Polytec

VibroScan QTec Xtra 3D //

Datasheet

Full-field vibration measurement

Polytec 3D Scanning Vibrometers are state-of-the-art for noise and vibration measurement in research and development. Using three independent scanning heads they deliver the full information on all vibrational directions. The VibroScan QTec Xtra 3D determines operational deflection shapes and Eigen-modes for NVH, acoustics, structural dynamics, ultrasonics, FEM validation and NDT, featuring frequency ranges up to 32 MHz.

Every VibroScan QTec Xtra 3D integrates perfectly into the CAE world providing interfaces to 3D geometries, modal analysis and automation. The patented QTec® multi-path interferometer technology boosts the signal quality of infrared laser vibrometers (SWIR) decisively. It provides highest optical sensitivity for high-fidelity measurements on all surfaces, which significantly reduces testing time – even on dark, biological, rotating or moving objects. This safe laser technology is perfect for challenging applications also on distant targets. QTec® makes vibration measurements faster, easier, and more reliable than ever – for the most robust, unambiguous results.

The VibroScan QTec Xtra 3D ensures maximum flexibility and portability with its laptop computer based data management system. An optional system cabinet provides an ergonomic workspace with an additional 25" monitor and offers storage space for the entire system components especially for lab use. The three scanning heads of the VibroScan QTec Xtra 3D constitute with additional notebooks for data acquisition three fully operational VibroScan QTec Xtra Scanning Vibrometers for 1D measurements.

Highlights //

- Non-contact and full-field with FEM-like spatial resolution
- Best SNR on engineered surfaces
- Up to 10x faster with QTec®
- Upgradeable up to 30 m/s vibration velocity and 32 MHz
- Machine vision tools for easy setup
- Advanced geometry handling
- AI powered grid generation
- Extended evaluation and scripting options
- Open API and drivers
- Scanner interface enabling tracking and CSLDV
- Modal analysis featuring MIMO excitation and 13 input channels

Technical data //

VibroScan QTec Xtra 3D – scope of supply	
Vibrometer system and data acquisition	• PSV-I-780 VibroScan QTec Xtra Scanning Vibrometer with high precision scanner, HD video camera, PSV-G-700 High Precision Geometry Scanner, digital broadband decoder, data acquisition and signal generator hardware • 2x PSV-I-780 VibroScan QTec Xtra Scanning Vibrometer, HD video camera, PSV-S-AFGeo Autofocus Geometry Scanner for basic geometry acquisition, digital broadband decoder, data acquisition and signal generator hardware • 3x power supply unit with 2 m cables to the scanning vibrometer • PSV-F-700 VibroScan Front-End • Cables
Computer VibroScan QTec Xtra 3D tested and shipped ready-to-go with a high-end laptop computer for best stability	• PSV-W-710 High Performance Laptop with 17.3" (44 cm) screen, 2 TB SSD, 32 GB RAM, wireless mouse, laptop backpack • Microsoft® Windows®11 operating system and PSV software preinstalled
For any other computer running the PSV Software the following minimum specifications need to be fullfilled:	• Operating System: Windows 10 64-bit 1809 or higher or Windows 11 64-bit • Interfaces: 1 free USB-C port 1 free USB-C port (for operation of RoboVib® Bench – if applicable) 1 free USB-A port • Display: full HD, 1920x1080 pixels • RAM: 16 GB • Harddisk: 4 GB free, SSD recommended • CPU: 4 cores/8 threads and at least 3 GHz (e.g. IntelTM Core i5 or similar processor) • Graphics: DirectX 11-compatible graphics card or integrated graphics processor • Software installation: Local administrator rights
Accessories	• PSV-A-CL-VID Set of Close-Up Lenses for Video Camera • 3x VIB-A-T02 Tripod with tip-tilt head and tripod bag • Transportation Cases for all system components and accessories • Manuals

