

**RoboVib® Structural Test Station**  
Automated Experimental Modal Testing  
Product Brochure



# Automated Experimental Modal Analysis to Save Time and Cost



By mounting a 3D Scanning Vibrometer to a multi-axis industrial robot, RoboVib removes many of the limitations of traditional contact transducer methods. RoboVib is engineered for measuring anything – from complex components up to complete vehicle bodies. With RoboVib you can automatically acquire and record the data necessary for a modal analysis which can be indispensable for the development of new products.

This technological symbiosis drastically reduces test times for experimental modal analysis (EMA): from weeks to days and from days to hours. Deriving the measurement points from Finite Element (FE) Models facilitates Model updating. Due to the increased productivity, test fields and prototypes are used more efficiently, the results are faster available.

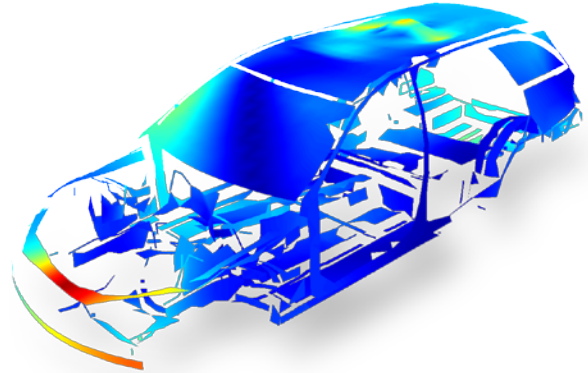
## Push the Boundaries Free From Limitations

Structure-borne noise measurements using laser-Doppler vibrometry are a perfect solution to optimize the noise and vibration characteristics of a product in development. This laser technology can increase the measurement point density without influencing the structure or its vibration characteristics, while simultaneously reducing the testing time. High fidelity test data measured in the coordinate system and at the nodal points of the FE mesh are the output of RoboVib.

And it is the perfect input data for modal analysis and subsequent model updating process. The datasets can be used inherently for acoustic simulations due to their spatial density and fidelity.

## Fast and Precise per Laser

By using a laser as the vibration probe, RoboVib takes data with zero mass loading, eliminating the inaccuracies and complexities associated with mounting and removing traditional contact sensors. At the same time, the number of measurement points is not limited by the sensor size and the number of available measurement channels. This allows a higher density of measurement points and a model validation at higher frequencies. The measurement points can be determined using the Scanning Vibrometer software or imported directly from the FE application. The setup is simple and the measurement sequence is fast. High resolution test data can be taken in a fraction of the time needed for traditional contact transducer methods.



## Save Time – Increase Quality

The RoboVib system can be run unattended, allowing measurements to be scheduled day or night. The test set-up is completed during standard working hours, the measurement is started and the results are ready for analysis the next day.

**Testing time for structural analysis of complex shaped objects like complete vehicles is drastically reduced from weeks to only a few hours and is conducted automatically overnight.**

## Improving Vibration Testing

The Goal	RoboVib®'s Contribution
<ul style="list-style-type: none"> <li>Integrate all data into one CAE data workflow</li> </ul>	Supplies interfaces for incorporating FE geometry, external sensor test data, and modal analysis
<ul style="list-style-type: none"> <li>Automate recurring tasks</li> </ul>	Computer driven robot arm allows unattended measurements and eliminates sensor mounting
<ul style="list-style-type: none"> <li>Reduce error sources</li> </ul>	Eliminates interpolation and errors in point definition (Euler angle determination), cabling, mounting, and calibration
<ul style="list-style-type: none"> <li>Reuse test setups for similar tasks</li> </ul>	Saves test setups. Can be used for similar object sizes and shapes



### Flexibility Through Robots

Using the PSV-500-3D Scanning Vibrometer, vibration data for deflection shape analysis of the visible part of the object are acquired segment by segment. To measure a car body or any complex shaped object, the scanning heads are repositioned several times to cover all views. Each of the partial measurements or views is then stitched together to make a complete picture of the car body.

The RoboVib Structural Test Station uses an industrial robot to automate the repositioning of the heads. Using six rotation axes, all spatial degrees-of-freedom can be accessed by the robot. For an extended measurement volume an additional linear axis is used or a second robot measures in parallel to double productivity. By using this unique combination of technologies, the degree of automation can be dramatically increased leading to significant time and cost savings.

