Free-Space KD*P Electro-Optical Modulator

(3, 8, 10, 20mm aperture, 400nm to 2500nm)

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Return to the Webpage

Features

- High Power Damage Threshold
- High Extinction Ratio
- Low Capacitance
- High Speed
- High Transparency
- Wide Wavelength Range

Applications

- Q-Switch
- Phase/Power Modulation
- Pulse Picker

Made from the highest-purity, strain-free, and highly deuterated Potassium Dideuterium Phosphate (KD*P) crystals, the KDPM series Pockels cells deliver exceptional optical damage resistance and long-term reliability. For demanding environments, an index-matching oil immersion version is available to enhance stability under harsh conditions. The KDPM series comes in three aperture sizes: 8 mm, 10 and 20 mm. A compatible high-voltage pulse driver is available to support high-speed operation. The housing features standard pin-type HV connectors. For intensity modulation applications, polarization cubes can be aligned and mounted at the input and output ports. The voltage required to induce a π phase shift (Vπ) in the optical signal is given by the equation:

$$V\pi = (\lambda \times d) / (n^3 \times r \times L)$$

where:

λ is the wavelength of light,
d is the electrode spacing,
n is the refractive index of the crystal,
r is the electro-optic coefficient,
L is the crystal length along the light path.

The **Vπ** voltage is proportional to the wavelength and inversely proportional to the crystal length.

Specifications

Parameter		Min	Typical	Max	Unit
Wavelength Range [1]		400		600	nm
		600		900	
		900		1250	
		1250		1650	
		1800		2500	
Clear Aperture [2]		5	8	20	mm
Crystal Length		30		90	mm
1/4 wave Voltage [3]	532nm		3300		V
	1064nm		6400		
Material Purity		99.8			%
Transmission		98			%
Extinction (on/off) [4]		20		35	dB
Rise/Fall Time (10-90%)		0.5		1.1	ns
Angle Tolerance (perpendicularity)			± 0.15		Degree
Parallelism		5			"
Humidity (non-condensing)				65	%
Capacitance (dielectric constant e~13)			10		pF
Damage Threshold (@1064nm, 10ns, 10Hz)				10	GW/cm^2
Surface Scratch/Dig			20/10		mm
Operation Temperature		10		80	°C
Electrooptic Coefficients		r41=8.8		R63=25	pm/V

Notes:

[1]. These are standard AR coatings, custom AR coating is available with narrower band for lower loss

[2]. These are standard sizes, custom size is available with max length up to 25mm for lower driving voltage

[3]. This relates to crystal size; the smaller the aperture, and the longer the length, the lower the driving voltage

[4]. Measure at DC using two crossed polarizers

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Typical Configurations @1060bm (the driving voltage is related to device length)

Length (mm)	32	39	44	46	49
Clear Aperture (mm)	8 mm	10 mm	12 mm	15 mm	19 mm
Insertion Loss	< 2%	< 2%	< 2%	< 2%	< 2%
Static Extinction Ratio	> 5000 : 1	> 5000 : 1	> 5000 : 1	> 5000 : 1	> 5000 : 1
Dynamic Extinction Ratio	> 1500 : 1	>1500 : 1	> 1500 : 1	> 1500 : 1	> 1500 : 1
Wavefront Distortion @633nm	< λ/6	< λ/6	< λ/6	< λ/6	< λ/4
Capacitance	4 pF	6 pF	6 pF	9 pF	9 pF
1/4-Wave Voltage	~3.4 kV	~3.4 kV	~3.4 kV	~3.4 kV	~3.4 kV
Damage Threshold@1064nm 10ns 10Hz	10 J/cm²	10 J/cm²	10 J/cm²	10 J/cm²	10 J/cm²

Length (mm)	65	70	90
Clear Aperture (mm)	8 mm	10 mm	19 mm
Insertion Loss	< 3%	< 3%	< 3%
Static Extinction Ratio	> 2000 : 1	> 2000 : 1	> 1000 : 1
Dynamic Extinction Ratio	> 1000 : 1	> 1000 : 1	> 500 : 1
Wavefront Distortion @633nm	< λ/3	< λ/3	< λ/3
Capacitance	8 pF	14 pF	21 pF
1/4-Wave Voltage	~1.7 kV	~1.7 kV	~1.7 kV
Damage Threshold@1064nm 10ns 10Hz	10 J/cm²	10 J/cm²	10 J/cm²

