

LASER VIBROMETRY

Non-contact. Precise. Innovative.



optomet.
LASER VIBROMETRY

About optomet.

THE BEGINNING

In 2004, Dirk Günther founded Optomet GmbH together with his business partner and former fellow student Qian Liu. Since then, the company has been developing and producing “state of the art” measurement technology for the highest requirements of vibration analysis in industry and research at its headquarter in Darmstadt.

MILESTONES

In 2011, the Darmstadt-based company was the first ever to use Field Programmable Gate Arrays (FPGAs) in its instruments. FPGAs are the key components for pushing laser Doppler vibrometers to the limits of what is technically possible. Optomet was also the first company in the world to demonstrate the infrared scanning vibrometer. It was introduced at the Automotive Testing Expo in Stuttgart in 2015. With the launch of the new imaging full-field vibrometer software OptoSCAN for intuitive data acquisition as well as analysis and visualization of vibrations in 2018, another revolutionary milestone was set in the laser vibrometer market.

PHILOSOPHY

“To always strive for the best solution possible and to go to the limit of what is technologically feasible without even a single compromise.” This motivation from the founding days still describes the Optomet DNA. To this day, the only questions underlying the development of every products are: Where are the technical limits and how can they be extended?



History

Beginning of the laser Doppler vibrometry.

2007

2004

Foundation of the company in Stuttgart with focus on opto-electronic products.

2010

Relocation of the company to Darmstadt.

Launch of the world's first fully digital FPGA-based HeNe laser Doppler vibrometer (Vector Series) with colored touch display.

2011

2015

- Launch of the ethernet-enabled infrared (SWIR) laser vibrometer (Nova Series).
- First data acquisition and analysis software OptoGUI for single-point vibrometer.
- Launch of the world's first SWIR scanning laser Doppler vibrometer (Scanning Series).

Launch of the innovative dual fiber system based on digital fiber-coupled SWIR laser Doppler vibrometer (Fiber Series).

2016

2018

Launch of the new imaging full-field vibrometer software OptoSCAN for scanning vibrometer.

Extension of laser vibrometry: Capturing the 3D geometry of measurement objects.

2019

2020

Launch of the enhanced Nova-Xtra with an extra-large aperture. It is designed to detect vibrations over distances up to 300 m.

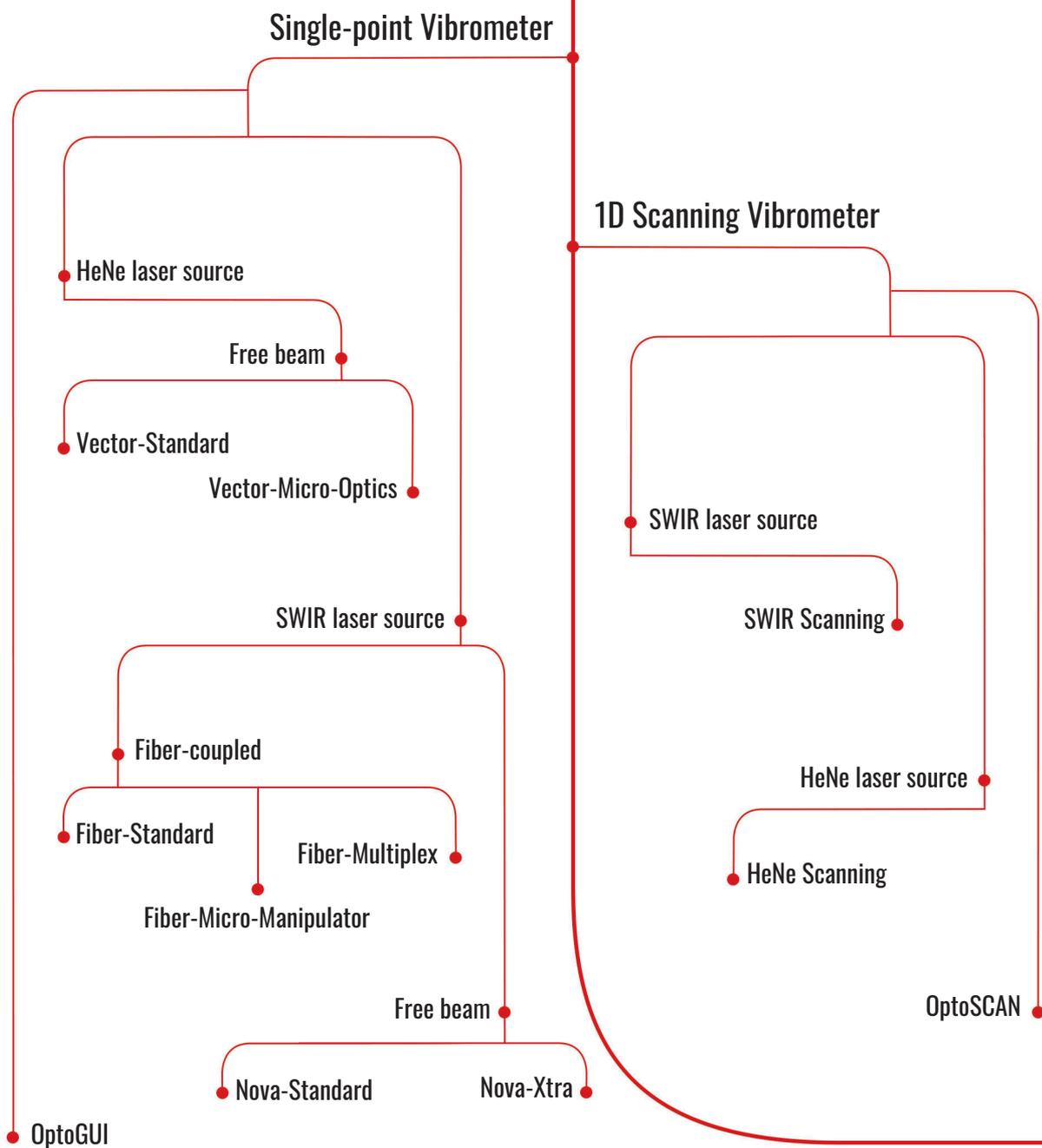
Introducing the Fiber-Micro-Manipulator, revolutionizing the study of hearing mechanics by exploring their vibrational and dynamic intricacies.