QTec

PSV-I-780 VibroScan QTec Xtra Scanning Vibrometer	
Dimensions [W x L x H]	187 x 391 x 177 mm (7.3 x 15.4 x 7.0 in)
Weight	10.2 kg (22.7 lbs); 10.6 kg (23.1 lbs) with PSV-G-700 High Precision Geometry Scanner
Optical setup	QTec® heterodyne multi-path interferometer utilizing reception diversity. Protected by international patents
Laser type	• Measuring laser: wavelength 1,550 nm (SWIR: infrared, invisible), Laser power <10 mW • Pilot laser [1]: wavelength 520 nm (green), Laser power <1 mW, dimmable in 5 steps
Laser noise quality	Linewidth (Lorenzian) <100Hz
Laser wavelength	Stability +/- 50 pm
Laser-MTTF	> 100,000 h expected (SWIR laser)
Laser safety class	Class 2
Optical signal processing	Interferometer raw signal: 960 MSamples/s Signal processing: Dual high-speed FPGA design
Working distance	125 mm ... ~100 m
Scan angle [h x v]	50° x 40°
Scanner properties	Angular resolution <0.0008°, angular stability <0.001°/h, max. 50 scan points/s
Sample size	From a few mm^2 to several m^2
Camera	HD format, 120x zoom, 30x optical, max. field of view [h x v] 64° x 38°
Interfaces, electrical	**Output:** • 1 BNC connector for vibration signal, switchable between velocity, displacement and acceleration (±1 V @ 50 Ω; ±2 V @ 1MΩ), 16 bit, 960 MSamples/s • 1 BNC connector for signal generator, max. 32 MHz (±1 V @ 50 Ω; ±2 V @ 1MΩ), 16 bit, 960 MSamples/s • 1 BNC-connector for Sync (TTL) **Input:** • 2 BNC connectors für reference channels, max. 200 kHz (±1 V, ±10 V), IEPE, TEDS [2], 24 bit • BNC connector for trigger/gate/encoder/aux in **Others:** • Interface for external scanner control [3]: voltage input for x and y scanner angle control, voltage output of scanner angle feedback and analog signal level • VibroLink Ethernet data interface to computer (push-pull connector) • Clock interface, synchronization frequency 80 MHz (push-pull connector) • Power (push-pull connector)

[1] Accuracy of alignment between measuring laser and pilot laser typ. <0.03°

Table continued ->

[2] Transducer Electronic Datasheet IEEE 1451, tested with typical templates

[3] Option

Interfaces, mechanical	Hexagon type tripod adapter for VIB-A-T02, 2x M6 thread
Power supply	100 VAC...240 VAC ±10 %, 50/60 Hz; <70 W typical, max. 115 W using external scanner control
Protection class	IP10, IP40 (beam shutter closed or PSV-A-526 protective window mounted)

PSV-F-700 VibroScan Front-End	
Dimensions [W x L x H]	325 x 402 x 140 mm (12.8 x 15.8 x 5.5 in)
Weight	8.7 kg (19.2 lbs)
Interfaces, electrical 	**Front: Output:** • 1 BNC connector for signal generator, max. 32 MHz (±1 V @ 50 Ω; ±2 V @ 1MΩ), 16 bit • 1 BNC connector for signal generator, max. 32 MHz (±5 V @ 50 Ω; ±10 V @ 1MΩ), 16 bit • 1 BNC connector for Sync (TTL) **Input:** • 4 BNC connectors for reference channels, max. 200 kHz (±1 V, ±10 V), IEPE, TEDS [1], 24 bit • 3 BNC connectors for reference channels, max. 32 MHz (±1 V, ±2 V, ±5 V, ±10 V), 14 bit • 1 BNC connector for trigger/gate **Rear:** • VibroLink Ethernet data interface to computer • 3 VibroLink Ethernet data interfaces to scanning vibrometers • 3 clock interfaces to scanning vibrometers • Power
Power supply	100 VAC...240 VAC ±10 %, 50/60 Hz; max. 80 W
Protection Class	IP-20

