

Configurable Raman Probe



Innovative Photonic Solutions' Configurable Raman Probe was developed to meet the needs of those who desire more control over the specifications of their Raman instrumentation.

The Configurable Raman Probe has a flexible, compact design that allows for optimization of the collection efficiency for $f\# < f/4$ or $f\# > f/4$ spectrometers. Customers have a choice of Raman filter cut-on wavenumber, working distance from the sample, and spot size. Specialized Raman filter sets and high efficiency collection optics allow for the generation and collection of quality Raman spectra with a high signal-to-noise ratio and exceptional Rayleigh suppression.

The Dual Wavelength option allows the user to take advantage of the technique known as Raman Concatenation, which allows for collection of a full range of spectral data without losing sensitivity in the stretch band or the use of expensive detection systems and/or long integration times

Designed for OEM integration the 8-32 mounting holes provide an easy solution to mount the probe in your system.

Standard Wavelengths

Applications

This Raman probe is designed for OEM Integration and is ideal for:

- High Resolution Raman Spectroscopy
- Portable Raman
- Process Raman

Key Features

- High throughput optical design that maximizes Raman collection efficiency.
- Choice of filter cut-on: $\leq 85 \text{ cm}^{-1}$, $\leq 100 \text{ cm}^{-1}$, $\leq 125 \text{ cm}^{-1}$
- Selection of excitation and collection optics offer a configurable spot size ratio.
- 3/8"- 40 lens tube thread allows for interchangeable lens tubes.
- Embedded Teflon standard in shutter for quick reference measurement.
- Removable collection and excitation fibers for system optimization or repair.
- Lens tubes available for laboratory and immersion applications.*
- Dual Wavelength option available.
- > 8-32 mounting holes on probe body.
- > Excitation (105 μm) and collection (200 μm) 1- meter fiber patch cables included.
- >Excitation source and control electronics sold separately.
- *Please note immersion lens tubes are available as an add-on accessory only. Extended lead times may apply.

532nm	680/785nm	860/1064nm
638nm	785nm	1064nm

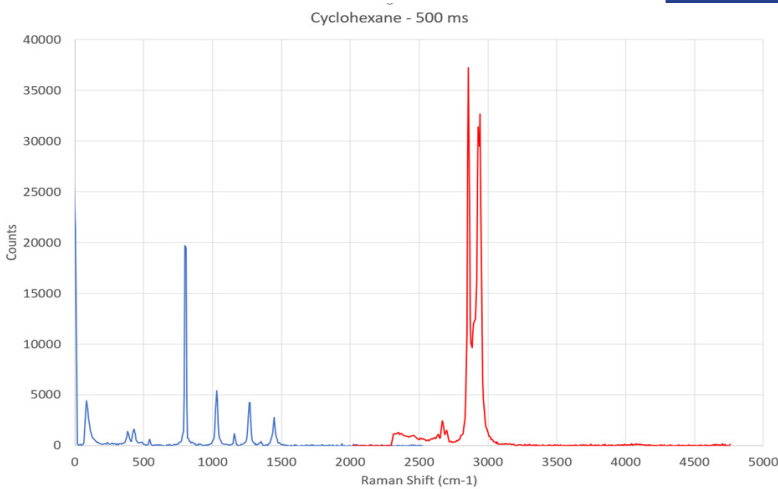
Custom wavelengths available upon request.

Specifications



Parameter	Unit
Available Wavelengths	532 nm, 638 nm, 680/785 nm, 785 nm, 860/1064 nm and 1064 nm
Excitation Fiber	105 μm diameter, 0.22NA, FC/PC to FC/PC, 1 meter length
Collection Fiber	200 μm diameter, 0.22NA, SMA to SMA, 1 meter length
Filter Cut-On Options	$\leq 85 \text{ cm}^{-1}$, $\leq 100 \text{ cm}^{-1}$, $\leq 125 \text{ cm}^{-1}$
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Working Distance (+/- 0.5 mm)	3.08 mm, 8.1 mm, 9.6 mm, 10.6 mm, 12.6 mm, 20.41 mm
Storage Temperature	-10°C-55°C

