



VibroFlex

Non-contact vibration measurement
from nano to macro
Product brochure





Precision is a choice

Laser Doppler vibrometers from Polytec combine precise optical vibration measurement with easy and rapid operation. Measuring without contact, they sense the true vibrations of microscopic to macro-sized structures and lightweight components with the highest accuracy.

The modular concept of VibroFlex combines the versatility of a universal front-end with a selection of special sensor heads, tailored to the needs of your measuring task.

The superior flexibility in optical vibration measurement



With VibroFlex, Polytec presents the superior flexibility in optical vibration measurement with a modular sensor solution that adapts to your needs: Add microscope optics for tiny structures or measure large, complex samples like machinery or motors from a safe distance. Discover acoustics and vibration phenomena in research and product development for a faster time-to-market or use it for reliable in-line inspections of your production parts with the focus on cost-efficiency.

Resolve from DC to 24 MHz bandwidth, sub-picometer displacements and up to 30 m/s fast movements. Easily access confined spaces using fiber-optics and analyze relative motions with differential optics. Use an integrated video camera for precise laser positioning. Measure vibrations reliably and with laser precision on all surfaces – no matter if dark, oily, shiny or (red) hot and from more than 500 m distance. Benefit from this flexibility in optical vibration measurement – VibroFlex.



- High-performance non-contact vibration measurement solution
- Flexible, modular sensor solution that adapts to your needs
- Sub-pm displacement resolution and vibration velocities up to 30 m/s
- Configurable bandwidth from DC to 24 MHz with highest time resolution
- Patented QTec® multi-path interferometry for best SNR
- Compact sensor head with integrated camera for precise laser positioning and sample monitoring
- SHM and condition monitoring from more than 500 m distance
- Differential fiber optic sensor head for separating relative motions
- Reliable measurement even on challenging surfaces (dark, oily, shiny, hot)
- Digital data interface for convenient setup and best SNR

Modular sensor solution that adapts to your needs



⊕ choose
your
sensor
head

- > Synchronous output of displacement, velocity and acceleration
- > VibroLink digital interface for comfortable measurement data transfer (Ethernet TCP/IP)
- > Frequency bandwidth up to 24 MHz

The modular VibroFlex laser vibrometer system can be configured using 2 optical technologies, providing you the best choice for your application. The Helium-Neon laser configuration used in the sensor heads Neo, Compact and Fiber allows measurements on super-fine structures with its small laser spot. This laser technology even allows measurements into and through water.

The patented QTec® multi-path interferometry provides a high velocity range up to 30 m/s and delivers the highest optical sensitivity, enabling high-fidelity measurements especially for laterally moving or rotating surfaces – featuring an SWIR laser source even for large stand-off distances of more than 500 m.

- > Measurement on all surfaces (oily, shiny, dark)
- > SWIR laser and QTec® for best SNR
- > Large stand-off distances
- > Vibrational velocities up to 30 m/s

- > Outstanding signal-to-noise ratio
- > Quick setup by auto focus
- > Measurements through glass or water

VibroFlex QTec

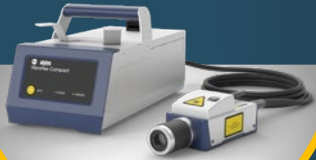


VibroFlex Range



- > Long range sensor head for distances up to > 500 m
- > For hard-to-access and hazardous areas
- > Coaxial HD camera for precise targeting
- > SWIR laser and QTec® for best SNR

VibroFlex Compact

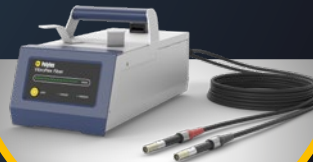


- > Compact design for narrow setups
- > Analyze microstructures with microscope objectives
- > Simplified targeting with HD+ camera
- > Easy integration into test stands

VibroFlex Neo



VibroFlex Fiber



- > For short distances and hard-to-reach locations
- > Micron sized spot size for tiny structures
- > Measures relative motion of two points on the sample

The VibroFlex modular vibrometer comprises the front-end Connect with a large color touch screen and a selection of laser sensor heads. Connect is the hub for decoding raw measurement data, signal conditioning and data interfacing. The modular concept simplifies handling and parametrization without touching the sensors and hence influencing the measurement procedure.

