The OFV-5000 Xtra Vibrometer Controller in combination with the new MLV-I-120 Sensor Head is designed to flexibly measure vibrational velocity, displacement and acceleration. The Xtra optical sensitivity gathers high-fidelity data from all surfaces – even on dark, biological, rotating or moving sample objects.

This non-contact approach solves challenging applications like NDT, biomedical, "long distance" displacement measurements, quasi-static displacement measurement and shaker control.

An alternative exchangeable fiber lens as an add-on to the MLV-I-120 head enables a dual purpose use for small objects and facilitates overhead measurements. The compactness of this robust sensor with different lens options leads to a versatile use and an easy integration into test setups.

Highlights

- Non-contact vibration sensor with Xtra sensitivity
- High-fidelity data from all surfaces – even on dark, biological or moving objects
- From µm-sized to large, distant objects
- High dynamic range with wide bandwidth up to 24 MHz
- Remote operation keeps laser precisely focused

OFV-5000 Xtra Laser Vibrometer

Xtra sensitivity and versatility

Datasheet

Technical data

Models

Version	Max. frequency	Max. velocity	Best velocity resolution[1]	Max. displacement	Best displacement resolution[1]	Acceleration output	Decoders
M	2.5 MHz	25 m/s	0.04 µm s^{-1}/√Hz	–	–	O	VX-09
R	2.5 MHz	25 m/s	0.004 µm s^{-1}/√Hz	–	–	O	VX-09, VX-08
V	24 MHz	25 m/s	0.04 µm s^{-1}/√Hz	±188 nm	0.2 pm/√Hz	–	VX-09, DX-300
MD	2.5 MHz	25 m/s	0.04 µm s^{-1}/√Hz	±125 mm	0.75 pm/√Hz	O	VX-09, DX-900
RD	2.5 MHz	25 m/s	0.004 µm s^{-1}/√Hz	±125 mm	0.75 pm/√Hz	O	VX-09, VX-08, DX-900
VD	24 MHz	25 m/s	0.04 µm s^{-1}/√Hz	±125 mm	0.2 pm/√Hz	–	VX-09, DX-900, DX-300

O: Option;
–: Not available

[1] Best value of the typical resolution of the included decoders

Metrological specifications

Analog signal outputs	BNC, ±10 V[2]: Velocity signal Displacement signal AUX output[3]
Digital signal output	S/PDIF, 24 bit, 48/96 kSa/s (available on request, only for VX-08 decoder)
Frequency range[4]	DC to 24 MHz
Max. velocity[4]	±25 m/s
Filters	High pass filter: 100 Hz, off Low pass filter: 5 kHz, 20 kHz, 100 kHz, off
Tracking filter[2]	3 settings: slow, fast, off
Signal level	Bargraph on touchscreen and on sensor head Output as DC voltage signal (BNC, 0 ... 5 V)
PC interface	RS-232, remote control of the instrument settings

[2] Depends on decoder configuration.
[3] Displacement or acceleration signal, depends on decoder configuration (see table "Models").
[4] Notice: frequency range, max. velocity and measurement range depend on decoder configuration (see below).

Velocity decoders

Decoder	Description	No. of ranges	Typical resolution[5, 6]	Max. velocity	Frequency range
VX-08	Digital high-resolution velocity decoder	8	0.004 µm s^{-1}/√Hz	1.25 m/s	0 Hz - 25 kHz
VX-09	Digital velocity decoder	14	0.04 µm s^{-1}/√Hz	25 m/s	0 Hz - 2.5 MHz

Displacement decoders

Decoder	Description	No. of ranges	Resolution[5]	Max. displacement	Frequency range
DX-300	Analog displacement decoder for ultrasonic applications	1	0.2 pm/√Hz	±188 nm	30 kHz - 24 MHz
DX-900	Broadband digital displacement decoder	16	0.75 pm/√Hz	±125 mm	0 Hz - 2.5 MHz

[5] Noise-limited resolution in the smallest measurement range. 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 a mirror.

