

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 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/e² 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	virtual serial port, ASCII commands
RS232	ASCII commands

Interface	Description
LAN	REST API
WLAN	REST API

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

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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.

PT503 FEATURES

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

TUNING CURVES

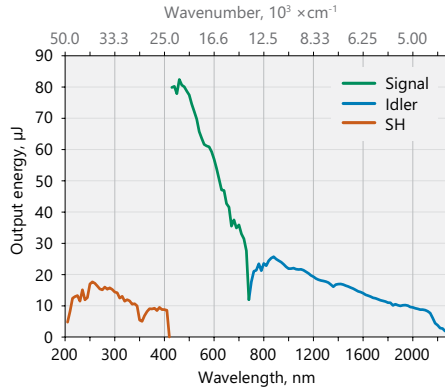


Fig 2. Typical PT403 tuning curves in signal (410 – 709 nm), idler (710 – 2300 nm) ranges, SH (210 – 409 nm) ranges

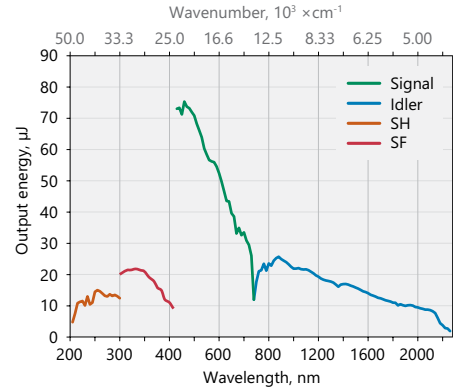


Fig 3. Typical PT403 tuning curves in signal (410 – 709 nm), idler (710 – 2300 nm) ranges, SH (210 – 300 nm), SF (300 – 409 nm) ranges

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

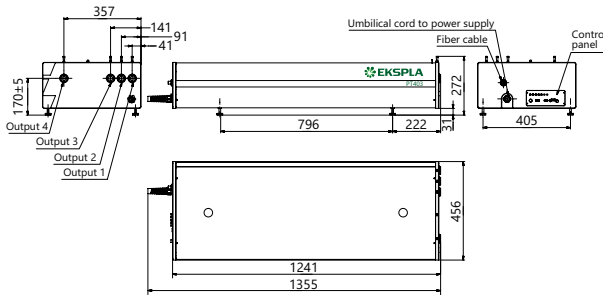


Fig 4. PT403 series laser head typical outline drawing

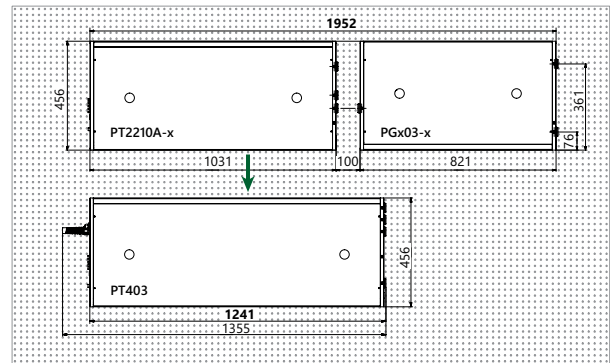


Fig 5. Compared with layout where laser and OPO are in different units, PT403 features almost twice smaller footprint

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.

PT277-XIR SERIES

Single Housing
MIR (mid infrared
range) Tunable
Picosecond Laser



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. It makes laser installation shorter and improves long-term stability, reduces maintenance costs. The tuning range for the model PT277-XIR 1405 – 2020 nm, 2250 – 4400 nm, 5000 – 16000 nm (7115 – 4950 cm^{-1} , 4444 – 2253 cm^{-1} , 2000 – 625 cm^{-1}) with linewidth $<5 \text{ cm}^{-1}$ in the full tuning range.

The fast wavelength tuning is based on the microprocessor-control and wavelength tuning is fully automatic. The wavelength tuning elements are mounted on precise closed loop micro stepping motors. The temperatures of the non linear crystals is controlled by a precise thermocontrollers. For customer convenience the system can be controlled via keypad and/or any controller running on any OS using REST API commands. Variety of interfaces USB, RS232, LAN, WLAN (optionally) ensures easy control and integration with other equipment.

