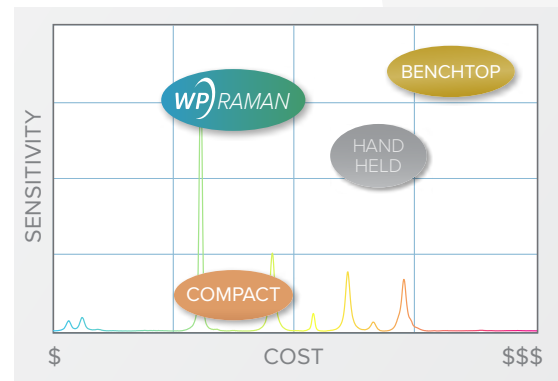


Choosing a Portable Raman Spectrometer

What factors are important to consider, and why Wasatch?

A good portable Raman spectrometer bridges the gap in performance, capability, and size between handheld and benchtop Raman spectroscopy. It enables new point-of-use applications in medicine and industry by providing high sensitivity and dependable answers in a compact, cost-effective footprint. These qualities are important to both researchers and OEM instrument developers, particularly for applied research and commercialization of new technologies. Medical diagnostics, environmental monitoring, and quality and process control in the food chain, energy industry, and manufacturing are all beginning to harness the power of portable Raman spectrometers to provide sensitive and specific answers to difficult questions. Raman is also being used as a complementary diagnostic within other systems, from high-end research tools to machine inspection and surgical instruments.

[Learn more about Raman spectroscopy applications](#)



At Wasatch Photonics, we share your goals. Like you, we want to see the full power and potential of Raman used to save lives, protect our environment, keep our families safe, and improve the world around us. We want ‘next generation’ to happen in our generation, by providing a line of world-class portable Raman spectrometers that allow research to become reality.

That’s why our spectrometers are more sensitive and higher throughput – to give you better spectra in less time. We’ve made them robust & reproducible enough to give reliable answers in the lab, the field, or the hospital. We offer more configurations than any other Raman spectrometer provider, and help you to find the right fit through our expertise & experience, supported by Raman-specific software tools with full data transparency so that you have full control over data analysis. We care enough to listen to our customers and respond, and we will listen to your needs to help you get the best solution possible.



Sensitivity



Reliability



Configurability



Ease of use



Data access

Benchtop vs portable vs handheld Raman - What's the difference?

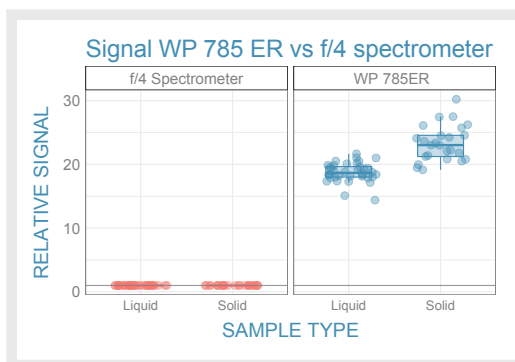
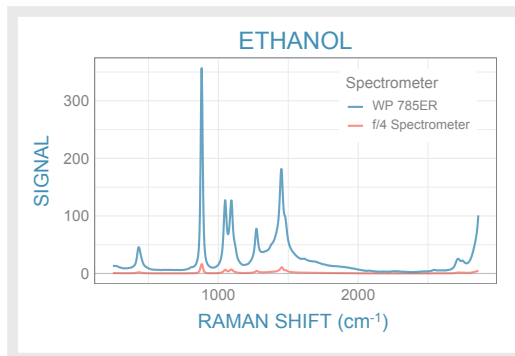
Benchtop Raman systems are designed for use in the lab, integrating complex optical interfaces for sample positioning and/or imaging, high-end detectors, and multiple excitation wavelengths to provide the greatest flexibility for research. They come with sophisticated software that automates signal acquisition and processing, but which may block the user’s access to the raw data or their ability to write custom software. They are expensive, large, and heavy, limiting their use to research.