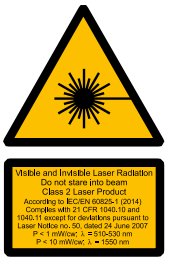
Acceleration decoder

Decoder	No. of ranges	Max. acceleration	Frequency range
AX-100	8	250,000 m/s^2	0.5 Hz - 20 kHz

[6] The attainable resolution is frequency-dependent. The typical value refers to the center of the operating frequency range.

General specifications		
	OFV-5000 Xtra Controller	**MLV-I-120 Sensor Head Xtra**
Interface/display	7" color touchscreen with interactive menu guidance	
Dimensions	19" rack mounting, W x D x H: 450 x 360 x 150 mm (19", 84 HP/3U) without angle brackets	W x H x L: 135 x 100 x 383 mm
Weight	10 kg	4.55 kg
Protection class	IP20	IP40
Operating 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	
Power supply	100...240 VAC ±10%, 50/60 Hz	
Power consumption	max. 100 VA	

Optical specifications: MLV-I-120 Sensor Head Xtra	
Laser type	Measurement laser: invisible (IR), wavelength 1550 nm, output power <10 mW Targeting laser: visible (green), wavelength 510 - 530 nm, effective output power < 1 mW
Laser class	Class 2, eye-safe, with both lasers in operation
Focus	Auto focus, remote focus, manual focus
Maximum stand-off distance	Up to 100 m (with MLV-O-LRI long range front lens, surface dependent)



Working distance and laser spot size				
	Front lenses		**Fiber heads for MLV-O-FMI-02**	
	MLV-O-SRI short range	**MLV-O-LRI long range**	**MLV-O-100[1] Mini Fiber Head**	**MLV-O-110[2] Micro Spot Fiber Head**
Focal length [mm]	29	70	16	35
Min. stand-off distance [mm]	25	380	60	56±2
Exit beam diameter (1/e²) [mm]	2...4.5	11...12.4	3.3...4.3	14
Typical spot size in µm at				
25 mm	48	–	–	–
50 mm	77	–	–	–
56 mm	81	–		8
60 mm	84	–	28	–
75 mm	91	–	37	–
100 mm	97	–	53	–
300 mm	150	–	180	–
380 mm	184	60	224	–
500 mm	236	81	295	–
1,000 mm	448	171	608	–
2,000 mm	906	349	–	–
5,000 mm distance	2,766	898	–	–
Each additional meter add [µm]	–	+183	–	–

[1] Included with MLV-O-FMI-02 Fiber Lens (IR).
[2] Optional available for MLV-O-FMI-02 Fiber Lens (IR).

Options and accessories

Tripods		
VIB-A-T02 Standard Tripod	Easy targeting on the object under test	
VIB-A-T05 Tripod with Geared Pan/Tilt Head	For precise pointing of the sensor head. The geared pan/tilt head allows quick coarse adjustment and fine adjustment in 3 axes	

Optical accessories		
MLV-O-SRI SR Front Lens (IR)	Short Range front lens for measuring at short working distances (highest depth of focus)	
MLV-O-LRI LR Front Lens (IR)	Long Range front lens for measuring at long working distances	
MLV-O-FMI-02 Fiber Lens (IR) 2m	Flexible measurements with 2 m fiber cable on small objects or where space is restricted. Includes MLV-O-100 Mini Fiber Head and VIB-A-CAS08 Transportation Case	
MLV-O-100 Mini Fiber Head	Small fiber head (10 mm diameter) with a laser spot size down to 28 µm for MLV-O-FMI-02 Fiber Lens (IR) 2 m	
MLV-O-110 Micro Spot Fiber Head	Small fiber head (24 mm diameter) with a laser spot size of 8 µm for MLV-O-FMI-02 Fiber Lens (IR) 2 m	

Positioning stages		
VIB-A-P35 Precision 4-Axes Stage	XY-traverse stage featuring 18 mm travel with +/- 5° tip/tilt function for positioning a single 10 mm outer diameter Mini Fiber Head.	
OFV-036 Tip/Tilt Precision Stage	For positioning a single 10 mm outer diameter Mini Fiber Head. Travel range ±5°.	

