



# 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 new flexibility in optical vibration measurement



With VibroFlex, Polytec introduces the new 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, motors etc. 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 optional 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. Benefit from the new flexibility in optical vibration measurement – VibroFlex.

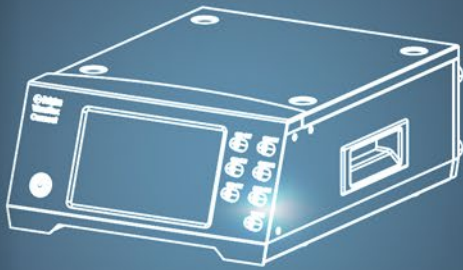


- High-performance non-contact vibration measurement solution
- Flexible, modular sensor solution that adapts to your needs
- Sub-pm displacement resolution and vibration velocities up to 30 m/s
- Configurable bandwidth from DC to 24 MHz with highest time resolution
- Patented QTec concept featuring multiple detection channels for best signal-to-noise ratio
- Compact sensor head with integrated camera for precise laser positioning and sample monitoring
- 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

Configurable front-end

## VibroFlex Connect



- > 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 VibroFlex QTec head provides high velocity limits up to 30 m/s and delivers the highest optical sensitivity, enabling high-fidelity measurements especially for laterally moving or rotating surfaces and larger stand-off distances. This is the best choice for all engineered surfaces.

## VibroFlex Neo



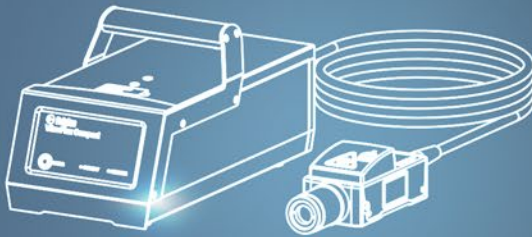
- > Outstanding signal-to-noise ratio
- > Quick setup by auto focus
- > Measurements through glass or water

## VibroFlex QTec



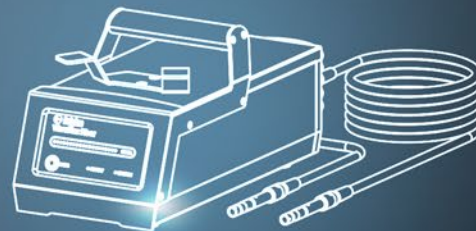
- > Measurement on all surfaces (oily, shiny, dark)
- > Best SNR on engineered surfaces
- > Large stand-off distances
- > Vibrational velocities up to 30 m/s

## VibroFlex Compact



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

## 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

+ choose your sensor head

The VibroFlex modular vibrometer comprises the front-end Connect with a multi touch display 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  $\mu\text{m}$  range for resolving tiny details
- Simple alignment using a visible measurement point, optional 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 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 head featuring multi-channel detection with diversity combining for best SNR on all engineered 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 velocity measuring range 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
- Make use of every quantum of light for unparalleled optical sensitivity
- High-fidelity data with no surface preparation – even dark, biological or moving objects
- From  $\mu\text{m}$ -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

To achieve these benefits in demanding applications, our patented QTec technology is combined with the well proven infrared Xtra sensor design.

QTec represents a new quality in non-contact vibration analysis on engineered surfaces, making use of the very last quantum of light for high-fidelity data under all conditions. The significance is a signal that is always stable, the signal-to-noise ratio is notably higher with clear results facilitating interpretation and post-processing. QTec Vibrometers use for the first time multi-path interferometer and reception diversity to recombine the best reading from different perspectives for a consistent result.



