 7 ns
HV pulse duration (Fig. 4)	100 – 5000 ns		15 – 5000 ns
HV pulse duration extension using pulse regeneration technique	Yes		No
Maximal HV pulse repetition rate	up to 1000 kHz		
Triggering pulse duration requirement	> 100 ns		> 10 ns
Triggering pulse amplitude requirement	3.5 – 5 V (50 Ohms)		
Triggering pulse rise & fall time requirement	< 20 ns		< 5 ns
Maximal length of leads to Pockels cell	10 cm (< 5 cm recommended)		
Control by triggering (sync) pulses	1 or 2, fixed	1 or 2, switchable	1 or 2, switchable
Control by triggering pulses diagram options	Fig. 1 for two triggering pulses or Fig. 2 for single triggering pulse		
HV pulse delay	45 ns		30 ns
External powering requirements 2)	Depends on the model and each model has particular recommendation		
High voltage supply	Depends on the model and each model has particular recommendation		
Low voltage DC supply	24 V DC ±1.0 V on request 12 V DC ±0.5 V	24 V DC ±1.0 V	

1) Specifications are given for Pockels cell with capacity < 6 pF. Not all combinations of parameters can be possible at the same time. Specifications are subject to changes without advance notice.

2) Driver needs to be mounted on the heatsink (excluding water cooled versions). Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation.

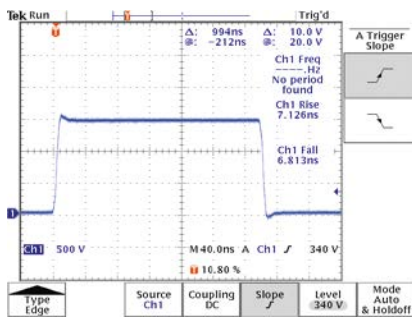


Fig. 4. Typical output pulse shape

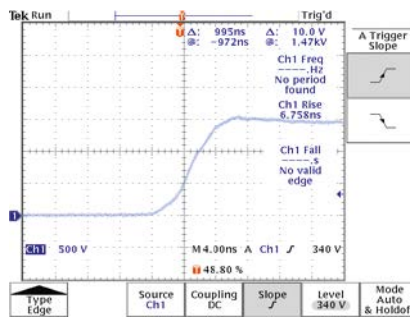


Fig. 5. Typical rising front of output pulse in detail

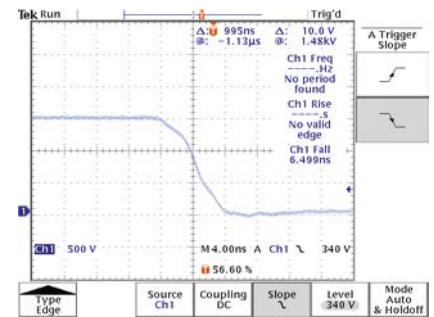
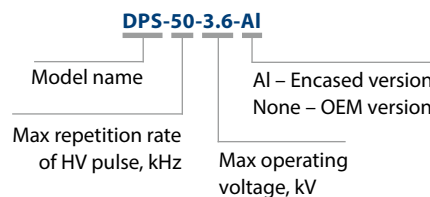


Fig. 6. Typical falling front of output pulse in detail

ORDERING/PART NUMBER INFORMATION

Please provide following information about the driver:

- > Operating voltage
- > Repetition rate
- > HV Pulse duration (range)
- > Capacitance of Pockels cell
- > OEM or Encased version



OEM VERSION UNIPOLAR DRIVERS

CONFIGURATION SAMPLES OF DPS/DPD SERIES OEM VERSION UNIPOLAR DRIVERS

CATALOGUE NUMBER OF DRIVER	DPS-50-3.6 DPD-50-3.6	DPS-500-2.6 DPD-500-2.6	DPS-1000-1.8 DPD-1000-1.8
Maximal HV operating voltage	3.6 kV	2.6 kV	1.8 kV
Maximal HV repetition rate *	50 kHz	500 kHz	1000 kHz
Pulse duration	100 – 5000 ns		
HV pulse rise time, typical	<7 ns	<6.5 ns	<6 ns
HV pulse fall time, typical	<7 ns	<6.5 ns	<6 ns
Output polarity	positive		
HV power consumption	<20 W	<90 W	<80 W
12V/24V power consumption	1 W	6 W	9 W
Recommended HV power supply model	PS-40	PS-120	PS-80
Dimensions	see Fig. 7		
Cooling	conductive	conductive or water	

DPS in code indicates that driver is controlled by 1 sync pulse, DPD in code indicates that driver is controlled by 2 sync pulses.

HV output voltage to Pockels cell is equal to HV power supply voltage.

Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation.

* Drivers with any non-standard HV pulse repetition rate from 0 to 1000 kHz are also available in case of request.



OEM version of DPS/DPD series driver with conductive pad.
Suitable for repetition rate up to 50 kHz

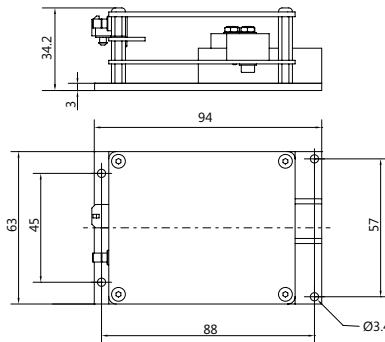


Fig. 7. Outline drawing of DPS series drivers with conductive pad

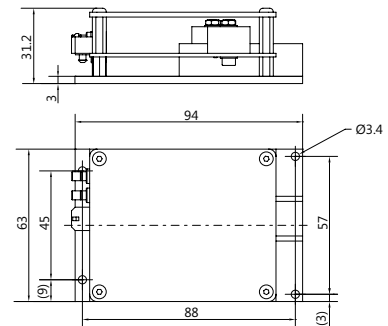


Fig. 7a. Outline drawing of DPD series drivers with conductive pad



OEM version of DPS/DPD series driver with general purpose pad

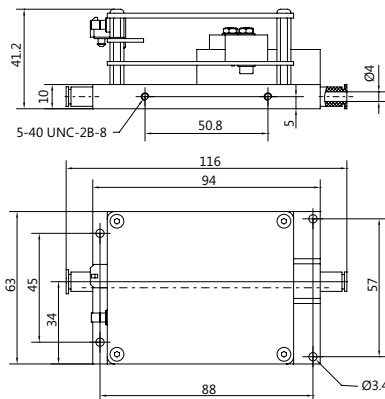


Fig. 8. Outline drawing of DPS series driver with general purpose pad

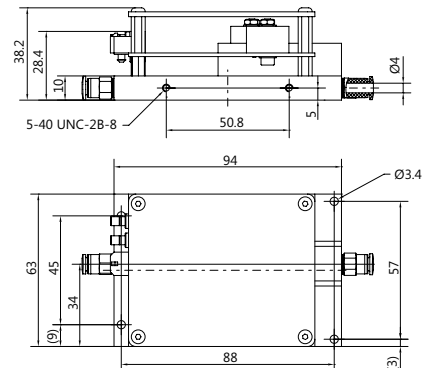


Fig. 8a. Outline drawing of DPD series driver with general purpose pad

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

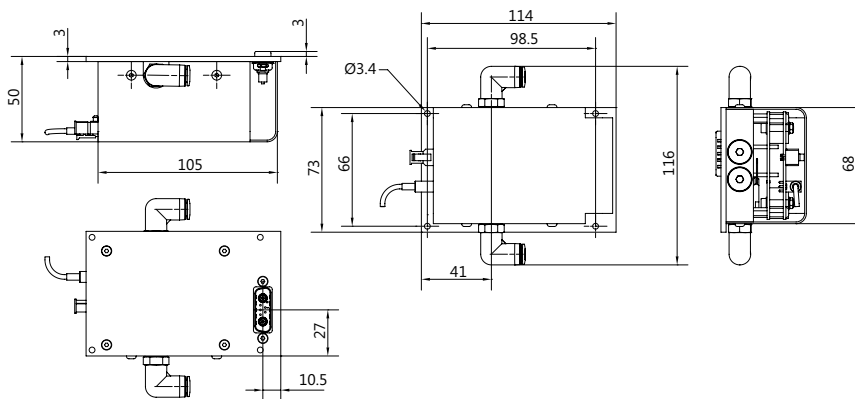
CRYSTAL OVENS

ENCASED VERSION UNIPOLAR DRIVERS

CONFIGURATION SAMPLES OF DPS/DPD SERIES ENCASED VERSION UNIPOLAR DRIVERS

CATALOGUE NUMBER OF DRIVER	DPS-250-3.6-AI DPD-250-3.6-AI	DPS-500-2.6-AI DPD-500-2.6-AI	DPS-1000-1.8-AI DPD-1000-1.8-AI
Maximal HV operating voltage	3.6 kV	2.6 kV	1.8 kV
Maximal HV repetition rate *	250 kHz	500 kHz	1000 kHz
Pulse duration	100 – 5000 ns		
HV pulse rise time, typical	<7 ns	<6.5 ns	<6 ns
HV pulse fall time, typical	<7 ns	<6.5 ns	<6 ns
Output polarity	positive		
HV power consumption	<75 W	<90 W	<80 W
12V/24V power consumption	4 W	6 W	9 W
Recommended HV power supply model	PS-80	PS-120	PS-80
Dimensions	see Fig. 9		
Cooling	water		

* Drivers with any non-standard HV pulse repetition rate from 0 to 1000 kHz are also available in case of request.



