VACUUM RESEARCH FT-IR SPECTROSCOPY

VERTEX NEO Ultra

Unleash the Future -
The Revolutionary FT-IR Vacuum Research Spectrometer

Innovation with Integrity

VERTEX NEO - Unleash the Future

Building on our legacy of innovation and excellence, VERTEX NEO Ultra is the pinnacle of bench-top FT-IR technology. This state-of-the-art spectrometer meets the most demanding research requirements, with the highest spectral resolution, the broadest spectral ranges, and complete automation. With unparalleled precision and versatility, the VERTEX NEO Ultra sets a new standard in scientific instrumentation, empowering researchers to explore new frontiers with confidence and ease.

Unmatched Automation for Advanced Research

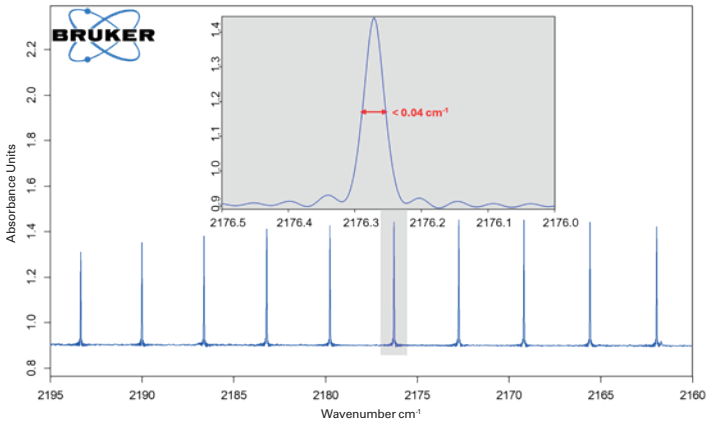
The VERTEX NEO Ultra revolutionizes FT-IR spectroscopy with its advanced automation capabilities. This cutting-edge spectrometer can seamlessly switch between 4 radiation sources (2x internal and 2x external), 6 internal detectors (with MultiTect™ and DigiTect™ positions), and 4 beam splitters (BMS), automatically via software without any manual intervention. The NEO Ultra covers the entire spectral range: UV, VIS, NIR, MIR, and FIR, FIR/THz ensuring optimal performance throughout with the best-suited optical components.

By combining proven technologies like the MultiTect™ detector unit and the 4x beam splitter changer with the latest Vacuum Platinum ATR innovation, the Neo Ultra ensures a stable vacuum environment - even during sample and component changes. This guarantees peak performance under the most stable conditions, making high-end research effortless and efficient.

Heritage of Excellence

UltraScan™ Interferometer

VERTEX NEO Ultra is based on our proven UltraScan™ interferometer, which features active alignment of the scanning mirror for peak performance. Get unparalleled sensitivity and stability with our precise linear air bearing scanner, designed for high-resolution measurements, ultra-fast rapid scans, high-precision step-scan techniques, and spectral range extension through the UV spectral region. The vacuum-compatible automatic beam splitter changer option for the UltraScan™ interferometer can house up to 4 different types of beam splitters, significantly enhancing efficiency and enabling seamless operation across multiple spectral ranges.



High-resolving FT-IR spectrum measured for CO gas demonstrating the excellent spectral resolution better than 0.04 cm^{-1}.

Spectral Resolution

The VERTEX NEO Ultra achieves a maximum spectral resolution of 0.04 wavenumbers, setting the standard for FT-IR benchtop instruments. This exceptional resolution enables precise measurements of almost any sample type.

