The OFV-5000 Controller is the core of Polytec's latest state-of-the-art laser vibrometer systems. Its modular design allows the frequency, velocity and displacement capabilities to be tailored to your applications.

Both analog and digital decoders are available, giving a frequency range from near DC to 24 MHz, with velocities up to ±10 m/s and displacements from the picometer to meter range.

In combination with an interferometric sensor head OFV-505 for highest signal quality, OFV-534 compact sensor head or OFV-551/552 fiber-optic sensor heads, the OFV Modular Vibrometer is an ultra-precise workhorse for non-contact vibration measurement.

Highlights

- Measure displacement and velocity in real-time
- High resolution and bandwidth
- Flexible and expandable with several sensor heads and decoders
- Simple and comfortable operation with touchscreen and remote control

OFV-5000 Vibrometer Controller

The Versatility in Vibration Measurement

Datasheet

Technical Data

Metrological Specifications	
Analog signal outputs	BNC, ±10 V[1]: Velocity signal Displacement signal AUX output[2] DSP output (velocity with DSP filter)[1]
Digital signal output	S/P-DIF standard 24 bit 48/96 kSa/s
Frequency range[3]	DC to 24 MHz
Max. velocity[3]	±10 m/s
Filters	High pass filter: 100 Hz, off Low pass filter: 5 kHz, 20 kHz, 100 kHz, off
Tracking filter[1]	3 settings: slow, fast, off
Adaptive filter module LF-02	DSP based: suppresses statistic noise, analog and digital signal output, frequency range 0 ... 20 kHz (optional for decoder VD-06)
Signal level	Bargraph on touchscreen Output as DC voltage signal (BNC, 0 ... 5 V)
PC-Interface	RS-232, Remote control of the instrument settings

[1] Depends on decoder configuration.
[2] Velocity or displacement signal, depends on decoder configuration (see page 3).
[3] Notice: frequency range, max. velocity and measurement range depend on decoder configuration (see page 3).

Sensor Head Compatibility	
Sensor heads	OFV-505, OFV-503
Compact sensor head	OFV-534
Fiber optic sensor heads	OFV-551, OFV-552

General Specifications	
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
Weight	10 kg
Protection class	IP20
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

System Configuration

Different analog and digital decoders ensure that the OFV-5000 Vibrometer Controller fits perfectly to your application. With a combination of up to four decoders the Modular Vibrometer system shows its high flexibility. Therefore the OFV-5000 contains four slots: two for velocity decoders, one for the displacement decoder and one additional auxiliary slot for a velocity or a displacement decoder.

Velocity Decoders

Decoder	Description	No. of ranges	Typical resolution[1]	Max. velocity	Frequency range
VD-02	Analog, broadband universal decoder	4	0.1 µm/s	10 m/s	0.5 Hz - 1.5 MHz
VD-05	Analog decoder for ultrasonic applications	2	< 3 µm/s	2.5 m/s	0.5 Hz - 10 MHz
VD-06	Digital high-precision velocity decoder	4	0.01 µm/s	0.5 m/s	0 Hz - 350 kHz
VD-08[2]	Digital high-precision velocity decoder	8	0.005 µm/s	0.5 m/s	0 Hz - 25 kHz
VD-09	Digital velocity decoder	14	0.02 µm/s	10 m/s	0 Hz - 2.5 MHz

[1] 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 3M Scotchlite™ Tape (reflective film).
[2] In combination with DD-500 only specific measurement ranges of the VD-08 can be used.

Displacement Decoders

Decoder	Description	No. of ranges	Resolution[1]	Max. displacement	Frequency range
DD-300	Analog displacement decoder for ultrasonic applications	1	0.05 pm	±75 nm	30 kHz - 24 MHz
DD-500	Digital high-end displacement decoder 16-bit-DSP (requires VD-06)	16	0.05 pm	±50 mm	0 Hz - 350 kHz
DD-600[2]	I&Q converter for data processing with VibSoft VDD	–	0.1 pm	–	0 - 5 MHz
DD-900	Broadband digital displacement decoder (requires VD-09)	16	0.5 pm	±50 mm	0 Hz - 2.5 MHz

[1] 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 3M Scotchlite™ Tape (reflective film).
[2] I&Q converter delivering I and Q raw phase signals up to 5 MHz for velocities up to 1.5 m/s for highest displacement resolution. With the PC-based system VibSoft-VDD Data Analysis, frequencies up to 2 MHz and velocities up to 0.81 m/s can be achieved.

