

# PT403 SERIES



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  $< 9 \text{ cm}^{-1}$ ) 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 applications.

### 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.

## Tunable Wavelength Picosecond Laser

### FEATURES

- ▶ Tuning range: 210 – 2300 nm
- ▶ Motorized hands-free tuning
- ▶ High pulse energy at 1 kHz rates
- ▶ Diode pumped solid state design
- ▶ Narrow linewidth  $< 9 \text{ cm}^{-1}$
- ▶ Remote control via keypad
- ▶ PC control
- ▶ Optional streak camera triggering pulse with  $< 10 \text{ ps rms jitter}$
- ▶ 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

**SPECIFICATIONS** <sup>1)</sup>

Model	PT403	PT403-SH
<b>OPA SPECIFICATIONS</b>		
Output wavelength tuning range		
SH	–	210 – 409 nm
Signal	410 – 709 nm	
Idler	710 – 2300 nm	
Output pulse energy <sup>2)</sup>		
SH <sup>3)</sup>	–	15 µJ
Signal <sup>4)</sup>	80 µJ	
Idler <sup>5)</sup>	25 µJ	
Pulse repetition rate	1000 Hz	
Linewidth	< 9 cm <sup>-1</sup>	< 12 cm <sup>-1</sup>
Typical pulse duration <sup>6)</sup>	~ 20 ps	
Scanning step		
SH	–	0.05 nm
Signal	0.1 nm	
Idler	1 nm	
Typical beam size <sup>7)</sup>	~ 2 mm	
Beam divergence <sup>8)</sup>	< 2 mrad	
Beam pointing stability	≤ 100 µrad rms	
Beam polarization		
SH	–	horizontal
Signal	horizontal	
Idler	vertical	
Optical pulse jitter		
Internal triggering regime <sup>9)</sup>	< 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 <sup>10)</sup>	-400 ... 150 ns	
<b>OPERATING REQUIREMENTS</b>		
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	

<sup>1)</sup> 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.

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

<sup>3)</sup> Measured at 260 nm.

<sup>4)</sup> Measured at 450 nm.

<sup>5)</sup> Measured at 1000 nm.

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

<sup>7)</sup> Beam diameter at the 1/e<sup>2</sup> level. Can vary depending on the wavelength.

<sup>8)</sup> Beam divergence measured at FWHM.

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

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



**Communication module interfaces**

Interface	Description
USB	virtual serial port, ASCII commands
RS232	ASCII commands

Interface	Description
LAN	REST API
WLAN	REST API

Femtosecond Lasers

Picosecond Lasers

Picosecond Tunable Wavelength Lasers

Nanosecond Lasers

Nanosecond Tunable Wavelength Lasers

Other Ekspla Products

**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 <sup>1)</sup>	PT403	PT403-SH
SH <sup>2)</sup>	–	> 13 µJ
Signal <sup>3)</sup>		> 70 µJ
Idler <sup>4)</sup>		> 22 µJ

<sup>1)</sup> 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.

<sup>2)</sup> Measured at 260 nm.  
<sup>3)</sup> Measured at 450 nm.  
<sup>4)</sup> Measured at 1000 nm.

► **Options -H, -2H, -3H**

- 1064 nm or 532 nm, or 355 nm outputs <sup>1) 2)</sup>
- H output energy 0.7 mJ;
  - 2H output energy 0.3 mJ;
  - 3H output energy 0.3 mJ.

<sup>1)</sup> Outputs are not simultaneous.  
<sup>2)</sup> 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.

**PT503 FEATURES**

- The higher pulse energy in the near-IR spectral range
- Tuning range from 700 to 2200 nm

TUNING CURVES

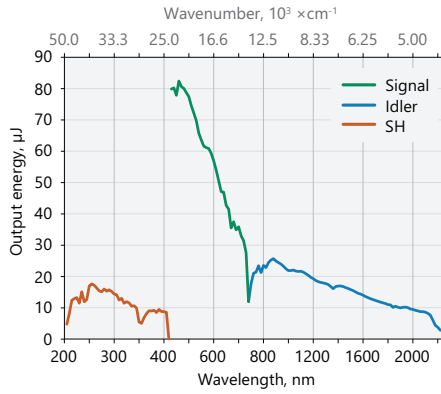


Fig 2. Typical PT403 tuning curves in signal (420 – 709 nm) and idler (710 – 2300 nm) ranges.

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

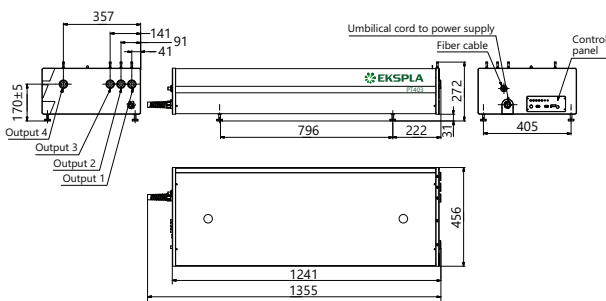


Fig 3. PT403 series laser head typical outline drawing

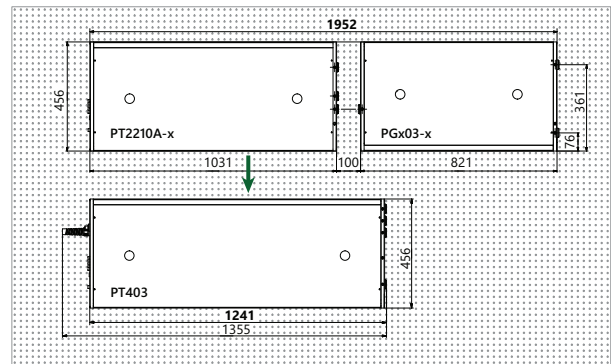


Fig 4. Compared with layout where laser and OPO are in different units, PT403 features almost twice smaller footprint

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.