2021

2022

Presenting Vector-Micro-Optics, enabling ultra-precision measurement on the smallest objects with an extra small laser spot of around $3\mu\text{m}$.

Product Overview



Introduction

Vibration analysis in all sizes and on all surfaces

Using cutting edge laser sources and interferometry, Optomet laser Doppler vibrometers enable the non-contact measurement of vibration over a range of several orders of magnitude, from atomic dimensions all the way to large buildings.

Easy measurements on virtually any kind of surface and without any influence on the sample are an indispensable tool for the analysis of even the most delicate structures. Optical laser doppler vibrometry uses the principle of a Mach-Zehnder Interferometer, which shows any changes in the measurement beam due to the frequency shift induced by the doppler effect when the laser light of the measurement beam is reflected from a vibrating surface.

For a wide variety of applications in industry and research, Optomet consequently utilizes advanced and user-friendly laser Doppler vibrometers that meet highest technical standards while being easy to operate.





SWIR Scanning Vibrometer

The world's first SWIR Scanning Vibrometer: compact, high-end, and groundbreaking.

Scanning laser Doppler vibrometry is an advanced technique for measuring vibrations, offering full-field coverage. By scanning the test object with a measurement beam, it captures vibration data from a grid of measurement points in a short span of time.

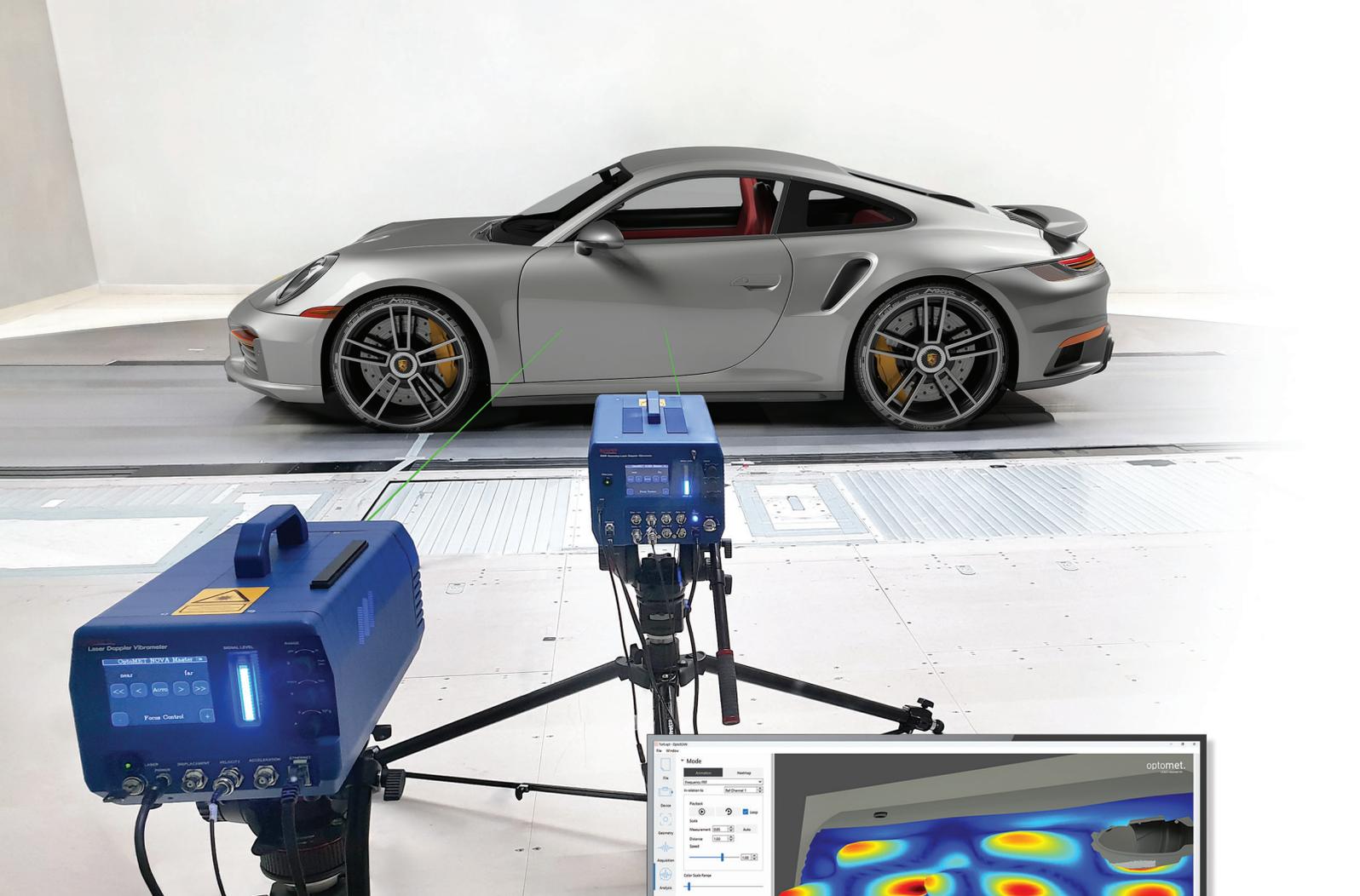
The Optomet scanning laser Doppler vibrometer (SLDV) combines the exceptional signal quality of the Nova SWIR digital vibrometers with beam deflection mirrors, a Full HD video camera, an integrated signal generator, and inputs for reference channels. By utilizing the OptoSCAN software, the scanning laser vibrometer transforms into a user-friendly and comprehensive vibration visualization system.

With non-contact vibration measurement, the SLDV provides accurate and valuable insights into the dynamic behavior of any test structure. It enables the visualization of operational and structural vibrations, validation of finite element model calculations, and the visualization of energy propagation through surface waves.