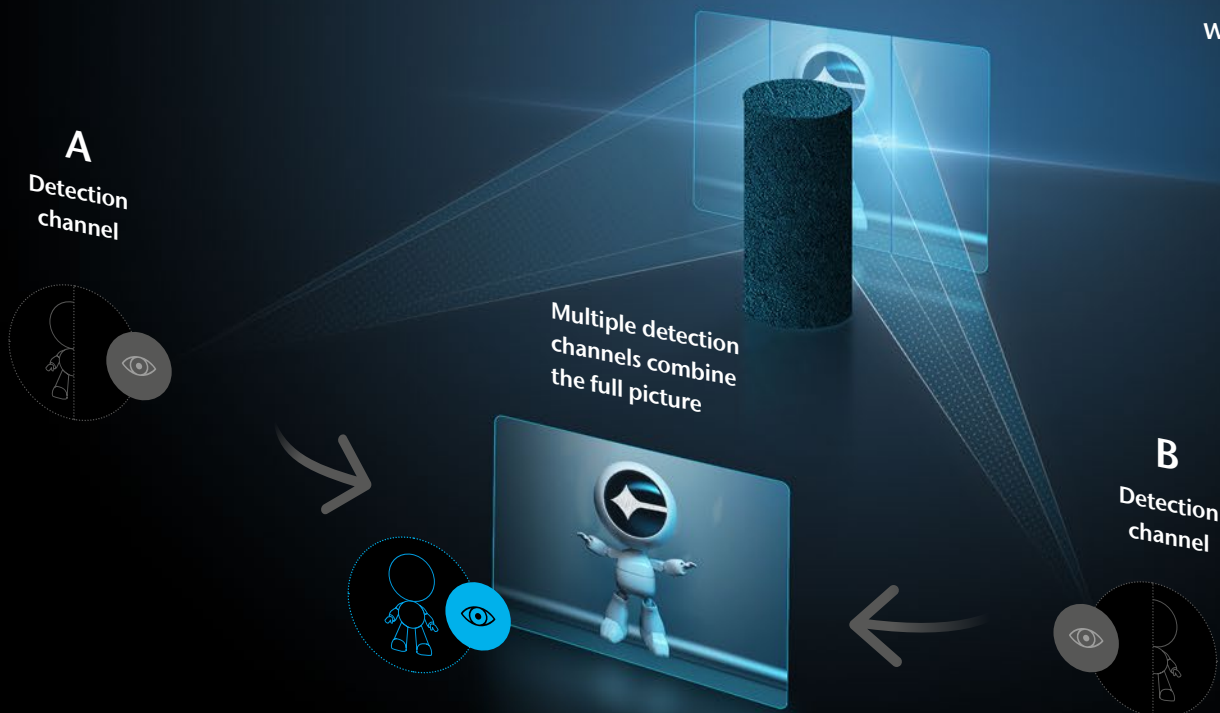
#### What can QTec do for you?

- **Uncover the hidden features**  
with better SNR find small peaks easily  
for unambiguous results
- **Save time**  
faster measurement, faster results
- **Trusted results**  
clear spectra on rotating or moving surfaces
- **Keeps track of every photon**  
Continuous time signal
- **Spare performance**  
SNR improvement up to 20 dB or a factor of 10

**Sometimes you  
have to change your  
perspective ...**



Watch the video



**... to get the full information.**



# VibroFlex Compact

## Compactness meets versatility

The 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 optional 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.



### 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 (optional)
- 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