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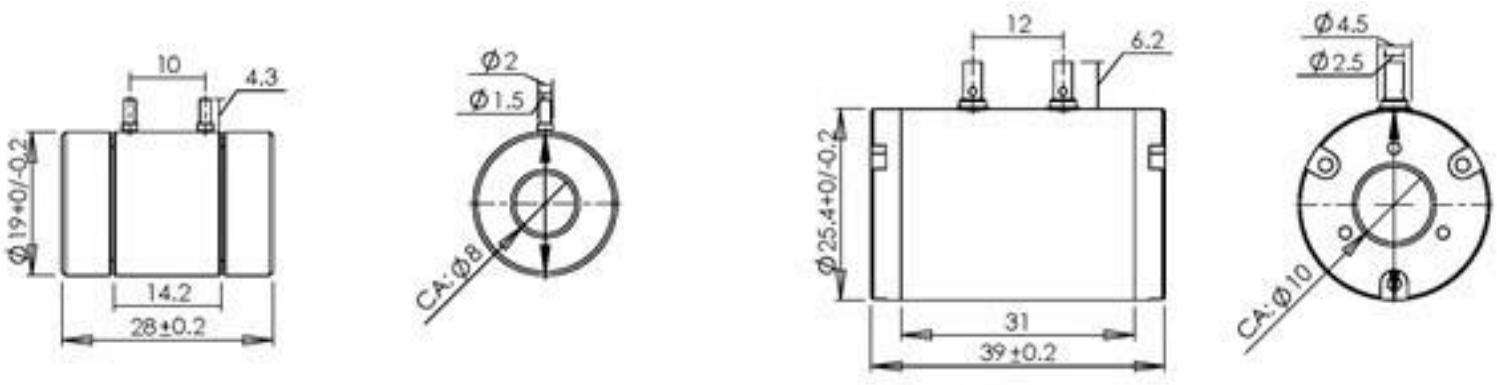
High Voltage and High Optical Power Safety Warning

- Do not look at the device – Even indirect exposure to high-power laser light can cause serious eye damage.
- Do not touch the device – The driving high voltage can cause serious injury.
- Do not clean the optical surfaces improperly – Mishandling may damage coatings or surfaces.
- Do not solder directly to the crystal – This can cause internal cracking and device failure.

Mechanical Drawing (mm) aperture 8mm and 10mm



*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

Ordering Information

	☐☐	☐	☐	☐	☐	☐	☐	☐	☐
Prefix	**Wavelength**	**Aperture**	**Length**	**Grade [1]**	**Input Cube [2]**	**Output Cube [2]**	**Mounting**	**Driver**	**Isolator**
KDPM-	400~600nm = 05 600~900nm = 07 900~1250nm = 10 1250~1650nm = 14 1800~2500nm = 15	3mm = 3 8mm = 8 10mm = A 20mm = B	39mm = 3 46mm = 4 50mm = 5 65mm = 6 70mm = 7 90mm = 9	Standard = S Premium = P Ultra = U Oil Package = L	No = 1 Polacore = 3 PBS = 4 Glan-Thompson = 5	No = 1 Polacore = 3 PBS = 4 Glan-Thompson = 5	Non = 1 Yes = 2	Non = 1 Yes = 2	Non = 1 Yes = 2

[1]. **Affect Intrisic Contrast Ratio, Electro-Optic Effect Uniformity, Defect Density (**related to the material selection from an as-grown crystal boule in which near center is the best**)**

[2]. **Polacore** (1060nm) – CW 10W/cm^2
PBS (1060nm) – CW 15W/cm^2
Glan-Thompson (1060nm) – CW 2kW/cm^2

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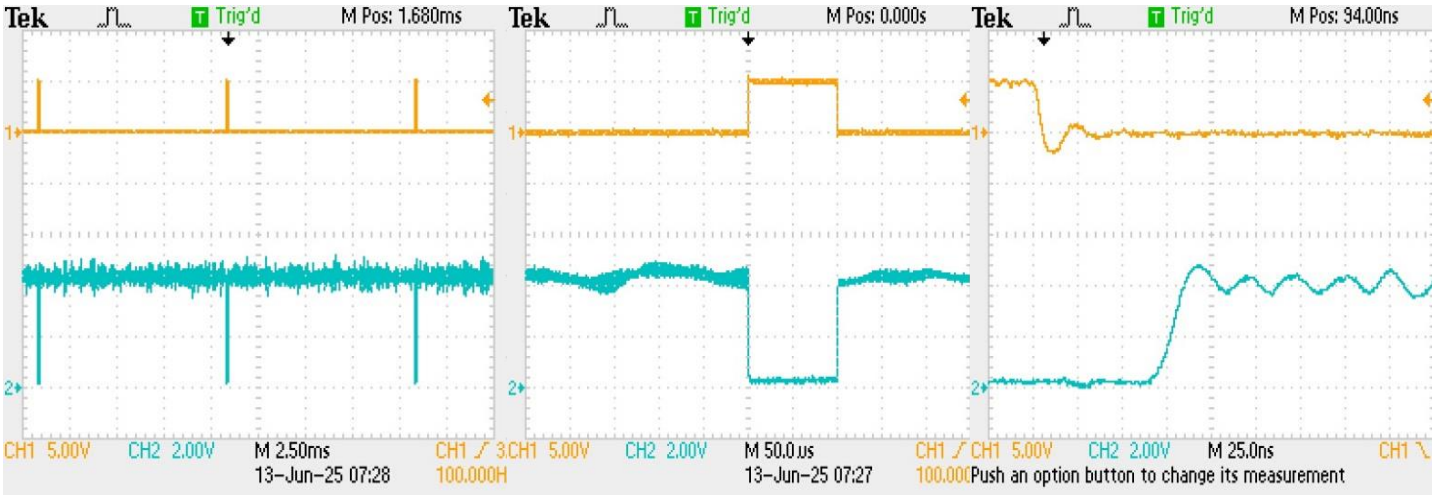
Typical Q Switch Response (yellow is electrical, blue is optical)



Application Notes (Q-switch alignment)