HIGHLIGHTS

- Very compact and portable design
- Infrared laser (SWIR) for optimum signal quality
- Easy to operate
- Highest accuracy and resolution
- High-speed vibrations up to 30 m/s
- Easy to use with intuitive and feature-rich data analysis software OptoSCAN
- Measure distances to objects and their geometry
- Visible pilot laser for easy positioning
- Update- and upgradeable firmware

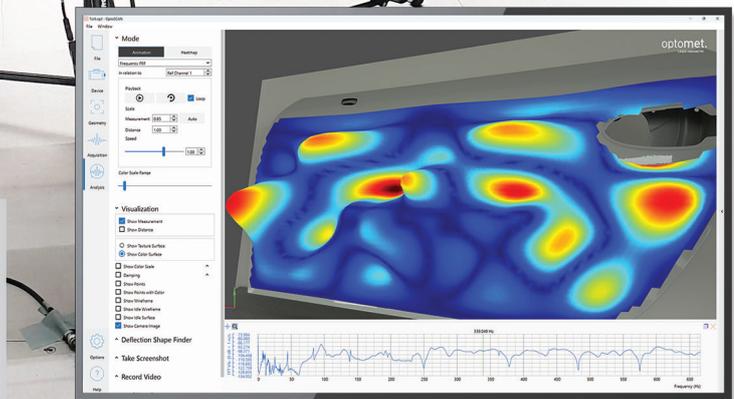


DETAILS

- Working distance from 250 mm up to 100 m
- Frequency bandwidth from 0 to 25 MHz
- Sampling rate of 160 Megasamples/s
- Vibrational velocities up to 30 m/s
- Displacement resolution down to 50 Femtometer
- Dynamic range for displacement measurements: 32 Bit
- Max scan angles: 50° x 40°
- Over 50 scan points per second
- Up to 256 000 scan points
- Full HD 1080p camera with 30x optical zoom
- 15 velocity-, 19 displacement- und 15 acceleration measuring ranges

APPLICATION

- NVH testing by deflection shape analysis to find and eliminate noise sources
- Optimization of car components using modal analysis and FE-model validation
- Non-destructive testing of airplane components and turbines
- Material defect analysis
- Vibration testing and development of household appliances



At Optomet, we understand the importance of capturing the finest details of vibrations. That's why our Scanning Laser Doppler Vibrometer boasts the largest optical aperture in the industry. By maximizing the collection of reflected laser light, our system achieves the highest possible measurement sensitivity, even in areas with minimal laser backscattering. This remarkable feature guarantees precise and accurate results across a wide range of applications.

Combining the extraordinary sensitivity of our Scanning Laser Doppler Vibrometer with the superiority of SWIR laser technology, we enable accurate measurements on surfaces with low optical reflectivity and even at significant distances. Our system excels in capturing vibrations on test objects with varying surface reflectivity. Unlike traditional methods that require reflective film preparation, Optomet's scanning laser technology provides a streamlined measurement process, saving time and effort while delivering exceptional results.

Optomet's Scanning Laser Doppler Vibrometer represents the pinnacle of vibration measurement technology. With its cutting-edge features, unmatched sensitivity, and versatility on any surface, it is the ideal choice for precise and reliable measurements in various industries and research fields. Stay ahead of the curve and unlock new possibilities with our state-of-the-art solution.



HeNe Scanning Vibrometer

Precisely visualize vibrations of small objects.

Scanning laser Doppler vibrometry is an advanced and efficient method of measuring vibrations, offering complete coverage of the entire field. This technique involves scanning the test object with a measurement beam, swiftly capturing vibration data from a grid of measurement points.

The Optomet HeNe scanning laser Doppler vibrometer (SLDV) is a cutting-edge device that combines a reliable HeNe laser source with beam deflection mirrors, a Full HD video camera, an integrated signal generator, and inputs for reference channels. By utilizing the OptoSCAN software, the scanning laser vibrometer transforms into a user-friendly and comprehensive vibration visualization system.

Through non-contact vibration measurement, the SLDV offers precise and valuable insights into the dynamic behavior of any test structure. It allows users to visualize operational and structural vibrations, validate finite element model calculations, and observe energy propagation through surface waves. This technology is a powerful tool for gaining a deeper understanding of vibration phenomena.

HIGHLIGHTS

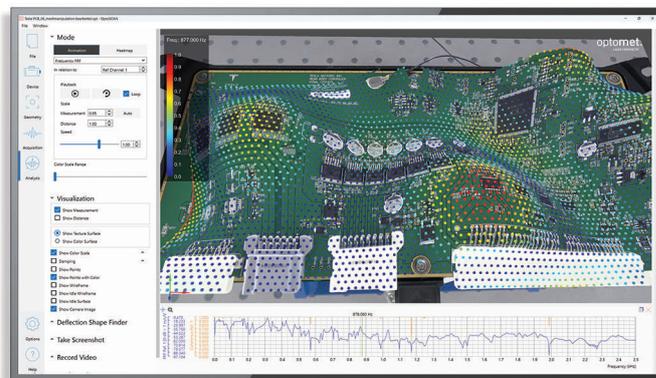
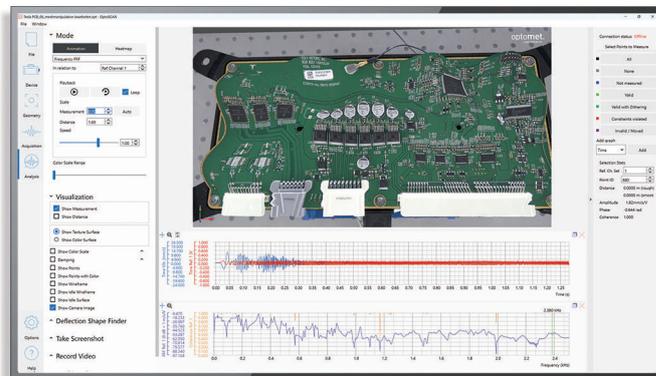
- Very compact and portable design
- Small laser spot size
- Easy to operate
- High-speed vibrations up to 10 m/s
- Easy to use with intuitive and feature-rich data analysis software OptoSCAN

APPLICATION

- Vibration testing and development of electronic components and printed circuit boards
- NVH testing by deflection shape analysis to find and eliminate noise sources
- Optimization of car components using modal analysis and FE-model validation
- Non-destructive testing for material defect analysis

DETAILS

- Working distance from 50 mm up to 100 m
- Frequency bandwidth from 0 to 25 MHz
- Sampling rate of 160 Megasamples/s
- Vibrational velocities up to 10 m/s
- Displacement resolution down to 50 Femtometer
- Dynamic range for displacement measurements: 32 Bit
- Max scan angles: 50° x 40°
- Over 50 scan points per second
- Up to 256 000 scan points
- Full HD 1080p camera with 30x optical zoom
- 14 velocity-, 19 displacement- und 14 acceleration measuring ranges



OptoSCAN: Remote control, data acquisition, visualization & analysis

Achieve your precise vibration data quickly and effortlessly with our truly intuitive Software.