SENSITIVITY: MORE SIGNAL, HIGHER THROUGHPUT, FASTER MEASUREMENTS

Raman is a low-light technique, which makes every photon precious. A general-purpose compact spectrometer may not have the sensitivity needed to capture sufficient Raman signal without accumulating excess background noise. The ideal portable Raman spectrometer is designed around a few simple principles – [collect more light, keep more light, detect more light](#). We design every Wasatch Photonics portable Raman spectrometer for maximum sensitivity – to collect more signal from weak Raman emitters compared to other spectrometers. Even low concentrations can be measured, thanks to higher signal and cleaner spectra.

Wasatch Photonics Raman spectrometer designs use a low f/# (high NA) input to increase light collection, our own patented VPH transmission gratings for maximum diffraction efficiency at all wavelengths, and custom optics to achieve diffraction-limited optical design. This combination yields a superior, high throughput optical bench for low light level applications, which we match to the best detectors for each application. The result? You can collect more Raman signal in a shorter period of time – for better signal-to-noise, lower limits of detection, and faster back-to-back measurements.

[Learn more about our optical design benefits](#)



Benchtop vs portable vs handheld Raman - What's the difference?

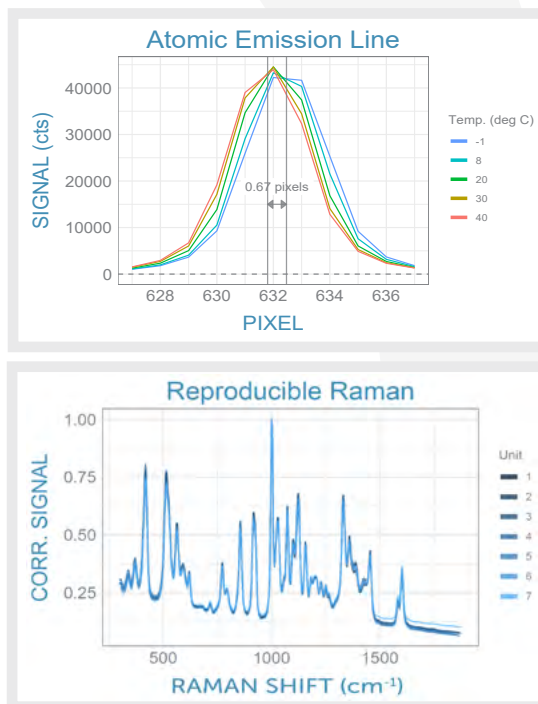
Portable Raman spectrometers (sometimes referred to as 'compact' Raman spectrometers) allow the user to streamline and configure a Raman system to their specific application – reducing size, weight, complexity, and cost in the process. If designed with an integrated excitation laser, they can be small and robust enough to be easily moved from one location to another, yet powerful enough to be used for many research projects. They come with options for excitation wavelength, sample interface, and level of integration. They are operated via a laptop or tablet, with software for data collection and processing. A portable Raman spectrometer is an excellent choice for applied research, measurements in the field, and for integration into larger, application-specific instruments for OEM use.

Handheld Raman instruments are designed for use in the field by non-experts to deliver definitive identification of a substance upon point-and-click operation. They integrate a single wavelength Raman system and sampling optics, data processing, and a display screen/user interface into a lightweight, battery-operated unit that is robust enough for use by first responders and in manufacturing environments. They deliver rapid and reliable answers, but are limited to the libraries installed. Handheld Raman instruments seldom offer access to raw data, and configurability is limited to the sampling accessories provided.

RELIABILITY: ROBUST DESIGN, REPRODUCIBLE MEASUREMENTS

A portable Raman spectrometer needs to perform reliably in a variety of different use-case environments, providing consistent spectral data from one day to the next – independent of changes in temperature and movement. We use a transmission-based optical design known to minimize wavelength drift and peak distortion with temperature, as demonstrated at right. We also perform shock and vibration testing to ensure our designs are mechanically robust.

