

Laser assembly electro-optic Q-switch (Pockels cell)



DKDP Pockels cell



BBO Pockels cell

DKDP Pockels cell:

Potassium dideuterium phosphate DKDP ($KD * P$) crystal has low optical loss, high extinction ratio, good electro-optic performance and wide application. Generally, potassium dideuterium phosphate crystal (DKDP) with deuterium content of more than 98 % is used to make electro-optic Q-switch by its longitudinal effect, which is suitable for pulsed solid-state laser. It is usually used in laser cosmetic and laser medical fields under low repetition rate conditions. However, the disadvantage of electro-optic application of DKDP crystal is that the quarter-wave voltage is relatively high, and there is ringing effect above 1KHz.

Electro-optic Q-switch parameters (DKDP)	
Through distortion	$\lambda / 8 @ 633nm$
Optical parallelism	< 20 arc sec.
Side droop	< 5 arc sec.
degree of finish	10-5, after coating 20-10
extinction ratio	>1000:1
A quarter wave voltage	3.2kV at 1064nm, 20° C
Input / output coating	AR/AR@1064nm
Overall transmittance	>98%
damage threshold	350 MW/cm ² at 1064nm, 10ns, 1Hz

Standard specification (Z-cut DKDP crystal)

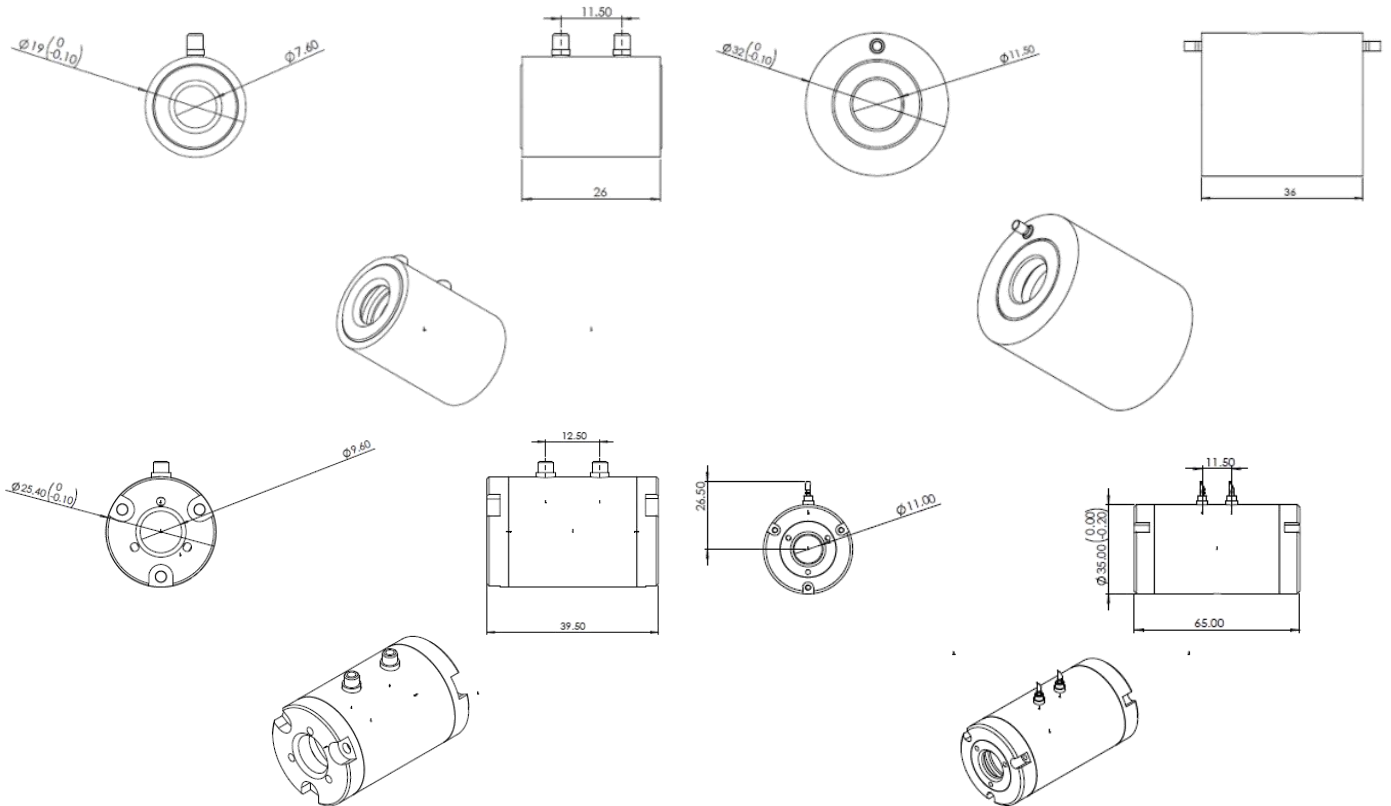
Single crystal DKDP switch

product model	crystal size	limiting aperture	case size	damage threshold 10ns 10Hz 1064nm	electrode manner	extinction ratio	$\lambda/4$ voltage (@1064 nm), kV DC	penetration	capacitance, pF
