

CLV-2534 Compact Laser Vibrometer



Polytec Industrial Vibrometers

- OFV-2500 Series Vibrometer Controllers
- OFV Series Sensor Heads
- **CLV-2534 Compact Laser Vibrometer**
- IVS-200 Industrial Vibration Sensor
- IVS-300 Digital Industrial Vibration Sensor

The CLV-2534 Compact Laser Vibrometer is designed as a flexible and cost-effective instrument for non-contact, high-precision vibration measurement. A superior replacement for contact transducers, the CLV-2534 eliminates mass-loading while providing a micron-sized probe, simple operation, long stand-off distances and increased accuracy. The CLV-2534 has a wide range of options including an integrated video camera, an ultrasonic integrator and microscope objectives that enable many key applications including dynamic measurements on microstructures, on-line quality inspection and frequency response measurements on automotive and aerospace components.

Designed for both R&D and Manufacturing Applications

By integrating the laser into the controller and using a fiber-optic cable to provide laser power to the vibrometer head, Polytec engineers substantially improved placement, mounting and positioning options without sacrificing measurement precision. In addition to the laser, the controller incorporates the signal processing electronics, power supply and laser interferometer. Taken as a system, vibration velocity can be measured in a bandwidth of 3.2 MHz with a 10 m/s maximum velocity. If real-time displacement measurement is preferred, an optional integrator provides a direct readout.

Key Features and Benefits

- Non-contact laser measurement avoids traditional contact transducers drawbacks
- Direct velocity and optional displacement output
- Up to 3.2 MHz bandwidth, 10 m/s maximum velocity, excellent linearity
- Compact Vibrometer Head with ruggedized design (IP64) for manufacturing environments
- Low noise, high optical sensitivity allows a wide range of working distances
- Internal CCD video camera for visually monitoring the test structure (option)



The CLV-2534 Vibrometer Family

CLV-2534-2 Large Bandwidth Vibrometers

The CLV-2534-2 Vibrometer Controller incorporates a velocity demodulator with 3 ranges for velocities up to 10 m/s and frequencies up to 3.2 MHz. All range/filter setting changes are made via touch buttons on the front panel or via the built-in RS-232 interface. For applications requiring a displacement output such as ultrasonic wire bonding, an optional displacement output is achieved by analog integration of the velocity signal.

CLV-2534-3 High Precision Vibrometers

The CLV-2534-3 Vibrometer Controller features high-precision digital velocity demodulation in a frequency range up to 350 kHz. Excellent signal-to-noise, high resolution and linear response are the key benefits of digital demodulation. Five velocity ranges allow a flexible adaptation to the measurement task.

Compact Sensor Head

For commercial production testing, the IP64 rated Vibrometer Head provides protection from dust and moisture. Its compact size easily fits into test stands,

avoiding special handling systems. With variable stand-off distance and focus lock, the CLV-2534 is an excellent choice for 100 % quality testing of products for noise, structural and material properties.

The Vibrometer Head features a variable focus lens from 200 mm to infinity, a compact housing, and a three-meter fiber optic cable connection to the 19-inch rack compatible controller. Designed for manufacturing environments, the Vibrometer Head is IP64 protected, features a mechanical focus lock and an electronic remote controlled laser beam shutter. Derived from its compact size, the wide choice of mounting possibilities together with a visible, class II laser makes for simple integration in existing and future test facilities. By eliminating physical contact to the test structure, long term trouble-free operation and reproducible measurement results are

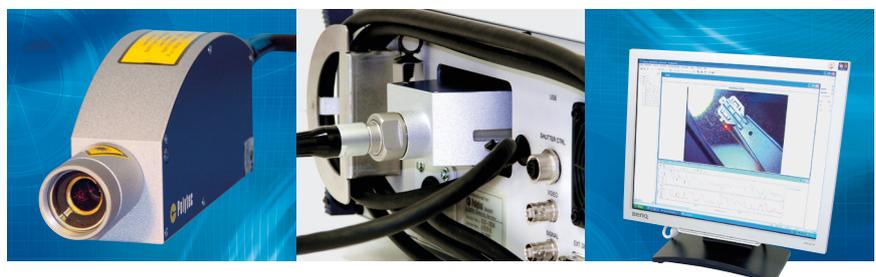
guaranteed. When the vibrometer is not operating, the sensor head can be stored away safely in the sensor tray at the back side of the controller housing.

Expand the Capabilities

Placing the laser probe at the correct measurement location is essential for accurate results. All CLV-2534 models can be equipped with an integrated video camera for a clear view of the test structure, the measurement point and the laser beam. A standard PAL or NTSC video signal is provided which can be displayed via a TV monitor (S-Video) or directly in the Polytec VibSoft data acquisition software.

