Eksma Optics

Electro-optics & Laser Electronics

Pockels cells & drivers
Pulse picking systems
Timing generators
HV power supplies
Crystal ovens

Eksma Optics

EKSMA Optics is a manufacturer of precision laser components, used in high power lasers, laser systems and various other photonic devices and optical instruments. Rooted in laser community and with more than 40 years of experience in lasers and photonic components EKSMA Optics is your partner for enabling photonics innovations, offering fast delivery components tailored to customer applications.

This optical components catalog contains products dedicated to lasers and laser systems manufacturers, integrators, innovators, and scientists. The standard catalog components are available for fast off-the-shelf delivery. We also develop and customize our optical components tailoring the parameters of the particular laser and its applications.

All components provided by EKSMA Optics are subject to performance and 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 & ISO 14001:2015 certified company.

Your Partner in Photonics Innovations!

2022

Establishment of a department for **optical systems assembling.**

2021

Opening and moving to **new** 7300 square meters EKSMA Optics **building** in Vilnius.

2015

Establishment of a CNC-based **spherical and aspherical** lens production.
Commenced production of **pulse picking systems.**

2014

Establishment of a department **dielectric coatings deposition** on **laser optics** and **crystals**.

2010

Commenced production of **Pockels cells** and **Femtokits**.

2007

Investment into and expansion of flat **optics production** and **nonlinear crystals polishing**.

2006

Establishment of EKSMA's daughter company, **EKSMA Optics,** for laser optics business activities.

1992

State-owned company privatization and **EKSMA UAB** joint-stock company establishment.

1987

First-time participation at Munich Laser Fair. **EKSMA shows picosecond Nd:YAG laser.**

1983

Establishment of experimental optics and opto-mechanics company **EKSMA,** a spin-off from the Physics Institute.

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Ordering information

Prices

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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 "Get Official Quotation". Our sales team will contact you soon and provide the estimated delivery time for the shopping cart.

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Ordering

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Company details

EKSMA Optics, UAB
Dvarčionių st. 2B, LT-10233, Lithuania
VAT No.: LT100002802516
Tel: +370 5 272 99 00; Fax: +370 5 272 92 99
info@eksmaoptics.com; www.eksmaoptics.com

Payment Options

Standard payment is by wire transfer. We also accept payments by major credit cards using PayPal or SEB Bank money transfer systems.

Wire transfer details

Account number (IBAN)	LT16 7044 0600 0577 4220
Bank name	AB SEB Bankas
Bank address	Konstitucijos ave. 24, LT-08105 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.

Electro-optics
Laser electronics

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Eksma Optics

Pockels cells

Pockels cell is an electro-optical modulator for polarization control of the laser beam. The key element of the Pockels cell is an electro-optical crystal, which produces or changes birefringence, when high voltage is applied to it. Induced birefringence or refractive index modification in the material by the 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.

RTP POCKELS CELL – PCR

Features

- Lower operating voltage required compared to other types of Pockels cells
- Operates at high duty cycles
- Very low piezo-electric resonances
- Standard apertures: 4×4 and 6×6 mm
- Thermally compensated double-crystal configuration

PCR series Pockels cells developed at EKSMA Optics are based on specially grown high resistivity RTP crystals. The outstanding feature is possibility to operate RTP Pockels cells at high duty cycles or even to keep at high voltage for longer.

RTP Pockels cells can be supplied in standard one inch housing or in open-type OEM mount when small footprint is required.

PCR4

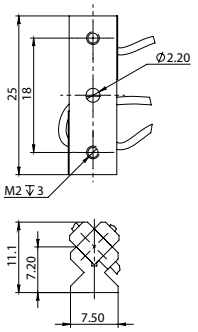
Applications

- Q-switching for high repetition rate lasers 1 kHz – 6 MHz
- Pulse picking of high repetition rate lasers

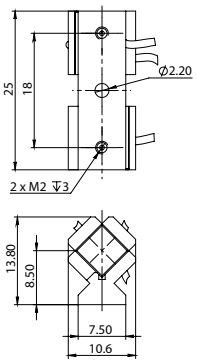
Specifications

Model	PCR4	PCR4-O	PCR6	PCR6-O
Clear aperture, mm	Ø3.5		Ø5.5	
Quantity of crystals	2			
Half-wave voltage (@ 1064 nm), kV DC	< 1.8		< 2.8	
Capacitance, pF (typical)	4		< 6	
Optical transmission	> 98 % at 1064 nm			
LIDT of AR coatings	> 1 GW/cm² (10 J/cm²), 1064 nm, 10 Hz, 10 ns			
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

Specifications are subject to change without advance notice.



PCR4-O drawing



PCR6-O drawing

PCR4-O / PCR6-O

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Eksma Optics

KD*P POCKELS CELLS – PC / D-compact / D-mini

Features

- Low absorption and high deuteration material
- High damage threshold dielectric AR coatings for requested wavelengths
- Operating voltage does not depend on crystal aperture, so large apertures are available
- Suitable for fs applications due to low GVD
- Single-crystal based three terminal design available upon request

KD*P (DKDP) crystals are the standard choice for Pockels cell Q-switching, operating across 400–1100 nm. Compatible with flashlamp-pumped Nd:YAG, Ruby, and low-rep-rate DPSS lasers (Nd:YAG, Nd:KGW, Nd:YLF, Nd:Glass).

EKSMA Optics DKDP crystals feature high-LIDT dielectric AR coatings (>10 J/cm², 10 ns, 10 Hz, 1064 nm) with long coating lifetime and reliable pulsed-laser performance.

PC12SR, PC20SR, D-Compact, D-Mini, and three-terminal models include AR-coated protective windows (flat, wedged, or beam-shift-compensating) to suppress etalon effects.

PC5S, PC5D, and PC10S rectangular cells ship without windows for use in hermetically sealed lasers.

Three-terminal single-crystal cells are optimised for bipolar HV drivers (GND center, ±HV on sides).

A full range of matching HV drivers and power supplies is available – see the following catalogue chapter.

Applications

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

PC12SR

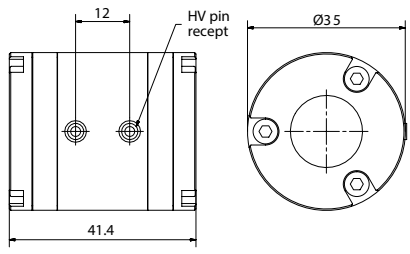
PC14x45SR

PC5S

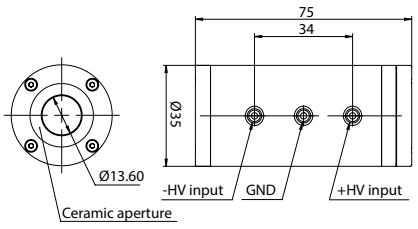
Specifications

Model	PC20SR	PC14x45SR	PC12SR	D-compact/12	D-compact/9	D-mini/9	D-mini/8	PC10S	PC5S21
Clear aperture, mm	Ø 18	Ø 13	Ø 11		Ø 8		Ø 7	9.5 × 9.5	4.5 × 4.5
Quantity of crystals	1								
λ/4 @ 1064 nm voltage, kV DC	< 3.4	< ±1.7	< 3.4						
Capacitance, pF (typical)	< 10		6				3	4	1.5
Optical transmission	> 97 % at 1064 nm								
LIDT of AR coatings	> 1 GW/cm² (10 J/cm²), 1064 nm, 10 Hz, 10 ns								
Contrast ratio	> 1:2000								
Cell size, mm	Ø35×51	Ø35×75	Ø35×41.4	Ø25.4×39	Ø25.4×35	Ø19×25.4	Ø19×19	22×18×33	18×14×25

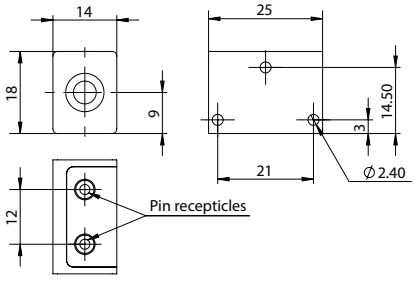
Specifications are subject to change without advance notice.



PC12SR drawing



PC14x45SR drawing



PC5S21 drawing

BBO POCKELS CELLS – PCB

Features

- Minimal piezoelectric ringing
- Very low absorption and suitability for high power laser applications
- Reliable design for operation up to 3 MHz HV pulse repetition rate
- Broad transmission rate from 200 to 2000 nm
- Pockels cell with active cooling available upon request

BBO Pockels cells are transverse field devices. Low electro-optical coefficient of BBO results in higher operating voltages. The operating voltage is proportional to the ratio of electrode spacing and crystal length. Double crystal design is employed to reduce required voltages and to allow operation in half-wave mode with fast switching times.

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.

Quatro BBO Pockels cell employs quadruple crystal design with an independent control of two sides, meaning this Pockels cell can be controlled by two synchronized sets of Pockels cell drivers enabling advanced polarization control.

Applications

- High repetition rate Q-switching
- Pulse picking at up to 3 MHz rate
- Laser cavity dumping
- Pulses coupling into and from regenerative amplifier

PCB4D

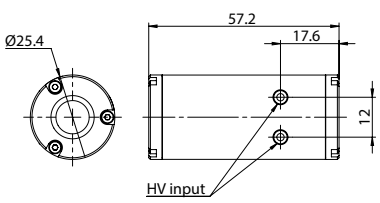
PCB6.3D

BBO Pockels cell with active cooling

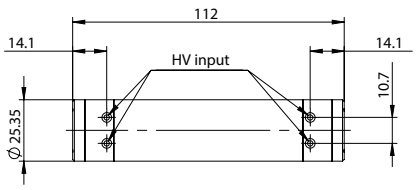
Specifications

Model	PCB3S	PCB3D	PCB4S	PCB4D	PCB6.3S	PCB6.3D	PCB4Q
Clear aperture diameter, mm	2.5		3.5		5.8		3.5
Quantity of crystals	1	2	1	2	1	2	4
λ/4 voltage (@ 1064 nm), kV DC	< 3.5	< 1.8	< 4.6	< 2.3	< 7.5	< 3.8	2 × < 1.3
Capacitance, pF (typical)	4	6	3	6	6	< 8	2 × < 6
Optical transmission	> 98 % at 1064 nm						
LIDT of AR coatings	> 1 GW/cm² (10 J/cm²), 1064 nm, 10 Hz, 10 ns						
Contrast ratio	> 1:1000	> 1:500	> 1:1000	> 1:500	> 1:1000	> 1:500	> 1:500
Dimensions, mm	Ø25.4×37.2	Ø25.4×57.2	Ø25.4×37.2	Ø25.4×57.2	Ø25.4×42.2	Ø35×68	Ø25.4×112

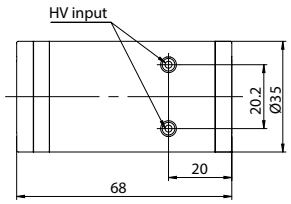
Specifications are subject to changes without advance notice.