# PT277 SERIES



PT277 series laser systems integrate a picosecond optical parametric oscillator and DPSS pump laser into a single compact housing. Mounting the components into one frame provides a cost-effective and robust solution with improved long-term stability and reduced maintenance costs.

The tuning range is for the model PT277 1400 – 2050 and 2200 to 4450 nm with nearly Fourier transform limited linewidth.

The microprocessor-controlled wavelength tuning is fully automatic. The wavelength controlling

elements are mounted on precise micro-stepping motors. The temperature of the non-linear crystal is controlled by a precise thermocontroller with a bidirectional Peltier element, resulting in the fast tuning of crystal temperature. For customer convenience the system can be controlled through USB (VCP, ASCII commands), RS232 (ASCII commands), LAN (REST API) or RS232 (ASCII commands), LAN (REST API) depending on the system configuration or a remote control pad. Both options allow easy control of system settings.

## Single Housing NIR-IR Range Tunable Picosecond Laser

### FEATURES

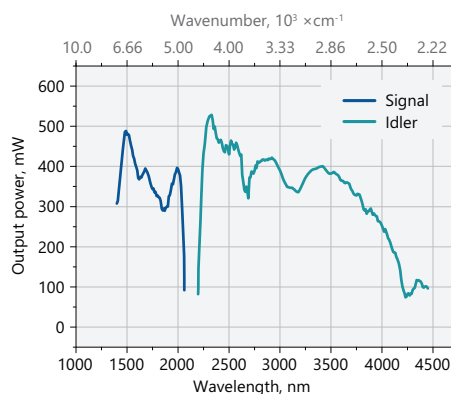
- ▶ 1400–4450 nm tuning range
- ▶ Nearly Fourier transform-limited linewidth
- ▶ Nearly diffraction limited divergence
- ▶ Output wavelength monitoring (optional)
- ▶ PC control

### APPLICATIONS

- ▶ Infrared microscopy
- ▶ Infrared spectroscopy
- ▶ Near field spectroscopy

### TUNING CURVES

Fig 1. Typical output power of PT277 tunable laser. The power is shown only at the wavelengths where ambient air absorption is negligible



**SPECIFICATIONS <sup>1)</sup>**

Model	PT277
Pulse repetition rate <sup>2)</sup>	87 MHz
Tuning range	
Signal	1400 – 2050 nm
Idler	2200 – 4450 nm
Output power <sup>3)</sup>	
OPO <sup>4)</sup>	> 500 mW
Linewidth <sup>4)</sup>	< 2.5 cm <sup>-1</sup>
Typical pulse duration <sup>4) 5)</sup>	70 ps
Scanning step	
Signal	0.1 nm
Idler	0.1 nm
Polarization	
Signal beam	horizontal
Idler beam	horizontal
Typical beam diameter <sup>4) 6)</sup>	~2 mm
Typical beam diameter, Idler <sup>4) 6)</sup>	~5 mm
Typical beam divergence <sup>4) 7)</sup>	< 2 mrad
<b>PHYSICAL CHARACTERISTICS</b>	
Unit size (W × L × H)	370 × 800 × 260 mm
Power supply size (W × L × H)	520 × 500 × 290 mm
Umbilical length	2 m
<b>OPERATING REQUIREMENTS</b>	
Cooling	water-air
Room temperature	22 ± 2 °C
Relative humidity	20 – 80 % (noncondensing)
Power requirements	100 – 240 V AC, single phase 50/60 Hz
Power consumption	< 1 kVA

<sup>1)</sup> Due to continuous improvement, all specifications are subject to change without notice. Parameters marked 'typical' are indications of typical performance (not specifications) and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 1064 nm and for basic system without options.  
<sup>2)</sup> Inquire for custom pulse repetition rates.  
<sup>3)</sup> Output powers are specified at selected wavelengths. See typical tuning curves for power at other wavelengths.

<sup>4)</sup> Measured at 1600 nm for PT277 model at signal range.  
<sup>5)</sup> Pulse duration can vary depending on wavelength and pump energy.  
<sup>6)</sup> Beam diameter at the 1/e<sup>2</sup> level and can vary depending on the pump pulse energy.  
<sup>7)</sup> Full angle measured at the FWHM level.



**OUTLINE DRAWINGS**

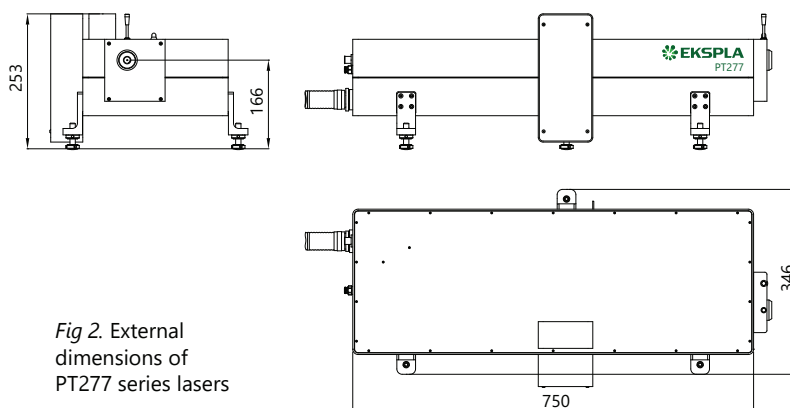


Fig 2. External dimensions of PT277 series lasers

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

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