

Explorer XP

Actively Q-Switched, High-Repetition Laser Systems

Model Description Manual

This laser product is intended to be sold to a manufacturer of OEM products for use as a component (or replacement thereof) in those products. As such, this product is exempt from performance standards of *United States Code of Federal Regulations*, Title 21, Chapter 1 – Food and Drug Administration, Department of Health and Human Services, Subchapter J – Parts 1040.10 (a), (1) or (2).



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The Explorer XP Models

Introduction

Safety and operational information for the *Explorer XP* series lasers is located in the *Explorer XP User's Manual*. This book contains the specifications for each of the *Explorer XP* models and highlights any particular differences between the models.

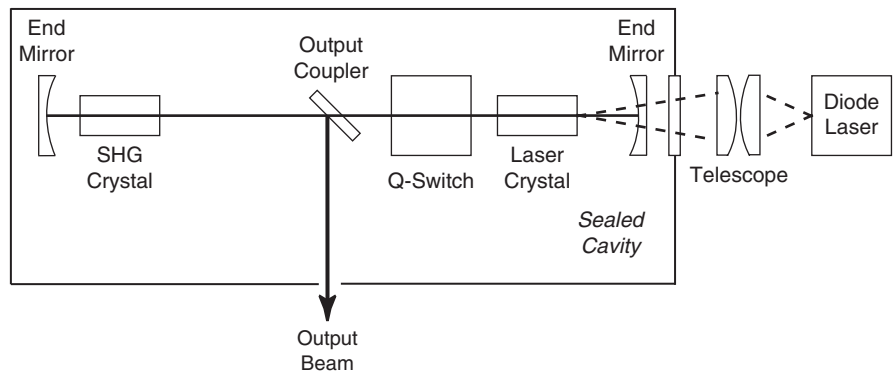


Figure 1: Optical Design of the *Explorer XP* 532-5W Laser Head

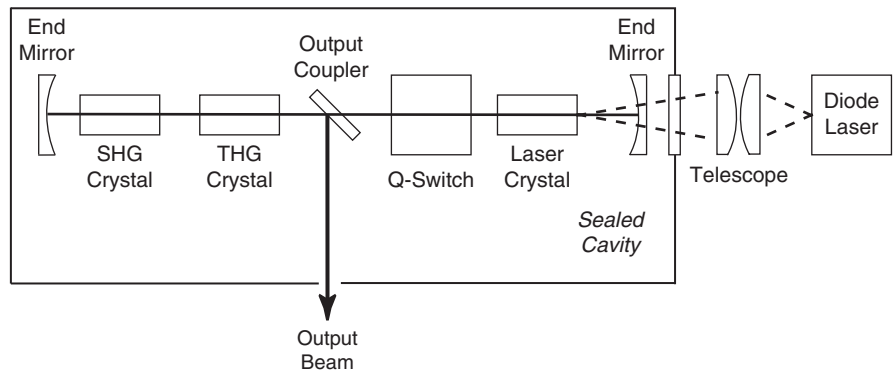


Figure 2: Optical Design of the *Explorer XP* 355-1W Laser Head

Maximum Emission Levels

Table 2 lists the maximum emission levels possible for the *Explorer XP* lasers. Use this information for selecting appropriate laser safety eyewear and to implement appropriate safety procedures. These values do not imply actual system power or specifications.

Laser light at longer wavelengths is generated in the production of green and UV emission, and the diode pump laser used in all *Explorer XP* models produces infrared light. These wavelengths are confined to the inside of the laser head.