Possible configuration of the slots[1]

Slot	Measurand	Possible decoders
Slot 1	Velocity	VD-02, VD-09
Slot 2	Velocity	VD-06, VD-08
Slot 3	Displacement	DD-500, DD-600, DD-900
Slot 4	Velocity or displacement	VD-05, DD-300

[1] Every slot contains one decoder. Not all combinations are possible. Ask your Polytec sales engineer.

Recommended Decoder Combinations

The following table lists recommended decoder combinations for representative applications. The concept of the OFV Modular Vibrometer System accepts further decoders allowing to study even complex vibration phenomena. If you have specific requirements, please contact Polytec's application and sales engineers who will help to choose the appropriate sensor heads, decoders and VibSoft software.

Velocity decoder	Displacement decoder	Applications
VD-09		Acquisition of vibrations at frequencies from DC up to 2.5 MHz at high resolution and velocity. For ultrasonics and microstructures.
VD-09	DD-900	Additional direct displacement output with picometer resolution. Suitable for measurement of signals with DC components like switches or transient behaviour.
VD-09 VD-06	DD-900	Same as the combination VD-09 + DD-900, but with additional high-precision measurement of velocities up to 0.5 m/s at frequencies up to 350 kHz.
VD-06	DD-500	Digital, high-precision measurement of velocity and displacement at frequencies up to 350 kHz with a velocity limited to 0.5 m/s. For demanding applications e.g. acoustics, microsystems, precision mechanics.
VD-02 VD-06	DD-500	Same as the combination VD-06 + DD-500, but vibration frequency range extended up to 1.5 MHz and velocity range extended up to 10 m/s.
VD-02 VD-05		Measurement of velocity at high frequencies up to 10 MHz. For high-frequency applications like ultrasonics and microsystems.
VD-02	DD-300	Acquisition of vibrations at frequencies up to 24 MHz. For high-frequency applications like ultrasonics and micro systems.

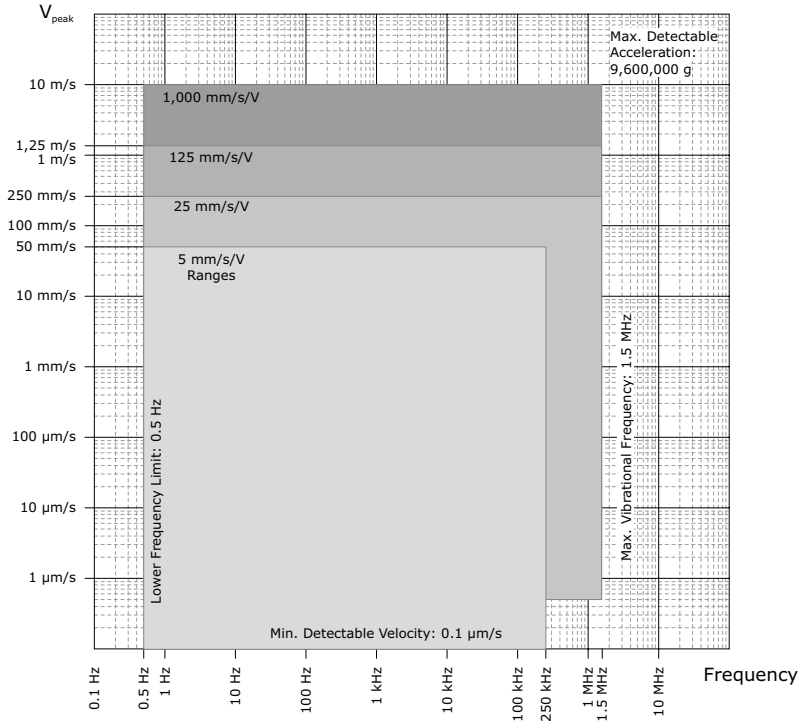
Velocity Decoders

VD-02

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		g	%
5	0.05	0.1	0.5 Hz - 0.25 kHz	8,000	1.0
25	0.25	0.5	0.5 Hz - 1.5 MHz	240,000	1.5
125	1.25	0.6	0.5 Hz - 1.5 MHz	1,200,000	1.0
1,000	10	2.5	0.5 Hz - 1.5 MHz	9,600,000	1.0

[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, measured on 3M Scotchlite™ Tape (reflective film). The typical value refers to the center of the operating frequency range.