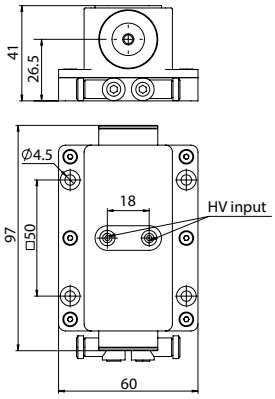
PCB3D, PCB4D drawing



PCB4Q drawing



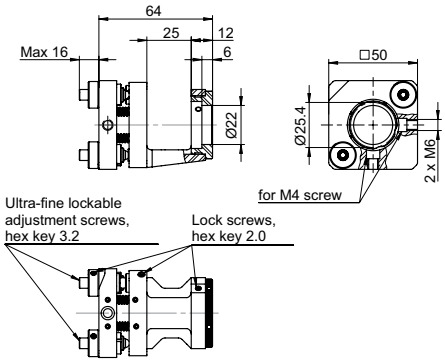
PCB6.3D drawing



Drawing of BBO Pockels cell with active cooling

MOUNTING STAGE FOR POCKELS CELLS OF Ø25.4 mm – PM1

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.

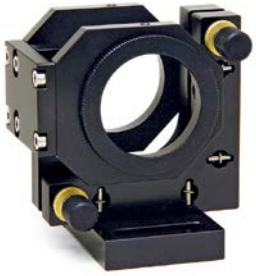


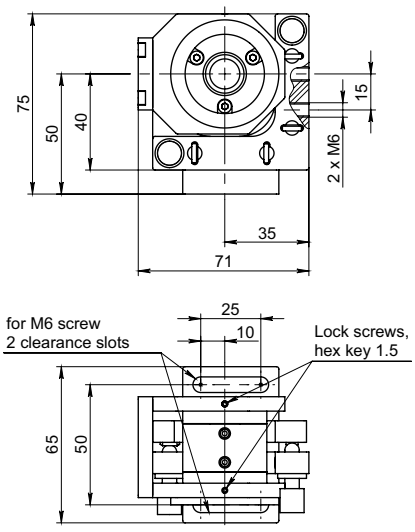
Specifications

Model	PM1
Adjusting angles, tilt and tip, deg	±3.5
Rotation along Z-axis, deg	180
Adjustment screw thread	M6×0.25
Screw sensitivity, µm	0.5

MOUNTING STAGE FOR POCKELS CELLS OF Ø35 mm – HPR-35

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
Adjusting angle along X and Y axis, deg	9
Rotating angle along Z-axis, deg	20
Beam height above breadboard, mm	50
Adjustment screw thread	M6×0.5
Screw sensitivity, µm	1.5

POCKELS CELL AND POCKELS CELL DRIVER SELECTION GUIDE

Suggested Configuration samples. Please contact our sales engineers for a complete solution tailored to your application.

For operation at 515 – 532 nm wavelength

Material	Max repetition rate, kHz	Ø CA, mm	Phase retardation	HV pulse duration	Pockels cell	Driver	HV Power supply
BBO	1000	2.5	λ/4	100 – 5000 ns	PCB3S	DP-1000-1.8-AI	HVS100-80-1.8
BBO	500	3.5			PCB4S	DP-500-2.6-AI	HVS100-120-2.6
DKDP	10	11		30 – 3000 ns	PC12SR or D-compact/12	DPB-10-4.2	PS-5-2.1
KTP / RTP	2000	5.5	λ/2	0 – 5000 ns	PCK6 / PCR6	2DP-2000-1.6-AI	HV-200-1.6 or HVS100-2x120-1.6
BBO	500	3.5	0 – λ/2	70 – 1000 ns	PCB4D	DP-FAM-500-2.5-AI	HVS100-120-2.6
DKDP	5	11	λ/2	30 – 3000 ns	PC12SR or D-compact/12	DPB-5-5.5	PS-5-2.8

For operation at 780 – 800 nm wavelength

Material	Max repetition rate, kHz	Ø CA, mm	Phase retardation	HV pulse duration	Pockels cell	Driver	HV Power supply
BBO	6000	2.5	λ/4	0 – 5000 ns	PCB3D/25	2DPB3-6000-1.3-AI	HV-400-1.5
BBO	1000	5.8		100 – 5000 ns	PCB6.3D	DPB1-1000-3.0-AI	HVS100-2x60-1.6
DKDP	10	11		30 – 3000 ns	PC12SR or D-compact/12	DPB-10-4.2	PS-5-2.1
KTP / RTP	1000	5.5	λ/2	0 – 5000 ns	PCK6 / PCR6	2DP-1000-2.4-AI	HV-200-2.4
KTP / RTP	500	5.5	0 – λ/2	70 – 1000 ns	PCK6 / PCR6	DP-FAM-500-2.5-AI	HVS100-120-2.6
DKDP	3	11	λ/2	35 – 2000 ns	PC12SR or D-compact/12	DPB-3-8.6	PS-5-4.4

For operation at 1030 – 1064 nm wavelength

Material	Max repetition rate, kHz	Ø CA, mm	Phase retardation	HV pulse duration	Pockels cell	Driver	HV Power supply
KTP / RTP	4000	5.5	λ/4	0 – 5000 ns	PCK6 / PCR6	2DPB3-4000-1.7-AI	HV-400-2.0
BBO	600	3.5		15 – 400 ns	PCB4D	DP-SP-500-2.6-AI	HVS100-120-2.6
DKDP	5	11		30 – 3000 ns	PC12SR-1/1, D-compact/12	DPB-5-5.5	PS-5-2.8
KTP / RTP	1000	5.5	λ/2	100 – 5000 ns	PCK6 / PCR6	DPB1-1000-3.0-AI	HVS100-2x60-1.4
BBO	300	3.5			PCB4D	DPB1-300-4.6-AI	HVS100-2x60-2.6
DKDP	2.5	11		35 – 2000 ns	PC12SR-1/1, D-compact/12	DPB-2.5-9.8	PS-5-5.0

For operation at 1550 – 1560 nm wavelength

Material	Max repetition rate, kHz	Ø CA, mm	Phase retardation	HV pulse duration	Pockels cell	Driver	HV Power supply
BBO	1000	3.5	λ/4	100 – 5000 ns	PCB4D	DPB2-1000-3.8-AI	HV-2x200-2.0 or HVS100-4x60-2.0
KTP / RTP	500	5.5			PCK6 / PCR6	DP-500-2.6-AI	HVS100-120-2.6
BBO	250	3.5			PCB4D	DP-250-3.6-AI	HVS100-80-3.6
KTP / RTP	2500	3.5	λ/2	100 – 5000 ns	PCK4 / PCR4	DPB3-2500-3.1-AI	HV-2x200-2.0
BBO	300	2.5			PCB3D/25	DPB1-300-4.6-AI	HVS100-2x60-2.6

All combinations of Pockels cell, driver and HV power supply can be integrated into a single pulse-picking system UP2 or MP1.

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Pockels cells drivers

OEM version of DP-SP series Pockels cell driver

Encased version of DPB2 series Pockels cell driver

CAVITY DUMPING & PULSE PICKING POCKELS CELL DRIVERS – DP / DPB / DP-SP

Features

- HV rise/fall time down to 6 ns
- HV pulse amplitude up to 9.8 kV
- Pulse repetition rate up to 6 MHz
- Output pulse jitter <60 ps if trigger pulse rise time <0.5 ns

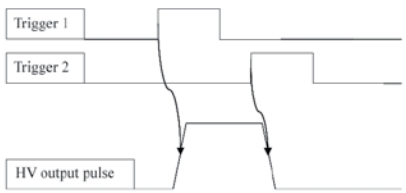


Fig. 1. Control timing charts using two pulses trigger control

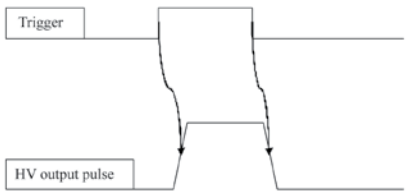


Fig. 2. Control timing charts using single pulse trigger control

Pockels cell drivers are designed for a 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 output voltage.

Pockels cell drivers 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.

DP/DPBx series Pockels cell drivers operate safely with HV pulse duration from 100 ns to 5 µs. 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 µs. However, pulse regeneration technique does not work with short pulse drivers.

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. Drivers have switchable option to be controlled by one or two trigger pulses.

Pulse regeneration technique

Gives possibility to extend HV pulse duration. Pulse regeneration technique does only work with DP series drivers. Pulse regeneration technique diagram is shown in *Fig. 3*.

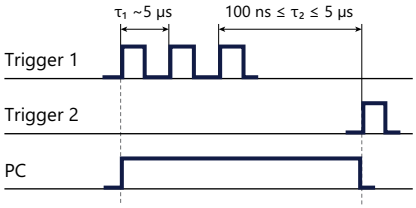
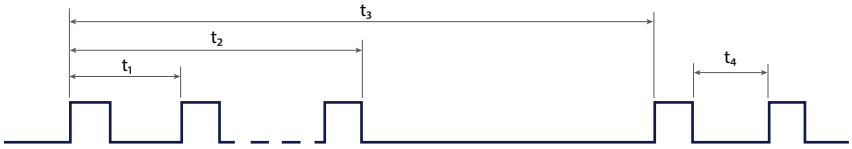


Fig 3. Principle pulse regeneration diagram

Burst mode operation

Certain laser applications, such as laser material processing, optical metrology and others require for relatively short sequence of high repetition rate of pulses with following pause, i.e. burst mode. All the EKSMA Optics Pockels cell drivers series DP/DPBx, DP-SP and DPB can operate up to 3 MHz bursts by reducing duty cycle and preserving below requirements.