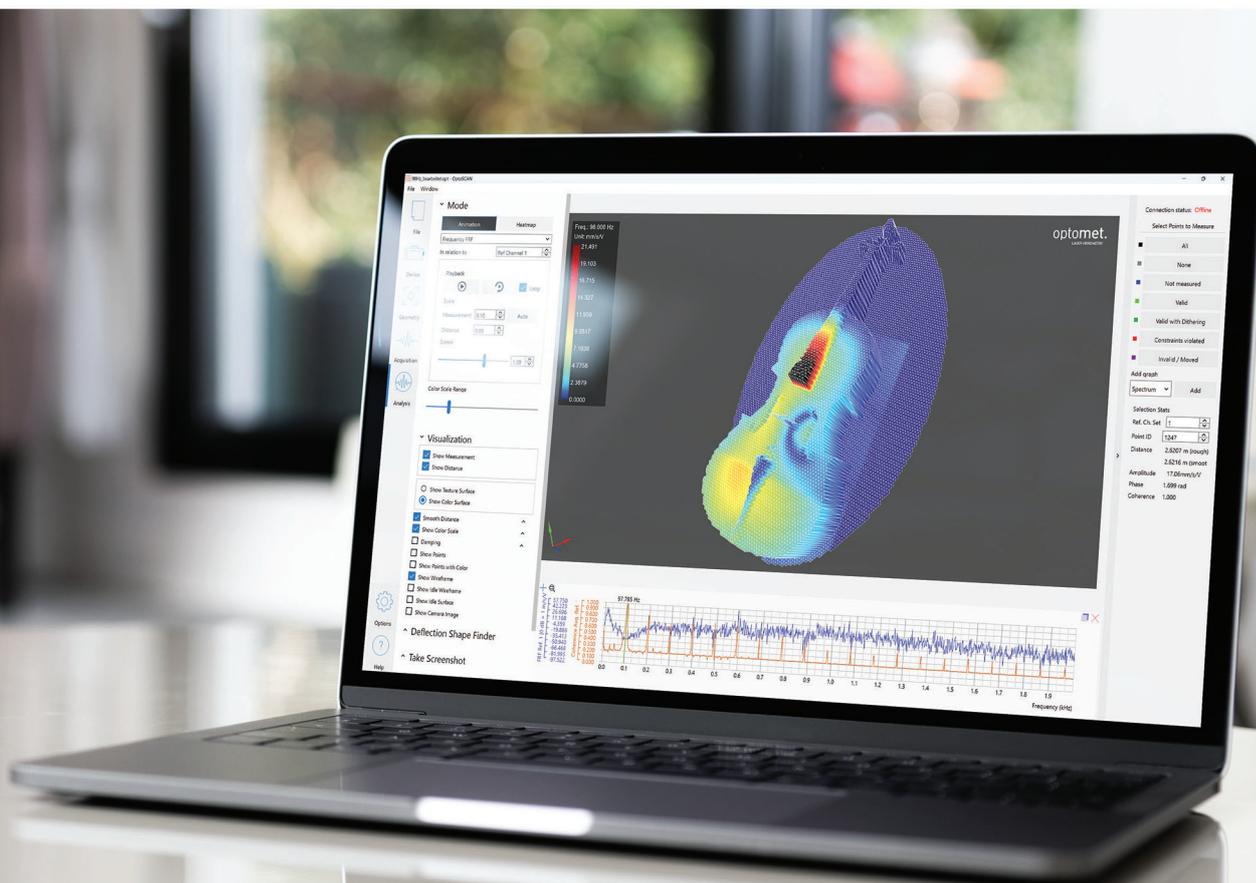
Advanced Software for Imaging Vibrometry

When paired with Optomet scanning laser Doppler vibrometers, the powerful OptoSCAN software provides a comprehensive solution for conducting imaging vibration measurements.

OptoSCAN seamlessly integrates point-by-point scanning data with accurate geometry information, enabling the visualization of vibrations and surface waves across a wide range of test objects. This unique capability allows for enhanced design optimization, effective resolution of structural issues, validation of FE models, and impactful fundamental research.

With OptoSCAN, data is presented in various time and frequency-based formats, providing comprehensive insights into the measured vibrations. This comprehensive display allows for in-depth analysis and facilitates informed decision-making.

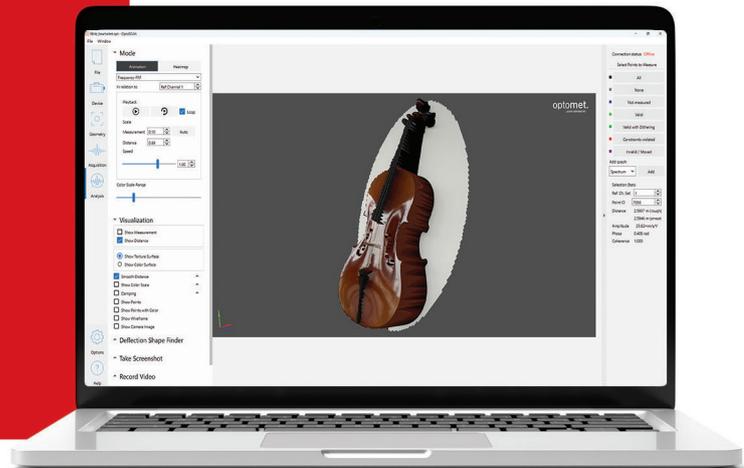
Discover the potential of OptoSCAN: the cutting-edge software for precise imaging vibrometry.