Encased version of driver DPS/DPD models
DPS/DPD-200-xx, DPS/DPD-250-xx, DPS/DPD-500-xx,
DPS/DPD-1000-1.8

Fig. 9. Outline drawing of encased version of driver DPS/DPD models DPS/DPD-200-xx,
DPS/DPD-250-xx, DPS/DPD-500-xx, DPS/DPD-1000-1.8

POCKETS
CELLS

POCKETS CELLS
DRIVERS

HV POWER
SUPPLIES

Q-SWITCHING
KITS

ULTRAFAST PULSE
PICKING SYSTEMS

LASER DIODE
DRIVERS

LASER SYNCHRONIZATION
MODULES

CRYSTAL
OVENS

ENCASED VERSION BIPOLAR DRIVERS

CONFIGURATION SAMPLES OF DPS/DPD/DPBX SERIES ENCASED VERSION BIPOLAR DRIVERS

CATALOGUE NUMBER OF DRIVER	DPS-250-5.2-AI DPD-250-5.2-AI	DPS-300-4.6-AI DPD-300-4.6-AI	DPS-1000-2.9-AI DPD-1000-2.9-AI	DPBX-250-7.0-AI	DPBX-1000-3.8-AI
Maximal HV operating voltage	5.2 kV	4.6 kV	2.9 kV	7.0 kV	3.8 kV
Maximal HV pulse repetition rate ¹⁾	250 kHz	300 kHz	1000 kHz	250 kHz	1000 kHz
Pulse duration ²⁾	100 – 5000 ns				
HV pulse rise time, typical	<8.5 ns	<8 ns	<7.5 ns	< 9.5 ns	< 6 ns
HV pulse fall time, typical	<8.5 ns	<8 ns	<7.5 ns	< 9.5 ns	< 6 ns
Output polarity	bipolar				
HV power consumption ³⁾	<100 W	<100 W	<120 W	< 200 W	< 210 W
DC power consumption	9 W			< 6 W	< 10 W
Recommended HV power supply model	PS2-60			PS2-60-3.6 Two pieces	PS2-60-2.0 Two pieces
Dimensions	see Fig. 10			See Fig. 11	
Cooling	conductive or water			Water	

¹⁾ Drivers with any non-standard HV pulse repetition rate from 0 to 1000 kHz are also available in case of request
²⁾ Pulse duration can be extended using pulse regeneration.
³⁾ Power consumption for 6 pF load. Voltage or repetition rate derating is necessary if capacitance of your Pockels cell is higher. Contact vendor for details.

- Bipolar drivers DPS and DPD series have fixed 1 OR 2 trigger pulses (sync pulses) control.
- Bipolar drivers DPBX series have switchable 1 or 2 trigger pulses control.
- HV output voltage to Pockels cell is equal to HV power supply voltage, i.e. sum of positive and negative voltage values.
- Driver needs to be mounted on heatsink unless it is cooled by water.
- Drives base plate temperature needs to be lower than 35 °C in all regimes of operation.

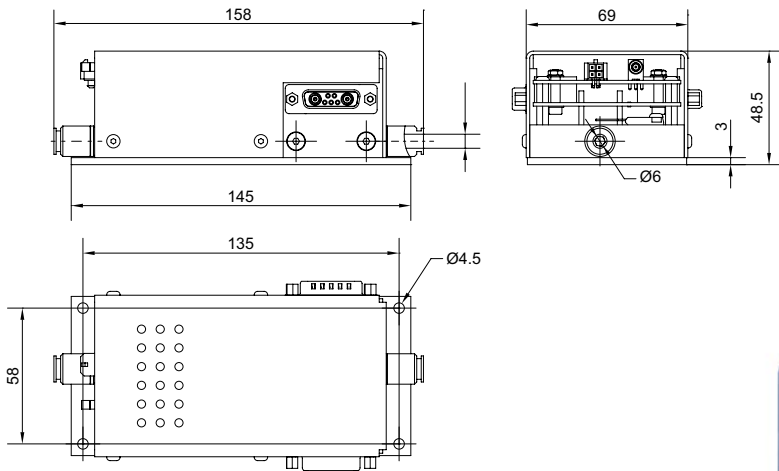


Fig. 10. Outline drawing of encased version of driver DPS/DPD models

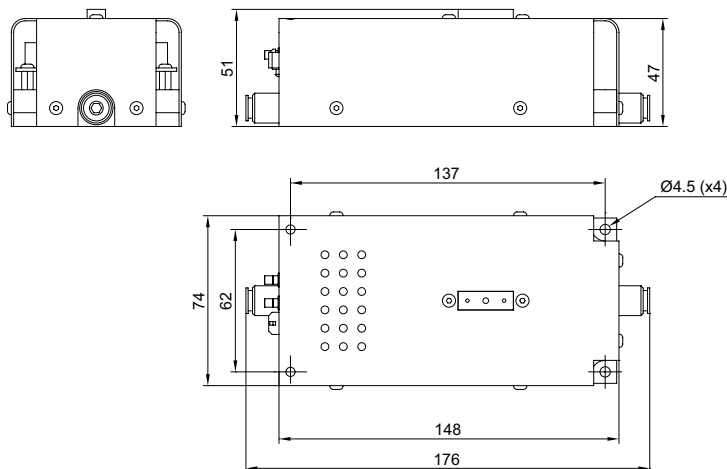


Fig. 11. Outline drawing of encased version of driver DPBX models



Encased version of driver DPS/DPD models. Water cooled version

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

CRYSTAL OVENS

SHORT PULSE DRIVERS

FEATURES

- > Short circuit protection at driver output
- > Driver pad overheat sensor stops operation when overheated
- > Overheat optocoupled output signal
- > Switchable single pulse and two pulses control operation modes
- > LED for error indication (overheat and short circuit)

CONFIGURATION EXAMPLES OF DP-SP SERIES SHORT-PULSE DRIVERS

CATALOGUE NUMBER OF DRIVER	DP-SP-50-3.6	DP-SP-250-3.6	DP-SP-600-2.5	DP-SP-250-3.6-AI	DP-SP-600-2.5-AI
Max / min HV operating voltage	3.6 kV / 1.8 kV	3.6 kV / 1.8 kV	2.5 kV / 1.25 kV	3.6 kV / 1.8 kV	2.5 kV / 1.25 kV
Maximal HV repetition rate ¹⁾	50 kHz	250 kHz	600 kHz	250 kHz	600 kHz
Pulse duration ²⁾	15 – 5000 ns	15 – 1250 ns	15-400 ns	15 – 1250 ns	15-400 ns
HV pulse rise time, typical	<7 ns	<7 ns	<6.5 ns	<7 ns	<6.5 ns
HV pulse fall time, typical	<7 ns	<7 ns	<6.5 ns	<7 ns	<6.5 ns
Output polarity	positive				
HV power consumption	<20 W	<75 W	<100 W	<75 W	<100 W
12V / 24V power consumption	1 W	4 W	7 W	4 W	7 W
Recommended HV power supply model	PS-40	PS-80	PS-120	PS-80	PS-120
Dimensions	see Fig. 12	see Fig. 13		see Fig. 14	
Cooling	conductive	water			

¹⁾ Upon request maximal HV repetition rate can be extended to 1000 kHz if output voltage is below 1.8 kV.

²⁾ Pulse regeneration technique does not work with short pulse drivers.

Driver needs to be mounted on the heatsink (excluding water cooled versions). Heat sink temperature needs to be lower than 35 °C (95 °F) in all regimes of operation. Please specify working voltage and required tuning range by ordering. HV output voltage to Pockels cell is equal to HV power supply voltage.



OEM version of DP-SP series driver with general purpose pad

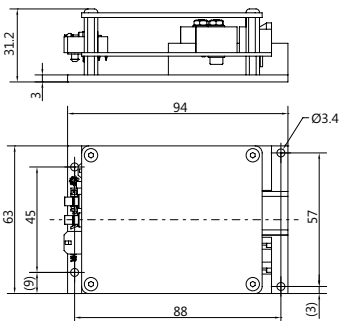


Fig. 12. Outline drawing of DP-SP series drivers with conductive pad

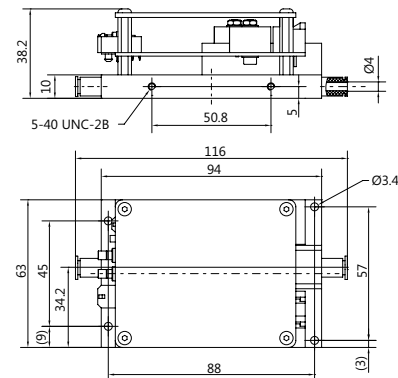


Fig. 13. Outline drawing of DP-SP series driver with general purpose pad



Encased version of driver DP-SP

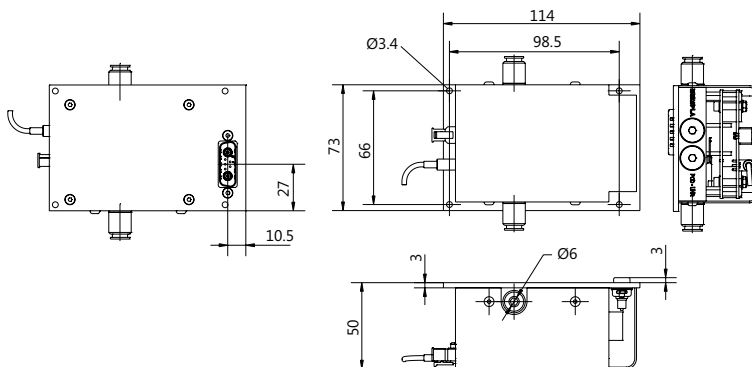


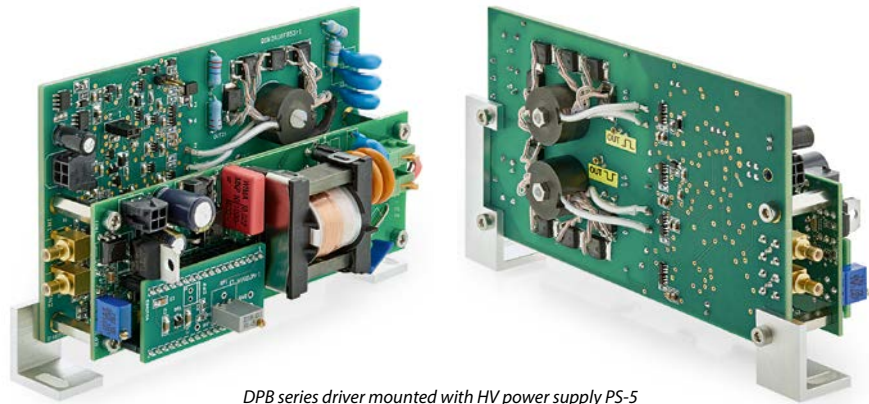
Fig. 14. Outline drawing of encased version of driver DP-SP

DPB

HIGH VOLTAGE POCKELS CELL DRIVER

FEATURES

- › HV pulse amplitude up to 9.8 kV
- › HV pulse duration down to 30 ns
- › HV pulse amplitude doubling layout
- › Repetition rate up to 10 kHz
- › Easy integration with HV power supply
- › Switchable one/two trigger pulses control model



DPB series driver mounted with HV power supply PS-5

DPB series High Voltage drivers can operate with highest possible high voltage amplitudes among the Pockels cells drivers offered by EK SMA Optics.