Transportation cases		
VIB-A-CAS07 Transportation Case for MLV-I-120 Sensor Head Xtra	Robust transportation case for the sensor head (included with sensor head)	
VIB-A-CAS02 Transportation Case OFV-5xxx	Robust transportation case for the OFV-5000 Xtra Controller	

Please contact Polytec's application and sales engineers who will help to choose the appropriate accessories like VibSoft data acquisition and analysis software.

Velocity decoders

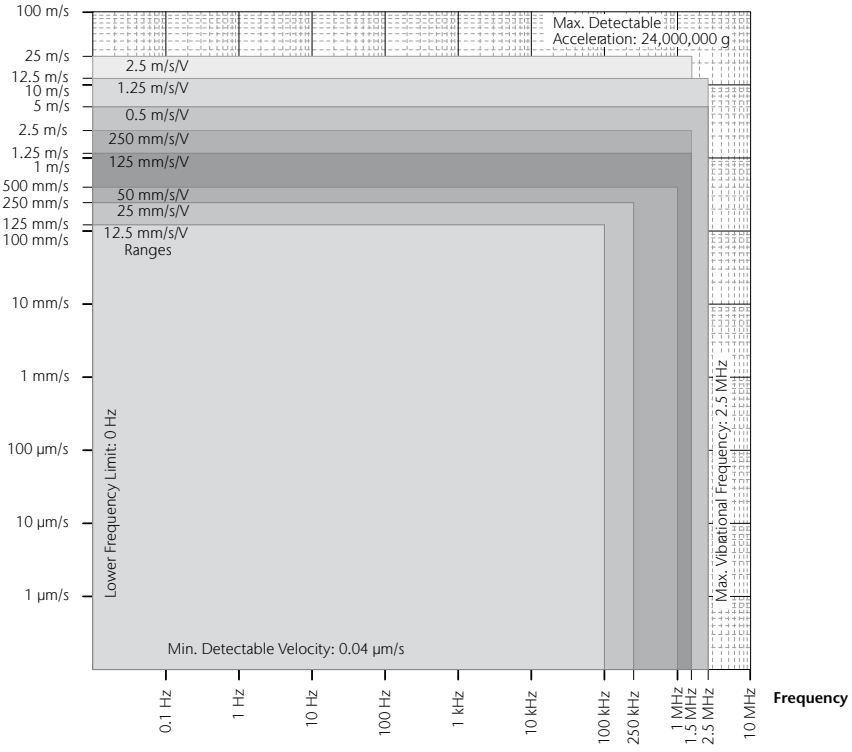
VX-09 digital velocity decoder

Measurement range[1]	Full scale output (peak)[2]	Typical resolution[3]	Frequency range	Max. acceleration	Max. linearity error
mm/s/V	m/s	µm s^{-1}/√Hz	MHz	g	%
12.5	0.125	0.04	0 - 0.1	8,000	0.5
25	0.25	0.1	0 - 0.25	40,000	0.5
50	0.5	0.35	0 - 1	320,000	0.5
125	1.25	0.55	0 - 1.5	1,200,000	0.5
250	2.5	0.55	0 - 1.5	2,400,000	0.5
500	5	1.1	0 - 2.5	8,000,000	0.5
1,250	12.5	1.4	0 - 2.5	20,000,000	0.5
2,500	25	2	0 - 1.5	24,000,000	0.5

[1] Measurement ranges 50 ... 2,500 mm/s/V each feature an additional low pass range with 250 kHz frequency range, higher resolution but reduced max. acceleration.
[2] The full scale values correspond to the maximum output voltage of 10 V_{peak}.
[3] 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, for frequencies above 1 kHz measured on a mirror. The attainable resolution is frequency-dependent. The typical value refers to the center of the operating frequency range.