Peak power capacity of HV power supply must be increased for burst operation. Contact EKSMA Optics for details and suggestions.



t_1 – pulse repetition period in burst, should be $1/t_1 \leq 3$ MHz.

t_2 – burst duration.

t_3 – burst packet repetition period.

t_4 – minimal pause between two HV pulses, should be ≥ 150 ns for most of the drivers.

Duty cycle is determined as $D = t_2/t_3$, should be $D \leq F * t_1$.

Here F – maximal repetition rate specified for the driver.

General specifications of Pockels cell drivers

Driver series	DP/DPBx	DP-SP	DPB
Minimal HV pulse duration (FWHM)	100 ns	15 ns	30 ns
Maximal HV operation voltage	up to 7.2 kV	up to 3.6 kV	up to 9.8 kV
Maximal HV pulse repetition rate	6 MHz	1 MHz	10 kHz
HV pulse duration extension 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)		
Triggering pulse rise & fall time requirement	≤ 10 ns	≤ 5 ns	≤ 10 ns
Maximal length of leads to Pockels cell	10 cm		
HV pulse delay	25 ns	30 ns	

Specifications are given for Pockels cells with capacity < 6 pF. Not all combinations of parameters are possible at the same time. Specifications are subject to change without advance notice.

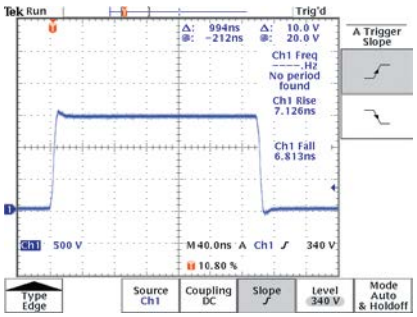


Fig. 5. Typical output pulse shape

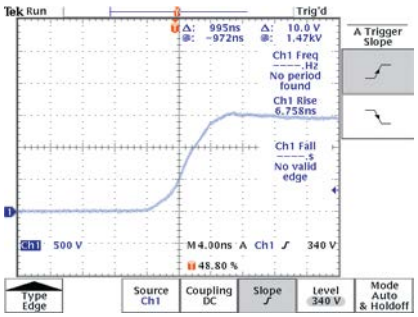


Fig. 6. Typical rising edge of output pulse

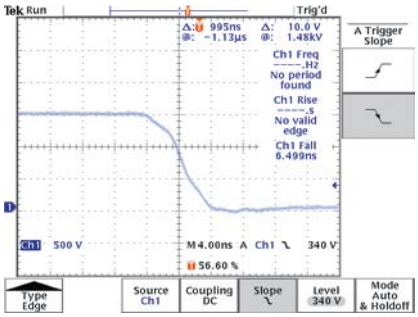


Fig. 7. Typical falling edge of output pulse

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

DP-50-3.6-AI

Model name

Max repetition rate of HV pulse, kHz

Max operating voltage, kV

AI – Encased version
None – OEM version

HIGH VOLTAGE POCKELS CELL DRIVERS – DPB

Features

- HV pulse amplitude up to 9.8 kV
- HV pulse amplitude doubling layout
- Repetition rate up to 10 kHz
- Easy integration with HV power supply
- Easy mounting on optical breadboard

DPB Pockels Cell Driver.
OEM version with HV power supply

HVS-D2 Pockels Cell Driver.
Encased version with HV power supply

Configuration samples

Catalogue number of driver	DPB-10-4.2 HVS-D2-10-4.2	DPB-5-5.5 HVS-D2-5-5.5	DPB-3-8.6 HVS-D2-3-8.6	DPB-2.5-9.8 HVS-D2-2.5-9.8
Maximal HV operation voltage	4.2 kV	5.5 kV	8.6 kV	9.8 kV
Output polarity	bipolar			
HV pulse rise time, typical	6 ns	7 ns	10.5 ns	12 ns
HV pulse fall time, typical	6 ns	7 ns	9.5 ns	10.5 ns
HV pulse duration	30…3000 ns		35…2000 ns	
Maximal HV pulse repetition rate	10 kHz	5 kHz	3 kHz	2.5 kHz
HV pulse delay	30 ns			
Requirement for external triggering pulse amplitude	3.5…5 V (50 Ω load)			
Requirement for external triggering pulse rise time	≤ 10 ns		≤ 5 ns	
Requirement for external triggering pulse duration	See Fig. 8 for control by 1 pulse, see Fig. 9 for control by 2 pulses			
Cooling	Air			

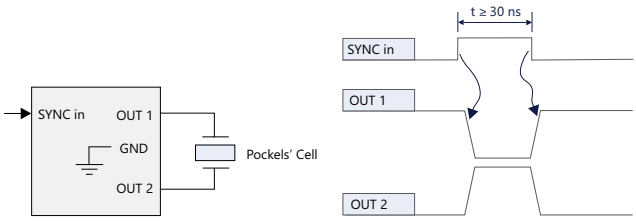


Fig. 8. Diagram of pockels cell connection to driver and timing charts of driver controlled by 1 sync pulse

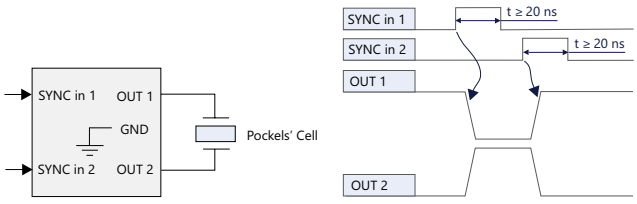


Fig. 9. Diagram of pockels cell connection to driver and timing charts of driver controlled by 2 sync pulses

Specifications of OEM type DPB series Pockels cell driver

Catalogue number of driver	DPB-10-4.2	DPB-5-5.5	DPB-3-8.6	DPB-2.5-9.8
Control	by 1 or 2 external triggering pulses, switchable			
External powering requirements:				
Low voltage DC supply	15 – 25 V, 150 mA (0.5 A inrush current)		24 – 25 V, 150 mA	
HV power supply (not included, should be purchased separately)	2.1 kV, 5 W	2.8 kV, 5W	4.4 kV, 5W	5.0 kV, 5W
Voltage control limits	U_{max} –1 kV to U_{max} (internal trimmer); 40% U_{max} to U_{max} (CAN)			
Output voltage control options	Internal trimmer potentiometer or CAN interface (requires CAN-USB converter)			
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	See Fig. 10		See Fig. 11	

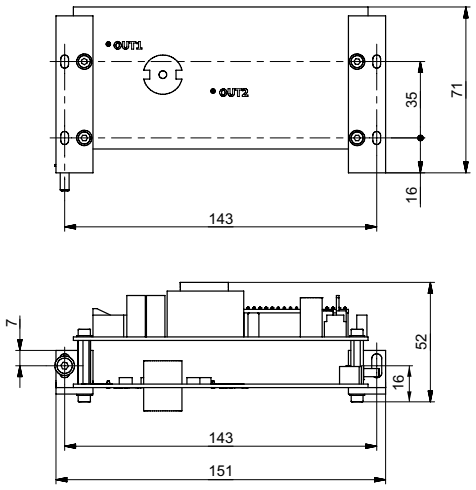


Fig. 10. Outline drawing of OEM version DPB-10 and DPB-5 drivers with PS-5 power supply

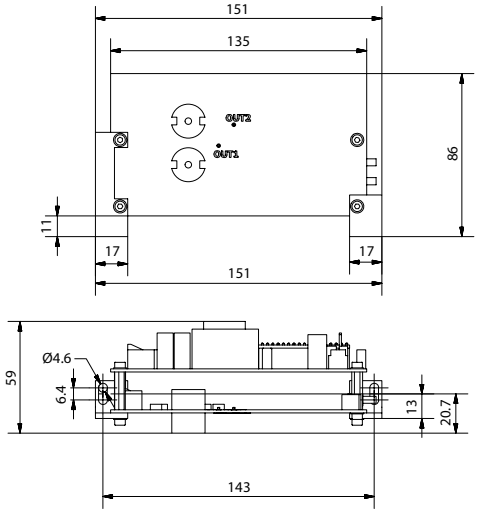


Fig. 11. Outline drawing of OEM version DPB-3 and DPB-2.5 drivers with PS-5 power supply

Specifications of encased type HVS-D2 series Pockels cell driver with HV power supply

Catalogue number of driver	HVS-D2-10-4.2	HVS-D2-5-5.5	HVS-D2-3-8.6	HVS-D2-2.5-9.8
Control	by 1 or 2 external triggering pulses, factory preset			
HV Power supply (integrated)	2.1 kV, 5 W	2.8 kV, 5W	4.4 kV, 5W	5.0 kV, 5W
Voltage control limits	40% U_{max} to U_{max} (CAN)			
Mains voltage	90 to 264 V AC, 47 – 63 Hz			
Dimensions (W × L × H)	80 × 120 × 225 mm (see Fig. 12)			

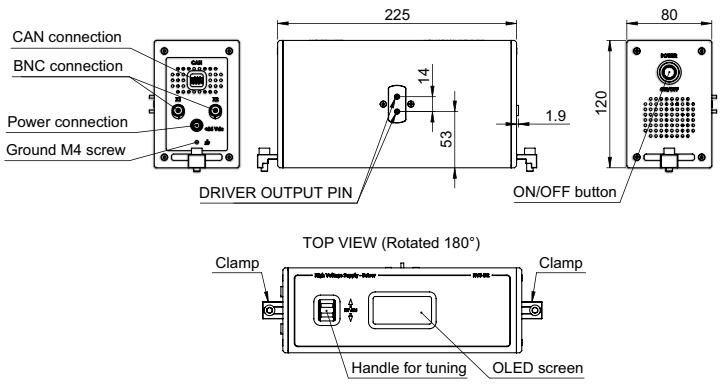


Fig. 12. Outline drawing of encased type HVS-D2 driver with HV power supply

HIGH VOLTAGE POCKELS CELL DRIVERS – **DPBx**

Features

- HV pulse amplitude up to 7.0 kV
- Repetition rate up to 1 MHz
- OEM version available upon request