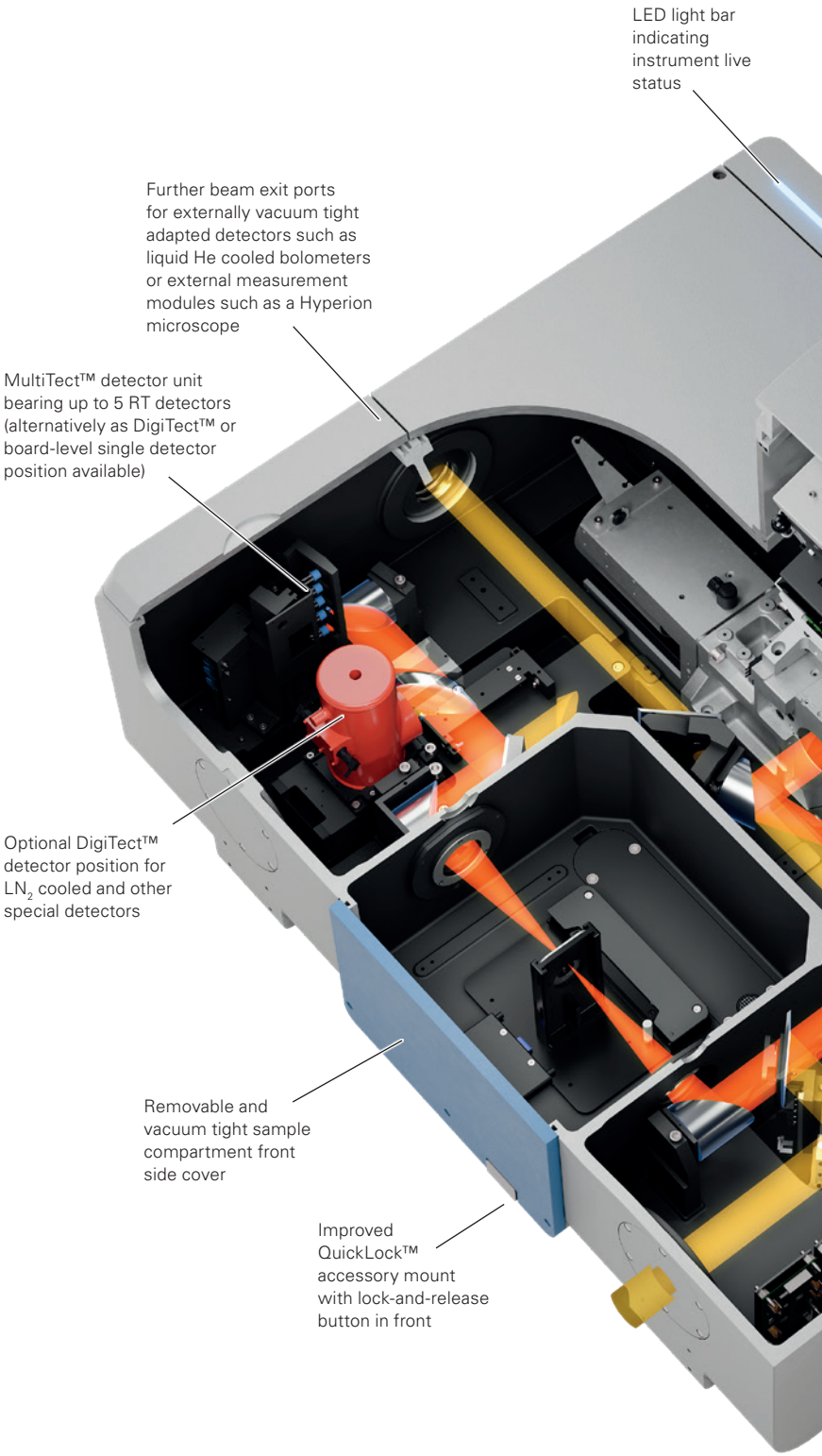
A standard resolution version with 0.12 cm^{-1} and an advanced resolution version with 0.07 cm^{-1} are also available. These are sufficient for many samples, including most condensed phase samples, low-temperature crystals, and gases at low pressure.