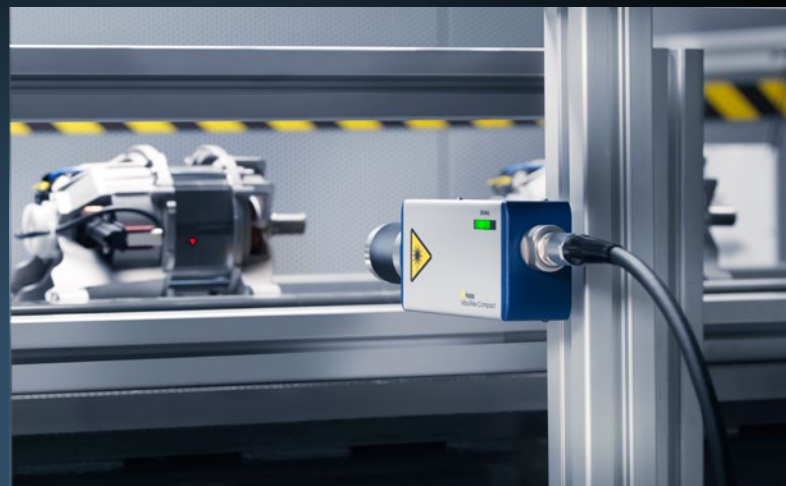
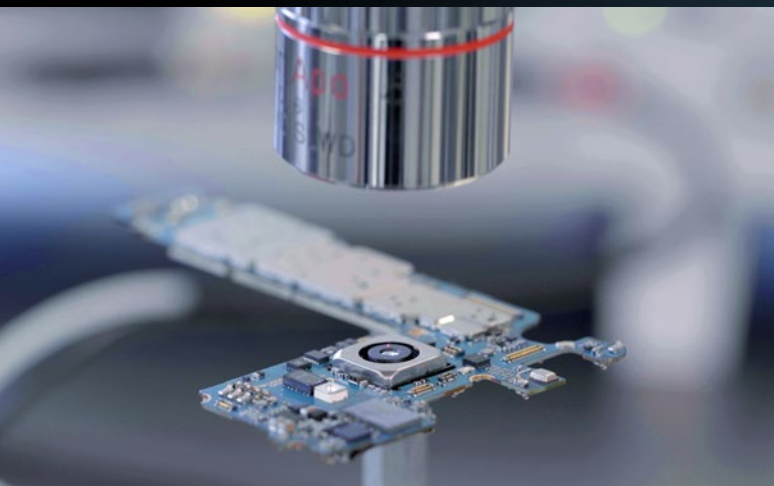
# Accessories that expand applications

## 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.

## 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.



### 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  $\mu\text{m}$  precision



### Documentation

Easy laser positioning and test documentation with integrated HD+ camera (optional)



### 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

The 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.



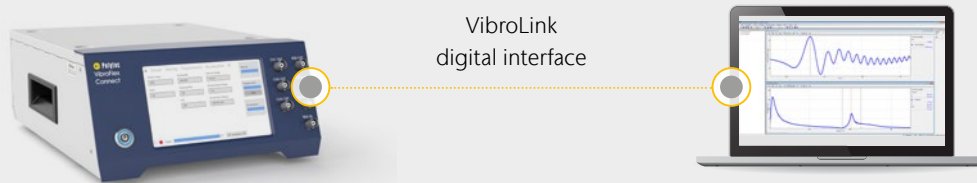
### Highlights

- 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 with the VibroLink Ethernet interface or using the analog junction box 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 up to 24 MHz. Alternatively, the multi-channel DAQ units permit connecting additional analog inputs like other sensors, processing data up to 40 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 40 MHz
- Portable notebook-based solution
- Comprehensive toolbox for analysis in the time and frequency domain
- Sample excitation via internal signal generator (optional)
- Individual post-processing with the optional 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 xy-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





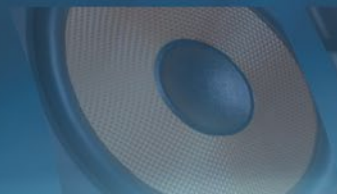
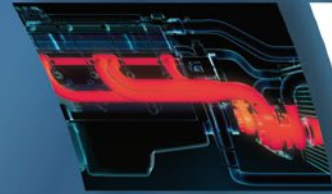
# Vibrations everywhere

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.