DKDP-1520 -3542-AR	Dia.15×20 mm ³	15mm	Dia.35×42mm	350MW/cm ²	Cylindrical pin electrode	1000: 1	3.2kV	>98.5%	5pF
DKDP-1220 -3236-AR	Dia.12x20 mm ³	12mm	Dia.32x36mm	600MW/cm ²	End-face pin electrode	1000: 1	3.2kV	> 98.5%	5pF
DKDP-1220 -3240-AR	Dia.12x20 mm ³	12mm	Dia.32x40mm	350MW/cm ²	Cylindrical pin electrode	1000: 1	3.2kV	> 98.5%	5pF

DKDP-1220 -2540-AR	Dia.12x20 mm ³	12mm	Dia.25x40mm	350MW/cm ²	Cylindrical pin electrode	1000: 1	3.2kV	> 98.5%	5pF
DKDP-1020 -2532-AR	Dia.10x20 mm ³	10mm	Dia.25x32mm	350MW/cm ²	Cylindrical pin electrode	1000: 1	3.2kV	> 98.5%	5pF
DKDP-0816 -1926-AR	Dia.8x16 mm ³	8mm	Dia.19x26mm	350MW/cm ²	Cylindrical pin electrode	1000: 1	3.2kV	> 98.5%	5pF
DKDP-0816 -1926-SG	Dia.8x16 mm ³	8mm	Dia.19x26mm	750MW/cm ² (Sol-gel coatings)	Cylindrical pin electrode	1000: 1	3.2kV	> 98%	5pF
DKDP-0816 -2028-AR	Dia.8x16 mm ³	8mm	Dia.20x28mm	350MW/cm ²	Cylindrical pin electrode	1000: 1	3.2kV	> 98.5%	5pF
DKDP-0816 -1930-AR	Dia.8x16 mm ³	8mm	Dia.19x30mm	350MW/cm ²	End face lead wire	1000: 1	3.2kV	> 98.5%	5pF
DKDP-0918 -1928-AR	Dia.9x18 mm ³	8mm	Dia.19x28mm	350MW/cm ²	End-face pin electrode	1000: 1	3.2kV	> 98.5%	5pF

Double crystal DKDP switch

product model	crystal size	limiting aperture	case size	damage threshold 10ns 10Hz 1064nm	electrode manner	extinction ratio	$\lambda/4$ voltage (@1064nm), kV DC	penetration	capacitance, pF
DKDP-1220 -3565-AR	Dia.12×20mm X2	12mm	Dia.35×65mm	350MW/cm ²	Cylindrical pin electrode	500: 1	1.6kV	> 97.5%	5pF



BBO Pockels cell;