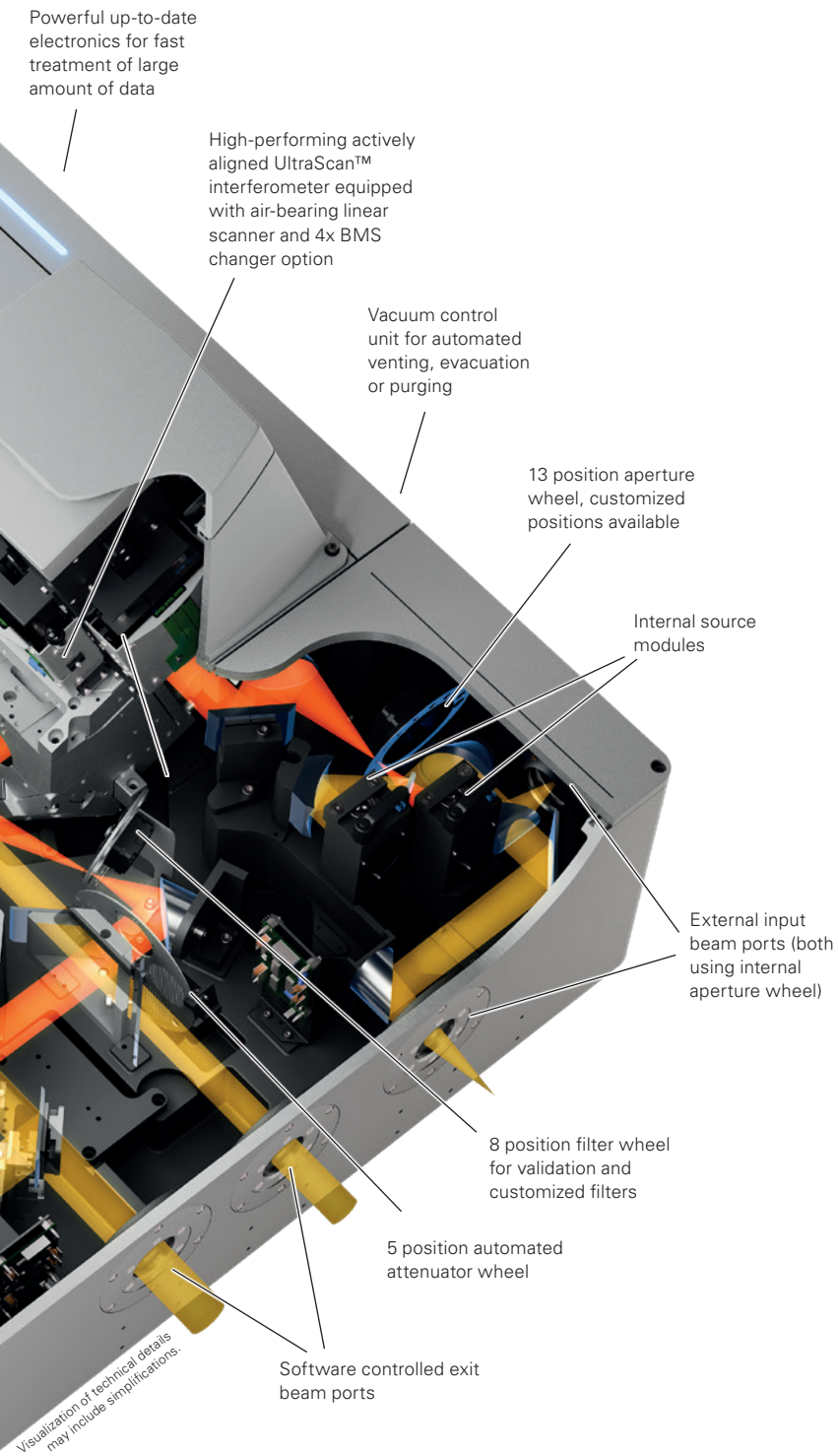
Vacuum Platinum ATR

With the Vacuum Platinum ATR unit you can maintain the entire optical path under vacuum, eliminating atmospheric interference while keeping your sample in ambient lab air. This means you can easily measure liquid samples, fine powders, and volatile substances without any issues. To change samples, you no longer need to interrupt the vacuum which enhances the working efficiency. Combining this with the UltraScan™ interferometer incl. the 4x BMS changer and the MultiTect™ detector technology, enables full spectral range vacuum ATR measurements without breaking the vacuum.

Pioneering Excellence in Vacuum FT-IR

- **Full-vacuum optics** bench for maximum stability and sensitivity
- Automated **vacuum ATR** measurements (NIR to FIR) with UltraScan™ & MultiTect™ – no vacuum break required
- **Step-scan** TRS functionality for fast (ns) and slow (µs) processes in one go
- Record **spectral resolution** of 0.04 cm^{-1}
- **UltraScan™** interferometer with air-bearing linear scanner
- Optional automatic 4-position **BMS changer**
- **MultiTect™** detector slots for up to 5 RT or TE-stabilized detectors
- **DigiTect™** slot for LN_2-cooled or other specialty detectors
- **verTera** extension: FT-IR / cw THz down to 3 cm^{-1} – no cryogenic cooling
- Touch panel with **OPUS TOUCH** for intuitive operation
- 7 beam ports (5 output, 2 input), software-controlled
- Compatible with VERTEX & INVENIO accessories





Vacuum Advantages

- No atmospheric absorbance masking weak spectral features
- No fake intrinsic features and no interference with high spectral resolution features
- No problems caused by fluctuations of the dry air purge supply
- Cast aluminum housing of the optics bench provides highest stability and reproducibility
- Utmost sensitivity and best effective performance for time resolved spectroscopy (step scan)

Multiple Detector Options

Bruker's innovative MultiTect™ detector technology and the DigiTect™ user exchangeable detector position are both available for VERTEX NEO Ultra. These two detector options can be freely combined and equipped in a single instrument to suit your specific needs. Additionally, an MCT detector with 12h holding time fits directly without the need for a raised lid. This versatility ensures that you have the optimal setup for any research application, providing you with the precision and adaptability needed for advanced spectroscopy.

