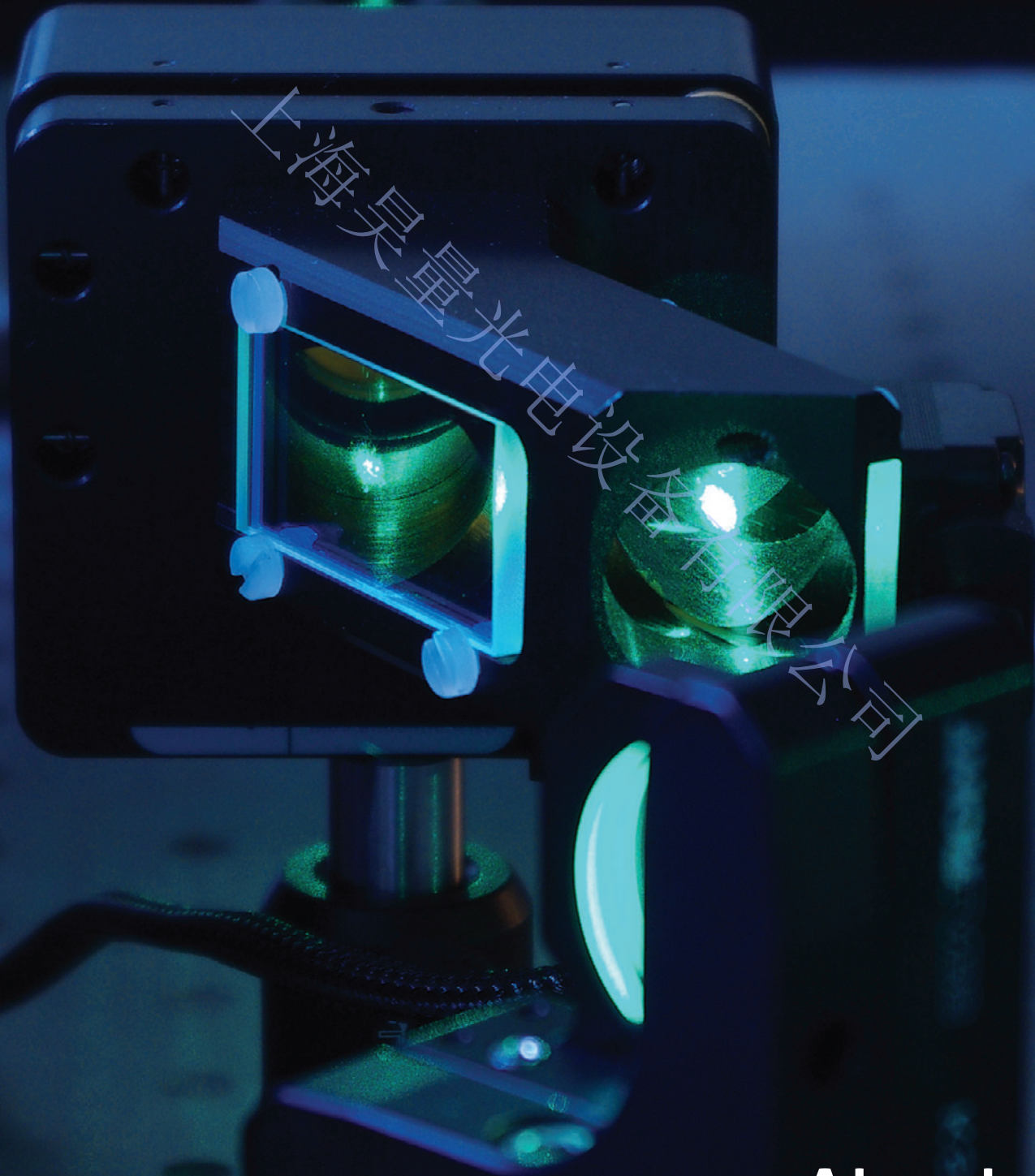


# Laser Beam Attenuators and Expanders



Altechna

## Attenuator selection guide

To select the right Watt pilot model one should consider the application carefully. Beam diameter, laser power, pulse duration, bandwidth, polarization, environmental conditions, requirement for maximum attenuation and beam misalignment should be taken into consideration. In order to pick suitable device, please follow selection guide below which will help you to get straight to the right model of Watt pilot.