λ (nm)	Output Power (mW)	Base Part Number
532	125	I0532P-FS-32-125-08
	100	I0532P-FS-32-100-08
638	125	I0638P-FS-32-125-08
	100	I0638P-FS-32-100-08
	85	I0638P-FS-32-085-08
785	125	I0785P-FS-32-125-08
	100	I0785P-FS-32-100-08
	85	I0785P-FS-32-085-08
1064	125	I1064P-FS-32-125-08
	100	I1064P-FS-32-100-08
	85	I1064P-FS-32-085-08
680/785	125	I0785P-FS-32-125-08-DW
	100	I0785P-FS-32-100-08-DW
	85	I0785P-FS-32-085-08-DW
860/1064	125	I1064P-FS-32-125-08-DW
	100	I1064P-FS-32-100-08-DW
	85	I1064P-FS-32-085-08-DW



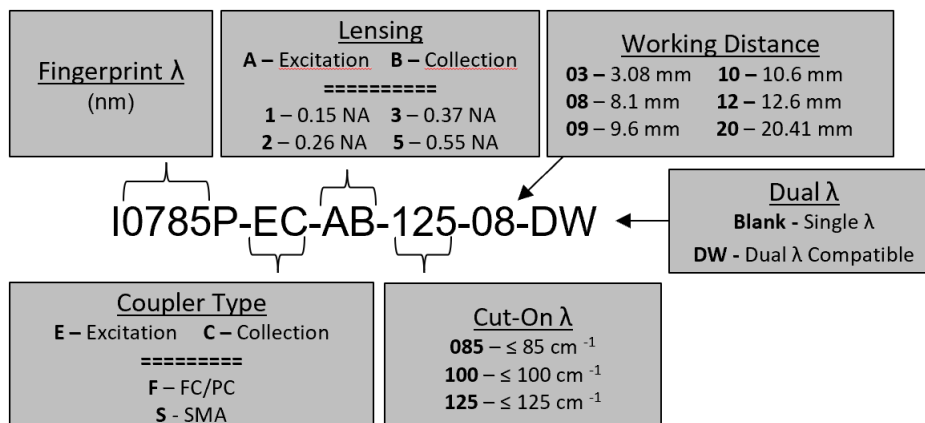
DW (Dual λ) Option

Paired with the Digital Dual Wavelength M-Type Module ([link underlined](#)) the Dual Wavelength Configurable Raman Probe option is part of IPS' Raman concatenation system.

Raman concatenation is a technique that offers the ability to use longer excitation wavelengths and still collect the entire Raman spectrum without the need for expensive detection systems and/or long integration times. Raman spectra are captured individually for each excitation wavelength and stitched together to provide a single spectral scan encompassing the entire range of data. This technique offers both increased selectivity and enhanced discrimination between spectral features in the long wavenumber region of the spectra.

Concatenated Fingerprint and Stretch Regions

Part Schema



Custom Capability



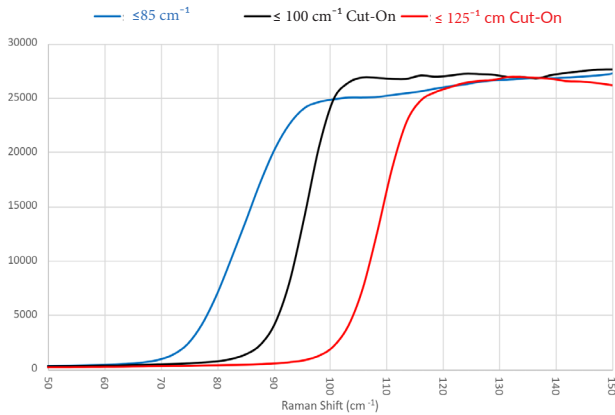
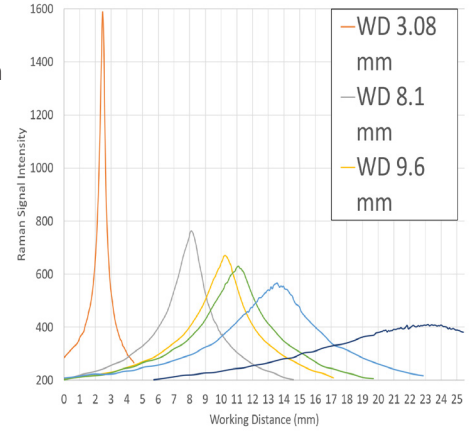
Working Distance (WD) vs. Raman Signal Intensity and Depth of Field (DOF)

Shorter WDs offer a higher Raman signal intensity and a narrower DOF making them excellent for fixed point sampling, however it makes for a very tightly toleranced system as there is a very specific optimal WD.