With the VibroLink digital interface to the VibSoft data acquisition and analysis software, the system is ready to go. View measurement data, video data and control all functions remotely.



Non-contact vibration analysis in research, product development and production testing



Benefit from the modular laser Doppler vibrometer

- Selection of handy, lightweight sensor heads covers all application needs
- Multi-wavelength system for all surfaces, media and working distances
- Laser spot in the μm range for resolving tiny details
- Simple alignment using a visible measurement point, auto-focus or integrated camera
- Wide range of application-specific accessories
- Laser class 2

VibroFlex Connect

Configurable core of the modular vibration sensing system



Core of VibroFlex as flexible laser vibrometer solution is the front-end Connect. Its latest generation FPGA-based signal processing takes care of decoding raw measurement data in displacement, velocity and acceleration, signal conditioning and data interfacing (analog and digital). The front-end Connect enables custom setups and makes sure to have the application-specific settings

with upgrade options at any time. The high-performance signal processing of the Connect assures reliable measurement data even under challenging conditions. Keep track of all relevant parameters and control via PC or the 7" large color touch screen, avoiding any influences on the measurement by this no-touch concept.



Best signal quality

- Robust and fast FPGA decoding assures phase synchronized signals and best SNR
- Tracking filter for reliable measurement results even under difficult conditions
- QTec® sensor heads featuring multi-path interferometry with reception diversity combining for best SNR on all surfaces
- Dynamics Enhancement Filter: Suppression of DC contribution emphasizes small dynamic signals

Flexibility

- Configure your options freely, upgrade later and stay future-proof
- Large bandwidth from DC to 24 MHz, also upgradeable
- High dynamic range featuring velocity measurement ranges from ± 1 mm/s up to ± 30 m/s

Smart data interfaces

- VibroLink digital interface for comfortable measurement data transfer (Ethernet TCP/IP)
- Standardized BNC outputs compatible with your DAQ
- Synchronous output of velocity, displacement and acceleration signals
- Optional LVDS output for digital data transfer in real time
- Optional IQ mode for highly precise displacement measurements and metrology applications

Remote control

- Remote control via VibSoft software or web interface
- Measure from a safe distance (e.g. in danger zones)
- HD+ camera simplifies laser spot positioning on samples

VibroFlex QTec

Powerful on all surfaces

The VibroFlex QTec sensor head delivers the highest optical sensitivity, enabling high-fidelity measurements on all surfaces – even on dark, biological, rotating or moving objects. This safe laser technology is perfect for challenging applications such as NDT, biomedical, long

distance displacement measurements, quasi-static displacement measurement and shaker feedback control. QTec makes vibration measurements faster, easier and more reliable than ever - for the most robust, unambiguous results.



Use the optional VFX-O-FMI Fiber lens for reaching hard-to-access measuring areas



Highlights

- Spare performance - SNR improvement up to 20 dB or a factor of 10
- SWIR laser and QTec® for best SNR
- High-fidelity data with no surface preparation – even dark, biological or moving objects
- From μm -sized to large, distant objects
- No limits with a high dynamic range up to 30 m/s
- Fast remote and auto focus for best signal quality
- Match range and depth of field with interchangeable lenses



QTec® patented multi-path interferometry

Always stable signal, 20 dB better SNR for faster and clearer results without post-processing: QTec® laser

vibrometers use multi-path interferometry and reception diversity for recombining the best readings from different perspectives for faster and more consistent results while avoiding the need for averaging.