Encased version of DPB2 series Pockels cell driver

Configuration samples of DPBx series drivers

Catalogue number of driver	DPB1-1000-3.0-AI	DPB1-300-4.6-AI	DPB1-250-5.2-AI	DPB2-1000-3.8-AI	DPB2-250-7.0-AI
Maximal HV operating voltage	3.0 kV	4.6 kV	5.2 kV	3.8 kV	7.0 kV
Maximal HV repetition rate	1000 kHz	300 kHz	250 kHz	1000 kHz	250 kHz
Pulse duration	100 – 5000 ns				
HV pulse rise time, typical	<7.5 ns	<8 ns	<8.5 ns	<6 ns	<9.5 ns
HV pulse fall time, typical	<7.5 ns	<8 ns	<8.5 ns	<6 ns	<9.5 ns
Output polarity	Bipolar				
HV power consumption	<120	<100 W	<100 W	<230 W	<200 W
24 V power consumption	<9 W	<4 W	<3 W	<9 W	<9 W
Recommended HV power supply model	HVS100-2x60			HV-2x200	
Dimensions	See Fig. 13			See Fig. 14	
Cooling	Water				

Driver needs to be mounted on heatsink unless it is cooled by water. Driver's base plate temperature needs to be lower than 35 °C in all regimes of operation. 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.

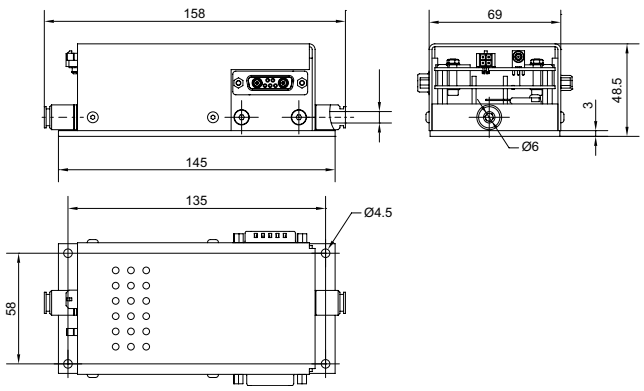


Fig. 13. Outline drawing of encased version DPB1 series Pockels cell drivers

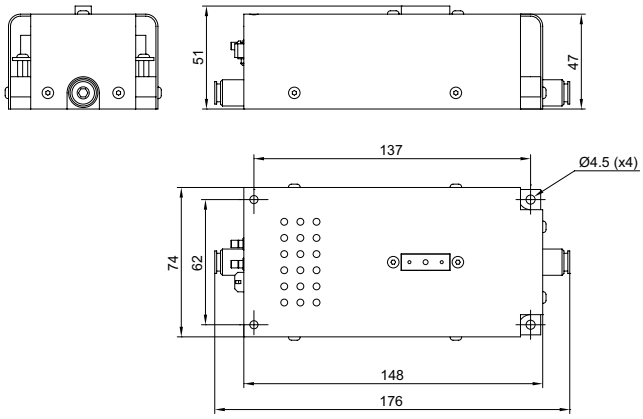


Fig. 14. Outline drawing of encased version DPB2 series Pockels cell drivers

POCKELS CELL DRIVERS – DP

Features

- HV pulse duration extension using pulse regeneration technique
- HV pulse amplitude up to 3.6 kV
- Repetition rate up to 2 MHz
- Alternative aluminum case option featuring conductive cooling possibility and relocated water and HV output connectors
- OEM version available upon request

Standard of DP/DP-SP series Pockels cell driver

Configuration samples of DP series drivers

Catalogue number of driver	DP-50-3.6-AI	DP-250-3.6-AI	DP-500-2.6-AI	DP-1000-1.8-AI	DP-2000-1.5-AI
Maximal HV operating voltage	3.6 kV	3.6 kV	2.6 kV	1.8 kV	1.5 kV
Maximal HV repetition rate	50 kHz	250 kHz	500 kHz	1000 kHz	2000 kHz
Pulse duration	100 – 5000 ns	100 – 3900 ns	100 – 1900 ns	100 – 900 ns	100 – 400 ns
HV pulse rise time, typical	< 7 ns	< 7 ns	< 6.5 ns	< 6 ns	< 7 ns
HV pulse fall time, typical	< 7 ns	< 7 ns	< 6.5 ns	< 6 ns	< 7 ns
Output polarity	Positive				
HV power consumption	< 20 W	< 75 W	< 90 W	< 80 W	< 120 W
24 V power consumption	< 1 W	< 4 W	< 6 W	< 9 W	< 12 W
Recommended HV power supply model	HVS100-40	HVS100-80	HVS100-120	HVS100-80	HVS100-120
Dimensions	Standard - see Fig. 15, alternative – see Fig. 16 [1]				
Cooling	Water [2]				

[1] If alternative aluminum case is required, please add note "option 1" when ordering, for e.g., "Pockels cell driver DP-250-3.6-AI option 1".
[2] Standard aluminum case is suitable for water cooling. Alternative aluminum case (option 1) is suitable for both, conductive and water cooling.
Driver needs to be mounted on heatsink unless it is cooled by water. Driver's base plate temperature needs to be lower than 35 °C in all regimes of operation.
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.

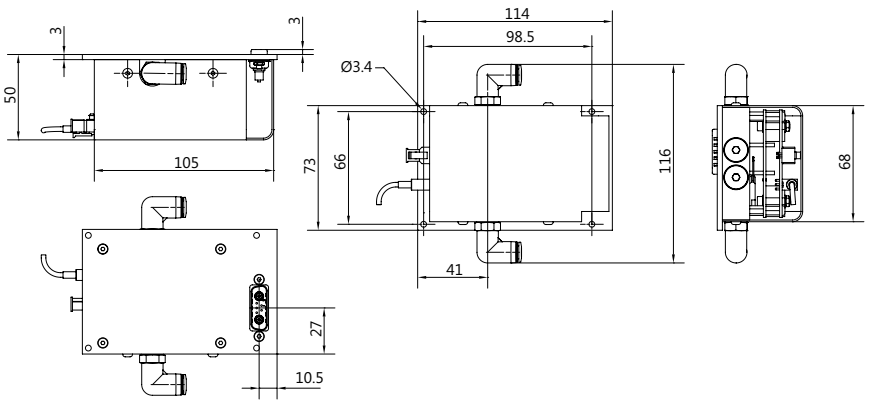


Fig. 15. Outline drawing of standard encased version DP/DP-SP series Pockels cell drivers

SHORT PULSE POCKELS CELL DRIVERS – DP-SP

Features

- HV pulse amplitude up to 3.6 kV
- Repetition rate up to 1 MHz
- HV pulse duration down to 15 ns
- Short circuit protection at driver output
- Driver pad overheat sensor stops operation when overheated
- Overheat optocoupled output signal
- LED for error indication (overheat and short circuit)
- Alternative aluminum case option featuring conductive cooling possibility and relocated water and HV output connectors
- OEM version available upon request

Configuration samples of DP-SP series drivers

Catalogue number of driver	DP-SP-50-3.6-AI	DP-SP-250-3.6-AI	DP-SP-500-2.6-AI	DP-SP-1000-1.8-AI
Maximal/minimal HV operating voltage	3.6 kV / 1.8 kV	3.6 kV / 1.8 kV	2.6 kV / 1.3 kV	1.8 kV / 0.9 kV
Maximal HV repetition rate	50 kHz	250 kHz	500 kHz	1000 kHz
Pulse duration	15 – 5000 ns	15 – 1000 ns	15 – 500 ns	15 – 250 ns
HV pulse rise time, typical	< 7 ns	< 7 ns	< 6.5 ns	< 6 ns
HV pulse fall time, typical	< 7 ns	< 7 ns	< 6.5 ns	< 6 ns
Output polarity	Positive			
HV power consumption	< 20 W	< 75 W	< 90 W	< 80 W
12 V / 24 V power consumption	1 W	4 W	< 6 W	9 W
Recommended HV power supply model	HVS100-40	HVS100-80	HVS100-120	HVS100-80
Dimensions	Standard - see Fig. 15, alternative – see Fig. 16 [1]			
Cooling	Water [2]			

[1] If alternative aluminum case is required, please add note "option 1" when ordering, for e.g., "Pockels cell driver DP-SP-250-3.6-AI option 1".
[2] Standard aluminum case is suitable for water cooling. Alternative aluminum case (option 1) is suitable for both, conductive and water cooling.
Driver needs to be mounted on heatsink unless it is cooled by water. Driver's base plate temperature needs to be lower than 35 °C in all regimes of operation.
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.