[1] Transducer Electronic Datasheet IEEE 1451, tested with typical templates

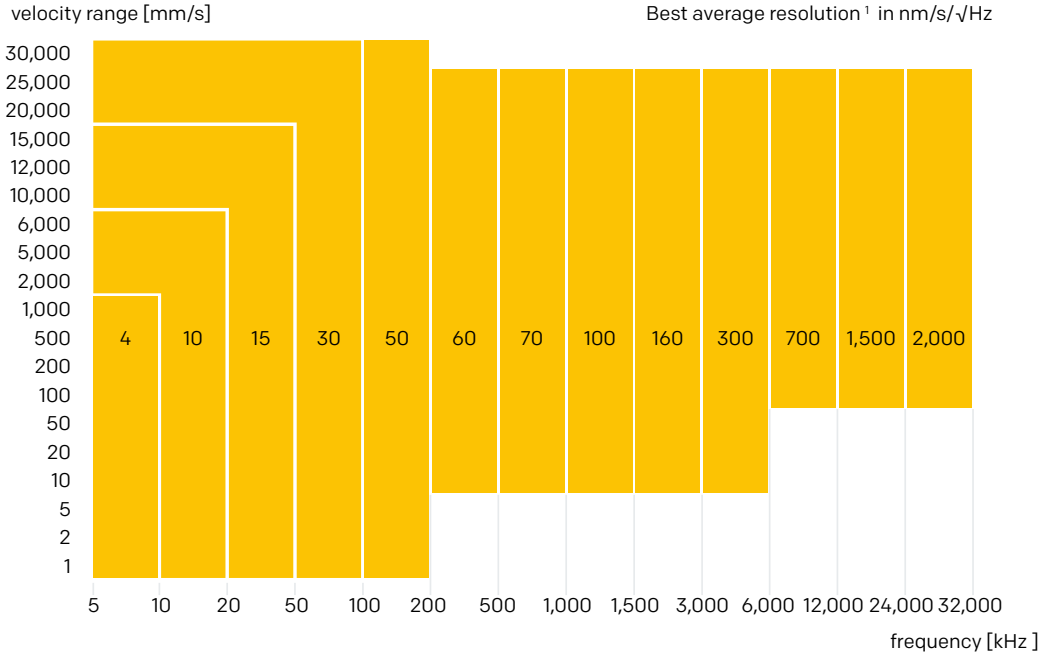
Metrological options //

Frequency bandwidth		
Choose between 4 different maximum frequency bandwidths from 200 kHz to 32 MHz		
PSV-L-BW200K	Frequency bandwidth 200 kHz	S
PSV-L-BW6M	Frequency bandwidth 6 MHz	O
PSV-L-BW12M	Frequency bandwidth 12 MHz	O
PSV-L-BW32M	Frequency bandwidth 32 MHz	O
Vibration velocity		
PSV-S-VELMAX15	Maximum velocity 15 m/s	S
PSV-S-VELMAX30	Maximum velocity 30 m/s	O

S = Standard; O = Option

Metrological specifications //

Specifications for velocity measurement



[1] The average noise-limited resolution is shown as the root mean square (rms) value of the noise in the respective frequency range, depending on the measurement range. Measurement conditions: spectral resolution of 1 Hz; distance 179 mm; focused measurement laser on 3M Scotchlite™ adhesive tape (retro-reflective film)