DPB series drivers feature short HV pulse rise and fall time and fast repetition rate. It is offered with power supply integrated on the top of the driver's board ensuring compact design of the complete unit.

SPECIFICATIONS

CATALOGUE NUMBER	DPB-10-4.2	DPB-5-5.5	DPB-3-8.6	DPB-2.5-9.8
Maximum output pulse amplitude (HV)	4.2 kV	5.5 kV	8.6 kV	9.8 kV
Output polarity	bipolar			
HV pulse rise time, typical	7 ns	8 ns	10.5 ns	12 ns
HV pulse fall time, typical	7 ns	8 ns	9.5 ns	10.5 ns
HV pulse duration	30...3000 ns		35...2000 ns	
Maximum HV repetition rate	10 kHz	5 kHz	3 kHz	2.5 kHz
HV pulse delay	30 ns			
Requirement for external triggering pulse amplitude load	3.5...5 V (50 Ω load)			
Requirement for external triggering pulse rise time	< 5 ns			
External powering requirements:				
Low voltage DC supply	15 – 25 V, 150 mA or 12 V, 220 mA (0.5 A inrush current)		24...25 V, 150 mA	
HV power supply	2.2 kV, 5 W	2.8 kV, 5W	4.4 kV, 5W	5.0 kV, 5W
DC Connectors	Molex Micro-Fit 3.0			
Dimensions (L x W x H):				
Driver board	135 × 65 × 30 mm		135 × 75 × 30 mm	
Driver board mounted with PS-5 power supply	151 × 71 × 52 mm (Fig. 3)		151 × 86 × 59 mm (Fig. 4)	
Weight not including HV power supply	70 g		130 g	

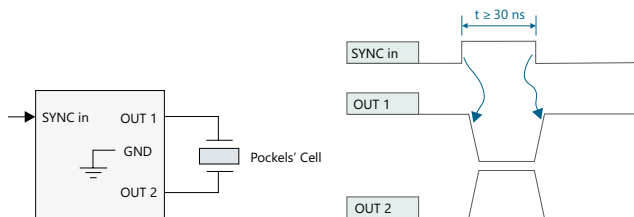


Fig. 1. Diagram of pockels cell connection to driver and timing charts of driver controlled by 1 sync pulse

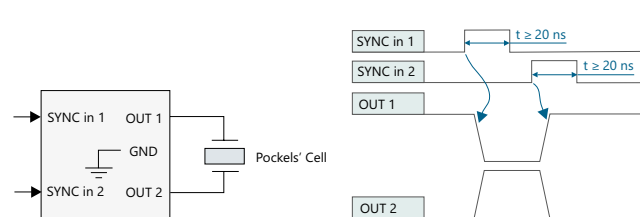


Fig.2. Diagram of pockels cell connection to driver and timing charts of driver controlled by 2 sync pulses

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

CRYSTAL OVENS

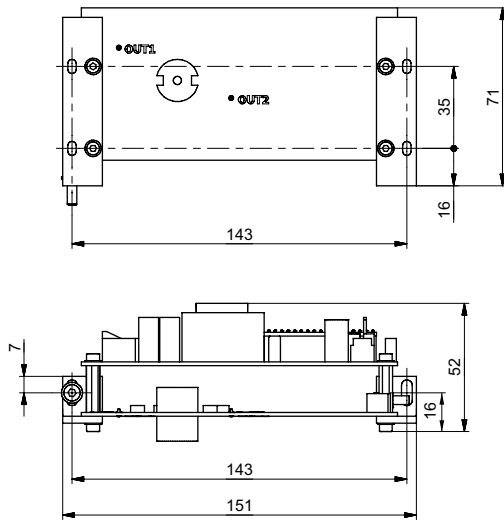


Fig. 3. Outline drawing of DPB-10 or DPB-5 drivers

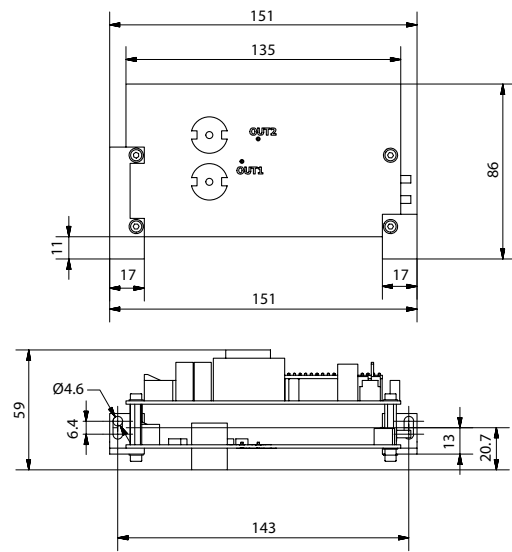


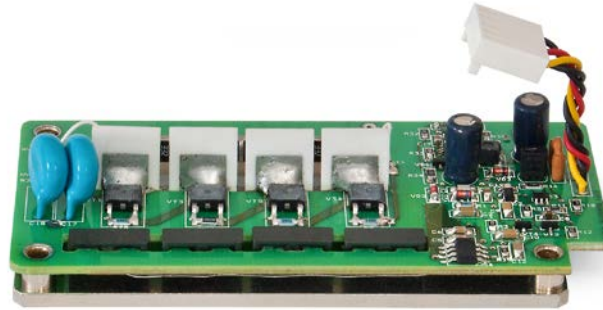
Fig. 4. Outline drawing of DPB-3 or DPB-2.5 drivers

DQ

HIGH REPETITION RATE POCKELS CELL DRIVER FOR Q-SWITCHING OF DIODE PUMPED LASERS

FEATURES

- › Pulse repetition rate up to 100 kHz
- › Fast HV rise time <7 ns for 4 kV pulse
- › HV pulse amplitude up to 4 kV



DQ series high repetition rate Pockels cell driver has been designed for use in mode-locked lasers for cavity dumping or for cavity Q-switching of solid-state nanosecond lasers. Fast HV (less than 7 ns) edge ensures excellent pre- and post-pulse contrast.

Ability to operate at high pulse repetition rates makes this driver perfect fit for most of diode-pumped nanosecond lasers. For pulse repetition rates up to 10 kHz heatsink is not

required. For high repetition rates the driver should be attached to the heatsink with thermal resistance of at least 0.4 °C/W for room temperature (25 °C) operation.

The driver should be mounted into dielectric box (not provided) providing electrical insulation. Low voltage power supply is required to internal triggering circuit, while tuning of HV power supply voltage.

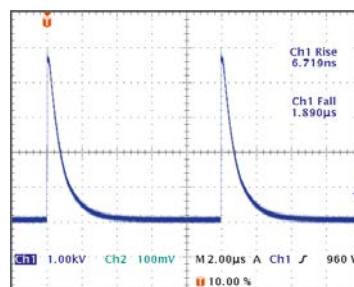
SPECIFICATIONS

CATALOGUE NUMBER	DQ-100-4
Maximum high voltage (HV) pulse amplitude	4.0 kV
Polarity	Positive
HV pulse rise time	< 7 ns
HV pulse fall time	~2 μs ¹⁾
HV pulse duration	180 ns ¹⁾
Maximum HV pulse repetition rate	100 kHz
HV pulse jitter	< 0.5 ns
External triggering pulse duration requirement	100 – 1000 ns
External triggering pulse amplitude requirement	3 – 5 V (50 Ω)
External triggering pulse rise & fall time	< 10 ns
HV pulse delay	35 – 40 ns
External powering requirements:	
high voltage supply	0 – 4.0 kV, 9 mA max ²⁾
low voltage DC supply	9 – 24 V, 500 mA max ²⁾
Operating temperature	0 – 35 °C ³⁾
Size	104 × 52 × 25 mm

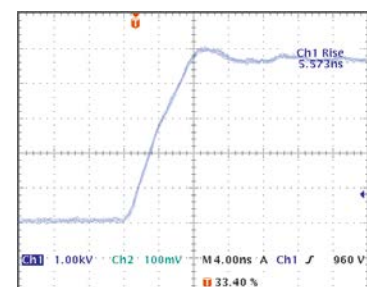
¹⁾ Typical value.

²⁾ Test conditions: PRR = 100 kHz, C = 6 pF, U = 4 kV.

³⁾ Heatsink temperature should be below 35 °C at 100 kHz pulse repetition rate.



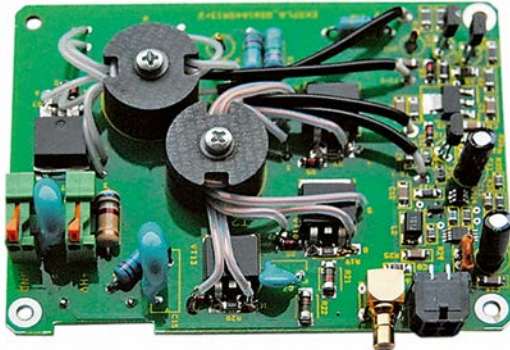
Oscillogram of DQ-100-4 driver operation



Fast edge of HV pulse in detail

DQF

POCKELS CELLS DRIVER FOR Q-SWITCHING OF FLASHLAMP PUMPED LASERS



External view of DQF-0.2-5 driver



External view of DQF-0.1-8 driver

DQF drivers are designed for Q-switching of nanosecond lasers without use of phase retardation plate. High voltage is applied to Pockels cell in order to inhibit oscillation. Pockels cell is opened by negative polarity pulse allowing laser to radiate.