Table 1: The *Explorer XP* OEM Models

Explorer XP Part Number	Wavelength (nm)	Ave Power (mW)	Max PRF (kHz)
EXPL-XP-532-5W	532	5000	300
EXPL-XP-355-1W	355	1000	300

Table 2: Maximum Emission Levels from the Laser Head

Emission Wavelength	Max Power, Max Pulse Energy Min Pulse Duration	Leakage Wavelengths
Laser Output: 532 nm	7 W, 0.2 mJ, 4 ns	Diode Laser Emission: 808 nm < 20 mW Fundamental Beam: 1064 nm < 20 mW
Laser Output: 355 nm	3 W, 0.1 mJ, 2 ns	Diode Laser Emission: 808 nm < 20 mW Fundamental Beam: 1064 nm < 20 mW

CE Warning Labels



Class 4, 532 nm
CE Warning Label (1)



Class 4, 355 nm
CE Warning Label (2)



CE Approval
Label (3)

Figure 3: *Explorer XP* CE Warning Labels

Label Translations

For safety, the following translations are provided for non-English speaking personnel. The number in parentheses in the first column corresponds to the label number listed on the previous page.

Table 3: Label Translations

Label No.	French	German	Spanish	Dutch
Class 4 CE Warning Label (1)	Rayonnement laser visible et/ou invisible. Exposition dangereuse de l'oeil ou de la peau au rayonnement direct ou diffus. Laser de classe 4. 532 nm Puissance maximum moyenne de 7 W. Énergie maximum par impulsion 0,2 mJ. Durée d'impulsion 5–50 ns @ 1–300 kHz.	Sichtbare und/oder unsichtbare Laserstrahlung. Bestrahlung von Auge oder Haut durch direkte oder Streustrahlung vermeiden. Laser Klasse 4. 532 nm Mittlere maximale Leistung 7 W. Maximale Pulsenergie 0,2 mJ. Pulsdauer 5–50 ns @ 1–300 kHz.	Radiación láser visible y/o invisible. Evitar la exposición directa ó dispersa sobre la piel o los ojos. Producto Láser Clase 4 532 nm Potencia máxima promedio 7 W. Energía máxima del pulso 0,2 mJ. Duración de pulso 5–50 ns @ 1–300 kHz.	Zichtbare en/of onzichtbare* laserstraling. Vermijd blootstelling aan ogen of huid door directe of gereflecteerd straling. Klasse 4 laser product 532 nm Maximaal uittredend vermogen 7 W. Maximaal pulsenergie 0,2 mJ. Pulsduur 5–50 ns @ 1–300 kHz.
Class 4 CE Warning Label (2)	Rayonnement laser visible et/ou invisible. Exposition dangereuse de l'oeil ou de la peau au rayonnement direct ou diffus. Laser de classe 4. 355 nm Puissance maximum moyenne de 3 W. Énergie maximum par impulsion 0,2 mJ. Durée d'impulsion 2–50 ns @ 0–300 kHz.	Sichtbare und/oder unsichtbare Laserstrahlung. Bestrahlung von Auge oder Haut durch direkte oder Streustrahlung vermeiden. Laser Klasse 4. 355 nm Mittlere maximale Leistung 3 W. Maximale Pulsenergie 0,2 mJ. Pulsdauer 2–50 ns @ 0–300 kHz wiederholt.	Radiación láser visible y/o invisible. Evitar la exposición directa ó dispersa sobre la piel o los ojos. Producto Láser Clase 4 355 nm Potencia máxima promedio 3 W. Energía máxima del pulso 0,2 mJ. Duración de pulso 2–50 ns @ 0–300 kHz.	Zichtbare en/of onzichtbare* laserstraling. Vermijd blootstelling aan ogen of huid door directe of gereflecteerd straling. Klasse 4 laser product 355 nm Maximaal uittredend vermogen 3 W. Maximaal pulsenergie 0,2 mJ. Pulsduur 2–50 ns @ 0–300 kHz.