Range diagram



- Multi-purpose decoder for a wide range of applications
- Large frequency bandwidth and velocity range up to 10 m/s
- Analog decoding for minimum signal delay

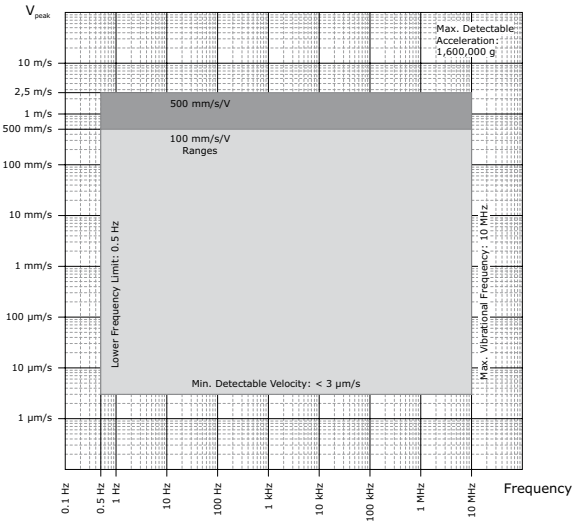
VD-05

Measurement range	Full scale output (peak)[1]	Resolution[2]	Frequency range	Max. acceleration	Max. linearity error
mm/s/V	m/s	µm s^{-1}/√Hz		g	%
100	0.5	< 3	0.5 Hz - 10 MHz	320,000	2
500	2.5	< 3	0.5 Hz - 10 MHz	1,600,000	2

[1] The full scale values correspond to the nominal output voltage of 5 V_{peak}. The range up to 6 V_{peak} can be used at reduced linearity specifications.
[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, measured on 3M Scotchlite™ Tape (reflective film). The attainable resolution is frequency-dependent.

- Precise decoding of highest frequencies up to 10 MHz
- Analog decoding for minimum signal delay
- For applications in the higher ultrasonic frequency range and for fast transient and pulse shaped motions
- Perfectly suited also for MEMS (micro electro mechanical systems)

Range diagram



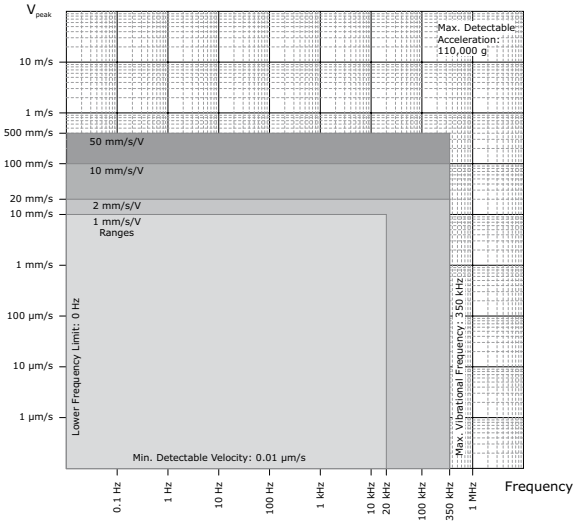
VD-06

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	kHz	g	%
1	0.01	0.01	0 - 20	128	0.1
2	0.02	0.05	0 - 350	4,500	0.1
10	0.10	0.05	0 - 350	22,000	0.1
50	0.50	0.06	0 - 350	110,000	0.1

[1] Measurement ranges 2, 10 and 50 mm/s/V each feature an additional low pass range with 100 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, measured on 3M Scotchlite™ Tape (reflective film). The attainable resolution is frequency-dependent. The typical value refers to the center of the operating frequency range.

- Digital velocity decoder with outstanding resolution covering a wide frequency range up to 350 kHz
- Very low noise
- True DC capability
- Outstanding linearity and frequency response