Driver DQF-0.1-8D is integrated with ± 4 kV HV power supply. High voltage can be controlled either by onboard trimmer potentiometer or by using CAN interface. We suggest CAN-USB converter with CAN browser software for Windows® operating system. CAN browser can be kept disconnected after proper voltage value is set.

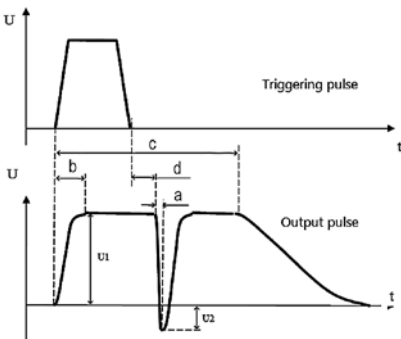


Fig. 1. Time diagram of DQF driver

SPECIFICATIONS

CATALOGUE NUMBER	DQF-0.2-5D	DQF-0.1-8D
Maximum high voltage to cell (HV) pulse amplitude (U1 + U2)	5 kV	8 kV
U1 value (Fig. 1)	equal to HV powering voltage	
U2 value (Fig. 1)	equal to 0.25xU1	
HV pulse fall time (a)	< 15 ns	< 12 ns
HV pulse rise time, typical (b)	60 μ s	120 μ s
HV pulse duration, typical (c)	300 μ s (1200 μ s optionally)	650 μ s
HV pulse repetition rate	\leq 250 Hz	\leq 100 Hz
HV pulse delay (d)	40 ns	25 ns
External triggering pulse duration	100 – 1200 μ s	120 – 650 μ s
External triggering pulse amplitude	3 – 5 V (50 Ω)	3.5 – 5 V (50 Ω)
External triggering pulse rise & fall time	< 20 ns	
Board dimensions ¹⁾	92 x 70 x 22 mm	92 x 70 x 27 mm
Mounting holes location for M3 studs	84 x 62 mm	
External powering requirements:		
DC supply	12 – 24 V, max 200 mA	12 V, max 15 mA
HV supply	4 kV, 1 mA	integrated in the driver

¹⁾ Keep safety distance at least 5 mm from any side of board or any component to surrounding conductive parts.

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

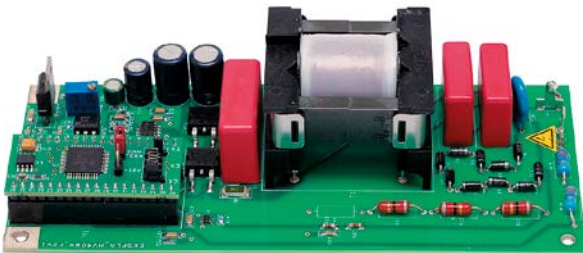
LASER SYNCHRONIZATION MODULES

CRYSTAL OUVENS

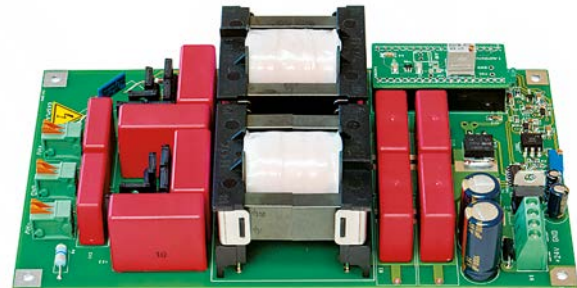
HV Power Supplies

PS

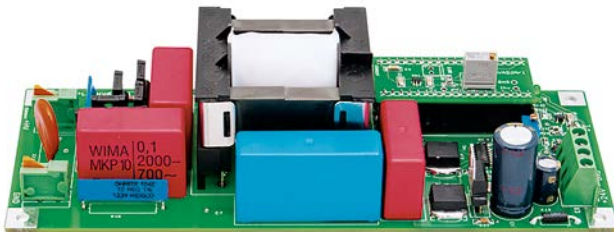
HIGH VOLTAGE POWER SUPPLY



PS-40 power supply



PS-120, PS2-60 power supply



PS-80 power supply

Power supply PS series is designed for powering Pockels cell driver with appropriate power and voltage requirement. Due to its performance and reliable design, PS is good choice for OEM customers. Table below shows general specifications of HV power supplies. Particularly "Maximal output high voltage" row gives reference of maximal achievable voltage for particular model limited by design. For specific driver this limitation is different. E.g. for the driver DPS-1000-1.8 voltage control limits are made from 0.8 kV to 1.8 kV typically.

Power supplies PS-120 and PS2-60 are equipped with overheat protection and LED indicator that stops operation and lights if ambient temperature exceeds 55 °C.

SPECIFICATIONS

CATALOGUE NUMBER	PS-5	PS-40	PS-80	PS-120	PS2-60
Maximal high voltage output options ¹⁾	1.8 kV 2.8 kV 4.0 kV 4.4 kV 5.0 kV	1.3 kV 1.8 kV 2.5 kV 3.6 kV 4.0 kV	1.8 kV 2.6 kV 3.1 kV 3.6 kV 4.0 kV 4.4 kV	1.8 kV 2.6 kV 3.1 kV 3.6 kV	±1.4 kV ±2.0 kV ±2.6 kV ±3.6 kV
Voltage control limits	-1 kV from maximal value				
Maximal output power at maximal output voltage ²⁾	5 W	40 W	80 W	120 W	2×60 W
Output voltage control options ³⁾	CAN interface ⁴⁾ , internal trimmer				
External powering	24 V DC, <15 W	24 V DC, <50 W	24 V DC, <90 W	24 V DC, <150 W	24 V DC, <150 W
Dimensions (L × W × H)	135 × 70 × 30 mm	160 × 70 × 40 mm	175 × 70 × 45 mm	175 × 110 × 45 mm	175 × 110 × 45 mm
Mounting holes Ø3.4 mm location	125 × 35 mm	150 × 60 mm	165 × 60 mm	165 × 100 mm	165 × 100 mm

¹⁾ Matching to Pockels cell driver voltage requirement is necessary by ordering.

²⁾ Maximal power is proportionally lower by tuning to lower HV output.

³⁾ Needs to be indicated by ordering.

⁴⁾ Requires USB-CAN converter for computer control that is sold separately. Voltage control limits from 40% U_{max} to U_{max} .

Output ripple is 0.5% typically at maximal power for all models of HV power supplies. External filter can be used to reduce that value if certain application requires smoother output. All Pockels cell drivers have integrated ripple filter and usually do not require additional one. Contact us for suggestions if your specific application needs lower ripple voltage.

POCKELS
CELLSPOCKELS CELLS
DRIVERSHV POWER
SUPPLIESQ-SWITCHING
KITSULTRAFAST PULSE
PICKING SYSTEMSLASER DIODE
DRIVERSLASER SYNCHRONIZATION
MODULESCRYSTAL
OVENS

HVS100

HIGH VOLTAGE POWER SUPPLY



Front and rear panels of HVS100 power supply

Laboratory type HVS100 series high voltage power supply is especially designed for powering of Pockels cells. However, it can be used as general purpose high voltage power supply for other electronic devices and different applications in the laboratory. HVS100 features two voltage output channels – adjustable high voltage output channel and 24 V DC output channel. Required high voltage value can be set and adjusted in the limits from 40% of maximal specified voltage to maximal specified voltage (40% U_{max} to U_{max}).

HVS100 has 2.4 inch OLED display for high voltage control and current consumption monitoring at the output channel.

SPECIFICATIONS

CATALOGUE NUMBER	HVS100-2x60	HVS100-120	HVS100-5	HVS100-40	HVS100-80	HVS100-150
Maximal high voltage output options	± 1.4 kV ± 2.5 kV	1.8 kV 2.6 kV 3.1 kV 3.6 kV	1.8 kV 2.8 kV 4.0 kV 4.4 kV 5.0 kV	1.3 kV 1.8 kV 2.5 kV 3.6 kV 4.0 kV	1.8 kV 2.6 kV 3.1 kV 3.6 kV 4.0 kV 4.4 kV	1.8 kV 2.6 kV 3.1 kV 3.6 kV 4.0 kV 4.4 kV
HVS100 Maximal output power at maximal output voltage	2x60 W	120 W	5 W	40 W	80 W	150 W
Voltage control limits	40 % U_{max} to U_{max}					
Remaining power at the output of 24 V DC for external needs	55 W	55 W	190 W	150 W	100 W	Not available
Mains voltage / DC supply	90 to 264 V AC, 47-63 Hz					24 V DC
Dimensions (W x L x H)	230 x 245 x 53.5 mm					
Weight	2.5 kg					

Output ripple is 0.5% typically at maximal power for all models of HV power supplies.
Maximal power is proportionally lower by tuning to lower HV output.

