Single Housing MIR Tunable Picosecond Laser PT277-XIR integrate a picosecond optical parametric oscillator and DPSS pump laser into a single compact housing



Picosecond Tunable Wavelength Lasers

For researchers demanding wide tuning range, high conversion efficiency and narrow line-width, EKSPLA PG&PT series optical parametric generators is an excellent choice. All models feature hands-free wavelength tuning, valuable optical components protection system as well as wide range of accessories and extension units.

Long-term experience and close cooperation with scientific institutions made it possible to create range of models, offering probably the widest tuning range: from 193 nm to 17000 nm. Versions, offering near transform limited line-width as well as operating at kHz repetition rates are available.

For customer convenience, the laser can be operated from a master device or a personal computer using various interfaces. Depending on the system configuration, control is available via the USB interface (REST API over RNDIS or VCP with ASCII commands), the RS-232 interface (ASCII commands), the LAN interface (REST API), or from the remote control pad with a backlit display that remains easy to read even while wearing laser safety glasses.

EKSPLA PL series picosecond mode-locked lasers are recommended for pumping of PG series Optical Parametric Generators. Combining together, researchers get complete tunable wavelength system, capable to assist researchers in wide range of spectroscopy applications: time-resolved pump-probe, nonlinear, infrared spectroscopy, laser-induced fluorescence, scanning near-field optical microscopy.

FEATURES

- *Wide spectral range*
- *Narrowband*
- *Pump laser from 8 to 30 picoseconds*
- *Fast wavelength scan (sweep) PT277, PT501, PT401 lasers systems*

SHORT SELECTION GUIDE

For Your convenience, table contains all available options and highest parameter values. Not all output specifications are available at the same time simultaneously. Please refer to the catalog page for exact specifications and available options.

Model	Output wavelength range	Max pulse repetition rate	Bandwidth	Special feature	Page
PGx01	193 – 2300 nm	50 Hz	< 6 cm^{-1}	High peak power (>50 MW), ideal for non-linear spectroscopy	16
PT277	1403 – 18500 nm	87 MHz	< 4 cm^{-1}	MHz-level pulse repetition rate. integrated pump laser and OPG in a single housing Mid-infrared spectral range	20
PT403	210 – 2300 nm	1000 Hz	< 9 cm^{-1}	Pump laser and OPG integrated in 2-in-1 combo housing	24
PT501	2300 – 16000 nm	100 Hz	< 3 cm^{-1}	High pulse energy. integrated pump laser and OPG in a single housing Mid-infrared spectral range	28
PT401	210 – 2300 nm	1000 Hz optionally 100 Hz	< 4 cm^{-1}	High pulse energy, integrated pump laser and OPG in a single housing	31

PGx01 SERIES

High Energy Broadly Tunable OPA



FEATURES

- *Ultra-wide spectral range from **193** to **2300 nm***
- *High peak power (**>50 MW**) ideal for non-linear spectroscopy applications*
- *Narrow linewidth **<6 cm^{-1}** (for UV < 9 cm^{-1})*
- *Motorized hands-free tuning in 193–2300 nm*
- *PC control*
- *Remote control via keypad*

APPLICATIONS

- *Nonlinear spectroscopy: vibrational-SFG, surface-SH, Z-scan*
- *Pump-probe experiments*
- *Laser-induced fluorescence (LIF)*
- *Other laser spectroscopy applications*

Travelling Wave Optical Parametric Generators (TWOPG) are an excellent choice for researchers who need an ultra-fast tunable coherent light source from UV to mid IR.

Design

The units can be divided into several functional modules:

- optical parametric generator (OPG);
- diffraction grating based linewidth narrowing system (LNS);
- optical parametric amplifier (OPA);
- electronic control unit.

The purpose of the OPG module is to generate parametric superfluorescence (PS). Spectral properties of the PS are determined by the properties of a nonlinear crystal and usually vary with the generated wavelength. In order to produce narrowband radiation, the output from OPG is narrowed by LNS down to 6 cm^{-1} and then used to seed OPA.

Output wavelength tuning is achieved by changing the angle of the nonlinear crystal(s) and grating. To ensure exceptional wavelength reproducibility, computerized control unit driven precise stepper motors rotate the nonlinear crystals and diffraction grating. Nonlinear crystal temperature stabilization ensures long-term stability of the output radiation wavelength.

In order to protect nonlinear crystals from damage, the pump pulse energy is monitored by built-in photodetectors, and the control unit produces an alert signal when pump pulse energy exceeds the preset value.

For customer convenience, the laser can be operated from a master device or a personal computer using various interfaces. Depending on the system configuration, control is available via the USB interface (REST API over RNDIS or VCP with ASCII commands), the RS-232 interface (ASCII commands), the LAN interface (REST API), or from the remote control pad with a backlit display that remains easy to read even while wearing laser safety glasses.

Available models

Model	Features
PG401	Model has a tuning range from 420 to 2300 nm and is optimized for providing highest pulse energy in the visible part of the spectrum. The wide tuning range makes PG401 units suitable for many spectroscopy application.

