



# BRAVO

- The next generation handheld Raman spectrometer

# ● BRAVO Raises Standards.

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 swipe actions on a large touch screen display the graphical user interface of BRAVO facilitates an extremely reliable use by everybody's hands.

## **Bruker RAman Verification Optics APPLAUSE FOR BRAVO**

Patented technologies especially designed for BRAVO provide an unchallenged performance for increased accessibility to many material systems. BRAVO's innovations are all protected in a robust housing for maximum durability.

### **Accuracy is crucial**

BRAVO is designed for material verification in validated environments. The integrated neon lamp ensures an automated wavenumber calibration for unprecedented accuracy.

### **BRAVO - All in One**

- SSE™ - Patented fluorescence mitigation
- Duo LASER™ excitation
- IntelliTip™ - Automated measuring tip recognition
- Intuitive and guided touchscreen operation
- Automated batch scan reporting
- Inbuilt wavenumber calibration
- Robust and precise optics
- Wireless data exchange
- Complies with 21 CFR Part 11 requirements



● Handheld Raman Analyzer



# • BRAVO Is Intuitive.

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.

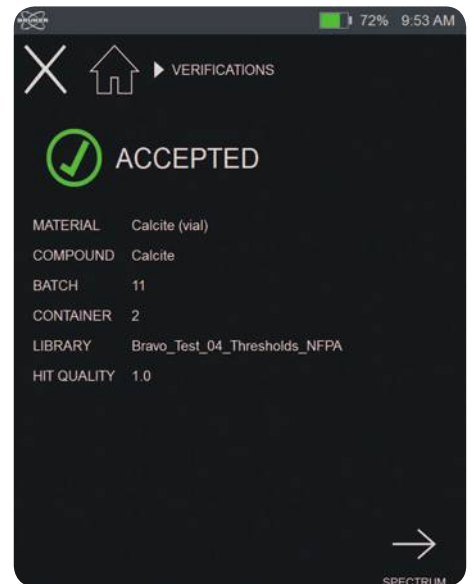
**1** The 2D barcode scanner registers the material suppliers information to be ready in seconds for material verification.



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

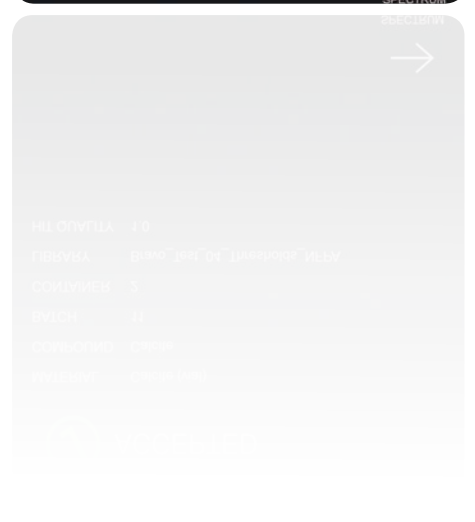


**3** The acquired Raman spectrum is compared to library data and a clear pass or fail result is presented.



## 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.





# ● BRAVO Is A Mobile Lab In Your Hands

BRAVO offers you maximized flexibility. No unpacking of incoming materials, no transport to expensive laboratories and no time consuming analysis. BRAVO moves the lab in your hands to the desired location and offers the most effective analysis. BRAVO's settings and functions are adopted to different user levels for maximum security and validity of your results. Good to know: The user interface is supported by 17 languages in parallel.

## Built and Validate your Own Library

BRAVO allows to build and manage libraries according to your needs. For example spectra of a single raw material present in various packaging can be stored in one comprehensive method separately. All methods are stored within a library that can be checked for consistency and signed.

Note, that building up 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 the one of a verification in standard measurement mode.