Longer WDs provide a reduced Raman signal intensity, however they offer a much broader DOF, which spreads the optimal WD over a greater range and provides meaningful Raman spectral data even outside the optimal WD.

IPS recommends an 8.1 mm WD as an excellent compromise between approximate spot size, Raman signal intensity, and DOF.

Additional lens tubes are available as accessories. The 3/8" - 40 lens tube thread allows for interchanging lens tubes, which can bring a range of WDs to your experiment or system.



Selection of Raman Filter Cut-On

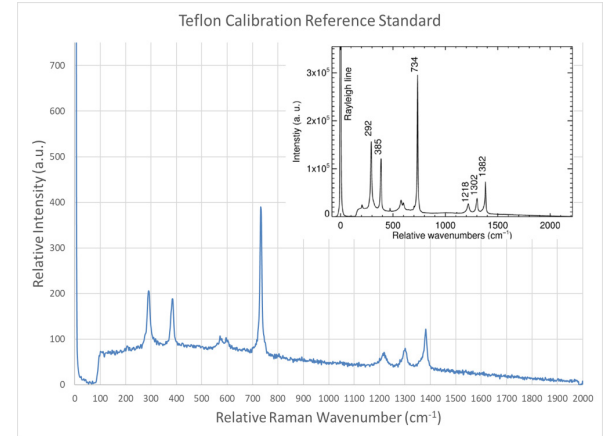
Dependent upon application needs and the region of interest to be interrogated, the Configurable Raman Probe offers three distinct filter cut-on choices to choose from: $\leq 85 \text{ cm}^{-1}$, $\leq 100 \text{ cm}^{-1}$, or $\leq 125 \text{ cm}^{-1}$. Cut-On is measured as 10% Tpk.

The spot sizes for the Configurable Raman Probe are dependent upon the focal length of the collimators selected and the focal length of the lens tube. IPS' standard configuration offers an average excitation spot size of $\sim 165 \mu\text{m}$ and an average collection spot size of $\sim 175 \mu\text{m}$. Please review the data below for additional lens tube/collimator combinations and their correlating spot size for our 8.1 mm and 9.7 mm working distance options.