VibroFlex Range

Remote detection of vibrations from distant structures

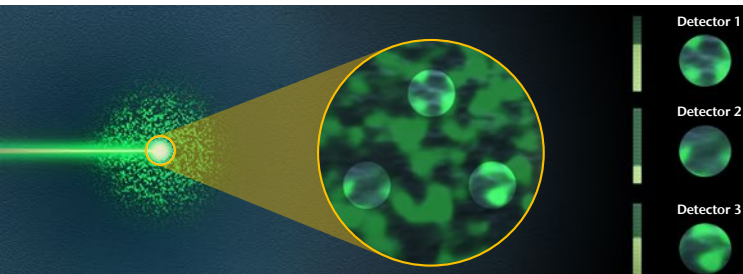
VibroFlex Range is the outdoor-proof long-range vibration measurement solution designed for remote analysis of vibrating structures, model validation and health monitoring on large and distant structures from more than 500 m. The laser sensor featuring QTec® conveniently monitors structural dynamics and stability of buildings,

operating machinery and critical production facilities, providing a fast and efficient on-site testing solution. The determined Eigen frequencies and deflections can be used e. g. for health monitoring or model validation of simulations.



Highlights

- Remote vibration analysis > 500 m with laser precision
- SWIR laser and QTec® for best SNR
- Measures on all surfaces, even corroded and dirty structures
- Remote access to distant and hazardous areas
- True zero Hz performance for precise determination of natural frequencies
- Easy setup in minutes avoids sample cabling and surface preparation
- Patented coaxial HD camera for precise targeting
- Robust and outdoor-proof sensor (IP63)



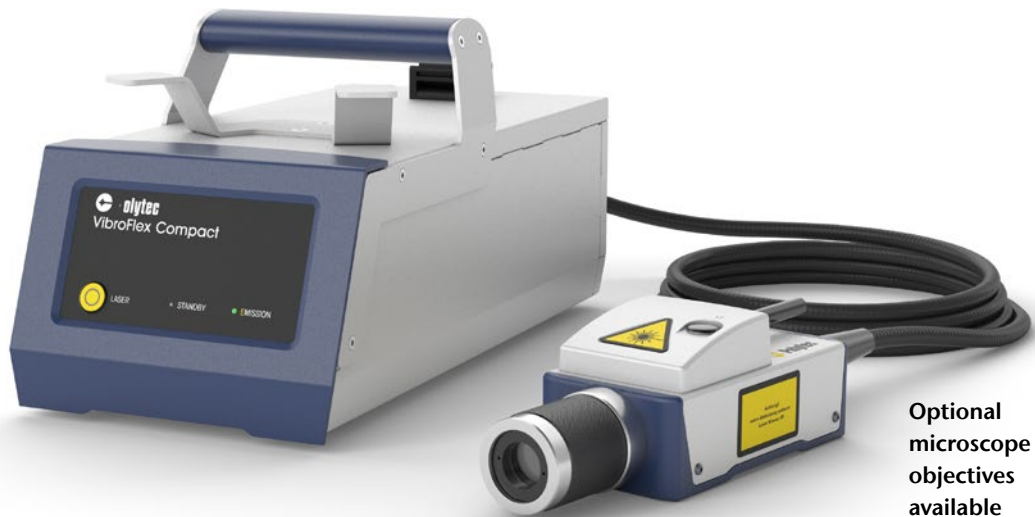
Learn more
about QTec®

VibroFlex Compact

Compactness meets versatility

VibroFlex Compact is a very compact and versatile vibrometer sensor head and is designed for tightly packed setups, challenging production environments and tiny details in technology or bio-med applications. The inline HD+ camera helps positioning the laser

precisely and provides proper test documentation. An optical filter adjusts for a perfect contrast. Optional microscope objectives focus the laser spot down to $1.5\text{ }\mu\text{m}$, allowing the characterization of microsystems and complex structures with fine details.