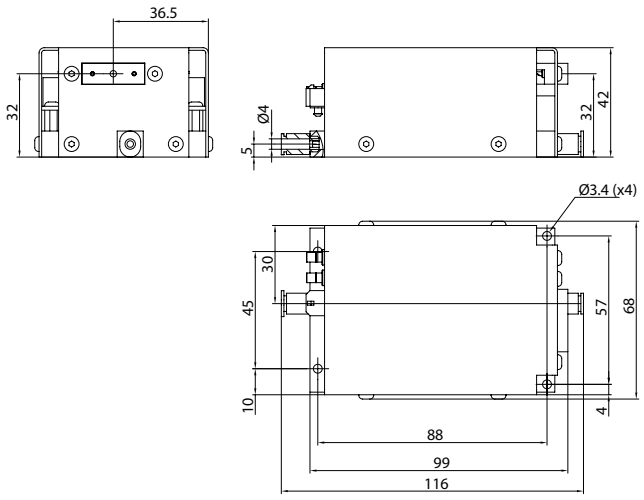


Fig. 16. Outline drawing of alternative encased version DP/DP-SP series Pockels cell drivers with relocated water and HV output connectors (option 1)

HIGH REPETITION RATE POCKELS CELL DRIVERS – 2DP / DPB3

Features

- HV pulse amplitude up to 3.1 kV
- Repetition rate up to 6 MHz
- HV pulse duration down to <1 ns

Encased version of DPB3 series
Pockels cell driver

Catalogue number of driver	2DP-1000-2.4-AI	2DP-2000-1.6-AI	DPB3-2000-3.4-AI	DPB3-2500-3.1-AI	DPB3-3000-2.6-AI	2DPB3-4000-1.7-AI	2DPB3-6000-1.3-AI
Maximal HV operating voltage	2.4 kV	1.6 kV	3.4 kV	3.1 kV	2.6 kV	1.7 kV	1.3 kV
Maximal HV repetition rate	1000 kHz	2000 kHz	2000 kHz	2500 kHz	3000 kHz	4000 kHz	6000 kHz
Pulse duration	0 – 900 ns	0 – 400 ns	100 – 400 ns	100 – 300 ns	100 – 233 ns	100 – 300 ns	100 – 233 ns
HV pulse rise time, typical	< 6.5 ns	< 6 ns	< 10 ns	< 9.5 ns	< 8.5 ns	< 10.5 ns	< 8.5 ns
HV pulse fall time, typical	< 6.5 ns	< 6 ns	< 10 ns	< 9.5 ns	< 8.5 ns	< 10.5 ns	< 8.5 ns
Output polarity	Positive		Bipolar			Positive	
HV power consumption	< 180 W	< 130 W	< 360 W	< 360 W	< 325 W	< 360 W	< 330 W
24 V power consumption	< 14 W	< 18 W	< 6 W	< 10 W	< 10 W	< 6 W	< 10 W
Recommended HV power supply model	HV-200 or HVS100-2x120		HV-2x200			HV-400	
Dimensions	See Fig. 17		See Fig. 18				
Cooling	Water						

Driver needs to be mounted on heatsink unless it is cooled by water. Driver's base plate temperature needs to be lower than 35 °C in all regimes of operation.
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.

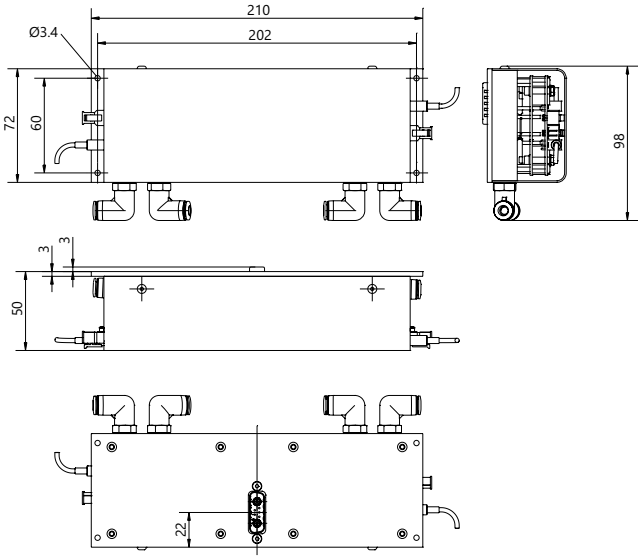


Fig. 17. Outline drawing of encased version
2DP series Pockels cell drivers

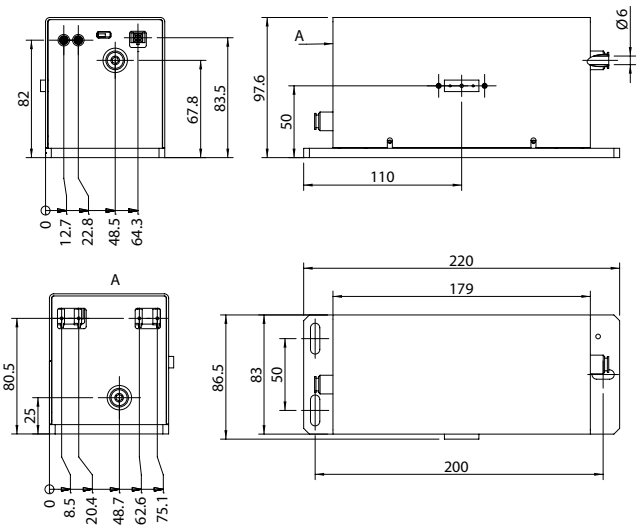


Fig. 18. Outline drawing of encased version
2DPB3/DPB3 series Pockels cell driver

Catalogue number of driver	2DPB2-300-3.4	2DPB2-500-3.4-AI	2DPB2-1000-2.5-AI	2DPB2-2000-1.8-AI	2DPB2-2000-1.5-AI
Maximal working (HV supply) voltage	3.6 kV		2.6 kV	2.0 kV	1.75 kV
Maximum output voltage (HV)	3.4 kV		2.5 kV	1.8 kV	1.5 kV
Maximum HV consumption	<110 W	<200 W	<170 W	<210 W	<215 W
Output polarity	Positive				
HV pulse rise/fall time	<7 ns	<7 ns	<7 ns	<7 ns	<6 ns
Output HV pulse duration with frequency doubling at maximal repetition rate	0 – 1566 ns	0 – 900 ns	0 – 400 ns	0 – 150 ns	
Output HV pulse duration without frequency doubling at maximal repetition rate	0 – 3233 ns	0 – 1900 ns	0 – 900 ns	0 – 400 ns	
External triggering pulse duration at maximal repetition	100 – 5000 ns	100 – 3900 ns	100 – 1900 ns	100 – 900 ns	
Maximum repetition rate using frequency doubling	300 kHz	500 kHz	1000 kHz	2000 kHz	
Maximum repetition rate appearing on each of HV outputs	150 kHz	250 kHz	500 kHz	1000 kHz	
Maximal triggering frequency	150 kHz	250 kHz	500 kHz	1000 kHz	
HV pulse delay	~30 ns				
External triggering inputs	2				
External triggering pulse amplitude @ 50 Ω load	3.5 – 5 V				
External triggering pulse rise/fall time	<10 ns				
Low voltage DC requirements	+24 V ± 1 V				
	200 mA	250 mA	350 mA	450 mA	
Recommended HV power supply model	PS-120	HV-200	PS-170	HV-400	
Dimensions	See Fig. 19	See Fig. 20			
Cooling	Conductive	Water			

Driver's base plate temperature needs to be lower than 35 °C in all regimes of operation. Power consumption for 6 pF load. Voltage or repetition rate derating is necessary if capacitance of your Pockels cell is higher. Contact EKSMA Optics for details.

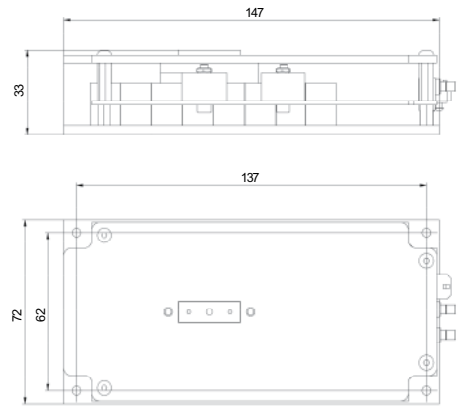


Fig. 19. Outline drawing of 2DPB2-300-3.4 Pockels cell driver

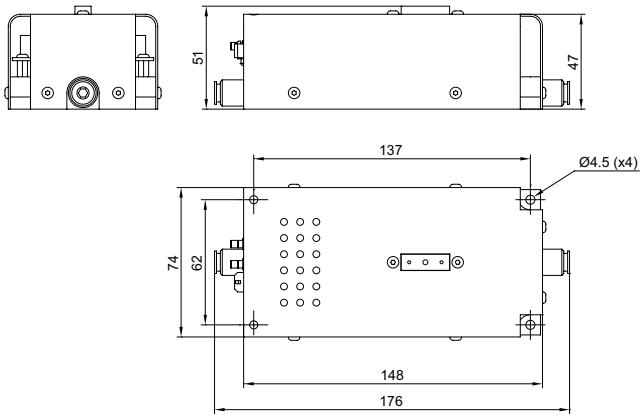


Fig. 20. Outline drawing of encased version 2DPB2 series Pockels cell drivers

HIGH VOLTAGE DRIVERS WITH FAST AMPLITUDE MODULATION – DP-FAM

Features

- HV pulse repetition rate up to 500 kHz
- Fast amplitude modulation of HV pulses
- Output HV pulse amplitude ranges from 0.1 kV to 2.5 kV

DP-FAM series drivers allow to control the amplitude of each HV output pulse with specific user-defined amplitude levels.
The control is realized by one or two trigger-sync pulses and analog signal for amplitude modulation (HV program).

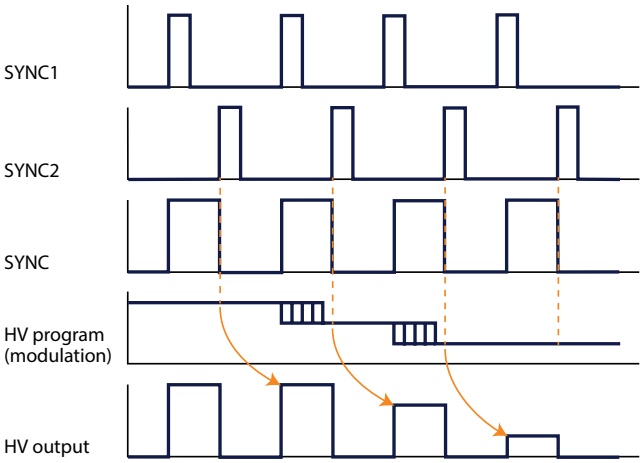
DP-FAM Pockels cell driver

Configuration samples of DP-FAM series encased drivers

Catalogue number of driver		DP-FAM-250-2.5-AI	DP-FAM-500-2.5-AI
HV operation voltage range		0.1 - 2.5 kV	
HV program input signal range		0.1 - 4.9 V	
Maximal HV repetition rate		250 kHz	500 kHz
HV pulse duration		70 – 3000 ns	70 – 1000 ns
HV pulse rise time, typical [1]		< 26 ns	
HV fall time, typical [1]		< 13 ns	
Output polarity		positive	
External trigger pulse requirements	Amplitude on 50 Ω	3.5 – 5 V	
	Rise/fall time	< 10 ns	
HV power consumption		60 W	120 W
24 VDC power consumption		<12 W	
Recommended HV power supply model		HVS100-80-2.6	HVS100-120-2.6
Dimensions		139 × 69 × 57 mm (Fig. 21)	
Cooling [2]		conductive or water	
Control interface [3]		CAN	

[1] All specifications are given for 6 pF Pockels cell load.
[2] Heat sink temperature must not exceed 35 °C (95 °F) in all regimes of operation.
[3] Requires USB-CAN converter for computer control that is sold separately.