### Customized to Your Needs

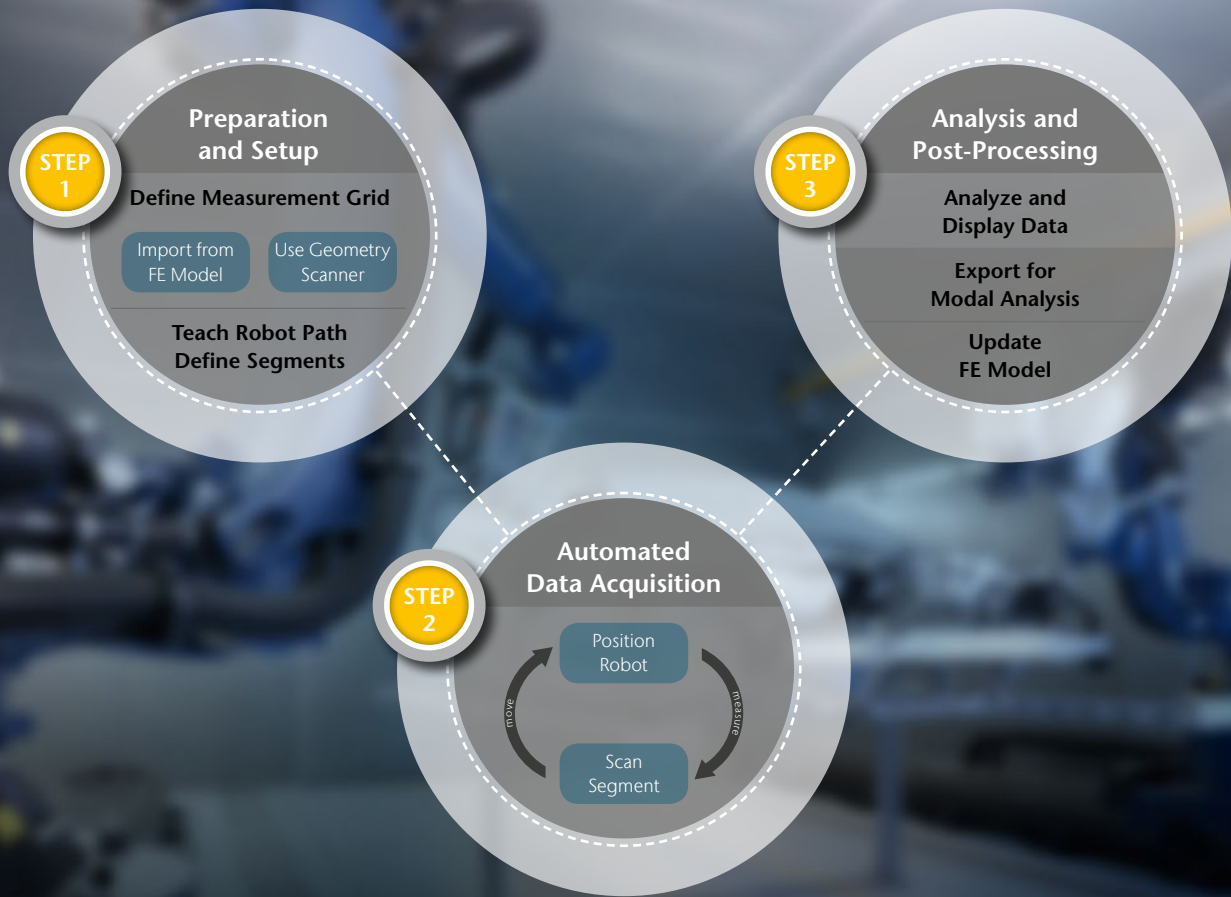
A RoboVib Structural Test Station can be tailored to your requirements and measurement tasks. The basic setup comprises a PSV-500-3D Scanning Vibrometer and an industrial robot. Two powerful software packages – PSV Software and the RoboVib Software – assure precise control of the data acquisition process and the robot(s) positioning.

### Optional Xtra Performance

The optional PSV Xtra for best optical sensitivity expands your measurement possibilities. Using Xtra technology helps on uncooperative surfaces by avoiding surface preparation. On the one hand, measuring from larger working distances while maintaining signal quality is an additional time saver. On the other hand, structural details can be analyzed in ultra high resolution thanks to significantly enhanced signal-to-noise ratio (SNR).