Optional
microscope
objectives
available



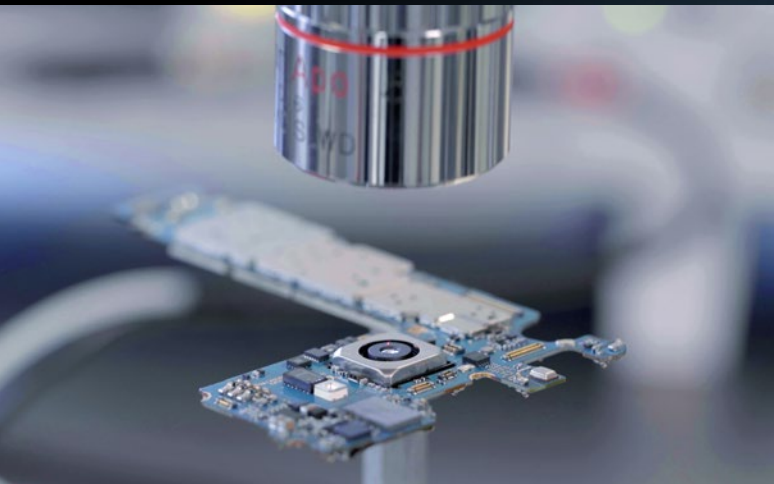
Highlights

- Very compact design for easy setup in limited workspaces and integration into test stands
- Easy laser positioning and test documentation with integrated HD+ camera and adjustable contrast filter
- Excellent optical sensitivity
- Completely integrated miniaturized interferometer for robust measurements under noisy conditions
- Microscope objectives and coaxial illumination unit available
- Protective windows, deflection units and further accessories especially for integration in test stands

Accessories that expand applications

Science and research

VibroFlex Compact serves an expandable tool for the lab to help push your science to new limits. It extracts vibration data from the smallest features with pm resolution and can be augmented with coaxial illuminations and microscope lenses.



Magnification

Microscope lenses for small or intricate structures



Illumination

Coaxial illumination for crisp images and best contrast



Positioning

Quickly fine adjust the laser beam with μm precision



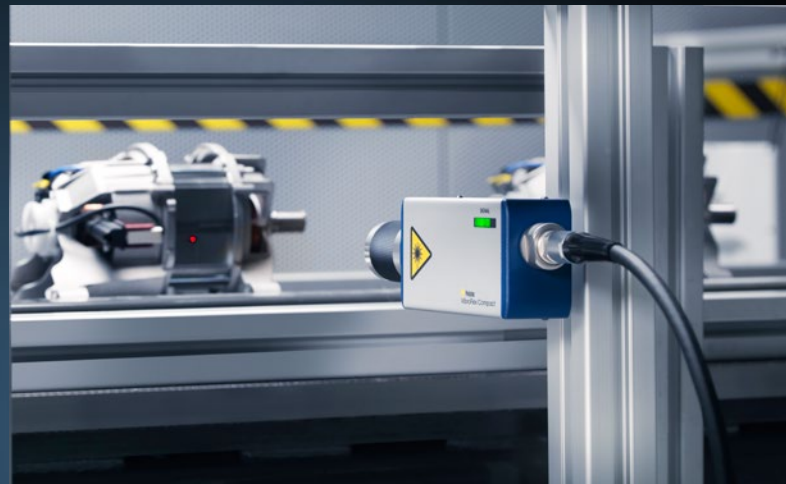
Documentation

Easy laser positioning and test documentation with integrated HD+ camera and adjustable contrast filter



Quality assurance

Our most compact Laser Doppler Vibrometer sensor with integrated miniaturized interferometer for robust measurements under noisy conditions conveys its unique performance and suitability in testing machines. Accepting a large range of protective and directional accessories makes it a low life cycle cost package for end-of-line testing.



Direction

Guide the laser to the right spot in confined spaces of testing machines



Protection

Protective windows for dust and oil spray protection



VibroFlex Neo

For demanding vibration measuring tasks

VibroFlex Neo is the robust and reliable laser Doppler vibrometer sensor head for demanding measurement tasks. Gather high-resolution vibration data anytime, and even measure through transparent media like glass for climate chamber tests or water like fluid-coupled ultrasonic analysis.