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SPECIFICATIONS [1]

Model	PG401	PG401-SH	PG401-DUV
Tuning range			
DUV	–		193 – 209.95 nm
SH	–	210 – 340, 370 – 419 nm	–
Signal	420 – 680 nm	–	
Idler	740 – 2 300 nm	–	
DFG	–		
Output pulse energy [2]	> 1000 µJ at 450 nm	> 100 µJ at 300 nm	> 50 µJ at 200 nm
Linewidth	< 6 cm^{-1}	< 9 cm^{-1}	
Max pulse repetition rate	50 Hz		
Scanning step			
Signal	0.1 nm	–	
Idler	1 nm	–	
Typical beam size [3]	~4 mm	~3 mm	
Beam divergence [4]	< 2 mrad		
Beam polarization	–	vertical	
Signal	horizontal	–	
Idler	horizontal	–	
Typical pulse duration	~20 ps		
PUMP LASER REQUIREMENTS			
Pump energy			
at 355 nm	10 mJ		
at 532 nm	–		
at 1064 nm	–		2 mJ
Recommended pump source [5]	PL2231-50-TH, PL2251A-TH		
Beam divergence	< 0.5 mrad		
Beam profile	homogeneous, without hot spots, Gaussian fit >90 %		
Pulse duration [6]	29 ± 5 ps		
PHYSICAL CHARACTERISTICS			
Size (W x L x H)	456 × 633 × 244 mm	456 × 1031 × 249 ± 3 mm	
OPERATING REQUIREMENTS			
Room temperature	15 – 30 °C		
Power requirements	100 – 240 V AC single phase, 47 – 63 Hz		
Power consumption	< 100 W		

[1] Due to continuous improvement, all specifications are subject to change without notice. Parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 450 nm for PG401 units, and 300 nm for PG401SH units and for basic system without options.

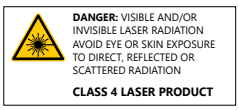
[2] See tuning curves for typical pulse energies at other wavelengths. Higher energies are available, please contact EKSPLA for more details.

[3] Beam diameter is measured at the $1/e^2$ level.

[4] Full angle measured at the FWHM point.

[5] If a pump laser other than PL2250 or PL2230 is used, measured beam profile data should be presented when ordering.

[6] Should be specified if non-EKSPLA pump laser is used.



Communication interface	Description
USB*	REST API over RNDIS
RS232	ASCII commands
LAN	REST API

* Default, other option: ASCII commands over virtual serial port.

CUSTOMIZED FOR SPECIFIC REQUIREMENTS

Please note that these products are custom solutions tailored for specific applications or specific requirements.

Interested? Tell us more about your needs and we will be happy to provide you with tailored solution.

Gap free tuning extension for PG401:

- Gap-free tuning range 410 – 709, 710 – 2300 nm
- Linewidth < 18 cm^{-1}

TUNING CURVES

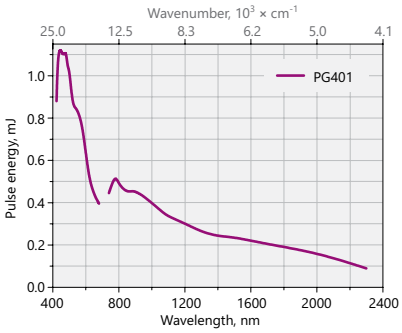


Fig 1. Typical PG401 model tuning curve *Pump energy: 10 mJ at 355 nm*

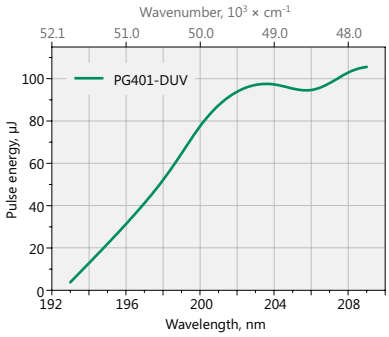


Fig 2. Typical PG401-DUV model tuning curve

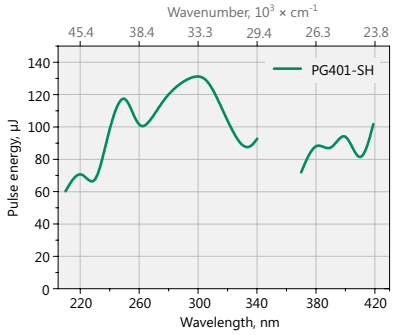


Fig 3. Typical PG401-SH model tuning curve. *Pump energy: 10 mJ at 355 nm*

OUTLINE DRAWINGS

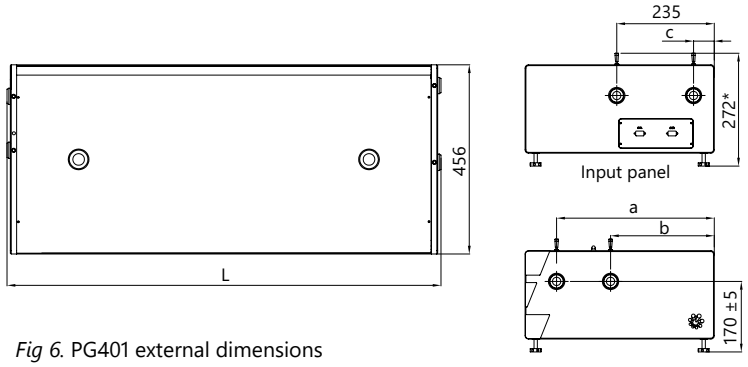


Fig 6. PG401 external dimensions

OUTPUTS PORTS

Model	L, mm	a, mm	b, mm	c, mm	Port 1	Port 2
PG401	633	380	×	×	420–680 nm, 740–2300 nm	–
PG401-SH	838	380	×	×	210–340 nm, 370–419.9 nm, 420–680 nm, 740–2300 nm	–
PG401-SH/DUV	1026	380	250	50	210–340 nm, 370–419 nm, 420–680 nm, 740–2300 nm	192–209.95 nm

