PSV-400 *Scanning Vibrometer*

POLYTEC SCANNING VIBROMETERS

- **PSV-400 Scanning Vibrometer**
- PSV-400-3D Scanning Vibrometer
- MSV-400 Microscope Scanning Vibrometer
- PMA-400 Planar Motion Analyzer
- MMA-400 Micro Motion 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
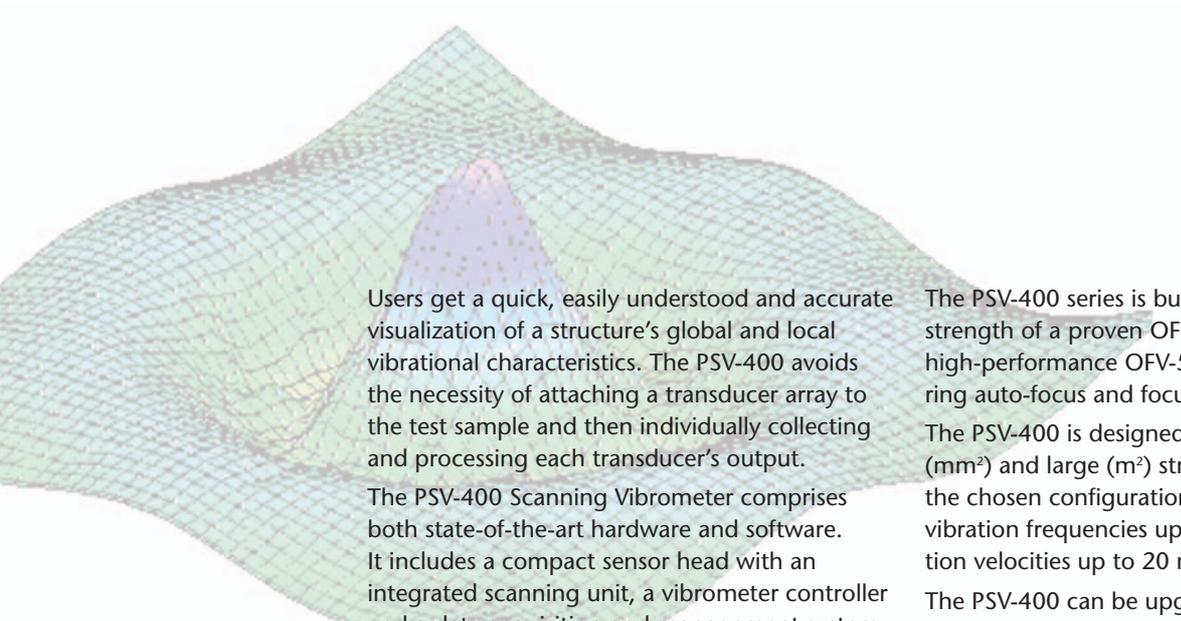
Users get a quick, easily understood and accurate visualization of a structure's global and local vibrational characteristics. The PSV-400 avoids the necessity of attaching a transducer array to the test sample and then individually collecting and processing each transducer's output.

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 (mm^2) and large (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 II He-Ne laser, < 1 mW, eye-safe
Sample size	Several mm^2 up to 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

* in preparation

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

Laser Radiation
Do not stare into beam
Class 2 Laser Product
According to IEC/EN 60825-1 (2001)
Complies with 21 CFR 1040.10 and 1040.11
except for deviations pursuant to
Laser Notice no. 50, dated 26 July 2001
P ≤ 1 mW/cw; λ = 620-700 nm

PSV-400 Hardware	

Sensor Head PSV-I-400	**Components:**
	▪ High sensitivity vibrometer sensor model OFV-505
	▪ High precision scan unit (scanning range ± 20° about X, Y)
	  Angular resolution < 0.002°, angular stability < 0.01° /hr
	▪ Color video camera with Auto Focus and 72x Zoom (4x digital, 18x optical)
	Features:
	▪ Scan speed > 100 points/s
	▪ Individual focusing of each scan point utilizing remote focus control
	  with memory position function
	▪ Mountable Geometry Scan Unit for acquisition of test sample geometry
	  (optional)
	▪ Working distance > 0.4 m (standard)
	▪ Weight 7.5 kg
	▪ Dimensions (L x H x W) 365 mm x 160 mm x 190 mm

Vibrometer Controller OFV-5000	▪ Velocity ranges:
	  (digital) 1/2/10/50 [mm/s/V]
	  (analog) 10/100/1000 [mm/s/V]
	  (PSV-400-B: (analog) 10/100/1000 [mm/s/V])
	  (PSV-400-M2-20: (analog) 10/100/500*/1000 [mm/s/V];
	  *depending on configuration,
	  further ranges dependent on the decoder configuration)
	▪ Bandwidth: 1.5 MHz
	  (PSV-400-M2-20: 20 MHz)
	▪ Four analog low pass filters with limit frequency
	  5 kHz, 20 kHz, 100 kHz and 1.5 MHz resp.
	▪ RS-232 interface for remote control by the Data Management System