Highlights

- Outstanding nominal signal-to-noise ratio (SNR)
- Integrated signal level indicator for optimizing data quality
- Fast remote and auto focus for best signal quality
- Measures through transparent media like glass or water
- Full remote control for zero impact on the measurement setup

VibroFlex Fiber

Big insights from small spaces

VibroFlex Fiber is a fiber-optic vibrometer sensor head and particularly suitable for short measurement distances and sample points difficult to access by using the flexible and slim optical fiber cables. In addition the VibroFlex Fiber sensor head is capable of measuring differentially, i.e. it can acquire relative movements

between two sample points. The differential interferometer separates the different motion vectors already in the optical signal path and allows high-resolution measurement with inherent absolute phase stability. Thus VibroFlex Fiber extracts minute vibrations of components on heavily vibrating structures.



Highlights

- 10 mm diameter fiber-optic head reaches hard-to-access areas
- Differential optics measures relative motions between two locations
- Inherent absolute phase stability between two measurement points
- Micron-sized measurement spot for tiny structures
- Also usable for single-point vibration measurement
- Wide range of optical accessories available



VibSoft data acquisition and analysis

digital



VibSoft data acquisition fully digital with the VibroLink Ethernet interface
or using the analog VibSoft solutions with additional signal inputs

analog



VibSoft is a comprehensive and easy-to-use software package for digital vibration data acquisition and analysis. VibSoft closes the gap between raw signal acquisition and profound analysis of vibration measurement data. The VibroLink interface allows for direct and fully digital data acquisition via Ethernet and is optimally integrated in the operating system for flawless data transfer up to 24 MHz. Alternatively, the multi-channel DAQ units permit connecting additional analog inputs like other sensors, processing data up to 25 MHz. Further options like the powerful SignalProcessor (a Polytec math library for post-processing) and a scripting engine for individual post-processing and control make VibSoft an extremely powerful tool.



Benefit from advanced options

- Fully digital data acquisition with VibroLink up to 24 MHz
- Multi-channel data acquisition up to 25 MHz
- Portable notebook-based solution
- Comprehensive toolbox for analysis in the time and frequency domain
- Sample excitation via internal signal generator
- Individual post-processing with the Polytec SignalProcessor
- Integrated scripting and interfaces for Matlab®, LabView®, Microsoft Excel® and Python

Application-specific accessories

A wide range of application-specific accessories

We constantly learn from our customers and every project. Benefit now from the wide range of smart and well-thought accessories to comfortably solve your specific measurement task.



Positioning accessories

Stands, tip-tilt and xyz-positioning stages and more



Optical accessories

Multiple microscopic objectives for observing fine details, mirror sets, laser beam deflection units and fiber lenses for accessing hard-to-reach locations



Miscellaneous

Transportation cases, laser adjustment goggles and more



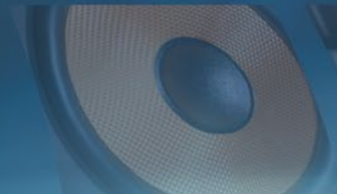
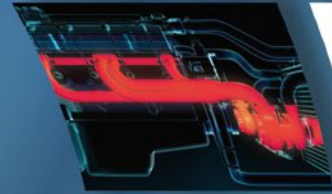
Vibrations everywhere

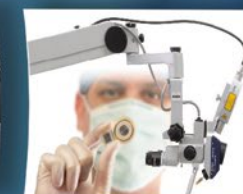
The heart beats, wings flap, sounds are sent out and received – life would be much too quiet without vibrations.

In the field of industrial research and development, Polytec's laser Doppler vibrometers are used to study objects of very different sizes including large automobile bodies, airplane fuselages, ship engines and buildings as well as tiny silicon micromachines, hard disk drive components and wirebonders. There are numerous other research applications in mechanical and civil engineering.

Demanding applications such as measurements on hot running exhausts, rotating surfaces, under water objects, delicate structures or ultrasonic devices are all made possible by non-contact laser vibrometry.