RECOMMENDED UNITS ARRANGEMENT ON OPTICAL TABLE

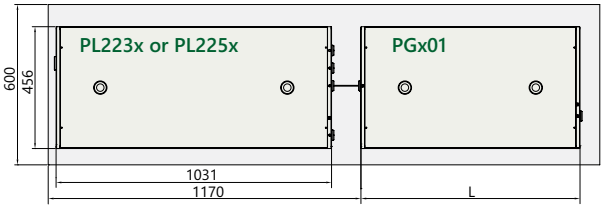


Fig 4. Arrangement of pump laser and PGx01 unit on optical table

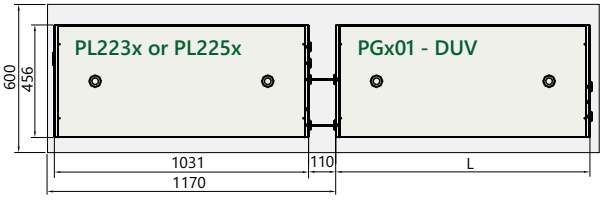


Fig 5. Arrangement of pump laser and PGx01-DUV unit on optical table

ORDERING INFORMATION

PG401-DUV

Model
PG4xx → 355 nm pump

01 → travelling wave, narrowed linewidth
02 → travelling wave, not narrowed
11 → synchronous pumping, narrowed

Optional tuning range extension
DUV → 193–209.95 nm
SH → 210-340 nm & 370-420 nm

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

PT277 SERIES

Single Housing Mid-Infrared Tunable Picosecond Laser System



The PT277 series are turn-key, single-housing mid-infrared lasers integrating a pump laser and OPO. PT277 delivers narrowband (2 – 4 cm^{-1}) pulses in the wide spectral range of 703 – 18 500 nm, with an optional optically synchronised second output at 1064 nm. Hands-free spectral scanning is superior for vibrational spectroscopy, nanoscopy, nonlinear spectroscopy. The Fast Scan accelerates spectral measurements through rapid wavelength switching and full-range scanning.

The laser has an internal air cleaning system to clean from water vapor and organics.

Nearly diffraction-limited divergence and beam-direction stability throughout the entire spectral tuning range are essential in tunable radiation applications requiring high-precision laser beam focusing.

Fast and fully automatic wavelength tuning is achieved by advanced microprocessor control. The wavelength tuning elements are mounted on precise closed-loop micro-stepping motors. The temperatures of the nonlinear crystals are controlled by thermo-controllers. No additional manual adjustment of the laser system is needed.

PT277 series features two models

Model	Features
PT277-SI	Tuning range: 1403 – 2020 nm (7127 – 4951 cm^{-1}) 2250 – 4400 nm (4444 – 2273 cm^{-1})
PT277-XIR	Tuning range: 1403 – 2020 nm (7127 – 4951 cm^{-1}) 2250 – 4400 nm (4444 – 2273 cm^{-1}) 4800 – 18500 nm (2083 – 540 cm^{-1})
-SH option	Tuning range 703 – 1024 nm (14 225 – 9 766 cm^{-1})
-H option	Synchronised second output at 1064 nm

FEATURES

- ***Tuning range 703 – 18 500 nm (14 225 – 540 cm^{-1})***
- *Optically synchronised second output at 1064 nm*
- ***Hands-free tuning**: motorized for the entire tuning range*
- ***Linewidth <4 cm^{-1}** in the entire tuning range*
- *Nearly diffraction limited divergence*
- *Beam direction stability in the entire tuning range*
- ***Single housing**: integrates a pump laser and OPO in a single housing*
- *Internal air cleaning system*
- *PC control via USB (virtual COM port), RS232, LAN using REST API commands*
- *Fast wavelength scan (sweep)*
- *System with two independently tunable wavelengths (available on request)*

APPLICATIONS

- *Infrared spectroscopy*
- *SNOM (scanning near field microscopy)*
- *PiFM (Photoinduced Force Microscopy)*
- *Nonlinear spectroscopy:*
  - *SFG (Sum frequency generation spectroscopy)*
  - *CARS (Coherent Anti-Stokes Raman Spectroscopy)*

SPECIFICATIONS [1]

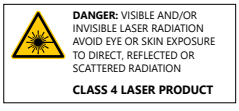
Parameter	PT277-SI	PT277-XIR
OUTPUT SPECIFICATIONS		
Tuning range		
Signal	1403 – 2020 nm (7127 – 4951 cm^{-1})	
Idler	2250 – 4400 nm (4444 – 2273 cm^{-1})	
DFG	–	4800 – 18 500 nm (2083 – 540 cm^{-1})
Output power [2]		
@ 1403 – 2020 nm (Signal)	> 400 mW	
@ 2250 – 4000 nm (Idler)	> 100 mW	
@ 12 500 nm (DFG)	–	> 10 mW
@ 18 000 nm	–	> 1 mW
Linewidth	< 4 cm^{-1}	
Pulse repetition rate	~ 87 MHz (same as pump laser)	
Pulse duration	7.5±1 ps	
Typical beam diameter [3] (at $1/e^2$ level)	~ 3 mm @ 3000 nm	
Typical beam divergence [4]	< 5 mrad @ 1600 nm	
Beam pointing stability	< 50 µrad rms @ 1600 nm	
Polarization		
Signal and idler	linear, vertical	
DFG	–	linear, vertical
Sweep speed for spectral range		
From 1403 to 2020 nm (Signal)	< 4 s	
From 2250 to 4400 nm (Idler)	< 4 s	
From 4800 to 18 000 nm (DFG)	–	< 2 s
Output power modulation frequency (AOM)	0 Hz – 2 MHz	
PHYSICAL CHARACTERISTICS		
Laser unit size (W×L×H)	320 × 766 × 241 mm	
Power supply size (W×L×H)	483 × 140 × 390 mm , stand-alone	
Chiller (third-party, approx.) (W×L×H)	290 × 420 × 290 mm , stand-alone	
Umbilical length	3 m	
SERVICE AND OPERATION REQUIREMENTS		
Cooling	water-air	
Room temperature	22 ± 2 °C	
Room temperature stability	± 1 °C	
Relative humidity	< 80 % (non-condensing)	
Power requirements	100 – 240 VAC (-10% / +5%), single phase, 50/60 Hz	
Power consumption	< 1 kW	
Cleanness of the room	not worse than ISO Class 9	

[1] All specifications are subject to change without notice. The parameters given in the table are indicators of the typical performance of the laser system. They may vary with each manufactured laser system.