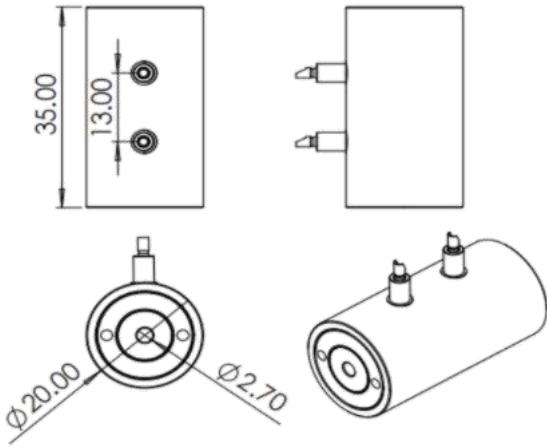
Compared with the traditional KD * P electro-optic modulation crystal, BBO (barium metaborate β -BaB₂O₄) crystal has the advantages of extremely low absorption coefficient, weak piezoelectric ringing effect, and wider spectral transmission range (210-2000nm). Compared with RTP electro-optic modulation crystal, BBO crystal has higher extinction ratio, anti-damage threshold and temperature adaptability, which is beneficial to improve the stability of laser output power. Therefore, electro-optic Q-switches made of BBO crystals are often used in high repetition rate (1MHz), high power (up to 1000W) electro-optic Q-switched solid-state lasers, cavity-inverted air-conditioned Q lasers, and all-solid-state picosecond and femtosecond regenerative amplification laser systems. Without water cooling, the BBO electro-optic Q-switch can turn off and withstand up to 150 W of intra-cavity oscillating light power (laser output power up to 50 W). The disadvantage of BBO crystal is that the electro-optic coefficient is small and the half-wave voltage is relatively high. Therefore, the half-wave voltage and the quarter-wave voltage can be reduced by increasing the crystal length and using two BBO crystals in series.

	Electro-optic Q-switch parameters (BBO)
Through distortion	$\lambda / 8 @ 633\text{nm}$
Optical parallelism	< 20 arc sec.
Side droop	< 5 arc sec.
degree of finish	10-5 , after coating 20-10
A quarter wave voltage	4.8kV at 1064nm, 20° C
Input / output coating	AR/AR@1064nm
damage threshold	600MW/cm ² at 1064nm, 10ns, 10Hz

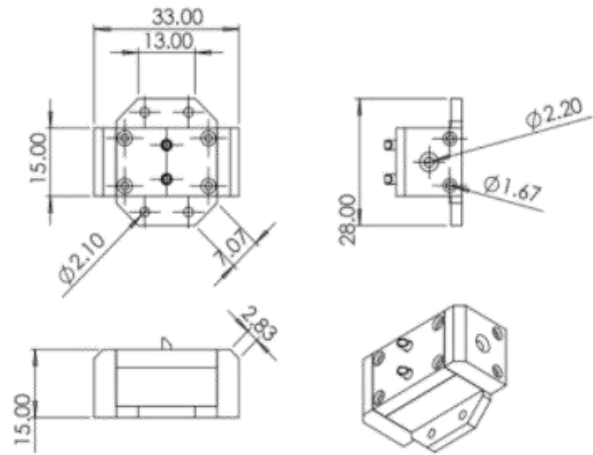
Single crystal BBO switch Standard specification						
product model	BBO-02502525-2035	BBO-02502525-151728S	BBO-030320-2035	BBO-030325-2035	BBO-040420-2035	BBO-040425-2035
limiting aperture, mm	2.2	2.2	2.7	2.7	3.7	3.7
crystal size, (W×H×L), mm ³	2.5x2.5x25	2.5x2.5x25	3x3x20	3x3x25	4x4x20	4x4x25
case size (mm)	Dia.20x35	15x17.5x28 方形外壳	Dia.20x35	Dia.20x35	Dia.20x35	Dia.20x35
$\lambda / 4$ voltage (@ 1064 nm), kV DC	2.4kV	2.4kV	3.6kV	2.9kV	4.8kV	3.9kV
capacitance, pF	2.2	2.2	3	3	4	4
penetration (%)	>99%					
extinction ratio (Voltage-Free)	1000: 1					
Input / output coating	1030nm-1064nm					
damage threshold 10ns 10Hz 1064nm	600MW/cm ²					

Double crystal BBO switch		
product model	BBOD-030320-2555	BBOD-040420-2555
limiting aperture, mm	2.7	3.7
crystal size, (W×H×L), mm ³	3x3x20 Double	4x4x20 Double
case size	Dia.25x55	Dia.25x55