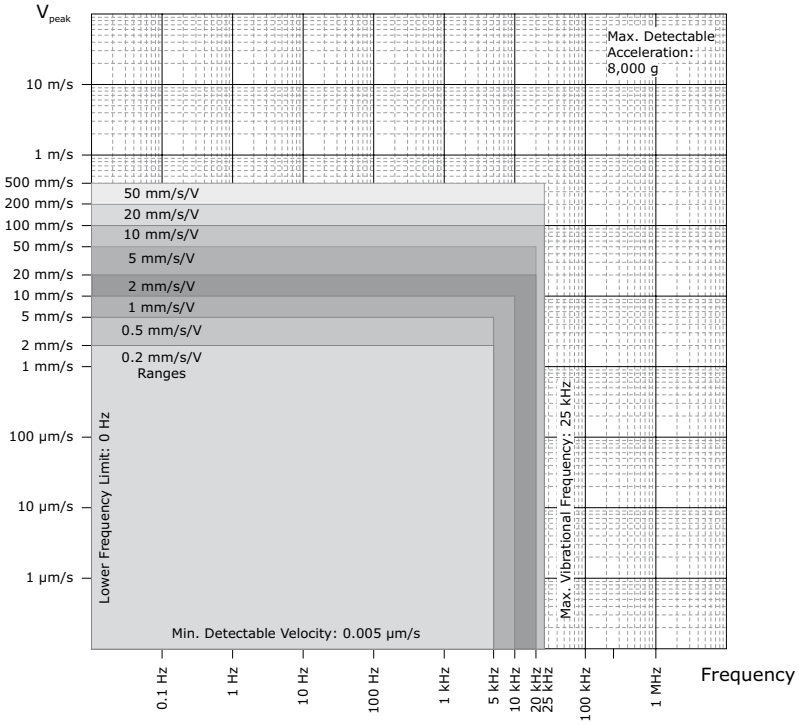
Range diagram



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	kHz	g	%
0.2	0.002	0.005	0 - 5	6.4	0.1
0.5	0.005	0.005	0 - 5	16	0.1
1	0.01	0.01	0 - 10	64	0.1
2	0.02	0.01	0 - 20	256	0.1
5	0.05	0.01	0 - 20	640	0.1
10	0.1	0.02	0 - 20	1,280	0.1
20	0.2	0.03	0 - 25	3,200	0.1
50	0.5	0.05	0 - 25	8,000	0.1

[1] In combination with DD-500 only specific measurement ranges of the VD-08 can be used.
[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, measured on 3M Scotchlite™ Tape (reflective film). 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

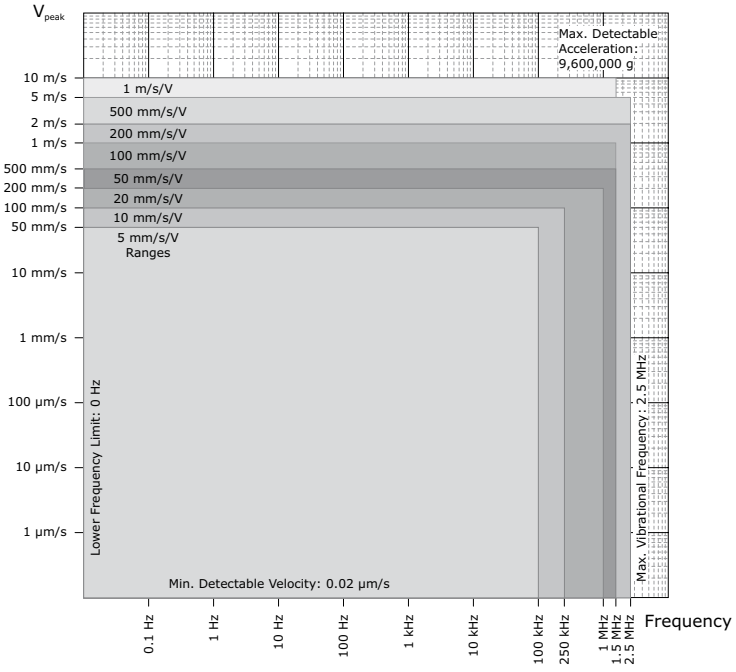
VD-09

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	%
5	0.05	0.02	0 - 0.1	3,200	0.5
10	0.1	0.04	0 - 0.25	16,000	0.5
20	0.2	0.12	0 - 1	128,000	0.5
50	0.5	0.18	0 - 1.5	480,000	0.5
100	1	0.2	0 - 1.5	960,000	0.5
200	2	0.5	0 - 2.5	3,200,000	0.5
500	5	0.6	0 - 2.5	8,000,000	0.5
1,000	10	0.7	0 - 1.5	9,600,000	0.5

[1] Measurement ranges 20 ... 1,000 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, measured on 3M Scotchlite™ Tape (reflective film). 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