Specification for displacement measurement

Best resolution [1]	< 0 ,1 pm/√Hz

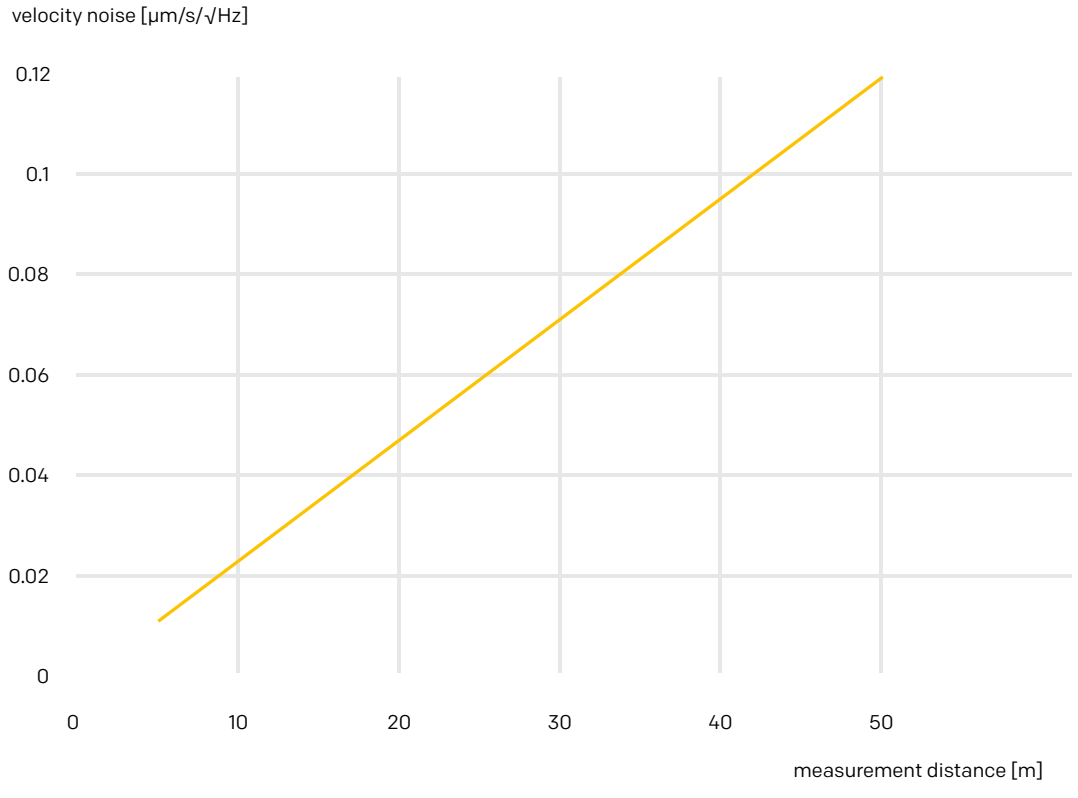
Specification for acceleration measurement

Max. range	10.000 km/s²

Noise performance on engineered surfaces

Optical Signal Robustness OSR [2]	> 10.000 mm/dropout

Noise density of the velocity signal over the measurement distance [1]



[1] Typical values at 2,500 Hz measured on 3M Scotchlite™ tape (retro-reflective film)

Hardware options and optional accessories //

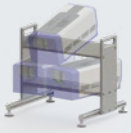
PSV-G-700 High Precision Geometry Scanner	Integrated high performance laser distance sensor to measure the sample geometry from the scanning vibrometer perspective. One PSV-I-780 VibroScan QTec Xtra Scanning Vibrometer equipped with PSV-G-700 High Precison Geometry Scanner is included in the standard scope of delivery. Optionally the second and third PSV-I-780 Scanning Vibrometer can also be equipped with a PSV-G-700 High Precision Geometry Scanner, having the functionality available when using those PSV-I-780 Scanning Vibrometers as stand alone 1D scanning vibrometers.	
PSV-A-526 Protective Window	Protects the scanning mechanism against dust, wind and acoustic excitation at high dB levels.	
PSV-A-EXT External Scanner Control	Allows for an additional control of the scanning mirrors by external voltage signals. Enables Continuous Scanning Vibrometry and tracking applications. Shipped with PSV-E-EXT Junction Box for accessing position feedback and optical signal strength.	
PSV-A-018 System Cabinet	Ergonomic mobile workstation with storage for all parts and accessories.	
A-AMP-0001 Amplifier for Signal Generator	Amplifies the max. 2 V output signal of the signal generator to max. 10 V. Bandwidth max. 32 MHz. USB-C power supply, 7.5 W.	
A-RMK-0004 Rack Mounting Kit	Rack installation kit with two front handles and mounting brackets for installing the PSV-F-700 VibroScan Front-End in a 19'' rack.	

Accessories for (brake) acoustics and modal analysis

PSV-A-T51 Motorized Tripod	Convenient motorized support for 3 scanning heads.	
PSV-A-430 Acoustic Gate Unit	Activates the measurement if noise exceeds a certain threshold or frequency.	
A-MIR-S001/ A-MIR-S002 Mirror Set	Mirror set for measurements in difficult-to-access areas. The mirror set comprises 4 (PSV-A-MIR-S002: 5) front coated mirrors including magnetic fixtures. Delivery in robust transportation case.	