CE Declaration of Conformity

We,

Newport Spectra-Physics GmbH
Ruhlsdorfer Strasse 95
Stahnsdorf, 14532
Germany

declare under sole responsibility that the:

Explorer XP 532-5W Laser System Explorer XP 355-1W Laser System

manufactured after August 9, 2013

meet the intent of the EMC Directive 2004/108/EC for Electromagnetic Compatibility and 2006/95/EC for Low Voltage Directive. Compliance was demonstrated to the following specifications as listed in the official *Journal of the European Communities*:

EMC Directive 2004/108/EC

EN 61000-4-2: 2009-03: Part 4: Section 2: Electrostatic discharge immunity test

EN 61000-4-3: 2006-05 + A2: 2008-02: Part 4: Section 3: Testing and measurement techniques—radiated, radio-frequency, electromagnetic field immunity

EN 61000-4-4: 2004-12: Part 4-4: Testing and measurement techniques—electrical fast transient/burst immunity test

EN 61000-4-6: 2009-03: Part 4-6: Testing and measurement techniques—immunity to conducted disturbances induced by radio-frequency fields

EN 61000-6-2: 2005: (EMC) Generic standards—Immunity standard for industrial environments

EN 61000-6-4: 2007: (EMC) Generic standards—Emission standard for industrial environments

Low Voltage Directive 2006/95/EC

EN60950-1: 2006 + A11: 2009 + A1: 2010 + A12-2011 + AC:2011: Safety of Information Technology Equipment—General Requirements

EN60825-1: 2007: Safety of laser products—Equipment classification, requirements and user's guide

I, the undersigned, hereby declare that the equipment specified above conform to the above Directives and Standards.



Jürgen Niederhofer
General Manager
Newport Spectra-Physics GmbH
Niederlassung Stahnsdorf
August 9, 2013

Laser Performance, Explorer XP-355-1W

Maximum output power and pulse energy will be achieved around 30 kHz for vanadate (as gain medium) when maximum power is applied. Figure 4 shows pulse energy vs. pulse repetition frequency graph for the 355 nm model.

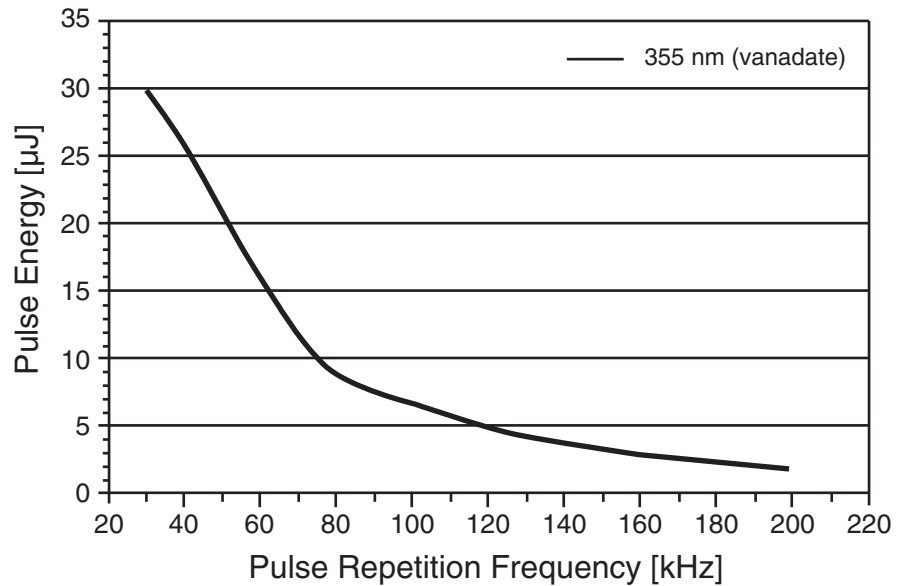


Figure 4: Pulse Energy and Pulse Repetition Frequency

At a given diode laser pump current, the individual pulse energy itself will decrease as the repetition rate is increased as shown in Figure 4. The lower the diode laser pump current (i.e., the lower the average output power), the less pronounced this effect will be.

Pulse width broadens when the pulse repetition rate is increased (Figure 5). The pulse-to-pulse stability stays quite constant over the whole repetition frequency range (Figure 6).

Pulse duration is commonly measured at full width, half maximum, or FWHM (see Figure 5).