Numerous Sampling Accessories

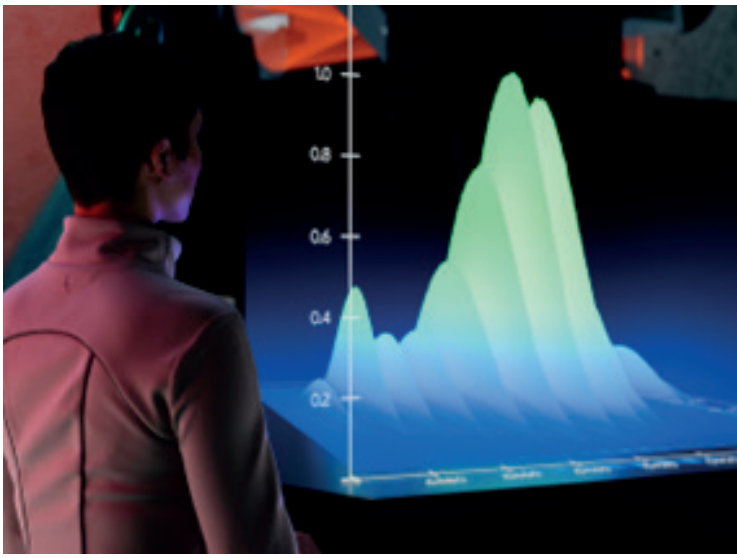
The VERTEX NEO Ultra features a sample compartment that is even larger than its predecessor, providing sample space for most bulky accessories used in research experiments. For taller or specialized accessories, raised or modified lids are available. The QuickLock™ mount and the lock and release button at the front of the sample compartment make exchanging accessories easier than ever before.

Bruker offers a wide range of accessories for the VERTEX NEO which cover all possible measurement modes: transmission, ATR, reflection, DRIFTS, and emission. Many of these accessories were developed by Bruker in response to customer requests and are exclusively available from Bruker, ensuring dedicated applications are met with unique solutions.

Expand Your Capability

Combined Step Scan

The VERTEX NEO Ultra offers combined Step-Scan measurements for fast (ns) and slower (µs/ms) kinetics. In contrast to standard step scan TRS, data collection for ns kinetics and µs/ms kinetics just requires one (instead of two) consecutive step-scan runs. This reduces the measurement time significantly for experiments where different time scales, from ns to ms, are of interest. The transient recorder board (TRB) captures fast changes with exceptional time resolution (up to 2.5 ns) and the standard ADC samples slower changes (up to 6 µs) while the scanner is going step-wise through the interferogram just once.
Analyze both fast and slow kinetics within a single experiment effortlessly, while benefiting from efficient memory usage, minimized redundant data, and an improved signal-to-noise ratio.



Improved Interleaved TRS

Interleaved Time-Resolved Spectroscopy (TRS) has long been a highly efficient alternative to step-scan methods, enabling real-time data acquisition. However, traditional setups had limitations such as reliance on an internal 24-bit ADC and restriction to interleaving factor 1.
With the VERTEX NEO and the latest OPUS software, these constraints are now lifted. The system supports external high-speed acquisition cards, removing ADC limitations, and allows for higher interleaving factors, extending process times. Additionally, a faster TRB enables time resolution down to 2.5 ns, unlocking new possibilities for ultrafast spectroscopy.
These advancements make interleaved TRS a powerful tool for various applications, including light source characterization, laser tracing, photoinduced reaction kinetics, and identifying metastable species. With greater flexibility, improved efficiency, and higher time resolution, interleaved TRS has never been this fast, precise, and versatile!

Broadest Spectral Range

The VERTEX NEO Ultra sets a new standard in vacuum spectrometry, offering an unparalleled optional spectral range from 50,000 to 5 cm^{-1}. In its standard configuration, it covers a spectral range from 8,000 to 350 cm^{-1}. With available spectral range extension packages, the VERTEX NEO Ultra can be expanded into the UV/VIS, NIR and FIR regions, making it incredibly versatile for a wide array of applications.
One of its standout features is the verTera extension, which combines vacuum FT-IR with continuous-wave terahertz (cw THz) technology. This innovation extends the spectral range further, down to an impressive 3 cm^{-1}, without the need for cryogenic cooling. With the new optical design of VERTEX NEO, the verTera emitter and detector can be permanently integrated into the optics bench without occupying detector positions, which allows for automatic switching between FT-IR and cw THz modes.