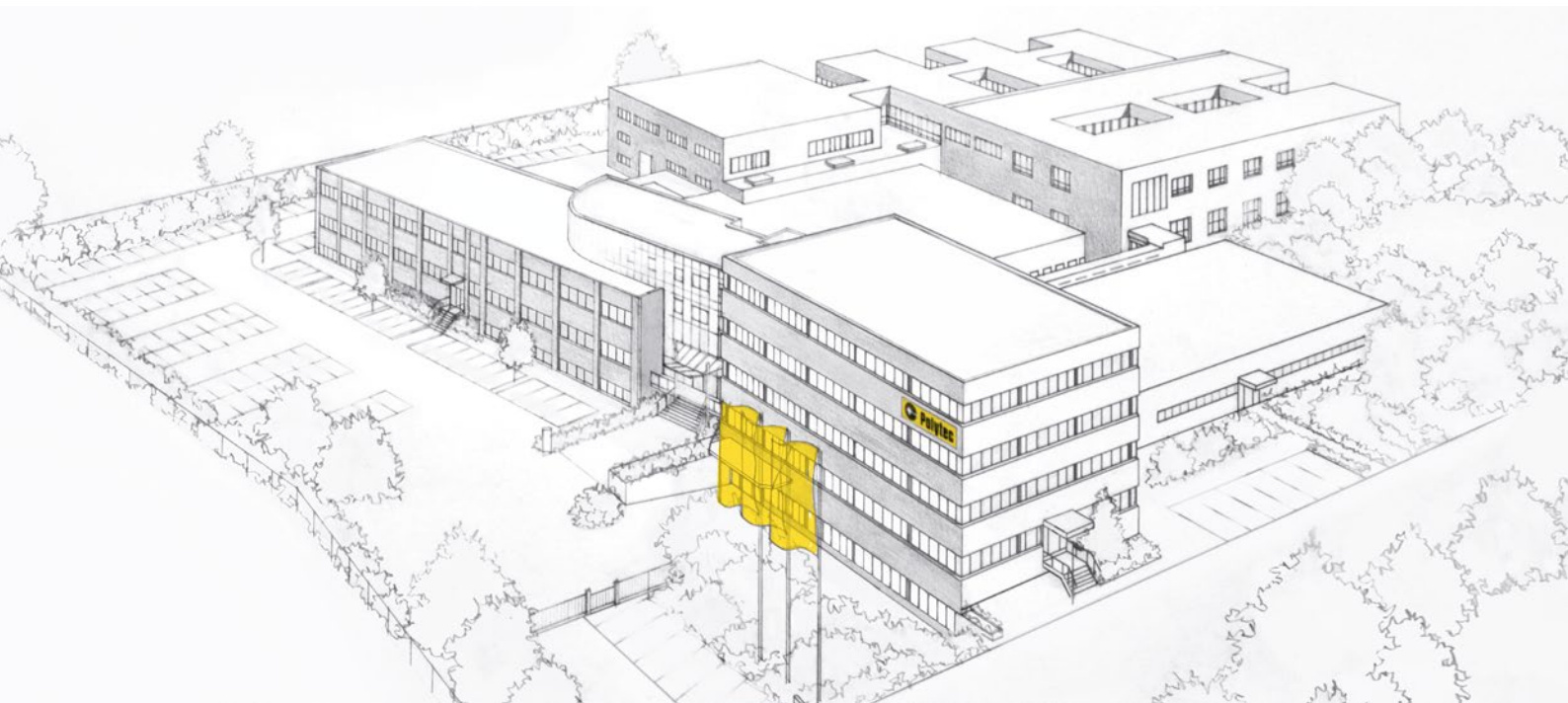
To investigate vibrating systems in nature requires sensitive and flexible measurements that don't disturb the specimen. Challenging tasks in medicine, biology and many other sciences take advantage of Polytec's universal laser Doppler vibrometers.





For detailed technical specifications of the new VibroFlex laser vibrometer system refer to the corresponding datasheets.

www.polytec.com/vibroflex



Shaping the future since 1967

High tech for research and industry.
Pioneers. Innovators. Perfectionists.

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