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

CRYSTAL OUVENS

Q-Switching Kits

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

CRYSTAL OVENS

QKD

KD*P POCKELS CELL Q-SWITCHING KIT

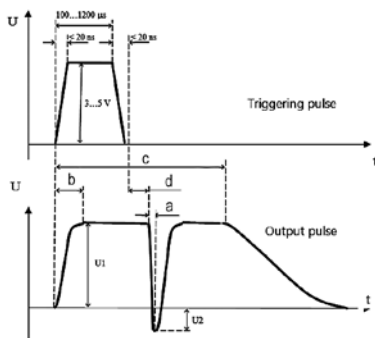
FEATURES

- Pulse repetition rate up to 200 Hz
- Q-switching without retardation plate

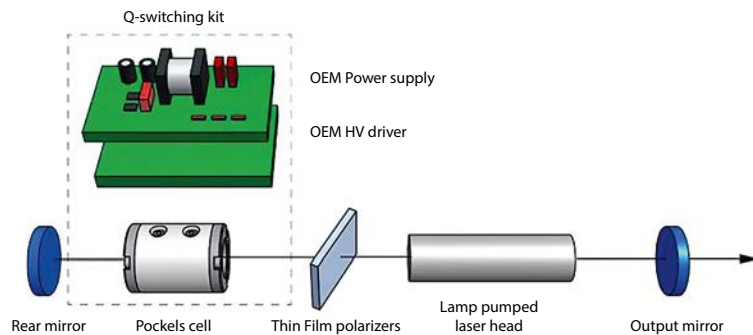
OEM QKD series Pockels cell kits are designed to be used with lamp pumped nanosecond lasers. High voltage is applied to DKDP (KD*P) Pockels cell through DQF Pockels cell driver in order to inhibit oscillation. Pockels cell is opened by negative polarity pulse allowing laser to radiate.

DKDP POCKELS CELLS Q-SWITCHING KIT INCLUDES:

- Low repetition rate Pockels cell driver (see page 18)
- High voltage power supply for Pockels cell driver (see page 19)
- KD*P Pockels cell (see page 5)



Time diagram of DQF Pockels cell driver



Typical Q-switching with DKDP or BBO Pockels cell in $\lambda/4$ scheme

ORDERING INFORMATION

MODEL	QKD-01	QKD-02	QKD-03
Wavelength	1064 nm		
Operation	quarter wave, $\lambda/4$		
Repetition rate	up to 200 Hz		
Clear aperture	4.5 x 4.5 mm	Ø 8 mm	Ø 11 mm

QKB

BBO POCKELS CELL Q-SWITCHING KIT

FEATURES

- Pulse repetition rate up to 100 kHz
- Up to 10 kHz no external cooling is required
- Fast HV rise time <7 ns

OEM QKB series Pockels cell kit is designed for Q-switching of high repetition rate nanosecond lasers and mode locked lasers.

BBO POCKELS CELLS Q-SWITCHING KIT INCLUDES:

- High repetition rate Pockels cell driver (see page 17)
- High voltage power supply for Pockels cell driver (see page 19)
- BBO Pockels cell (see page 7)

ORDERING INFORMATION

MODEL	QKB-01	QKB-02
Wavelength	1064 nm	
Operation	quarter wave, $\lambda/4$	
Repetition rate	up to 100 kHz	
Clear aperture	Ø 2.5 mm	Ø 3.5 mm

Ultrafast Pulse Picking Systems

pMaster 4.2

DIGITAL SYNCHRONIZATION AND DELAY PULSE GENERATOR



pMaster 4.2 is a timing generator with four output channels used for the full control of operation of high voltage Pockels cells drivers which are built-in in UP2 or MP1 pulse picking units. pMaster 4.2 also has built-in high voltage power supplies for Pockels cells drivers powering.

FEATURES

- › Synchronization with pulsed lasers emitting laser pulses at up to 100 MHz repetition rate
- › Control of ultrafast pulse picking units operating at up to 2 MHz repetition rate
- › Single shot, burst or normal operation modes
- › 4 output channels for full control of Pockels cells drivers with 100 picoseconds resolution
- › Touch screen for setting operation parameters and monitoring of HV current
- › Communication via USB port

SPECIFICATIONS of pMaster 4.2 Timing Generator

MODEL		pMaster 4.2
CONTROL MODES		Internal pulse generator, External trigger, External RF source
INTERNAL PULSE GENERATOR	Operation modes	Single shot, burst, normal
	Delay range	1.1 nanoseconds to 140 milliseconds
	Resolution	100 ps
	Accuracy	25 ps + 0.000001 × delay
	Time base	100 MHz, 0.2 ppm
	RMS jitter	< 100 ps
	Channel to channel jitter	< 30 ps
EXTERNAL SYNCHRONIZATION	Synchronization source	External trigger, SYNC IN input
	Rate	1 Hz to 20 MHz
	Min pulse width	10 ns
	Threshold	1.3 V
	Input level	LVTTL, tolerates 5 V
	Impedance	0.2 mA pulldown
EXTERNAL RF SOURCE, CLK IN INPUT	Slope	rising
	Rate	10 MHz to 100 MHz
	Min pulse width	300 ps
	Input level	0.5 V to 3.3 V
OUTPUTS	Impedance	50 Ω
	Output level	4.5 V
COMMUNICATION, POWERING AND PHYSICAL SPECIFICATIONS	Output impedance	50 Ω
	Communication	USB
	Power	230 V AC 50 Hz or 110 V AC 60 Hz
	Dimensions	482 × 387 × 88 mm
	Weight netto (including standard 2 m power cable and 1.5 m HV cable)	~ 6.6 kg

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

CRYSTAL OUVENS

MP1

PULSE PICKER



FEATURES

- Pulse picking rate up to 600 kHz

MP1 pulse picker consists of built-in fast driver and a Pockels cell. This unit is able to select pulses at up to 600 kHz rate. MP1 is operated by pMaster 4.2 generator which provides sync pulses for driver control and

has built-in HV power supply. MP1 can be synchronized with a laser generating pulse train with max 60 MHz repetition rate for single pulse picking task when it is in setup with pMaster 4.2 generator.

MP1 pulse picker comes with BBO or DKDP Pockels cell and it is set for quarter wave voltage operation. On special requests KTP Pockels cell can be installed for half wave voltage operation.

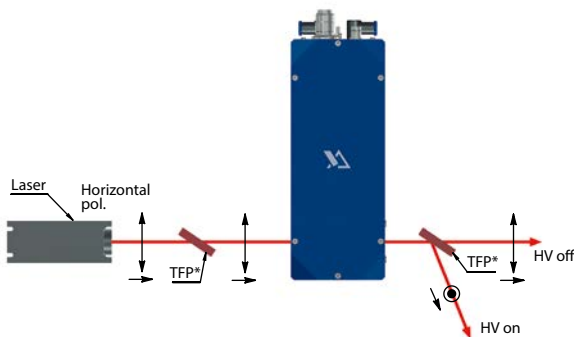
SPECIFICATIONS of MP1 Pulse Picker Units

PULSE PICKER	MP1-DKDP-11	MP1-BBO-5.8	MP1-BBO-3.5
Built-in-driver, max operating rate	up to 5 kHz	up to 250 kHz	up to 600 kHz
Max laser repetition rate for single pulse picking	40 MHz	60 MHz	
HV power supply	provided in pMaster 4.2		
Operation	quarter-wave, $\lambda/4$		
HV pulse duration	30 – 3000 ns	15 – 1250 ns	15 – 400 ns
HV pulse rise time, typical	< 9 ns	< 8 ns	< 7 ns
HV pulse fall time, typical	< 9 ns	< 8 ns	< 7 ns
Pockels cell contrast ratio, VCR	1 : 500		
Pockels cell transmission	> 97 % at 1064 nm	> 98 % at 1064 nm	
Clear aperture	Ø11 mm	Ø5.8 mm	Ø3.5 mm
Cooling	conductive	water	
Dimensions (L x W x H)	230 x 90 x 69 mm		

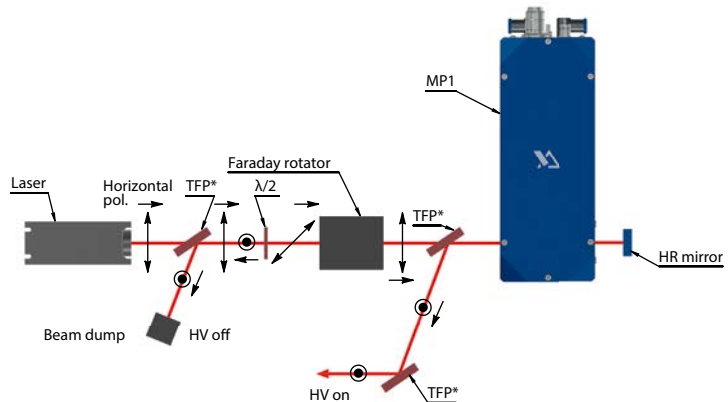
MP1 can be set for operation at standard laser wavelengths (1064 nm, 1030 nm, 800 nm) or at any specific laser wavelength in the range from 500 to 2000 nm.

SUGGESTED OPERATION SCHEMES

Single pass (half-wave) operation scheme



Double pass (quarter-wave) operation scheme



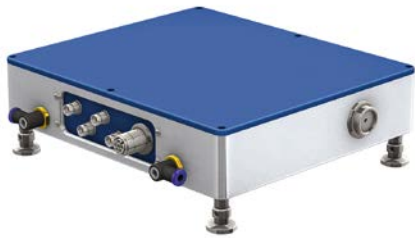
TFP – Thin film polarizer, for instance our standard products: 420-1258UHT, 420-1256UHT or 420-1248UHT

ORDERING INFORMATION

CODE	DESCRIPTION
pMaster 4.2	Pulse synchronization and delay generator, 4 output channels for trigger pulses with built-in High Voltage supply
MP1-DKDP-11	Ultrafast pulse picker for up to 5 kHz operating rate, DKDP clear aperture Ø11 mm, $\lambda/4$ operation at 1064 nm
MP1-BBO-5.8	Ultrafast pulse picker for up to 250 kHz operation, BBO clear aperture Ø5.8 mm, $\lambda/4$ operation at 1064 nm
MP1-BBO-3.5	Ultrafast pulse picker for up to 600 kHz operation, BBO clear aperture Ø3.5 mm, $\lambda/4$ operation at 1064 nm

UP2

ULTRAFAST PULSE PICKER



FEATURES

- Pulse picking rate up to 2 MHz

UP2 pulse picker consists of built-in drivers in full bridge configuration, Pockels cell, high contrast ratio polarizers, beam dump and other optical components necessary for pulse picking application. The UP2 pulse picker in setup with pMaster 4.2 generator is able to select pulses at up to 2 MHz rate from max

100 MHz repetition rate pulse train. UP2 comes with BBO or KTP Pockels cell which are set for quarter wave or half wave voltage operation depending on the laser wavelength and required minimal clear aperture of the Pockels cell.

