

# PSV-400 Scanning Vibrometer



## POLYTEC SCANNING VIBROMETERS

- PSV-400 Scanning Vibrometer
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- MSV-400 Microscope Scanning Vibrometer
- MSA-400 Micro System Analyzer

## SCANNING & VISUALIZING VIBRATIONS

*The PSV-400 Scanning Vibrometer represents state-of-the-art measurement technology for the analysis of structural vibrations. Entire surfaces are rapidly scanned and automatically probed with flexible and interactively created scan grids. The PSV-400 offers technical excellence, ease of use and features designed for resolving noise and vibration issues in the automotive, aerospace, commercial manufacturing and R&D markets.*

### Measuring Vibrations of Complete Surfaces

Polytec Laser Doppler Vibrometers are used to precisely measure mechanical vibrations, quickly, easily and free from mass-loading or feedback problems. A modular design allows task specific optimization while retaining maximum flexibility and expandability for future needs.

Polytec Vibrometers operate on the Doppler principle, measuring the frequency shift of back-scattered laser light from a vibrating structure to determine its instantaneous velocity and displacement.

The PSV-400 Scanning Vibrometer is a single, automated, turnkey system that offers all the advantages of a laser vibrometer integrated with the speed, ease of use, accuracy and comprehensive data processing and visualization of a dual-axis laser scanner.

### Key Features and Benefits

- Easy and intuitive operation and rapid, non-contact vibration measurement
- Digital data decoding available (depending on system configuration)
- Mountable Geometry Scan Unit (optional) allows acquisition of geometry data
- Measuring on imported or directly acquired object geometries or on interactively created scan grids
- Focus position of each sample point can be individually set
- MIMO (Principal Component Analysis)
- Open software platform with standardized programming and data interfaces for perfect integration in the development workflow
- Polytec Signal Processor as an integrated tool used in presentation mode
- Fully upgradeable to the PSV-400-3D 3D measuring Scanning Vibrometer

Users get a quick, easily understood and accurate visualization of a structure's global and local vibrational characteristics. The PSV-400 avoids the necessity of attaching a transducer array to the test sample and then individually collecting and processing each transducer's output.

The PSV-400 Scanning Vibrometer comprises both state-of-the-art hardware and software. It includes a compact sensor head with an integrated scanning unit, a vibrometer controller and a data acquisition and management system. These components are complimented by a powerful software package that controls the scanners, data processing, and visualization of the measurement results.

The PSV-400 series is built upon the combined strength of a proven OFV-5000 Controller and a high-performance OFV-505 Sensor Head featuring auto-focus and focus memory functionality.

The PSV-400 is designed to scan both small ( $\text{mm}^2$ ) and large ( $\text{m}^2$ ) structures. Depending on the chosen configuration, the PSV-400 covers vibration frequencies up to 20 MHz and vibration velocities up to 20 m/s.

The PSV-400 can be upgraded to the fully featured, PSV-400-3D Scanning Vibrometer for three-dimensional measurements. It is also the base for the award-winning Polytec Microscanning Systems.

## Technical Data

General Specifications	
Working distance	> 0.4 m (shorter distances accessible by using Close-up Unit)
Laser wavelength	633 nm, visible beam
Laser protection class	Class 2 He-Ne laser, < 1 mW, eye-safe
Sample size	Several $\text{mm}^2$ up to $\text{m}^2$ range
Scan grid	Multiple grid densities and coordinate systems (polar, cartesian and hexagonal) each with up to 512 x 512 points

Configurations		
PSV-400-B	Basic Scanning Vibrometer	2 channels, 40 kHz, 10 m/s
PSV-400-H4	High End Scanning Vibrometer	4 channels, 80 KHz, 10 m/s
PSV-400-H4-S	High Amplitude Scanning Vibrometer	4 channels, 80 KHz, 20 m/s
PSV-400-M2	Wide Bandwidth Dual Channel Scanning Vibrometer	2 channels, 1 MHz, 10 m/s
PSV-400-M4	Wide Bandwidth Four Channel Scanning Vibrometer	4 channels, 1 MHz, 10 m/s
PSV-400-M2-20	20 MHz Scanning Vibrometer	2 channels, 20 MHz, 10 m/s

Accessories	
PSV-A-410 Close-up Unit	For the measurement of small parts and for measurements in close distance to model PSV-I-400 scan unit
PSV-A-420 Geometry Scan Unit	Laser-based distance sensor for the direct acquisition of 3D-geometry data
PSV-A-T18 Vertical Test Stand	For translational positioning of model PSV-I-400 scan heads
PSV-A-T11 pan/tilt head	Motorized pan/tilt head mounted on a heavy duty tripod