Analysis of Raman spectra often involves matching to a library or use of chemometric models. This makes low unit-to-unit variability important, especially for OEMs. At Wasatch Photonics, we pride ourselves on high unit-to-unit consistency, and we are committed to providing the appropriate wavelength, wavenumber, and spectral response calibrations and standards to ensure rock-solid spectra. This allows you to achieve better than >99.5% unit-to-unit spectral agreement using Wasatch Photonics spectrometers, as demonstrated by the spectra from seven separate spectrometers overlaid at right. [Learn how to collect reproducible Raman spectra](#)



CONFIGURABILITY: MORE WAVELENGTHS, SAMPLE COUPLING, & OEM OPTIONS

A small footprint shouldn't mean limited options. The configuration of a portable Raman spectrometer influences the strength and quality of its spectra, and its practical fit for each application or use-case. The options & factors to consider include:

- [Excitation wavelength](#): a balance between signal strength and background fluorescence
- [Integrated laser](#): retain the flexibility of a modular system and reduce cost with a built-in excitation laser, or use a fully integrated system for the greatest signal in the smallest footprint
- [Spectral range](#): fingerprint region for identification (<1800 cm^{-1}) or extended functional range for maximum information (<3600 cm^{-1})
- [Choice of detector & cooling level](#): a compromise between cost, dark noise, and power draw/size that depends on signal level and how & where the instrument will be used
- [Sample coupling](#): is the sample solid or liquid? Is a [fiber optic Raman probe](#) needed to reach it?
- [OEM options](#): availability of a streamlined, equivalent model for integration into an application-specific instrument is important for OEMs and researchers developing a new product

At Wasatch Photonics, we understand the influence and interplay of each of these factors, and can advise on the best match to your application. In fact, that's why our portable Raman spectrometer family includes [configuration options from 248-1064 nm](#) with a choice of detectors to suit research & OEM applications – all with our signature high sensitivity & speed – to help you get the best data possible in the right form factor for your application. It also

makes it easy for you to source multiple Raman needs from one vendor, saving you time and effort so that you can get to the science faster, and providing the consistency needed to easily transfer your software, analysis methods, and learnings from one project to the next.

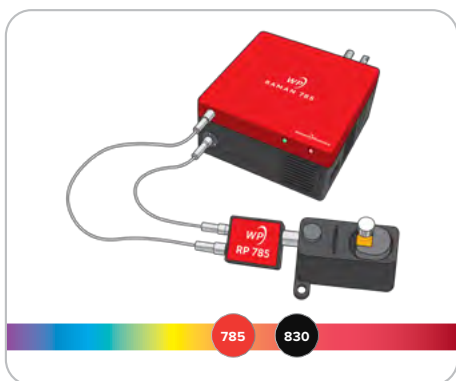
Consistency is particularly important when developing a new Raman-based instrument. Too often, instrument developers are forced to perform proof-of-concept testing on a benchtop instrument initially, then repeat it with a more compact OEM spectrometer, but why waste that time & effort? The high sensitivity of our portable Raman spectrometer line allows you to perform R&D with a compact benchtop unit for the lab, then quickly & easily migrate to the equivalent OEM module for prototyping and production. We call this our '[OEM by design](#)' philosophy. By using the same optical design throughout, you guarantee consistent performance from R&D to launch, which in turn reduces your risk and accelerates your product development.

FULLY MODULAR SYSTEMS



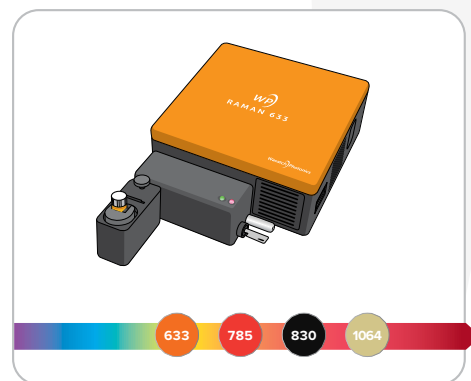
Spectrometer with external laser
Flexible fibers & Raman probe

