HANDHELD RAMAN SPECTROMETER

BRAVO

The Next Generation.

BRAVO Raises Standards.

Handheld Raman Analyzer.

BRAVO sets new standards in performance, safety and ease of use of handheld Raman analyzers dedicated for raw material verification. Operated by touching icons and intuitive workflows on a large touch screen, the graphical user interface of BRAVO facilitates an extremely reliable use by everybody´s hands.

It is All-in-One:

- SSE™ - Patented fluorescence mitigation
- Duo LASER™ excitation
- IntelliTip™ - Automated measuring tip recognition
- Laser class 1 in all operating modes
- Intuitive and guided touchscreen operation
- Ultimate Raman shift accuracy
- Wireless and Ethernet connectivity
- Automated data transfer and reporting
- Complies with latest pharmaceutical regulations

BRAVO´s innovatins are all protected in a rugged housing for maximum robustness.

Bruker **RA**man **V**erification **O**ptics
APPLAUSE FOR BRAVO

Patented technologies especially designed for BRAVO provide an unchallenged performance for routine material analysis and an increased accessibility to many material systems.

Compliance

BRAVO is designed to be operated in validated environments in Pharmaceutical industry. Bruker´s mission statement "Innovation with Integrity" is a commitment to offer solutions compliant to latest Pharmaceutical regulations.

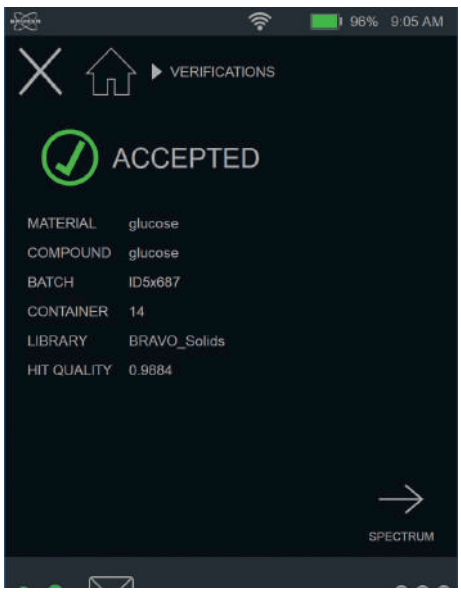
BRAVO Is Intuitive.

Advanced Operation.

1 The 2D barcode scanner registers the material suppliers information to be ready in seconds for material verification.

2 BRAVO measures through packaging material (e.g. vials and plastic bags).

3 The acquired Raman spectrum is compared to library data and a clear pass or fail result is presented.



Batch Scan Mode

The automated batch scan mode of BRAVO enables to analyze the same raw material provided in a larger number of lots while requiring a minimum of user adjustments. In particular it allows to easily switch between batch scans of different raw materials.

Maximum User Safety

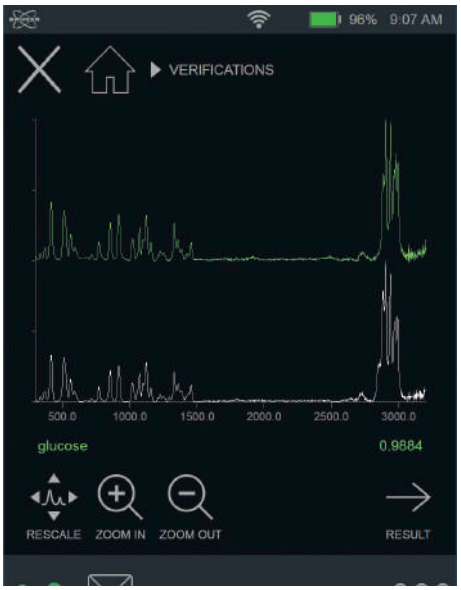
BRAVO is the only handheld Raman instrument certified as laser class 1 product in all operation modes.