Using Polytec's VibSoft data acquisition software, the engineer can display video images on an external video monitor, position the micron-sized laser probe, facilitate the measurement process on the test structure, and store a video snapshot with the measurement results. This feature provides traceable documentation of the measurement results and setup.

The measurement capabilities can be expanded with a range of microscope objectives and a super-bright, in-line, LED illumination unit. Together with the video camera option, the CLV-2534 turns into a single-point, microscope-based vibrometer for measurements on micro-structures featuring a laser probe diameter down to 1.5 μm. A larger field-of-view can be achieved with a dedicated telephoto lens instead of a standard objective. This lens provides crisp video images with a 15 μm laser probe and a field-of-view of 3.8 mm by 2.9 mm.



Benefits for Challenging Applications

Hard Disk Drive Testing

- Up to 3.2 MHz bandwidth (CLV-2534-2)
- High resolution of 0.02 $\mu\text{m/s}$ with digital decoding (CLV-2534-3)
- VIB-A-520 Telephoto lens for small laser spot diameter and large field-of-view
- VIB-A-T30 Basic test stand

QA and Production Testing

- Very compact sensor head with optional video camera
- IP64 industrial protection
- High optical sensitivity accommodates a variety of production environments
- Variable stand-off distance
- Fully remote controlled
- Electronic laser shutter
- Visible Class II laser for safe unrestricted operation

Wirebonding

- Very compact sensor head
- 7-range displacement integrator up to 250 kHz (option)

Printers, Inkjet, Ultrasonic Actuators, MEMS

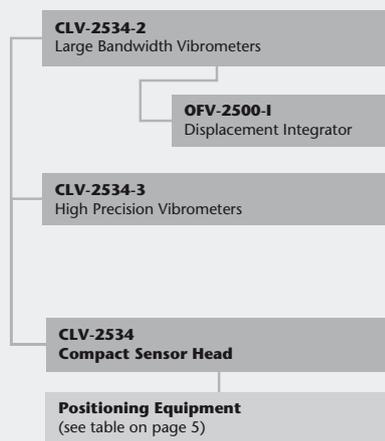
- Frequency up to 3.2 MHz
- 10 m/s maximum velocity
- Microscope objective for 1.5 μm spot diameter
- VIB-A-510 super-bright LED illumination unit

General R&D

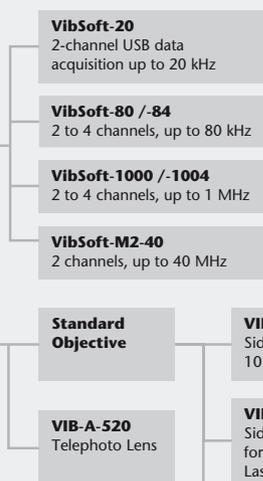
- High optical sensitivity
- Compact design
- Velocity 10 m/s, 3 ranges for optimal setting
- Store image of test object with measurement file in VibSoft data acquisition system
- Convenient: vibrometer head stores away in controller cabinet



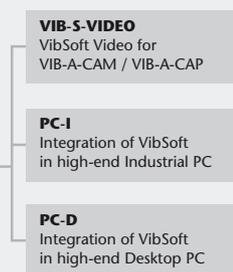
CLV-2534 Series Vibrometer Systems



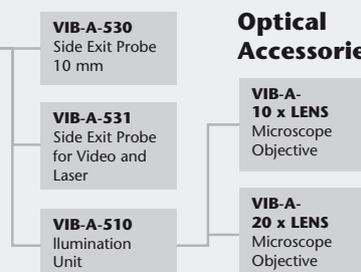
VibSoft Data Acquisition



VibSoft Options



Optical Accessories



Technical Data

Compact Sensor Head Specifications										
Laser type	Helium neon (HeNe)									
Laser protection class	Class 2, <1 mW									
Laser wavelength	633 nm, visible red laser beam									
Minimum stand-off distance	200 mm (without optical accessories)									
Minimum spot diameter	1.5 µm (with VIB-A-20xLENS 20X objective)									
Maxima of visibility	295 mm + n · 204 mm; n = 0; 1; 2; ...									
Video Camera (optional)										
Camera type	W" CCD Color Board Camera									
Active pixels (H x V)	510 x 492									
Lens	F 4.5									
Shutter speeds	Automatic from 1/60 to 1/100,000									
Video output	Composite (CVBS), 1 Vp-p @ 75 Ohm, BNC									
Characteristics										
Stand-off distance ¹⁾	[mm]	21.7	37.3	200	300	320	500	1000	2000	each m
Laser depth-of-field	[mm]	0.012	0.048	±2	±6	±0.08	±19	±81	±339	–
Spot diameter (1/e ²)	[µm]	1.5	3.0	25	40	15	70	148	302	add 150
Camera field of view	[mm x mm]	0.68 x 0.52	1.36 x 1.04	10 x 8	17 x 13	3.8 x 2.9	31 x 24	64 x 49	130 x 100	–