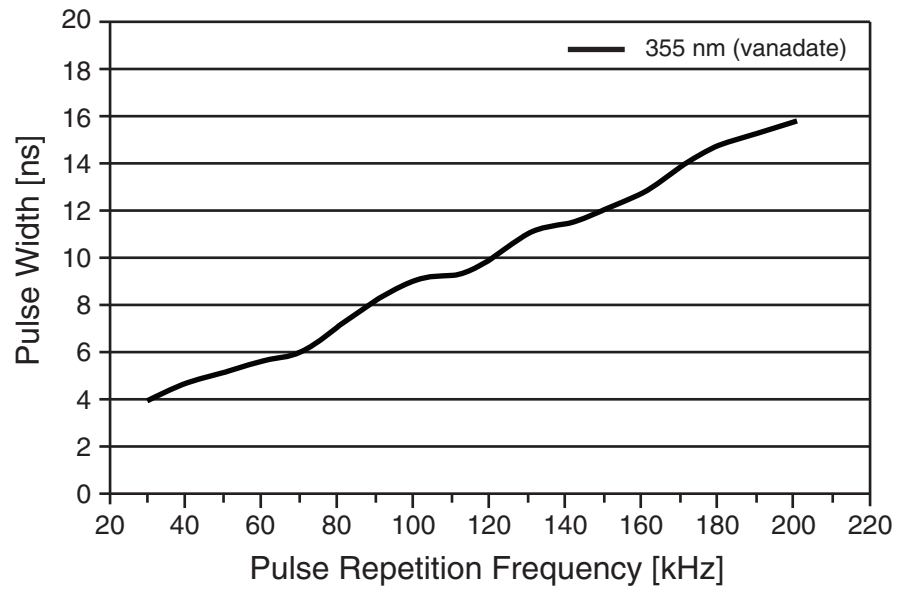


Figure 5: Pulse Width vs. Pulse Repetition Frequency

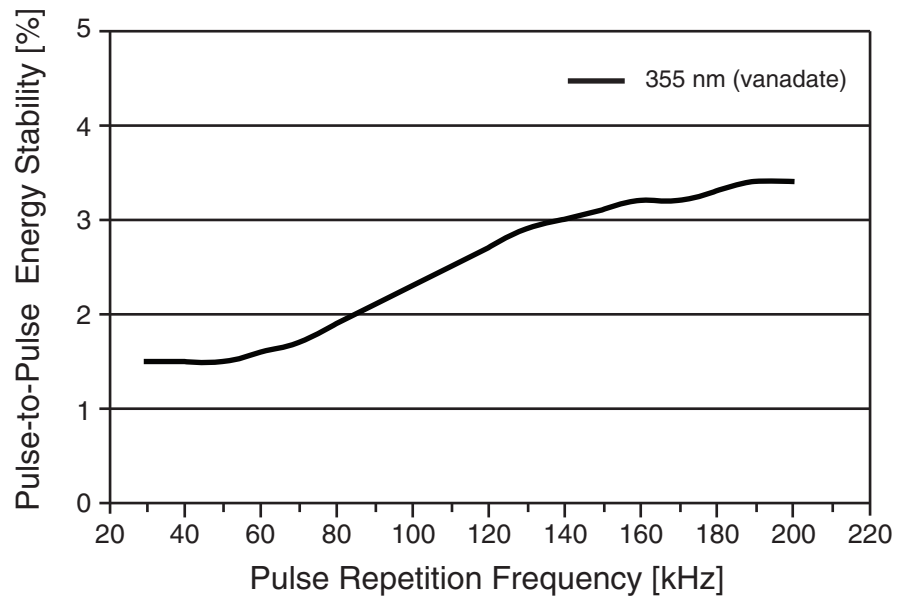


Figure 6: Pulse-to-Pulse Stability vs. Pulse Repetition Frequency

Table 4: Ranges for Automatic Energy Adjustment¹

Explorer XP Model	Min. Pulse Repetition Frequency (Hz)	Max. Pulse Repetition Frequency (Hz)	Voltage at Analog Port Pin 1 / Output Power
EXPL-XP 532-5W	60,000	300,000	25 μ J/V
EXPL-XP 335-1W	40,000	300,000	10 μ J/V

¹ If the requested combination of pulse energy and pulse repetition frequency is not within the power budget of the system, the command `CONT:PENER <n1>,<n2>,<n3>` will not be rejected but the diode current seek process will fail. Therefore, the result of the query `CONT:PENER?` after the seek process has stopped (monitor bit 6 of status byte `STAT:COND:EVEN?`) will be “?”.