[2] Output powers are specified at selected wavelengths. See typical tuning curves for power at other wavelengths. Power drops are possible.

[3] May vary depending on pump pulse energy.

[4] Full angle at FWHM level.



Note: The laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer than 1 hour then the laser system needs to warm up for a few hours before switching radiation on. The laser and auxiliary units must be installed in a place free from dust and aerosols. It is advisable to operate the laser in an air-conditioned room and to place the laser at a distance from air conditioning outlets. The laser should be positioned on a solid optical table. Access from both sides should be ensured. Intense sources of vibrations like freight elevators, railway stations, etc. should be avoided nearby.

OPTIONS

Option -H

Synchronised second output at 1064 nm. Output power >0.5 W.
Available with PT277-SI or PT277-XIR.

Option -SH

Tuning range 703 – 1024 nm (14 225 – 9766 cm^{-1}).
Available with PT277-SI or PT277-XIR.

TUNING CURVES

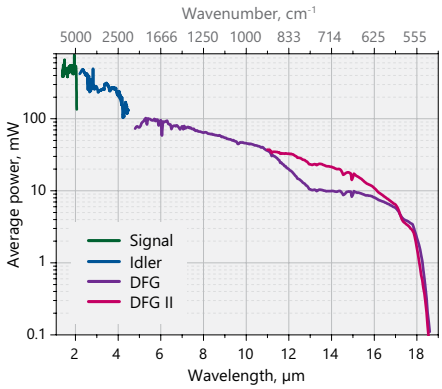


Fig 1. Typical PT277-XIR laser system output tuning curve.
The actual tuning curve might differ from presented here.

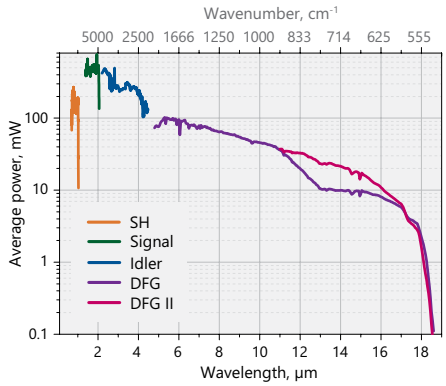


Fig 2. Typical PT277-XIR-SH laser system output tuning curve.
The actual tuning curve might differ from presented here.

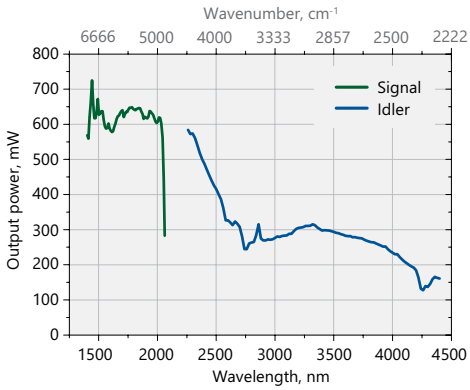


Fig 3. Typical PT277-SI laser system output tuning curve.
The actual tuning curve might differ from presented here.

ACOUSTO-OPTIC MODULATOR AOM

An acousto-optic modulator AOM is used for the output pulse train modulation.
Modulation frequency range is 0 – 2 MHz.

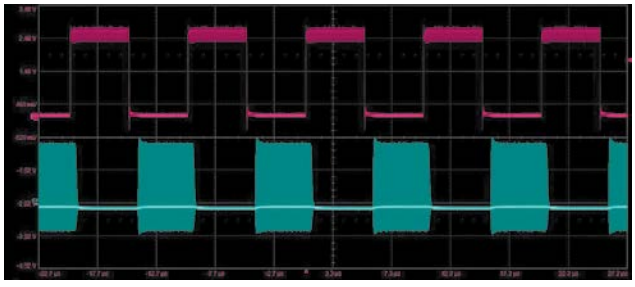


Fig 4. AOM control example:
magenta – 100 kHz control TTL signal to AOM CONTROL;
cyan – optical signal

COMMUNICATION INTERFACES

For customer convenience, the laser can be operated from a master device or a personal computer using various interfaces. Depending on the system configuration, control is available via the USB interface (REST API over RNDIS or VCP with ASCII commands), the RS-232 interface (ASCII commands), the LAN interface (REST API), or from the remote control pad with a backlit display that remains easy to read even while wearing laser safety glasses.

Communication module interfaces

Interface	Description
USB*	REST API over RNDIS
RS232	ASCII commands
LAN	REST API

* Default, other option: ASCII commands over virtual serial port

OUTLINE DRAWINGS



Fig 5. PT277-SI laser features the same external housing as PT277-XIR. PT277-XIR and PT277-SI lasers feature attachable handles that enable easy transportation and installation

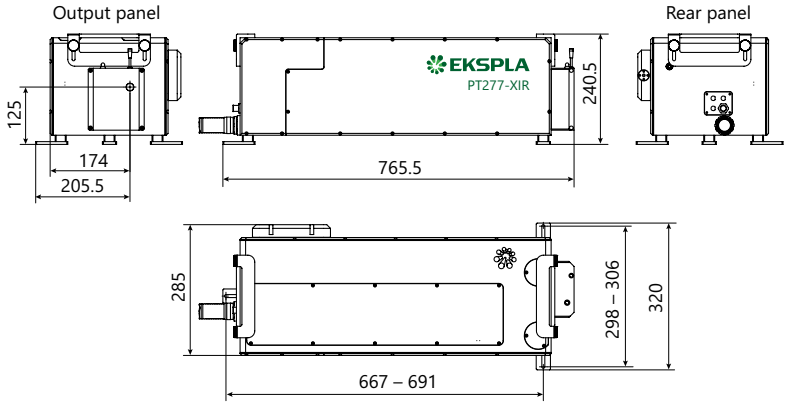


Fig 6. External dimensions of PT277-XIR and PT277-SI laser units (the same external housing)

PT403 SERIES

Tunable Wavelength Picosecond Laser



PT403 series laser systems integrate a picosecond 1 kHz repetition rate DPSS pump laser and optical parametric generator into a single housing. New picosecond tunable wavelength laser system provide from 210 to 2300 nm from the one box.