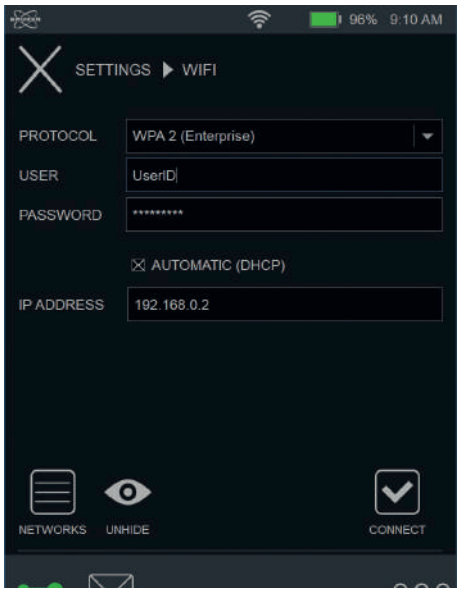
You do not need to be an expert. Raman analysis has never been that simple before. Likewise the operation of a smartphone the user is guided through a clearly laid out user interface designed for the needs of incoming raw material inspection. BRAVO ensures high standards and a sophisticated workflow for an efficient operation.

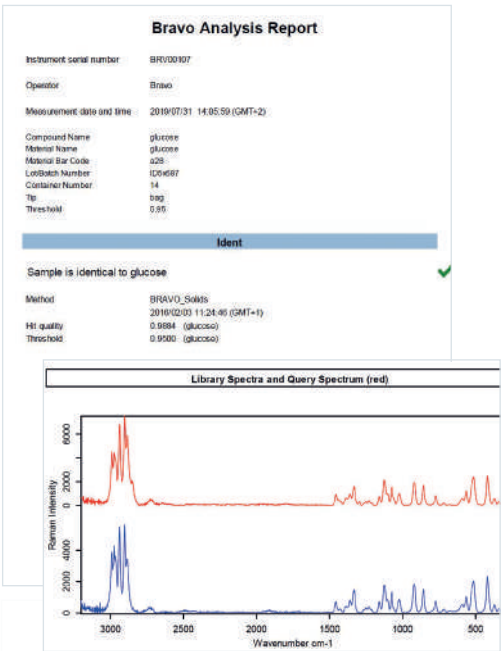
4 Review results on the large 7 inch touch screen display.

5 The WLAN and Ethernet connectivity of BRAVO offer the highest flexibility for system integration and data transfer.

6 BRAVO generates measurement reports of individual as well as batch scan verifications.







Endurance

The intelligent power management combined with a high capacity lithium ion battery does not let you alone. At frequent data acquisition 4 hours operation time is achieved.

BRAVO Is Effective and Versatile.

Outstanding Functionality.

BRAVO offers you maximized flexibility. No unpacking of incoming materials, no transport to expensive laboratories and no time consuming analysis. BRAVO moves the analysis in your hands to the desired location and offers the most effective workflow. BRAVO's settings and functions are assigned to different user levels to ensure segretation of duty (SOD) and the validity of your results.

Build and Validate your Own Library

BRAVO allows to build and manage libraries according to your needs. The validation process is supported by software tools and electronic signatures offer controls to enforce only released methods to be used for analysis.

Note, building a library is no time-consuming process. The acquisition time of a spectrum of a material to be stored in a library is identical to a verification measurement.

Optimum Results, Maximum Trust

Samples are contained in different forms using various packaging. BRAVO offers adaptors to measure through different packaging, ranging from thin films to solid glass barriers of several milimeters thickness.

The Multi Purpose Adapter allows to attach sample holders for tablets and enables for direct measurements at small amounts of powder. The Vial Tip accommodates several certified reference samples for performance testing, as well as standard glass vials.

No matter if it is solid, liquid or in powder form, BRAVO offers a solution at minimized sample preparation.

Left: Tip for direct measurements at small amounts of powder samples.

Right: Tablet Tip

Docking Station

Have a BRAVO that is always ready to use. The optional docking station charges BRAVO as well as the additional battery and offers storage possibilities for the daily check sample and a second measuring tip. Furthermore, the docking station enables data transfer between BRAVO and your PC, as well to connect to a local area network.