Specifications

Environmental specifications for operating and non-operating conditions are listed in “Environmental Specifications” on page v of the User’s Manual.

Table 5: Explorer XP Performance Specifications¹

Model Part Number	EXPL-532-5W	EXPL-355-1W
General Characteristics		
Wavelength	532 nm	355 nm
Gain Medium	Nd:YVO ₄	Nd:YVO ₄
Output power	> 5 W ²	> 1 W ³
Pulse width (FWHM)	< 8 ns ⁴	< 8 ns ⁵
Pulse Repetition rate	60–300 kHz	40–300 kHz
Leakage power @ 1064 nm	< 1 mW	< 1 mW
Beam Characteristics		
Spatial mode	TEM ₀₀	TEM ₀₀
Beam Quality	M ² < 1.2	M ² < 1.2
Polarization Ratio	> 100:1 (horizontal)	> 100:1 (vertical)
Beam Waist Diameter ⁶	0.19 mm ±15%	0.16 mm ±15%
Waist Location	(–64.5 ±10) mm	(–64.5 ±10) mm
Beam Divergence ⁷	<4.5 mrad	<4.5 mrad
Beam Ellipticity ³	< 1.1	< 1.1
Astigmatism	< 0.2	< 0.2
Beam Height	35.0 mm	34.1 mm
Stability		
Pulse energy stability	< 3%	< 4%
Long-term power stability (rms)	< ±2%/2 hr (±1°C)	< ±2%/2 hr (±1°C)
Warm-up time ⁸	< 10 min	< 10 min
Static Alignment Tolerance		
Beam Position	< ± 0.25 mm	< ± 0.3 mm
Beam Angle	< ± 1 mrad	< ± 1 mrad

¹ Due to our continuous product improvement program, specifications may change without notice.

² Measured at 80 kHz.

³ Measured at 50 kHz.

⁴ Measured at 80 kHz and nominal average power.

⁵ Measured at 50 kHz and nominal average power.

⁶ Specified at the beam waist, beam diameter at 1/e² intensity.

⁷ Diameter at 1/e², full angle

⁸ Cold start to > 95% of full power.

Table 6: Electrical and Cooling Specifications

Operating voltage	24 Vdc \pm 2 V
Power consumption typical	< 90 W @ 22°C
maximum	< 150 W
Maximum inrush current	< 9 A
Cooling	Air- and conduction-cooled Optionally water-cooled
Laser thermal heat dissipation	< 150 W
Operating temperature (< 80% relative humidity), dew point < 20°C	18 to 35°C
Storage temperature (< 90% relative humidity, dew point < 20°C)	- 20 to + 60°C

Table 7: Dimensions and Weight

<i>Explorer XP Laser System</i>	
Size (L x W x H)	240 x 95 x 94 mm (9.45 x 3.74 x 3.70 in.)
Weight (typical)	3 kg (6.6 lb)

Maintenance

The output window of the *Explorer XP 355-1W* laser should be replaced every 4,000 hours. The uncoated window is oriented at Brewster's angle and must be mounted as shown in Figure 7 to protect the optical surface from dust. Refer to Chapter 8 in the user's manual for instructions on removing/replacing the window.



Figure 7: Mounting the window at Brewster's angle.

Table 8: Field Replaceable Units

Description	Part Number
Output window, customer exchangeable, 532 nm systems	EXPL-532-OW
Output window, customer exchangeable, 355 nm systems	EXPL-XP-355-OW
Optional Explorer XP Heatsink/Fan	EXPL-XP-HTSNK-A