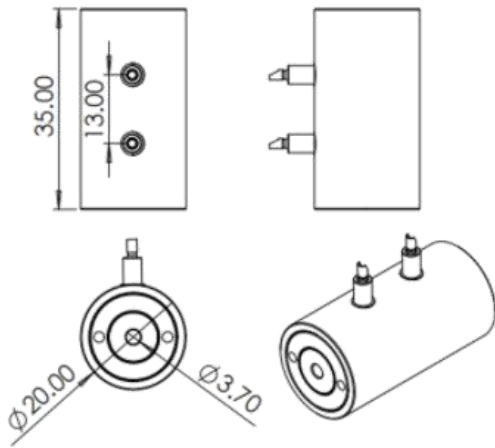
(mm)		
$\lambda/4$ voltage (@ 1064 nm), kV DC	1.8kV	2.4kV
capacitance , pF	6	7
penetration (%)	>99%	
extinction ratio (Voltage-Free)	>500: 1	
Input / output coating	1030nm-1064nm	
damage threshold 10ns 10Hz 1064nm	600MW/cm ²	



BBO3X3X20



BBO2.5X2.5X25



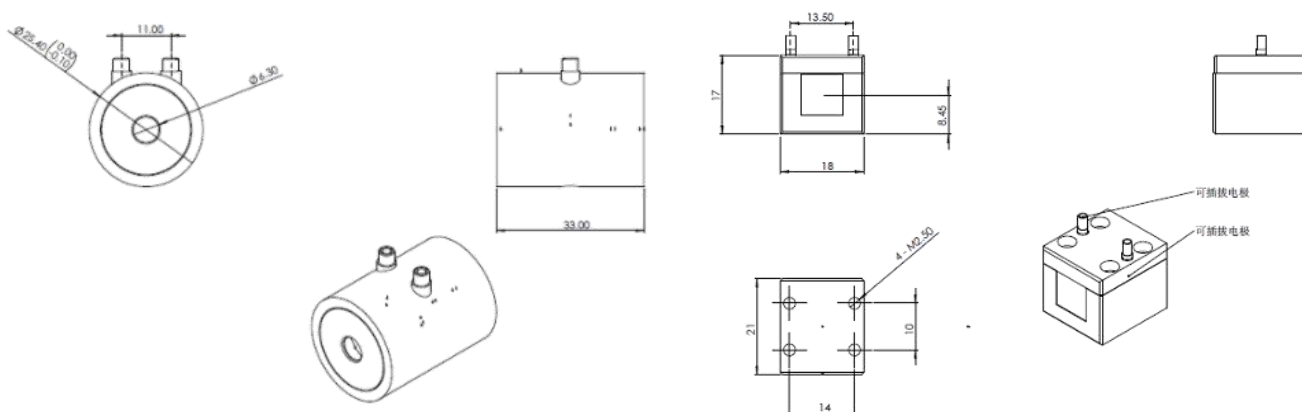
BBO4X4X20

MgO:LN Pockels cell:

Optical grade magnesium oxide doped lithium niobate (MgO : LN) crystals and lithium niobate (LN) crystals have good electro-optical properties, large nonlinear coefficient, good optical uniformity, stable mechanical and chemical properties, no deliquescence, and low half-wave voltage. Their disadvantages are low extinction ratio and low damage threshold, which are often used in low repetition rate (100Hz).

	Standard specification (MgO:LN)
Through distortion	$\lambda / 4 @ 633\text{nm}$
Optical parallelism	< 20 arc sec.
Side droop	< 5 arc sec.
degree of finish	10-5, after coating 20-10
Input / output coating	AR/AR@1064nm
damage threshold	200MW/cm ² at 1064nm, 10ns, 10Hz

Electro-optic Q-switch parameters (MgO:LN)									
MgO:LN Standard specification									
product model	crystal size	limiting aperture	case size	damage threshold 10ns 10Hz 1064nm	electrode manner	extinction ratio	half-wave voltage (@1064 nm), kV DC	penetration	capacitance, pF
MgO:LN-0920-3026	9x9x20 mm ³	9mm	Dia.30x26mm	200MW/cm ²	Cylindrical lead wire	300: 1	1.9kV	>99%	14pF
MgO:LN-0620-2533	6x6x20 mm ³	6mm	Dia.25x33mm	200MW/cm ²	Cylindrical pin electrode	300: 1	1.4kV	>99%	14pF
MgO:LN-0920-181720-S	9x9x20mm ³	9mm	18x17 x 20mm	200MW/cm ²	Square shell, pin electrode	300: 1	1.9kV	>99%	14pF