Range diagram



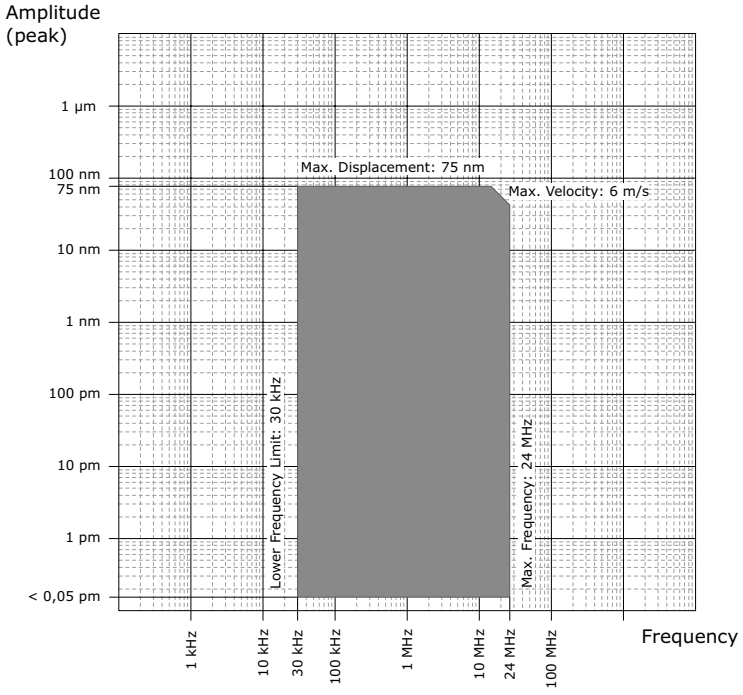
Displacement Decoders

DD-300

Measurement range	Full scale output (peak)[1]	Resolution[2]	Frequency range	Max. velocity
nm/V	nm	pm/√Hz	kHz	m/s
50	±75	< 0.02 pm/√Hz at 100% reflectivity < 0.05 pm/√Hz when measuring on reflective film	30 - 24,000 (–3dB)	6

[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.

Range diagram



- Displacement decoder for measuring smallest motions up to 75 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

DD-500

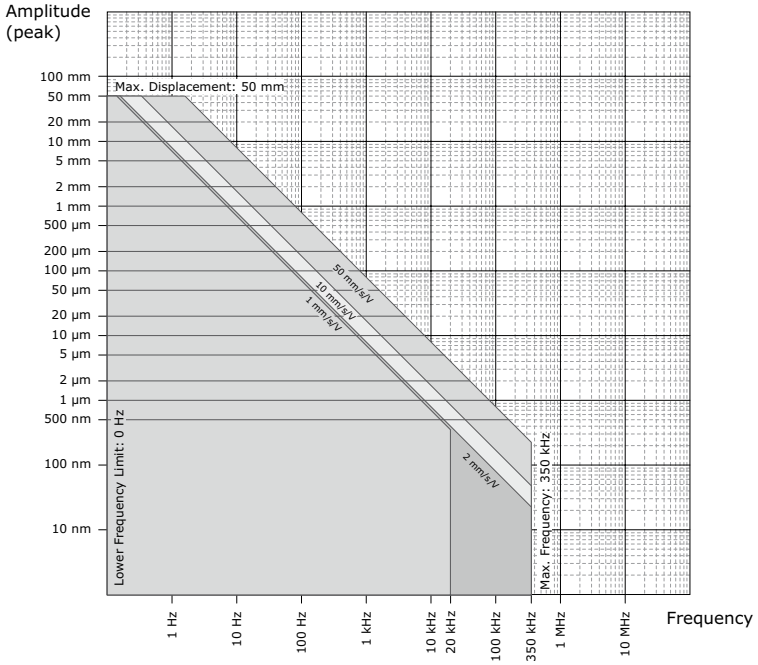
Required velocity decoder: VD-06

Measurement range	Full scale output (peak-to-peak)[1]	Resolution[2]	Frequency range[3]	Max. velocity
µm/V	µm	nm	kHz	m/s
0.05	1	0.015	0 - 350	0.5
0.1	2	0.03	0 - 350	0.5
0.2	4	0.06	0 - 350	0.5
0.5	10	0.15	0 - 350	0.5
1	20	0.3	0 - 350	0.5
2	40	0.6	0 - 350	0.5
5	100	1.5	0 - 350	0.5
10	200	3	0 - 350	0.5
20	400	6	0 - 350	0.5
50	1,000	15	0 - 350	0.5
100	2,000	30	0 - 350	0.5
200	4,000	60	0 - 350	0.5
500	10,000	150	0 - 350	0.5
1,000	20,000	300	0 - 350	0.5
2,000	40,000	600	0 - 350	0.5
5,000	100,000	1,500	0 - 350	0.5