- Multi-purpose high frequency bandwidth digital decoder with high precision and high resolution
- True DC capability
- Well balanced properties regarding bandwidth, resolution and velocity limits make it the decoder of choice for most measurement applications
- Universal decoder, included in all models

Range diagram

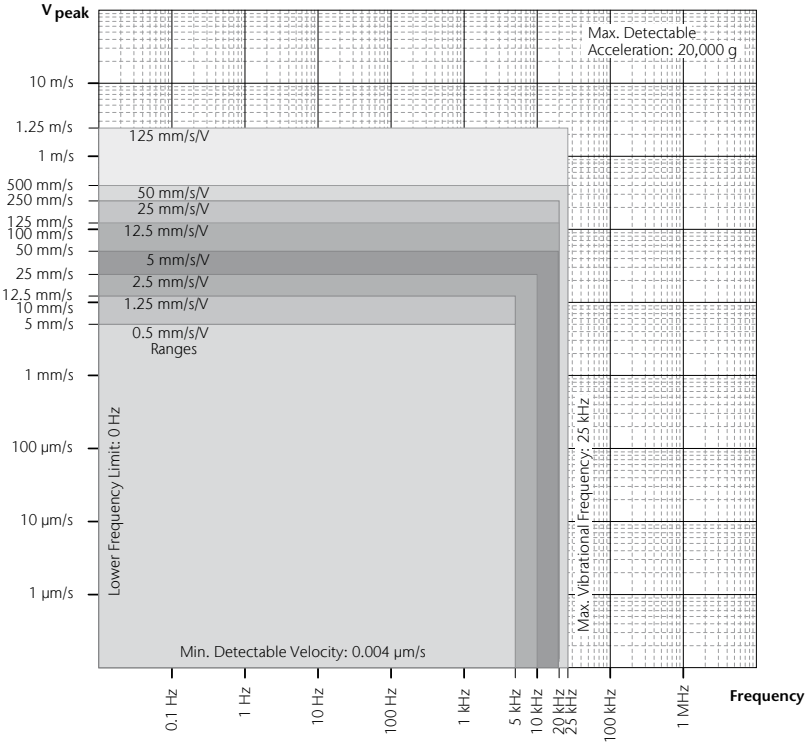


VX-08 digital high-resolution velocity decoder

Measurement range	Full scale output (peak)[1]	Typical resolution[2]	Frequency range	Max. acceleration	Max. linearity error
mm/s/V	m/s	µm s^{-1}/√Hz	kHz	g	%
0.5	0.005	0.004	0 - 5	16	0.1
1.25	0.0125	0.004	0 - 5	40	0.1
2.5	0.025	0.004	0 - 10	160	0.1
5	0.05	0.01	0 - 20	640	0.1
12.5	0.125	0.015	0 - 20	1,600	0.1
25	0.25	0.03	0 - 20	3,200	0.1
50	0.5	0.06	0 - 25	8,000	0.1
125	1.25	0.15	0 - 25	20,000	0.1

[1] The full scale values correspond to the maximum output voltage of 10 V_{peak}.
[2] 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, for frequencies above 1 kHz measured on a mirror. The attainable resolution is frequency-dependent. The typical value refers to the center of the operating frequency range.

Range diagram



- Digital velocity decoder dedicated to low frequencies up to 25 kHz with highest resolution
- Highest optical sensitivity for measurement on dark surfaces
- True DC capability
- Outstanding linearity and frequency response
- Included in models R and RD