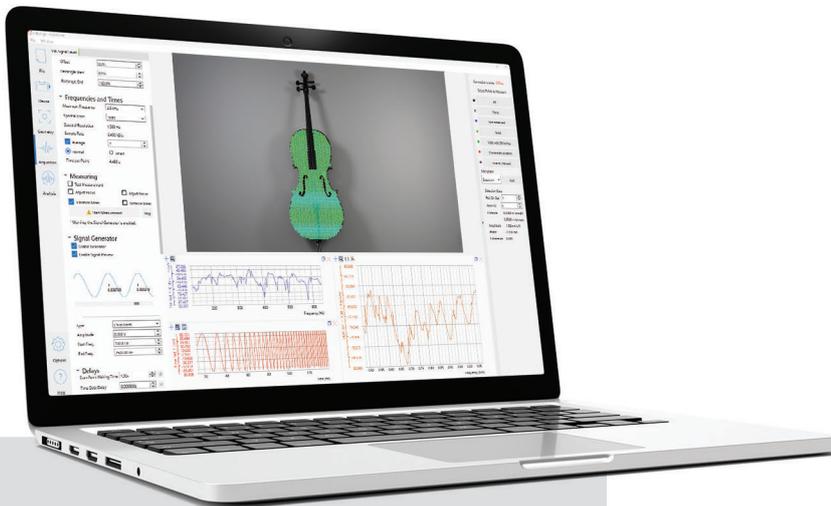
Vibration / Geometry measurement

HIGHLIGHTS

- Multithread 64 bit application
- Running on standard PC hardware
- Workflow oriented layout
- Recording of time and frequency data simultaneously
- Modern look & feel
- Fast way to your vibration data



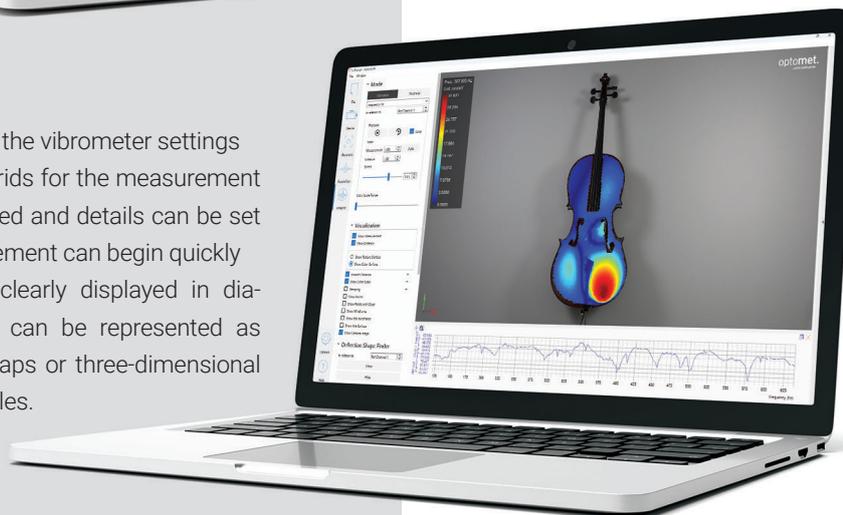
Data acquisition



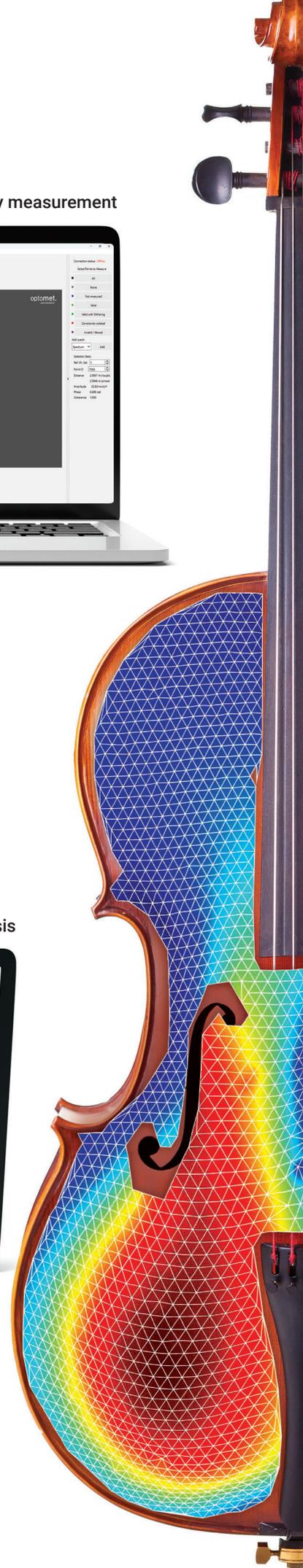
Analysis

DETAILS

- Remote control of the vibrometer settings
- With little effort, grids for the measurement points can be created and details can be set so that the measurement can begin quickly
- The results are clearly displayed in diagrams, waveforms can be represented as two-dimensional maps or three-dimensional animated time profiles.



- Real time measurements even during the scan process
- Offline measurements are possible as well
- Intuitive operation of the software
- Extensive export options for further processing of measurement data
- Clear storage of all measurement projects for reuse



HIGHLIGHTS

- Infrared laser (SWIR) for optimum signal quality on any surface
- Long distance measurements
- Very compact and portable design
- Highest accuracy and resolution
- End-to-end digital workflow
- Intuitive handling
- Update- and upgradeable firmware

The Nova series represents a leap forward in laser Doppler vibrometry, combining modern digital technology with the power of a Short-Wavelength-Infrared (SWIR) measuring laser at 1550 nm. This advanced system boasts photodetectors with an impressive efficiency exceeding 98%. Paired with the increased laser power, the signal level achieved by the Nova series surpasses that of conventional laser Doppler vibrometers by a remarkable 20 dB.

This significant advancement empowers high signal-to-noise ratio measurements without the need for surface treatment, even on the most challenging surfaces. Whether it's deep black, glowing metal, or glass, the Nova series ensures accurate and reliable measurements, regardless of surface characteristics.

Detect nearly all types of vibrations with our robust, surface-property-insensitive system.

Nova Series: Digital free beam SWIR Laser Vibrometer



APPLICATION

- Accurate measurements on dark or rough surfaces and transparent materials
- Biological surfaces
- Moving or rotating objects
- Long distance measurements, e.g., in civil engineering or the aerospace industry

Measure on dark and rough surfaces and on rotating objects



DETAILS

- Working distance from 6 mm up to 200 m
- Frequency bandwidth from 0 to 25 MHz
- Sampling rate of 160 Megasamples/s
- Vibrational velocities up to 30 m/s
- Displacement resolution down to 50 Femtometer
- Dynamic range for displacement measurements: 32 Bit
- 15 velocity-, 19 displacement- und 15 acceleration measuring ranges

To cater to a wide range of applications, the Nova series offers several optimized lenses that can be easily interchanged. The lenses feature a convenient bayonet lock mechanism, reminiscent of SLR cameras, enabling swift and effortless lens swaps for different measurement scenarios.





