

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
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.

PULSE PICKER – MP1

Features

- Pulse picking rate up to 600 kHz
- 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 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.

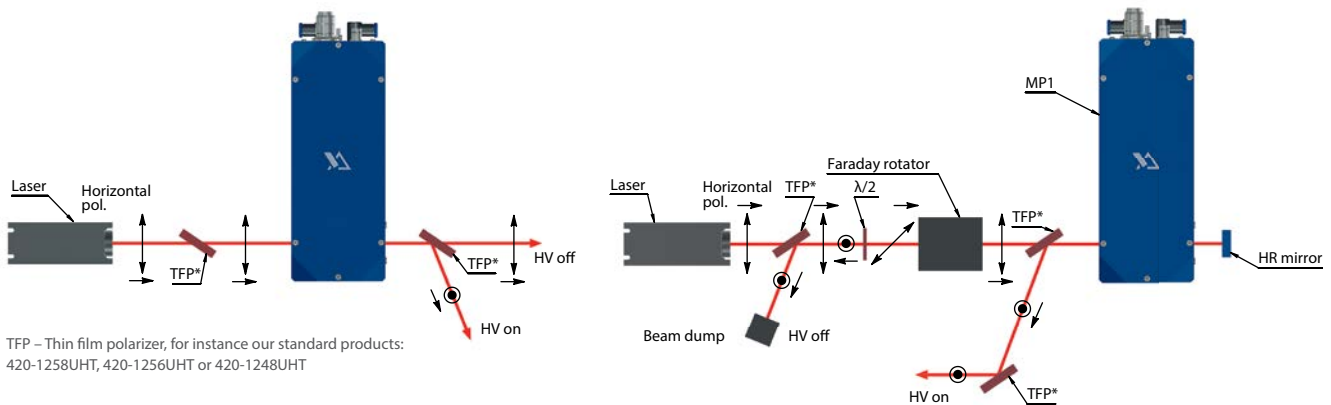


Specifications of MP1 pulse picker units

PULSE PICKER	MP1-DKDP-11	MP1-BBO-5.8	MP1-BBO-3.5	MP1-FAM-KTP-5.5
Built-in-driver, max operating rate	up to 5 kHz	up to 250 kHz	up to 600 kHz	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, $\lambda/4$			0 to $\lambda/2$
HV pulse duration	30 – 3000 ns	15 – 1250 ns	15 – 400 ns	70 – 1000 ns
HV pulse rise time, typical	< 9 ns	< 8 ns	< 7 ns	< 26 ns
HV pulse fall time, typical	< 9 ns	< 8 ns	< 7 ns	< 13 ns
Pockels cell contrast ratio, VCR	1 : 500			
Pockels cell transmission	> 97 % at 1064 nm	> 98 % at 1064 nm		
Clear aperture	$\varnothing 11$ mm	$\varnothing 5.8$ mm	$\varnothing 3.5$ mm	$\varnothing 5.5$ 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

Suggested configurations

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

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.

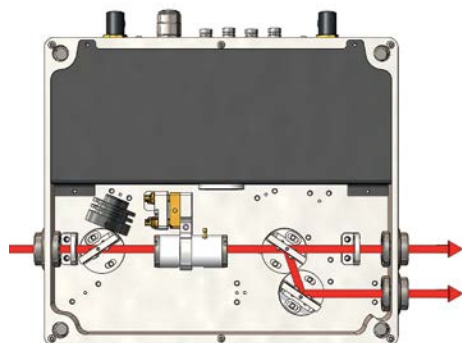


Specifications of UP2 pulse picker units

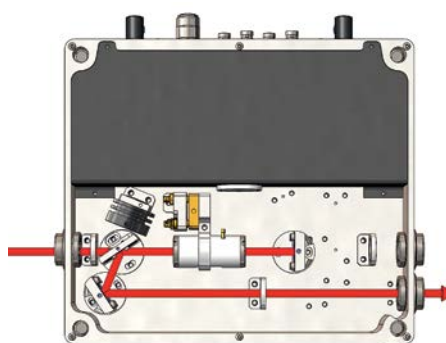
PULSE PICKER	UP2-BBO-3.5	UP2-BBO-2.5	UP2-KTP-5.5	UP2-KTP-3.5
Built-in-driver, max operating rate	up to 1 MHz	up to 2 MHz	up to 1 MHz	up to 2 MHz
Max laser repetition rate for single pulse picking	100 MHz			
HV power supply	provided in pMaster 4.2			
Operation	quarter-wave, $\lambda/4$		half-wave, $\lambda/2$	
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		> 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 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 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, $\lambda/4$ 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, $\lambda/4$ 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, $\lambda/2$ 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, $\lambda/2$ operation at 1064 nm. Pulse synchronization and delay generator, 4 output channels for trigger pulses with built-in High Voltage supply