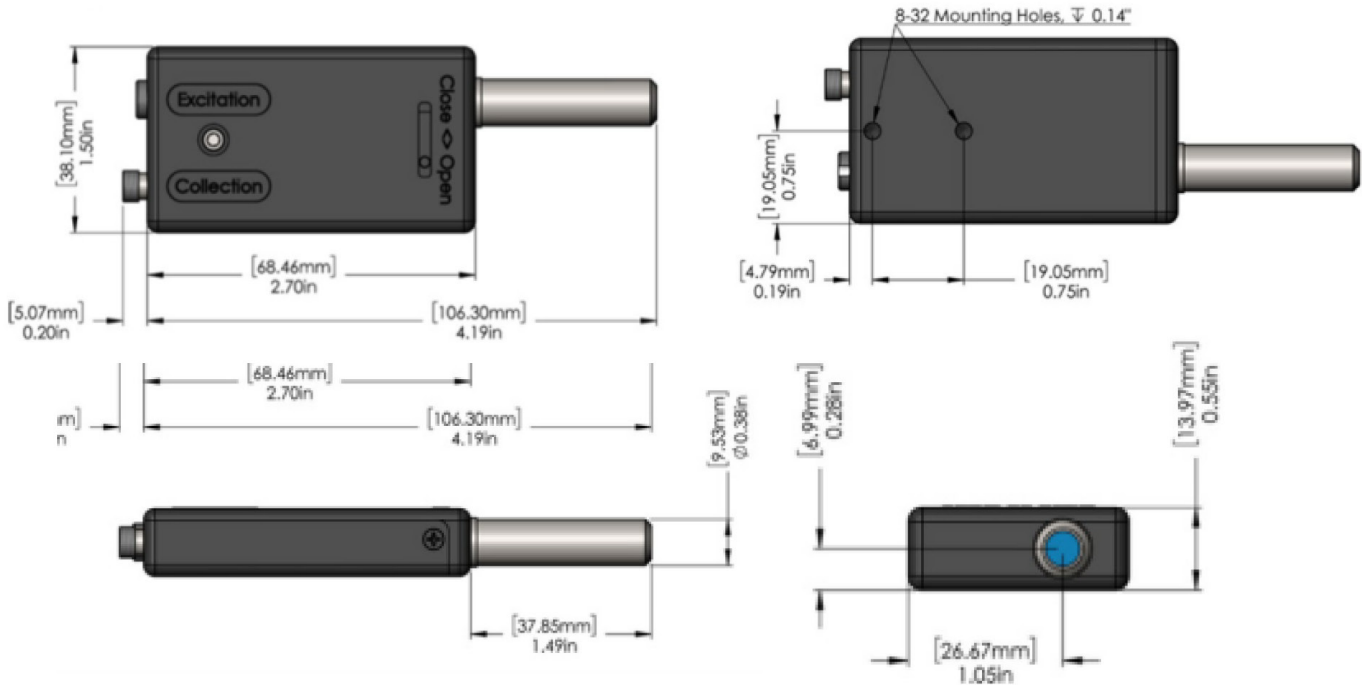
Spot Size Calculations									
Excitation Spot Size: Fiber Diameter x (f lens tube)/(f collection collimator)									
Collection Spot Size: Fiber Diameter x (f lens tube)/(f collection collimator)									
785 nm Configurable Raman Probe									
Standard Configuration—Excitation: 0.37 NA Collimator, 105 μm fiber; Collection: 0.26 NA Collimator, 200 μm fiber.									
Focal Length (mm) (Note: This is not the WD)					Focal Length (mm) (Note: This is not the WD)				
8.1 mm WD Lens (L1)		9.6			9.7 mm WD Lens (L1)		11		
Collimator	0.15 NA	0.26 NA	0.37 NA	0.55 NA	Collimator	0.15 NA	0.26 NA	0.37 NA	0.55 NA
(L2)	18.4	11.07	6.24	4.51	(L2)	18.4	11.07	6.24	4.51
Magnification (=L1/L2)	0.52	0.87	1.54	2.13	Magnification (=L1/L2)	0.60	0.99	1.76	2.44
Fiber Diameter (μm)	Approximate Spot Size (μm)				Fiber Diameter (μm)	Approximate Spot Size (μm)			
	Fiber Diameter x Magnification					Fiber Diameter x Magnification			
105	55	95	165	225	105	65	105	190	260
200	105	175	310	430	200	120	200	355	490
300	160	265	465	640	300	180	300	530	735
400	210	350	620	855	400	240	400	710	980
Notes									
<ul style="list-style-type: none"> A larger collection spot size vs. excitation spot size is desirable due to spatially offset Raman signal. Higher NA spectrometers ($f\# < f/4$) show improved performance with higher NA collection optics. Lower NA spectrometers ($f\# > f/4$) show improved performance with lower NA collection optics. Once a set of collimators is selected, they cannot be exchanged for another collimator choice without a full realignment of the probe. Once an excitation fiber is selected, IPS does not recommend exchanging it for a fiber with a larger diameter core as the system is optimized for Rayleigh suppression based upon the diameter of the excitation beam. 									
Recommendations									
<ul style="list-style-type: none"> Excitation Fiber (All spectrometers): 105 μm, 0.22 NA, 1-meter. Collection Fiber ($f\# < f/4$ spectrometers): 300-400 μm, 0.22 NA, 1-meter. Collection Fiber ($f\# > f/4$ spectrometers): 200-300 μm, 0.22 NA, 1-meter. 									

Mechanical Drawings

Each Configurable Raman Probe comes with an embedded Teflon standard in the shutter which allows for quick and easy reference measurements.



Mechanical Drawings



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