LGS Pockels cell:

Gallium lanthanum silicate crystal (LGS crystal) is an optical nonlinear material with high damage threshold. It has high electro-optic coefficient and excellent electro-optic performance. It belongs to the trigonal crystal structure. The thermal expansion coefficient is small, the thermal expansion anisotropy is weak, and the temperature stability at high temperature is good (better than quartz crystal). It has two

independent electro-optic coefficients, which are equivalent to the electro-optic coefficient of BBO crystal. The electro-optic coefficient value remains stable in a large temperature range. The crystal has good mechanical properties, no dissociation, no deliquescence, stable physical and chemical properties, and has very good comprehensive performance. The LGS crystal has a wide transmission band, and has a high transmittance from 242 nm to 3550 nm. It can be applied to electro-optic modulation and electro-optic modulation q, but the disadvantage is high voltage.

	Electro-optic Q-switch parameters (LGS)
Through distortion	$\lambda / 6 @ 633\text{nm}$
Optical parallelism	< 20 arc sec.
Side droop	< 5 arc sec.
degree of finish	20-10, after coating 40-20
capacitance	9pF
Input / output coating	AR/AR@1064nm
damage threshold	600MW/cm ² at 1064nm, 10ns, 10Hz

Standard specification		
product model	LGS-0845-3055nm	LGS-0750-3055
crystal size, (W×H×L), mm ³	8 x 8 x 45 mm	7x 7 x 50 mm
case size (mm)	Dia.30 x 55mm	Dia.30 x 55mm
$\lambda / 4$ voltage (@ 1064 nm), kV DC	3.2 kv	
penetration (%)	>98%	
extinction ratio (Voltage-Free)	>350:1	
damage threshold 10ns 10Hz 1064nm	600MW/cm ²	

RTP Pockels cell:

RTP (Rubidium Titanyle Phosphate-RbTiOPO₄) is the same type of KTP crystal, which has higher electro-optic properties and can be used for electro-optic effect and nonlinear effect. RTP crystal has the advantages of high damage threshold (about 1.8 times of KTP), high resistivity, high repetition rate, no deliquescence, stable mechanical and chemical properties, and no piezoelectric effect. The RTP transmission range is very wide. It has good optical transmittance between 400nm and 4 μ m. The transmission range is from 350nm to 4500nm, and it is very good for intracavity laser operation. RTP has a significant advantage in high anti-photodamage threshold, which can reach 1GW / cm², 1ns, 10 Hz in the 1064 nm band.

	Electro-optic Q-switch parameters (RTP)
1064nm penetration	>98.5%
limiting aperture,	3, 4, 5, 6, 7, 8, 9, 10, 11, 12mm
1064nm half-wave voltage	1000V (3x3x10+10)
case size	Dia. 25.4 x 35mm
penetration	>23dB
reception perspective	>1°
damage threshold	>600MW/cm ² at 1064nm (t = 10ns)

Stability temperature range	-50°C - +70°C

H-KTP Pockels cell:

The H-KTP crystal is grown by hydrothermal method, which overcomes the common defect of ordinary molten salt KTP crystal- ' Gray Track ' phenomenon. It has the ability of high laser damage threshold and high gray track resistance, and can be stably applied to laser systems with medium and high power, high repetition rate and high conversion efficiency for a long time.

	Electro-optic Q-switch parameters (H-KTP)
Through distortion	$\lambda / 8 @ 633\text{nm}$
Optical parallelism	< 20 arc sec.
Side droop	< 5 arc sec.
degree of finish	10-5
capacitance	9pF
Input / output coating	AR/AR@1064nm&532nm
damage threshold	600MW/cm ² at 1064nm, 10ns, 10Hz
1064nm penetration	>98.5%
extinction ratio	>150:1

Single crystal H-KTP switch Standard specification				
product model	limiting aperture	case size	$\lambda/4$ voltage	capacitance, pF
H-KTP-4	3.6 mm	$\Phi 20 \times 35\text{mm}$	1000V at 20°C	<4pF
H-KTP-8	7.6 mm	Stand with base bracket	2000V at 20°C	<4pF