Junction Box PSV-E-400	Interface between PSV-I-400 Sensor Head, OFV-5000 Vibrometer Controller and the Data Management System ▪ Input for 4 analog signals, triggers and gate available on BNC connectors, ICP®-compatible ▪ Output for signal generator available on BNC connectors

Data Management System PSV-W-400	State-of-the-art rack-mountable industrial PC equipped with:
	▪ DVD-Recorder
	▪ 19" LCD Display
	▪ 100 Mb/s Ethernet network connection
	▪ Data acquisition:
	  PSV-400-B 2 channels, 40 kHz bandwidth
	  PSV-400-H4 4 channels, 80 kHz bandwidth
	  PSV-400-H4-S 4 channels, 80 kHz bandwidth
	  PSV-400-M2 2 channels, 1 MHz bandwidth
	  PSV-400-M4 4 channels, 1 MHz bandwidth
	  PSV-400-M2-20 2 channels, 20 MHz bandwidth
	▪ Signal generator
	▪ Operating system Windows® 2000 or Windows® XP
	  (German, English and Japanese version available)

Systems cabinet, rollable (optional)	Houses PC Workstation, Vibrometer Controller, Junction Box and Data Management System
Motorized pan/tilt head (optional)	Maximum panning angle (horizontal): ± 90°, Maximum tilt angle (vertical): ± 84°

PSV-400 Software Features

2D Alignment	Simple and interactive procedure to align the coordinates of the video image to the coordinates of the scanners
Scan grid definition	Two alternatives: ▪ 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 ▪ Data import from CAD- and FEM-systems via Universal File Format (UFF) or ASCII or binary from ME'scope (optional)
Focus control	▪ Manual focussing and Autofocus ▪ Focus Scan and Focus Memory used to determine and save the optimum focus position of each respective scan point
Data acquisition	▪ Simultaneous data acquisition from up to 4 channels (vibrometer signal, 3 reference signals) ▪ Acquisition modes: FFT; zoom-FFT (optional available except for B); fast scan (optional for B); multi frame (optional, only for H); time mode (optional) ▪ Digital filtering and averaging available ▪ Trigger options: external, analog, pre and post trigger
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	▪ Velocity is measured; displacement (calculated by integration of velocity) and acceleration (calculated by differentiation) can also be displayed ▪ Data are saved in form of either spectra or time signal (optional for scan data) ▪ Calculation of transfer functions between primary and reference signals: FRF, H1, H2, Coherence, Autopower, Crosspower
Data presentation	Spectral presentation: ▪ Spectrum averaged over all scan points ▪ Spectra of individual points Display of video image overlaid with measured data and various presentation modes of deflection shapes: ▪ 2D: color map presentation of vibration data ▪ 3D: three-dimensional presentation of vibration data ▪ Isolines: equivalent values are interconnected by colored isolines ▪ Scan point: Each scan point is depicted as a square symbol colored according to the measured value Profile representation of section cuts across the test sample which are created interactively
Data export	▪ Windows® Automation Interface: Polytec FileAccess (enables data access utilizing Visual Basic® or C++) ▪ Export of geometry data, spectra, time signals and deflection shapes as ASCII files (Microsoft Excel compatible), UFF (both standard) or ME'scope format (optional) ▪ Export of animated 2D- and 3D-models and profiles as AVI-file
Signal generation	The internal signal generator is used to create specific excitation signals

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Polytec GmbH
Polytec-Platz 1-7
76337 Waldbronn
Germany
Tel. + 49 (0) 7243 604-0
Fax + 49 (0) 7243 69944
info@polytec.de

Polytec-PI, S.A.
32 rue Délizy
93694 Pantin
France
Tel. + 33 (0) 1 48 10 39 34
Fax + 33 (0) 1 48 10 09 66
info@polytec-pi.fr

**Lambda
Photometrics Ltd.**
Lambda House, Batford Mill
Harpenden, Herts AL5 5BZ
Great Britain
Tel. + 44 (0) 1582 764334
Fax + 44 (0) 1582 712084
info@lambdaphoto.co.uk

Polytec KK
Hakusan High Tech Park
1-18-2 Hakusan, Midori-ku
Yokohama-shi, 226-0006
Kanagawa-ken
Japan
Tel. +81 (45) 938-4960
Fax +81 (45) 938-4961
info@polytec.co.jp

Polytec, Inc.
North American Headquarters
1342 Bell Avenue, Suite 3-A
Tustin, CA 92780
USA
Tel. +1 714 850 1835
Fax +1 714 850 1831
info@polytec.com

Polytec, Inc.
East Coast Office
16 Albert Street
Auburn, MA 01501
USA
Tel. +1 508 832 0501
Fax +1 508 832 4667