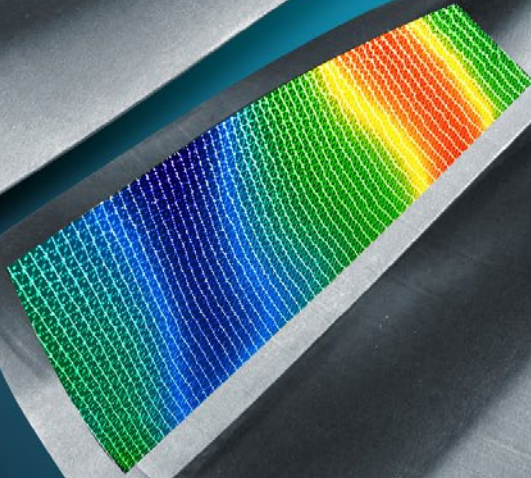
## The RoboVib® Workflow



### The RoboVib® Workflow

Step 1 starts with the setup using a measurement grid from the FE model. Step 2 comprises the fully automated test cycle, moving the laser scanning heads from position to position scanning each segment. Every measurement point directly refers to a FE nodal point. The segmental data is stitched together, resulting in a common data set based on the FE nodal information. No human interaction is necessary. Thus Step 2 can be performed unattended and during off-hours.

In Step 3, the test data is ready for analysis. Animated deflection shapes and the full frequency and phase information is presented for analysis and for export to modal analysis software or to further post-processing.



Automating acoustic and vibration analysis for lightweight and complex shaped structures: The flexibility of the RoboVib structural test station allows for full-field measurement with highest spatial resolution improving the quality of FE modal analysis.



## Highlights

### Reduced Test Time

- Cut down testing time  
*Large component test in hours instead of days, also over night*
- Store measurement settings  
*Reuse measurement positions for similar objects*
- Import geometry data  
*Results displayed in object's coordinate system*
- Automate test procedure  
*Run tests unattended and during off-times*

### Ultimate Precision

- See more details  
*High point density for better FE model update*
- Eliminate mass loading  
*Non-contact laser measurement*
- Export test data on nodal points  
*No interpolation required*
- Easy maintenance  
*Only 3 sensors are calibrated every two years*

### Increased Freedom

- Scan geometries  
*Unveil deviations between model and sample geometry*
- Integrate external data  
*Include accelerometer measurements for hidden points*
- Use unlimited measurement channels  
*Allows higher density of measurement points and model validation at higher frequencies*



# Key Product Features

## Components

- KUKA robot suitable for the required working space
- KUKA linear axis (optional)
- PSV-500-3D Scanning Vibrometer
- RoboVib Software

## Performance

- Frequency bandwidth: 25 MHz in 1D-mode, 5 MHz in 3D-mode
- Velocity range up to 30 m/s
- Resolution down to  $0.005 \mu\text{m s}^{-1}/\sqrt{\text{Hz}}$

## Data handling

- Target data: frequency response functions in Cartesian coordinates in the coordinate system of the test object
- MIMO capability (up to 8 reference channels, and 4 uncorrelated signal generator channels), principal component analysis
- Import and export of geometry and vibration data in common file formats including ASAM ODS



- Open data interface: Polytec File Access (enables data access utilizing Visual Basic®, C++ or MATLAB®)