Example of driver operation.
Green trace – modulated analog input signal, purple trace – trigger signal SYNC (single pulse control mode), yellow trace – HV pulse.



Operation timing charts.
SYNC1 and SYNC2 are used for 2-pulses control operation mode. HV program input amplitude is readout at SYNC2 rising edge and is used to set HV output amplitude for next HV output pulse which is started with SYNC1 rising edge. SYNC is used for single pulse control mode. HV program input amplitude is readout at SYNC falling edge and is used to set HV output amplitude for next HV output pulse which is started with SYNC rising edge.

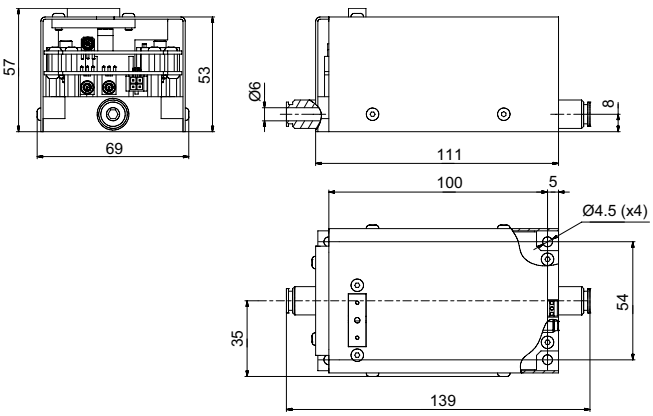


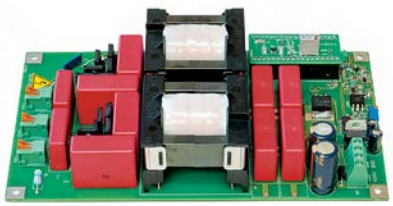
Fig. 21. Outline drawing of DP-FAM series drivers.

HV Power Supplies

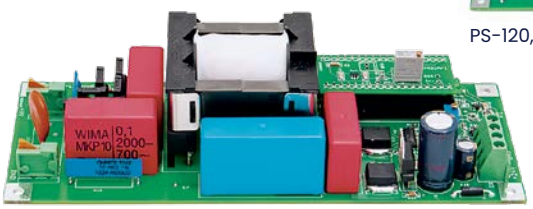
OEM TYPE HIGH VOLTAGE POWER SUPPLY – PS

PS series Power supplies are designed for powering Pockels cell drivers with required power and voltage. Due to its performance and reliable design, PS is good choice for OEM customers. It features high stability low ripple output together with convenient voltage control by internal trimmer or CAN computer interface.

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.



PS-120, PS2-60 power supply



PS-80 power supply

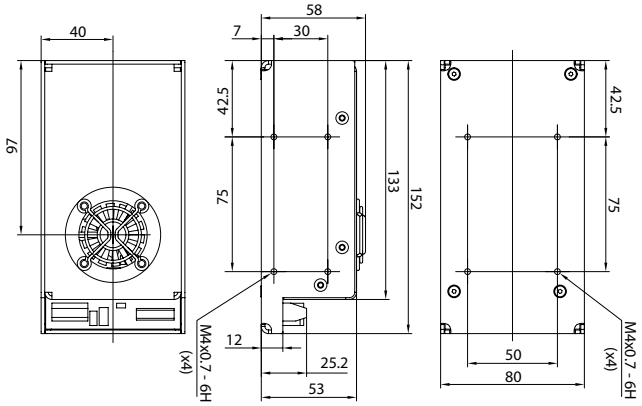
Specifications

Catalogue number	PS-5	PS-40	PS-80	PS-120	PS2-60	PS-170	PS-2x85
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	1.8 kV 2.6 kV 3.1 kV 3.6 kV	±1.4 kV ±2.0 kV ±2.6 kV ±3.6 kV	1.8 kV 2.6 kV 3.6 kV	±1.5 kV ±1.8 kV
Maximal output power at maximal output voltage [2]	5 W	40 W	80 W	120 W	2 × 60 W	170 W	2 x 85 W
Voltage control limits	U_{max} –1 kV to U_{max} (internal trimmer); 40% U_{max} to U_{max} (CAN)					40% U_{max} to U_{max}	
Output voltage control options [3]	CAN interface [4], internal trimmer potentiometer						
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	24 V DC, <200 W	
Dimensions (L × W × H)	135 × 70 × 30 mm	160 × 70 × 40 mm	175 × 70 × 45 mm	175 × 110 × 45 mm		152 × 80 × 58 mm	
Mounting holes Ø3.4 mm location	125 × 35 mm	150 × 60 mm	165 × 60 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% Umax to Umax .

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.

PS-170, PS2-85 HV power supply



Outline drawing of PS-170, PS2-85 HV power supply

LABORATORY TYPE HIGH VOLTAGE POWER SUPPLY – HVS100

Laboratory type HVS100 series high voltage power supply is especially designed for powering of drivers 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.

Front panel of HVS100 power supply

Rear panel of HVS100 power supply

Specifications

Catalogue number	HVS100-2x60	HVS100-120	HVS100-5	HVS100-40	HVS100-80	HVS100-150	HVS100-4x60	HVS100-120
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	1.8 kV 2.6 kV 3.1 kV 3.6 kV 4.0 kV	± 1.4 kV ± 2.0 kV ± 2.6 kV ± 3.6 kV	1.8 kV 2.6 kV 3.1 kV 3.6 kV
HVS100 Maximal output power at maximal output voltage	2 × 60 W	120 W	5 W	40 W	80 W	150 W	4 × 60 W	2 × 120 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 [1]		
Dimensions (W × L × H)	230 × 245 × 53.5 mm							
Weight	2.5 kg							

[1] External Desktop AC-DC Adapter unit. Weight 1.6 kg. Dimensions 112 × 222 × 45 mm (included).
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.

HIGH VOLTAGE POWER SUPPLY – HV

Features

- Up to 400 W and 4 kV at the output
- Single polarity HV and bipolar HV-2x versions
- Computer control through CAN and RS232
- 48 V DC powering
- Auxiliary 24 V DC output for Pockels cell drivers

OEM type HV series power supply modules are designed to be used with high power and high repetition rate Pockels cell drivers that require >120 W power from HV source. To extend the versatility of possible applications we offer both single (positive) polarity and bipolar HV series power supplies.

HV power supplies can also be used as universal HV power supplies for different applications where up to 200 – 400 W high voltage source is required. HV series module provides maximal power (200 W or 400 W) at the indicated maximal rated voltage only. Therefore, the required rated voltage should be noted when ordering (possible options are listed in the specifications table).

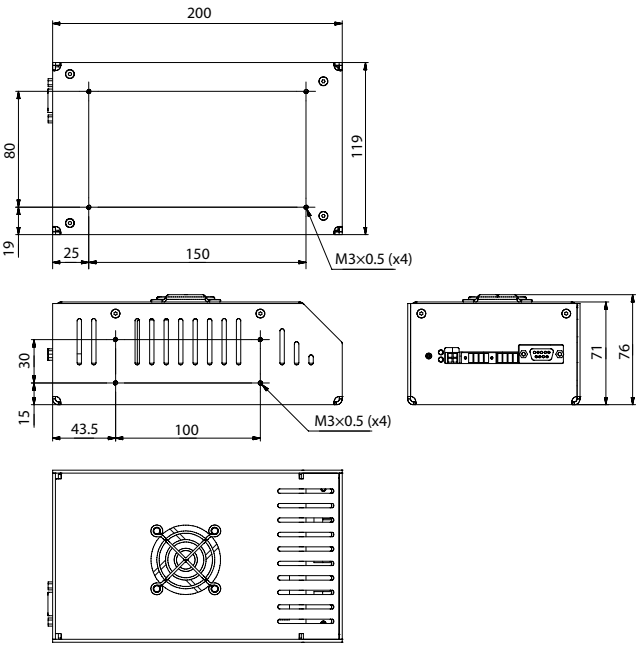
The input of HV series power supply is 48 VDC. 24 VDC auxiliary output is a convenient feature to use the module as a single power source (high plus low voltage) with one of EKSMA Optics Pockels cell drivers. The output voltage can be tuned from zero to maximal value using an internal trimmer potentiometer, CAN or RS232 interfaces. Analog control (0 – 10 V) is possible under request.

Front and rear view of HV power supply module

Specifications

Model	HV-200	HV-400	HV-2x200
Maximal HV options	1.8 kV 2.6 kV 3.6 kV 4.0 kV [1) 2)]		± 1.5 kV ± 2.0 kV ± 2.6 kV ± 3.6 kV
Maximal output power	200 W [1)]	400 W [2)]	2 × 200 W
Voltage control range	0 – U_{max}		
Auxiliary output	24 VDC, 1.2 A		
Controls	CAN, RS232, internal trimmer potentiometer		
Powering requirement	48 V, 4.5 A	48 V, 9 A	
Dimensions	200 × 118 × 75 mm		

[1)] Maximal output power of 4 kV HV-200 version is limited to 180 W.
[2)] Maximal output power of 4 kV HV-400 version is limited to 360 W.