Nova-Xtra

Detect distant vibrations
UP to 300m
with our precision-enhancing
Extra-Large-Lens system.

The Optomet Nova-Xtra is an extension of the nova series and enables measurements on objects with extra-long distances of more than 300m. The invisible SWIR laser ensures the best signal strength. The ideal application of the Nova-Xtra is in the civil engineering and aerospace industries.

In addition, there is an IR camera for visualizing and locating the laser spot on the object.



HIGHLIGHTS

- Infrared laser (SWIR) for optimum signal quality
- Structural health monitoring by means of non-contact laser vibration measurement
- Compact all-in-one design ideal for mobile applications
- Best signal quality on all kinds of surfaces
- Simple and quick set-up
- Specially designed extra-long-range lens
- Reliable even under challenging conditions
- Update- and upgradeable firmware
- Infrared camera to locate the laser spot

DETAILS

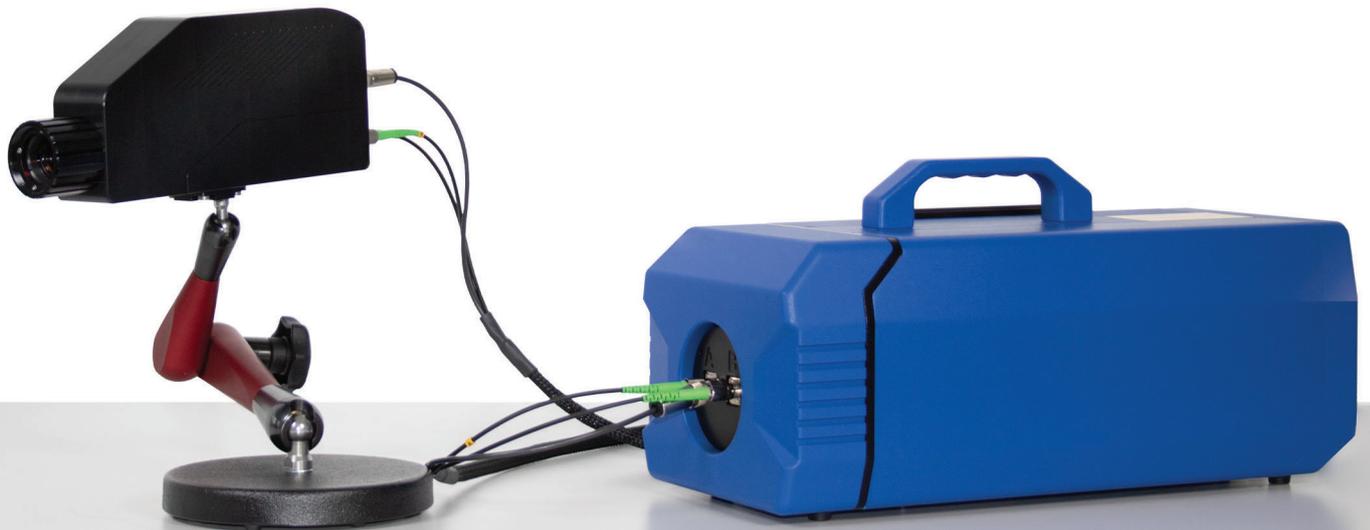
- Working distance from 2490 mm up to 300 m
- Frequency bandwidth from 0 to 25 MHz
- Focus spot size (typ.): 170 μm at 2490 mm
- Sampling rate of 160 Megasamples/s
- Vibrational velocities up to 30 m/s
- Dynamic range for displacement measurements: 32 Bit
- 15 velocity-, 19 displacement- und 15 acceleration measuring ranges

APPLICATION

- Long distance measurement, e.g., wind turbines
- Bridges, pipelines, other structures and industrial plants
- High Buildings
- Restricted and inaccessible areas
- Measurement on any material, e.g., concrete, metal



Fiber-Series: Digital fiber-coupled SWIR Laser Vibrometer



Experience true flexibility to meet your exact needs.

The Optomet Fiber series combines the superior performance of SWIR (short-wavelength infrared) laser Doppler vibrometry with the flexibility of compact optical fiber-coupled heads. The laser vibrometer is connected to the optical sensing head by glass fibers. The dual fiber system separates the outgoing measurement beam from the incoming reflected signal to ensure optimum signal quality without mutual interference.

Small and robust fiber sensing heads make the system suitable for measurements in confined spaces and simplify handling considerably, especially if the heads must be repositioned frequently. Variants with a built-in camera make it easier to define the measuring point. Fiber heads are available for different applications including long distance measurements and measurements in extremely confined spaces.

HIGHLIGHTS

- Combines SWIR laser vibrometry performance with fiber-coupled heads
- Compact, flexible and robust sensing heads for measurements in harsh environments
- Excellent signal level
- Highest accuracy and resolution
- Separate fibers for outgoing measurement beam and incoming reflected signal
- Ability to multiplex several sensing heads
- Easy to use with intuitive data analysis software OptoGUI
- Update- and upgradeable firmware

APPLICATION

- Space constrained areas where physical access is difficult
- Measurements in harsh environments, e.g., vacuum- or climatic chambers
- Vibration sensing under radiation
- Accurate measurements on dark or rough surfaces and biological tissue

Miniature fiber head with camera:

- Three different fixed working distances available: 4, 7 or 14 mm
- Optional lens kit: Three interchangeable lenses for the mentioned working distances
- Inspection camera: resolution 640 x 480 pixel



Compact fiber head:

- Six different fixed working distances selectable
- 25, 37, 64, 89, 139 or 189 mm



Manual focus fiber head:

- Short-range version:
Working distance from 15 mm up to 5 m
- Mid-range version:
Working distance from 270 mm up to 10 m



Autofocus mid-range fiber head:

- Working distance from 135 mm up to 10 m



Autofocus long-range fiber head:

- Working distance from 450 mm up to 100 m



Autofocus Pro mid-range fiber head:

- Working distance from 135 mm up to 10 m
- Removable fiber cable
- Smaller spot size of the pilot laser
- Compatible with Micro-Manipulator



Autofocus Pro long-range fiber head:

- Working distance from 450 mm up to 100 m
- Removable fiber cable
- Smaller spot size of the pilot laser



Fiber-Multiplex

HIGHLIGHTS

- Save time and costs by measuring at multiple different locations without repositioning
- Remote controlled channel selection

DETAILS

- Multiplex 2, 4, 8, 16 or more different fiber heads
- Connect fiber switch to your PC using Ethernet and USB
- Switching times: 2 ms
- Fiber switch remotely operated by a PC

APPLICATION

- Quality assurance

Eliminate the need for constant repositioning.