Accessories for measurements on small parts

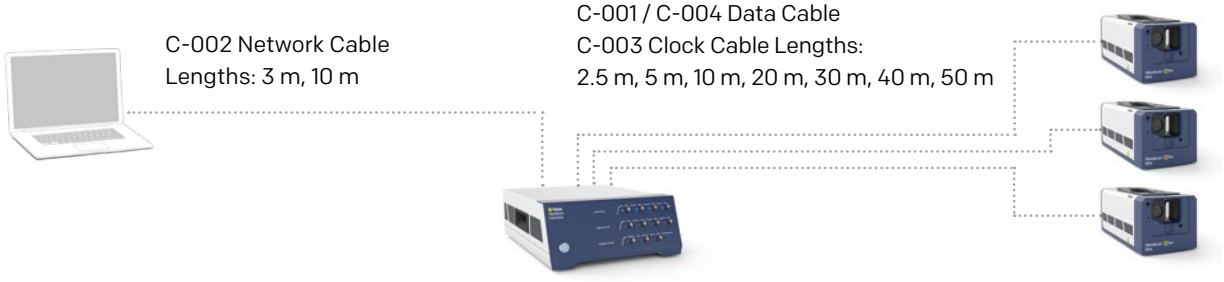
PSV-A-T34 **Table Tripod**	Rigid support of 3 scanning heads. Provides a configuration optimized for in-plane performance with small parts.
PSV-A-T35 **Table Tripod**	Rigid support of 3 scanning heads. Provides a narrow configuration optimized for out-of-plane performance with small parts.
PSV-A-655-S **Alignment Object (Set)**	Precision patterned and lightweight CFRP plate including adjustable stand for automatic 3D alignment.



Accessories for 1D measurements on small parts

PSV-A-710-Xtra **Close-up Unit**	For close-up measurements on small parts without parallax.
PSV-A-CL-Xtra-200 **Micro Scan Lens**	Special optics for laser spot minimization and parallel beam scanning for small shiny parts. Requires PSV-A-710-Xtra Close-up Unit.
PSV-A-RLight **LED Ring Light**	LED ring light for illumination of small test objects. Requires PSV-A-710-Xtra Close-up Unit and PSV-A-CL Xtra-200 Micro Scan Lens.
PSV-A-711 **Microscope Extension**	Attachment for vibration measurement on small objects. Compatible with 5x and 10x microscope objectives for fields of view of 2 mm and 0.9 mm diameter, respectively. Requires the PSV-A-710-Xtra Close-up Unit.

System architecture, cables



PSV-W-710 High Performance Laptop Computer or customer's

PSV-F-700 VibroScan Front-End

PSV-I-780 VibroScan QTec Xtra Scanning Vibrometer

General specifications	
Environmental conditions	Operating temperature: -10 °C ... +40 °C (14 °F ... 104 °F) with passive cooling, -10 °C ... +45 °C (14 °F ... 113 °F) with PSV-L-HighTemp option Storage temperature: -10 °C ... +65 °C (14 °F ... 149 °F) Relative humidity: max. 80 %, non-condensing
Calibration	Every 24 months (recommended)

Compliance with standards	
Electrical safety	IEC/EN 61010-1
Environmental conditions	IEC/EN 61326-1 Emission: FCC Class A, IEC/EN 61000-3-2 and 61000-3-3 Immunity: IEC/EN 61000-4-2 to 61000-4-6 and IEC/EN 61000-4-11
Laser safety	IEC/EN 60825-1
Shock reliablity	IEC/EN 60068-2-27 Conditions: Load direction: 6 directions; Peak acceleration: 100 m/s^2 Shock duration: 16 ms
Environmental management system	DIN EN ISO 14001:2015
Quality management system	DIN EN ISO 9001:2016