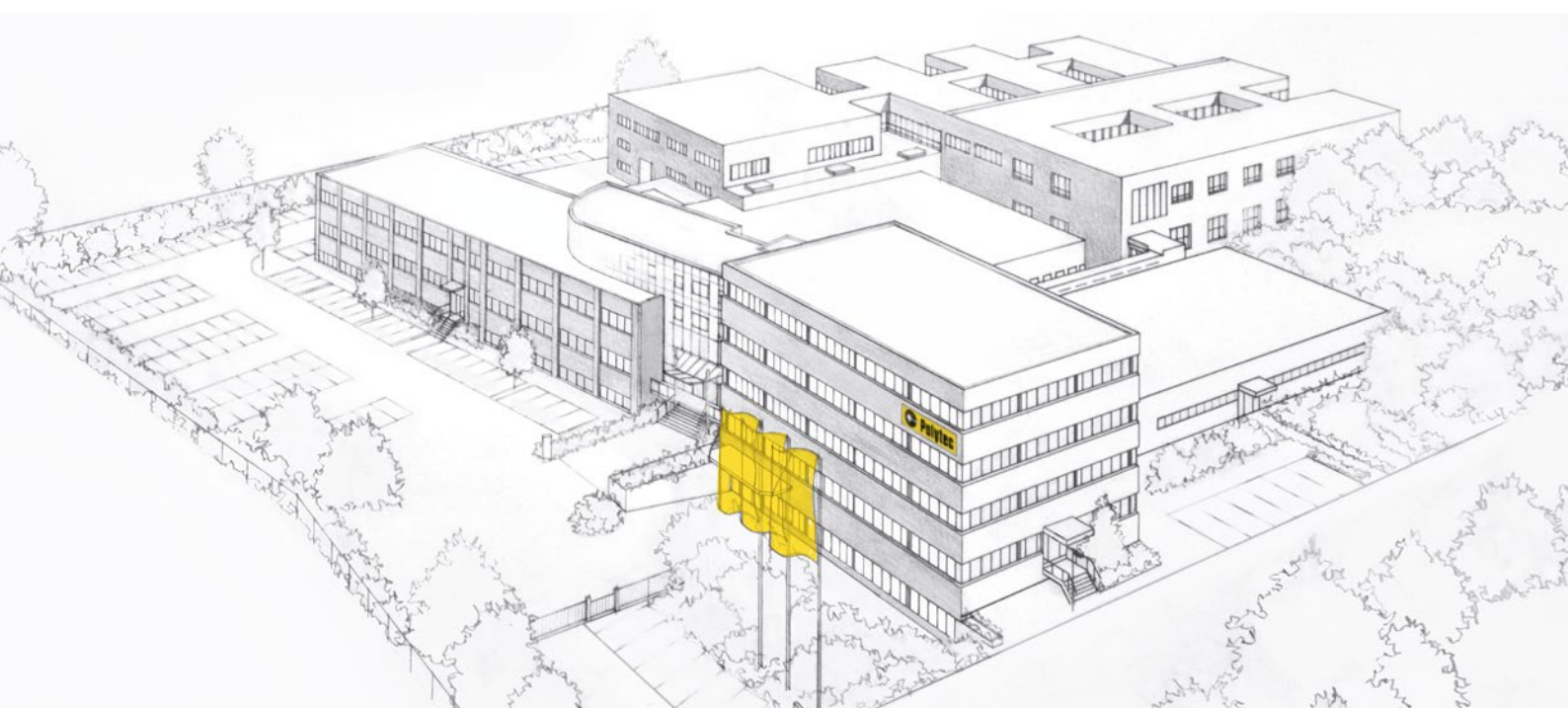
To investigate vibrating systems in nature requires sensitive and flexible measurements that don't disturb the specimen. Challenging tasks in medicine, biology and many other sciences take advantage of Polytec's universal laser Doppler vibrometers.





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

[www.polytec.com/vibrofex](http://www.polytec.com/vibrofex)



## Shaping the future since 1967

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**Polytec GmbH · Germany**  
Polytec-Platz 1-7 · 76337 Waldbronn