The Fiber-Multiplex is an innovative extension designed specifically for the Optomet Fiber series, offering enhanced functionality by integrating an additional fiber switch. This advanced feature enables the seamless connection of multiple fiber heads to the vibrometer, opening up a world of expanded measurement possibilities.

By leveraging the power of the Fiber-Multiplex, users can effortlessly connect and utilize multiple fiber heads with their vibrometer system. This flexibility allows for measurements from different locations or angles, significantly reducing measurement time and effort. Whether you need to capture data from various points on a complex surface or conduct measurements on multiple test objects, the Fiber-Multiplex empowers you to achieve comprehensive insights efficiently and accurately.

With its user-friendly design and straightforward operation, integrating the Fiber-Multiplex into your Optomet Fiber series setup is a breeze. Simply connect the fiber heads to the fiber switch and enjoy the enhanced capabilities it brings to your vibrometer system.



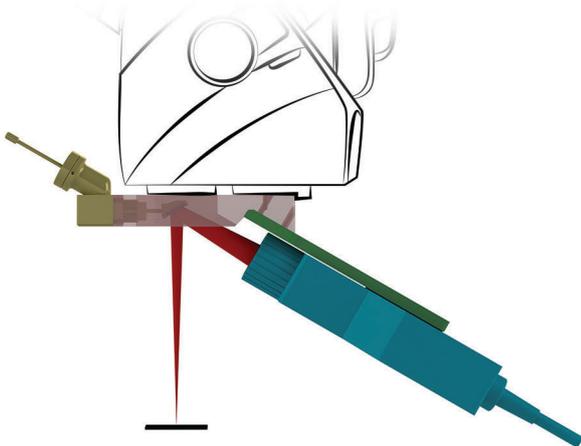
Fiber-Micro-Manipulator

Discover intriguing applications in medical technology.

The Fiber-Micro-Manipulator is a state-of-the-art tool designed for precise laser alignment. With its innovative mirror-controlled system, operated effortlessly by a joystick with a high gear ratio, it provides unparalleled control over the laser beam direction. This advanced technology works in perfect synergy with the Fiber vibrometer, harnessing the advantages of SWIR laser capabilities to accurately measure dark or rough surfaces and biological tissue with ease.

For optimal alignment precision, a visible targeting laser is integrated into the system. This laser assists in achieving the desired alignment, ensuring accuracy and efficiency in the setup process. The compact and lightweight design of the sensing head facilitates seamless integration into existing systems, while the autofocus feature enables flexibility in achieving different working distances and small spot sizes.

When combined with a microscope, the Fiber-Micro-Manipulator unlocks a new level of precision alignment possibilities. This unique combination allows for separate measurements, enabling researchers, for example, to analyze the ear canal while ensuring precise alignment of the laser beam.



The human ear represents an incredibly demanding system for amplifying sound and detecting vibrations. With the advent of state-of-the-art laser Doppler vibrometers, we now have the ability to explore the intricate vibrational and dynamic characteristics of hearing mechanics like never before. These cutting-edge instruments offer unmatched accuracy, resolution, and user-friendly operation, enabling researchers to delve into new dimensions of understanding.

Laser vibrometers have become an indispensable tool for individuals actively engaged in the design, development, quality control, calibration, and certification of middle ear implants. By harnessing the power of laser vibrometry, professionals in this field gain invaluable insights into the performance and behavior of these implants. This technology empowers them to make informed decisions, refine designs, ensure optimal functionality, and enhance the overall quality of their creations.

Vector Series:

Digital free beam HeNe laser vibrometer



Precise vibration measurements without the price tag.

Traditional laser Doppler vibrometers with helium-neon (HeNe) laser sources have been a useful tool for non-contact vibration measurement for many years. Optomet has perfected HeNe-based laser vibrometry with the Vector series. With the comparatively short wavelength (633 nm), the laser beam can be focused to a very small spot diameter. The Vector series enables non-contact vibration measurements of objects from microscopic to macroscopic sizes with the high accuracy and precision.

Due to the robust and eye safe HeNe laser source, the Vector series vibrometers are an affordable entry to laser Doppler vibrometry and are commonly used for measurements on highly reflective surfaces.

Several optimized lenses for a variety of applications are available for the Vector series. The lenses are easily exchangeable due to a bayonet lock as on SLR cameras.

APPLICATION

- Measurements through water with low power loss
- Vibration testing of the smallest objects or microstructures, e.g., electronic components and MEMS

DETAILS

- Frequency bandwidth from 0 to 25 MHz
- Sampling rate of 160 Megasamples/s
- Vibrational velocities up to 10 m/s
- Displacement resolution down to 50 Femtometer
- Dynamic range for displacement measurements: 32 Bit
- 14 velocity-, 19 displacement- und 14 acceleration measuring ranges
- Eye safe class 2 laser technology
- Visible, red laser beam

HIGHLIGHTS

- HeNe lasers measure through water with minimal loss of laser power
- Extremely small laser spot sizes enable measurements on microstructures, e.g., electronic components
- Very compact and portable design
- Cost effective entry to laser vibrometry
- Intuitive handling
- High power efficiency
- Update- and upgradeable firmware

DETAILS

- Frequency bandwidth from 0 to 25 MHz
- Working distance: 21.5 mm
- Focus spot size (typ.): 3.7 μm at 21.5 mm
- Sampling rate of 160 Megasamples/s
- Displacement resolution down to 100 Femtometer
- Vibrational velocities up to 10 m/s
- Dynamic range for displacement measurements: 32 Bit
- Camera: 4000 x 3000 pixel (12M output or 4K output)
- 14 velocity-, 19 displacement- und 14 acceleration measuring ranges
- Visible, eye safe class 2 laser technology (632.8 nm)