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. 0.4 mV at the analog output.
Noise-limited resolution: < 0.5 pm/√Hz. 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).
3 When a suitable measurement range has been selected for the digital velocity decoder.

- Best resolution displacement decoding in conjunction with VD-06 for velocities up to 0.5 m/s
- For demanding applications in acoustics, micro systems and precision mechanics
- Analog output as well as digital data stream in S/P-DIF format

Range diagram



- Detects even smallest displacements thanks to very good SNR
- Perfect for MEMS analysis or calibration purposes

DD-600

I&Q converter delivering I and Q raw phase signals up to 5 MHz for velocities up to 1.5 m/s

Highest displacement resolution. With VibSoft-VDD Data Analysis up to 2 MHz and velocities up to 0.81 m/s

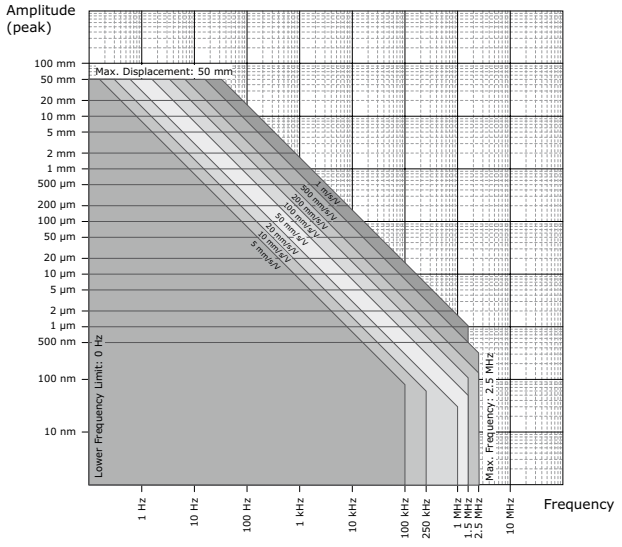
DD-900

Required velocity decoder: VD-09

Measurement range	Full scale output (peak-to-peak)[1]	Resolution[2]	Frequency range[3]	Max. velocity
µm/V	µm	nm	kHz	m/s
0.05	1	0.015	0 - 2,500	10
0.1	2	0.03	0 - 2,500	10
0.2	4	0.06	0 - 2,500	10
0.5	10	0.15	0 - 2,500	10
1	20	0.3	0 - 2,500	10
2	40	0.6	0 - 2,500	10
5	100	1.5	0 - 2,500	10
10	200	3	0 - 2,500	10
20	400	6	0 - 2,500	10
50	1,000	15	0 - 2,500	10
100	2,000	30	0 - 2,500	10
200	4,000	60	0 - 2,500	10
500	10,000	150	0 - 2,500	10
1,000	20,000	300	0 - 2,500	10
2,000	40,000	600	0 - 2,500	10
5,000	100,000	1,500	0 - 2,500	10

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: < 0.5 pm/√Hz. 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).
3 When a suitable measurement range has been selected for the digital velocity decoder.

Range diagram



- Broadband displacement decoder up to 2.5 MHz
- Supplements VD-09 velocity decoder for high precision displacement measurements with resolutions down to 15 pm
- 16 measurement ranges

Compliance with Standards	
Laser safety	IEC 60825-1:2014 / EN 60825-1:2014 / DIN EN 60825-1:2008-05 (Safety of Laser Products, complies to US 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice no. 50, dated 24 June 2007)
Electrical safety	IEC 61010-1:2010 + Cor.:2011 / EN 61010-1:2010 / DIN EN 61010-1:2011-07 (Safety requirements for electrical equipment for measurement, control, and laboratory use)
EMC	IEC 61326-1:2012 / EN 61326-1:2013 / DIN EN 61326-1:2013-07 (EMC requirements on Emission and Immunity – Electrical equipment for measurement, control, and laboratory use) 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

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