OPUS Software

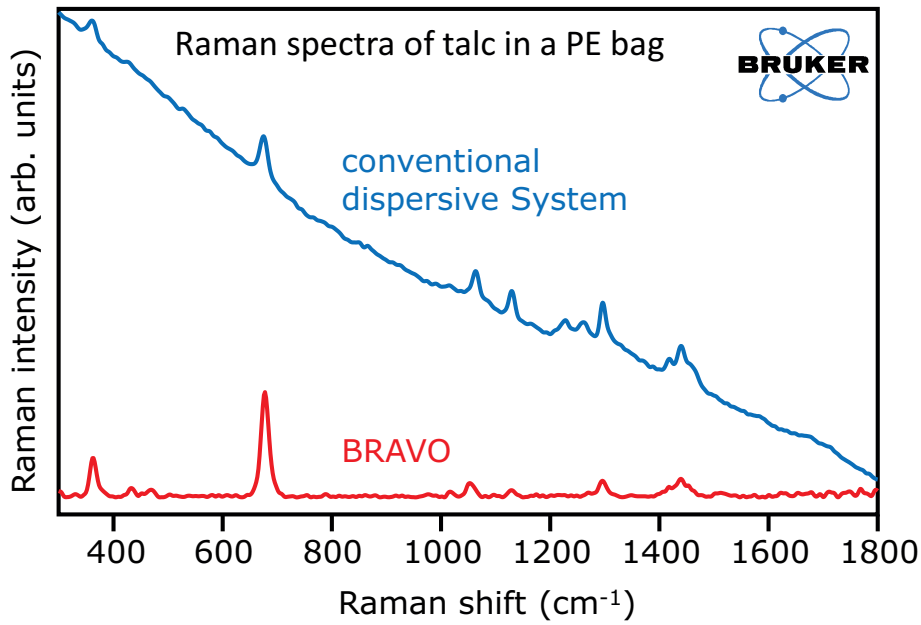
Bruker's approved OPUS spectroscopy software provides the administrative platform to manage a single or multiple BRAVO spectrometers. It offers a sophisticated User Management, modules for method setup, an interface for instrument configuration and prerequisite functionality to work in compliance to Pharmaceutical regulations. Additionally, OPUS is the powerful tool to fulfill all demands of post data evaluation like data processing, quantification and many more. At this point BRAVO converts to an easy to use, miniaturized scientific instrument. Furthermore, the remote control of BRAVO via OPUS facilitates a fast benchtop operation.

BRAVO Is Unique Performance.

BRAVO constitutes a new era of handheld Raman spectroscopy. Impressive performance, unique features in handy dimensions and a smart design form the basis of a high quality Bruker product.

Duo LASER™ excitation extends the available spectral range to include the CH-stretching region. Next to the additional spectral information being accessible, this technique results in best sensitivity across the large spectral range of 300 cm^{-1} to 3200 cm^{-1}.

Thus, very weak Raman signals are considered in the verification algorithms and accomplish maximum unambiguous verification of materials.



Raman spectra of talc in a PE bag measured with a conventional dispersive benchtop system and the BRAVO. BRAVO´s SSE™ demonstrates efficient fluorescence mitigation and Duo LASER™ enables the detection of the weak Raman signals of talc with an exceptional signal to noise ratio.

Tip Recognition

IntelliTip™ recognizes the mounted measuring tip of BRAVO and stores this information in your records. There is no room for mistakes, Intellitip™ guarantees that if defined for a raw material BRAVO will advise which tip has to be used. Furthermore, by the mechanical key-lock design an easy and precise adjustment is ensured for all measuring tips.

Fluorescence Mitigation

In many cases material verification by Raman spectroscopy is prevented by fluorescence. Patented Sequentially Shifted Excitation SSE™ technique (US patent 8,570,507 B1) manages an effective mitigation of fluorescence. The Raman spectra are acquired at SSE™ energies using temperature tuned diode lasers. The applied SSE™ algorithm takes advantage of the fact that Raman signals exhibit a spectral shift as a function of excitation energy whereas the fluorescence remains constant. The generated Raman spectra are free of fluorescence and feature a high signal to noise ratio. This allows the identification of a much wider range of raw materials using a handheld Raman system than ever before.