¹⁾ Measured from the front edge of the sensor head housing

²⁾ With VIB-A-20xLENS 20X objective

³⁾ With VIB-A-10xLENS 10X objective

⁴⁾ With VIB-A-520 telephoto lens

General Specifications		
Component	Vibrometer Controller	Compact Sensor Head
Dimensions (L x W x H)	450 mm x 355 mm x 150 mm (17.7 in x 14.0 in x 5.9 in)	201 mm x 38 mm x 71 mm (7.9 in x 1.5 in x 2.8 in)
Weight	11 kg (24.3 lbs)	0.8 kg (1.8 lbs)
Housing protection	I (protective grounding)	IP64 standard
Power	100 VAC ... 240 VAC ±10 %, 50/60 Hz, max. 75 W	
Ambient temperature	+5 °C ... +40 °C (41 °F ... 104 °F)	
Storage temperature	-10 °C ... +65 °C (14 °F ... 149 °F)	
Relative humidity	max. 80 %, non-condensing	
Optical cable length	3 m (Controller to Compact Sensor Head)	
Output voltage	±10 V	
Interfaces	RS-232, max. 115 kBd, serial interface for vibrometer control	
Filter	High pass filter: 100 Hz/off Low pass filter: 5 kHz/20 kHz/100 kHz/off Tracking filter: slow/fast/off (CLV-2534-2)	

Options and Accessories

VIB-A-520
Telephoto Lens



VIB-A-510
Illumination
Unit



VIB-A-10XLENS
Microscope Objective



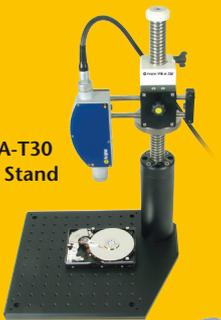
VIB-A-530
Beam Deflection Unit



VIB-A-531
Beam Deflection Unit



VIB-A-T30
Test Stand



VIB-A-T39
Flexible Arm



Measurement on Hard Disk Drive
with Sensor mounted on VIB-A-T04
Tripod and VIB-A-520 Telephoto Lens



Optical Accessories	
VIB-A-534-CAM	Video camera option providing a NTSC output signal
VIB-A-534-CAP	Video camera option providing a PAL output signal
VIB-A-10xLENS	10X Microscope objective providing a laser spot diameter of 3 μm at 37.3 mm stand-off distance
VIB-A-20xLENS	20X Microscope objective providing a laser spot diameter of 1.5 μm at 21.7 mm stand-off distance
VIB-A-510 Illumination Unit	LED light source providing a coaxial illumination of the test object. The illumination unit is highly recommended in conjunction with the microscope objectives.
VIB-A-520 Telephoto Lens	Telephoto lens for applications requiring measurements of small objects over longer distances. Fixed working distance of 320 mm; field of view 3.8 by 2.9 mm, laser spot diameter 15 μm .
VIB-A-530 90° Beam Deflection Unit	Attached to the CLV-2534 standard objective, this unit provides a 90 degree deflection of the laser beam. Probe tip diameter is 15 mm.
VIB-A-531 90° Beam/Video Deflection Unit	Attached to the CLV-2534 standard objective this unit provides a 90 degree deflection of the laser beam and of the video image.

Positioning Equipment	
VIB-A-P01	Tilt stage
VIB-A-P02	Traverse/tilt stage
VIB-A-P06	Traverse (X, Y) tilt stage
VIB-A-P07	Tilt and rotation mounting plate
VIB-A-T04	Tripod with standard pan-tilt head
VIB-A-T05	Tripod with geared pan-tilt head
VIB-A-T30	Basic test stand for vibration analysis of small and medium sized components like hard disk drives
VIB-A-T39	Flexible arm with magnetic base
VIB-A-600	Polytec ODS Extension

For detailed information please download our data sheet "Positioning Equipment" from www.polytec.com/vibrometers

Dedicated Data Acquisition Packages for CLV-2534				
VibSoft Version	Channels	Bandwidth	Int. Generator	ICP®
VibSoft-20	2	20 kHz	optional	yes
VibSoft-80	2	80 kHz	optional	yes
VibSoft-84	4	80 kHz	optional	yes
VibSoft-1000	2	1 MHz	optional	no
VibSoft-1004	4	1 MHz	optional	no
VibSoft-M2-40	2	40 MHz	optional	no

All packages include Visual Basic® compatible scripting engine and UFF+ASCII data export, as well as PolyFile-Access for 3rd party software data access. ME'scope binary export available as option. In conjunction with the optional video camera the VIB-S-Video software option is highly recommended. The video image is displayed and saved together with the measurement data.