Model	Clear aperture	Bandwidth	Configuration	Optimization	Attenuation range at CWL*	Typical application	Damage threshold <sup>1</sup>	More info
Standard	15 mm	±2 nm	λ/2 LO waveplate + cemented PBS cube	Transmission/reflection mode	0,5-95 %	CW medium power lasers and LDs	>0,3 J/cm <sup>2</sup> 10 Hz, 10 ns, 1064 nm	Page 5
	15 mm	±10 nm	λ/2 ZO waveplate + cemented PBS cube	Transmission/reflection mode	0,5-95 %	CW medium power lasers and LDs		
	10 mm	±10 nm	λ/2 ZO waveplate + optically contacted PBS cube	Transmission/reflection mode	0,5-95 %	High power CW and pulsed lasers, LDs	>20 J/cm <sup>2</sup> 10 Hz, 10 ns, 1064 nm	
Enhanced	15 mm	±5 nm	λ/2 ZO waveplate + 2x TFP	Reflection mode	0,3-99 %	High power CW and pulsed lasers, LDs	>5 J/cm <sup>2</sup> 10 Hz, 10 ns, 1064 nm;	Page 6
	15 mm	±20 nm	λ/2 ZO waveplate + 2x broadband TFP	Reflection mode	0,5-98 %	High power CW and pulsed lasers, LDs	or >100 mJ/cm <sup>2</sup> 1 kHz	
	15 mm	±5 nm	λ/2 ZO waveplate + 1x Brewster TFP	Transmission mode	0,3-95 %	High power CW and pulsed lasers, LDs	100 fs, 800 nm	
	15 mm	±25 nm	λ/2 High energy waveplate + 1x High contrast TFP	Transmission mode	0.04-99 %	High power CW and pulsed lasers	>20 J/cm <sup>2</sup> 10 Hz, 10 ns, 1064nm	
Ultrafast	15 mm	±25 nm		Transmission mode	1-85 %			Page 7
	15 mm	±25 nm	λ/2 ZO waveplate + 2x Broadband (ultrafast) TFP	Transmission Contrast mode	0,2-70 %	Ultrafast, broadband laser sources with pulse length 100 - 50 fs		
	15 mm	±25 nm		Reflection mode	4-96 %			
	15 mm	±25 nm		Reflection Contrast mode	0,1-70 %		>5 J/cm <sup>2</sup> 10 Hz, 10 ns, 1064 nm;	
	15 mm	±50 nm		Transmission mode	1-85 %		or >100 mJ/cm <sup>2</sup> 1 kHz	
	15 mm	±50 nm	λ/2 achromatic waveplate + 2x broadband (ultrafast) TFP	Transmission Contrast mode	0,2-70 %	Ultrafast, broadband laser sources with pulse length <50 fs	100 fs, 800 nm	
	15 mm	±50 nm		Reflection mode	4-96 %			
	15 mm	±50 nm		Reflection Contrast mode	0,1-70 %			

\*CWL - Center Wavelength

# Watt Pilot Motorized Attenuator



## Description

Watt Pilot Motorized Attenuator is a computer controlled laser beam attenuator. It attenuates free space laser beam/pulse continuously without introducing additional energy fluctuations. Watt Pilot is essential in systems, where stable laser power adjusting is necessary. Despite stand alone device look, motorized attenuator is very compact and it can be easily integrated in custom optical system.