Outline drawing of HV power supply module

Ultrafast Pulse Picking Systems

Digital synchronization and delay pulse generator pMaster 4.2

DIGITAL SYNCHRONIZATION AND DELAY PULSE GENERATOR – **pMaster 4.2**

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 ps resolution
- Touch screen for setting operation parameters and monitoring of HV current
- Communication via USB port
- Integrated over-temperature protection
- Protection installed in order to prevent damage if control cables are connected incorrectly
- Possibility to use asynchronous gate input signal

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.

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
	Slope	rising
External RF source, CLK IN input	Rate	10 MHz to 100 MHz
	Min pulse width	300 ps
	Input level	0.5 V to 3.3 V
	Impedance	50 Ω
Outputs	Output level	4.5 V
	Output impedance	50 Ω
Communication, powering and physical specifications	Communication	USB
	Power	230 V AC 50 Hz or 110 V AC 60 Hz
	Dimensions	482 × 387 × 88 mm

Ordering information

Digital synchronization and delay pulse generator pMaster 4.2 should be matched with pulse picker MP1 or UP2. Please contact our sales engineers for a complete solution tailored to your application.

ULTRAFAST PULSE PICKER – UP2

Features

– Pulse picking rate up to 2 MHz

UP2 pulse picker consists of built-in drivers, 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.

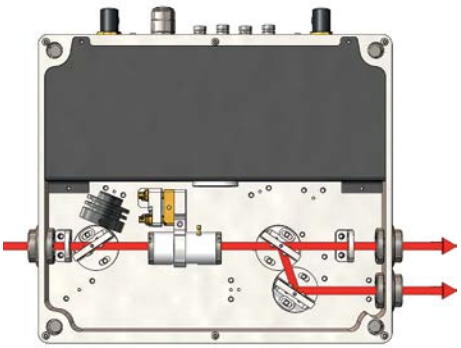
KTP Pockels cell's usage is limited by the average power of the laser beam – up to 2 W and contrast ratio is typically >1:500. While BBO Pockels cells operate at much higher power levels and feature higher contrast ratio – typically >1:1000.

Specifications of UP2 pulse picker units

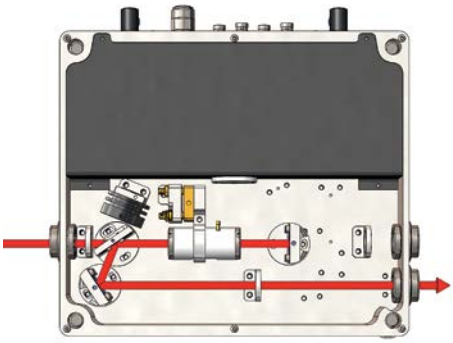
Pulse picker	UP2-BBO-3.5	UP2-BBO-2.5	UP2-KTP-5.5	UP2-KTP-3.5
Built-in-driver, max operating rate	up to 1 MHz	up to 2 MHz	up to 1 MHz	up to 2 MHz
Max laser repetition rate for single pulse picking	100 MHz			
HV power supply	provided in pMaster 4.2			
Operation	quarter-wave, λ/4		half-wave, λ/2	
HV pulse 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		> 98 % at 800 nm	> 98 % at 1064 nm
Clear aperture	Ø3.5 mm	Ø2.5 mm	Ø5.5 mm	Ø3.5 mm
Cooling	water			
Dimensions (L × W × H)	240 × 275 × 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, λ/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 26.

Suggested configurations

Code	Description
UP2-BBO-3.5 + pMaster 4.2	Ultrafast pulse picker for up to 1 MHz operation, BBO clear aperture Ø3.5 mm, λ/4 operation at 1064 nm. Pulse synchronization and delay generator, 4 output channels for trigger pulses with built-in High Voltage supply
UP2-BBO-2.5 + pMaster 4.2	Ultrafast pulse picker for up to 2 MHz operation, BBO clear aperture Ø2.5 mm, λ/4 operation at 1064 nm. Pulse synchronization and delay generator, 4 output channels for trigger pulses with built-in High Voltage supply
UP2-KTP-5.5 + pMaster 4.2	Ultrafast pulse picker for up to 1 MHz operation, KTP clear aperture Ø5.5 mm, λ/2 operation at 800 nm. Pulse synchronization and delay generator, 4 output channels for trigger pulses with built-in High Voltage supply
UP2-KTP-3.5 + pMaster 4.2	Ultrafast pulse picker for up to 2 MHz operation, KTP clear aperture Ø3.5 mm, λ/2 operation at 1064 nm. Pulse synchronization and delay generator, 4 output channels for trigger pulses with built-in High Voltage supply

PULSE PICKER – MP1

Features

- Pulse picking rate up to 1 MHz
- Fast Amplitude Modulation version available

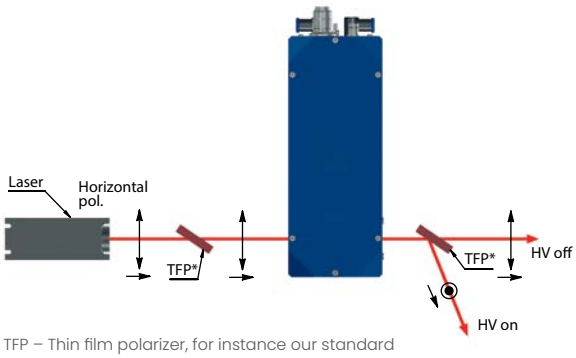
MP1 pulse picker consists of built-in fast driver and a Pockels cell. This unit is able to select pulses at up to 1 MHz rate. MP1 is operated by pMaster 4.2 generator which provides sync pulses for driver control and has built-in HV power supply. MP1 can be synchronized with a laser generating pulse train with max 60 MHz repetition rate for single pulse picking task when it is in setup with pMaster 4.2 generator.

Samples of suggested MP1 pulse picker configurations

Pulse picker	MP1-DKDP-11	MP1-BBO-5.8	MP1-BBO-2.5	MP1-FAM-KTP-5.5
Built-in-driver, max operating rate	up to 5 kHz	up to 250 kHz	up to 1 MHz	up to 500 kHz
Max laser repetition rate for single pulse picking	40 MHz	60 MHz		10 MHz
HV power supply	provided in pMaster 4.2			
Operation	quarter-wave, λ/4			0 to λ/2
HV pulse duration	30 – 3000 ns	15 – 1000 ns	15 – 250 ns	70 – 1000 ns
HV pulse rise time, typical	< 7 ns			< 26 ns
HV pulse fall time, typical	< 7 ns			< 13 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	Ø2.5 mm	Ø5.5 mm
Cooling	conductive	water		
Dimensions (L × W × H)	230 × 90 × 69 mm			

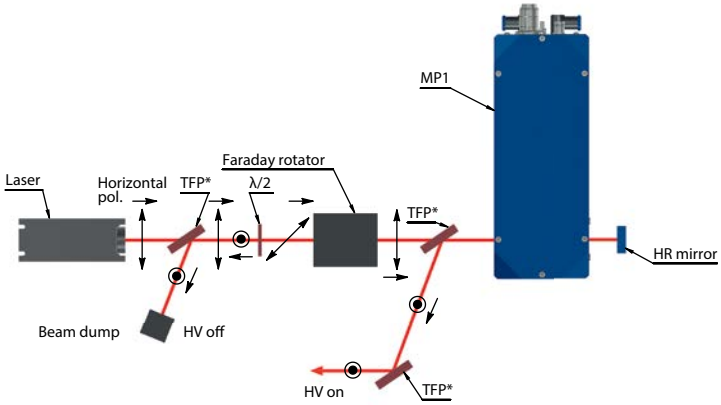
MP1 can be set for operation at standard laser wavelengths (1064 nm, 1030 nm, 800 nm) or at any specific laser wavelength in the range from 500 to 2000 nm.

Suggested operation schemes



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

Single pass (half-wave) operation scheme



Double pass (quarter-wave) operation scheme

Suggested configurations

Code	Description
MP1-DKDP-11 + pMaster 4.2	Ultrafast pulse picker for up to 5 kHz operating rate, DKDP clear aperture Ø11 mm, λ/4 operation at 1064 nm. Pulse synchronization and delay generator, 4 output channels for trigger pulses with built-in High Voltage supply
MP1-BBO-5.8 + pMaster 4.2	Ultrafast pulse picker for up to 250 kHz operation, BBO clear aperture Ø5.8 mm, λ/4 operation at 1064 nm. Pulse synchronization and delay generator, 4 output channels for trigger pulses with built-in High Voltage supply
MP1-BBO-2.5 + pMaster 4.2	Ultrafast pulse picker for up to 1 MHz operation, BBO clear aperture Ø2.5 mm, λ/4 operation at 1064 nm. Pulse synchronization and delay generator, 4 output channels for trigger pulses with built-in High Voltage supply

Timing Generators

Laboratory type
timing generator TG10

TIMING GENERATOR FOR APPLICATIONS WITH LASERS AND LASER COMPONENTS – TG10

Features

- Ultra-stable internal clock 0.2 ppm
- Precise delay control in range 2 ns to 150 ms
- 25 ps timing resolution
- Hi-accuracy synchronization to the external pulse train
- DAC output
- Frequency divider for photodetectors
- Measurement of:
  - Optical clock frequency
  - Triggering frequency
  - Delay

Applications

- Passive or active mode locked, Q-switched lasers, pulsed or QCW
- Data acquisition system triggering
- General purpose pulse generator
- Precise system clock source
- Laser pulse train converting to the clean clock source
- All functions listed above simultaneously at once!

The TG10 is a timing generator dedicated to the synchronization of laser systems and laser components: Pockels cell drivers, acousto-optical modulator drivers, laser diode and flash lamp drivers, detectors, data acquisition systems, laser pulse pickers, etc. The TG10 is designed to create up to 8 delayed output sequences precisely synchronized to the internal or external clock. A photodetector or electrical signal can be used as the input source to be synchronized with.

The TG10 device has an LCD touch screen for the manual control and a tunable knob for the adjustment of selected values set on the touch screen. Instructions of required actions are always displayed at the bottom of the screen. Besides, the timing generator has a digital control interface via CAN bus. Communication protocol with description for CAN is provided on request. CAN to USB converter is also available from EKSMA Optics.