SEMI-INTEGRATED SYSTEMS



Spectrometer with integrated laser
Flexible fibers & Raman probe

FULLY INTEGRATED SYSTEMS



Spectrometer with integrated laser,
filtering, and sample coupling optics

EASE OF USE: INTUITIVE & POWERFUL SOFTWARE, SIMPLE SETUP

Good products are easy to use, and a portable Raman spectrometer should be no different. Look for Raman-specific software that comes with the spectrometer at no additional cost, with an intuitive user interface that makes getting started easy, right out of the box ([see how](#)). Software development kits (SDKs) that are available in a variety of programming languages increases compatibility with other systems, your existing software stack, and your team's personal programming preferences, allowing automation of data acquisition and speeding instrument development. The ability to develop plug-ins compatible with the existing GUI can simplify data analysis and automate application-specific answers.

At Wasatch Photonics, we believe software should give you the freedom to collect and analyze your data in the way that works best for you.

Our [ENLIGHTEN™ spectroscopy software & SDKs](#) were developed by experienced Raman spectroscopists in collaboration with research & OEM customers. It offers features essential for Raman, including control of onboard laser power and detector/measurement parameters, plus



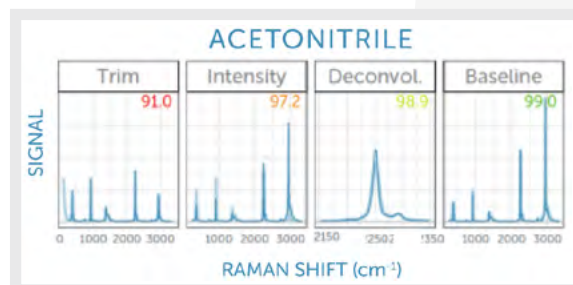
corrections for laser wavelength, spectral response, and thermal drift using known standards. It allows you to start each day with the same acquisition parameters, save & recall spectra for later analysis/export, run multiple units, and collect sequential spectra easily. We also offer [embedded Raman library matching](#) powered by Wiley's KnowItAll spectral identification engine, complete with the pre-processing steps needed to enhance matching accuracy.

Whether you want a quick & easy interface to collect data or SDKs to power your own software, we have you covered. ENLIGHTEN™ is included with every spectrometer and is free for download here. Don't see a feature you need? [Let us know](#)

FULL DATA TRANSPARENCY: ACCESS TO RAW DATA AND ALL DATA ANALYSIS STEPS

A portable Raman spectrometer should give you full access to **your** data, in unprocessed form. Many spectrometer manufacturers perform some degree of pre-processing, which in benchtop spectrometers can be automatic. Although this is convenient for some applications, it can limit your ability to understand, control, and modify spectral pre-processing and subsequent analysis.

The VPH gratings at the heart of our Raman spectrometers are transparent, and we believe our data collection and processing should be the same. We offer you full data transparency, giving you access to the raw spectrum collected in a variety of file formats, as well as all correction and processing steps thereafter. Our ENLIGHTEN™ software and SDKs are open source, which means you can see, adapt, and customize each step of data processing at the source code level to create your own custom algorithms and software attuned to your specific needs.



WHY WASATCH FOR RAMAN?

At Wasatch Photonics, we design and manufacture products specifically for Raman spectroscopy – to increase the ease of performing research and Raman-based product development that stands above the rest. We've spent thousands of hours collaborating with researchers and OEM instrument developers alike to understand your unique needs and develop the best possible products. We've put in the time in the lab to understand what a great Raman spectrum looks like, and the optical design required to achieve superior performance in a compact, cost-effective footprint. Why? It's our mission to bring Raman spectroscopy to life, and it drives everything we do.

We believe that science has the power to effect change and improve lives, and we want to support the visionaries making that possible – you. We may not always get everything right, but we will listen and we will learn. That's the benefit of working with an independent company who shares your pioneer mindset. By working together, 'next generation' can happen in **our generation**.



[Contact us to discuss your Raman spectroscopy application & needs](#)