## Mechanical Specifications

Dimensions	91 x 63 x 187 mm - Ultrafast Reflection mode
	91 x 63 x 167 mm - Ultrafast Transmission mode
	91 x 63 x 108 mm - Enhanced Reflection mode
	91 x 63 x 105 mm - Enhanced Transmission mode
	91 x 63 x 75 mm - Standard with PBS cube
	91 x 63 x 70 mm - Standard with HP PBS cube

Time between min and max attenuation	3 sec
Resolution	41.54 arcsec/step
Step accuracy in full rotation	± 4 steps*
Backlash	± 4 steps

\* Step accuracy for single start/stop rotation (not full cycle) depends on acceleration and speed of stepper motor; these parameters are user-controlled.

# Watt Pilot - Motorized Attenuator, Standard Version



## Description

Standard version incorporates rotating quartz  $\lambda/2$  phase Waveplate and Polarizing Cube Beamsplitter which separates s-polarized and p-polarized beams. The intensity ratio of these two beams is continuously tuned by rotating the waveplate. Pure p-polarization should be selected for maximum transmission, and pure s-polarization - for maximum attenuation.

Watt Pilot is essential in systems, where stable laser power adjusting is necessary. Despite stand alone device look, Motorized Watt Pilot is very compact and it can be easily integrated in custom optical system.

## Catalog Items

Clear aperture, mm	Operational wave-length, nm	Band-width	Configuration	Optimization	Attenuation range at CWL*	Damage threshold	Product ID
15	532	±2 nm	$\lambda/2$ LO waveplate + cemented polarizing cube	Transmission/reflection mode	0.5-95 %	0.3 J/cm <sup>2</sup> 10 Hz, 10 ns, 1064 nm	2-CVB-MP-15-0532-M
	780	±2 nm			0.5-95 %		2-CVB-MP-15-0780-M
	1064	±2 nm			0.5-95 %		2-CVB-MP-15-1064-M
	1550	±2 nm			0.5-95 %		2-CVB-MP-15-1550-M
15	532	±10 nm	$\lambda/2$ ZO waveplate + cemented polarizing cube	Transmission/reflection mode	0.5-95 %	>0.3 J/cm <sup>2</sup> 10 Hz, 10 ns, 1064 nm	2-CVB-MPEP-15-0532-M
	780	±10 nm			0.5-95 %		2-CVB-MPEP-15-0780-M
	1064	±10 nm			0.5-95 %		2-CVB-MPEP-15-1064-M
	1550	±10 nm			0.5-95 %		2-CVB-MPEP-15-1550-M
10	355	±10 nm	$\lambda/2$ ZO waveplate + High energy polarizing cube	Transmission/reflection mode	0.5-95 %	>20 J/cm <sup>2</sup> 10 Hz, 10 ns, 1064 nm	2-CVB-EPOC-10-0355-M
	532	±10 nm			0.5-95 %		2-CVB-EPOC-10-0532-M
	1064	±10 nm			0.5-95 %		2-CVB-EPOC-10-1064-M
	1550	±10 nm			0.5-95 %		2-CVB-EPOC-10-1550-M

\*CWL - Center Wavelength

# Watt Pilot - Motorized Attenuator, Enhanced Version



## Description

Enhanced version incorporates rotating quartz  $\lambda/2$  phase Waveplate and one or two thin film polarizers which separate s-polarized and p-polarized beams. The intensity ratio of these two beams is continuously tuned by rotating the waveplate.

Watt Pilot is essential in systems, where stable laser power adjusting is necessary. Despite stand alone device look, motorized attenuator is very compact and it can be easily integrated in custom optical system.