Unlike other solutions in the market, offering laser and OPO in different units, new approach features pump laser and OPO integrated into one unit. That delivers almost twice smaller footprint, shorter installation, better stability and other substantial benefits for user.

All-in one-box solution features all components placed into one compact housing. It means better overall stability because all potential causes for misalignment between separate units of pump laser and optical parametric generator are eliminated.

To ensure reliability industry and market tested solutions were employed during the build-up of PT403.

Pump laser is based on industry "gold standard" diode pumped EKSPLA PL2210 series picosecond mode-locked laser. Improved output parameters and reduced maintenance costs are achieved by employing diode-pumped-only technology.

Optical parametric generator is based on PGx03 picosecond optical parametric amplifier systems. Fully automatized and microprocessor based control system ensures hands free precise wavelength tuning.

PT403 was built without sacrificing any parameters or reliability. The optical design is optimized to produce low divergence beams with moderate linewidth (typically < 9 cm^{-1}) at approximately 20 ps pulse duration. Featuring 1 kHz repetition rate PT403 tuneable laser is versatile cost-efficient tool for scientists researching various kind of disciplines like time resolved fluorescence, pump-probe spectroscopy, laser-induced fluorescence, Infrared spectroscopy and other aplications.

Simple and convenient laser control

For customer convenience the laser can be operated from master device or personal computer through USB (VCP, ASCII commands), RS232 (ASCII commands), LAN (REST API) or RS232 (ASCII commands), LAN (REST API) depending on the system configuration or from remote control pad with backlit display that is easy to read even while wearing laser safety glasses.

FEATURES

- *Tuning range: 210 – 2300 nm*
- *Motorized hands-free tuning*
- *High pulse energy at 1 kHz rates*
- *Diode pumped solid state design*
- *Narrow linewidth < 9 cm^{-1}*
- *Remote control via keypad*
- *PC control*
- *Optional streak camera triggering pulse with < 10 ps rms jitter*
- *Turn-key operation*
- *Air cooled – external water supply is not required*
- *Low maintenance costs*

APPLICATIONS

- *Time resolved fluorescence (including streak camera measurements), pump-probe spectroscopy*
- *Laser-induced fluorescence*
- *Infrared spectroscopy*
- *Nonlinear spectroscopy: surface-SH, Z-scan*
- *Other spectroscopic and nonlinear optics applications*

BENEFITS

- *Better long term stability (compared with layout where laser and OPO are in different units)*
- *Higher safety – all beams are in the box*
- *Shorter installation time*
- *Almost twice smaller footprint*

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SPECIFICATIONS [1]

Model	PT403	PT403-SH
OPA SPECIFICATIONS		
Output wavelength tuning range		
SH	–	210 – 409 nm
Signal	410 – 709 nm	
Idler	710 – 2300 nm	
Output pulse energy [2]		
SH [3]	–	15 µJ
Signal [4]	> 75 µJ	
Idler [5]	> 25 µJ	
Pulse repetition rate	1000 Hz	
Linewidth	< 9 cm^{-1}	< 12 cm^{-1}
Typical pulse duration [6]	~ 20 ps	
Scanning step		
SH	–	0.05 nm
Signal	0.1 nm	
Idler	1 nm	
Typical beam size [7]	~ 2 mm	
Beam divergence [8]	< 2 mrad	
Beam pointing stability	≤ 100 µrad rms	
Beam polarization		
SH	–	horizontal
Signal	horizontal	
Idler	vertical	
Optical pulse jitter		
Internal triggering regime [9]	< 50 ps (StDev) in respect to TRIG1 OUT pulse	
External triggering regime	~ 3 ns (StDev) in respect to SYNC IN pulse	
TRIG1 OUT pulse delay [10]	-400 ... 150 ns	
OPERATING REQUIREMENTS		
Room temperature	22 ± 2 °C	
Relative humidity	20 – 80% (non-condensing)	
Power requirements	100 – 240 V single phase, 47 – 63 Hz	
Power consumption	< 0.6 kW	
Water service	air cooled	
Cleanness of the room	not worse than ISO Class 9	

1) Due to continuous improvement, all specifications are subject to change without notice. Parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 450 nm for PT403 units for basic system without options.

2) Pulse energies are specified at selected wavelengths. See typical tuning curves for pulse energies at other wavelengths.

3) Measured at 260 nm.

4) Measured at 450 nm.

5) Measured at 1000 nm.

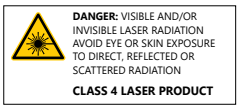
6) Estimated assuming 30 ps at 1064 nm pump pulse. Pulse duration varies depending on wavelength and pump energy.

7) Beam diameter at the $1/e^2$ level. Can vary depending on the wavelength.

8) Beam divergence measured at FWHM.

9) < 10 ps jitter is provided with PRETRIG option.

10) TRIG1 OUT lead or delay can be adjusted with 0.25 ns steps in specified range.



Communication module interfaces

Interface	Description
USB *	REST API over RNDIS
RS232	ASCII commands
LAN	REST API

* Default, other option: ASCII commands over virtual serial port

DESIGN

The units can be divided into several functional parts:

1. 1 kHz repetition rate DPSS pump laser,
2. Optical parametric generator (OPG),
3. Electronic control unit.