KTP Pockels cell's usage is limited by the average power of the laser beam – up to 2 W and contrast ratio is typically >1:500. While BBO Pockels cells operate at much higher power levels and feature higher contrast ratio – typically >1:1000.

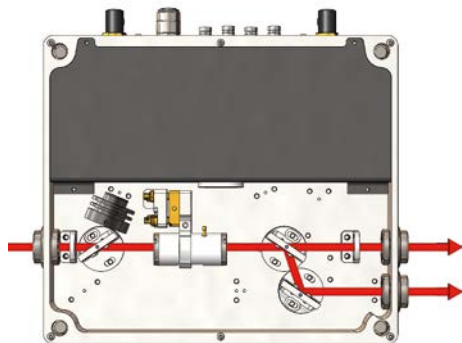
SPECIFICATIONS of UP2 Pulse Picker Units

PULSE PICKER	UP2-BBO-3.5	UP2-BBO-2.5	UP2-PCK-5.5	UP2-PCK-3.5
Built-in-driver, max operating rate	up to 1 MHz	up to 2 MHz	up to 1 MHz	up to 2 MHz
Max laser repetition rate for single pulse picking	100 MHz			
HV power supply	provided in pMaster 4.2			
Operation	quarter-wave, $\lambda/4$		half-wave, $\lambda/2$	
HV pulse duration	0 – 5000 ns			
HV pulse rise time, typical	< 7 ns			
HV pulse fall time, typical	< 7 ns			
Pockels cell contrast ratio, VCR	1 : 500			
Pockels cell transmission	> 98 % at 1064 nm			
Clear aperture	Ø3.5 mm	Ø2.5 mm	Ø5.5 mm	Ø3.5 mm
Cooling	water			
Dimensions (L x W x H)	240 x 275 x 59 mm			

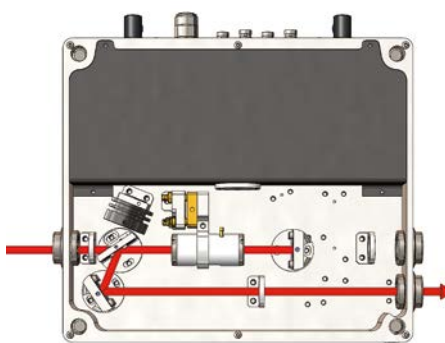
UP2 can be set for operation at standard laser wavelengths (1064 nm, 1030 nm, 800 nm) or at any specific laser wavelength in the range from 500 to 2000 nm.

SUGGESTED OPERATION SCHEMES

Single pass (half-wave) operation scheme



Double pass (quarter-wave) operation scheme



Note. Additional components – Faraday rotator, $\lambda/2$ waveplate and polarizer are required for safe operation of the laser when pulse picker is used in double pass configuration. See suggested scheme at page 28.

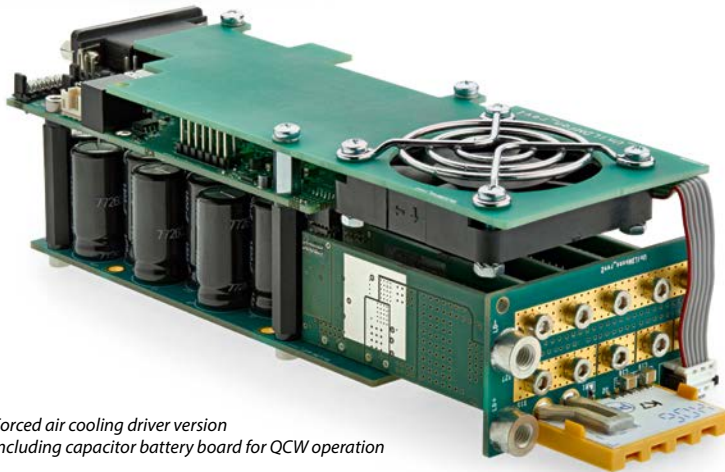
ORDERING INFORMATION

CODE	DESCRIPTION
pMaster 4.2	Pulse synchronization and delay generator, 4 output channels for trigger pulses with built-in High Voltage supply
UP2-BBO-3.5	Ultrafast pulse picker for up to 1 MHz operation, BBO clear aperture Ø3.5 mm, $\lambda/4$ operation at 1064 nm
UP2-BBO-2.5	Ultrafast pulse picker for up to 2 MHz operation, BBO clear aperture Ø2.5 mm, $\lambda/4$ operation at 1064 nm
UP2-KTP-5.5	Ultrafast pulse picker for up to 1 MHz operation, KTP clear aperture Ø5.5 mm, $\lambda/2$ operation at 1064 nm
UP2-KTP-3.5	Ultrafast pulse picker for up to 2 MHz operation, KTP clear aperture Ø3.5 mm, $\lambda/2$ operation at 1064 nm

Laser Diode Drivers

uniLDD

UNIVERSAL LASER DIODE DRIVER



Forced air cooling driver version including capacitor battery board for QCW operation

uniLDD is a DC input power converter designed to supply CW or pulsed current for single emitter, bar, stacked laser diode or high power VCSEL in constant current (CC) mode. It can be installed as a set of assembled PCB boards or as a standalone unit. The

standalone unit consists of uniLDD and a power supply. uniLDD allows bidirectional control (active heating and cooling) of one or two TEC's with the same driver providing current up to 25 A and voltage up to 28 V.

FEATURES

- › Economical OEM module
- › Wide current range
- › Wide diode compliance voltage range
- › Storage capacitor option for pulse mode
- › Storage capacitor charger (current limit) option pulse mode
- › Latest DSP based control technology
- › Frequency response analysis feature allows easy compensation to achieve stable operation with any load and connection cables combination in both CW and QCW modes
- › High efficiency switching mode converter
- › Multi-phase low ripple power stage
- › Board fan and unit fan PWM controllers
- › Low current ripple
- › Low current drift
- › TEC controller option
- › Analog and digital control interfaces
- › Easy configuration

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

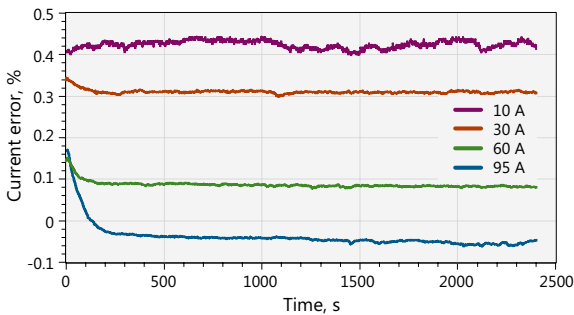
Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

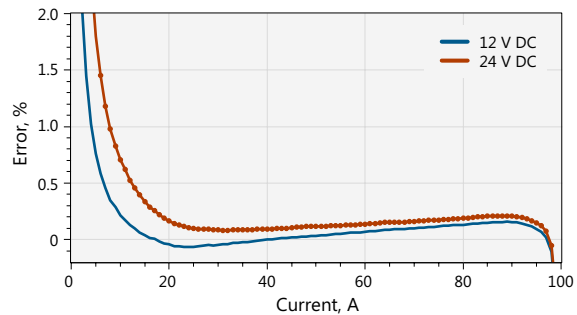
LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

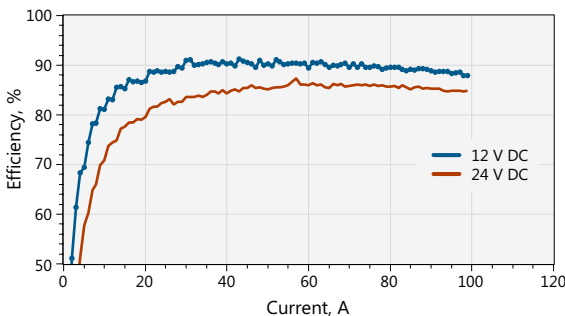
CRYSTAL OVENS



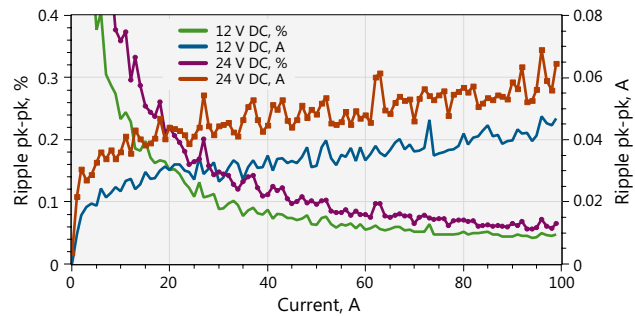
uniLDD current drift. From cold start for different currents