APPLICATION

- Proven visible HeNe Laser source for precise multi-purpose vibration measurements
- Compact all-in-one design
- Extremely small laser spot size (approximately 3 μm) for measurements on small objects
- 12 MP 4K camera included in Micro-Optics
- Precise placement of laser spot on test object
- Optional positioning stage for precise alignment of test object and Micro-Optics system
- Contrast adjustment: Built-in filter for adjusting the brightness of the laser spot in the video image, can be adjusted by the user

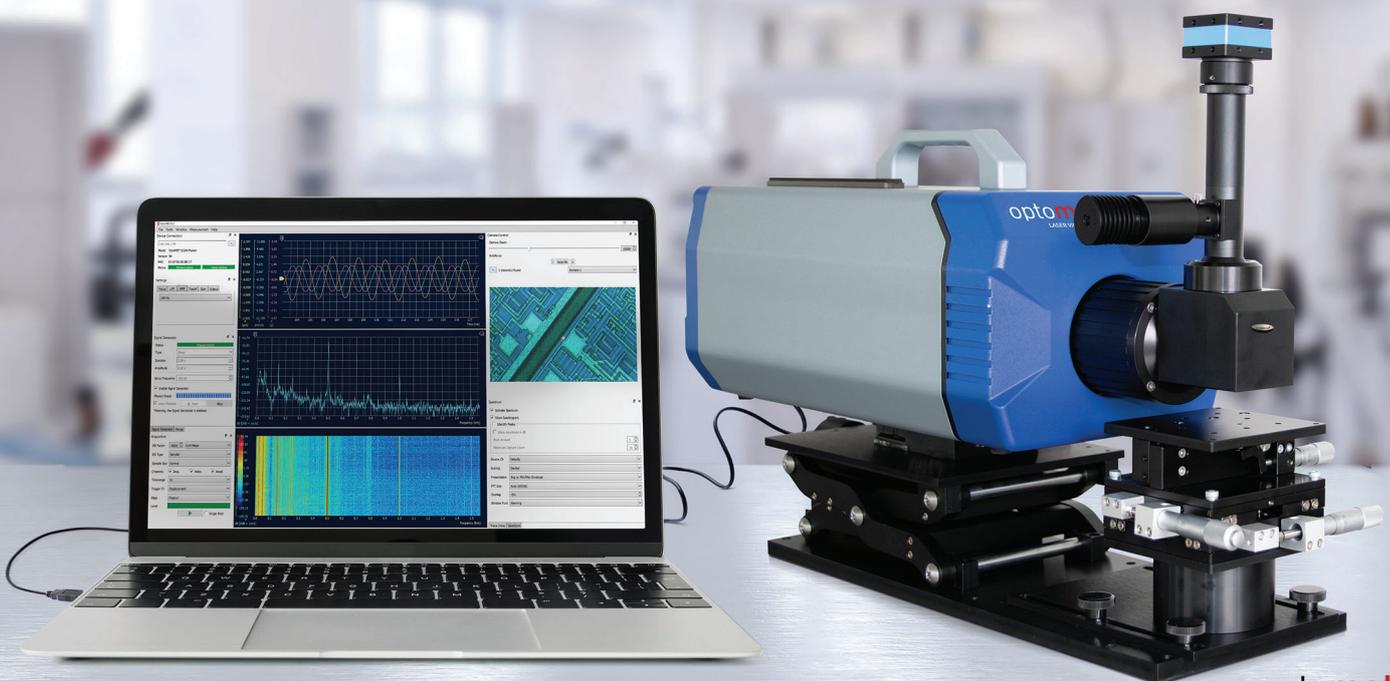
Vector-Micro-Optics

Unlock precise MEMS applications with an exceptional laser spot size of just 3 μm .

The Optomet Vector-Micro-Optics is an additional product for the Vector series and enables measurements on the smallest objects due to the extremely small laser spot (approx. 3 μm). It contains a 12 MP 4K camera so that precise placement of the laser spot on the test object is guaranteed. The Vector-Micro-Optic is ideal for use in electronics development and measurements on electronic components.

APPLICATION

- Ideal for applications in electronics development and measurements on electronic components
- Even such small objects can be measured, which the eye can almost no longer see





OptoGUI: Software for data acquisition, analysis and remote-control

Enjoy extensive features with our user-friendly interface.

OptoGUI is a powerful software that perfectly complements Optomet's single-point vibrometers, creating a complete vibration measurement system from a single source. With a continuous digital signal path, OptoGUI enables seamless control, precise measurement, and insightful analysis.

Designed to streamline the vibration measurement process, OptoGUI provides a user-friendly interface for effortless operation. Its intuitive controls allow for efficient data acquisition, ensuring accurate and reliable results.

The software's advanced analysis capabilities empower users to delve deep into the collected data.

OptoGUI offers a wide range of analytical tools and visualizations, enabling thorough investigations of vibration patterns, resonances, and other crucial parameters. This comprehensive analysis enhances decision-making processes and facilitates effective troubleshooting.

Furthermore, OptoGUI supports remote control functionality, allowing users to conveniently operate and monitor the vibration measurement system from a distance. This feature is particularly valuable in scenarios where physical access to the equipment may be limited or hazardous.

Experience the convenience and power of OptoGUI: the ultimate software for measurement, analysis, and remote control in vibration analysis.



Up to 3 analog outputs

OptoGUI



Digital output

DETAILS

- Digital Workflow for Optomet Vibrometers
- Remotely control all vibrometer settings via ethernet
- Automatically identify signal peaks in the frequency spectrum
- Live view of measured vel./disp./accel. Data
- Show a live Spectrogram of the FFTs of the ongoing measurements
- Limit live FFT-calculation to certain time ranges of the time data
- Real-Time Fast Fourier Transformation
- Up to 536 Mio. FFT lines
- Export time data as .csv, .h5, .wav or .mat files

APPLICATION

- High dynamic range
- Large measuring range and small amplitudes simultaneously
- Continuous digital signal path
- Remote control of the LDV
- Presentation and analysis: FFT with up to 536 million lines
- Data export: .csv, .wav, .h5, .mat

Contact us!

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Meet Optomet at events and trade fairs.
Our sales team will be happy to help you with any questions
you may have about our products or the feasibility of your measurement.