Ultimate Raman Shift Accuracy

BRAVO offers utmost performance with a Raman shift accuracy typically better than 1 cm^{-1} in the fingerprint region. A performance that meets requirements for benchtop instrumentation defined in Pharmaceutical regulations.
The high accuracy level assures the sharing of library data amongst different instruments with highest confidence.

BRAVO In The Pharmaceutical Industry.

Speed Up Manufacturing.

No Unpacking of Materials
No Expensive, Time-Consuming Analysis

BRAVO performs efficient and reliable verifications of incoming raw materials which form the basis of your finished products. A maximized control of the world wide supply chain is essential for quality control and assurance, avoiding risks and to guarantee consumer safety.

Monitor Key Manufacturing Processes

Whether for your designed APIs or excipients as major building blocks of your product, BRAVO offers a fast and safe sampling throughout the whole manufacturing process.

Finished Product Inspection

Is it a solid, a liquid or a powder and even already within packaging material like blister packs? BRAVO provides a flexible solution for various purposes.

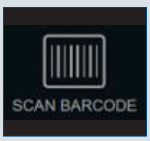
BRAVO meets strict requirements and regularities of the pharmaceutical industry offering a variety of applications to shape an efficient manufacturing process.

Everything with Ease

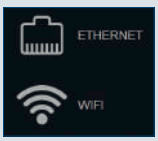
The workflow supported by the graphical user interface is dedicated for pharmaceutical applications. Combined with BRAVO's genius ease of use the basis for a seamless integration into the process line is formed.

Measure reference spectra to add materials to your spectrum library.

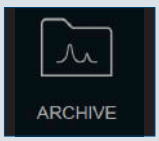
Guided verification workflow for valid results.



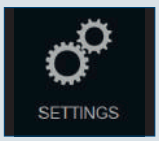
Scan product information in a fraction of a second.



Wired or wireless data transfer.



Review results.



Advanced settings, manage your libraries, access system information.

BRAVO in the Pharmaceutical Industry

BRAVO fully complies to current regulations of the Pharmaceutical industry. A state-of-the-art validation mode assures that manifold aspects such as 21 CFR Part 11, Data Integrity and performance testing according to applicable USP/PhEur protocols are considered.

For example, actions are logged in comprehensive Audit Trails, the user and signature management offers different user levels and the assignment of user rights to ensure the segregation of duties (SOD), electronic records are automatically stored in a Protected Data Pool, and many more.

Know How meets Service

Bruker Optics is the leading manufacturer and worldwide supplier of Fourier Transform Infrared, Near Infrared and Raman spectrometers for various industries and applications. For years, we set new standards on the market when it comes to precision and efficiency, ergonomics and ease of operation, consulting and services.

Worldwide on-site: We are there where you need us.

Bruker's competence is there where our customers need it - from the very first contact. Our application specialists are scientists and engineers who know Raman spectroscopy and spectrometers as well as the customers applications. With service centers all over Europe, North and South America, Asia and Oceania an efficient global technical support is guaranteed. This includes professional instructions regarding your application as well as qualified and fast after sales service and, if desired remote diagnostics.

Highest Quality from a Renowned Company: Always more than you expect

We are never satisfied with the common market standards. This is where our own research and development departments play a major role: here new ideas are turned into innovative products - in more precision, advanced user comfort and unrivalled reliability. To us, it is obvious that these highest demands are also valid for our production process. High quality materials, careful workmanship and, if necessary, especially developed production processes and test routines ensure the quality that is common to all Bruker Optics spectrometers. No matter which new products we design, we place the very highest demands on them all. This is why BRAVO fulfills the strict requirements for the certification in the pharmaceutical industry.

Bruker Optics is continually improving its products and reserves the right to change specifications without notice.
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