Displacement decoders

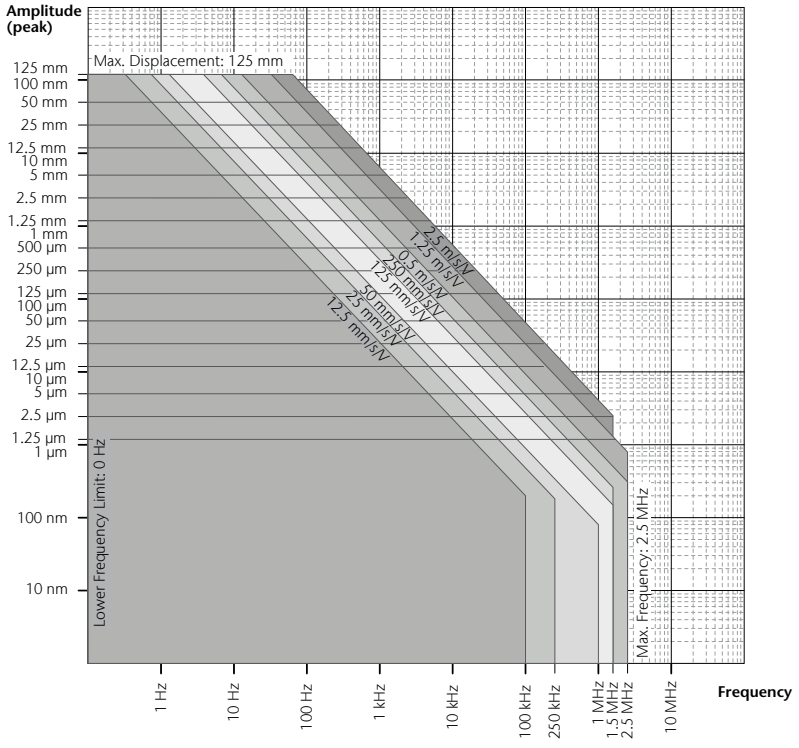
DX-900 broadband digital displacement decoder

Measurement range	Full scale output (peak-to-peak)[1]	Resolution[2]	Frequency range[3]	Max. velocity
µm/V	µm	nm	kHz	m/s
0.125	2.5	0.04	0 - 2,500	25
0.25	5	0.08	0 - 2,500	25
0.5	10	0.15	0 - 2,500	25
1.25	25	0.38	0 - 2,500	25
2.5	50	0.75	0 - 2,500	25
5	100	1.5	0 - 2,500	25
12.5	250	3.8	0 - 2,500	25
25	500	7.5	0 - 2,500	25
50	1,000	15	0 - 2,500	25
125	2,500	38	0 - 2,500	25
250	5,000	75	0 - 2,500	25
500	10,000	150	0 - 2,500	25
1,250	25,000	380	0 - 2,500	25
2,500	50,000	750	0 - 2,500	25
5,000	100,000	1500	0 - 2,500	25
12,500	250,000	3800	0 - 2,500	25

[1] The full scale values correspond to ±10 V (peak-to-peak) maximum output voltage.
[2] The resolution corresponds to the quantization step of approx. 0.3 mV at the analog output.
Noise-limited resolution: < 0.75 pm/√Hz in the smallest measurement range. 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, for frequenciey above 1 kHz measured on a mirror.
[3] When a suitable measurement range has been selected for the digital velocity decoder VX-09, which is required for using the DX-900.

- Broadband displacement decoder up to 2.5 MHz
- Supplements VX-09 velocity decoder for high precision displacement measurements with resolutions down to 40 pm
- 16 measurement ranges
- Included in models MD, RD and VD