Fig 1. PT403 unit

PT403 series laser systems integrate a picosecond 1 kHz repetition rate DPSS pump laser and optical parametric generator into a single housing. As pump laser is used PL2210 series diode-pumped, air-cooled, mode-locked Nd:YAG laser. Picosecond tunable wavelength laser system provide from 210 to 2300 nm from the single optical unit.

OPTIONS

▶ Option SF

Energy increasing in 300 – 409 nm range by sum-frequency generation. > 20 µJ @ 340 nm. Pulse energies are ~ 10 % lower in comparison to the system without SF option. See table below for pulse energy specifications:

Model [1]	PT403	PT403-SH
SH [2]	–	> 13 µJ
Signal [3]	> 70 µJ	
Idler [4]	> 22 µJ	

[1] Due to continuous improvement, all specifications are subject to change without notice. Parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.

[2] Measured at 260 nm.
[3] Measured at 450 nm.
[4] Measured at 1000 nm.

▶ Options -H, -2H, -3H

1064 nm or 532 nm, or 355 nm outputs [1] [2]

– H output energy 0.7 mJ;

– 2H output energy 0.3 mJ;

– 3H output energy 0.3 mJ.

[1] Outputs are not simultaneous.
[2] Inquire for outputs simultaneously with PG.

CUSTOMIZED FOR SPECIFIC REQUIREMENTS

Please note that these products are custom solutions tailored for specific applications or specific requirements.

Interested? Tell us more about your needs and we will be happy to provide you with tailored solution.

TUNING CURVES

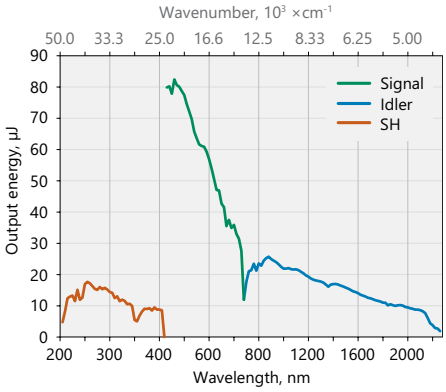


Fig 2. Typical PT403 tuning curves in signal (410 – 709 nm), idler (710 – 2300 nm) ranges, SH (210 – 409 nm) ranges

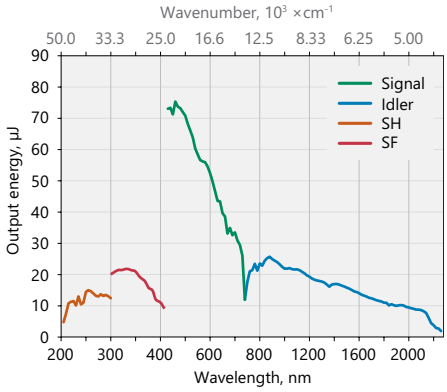


Fig 3. Typical PT403 tuning curves in signal (410 – 709 nm), idler (710 – 2300 nm) ranges, SH (210 – 300 nm), SF (300 – 409 nm) ranges

Note: The energy tuning curves are affected by air absorption due narrow linewidth. These pictures present pulse energies where air absorption is negligible.

OUTLINE DRAWINGS

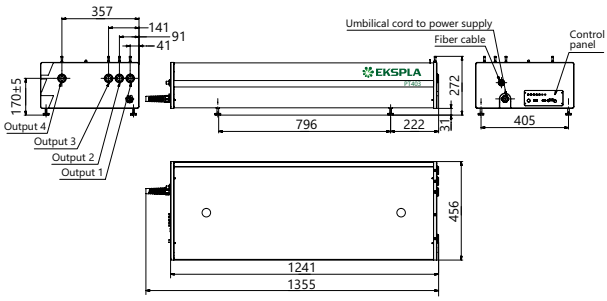


Fig 4. PT403 series laser head typical outline drawing

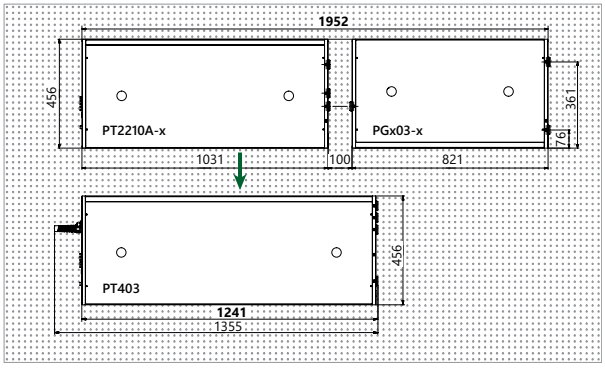


Fig 5. Compared with layout where laser and OPO are in different units, PT403 features almost twice smaller footprint

OUTPUTS PORTS

Model	L, mm	Port 1	Port 2	Port 3	Port 4
PT403	1241	1064 / 532 nm	–	355 nm	410 – 2300 nm
PT403-SH/SF	1441	1064 / 532 nm	210 – 2300 nm	355 nm	410 – 2300 nm

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

PT501 SERIES

Single Housing Mid-Infrared Tunable Picosecond Laser System



PT501 series laser systems integrate a picosecond optical parametric oscillator (OPO) and a pump laser in a single compact housing. Mounting the components on the same frame provides a robust solution. It makes laser installation shorter, improves long-term stability, and reduces maintenance costs.

Fast and fully automatic wavelength tuning is achieved by advanced microprocessor control. The wavelength tuning elements are mounted on precise closed-loop micro-stepping motors. The temperatures of the nonlinear crystals are controlled by precise thermo-controllers. No additional manual adjustment of the laser system is needed.

For customer convenience, the laser can be operated from a master device or a personal computer using various interfaces. Depending on the system configuration, control is available via the USB interface (REST API over RNDIS or VCP with ASCII commands), the RS-232 interface (ASCII commands), the LAN interface (REST API), or from the remote control pad with a backlit display that remains easy to read even while wearing laser safety glasses.