Software standard features //

Setup and data acquisition

Control

- Remote control via VibroLink Ethernet
- Laser: x-y position, auto focus, pilot laser brightness
- Video camera: zoom, focus, color
- Remote control of reference vibrometers (VibroFlex, VibroGo and OFV series)

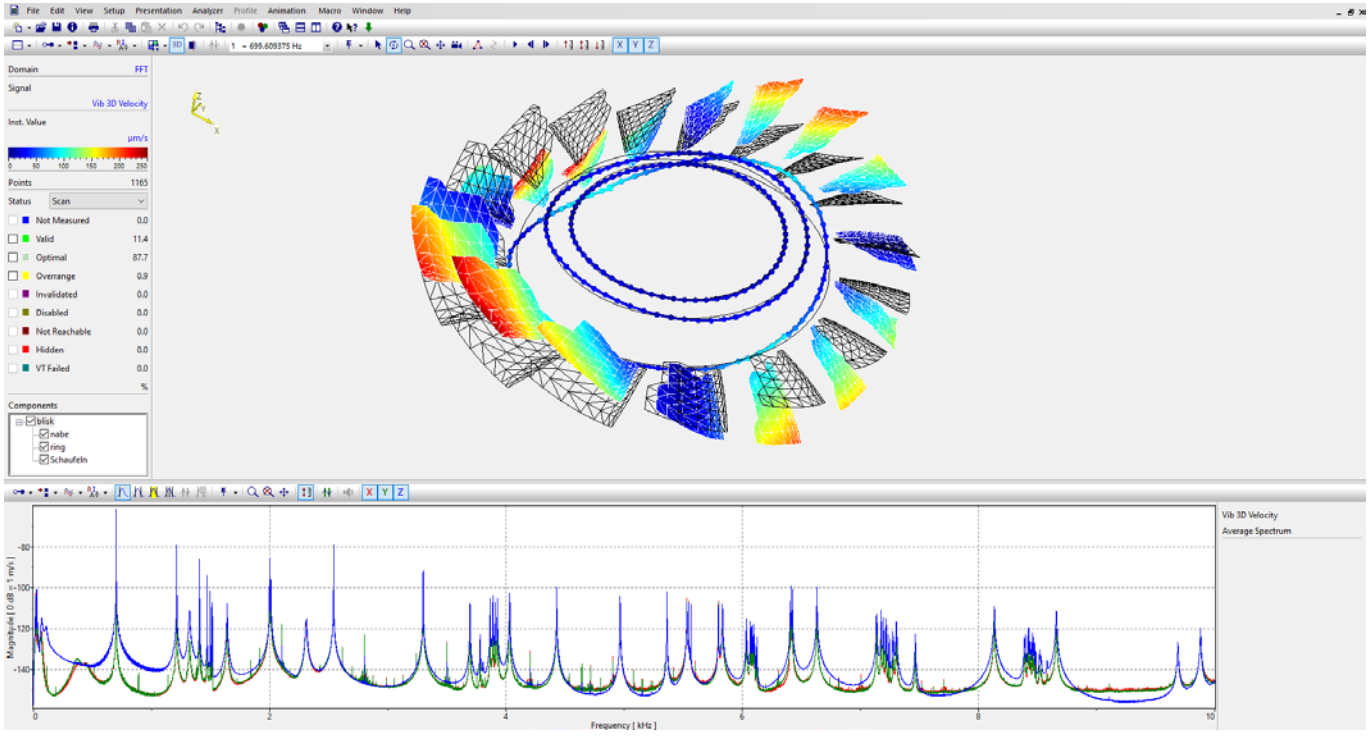
Measurement setup

- Real time HD video display during setup and scan
- Geometry scan
- Automatic and manual definition of scan point grids:
  - Standard mode: selection of various basic geometries for grid definition (polygon, circle, rectangle) with different grid types (polar, hexagonal, rectangular). Point density and rotation freely selectable. Subtraction of objects. Converting of objects to points for manipulation of individual points. Assignment of focus values to objects for signal optimization
  - Point mode: Creation and editing of individual scan points, grouping, assignment of focus values and meshing. Visual grid generation by defining scan points at the current laser position
  - AI supported automatic grid generation
  - Refining, Coarsening, Merging of points with close proximity
  - VideoTriangulation®: Image processing for precise superposition of measurement points in the video image and the laser on the sample