ICP® is a registered trademark of PCB Group, Inc. which uniquely identifies PCB sensors incorporating built-in electronics.

Technical Data

CLV-2534-2 Performance Specifications						
Velocity Decoder						
Range	Full scale (peak)	Lower frequency limit	Upper frequency limit	Resolution (typical) ¹⁾	Acceleration	Linearity error
mm s ⁻¹ /V	m/s	Hz	kHz	μm s ⁻¹ /√Hz	g	± %
10	0.1	0.5	250	0.2	16,000	1
100	1.0	0.5	3,000	0.5	1,900,000	1
1,000	10 (7.5) ²⁾	0.5	3,200	2.5	15,300,000	1
Displacement Decoder (Integrator Option)						
μm/V	μm	Hz	kHz	nm ³⁾	g	± %
0.01 ⁴⁾	0.1	1,000	250	depends on velocity range setting; best value 0.3 nm (rms) @ 0.01 μm/V in the 10 mm s ⁻¹ /V range	depends on velocity range setting	2.5
0.1 ^{4) 5)}	1	1,000	250			2.5
1 ^{4) 5) 6)}	10	1,000	250			2.5
10 ^{4) 5) 6)}	100	100	250			2.5
100 ^{4) 5) 6)}	1,000	10	20			2.5
1,000 ^{5) 6)}	10,000	10	20			2.5
10,000 ⁶⁾	100,000	10	20			2.5

CLV-2534-3 Performance Specifications						
Velocity Decoder						
Range	Full scale (peak)	Lower frequency limit	Upper frequency limit	Resolution (typical) ¹⁾	Max. acceleration	Linearity error
mm s ⁻¹ /V	mm/s	Hz	kHz	μm s ⁻¹ /√Hz	g	± %
2	20.0	0	100	0.02	1,280	<0.1
5	50.0	0	100	0.02	3,200	<0.1
10	100	0	350	0.05	22,000	<0.1
20	200	0	350	0.06	44,000	<0.1
50	500	0	350	0.06	110,000	<0.1

- ¹⁾ The noise-limited resolution is defined as the signal amplitude (rms) at which the signal-to-noise ratio is 0 dB with 1 Hz spectral resolution, measured on 3M Scotchlite Tape® (reflective film). The typical value refers to the center of the operating frequency range.
- ²⁾ 10 m/s @ 300 kHz; 7.5 m/s @ 3,200 kHz
- ³⁾ Limited by broadband noise. Measured in vibration-isolated environment on 3M Scotchlite Tape® (reflective film). High pass and tracking filter are switched on as long as this does not restrict the system operation in any way. The noise voltage is measured with the aid of a broadband rms voltmeter.
- ⁴⁾ Available in the 10 mm s⁻¹/V velocity measurement range
- ⁵⁾ Available in the 100 mm s⁻¹/V velocity measurement range
- ⁶⁾ Available in the 1,000 mm s⁻¹/V velocity measurement range

Compliance with Standards	
Laser safety	IEC/EN 60825-1 (CFR 1040.10, CFR 1040.11)
Electrical safety	IEC/EN 61010-1
EMC	IEC/EN 61326



For more information, please visit our website www.polytec.com/vibrometers or contact your local Polytec sales/application engineer.

Polytec GmbH (Germany)

Polytec-Platz 1-7
76337 Waldbronn
Tel. +49 7243 604-0
info@polytec.de

Polytec France S.A.S.

Bâtiment Orion – 1^{er} étage
39, rue Louveau
92320 Châtillon
Tel. +33 1 496569-00
info@polytec.fr

Polytec Ltd. (Great Britain)

Lambda House, Batford Mill
Harpenden, Herts AL5 5BZ
Tel. +44 1582 711670
info@polytec-ltd.co.uk

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, 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
25 South Street, Suite A
Hopkinton, MA 01748
Tel. +1 508 417-1040

Polytec South-East Asia Pte Ltd
Blk 4010 Ang Mo Kio Ave 10
#06-06 TechPlace 1
Singapore 569626
Tel. +65 6451 0886
info@polytec-sea.com

www.polytec.com