## Catalog Items

Clear aperture, mm	Operational wavelength, nm	Bandwidth	Configuration	Optimization	Attenuation range at CWL*	Damage threshold	Product ID		
	266	±5 nm			0.3-99 %		2-EWP-R-0266-M		
	343	±5 nm			0.3-99 %		2-EWP-R-0343-M		
	355	±5 nm			0.3-99 %		2-EWP-R-0355-M		
	400	±5 nm			0.3-99 %		2-EWP-R-0400-M		
	515	±5 nm	$\lambda/2$ ZO waveplate + 2x TFP	Reflection mode	0.3-99 %		2-EWP-R-0515-M		
	532	±5 nm			0.3-99 %		2-EWP-R-0532-M		
	780	±5 nm			0.3-99 %		2-EWP-R-0780-M		
	800	±5 nm			0.3-99 %		2-EWP-R-0800-M		
	1064	±5 nm			0.3-99 %		2-EWP-R-1064-M		
	1550	±5 nm			0.3-99 %		2-EWP-R-1550-M		
15	780-820	±20 nm			$\lambda/2$ ZO waveplate + 2x broadband (ultrafast) TFP	Broadband reflection mode	0.5-98 %	>5 J/cm <sup>2</sup> 10 Hz, 10 ns, 1064 nm; or	2-EWP-BBR-0800-M
	1020-1040	±20 nm					0.5-98 %	>100 mJ/cm <sup>2</sup> 1 kHz 100 fs, 800 nm	2-EWP-BBR-1030-M
	266	±5 nm			0.5-95 %		2-EWP-T-0266-M		
	355	±5 nm			0.5-95 %		2-EWP-T-0355-M		
	400	±5 nm			0.5-95 %		2-EWP-T-0400-M		
	515	±5 nm			0.5-95 %		2-EWP-T-0515-M		
	532	±5 nm			0.5-95 %		2-EWP-T-0532-M		
	780	±5 nm	$\lambda/2$ ZO waveplate + TFP	Transmission mode	0.5-95 %		2-EWP-T-0780-M		
	780-820	±5 nm			0.5-95 %		2-EWP-T-7882-M		
	800	±5 nm			0.5-95 %		2-EWP-T-0800-M		
	1020-1040	±5 nm			0.5-95 %		2-EWP-T-1030-M		
	1064	±5 nm			0.5-95 %		2-EWP-T-1064-M		
	1550	±5 nm			0.5-95 %		2-EWP-T-1550-M		

\*CWL - Center Wavelength

# Watt Pilot - Motorized Attenuator, Ultrafast Version



## Description

Ideal for ultraSHORT laser pulses (down to 20 fs).

Ultrafast version incorporates rotating quartz  $\lambda/2$  phase waveplate and two (or one) high-performance broadband 72 degree polarizers. The intensity ratio of these two beams is continuously tuned by rotating the waveplate.

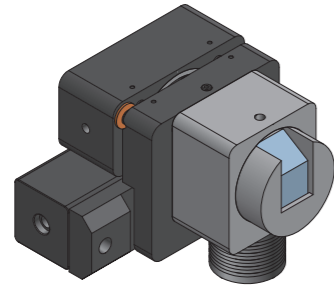
There are 4 types of ultraFAST attenuators: they can be reflection or transmission type and contrast or transmission/reflection optimized.

## Catalog Items

Clear aperture, mm	Operational wavelength, nm	Bandwidth	Configuration	Optimization	Attenuation range at CWL*	Damage threshold	Product ID
15	775-825	±25 nm		Transmission mode	1-85 %		2-UWP-T1-800-M
	1005-1055	±25 nm		Transmission mode	1-85 %		2-UWP-T1-1030-M
	775-825	±25 nm	$\lambda/2$ ZO waveplate + Broadband (ultrafast) TFP	Transmission contrast mode	0.2-70 %	10 ns @ 1064 nm	2-UWP-T2-800-M
	1005-1055	±25 nm			0.2-70 %		2-UWP-T2-1030-M
	775-825	±25 nm		Reflection mode	4-96 %	>100 mJ/cm <sup>2</sup> @100 fs, 800 nm	2-UWP-R1-800-M
	1005-1055	±25 nm		Reflection mode	4-96 %		2-UWP-R1-1030-M
	775-825	±25 nm		Reflection contrast mode	0.1-70 %		2-UWP-R2-800-M
	1005-1055	±25 nm	0.1-70 %			2-UWP-R2-1030-M	
	750-850	±50 nm		Transmission mode	1-85 %		2-UWPA-T1-800-M
	980-1090	±50 nm	1-85 %			2-UWPA-T1-1030-M	
	750-850	±50 nm		Transmission contrast mode	0.2-70 %	10 ns @ 1064 nm	2-UWPA-T2-800-M
	980-1090	±50 nm	0.2-70 %			2-UWPA-T2-1030-M	
	750-850	±50 nm		Reflection mode	4-96 %	>100 mJ/cm <sup>2</sup> @100 fs, 800 nm	2-UWPA-R1-800-M
	980-1090	±50 nm	4-96 %			2-UWPA-R1-1030-M	
	750-850	±50 nm		Reflection contrast mode	0.1-70 %		2-UWPA-R2-800-M
	980-1090	±50 nm	0.1-70 %			2-UWPA-R2-1030-M	