FEATURES

- *Tuning range **2300 – 16000 nm (4345 – 625 cm^{-1})***
- ***Hands-free tuning**: motorized for the entire tuning range*
- *Linewidth **<3 cm^{-1}** in the entire tuning range*
- *Repetition rate **100 Hz***
- ***Air cooled** – external water supply is not required*
- *Beam direction stability in the entire tuning range*
- ***Single housing**: integrates a pump laser and OPO in a single housing*
- *PC control via USB (virtual COM port), RS232, LAN using REST API commands*
- *Fast wavelength scan (sweep)*

APPLICATIONS

- *Infrared spectroscopy*
- *SFG (sum frequency generation spectroscopy)*

PT501 series features

Model	Features
PT501	provides a **narrowband radiation** with a linewidth <3 cm^{-1} in the entire tuning range: 2300 – 16000 nm (4345 – 625 cm^{-1}). Repetition rate 100 Hz.

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SPECIFICATIONS [1]

Model	PT501
Tuning range	2300–16000 nm
Output pulse energy	
at 3500 nm	> 200 µJ
at 10000 nm	> 50 µJ
Bandwidth	< 3 cm^{-1}
Pulse repetition rate	100 Hz
Tuning resolution	< 0.5 cm^{-1}
Typical beam size [2]	~4 mm
Beam divergence [3]	< 3 mrad
Beam pointing stability	≤ 100 µrad rms
Beam polarization	horizontal , > 100:1
Wavelength sweep	available
Optical pulse jitter	
Internal triggering regime [4]	< 50 ps (StdDev.) in respect to TRIG1 OUT pulse
External triggering regime [5]	~3 ns (StdDev.) in respect to SYNC IN pulse
TRIG1 OUT pulse delay	Positive pulse with controllable delay. Pulse width ~100 ns. Default delay – ~250 µs before optical pulse up to 10 ms.
PHYSICAL CHARACTERISTICS	
Laser unit size (W × L × H)	~ 508 × 1030 × 244 mm
Power supply size (W × L × H)	450 × 450 × 140 mm
OPERATING REQUIREMENTS	
Room temperature	22 ± 2 °C
Relative humidity	20–80 % (non-condensing)
Power requirements	100–240 V AC single phase, 47–63 Hz
Power consumption	< 0.5 kW
Cooling	air cooled
Cleanness of the room	not worse than ISO Class 9

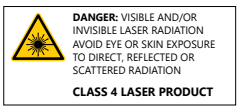
[1] Due to continuous improvement, all specifications are subject to change without notice. Parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 3500 nm for PT501 units for basic system without options.

[2] Beam diameter is measured at the $1/e^2$ level.

[3] At 3000 nm, Full angle measured at the FWHM point

[4] With respect to TRIG1 OUT pulse. <10 ps jitter is provided with PRETRIG option.

[5] With respect to SYNC IN pulse.



Communication module interfaces

Interface	Description
USB*	REST API over RNDIS
RS232	ASCII commands
LAN	REST API

* Default, other option: ASCII commands over virtual serial port

TUNING CURVES

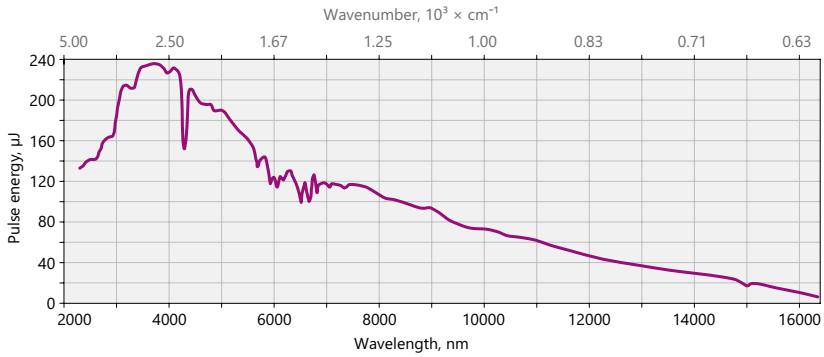


Fig 1. Typical PT501 tuning curve

OUTLINE DRAWINGS

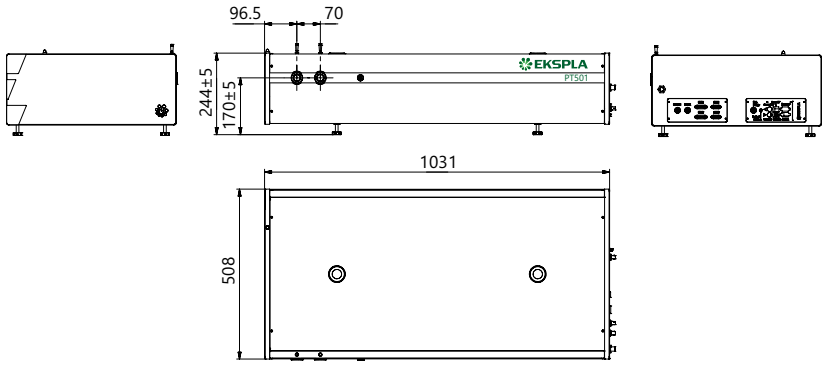


Fig 2. Typical PT501 outline drawing

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PT401 SERIES

Single Housing UV–VIS–NIR Tunable Picosecond Laser System



PT401 series laser systems integrate a picosecond optical parametric oscillator (OPO) and a pump laser in a single compact housing. Mounting the components on the same frame provides a robust solution. It makes laser installation shorter, improves long-term stability, and reduces maintenance costs.

Fast and fully automatic wavelength tuning is achieved by advanced microprocessor control. The wavelength tuning elements are mounted on precise closed-loop micro-stepping motors. The temperatures of the nonlinear crystals are controlled by precise thermo-controllers. No additional manual adjustment of the laser system is needed.