Data acquisition

- AC and DC coupling for reference channels
- Automatic phase compensation vibrometer vs. reference channels
- IEPE and TEDS support for reference channels (VibroLink mode only)
- Triggering on measurement signals or digital inputs
- Gate Input: Control of the scan process by an external TTL gate signal
- Encoder signals: Conversion to rotational speed
- Max. sample per point: 500 MSamples [1]
- Up to 208 million FFT lines
- Averaging: magnitude, complex, peak hold
- Digital filters: HP, LP, band pass, notch
- Windowing: Rectangle, Bartlett, Blackman-Harris, Exponential, Flat Top, Force, Hamming, Hanning, Tapered Hanning
- Real time integration and differentiation (s, v, a)
- Signal optimization: Signal Enhancement and Speckle Tracking

[1] On request


File Edit View Setup Presentation Analyzer Profile Animation Macro Window Help
Domain FFT
Signal
Vib 3D Velocity
Inst. Value
µm/s
Points 1165
Status Scan
Not Measured 0.0
Valid 11.4
Optimal 87.7
Overrange 0.9
Invalidated 0.0
Disabled 0.0
Not Reachable 0.0
Hidden 0.0
VT Failed 0.0
%
Components
blisk
nabe
ring
Schaufeln
Vib 3D Velocity
Average Spectrum
Frequency [kHz]

Data evaluation

Analysis (spectral)

- FFT and time data measured in parallel
- Cursor modes: delta, harmonic, max., band
- Curve fitting for damping estimation (-3dB, zeta, Q)
- Display of magnitude, phase, real- and imaginary part
- Calculation of FRF, H1, H2, AP, CP, ESD, PSD and coherence
- Peak-finder in frequency spectrum

Analysis (deflection shapes/ODS)

- Frequency or band selective 1D and 3D animation
- Free choice of clipping planes and profile cuts
- Display and animation in pseudo colors, video image "skin" or imported texture
- Show and hide components/groups of measurement points, editable point index

Analysis (time, rotational speed, order)

- Cursor modes: delta, harmonic, max., band
- Damping estimation with damped sine fit (-3dB, zeta)
- Campbell and waterfall diagram

Import and export filters

- Vibration data: Universal File Format (ASCII, Binary), ASCII, WAV
- Geometry: Universal File Format, STL, ASCII (CSV, import only)
- Graphics and animations (export only): GIF, JPG, BMP, TIFF, PNG, Animated GIF, MP4, WMV
- Import of external measurement data and mapping onto measurement points of the PSV scan point grid
- More filters optional

Automation and scripting

Programming and scripting interface Polytec File Access:
API for retrieval, programming and scripting via external applications supporting Microsoft's Component Object Model (COM), e.g. Visual Basic .NET®, C#, MATLAB®, LabVIEW™ and Python.

Software options //

Preparation		
PSV-S-GeoPro **Extended Geometry Processing**	Additional import filters für geomety data with texture (OBJ, PLY) and extended toolkit for editing of scan point grid (automatic refining and coarsening using a user defined target density).	O
Measurement		
PSV-S-FaScn **Fast Scan**	Fast scan routine for analyzing the response of structures at a single frequency.	S
PSV-S-TDD **Time Domain Animation**	Time domain data are acquired while scanning. Allows for "slow motion" animation e.g. of surface wave propagation or switching operations.	S
Analysis and data interface		
PSV-S-SigPro **SignalProcessor**	User interface to the math library of the PSV software, designed as an easy-to-use spreadsheet for applying mathematical operations to measurement data.	O
PSV-S-PCA **Principal Component Analysis**	Principal component analysis for MIMO measurements in experimental modal analysis.	O
PSV-S-ExpME **Data Export to ME'scope**	Data export to Vibrant's ME'scope modal analysis software.	O
PSV-S-ASAM ASAM ODS **Interface**	Import and export of data in ASAM ODS 5.3.0 ATFX standard.	O
PSV-S-Audio **Audio Output**	Makes vibration data audible. Allows listening to live and stored vibration signals.	O
Desktop Analysis **Version**	Desktop version of PSV software for offline post processing and presentation of measurement results.	O
PolyWave **Postprocessing Software**	Scalable post-processing software suite for comprehensive analysis of vibration test data. Comprises modules for experimental modal analysis, operational modal analysis and order analysis.	O
PSV-S-STRAIN-QTec **StrainProcessor**	Calculates dynamic strains and stresses from the in-plane component of the 3D measurement data, utilizing the high spatial resolution provided by VideoTriangulation®.	O