## Validate Library

Library name: BRAVO  
Description: BRAVO  
Copyright: BOPT  
OPUS version: 7.7 Build: 7, 7, 1, 105.B 20150121

		Entry No.	Correlation Coefficient	Compound Name
1	-	1		calcium oxalate hydrate
2	-	9	0.073773	fructose
3	-	2		talc
4	-	7	-0.032681	sodium carbonate anhydrous
5	-	3		glucose monohydrate
6	-	6	0.212180	potassium dihydrogen phosphate
7	-	4		ascorbic acid
8	-	9	0.154309	fructose
9	-	5		acetylsalicylic acid
10	-	4	0.093644	ascorbic acid
11	-	6		potassium dihydrogen phosphate
12	-	3	0.212180	glucose monohydrate
13	-	7		sodium carbonate anhydrous
14	-	10	0.267930	pentaerythritol
15	-	8		anthracene
16	-	1	0.017490	calcium oxalate hydrate
17	-	9		fructose
18	-	10	0.378244	pentaerythritol
19	-	10		pentaerythritol
20	-	9	0.378244	fructose

## ● Outstanding Functionality



### 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 direct data transfer between BRAVO and your PC if no wireless connectivity is available or desired.



### OPUS Software

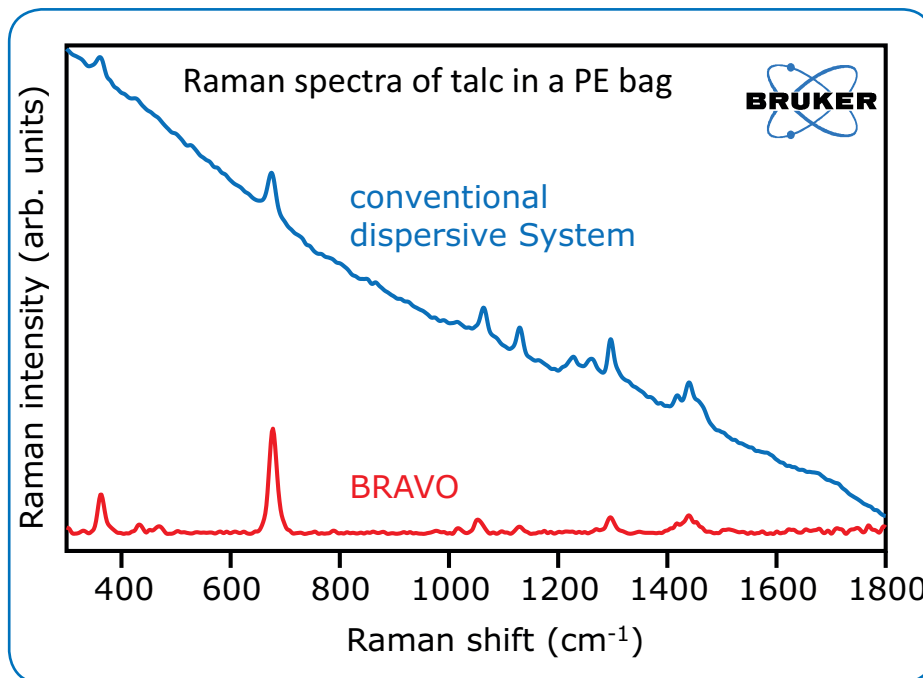
Bruker's approved OPUS spectroscopy software is the powerful tool to fulfill all demands of post data evaluation like interpretation, quantification and many more. At this point BRAVO converts to an easy to use, miniaturized scientific instrument. Furthermore, the remote control of BRAVO via OPUS facilitates 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.

### Advances in Sensitivity

Duo LASER™ excitation allows the measurement of Raman spectra within a smaller range of wavelengths. This technique results in the highest sensitivity across a large spectral range of  $300\text{ cm}^{-1}$  to  $3200\text{ cm}^{-1}$ . 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.



## ● Technical Features

### Automated Measuring 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.



# • BRAVO In The Pharmaceutical Industry

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



## **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.

## ● Speed Up Manufacturing

### 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 an seamless integration into the process line is formed.



Build validated libraries



Library management



Scan entries in a fraction of seconds



Advanced settings



Verification



Wireless or wired data transfer



Review results, generate reports

### Validation for pharmaceutical industry

BRAVO complies with CRF 21 part 11 requirements for operation in the validated environment of the pharmaceutical industry.

BRAVO's OQ/PQ test procedures permit the system administrator to qualify the key system performance criteria.



### Extraordinary support: Our commitment

Take advantage of the know-how and support by a renowned company setting global standards within the pharmaceutical market.



### **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.

### **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.

Technologies used are protected by one or more of the following patents:  
US 8,570,507 B1. Additional patents are pending.

### **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.



Plenty of time for personal consultation and customer service guarantee a sustainable and efficient solution.

**Bruker Optics is ISO 9001 and  
ISO 13485 certified.**

Laser class 1