Key features of the TG10

The key features of the TG10 module in addition to standard pulse generator features:

- Ability to lock to an external clock source, usually photo-diode pulse train. The triggering system is locked to the laser oscillator then, and trigger time is always in phase with the optical pulse.
- Instant switch between two configurations in delay blocks. Burst counter, gate input, frequency divider, or software commands may serve as the configuration switching signal sources. Configuration switch is used to control optical pulse pickers (EOM or AOM) in a highly flexible manner.
- Low jitter sync pulse output is used for high-speed acquisition systems like streak camera triggering. The typical jitter is 3...5 ps to the optical pulse.
- Control connector. The software-controllable multiplexer may divert any of the output signals to this connector to sniff what is on other connectors without disturbing them.
- Clock output: 1:1, 1:2 frequency.
- Up to 4 pulse outputs can be combined to single signals by OR, AND, NOT logical operations.
- DAC output, controlling, e.g. AOM pass though.

Input and output channels

Channel	Description
OUTx	five digital general-purpose output channels (4.5 V @ 50 Ω)
AN OUT	analog output with 12-bit resolution (1 V @ 50 Ω)
COM TRIG	common trigger output. Configurable source (2.5 V @ 50 Ω)
PRE TRIG	precise trigger output channel. Configurable source (>1.5 V @ 50 Ω)
GATE IN	configuration switch and burst control input. (LVTTL, tolerates 5 V, 0.2 mA pull-down)
SYNC IN	trigger input for DC to 20 MHz frequencies. (LVTTL, tolerates 5 V, 0.2 mA pull-down)
CLK IN	clock input for 10 MHz to 100 MHz frequencies. (0.5 V to 3.3 V @ 50 Ω pk-pk, sine or pulses)

General specifications

Parameter	Specification
Time base	
Internal source	100 MHz 0.2 ppm TCXO
External source, Optical clock	20...100 MHz
Internal rate generator	
Sources	100 MHz clock, Optical clock, SYNC IN, Software command
Rate (T0 period)	50 ns...100 s (0.01 Hz to 20 MHz)
Resolution	10 ns or 1 Optical period or 1 SYNC IN period
RMS jitter	< 350 ps
External trigger, SYNC IN input	
System modes	Direct SYNC IN, SYNC IN re-clocked to Optical clock
Rate	DC to 20 MHz
Threshold	1.3 V
Input range	0...5 V
Trigger slope	rising edge
RMS jitter, Direct SYNC IN	< 120 ps
RMS jitter, SYNC IN re-clocked	< 5 ns
Insertion delay	< 80 ns
Delay generators	
Channels, total	8
High res channels	5
High res channels, resolution	25 ps
Low res channels	3
Low res channels, resolution	< 10 ns
Delay	0 ... 150 ms
Pulse width	2 ns ... 150 ms
Accuracy, High res channel	2.5 ns + 0.000001 setpoint
Accuracy, Low res channel	≤ 10 ns + 0.000001 setpoint
Time base, Internal clock	100 MHz, 0.2 PPM TCXO
RMS jitter, channel to channel	< 30 ps TTL output, < 4 ps PRET output
Configuration switch	
System modes	Single shot, burst, continuous, frequency divider, GATE IN, inverted GATE IN
Burst counter	1 ... 65535
Frequency divider	1 ... 32767
Outputs, TTL/COMS	
Voltage @50 Ω load	2.5 V or 4.5 V
Voltage @1 MΩ load	5 V or 9 V
Voltage selection 5V/9V	internal jumper
Impedance	50 Ω
Rise time	1.5 ns typ
Output, PRET	
Pulse amplitude @ 50 Ω load	> 1 V
Impedance	50 Ω
Rise time	200 ps typ
Output, differential	
Type	LVPECL
Output, analog	
DAC resolution	12 bit
Max amplitude @ 50 Ω	1 V
Power	
Voltage	12 V ± 10%
Power	15 W max

Crystal Ovens

Nonlinear crystals such as KD*P, BBO, and LBO are sensitive to humidity and temperature, with coatings offering only limited protection. Crystal ovens maintain a stable elevated temperature, preventing condensation and reducing surface degradation.

They also ensure precise temperature control critical for performance. In harmonic generation, even a 1 °C change can significantly reduce efficiency, making stable crystal temperature essential for consistent and reliable laser operation.

HIGH-TEMPERATURE CRYSTAL OVEN – HP200

Features

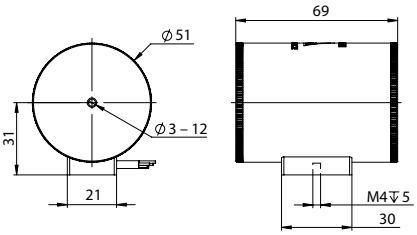
- Temperature range: 25 – 220 °C
- Aperture (max): 12 × 12 mm
- Length (max): 30 mm
- High long-term stability
- High temperature homogeneity

Heatpoint series HP200 oven is designed for precise long-term temperature stabilization of sensitive optical elements such as LBO, DKDP, and CLBO nonlinear crystals. It enables fine-tuning in 0.1 °C steps from room temperature (~25 °C) up to 220 °C.

For best performance, we recommend the complete Heatpoint high-temperature kit, including the HP200 oven and HPC thermo-controller. The HPC features an OLED display, control knob, and USB-C and CAN connections for easy operation and advanced monitoring. Together, they ensure long-term stability of ±0.03 °C, making the HP200 one of the most precise and stable ovens available.

A sealed version with anti-reflection coated optical windows is also available upon request.

HP200 crystal oven with HPC thermocontroller



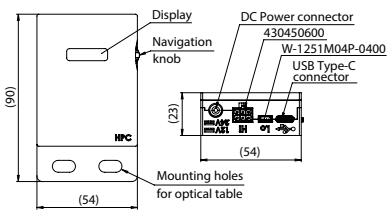
HP200 dimensions

Specifications

Model	HP200
Crystal length (max)	30 mm
Crystal aperture (max)	12 × 12 mm
Temperature tuning range	25 – 220 °C
Temperature tuning step	0.1 °C (knob) 0.001 °C (remote)
Long-term stability	± 0.03 °C [1]
Temperature ramp rate	1 – 10 °C/min [2]
Powering requirements	24 V DC
Power consumption	< 60 W
Oven-to-thermocontroller connector	Micro-Fit 3.0, Dual Row, 6 Circuits ("Hi")
Oven cable length	0.5 m
Oven dimensions	Ø50.8 × 69 mm

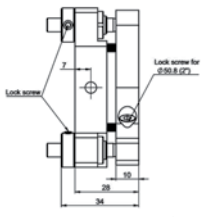
[1] In enclosed environment. [2] By default, limited to 4 °C/min.

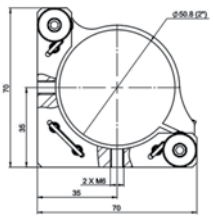
HPC thermocontroller



Description	Model
Thermocontroller with power supply (24 V) for HP200 Oven	HPC

Mounting stage OM-1





Specifications

Model	OM-1
Adjusting angle along X and Y axis, deg	±3.5
Beam height above breadboard, mm	35
Adjustment screw thread	M6x0.5

COMPACT CRYSTAL OVEN – HP15 / HP30

Features

- Compact Ø1" design
- Temperature range: 25 – 70 °C
- High long-term stability

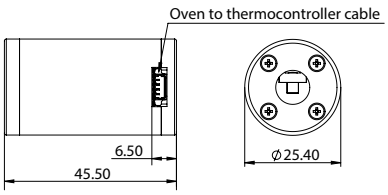
Heatpoint series HP15 / HP30 ovens are compact round heaters designed for thermo-stabilization of humidity-sensitive nonlinear crystals in the 25 – 70 °C range. Due to their compact design, Heatpoint ovens can be easily installed into tight spaces and mounted to any standard one-inch positioning mount.

Heatpoints are available in two sizes: HP15 accepts crystals up to 15 mm long, while slightly longer HP30 fits crystals up to 30 mm long. The exact aperture of the crystal must be specified when ordering.

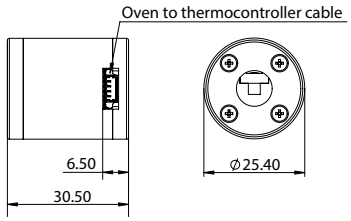
When used with an HPC thermocontroller, heatpoint ovens exhibit precise long-term stability and are perfect for keeping nonlinear crystals at their optimal operational temperature, preventing moisture condensation on the crystal's faces.

Heatpoint HP30

Heatpoint HP15



HP30 dimensions



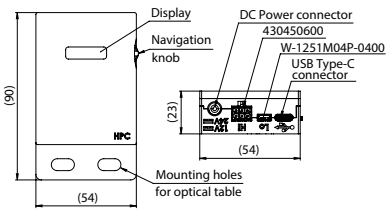
HP15 dimensions

Specifications

Model	HP15	HP30
Crystal length (max)	15 mm	30 mm
Crystal aperture (max)	6 × 6 mm	
Temperature tuning range	25 – 70 °C	
Temperature tuning step	0.1 °C (knob) 0.001 °C (remote)	
Long-term stability	± 0.1 °C	
Temperature ramp rate	1 – 10 °C/min [1]	
Powering requirements	12 V DC	
Power consumption (PMAX)	< 8 W	
Oven-to-thermocontroller connector	Picoblade, Single row, 4 Circuit ("Lo")	
Dimensions (oven)	Ø 25.4 × 30.5 mm	Ø 25.4 × 45.5 mm
Oven cable length	0.45 m	

[1] By default, limited to 4 °C/min.

HPC thermocontroller



Description	Model
Thermocontroller with power supply (24 V) for HP200 Oven	HPC

Related products

Kinematic Positioning Mount 840-0193

See www.eksmaoptics.com

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Dvarcioniu st. 2B
10233 Vilnius, Lithuania
info@eksmaoptics.com
Tel.: +370 5 272 99 00

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