Automation and programming interface		
PSV-S-VBEng Macro Programming	WinWrap® Basic Engine: Visual Basic® for Applications (VBA) compatible. Allows automation of test routines. Comprises a large selection of sample macros for measurement setup, preparation, data acquisition and analysis for easy adaptation to your task.	S
Macro Object Tracking	Image processing based adjustment of the scan point grid with 6 degrees of freedom upon movement of the sample after grid definition.	S
Application specific macros	Polytec gladly supports you in the development of new macros tailored to your needs.	O

Maintenance package		
PSV-S-SM-B Software Maintenance Basic	Basic software maintenance. Free PSV software updates for a period of 1 year.	S
PSV-S-SM-1 Extended Software Maintenance	Entitles for software updates for an additional period. Available in 12 month increments. increments	O
PSV-S-UNI Software Options Package for Universities	Software options bundle including lifetime software maintenance for universities and education (terms and conditions apply).	O

S = Standard; O = Option

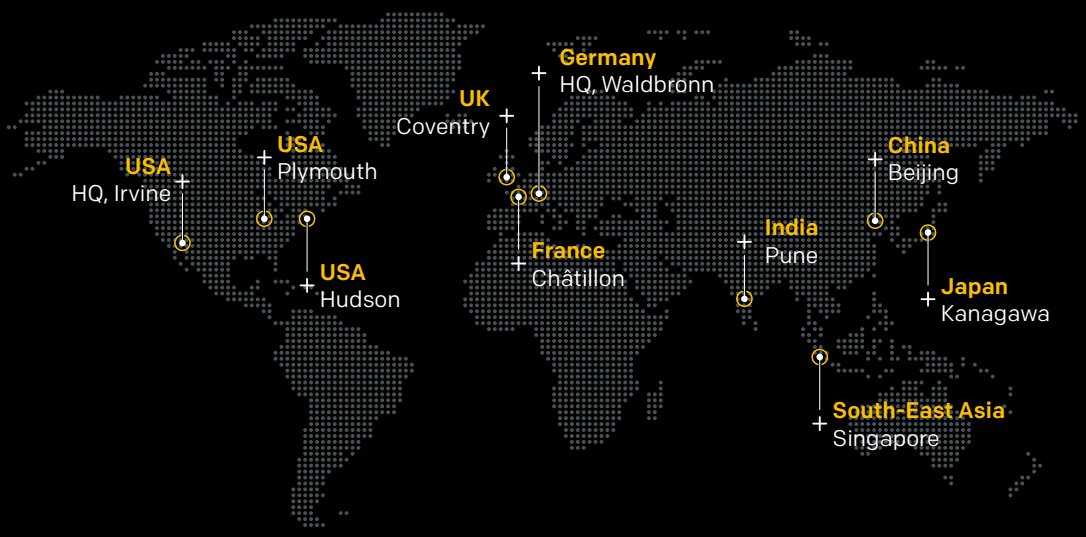
Polytec update //

Supplies your Polytec software with the latest updates

Polytec Update is a software tool that provides your Polytec products with the latest software releases and hotfixes. Polytec Update therefore always keeps you posted when there are updates for your Polytec measurement or desktop software – to ensure reliable measurement results and smooth working with Polytec products.

Online and offline operation

Polytec Update works best on a measuring computer with a direct connection to the Internet. But even on computers that don't have their own Internet access, Polytec Update helps you to update your Polytec software. All you need is a second computer with an Internet connection.



measure what matters. worldwide.

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www.polytec.com/contact

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