FEATURES

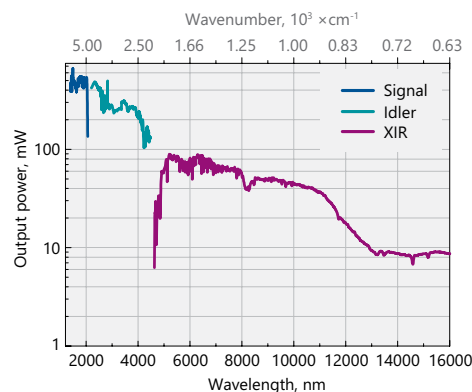
- ▶ 1405 – 16000 nm (7115 – 625 cm^{-1}) tuning range
- ▶ Linewidth $<5 \text{ cm}^{-1}$ in the full tuning range
- ▶ Nearly diffraction limited divergence
- ▶ Remote control via keypad and/or any controller running on any OS using REST API commands
- ▶ PC control via USB (virtual com port), RS232, LAN

APPLICATIONS

- ▶ Infrared spectroscopy

TUNING CURVES

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



SPECIFICATIONS

Model		PT277 - XIR
SYNCHRONOUSLY PUMPED OPO SPECIFICATIONS ¹⁾		
Tuning range		
Signal	1405 – 2020 nm (7115 – 4950 cm ⁻¹)	
Idler	2250 – 4400 nm (4444 – 2253 cm ⁻¹)	
XIR	5000 – 16000 nm (2000 – 625 cm ⁻¹)	
Linewidth	< 5 cm ⁻¹	
Output power ²⁾		
OPO @ 4000 nm (2500 cm ⁻¹)	> 100 mW @ 2200 – 4000 nm	
OPO @ 12500 nm (800 cm ⁻¹)	> 10 mW	
Pulse repetition rate	87 MHz	
Pulse duration (pump laser)	~8 ps	
Scanning step		
Signal	0.1 nm	
Idler, XIR	1 nm	
Polarization	vertical	
Typical beam diameter ^{3) 4)}	~3 mm	
Typical beam divergence ⁵⁾	< 5 mrad (for signal)	
Beam pointing stability	< 50 μrad rms @ 1596 nm	
AOM modulation	0 Hz – 2 MHz	
Fast spectral scan, scan speed (for spectral range)		
Idler	< 2 s	
XIR	< 1 s	
PHYSICAL CHARACTERISTICS		
Unit size (W×L×H)	320 × 766 × 241 mm	
Power supply size (W×L×H)	483 × 140 × 390 mm	
Umbilical length	2.5 m	
OPERATING REQUIREMENTS		
Cooling	water-air (by provided chiller)	
Room temperature	22 ± 2 °C	
Room temperature stability	± 1 °C	
Relative humidity	20 – 80 % (noncondensing)	
Power requirements	100 – 240 VAC (-10% / +5%), single phase, 50/60 Hz	
Power consumption	< 1 kVA	
Cleanness of the room	not worse than ISO Class 9	

- ¹⁾ All specifications are subject to change without notice. The 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 1596 nm.
- ²⁾ Output powers are specified at selected wavelengths. See typical tuning curves for power at other wavelengths.
- ³⁾ Measured at 3000 nm.
- ⁴⁾ Beam diameter at the 1/e² level and can vary depending on the pump pulse energy.
- ⁵⁾ Full angle measured at the FWHM level.

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. The laser and auxiliary units must be settled in such a place void of dust and aerosols. It is advisable to operate the laser in air conditioned room, provided that the laser is placed at a distance from air conditioning outlets. The laser should be positioned on a solid worktable. Access from both sides should be ensured. Intensive sources of vibration should be avoided, like railways station etc nearby laboratory.



OUTLINE DRAWINGS

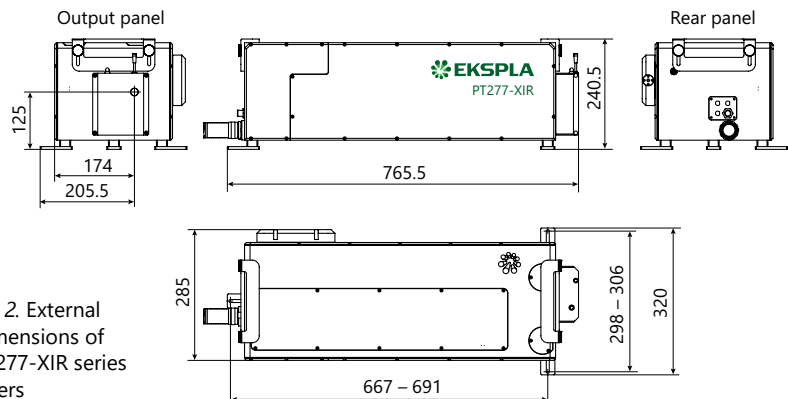


Fig 2. External dimensions of PT277-XIR series lasers