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



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



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

GENERAL SPECIFICATIONS

PARAMETER	VALUE	NOTES
INPUT		
Voltage, power stage	12 ... 90 V DC	Control and power stage may share single supply 12...30 V
Voltage, control stage	12 ... 30 V DC	
OUTPUT, CW mode		
Diode compliance voltage	1 ... 27 V	Up to 95% of power stage supply voltage
Max current	50 – 100 A	See SUGGESTED CONFIGURATION for max current values
Current ripple	0.1 % pk-pk	DC ... 100 kHz bandwidth, in $\times 0.5 \dots \times 1$ 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	See SUGGESTED CONFIGURATION for max current values
Max pulse current	160 – 360 A	
Current pulse raise	< 5 μ s	At minimal connection cable inductance and sufficient power stage voltage
Max RMS current	80 A	80 A for diode compliance voltage >28 V
Current pulse amplitude stability	0.1% pk-pk	In $\times 0.5 \dots \times 1$ of max current range
Current drift	< 0.2 %	Cold start, 8 h period, after 5 min warm up
ENVIRONMENT		
Operating temperature	0 to 40 °C	De-rate current at higher temperature
Cooling	Forced air, installed or external shared fan	Inquire for conduction cooled version
PROTECTIONS		
Current transient protection and shut-down		
Open circuit shut-down		
Power voltage brownout shut-down		
Over temperature shut-down		
Interlock shut-down		
AUXILIARY OUTPUTS		
+5 V @ 200 mA		
+15 V @ 100 mA		
-15 V @ 100 mA		
CONFIGURATIONS		
Operation mode	CW, QCW (pulse)	
Max current, CW mode	50 A, 80 A, 100 A	
Max current, pulse mode	160 A, 360 A	$I_{\text{RMS}} \leq 100$ A, duty factor ≤ 20 %
Max power stage voltage	28 V (CW, QCW) and 90 V (QCW)	
TEC CONTROL (if equipped)		
Quantity of outputs to control	0, 1 or 2	
Maximal output current to TEC	25 A	
Maximal output voltage to TEC	28 V	
PHYSICAL CHARACTERISTICS		
Assembly size (LxWxH)	190 × 68 × 55 mm	15 mm fan included
Conductive cooled assembly size (LxWxH)	117 × 90 × 27 mm	
Connectors	Analog control – DSUB-15	6 pin and 10 pin connectors
	Digital control – Molex Picoflex	
	DC power input – Multiple	
DIGITAL CONTROL INTERFACE		
CAN bus	Proprietary EKSMA Optics protocol	Protocol description, control application, libraries and programming samples are provided on request
	"CAN Open" stack	may be added on request
RS232 port	ASCII text command protocol	
	Proprietary EKSMA Optics CAN messages tunnel over RS232 protocol	Control application, libraries and programming samples are provided

Notes:

- Max current is transient protection upper setting. Laser diode EOL nominal current should be 95% or less of this value.
- Parallel connection of several drivers can be used above 100 A in CW and 400 A in QCW.
- Specifications are subject to change without prior notice. Not all combinations of parameters are possible at the same time. See configuration samples for suggested configurations or send a request with your requirements.

ANALOG INTERFACE PINOUT, 15-PIN D-SUB, FEMALE

PIN	SIGNAL NAME	DIRECTION	VOLTAGE LEVEL	DESCRIPTION
1	Enable	Input	TTL, LVTTTL	The enable function pulls the RTO signal high
2	Ready to Operate (RTO)	Input/Output through 330 Ω resistor	>2.4 V driver output is active, <0.5 V output is clamped	RTO is tied to "High" by the driver when "Enable" input is High. Alarms clamp RTO low and disable driver output. External device may clamp RTO to GND and disable driver output. RTO allows to join fault circuits of several drivers connected in parallel
3	Interlock	Input	10 kΩ pull up to 3.3 V, LOW ≤ 0.4 V	The Interlock function can be connected to external safety or machine protection switches such as door or temperature switches. Open = OFF Connect to GND = RUN
4	GND			
5	V _{out} monitor	Output	V _{out} , driver output voltage	The output voltage monitor. V _{out} = Diode compliance voltage + voltage drop on connection wires
6	I _{out} monitor	Output	0 – 12 V * = 0 – I _{out} max	The output current monitor
7	I _{program}	Input	0 – 9 V * = 0 – I _{out} max	Output current setting or modulating by applying a voltage, CW and Pulse mode
8	Pulse control	Input	TTL, LVTTTL positive pulse	Trigger input for pulse mode. Pulse rise will trigger current pulse of preset width
9	GND			
15	GND			
10, 11	+5V	Output	+5V	Auxiliary, 200 mA
12	-15V	Output	-15V	Auxiliary, 100 mA
13, 14	+15V	Output	+15V	Auxiliary, 200 mA

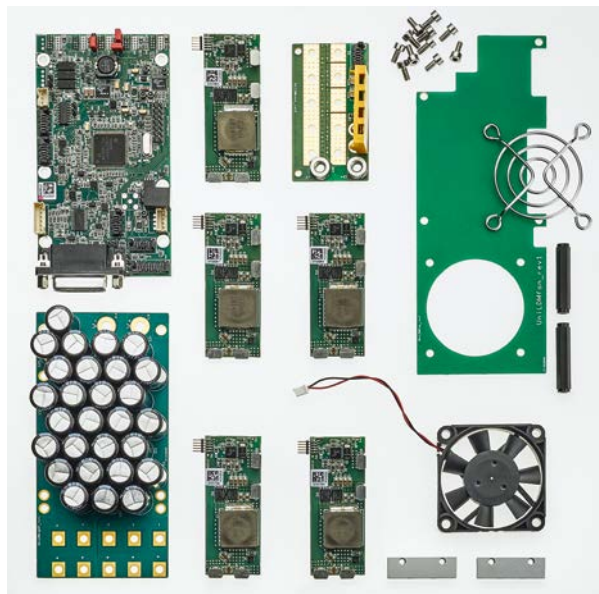
* Subject to change.

SUGGESTED uniLDD DRIVER CONFIGURATIONS

MODEL	OPERATION MODE	TEC CONTROL CHANNELS	DIODE COMPLIANCE VOLTAGE	OUTPUT CURRENT	REPETITION RATE	PULSE DURATION	COOLING
uniLDD-CW-30-50	CW	-	27 V	50 A	-	-	Forced air
uniLDD-CW-30-80	CW		27 V	80 A			
uniLDD-CW-30-100	CW		27 V	100 A			
uniLDD-CW-60-50	CW		35 V	40 A			
uniLDD-CW-TEC-30-50	CW	1	27 V	50 A			
uniLDD-QCW-2TEC-30-160	QCW	2	25 V	160 A	10 Hz	<300 μs	
uniLDD-QCW-2TEC-100-160	QCW	2	80 V	160 A	10 Hz	<300 μs	
uniLDD-QCW-100-360	QCW	-	80 V	300 A	15 Hz	<500 μs	
uniLDD-CW-QCW-30-80 *	CW, QCW		25 V	80 A	10 Hz	<250 ms	
uniLDD-C-CW-30-50 **	CW		27 V	50 A			
uniLDD-C-CW-30-80 **	CW		27 V	80 A			

* External capacitor required for QCW operation. Consult us for details.

** TEC controller and QCW mode operation are possible as an option.



Modular design. Required features and specifications are achieved by combining different boards to one module

Laser Synchronization Modules

SY4000

SYNCHRONIZATION MODULE AND PULSE DELAY GENERATOR



SY4000 Synchronization module and pulse delay generator encased

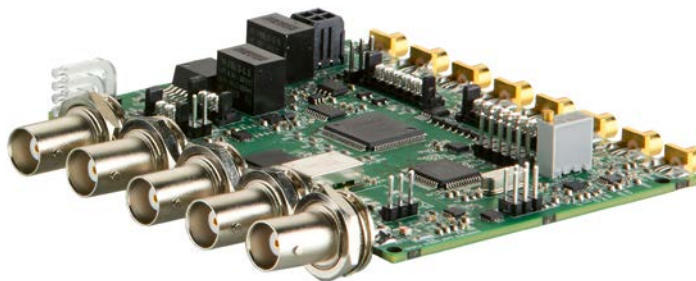
FEATURES

- > 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

Pulse synchronization module with delay generator is designed to create up to 8 delayed output pulse sequences precisely synchronized to internal or external clock. 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, EKSMA Optics recommends using SY4000 to create sets of pulses to control DPD/DPS series Pockels cell drivers with one, two or 4 triggering inputs.

ENCASED VERSION

Preserves all specifications as SY4000 and 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.



OEM version of SY4000 Synchronization module and pulse delay generator

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

CRYSTAL OUVENS

SPECIFICATIONS

MODEL		SY4000
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 ns
	Resolution	25 ps
	Accuracy	25 ps + 0.000001 × delay
	Time base	100 MHz, 0.2 ppm
	Burst mode	1 to 65535
EXTERNAL TRIGGER	Rate	DC to 20 MHz
	Thershold	1.3 V
	Input level	LVTTTL, 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
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

POCKELS CELLS

POCKELS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

CRYSTAL OVENS

Crystal Ovens

Many of widely used nonlinear crystals are susceptible to ambient humidity, for example KD*P, BBO, LBO. Protective coatings applied to the surface can reduce degradation to some extent only. To improve the protection of surfaces of the crystals from the degradation

it is desirable to keep the crystals at higher than ambient temperature, which helps avoid condensation on the crystal surfaces.

In addition, if the crystal is used for harmonics generation, the phase-matching angle depends on crystal temperature. For example,

the output power of second harmonics generator based on KD*P crystal can decrease by 50 % if the crystal temperature changes just by one degree, hence for good laser stability precise crystal temperature stabilization is necessary.

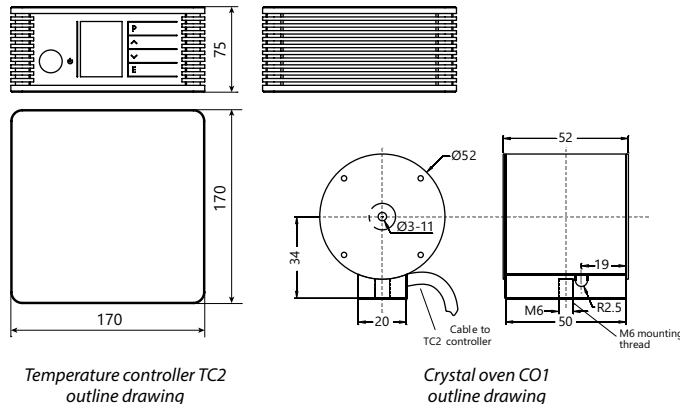
TC2 · CO1

TEMPERATURE CONTROLLER TC2 WITH OVEN CO1



TC2 and CO1 is high temperature set (up to 200 °C) consisting of thermocontroller TC2 and crystal oven CO1. TC2 has two independent outputs and can control two CO1-30 ovens simultaneously. Controller is equipped by LAN and USB computer control interfaces.