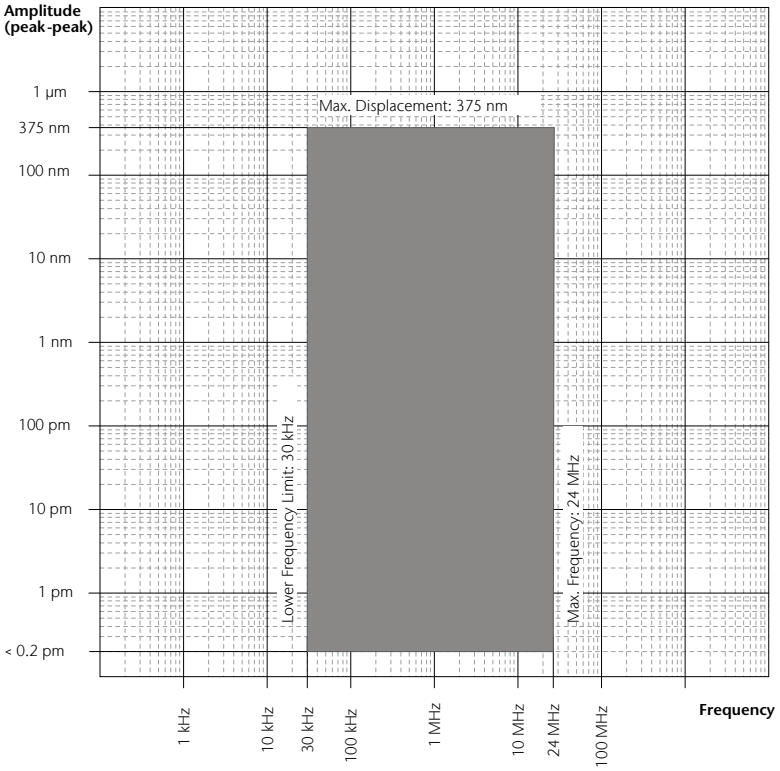
Range diagram



DX-300 analog displacement decoder for ultrasonic applications			
Measurement range	**Full scale output (peak)[1]**	**Resolution[2]**	**Frequency range**
nm/V	**nm**	**pm/√Hz**	**kHz**
125	±188	< 0.2	30 - 24,000 (–3dB)

[1] The full scale value corresponds to the output voltage swing of ±1.5 V at load resistance 50 Ω.
[2] 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 for frequencies above 30 kHz measured on a mirror.

Range diagram



- Displacement decoder for measuring smallest motions up to ± 188 nm with a large frequency bandwidth from 30 kHz up to 24 MHz
- For measurements on ultrasonic transducers, detection of ultrasonic pulses and to observe fast transient motions of MEMS devices
- Special high-pass filter suppresses low frequency (acoustic) vibrations and allows the detection of smallest high-frequency vibrations even under noisy ambient conditions
- Additional 2 MHz low-pass filter improves resolution performance in lower frequency range
- Included in models V and VD