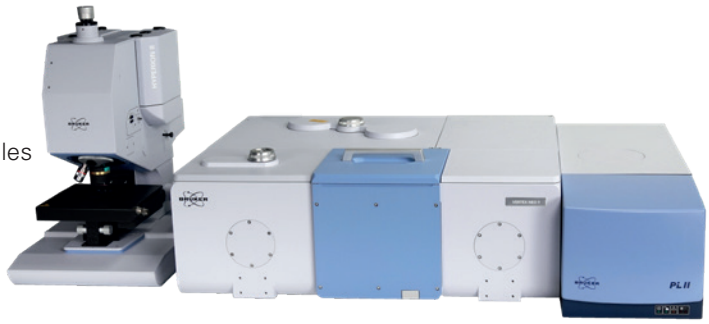
The VERTEX NEO Ultra is truly the ultimate bench-top FT-IR spectrometer for researchers seeking the broadest spectral range (50,000 to 3 cm^{-1} fully automated) and highest performance in their analytical work.

The VERTEX NEO optics and beam path are designed for highest flexibility and upgradability. Spectral range extensions, additional optical components (sources, beam splitters or detectors) for highest spectral performance, internal accessories or external modules for new applications are easy and cost-efficient to achieve.

Photoluminescence Experiments

To obtain high-quality PL spectra in mid IR region, it is essential to use a vacuum FT-IR system with an evacuated PL beam path. This setup typically requires step-scan operation (also known as amplitude-modulated step scan) to achieve the highest accuracy under vacuum conditions.

The Bruker vacuum PL module can be conveniently adapted to the right side of the VERTEX NEO vacuum spectrometers. It includes two additional beam paths for transmittance and reflectance, with seamless switching controlled by the OPUS software. This configuration enables sophisticated measurements, such as exploring the band structure of semiconductor materials.



Emission Microscopy

Emission microscopy is achieved by adapting the HYPERION II FT-IR microscope to the right side of the VERTEX NEO Ultra vacuum spectrometer. The light emitted from the sample is captured by the HYPERION II optics and directed through the emission port of the VERTEX NEO into the main spectrometer for measurement. A three-dimensional radiation profile of the measured device can be plotted in OPUS 3D. The VERTEX NEO offers an emission beam path option, bypassing the sample compartment for optimal performance in emission spectroscopy.

Low Temperature Experiments

Low-temperature experiments can be conducted using a cryostat as a sample accessory, essential for applications such as investigating origin of life in universology using matrix-isolation spectroscopy and studying superconductivity. The VERTEX NEO Ultra achieves outstanding sensitivity in the low parts-per-trillion atoms (ppta) range for these high-demanding experiments. The superconducting gap in the far IR region can be detected using an external bolometer detector.

The VERTEX NEO Ultra's vacuum-compatible design allows for seamless integration of low-temperature cryostats, ensuring optimal performance in low-temperature FT-IR experiments. Its vacuum optics excels in the far IR (FIR) region, eliminating atmospheric interference for the highest accuracy and sensitivity. This makes VERTEX NEO Ultra an indispensable tool for advanced research in semiconductor materials and other applications requiring precise LT-FIR measurements.

OPUS

The integrated OPUS software is made for state-of-the-art spectroscopic measurement, processing and evaluation of IR and Raman spectra. The basic package combines a wide range of functionality for analytical and research applications with intuitive design and flexibility. Powerful evaluation, data processing and report generation functions and versatile programming interfaces contribute to the impressive functional range of the OPUS software. On top of that, many featured packages like OPUS 3D, Quant or AID make OPUS well-rounded, capable of handling a wide range of applications.For example, OPUS/3D is a modern and intuitive spectral imaging software package for easy 3D data processing, evaluation and visualization. For TRS spectral data via rapid scan or step scan, the OPUS/3D method editor and post processing window provide powerful functions.
OPUS Touch is a complete spectroscopy software, including analysis and research functions, which is optimized for touch operation. It is available for the optional panel PC for the VERTEX NEO Ultra.

Application and Support

The application possibilities of IR spectroscopy are almost endless including analysis of powders, granules, liquids, particles, coatings, microplastics, laminates, composite materials, tissue samples, fibers, paints, pigments, pharmaceuticals and food safety. We want to make your application a complete success. For this reason, Bruker is mainly staffed by scientists and engineers with practical experience and in-depth knowledge. Therefore, you can trust us when it comes to questions regarding the selection of the best equipment or if you face difficult analytical problems. Bruker's FT-IR devices ensure consistent performance over many years. However, if an unforeseen problem should occur, you can count on a network of Bruker employees ready to deal with these issues as quickly as possible.

Laser class 1 product.

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