The nonlinear crystal is mounted into adapter before insertion into oven CO1. Such design facilitates handling and replacement of the crystal. The nonlinear 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 and up to 12×12 mm size. Oven is delivered with one, customer's specific size of adapter. Adapters for different sizes can be ordered separately.



Temperature controller TC2 outline drawing

Crystal oven CO1 outline drawing

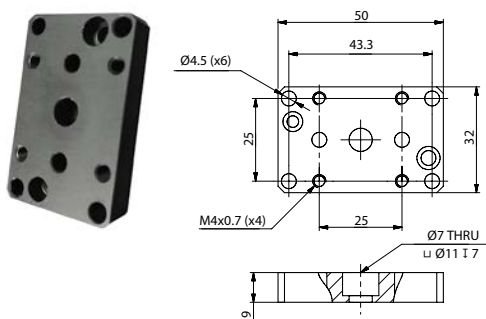
SPECIFICATIONS

MODEL	TC2 + CO1-30	TC2 + CO1-50
Quantity of ovens possible to connect to one controller TC2	2	
Temperature tuning range	RT – 200 °C	
Maximum crystals dimensions	12×12×30 mm	12×12×50 mm
Sealing (optional)	FS windows	
Temperature tuning step	0.05 °C	
Accuracy	± 0.5 °C	
Long-term stability	± 0.05 °C	
Control interfaces	LAN, USB	
Mains	90–264 V, 47–66 Hz	
Power consumption	< 50 W	
Dimensions, Dia×D	Ø52×52 mm	Ø52×72 mm

Specifications are subject to changes without advance notice.

RELATED PRODUCTS

Adapter MS-4 for CO1 mounting on tilt stage



ORDERING INFORMATION

CODE **	DESCRIPTION, FEATURES	
TC2	Temperature controller, RT-200 °C, Fuzzy logic can control two CO1 ovens, long-term stability ±0.05 °K	
For crystal length up to 30 mm	For crystal length up to 50 mm	
CO1-30-y/y	CO1-50-y/y	Standard crystal sizes *
CO1-30-y/z	CO1-50-y/z	Custom crystal sizes
CO1-30S-y/y	CO1-50S-y/y	Sealed, standard crystal sizes *
MS-4	Optional adapter for CO1 oven mounting on a tilt stage. Tilt stage should be ordered separately	

* Sizes 3×3, 4×4, 5×5, 6×6, 12×12 are standard. ** y/y, y/z – crystal size.

HEATPOINT

ROUND OVEN FOR NONLINEAR CRYSTALS



Heatpoint Crystal oven

Heatpoint is a compact round oven designed for heating of humidity sensitive nonlinear crystals. It is used to prevent moisture condensation on the crystal faces or for thermo-stabilization of the crystals.

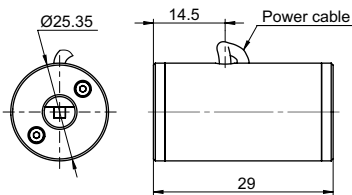
The oven features precise long term stability and compact design. Heatpoint is designed to be used with common one-inch optics positioning mounts or with our special positioning mount PM1. A small thermocontroller is attached to the oven on a wiring.

Required temperature of the oven is preset in the factory and it can be chosen by the customer in the range between 30 °C and 80 °C. Preset temperature can be adjusted in ± 5 °C range.

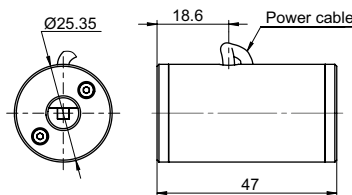
Heatpoint oven has special crystal adapter and fits crystals of size up to 6×6×30 mm. The adapter is made exactly for particular crystal size and it cannot be used for a crystal of a different size.

SPECIFICATIONS

MODEL	HP1	HP2
Maximum crystals dimensions	6 × 6 × 15 mm	6 × 6 × 30 mm
Preset temperature	30 – 80 °C	
Temperature tuning range near preset	± 5 °C	
Long-term stability	± 0.15 at 30-50 °C ± 0.2 at 50-80 °C	
Powering requirements	12 – 16 V	
Power consumption (P _{MAX})	5.5 W	
Sensor type	PTC thermo resistor	
Output connector	2.5 mm mono plug	
Thermocontroller size	18 × 12 × 42.5 mm	
Distance (wiring length) from oven to thermocontroller	180 mm	
Oven dimension, dia × L	Ø25.4 × 29 mm	Ø25.4 × 47 mm



HP1 dimensions



HP2 dimensions

MOUNT SPECIFICATIONS

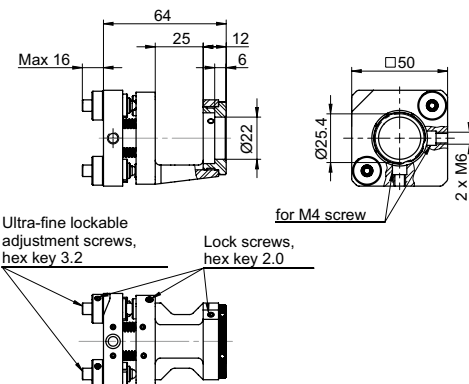
MODEL	PM1
Adjusting angles, tilt and tip	$\pm 3.5^\circ$
Rotation along Z-axis	180°

ORDERING INFORMATION

CODE	DESCRIPTION
HP1	Heatpoint oven (Ø25.4 × 29 mm) with attached thermocontroller
HP2	Heatpoint oven (Ø25.4 × 47 mm) with attached thermocontroller
PM1	Positioning mount for Heatpoint ovens



Heatpoint Crystal oven with PM1 holder



POCKETS CELLS

POCKETS CELLS DRIVERS

HV POWER SUPPLIES

Q-SWITCHING KITS

ULTRAFAST PULSE PICKING SYSTEMS

LASER DIODE DRIVERS

LASER SYNCHRONIZATION MODULES

CRYSTAL OVENS

CH8

OVEN FOR NONLINEAR CRYSTALS



CH8 is compact oven with built-in thermocontroller for nonlinear crystals to keep them at stabilized temperature in range 30...80 °C. It is ideal for larger aperture crystals like KD*P. The crystals with up to 15 x 15 mm dimensions can be mounted. Each oven is made exactly for specific

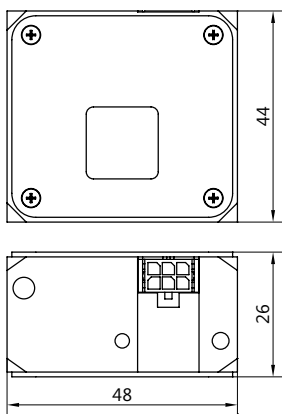
crystal aperture size, so it cannot be used for different size crystals.

CH8 crystal oven can be used with temperature preset at the factory or customer has the possibility to adjust temperature in the range 30 – 80 °C via CAN interface. Our CAN-USB converter is required in this case and it is sold separately.

SPECIFICATIONS

MODEL	CH8-20	CH8-30	CH8-50
Temperature range	30 – 80 °C		
Maximum crystals dimensions	15x15x20 mm	15x15x30 mm	15x15x50 mm
Temperature stability	better than ± 0.05 °C		
Power consumption	<6 W	<6 W	<9 W
Control interface	CAN		
Crystal center position above pad	16 mm		
Dimensions, WxHxD	48x44x26 mm	48x44x36 mm	48x44x56 mm

Specifications are subject to changes without advance notice.



CH8 dimensions

ORDERING INFORMATION

CODE **	DESCRIPTION, FEATURES
CH8-20 – crystal length up to 20 mm	
CH8-20-y/y	Standard crystal sizes *
CH8-20-y/z	Non-standard crystal size
CH8-30 – crystal length up to 30 mm	
CH8-30-y/y	Standard crystal sizes *
CH8-30-y/z	Non-standard crystal size
CH8-50 – crystal length up to 50 mm	
CH8-50-y/y	Standard crystal sizes *
CH8-50-y/z	Non-standard crystal size

MOUNTING ACCESSORIES

MS-1	Two axis tilt adjustment 5 degrees range, suitable for all types of CH8 crystal ovens
MS-2	Two axis tilt stage, adjustment in 5 degree range, fits two pc. of CH8 ovens

POWER SUPPLY

PS-12	Power supply for CH8 crystal oven, 100 – 240 VAC mains, +12 VDC output
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OPTIONAL EQUIPMENT

CAN-USB	CAN-USB converter for adjustment of temperature at 30 – 80 °C range
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* Sizes 3x3, 4x4, ..., 15x15 are standard.

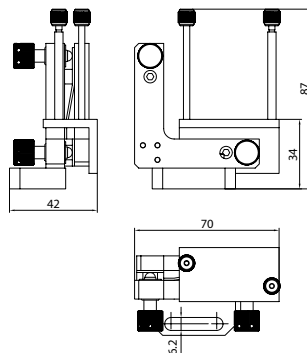
** y/y, y/z – crystal size.

RELATED PRODUCTS

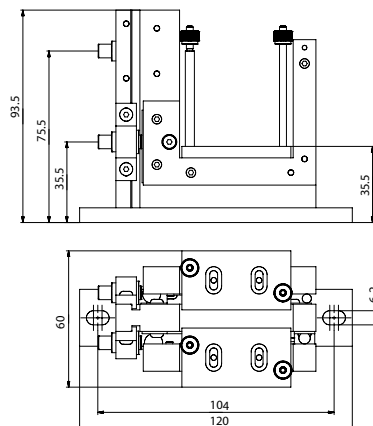
Mounts for fine tuning of CH8 crystal ovens angle. The tuning range is ± 2.5°.



Mount MS-1



Mount MS-1 outline drawing



Mount MS-2 outline drawing

POCKELS CELLS

POCKELS CELLS DRIVERS

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CRYSTAL OVENS

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