\*CWL - Center Wavelength

# Watt Pilot - Motorized Attenuator, Broadband Version



## Description

Ideal solution for NIR and MID-IR wavelengths, where wide operation wavelength range is required. Broadband motorized attenuator version incorporates rotating quartz  $\lambda/2$  waveplate and Glan Laser type polarizer which separates s-polarized and p-polarized beams. S-polarized beam is eliminated in a beam dump, while p-polarized beam's intensity is continuously tuned by rotating the waveplate. Watt Pilot is essential in systems, where stable adjustment of laser power is necessary. Despite stand alone device look, motorized attenuator is very compact and can be easily integrated in custom optical systems.

## Catalog Items

Clear aperture, nm	Operational wavelength, nm	Configuration	Attenuation range	Damage threshold	Product ID
12	650-1100	$\lambda/2$ Achromatic waveplate + Glan laser polarizer	1 - 90 %	$>5 \text{ J/cm}^2$ 10 Hz, 10 ns, 1064 nm	2-BBWP-T-NIR1-M
	900-2100		1 - 90 %		2-BBWP-T-NIR2-M
	2000-4000		1 - 90 %		2-BBWP-T-MIR1-M
	3000-5000		1 - 90 %		2-BBWP-T-MIR2-M

# PowerXP Compact Motorized Attenuator



## Description

Compact version of Altechna's Motorized Attenuator. This device attenuates free space laser beam (or pulse) continuously without introducing additional energy fluctuations. Contrast better than 3000:1 ( $T_p:T_s$ ) is achieved since this attenuator is mounted with high contrast polarizer. This very compact version of attenuator can be easily integrated in custom optical systems.

## Catalog Items

Clear aperture, mm	Operational wavelength, nm	Attenuation range	Polarization contrast	Product ID
8	343	0.1 - 97%	$>1000:1$	6-PWRXP-343
8	355	0.1 - 97%	$>1000:1$	6-PWRXP-355
8	400	0.1 - 98%	$>1000:1$	6-PWRXP-400
8	515	0.1 - 99%	$>1000:1$	6-PWRXP-515
8	532	0.1 - 99%	$>1000:1$	6-PWRXP-532
8	780-820	0.5 - 95%	$>200:1$	6-PWRXP-780-820
8	800	0.1 - 99%	$>1000:1$	6-PWRXP-800
8	1020-1040	0.5 - 95%	$>200:1$	6-PWRXP-1020-1040
8	1030	0.04 - 99%	$>3000:1$	6-PWRXP-1030
8	1064	0.04 - 99%	$>3000:1$	6-PWRXP-1064

## Standard specifications

Optimization	transmission mode
Typical application	high power CW and pulsed lasers
Clear aperture	8 mm
Configuration	$1/2$ high power waveplate + 1 high contrast TFP
Dimensions	60x32x64 mm
Time between min and max attenuation	1 sec
Resolution	$<15 \text{ arcsec/step}$