## Start Saving Test Time Today!

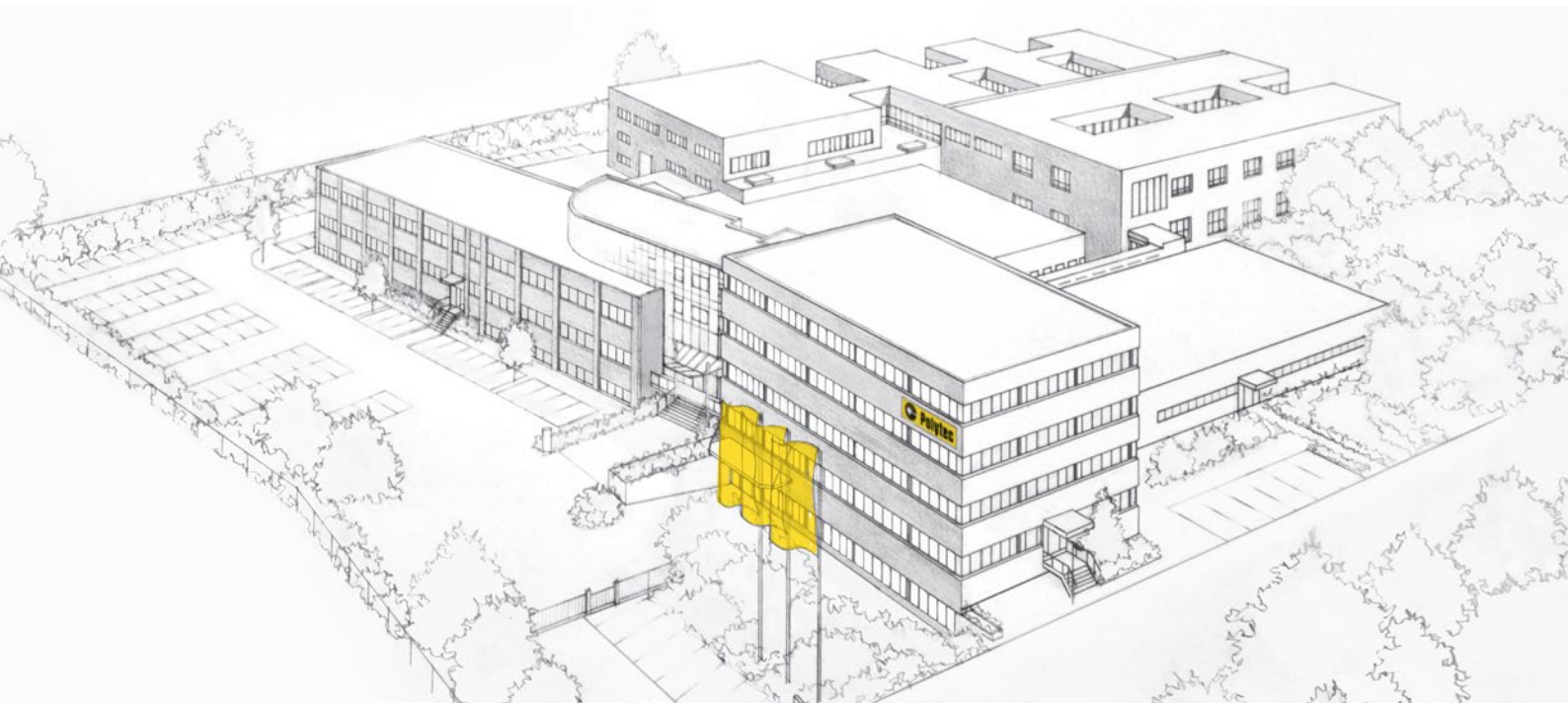
**Make use of the RoboVib benefits in the Polytec Test Centers in Waldbronn, Germany, Dexter, MI, USA and Yokohama, Japan.**

### More Info

Visit [www.robovib.net](http://www.robovib.net) for more information, applications and demo videos about the RoboVib Structural Test Station and the PSV-500-3D Scanning Vibrometer.

In addition, Polytec product specialists are available by phone and email to help configure the perfect system for your application.





 **Polytec GmbH  
(Germany)**  
Polytec-Platz 1-7  
76337 Waldbronn  
Tel. +49 7243 604-0  
info@polytec.de

**Polytec GmbH  
(Germany)  
Vertriebs- und  
Beratungsbüro**  
Schwarzschildstraße 1  
12489 Berlin  
Tel. +49 30 6392-5140

 **Polytec, Inc.  
(USA)**  
North American  
Headquarters  
16400 Bake Parkway  
Suites 150 & 200  
Irvine, CA 92618  
Tel. +1 949 943-3033  
info@polytec.com

**Central Office**  
1046 Baker Road  
Dexter, MI 48130  
Tel. +1 734 253-9428

**East Coast Office**  
1 Cabot Road  
Suites 101 & 102  
Hudson, MA 01749  
Tel. +1 508 417-1040

 **Polytec Ltd.  
(Great Britain)**  
Lambda House  
Batford Mill  
Harpenden, Herts AL5 5BZ  
Tel. +44 1582 711670  
info@polytec-ltd.co.uk

 **Polytec France S.A.S.**  
Technosud II  
Bâtiment A  
99, Rue Pierre Semard  
92320 Châtillon  
Tel. +33 1 496569-00  
info@polytec.fr

 **Polytec Japan**  
Arena Tower, 13th floor  
3-1-9, Shinyokohama  
Kohoku-ku, Yokohama-shi  
Kanagawa 222-0033  
Tel. +81 45 478-6980  
info@polytec.co.jp

 **Polytec South-East Asia  
Pte Ltd**  
Blk 4010 Ang Mo Kio Ave 10  
#06-06 TechPlace 1  
Singapore 569626  
Tel. +65 64510886  
info@polytec-sea.com

 **Polytec China Ltd.**  
Room 402, Tower B  
Minmetals Plaza  
No. 5 Chaoyang North Ave  
Dongcheng District  
100010 Beijing  
Tel. +86 10 65682591  
info-cn@polytec.com