Acceleration decoder

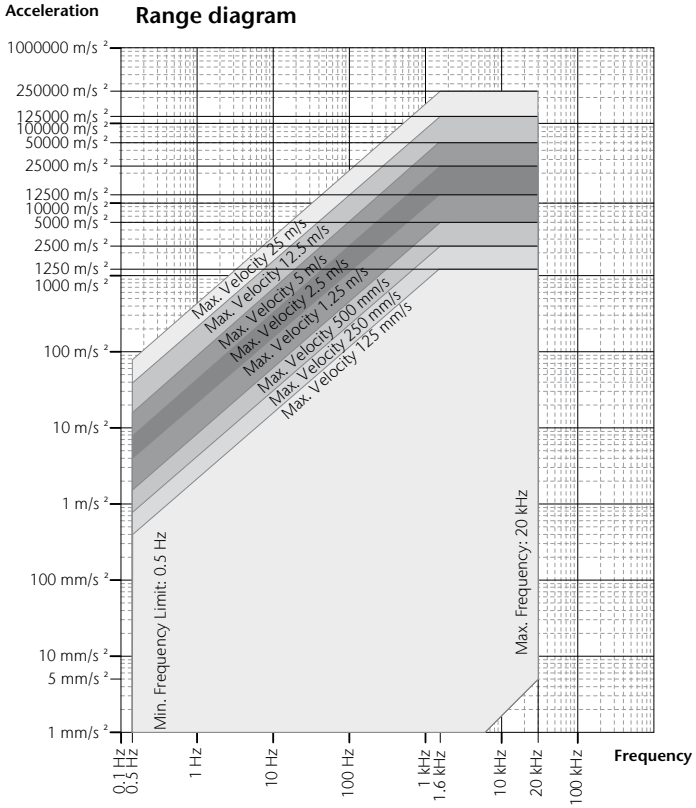
AX-100 acceleration decoder

Measurement range velocity	Measurement range accelaration	Full scale accelaration output (peak) [1]	Signal frequency range [2] (switchable)
mm/s/V	m/s²/V	m/s²	Hz
12.5	125	1,250	0.5 ... 5,000 / 20,000
25	250	2,500	0.5 ... 5,000 / 20,000
50	500	5,000	0.5 ... 5,000 / 20,000
125	1,250	12,500	0.5 ... 5,000 / 20,000
250	2,500	25,000	0.5 ... 5,000 / 20,000
500	5,000	50,000	0.5 ... 5,000 / 20,000
1,250	12,500	125,000	0.5 ... 5,000 / 20,000
2,500	25,000	250,000	0.5 ... 5,000 / 20,000

[1] The full scale values correspond to the maximum output voltage of 10 V_{peak}.
[2] Value is valid, as long as the corresponding velocity measurement range is not saturated.

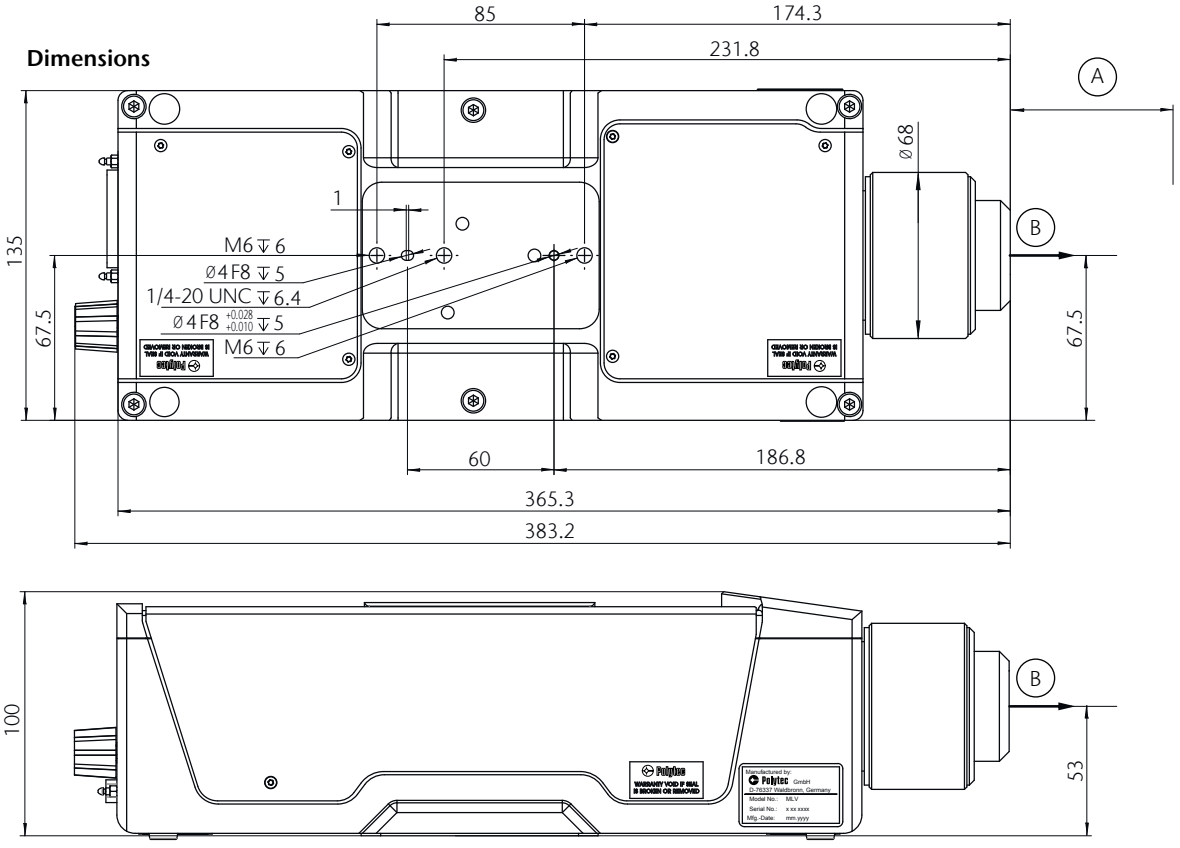
- 0.5Hz – 20kHz bandwidth
- 250,000 m/s² maximum acceleration
- 8 measurement ranges (coupled to VX-09 velocity decoder ranges)
- Available as an option in models M, MD, R and RD