<b>PSV-400 Hardware</b>	
Sensor Head PSV-I-400	<b>Components:</b> <ul style="list-style-type: none"> <li>■ High sensitivity vibrometer sensor model OFV-505</li> <li>■ High precision scan unit (scanning range <math>\pm 20^\circ</math> about X, Y) Angular resolution <math>&lt; 0.002^\circ</math>, angular stability <math>&lt; 0.01^\circ</math> /hr</li> <li>■ Color video camera with Auto Focus and 72x Zoom (4x digital, 18x optical)</li> </ul> <b>Features:</b> <ul style="list-style-type: none"> <li>■ Scan speed <math>&lt; 50</math> points/s</li> <li>■ Individual focusing of each scan point utilizing remote focus control with memory position function</li> <li>■ Mountable Geometry Scan Unit for acquisition of test sample geometry (optional)</li> <li>■ Working distance <math>&gt; 0.4</math> m (standard)</li> <li>■ Weight 7.5 kg</li> <li>■ Dimensions (L x H x W) 365 mm x 160 mm x 190 mm</li> </ul>
Vibrometer Controller OFV-5000	<ul style="list-style-type: none"> <li>■ Velocity ranges (digital) general: 1/2/5/10/20/50 [mm/s/V] PSV-400-H: 0.2/0.5/1/2/5/10/20/50 [mm/s/V] PSV-400-B: not available</li> <li>■ Velocity ranges (analog) general: 10/100/1000 [mm/s/V] PSV-400-M2-20: 10/100/500*/1000 [mm/s/V] *depending on configuration</li> <li>■ Displacement and further velocity ranges dependent on the decoder configuration</li> <li>■ Four analog low pass filters with limit frequency 5 kHz, 20 kHz, 100 kHz and 1.5 MHz resp.</li> <li>■ RS-232 interface for remote control by the Data Management System</li> </ul>
Junction Box PSV-E-400	<p>Interface between PSV-I-400 Sensor Head, OFV-5000 Vibrometer Controller and the Data Management System</p> <ul style="list-style-type: none"> <li>■ Input for 4 analog signals, triggers and gate available on BNC connectors, ICP®-compatible</li> <li>■ Output for signal generator available on BNC connectors</li> </ul>
Data Management System PSV-W-400	<p>State-of-the-art rack-mountable industrial PC equipped with:</p> <ul style="list-style-type: none"> <li>■ DVD-Recorder</li> <li>■ 19" LCD Display</li> <li>■ 100 Mb/s Ethernet network connection</li> <li>■ Data acquisition: <ul style="list-style-type: none"> <li>PSV-400-B      2 channels, 40 kHz bandwidth</li> <li>PSV-400-H4    4 channels, 80 kHz bandwidth</li> <li>PSV-400-H4-S 4 channels, 80 kHz bandwidth</li> <li>PSV-400-M2    2 channels, 1 MHz bandwidth</li> <li>PSV-400-M4    4 channels, 1 MHz bandwidth</li> <li>PSV-400-M2-20 2 channels, 20 MHz bandwidth</li> </ul> </li> <li>■ Signal generator</li> <li>■ Operating system Windows® 2000 or Windows® XP (German, English and Japanese version available)</li> </ul>
Systems cabinet, rollable (optional)	<p>Houses PC Workstation, Vibrometer Controller, Junction Box and Data Management System</p>
Motorized pan/tilt head (optional)	<p>Maximum panning angle (horizontal): <math>\pm 90^\circ</math>, Maximum tilt angle (vertical): <math>\pm 84^\circ</math></p>

PSV-400 Software Features	
Scan grid definition	<ul style="list-style-type: none"> <li>Manual, interactive definition in the live video image by APS Professional (Advanced Point Selection), allows multiple grid densities and coordinate systems (polar, cartesian and hexagonal) each with up to 512 x 512 points combined in one scan</li> <li>Data import from CAD- and FEM-systems via Universal File Format (UFF) or ASCII or binary from ME'scope (optional)</li> </ul>
Focus control	<ul style="list-style-type: none"> <li>Manual focussing and Autofocus</li> <li>Focus Scan and Focus Memory used to determine and save the optimum focus position of each respective scan point</li> </ul>
Data acquisition	<ul style="list-style-type: none"> <li>Simultaneous data acquisition from up to 4 channels (vibrometer signal, 3 reference signals)</li> <li>Acquisition modes: FFT; zoom-FFT (optional available except for B); fast scan (optional for B); multi frame (optional, only for H); time mode (optional)</li> <li>Digital filtering and averaging available</li> <li>Trigger options: external, analog, pre and post trigger</li> </ul>
Data quality	Continuous assessment of the S/N ratio in order to improve data quality by Signal Enhancement (increased number of samples used for averaging) and Speckle Tracking
Target data	<ul style="list-style-type: none"> <li>Velocity is measured; displacement (calculated by integration of velocity) and acceleration (calculated by differentiation) can also be displayed</li> <li>Data are saved in form of either spectra or time signal (optional for scan data)</li> <li>Calculation of transfer functions between primary and reference signals: FRF, H1, H2, Coherence, Autopower, Crosspower</li> </ul>
Data presentation	<p>Spectral presentation:</p> <ul style="list-style-type: none"> <li>Spectrum averaged over all scan points</li> <li>Spectra of individual points</li> </ul> <p>Display of video image overlaid with measured data and various presentation modes of deflection shapes:</p> <ul style="list-style-type: none"> <li>2D: color map presentation of vibration data</li> <li>3D: three-dimensional presentation of vibration data</li> <li>Isolines: equivalent values are interconnected by colored isolines</li> <li>Scan point: Each scan point is depicted as a square symbol colored according to the measured value</li> </ul> <p>Profile representation of section cuts across the test sample which are created interactively</p>
Signal Processor	User interface to the math library included in the PSV software, designed as an easy-to-use spreadsheet
Data export	<ul style="list-style-type: none"> <li>Windows® Automation Interface: Polytec FileAccess (enables data access utilizing Visual Basic® or C++)</li> <li>Export of geometry data, spectra, time signals and deflection shapes as ASCII files (Microsoft Excel compatible), UFF (both standard) or ME'scope format (optional)</li> <li>Export of animated 2D- and 3D-models and profiles as AVI-file</li> </ul>
Signal generation	The internal signal generator is used to create specific excitation signals

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