For customer convenience, the laser can be operated from a master device or a personal computer using various interfaces. Depending on the system configuration, control is available via the USB interface (REST API over RNDIS or VCP with ASCII commands), the RS-232 interface (ASCII commands), the LAN interface (REST API), or from the remote control pad with a backlit display that remains easy to read even while wearing laser safety glasses.

FEATURES

- *Tuning range **210 – 2300 nm***
- ***Hands-free tuning**: motorized for the entire tuning range*
- *Linewidth **<4 cm^{-1}***
- *Repetition rate **1000 Hz**, optionally 100 Hz*
- ***Air cooled** – external water supply is not required*
- *Beam direction stability in the entire tuning range*
- ***Single housing**: integrates a pump laser and OPO in a single housing*
- *PC control via USB, RS232 interface, LAN interface*
- *Fast wavelength scan (sweep)*

APPLICATIONS

- *Time resolved fluorescence (including streak camera measurements)*
- *Pump-probe spectroscopy*
- *Nonlinear spectroscopy*
- *Other spectroscopic and nonlinear optics applications*

PT401 series features

Model	Features
PT401	Provides a **narrowband radiation** with a linewidth <4 cm^{-1}. Tuning range 210 – 2300 nm. Repetition rate 1000 Hz, optionally 100 Hz.

SPECIFICATIONS [1]

Model	PT401	PT401-SH-SF
OPA SPECIFICATIONS		
Output wavelenth tuning range		
SH, SF	–	210–409 nm
Signal	410–709 nm	
Idler	710–2300 nm	
Output pulse energy [2]		
SH, SF [3]	–	> 45 µJ
Signal [4]	> 180 µJ	
Idler [5]	> 60 µJ	
Pulse repetition rate	1000 Hz	
Linewidth	< 4 cm^{-1}	< 6 cm^{-1}
Typical pulse duration [6]	~ 20 ps	
Tuning resolution	< 0.5 cm^{-1}	
Typical beam size [7]	~2–3 mm	
Beam divergence [8]	< 2 mrad	
Beam pointing stability	≤ 100 µrad rms	
Beam polarization		
SH, SF		horizontal
Signal	horizontal	
Idler	vertical	
Wavelength sweep	available	
Optical pulse jitter		
Internal triggering regime [9]	< 50 ps (StdDev.) in respect to TRIG1 OUT pulse	
External triggering regime [10]	~3 ns (StdDev.) in respect to SYNC IN pulse	
TRIG1 OUT pulse delay	Positive pulse with controllable delay. Pulse width ~100 ns. Default delay – ~250 µs before optical pulse up to 10 ms.	
PHYSICAL CHARACTERISTICS		
Laser unit size (W × L × H)	~ 508 × 1030 × 244 mm	
Power supply size (W × L × H)	450 × 450 × 140 mm	
OPERATING REQUIREMENTS		
Room temperature	22 ± 2 °C	
Relative humidity	20–80 % (non-condensing)	
Power requirements	100–240 V AC single phase, 47–63 Hz	
Power consumption	< 0.5 kW	
Cooling	air cooled	
Cleanness of the room	not worse than ISO Class 9	

1) Due to continuous improvement, all specifications are subject to change without notice. Parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 450 nm for PT401 units for basic system without options.

2) Pulse energies are specified at selected wavelengths. See typical tuning curves for pulse energies at other wavelengths.

3) Measured at 260 nm.

4) Measured at 450 nm.

5) Measured at 1000 nm.

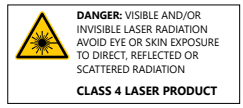
6) Estimated assuming 30 ps at 1064 nm pump pulse. Pulse duration varies depending on wavelength and pump energy.

7) Beam diameter at the $1/e^2$ level. Can vary depending on the wavelength.

8) Beam divergence measured at FWHM.

9) < 10 ps jitter is provided with PRETRIG option.

10) TRIG1 OUT lead or delay can be adjusted with 0.25 ns steps in specified range.



Communication module interfaces

Interface	Description
USB*	REST API over RNDIS
RS232	ASCII commands
LAN	REST API

* Default, other option: ASCII commands over virtual serial port

OPTIONS

▶ Option 100 Hz

Pulse repetition rate 100 Hz.
Energy increasing 2 times to compare with system 1000 Hz repetition rate.

▶ Options DUV

– Tuning range 192 – 209.95 nm
– Beam polarization: vertical

TUNING CURVES

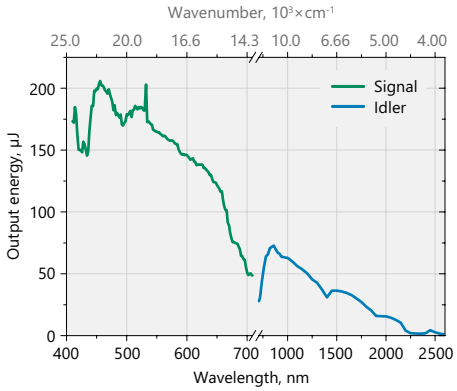


Fig. 1. Typical PT401 tuning curves in signal (410 – 709 nm), idler (710 – 2300 nm)

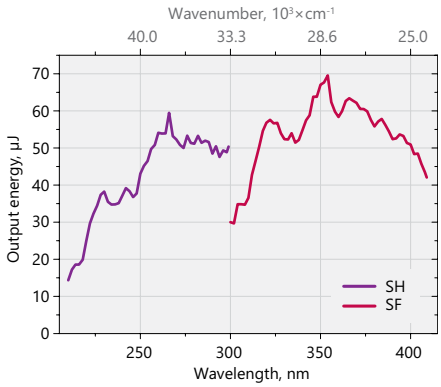


Fig 2. Typical PT401 tuning curves in SH (210 – 300 nm), SF (300 – 409 nm) ranges

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