Range diagram



Compliance with standards		
Laser safety	IEC 60825-1	
Electrical safety	IEC 61010-1	
EMC	IEC 61326-1	
	Emission:	Limit class B 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

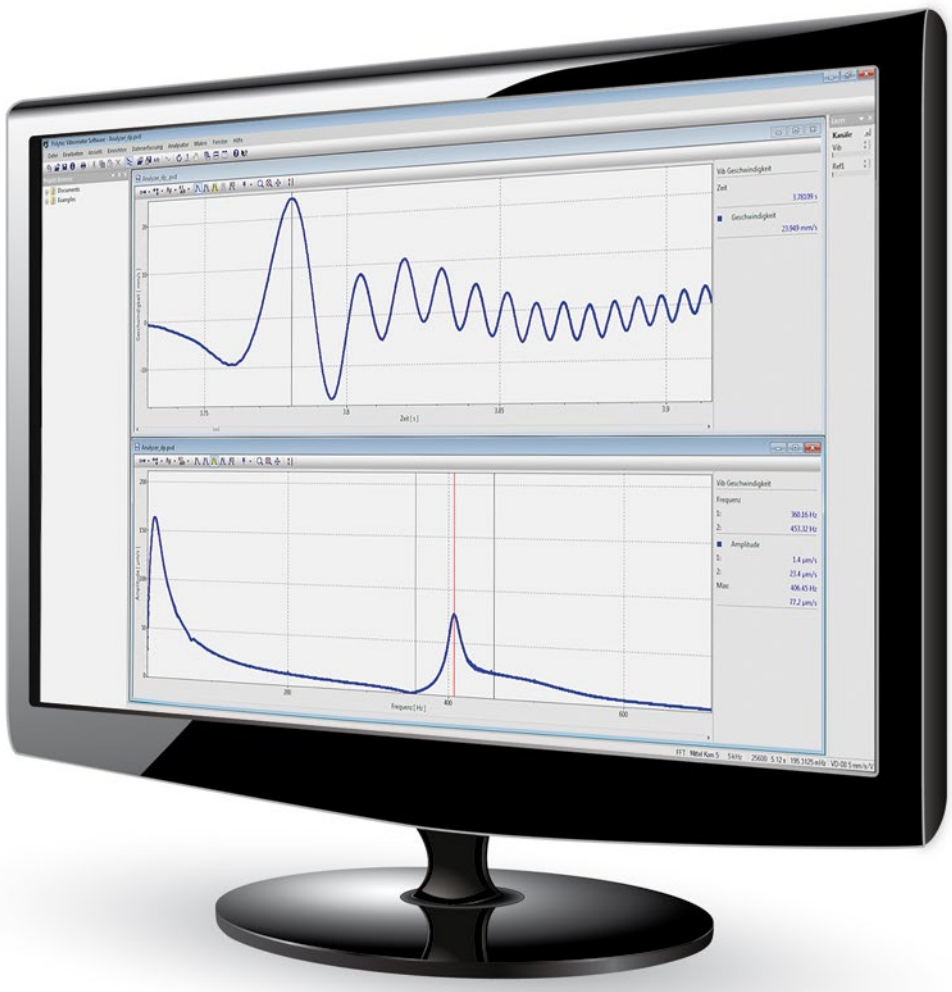
Dimensions



All dimensions in mm
if not marked otherwise

(A) Stand-off distance

(B) Beam



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