optomet.
LASER VIBROMETRY

Digital Laser Doppler Vibrometer

Nova-Series

SWIR Single-Point Laser Vibrometer

Vibrometry in the short-wave infrared range for maximum signal-to-noise ratio. Delivers best signal quality for dark or rough surfaces, biological tissue, as well as long working distances.

IDEAL FOR

- Dark / rough surfaces
- Very high-frequency vibrations
- Biological surfaces
- Moving or rotating objects
- High speed vibrations up to 24.5 m/s
- Long distance measurements

HIGH-END AND BEST-PERFORMANCE

The „Nova-Series“ Laser Vibrometer operates with an invisible SWIR Laser (1550 nm). At a wavelength of 1,550 nm, ten times the laser power of a HeNe system is available for measurements without compromising the eye safety.

The NOVA Series comes in when maximum dynamic range is required or every decibel of signal level counts. Typical use cases are surfaces that poorly reflect visible light, for example dark and rough surfaces or biological tissue. A high signal strength is also of vital importance for measurements over long distances, e.g. in civil engineering or aerospace.

Technical Data

Measured Quantities – Performance Parameters

Max.[2] Frequency	Max.[2] Velocity	Best Vel.[1] Resolution	Max.[2,3] Displacement	Best Disp. Resolution	Max.[2,3] Acceleration	Best Accel.[1] Resolution
24 MHz	25 m/s	1.7 nm $s^{-1}/\sqrt{Hz}$	$\pm$ 1.225 m	0.05 pm $/\sqrt{Hz}$	78.4 Mg	1.8μg $/\sqrt{Hz}$

[1] The resolution is defined as the signal amplitude (rms) that produces 0 dB signal/noise ratio with 1 Hz spectral resolution at 50 % fmax
[2] Actual specifications depend on the configured decoder.
[3] Optional available

Measurement Specifications

Measured quantities	Velocity, displacement, acceleration
Frequency bandwidth[2]	0 Hz - 24 MHz
Max. velocity[2]	25 m/s
Velocity measurement ranges[2]	14
Signal processing	Digital (FPGA based)
Source impedance	50 Ohm
Analog signal output	3$\times$BNC, $\pm$ 2 V: - Velocity, displacement[3], acceleration[3], signal generator[3] - Data rate: 160 MSamples/s @ 16-bit
Digital Signal Output & PC-Interface	1 Gbit RJ45 Ethernet: - Data rate: 1 GBit (53.3 MSamples/s @ 16-bit) - Digital data acquisition- and analysis software *OptoGUI* - Digital remote control of device settings
External Trigger	Digital external trigger in/out via SMB
Filter	High-pass filter: off / 25 Hz / 20 kHz (0.16 / 7 / 50 Hz)[4] Low-pass filter: off / 2.5 / 5 / 10 / 20 / 50 / 100 / 200 kHz Tracking filter: off / slow / fast

[4] For Sense Remote decoder

Optical Specifications

Working distances	Variable working distance from 0 mm to >300 m
Laser wavelength	Measurement laser: 1550 nm, Target laser: 510-530 nm
Laser safety class	Measurement laser: output power: <10 mW, class 1 Target laser: output power: <1 mW, class 2
Optics	Auto-, remote-, and manual focusing

General Device Specifications

User interface output	Color screen 3.5" + 20 segment LED bargraph
User interface input	Touch screen, knobs with push-button, key switch (power)
Operating temperature	0 to 40°C
Dimensions	Length×width×height (excluding handle and lens): 380×180×148 mm
Weight	8 kg + objective lens
Power supply	110 - 240 V AC (50-60Hz) or 12 V DC
Portable Operation	Possible
Portable power supply	12 V DC portable charger[3]
Integrated signal generator[3]	- Produce various preset functions (sin, chirp, gaussian, ...) - Import of arbitrary functions and audio wave-files

[3] Optional available

Model Options - Decoders[5,6]

[5]For details see decoder data-sheets. [6] Variations from displayed models available on request.

Overview Model Options and Characteristics of the default Velocity Decoder[7]

Model (Decoder)	Description	Measuring Ranges[5]	Max. Velocity	Frequency Bandwidth
Basis (D-VD-1N)	Versatile model with high resolution.[8]	8	5 m/s	0 Hz – 500 kHz
Sense (D-VD-2N)	Smallest measurement range ±2.45 mm/s and highest resolution.[9]	11	5 m/s	0 Hz – 1 MHz
Sense Remote (D-VD-2N-R)	Sense features + extra low disp.-HPF 0.16 / 7 / 50 Hz (measure building vibrations, etc.).	11	5 m/s	0 Hz – 25 kHz
Sense Speed (D-VD-2N-12)	Sense features + additional measurement range at ±12 m/s.	12	12 m/s	0 Hz – 1 MHz
High Speed (D-VD-3N)	Supports measurements up to highest velocities.	11	25 m/s	0 Hz – 2.5 MHz
High Frequency (D-VD-4N)	Supports measurements up to highest frequencies.	9	12 m/s	0 Hz – 10 MHz
Master (D-VD-5N)	The all-rounder: Includes all Sense, High Speed, and High Frequency features.	14	25 m/s	0 Hz – 10 MHz
Master+ (D-VD-5N-24)	Includes all Master features and has an additional super-high frequency upgrade	14	25 m/s	0 Hz – 24 MHz[10]

[7] All models feature by default a velocity decoder and optionally displacement and acceleration decoders
[8] Best velocity res.: 12 nm $s^{-1}/\sqrt{Hz}$.
[9] Best velocity res.: 1.7 nm $s^{-1}/\sqrt{Hz}$.
[10] Velocity limited to 1 m/s at frequencies above 10 MHz.

Characteristics of the optional Displacement Decoder[7]

Decoder	Required Vel.-Decoder	Number Measuring Ranges[5]	Smallest Range[8]	Largest Range	Frequency Bandwidth
D-DD-1N	D-VD-1N	19	±122.5 nm	±122.5 mm	0 Hz – 500 kHz
D-DD-2N	D-VD-2N	19	±122.5 nm	±122.5 mm	0 Hz – 1 MHz
D-DD-2N-R	D-VD-2N-R	19	±122.5 nm	±1.225 m	0 Hz – 25 kHz
D-DD-2N-12	D-VD-2N-12	19	±122.5 nm	±122.5 mm	0 Hz – 1 MHz
D-DD-3N	D-VD-3N	19	±122.5 nm	±122.5 mm	0 Hz – 2.5 MHz
D-DD-4N	D-VD-4N	19	±122.5 nm	±122.5 mm	0 Hz – 10 MHz
D-DD-5N	D-VD-5N	19	±122.5 nm	±122.5 mm	0 Hz – 10 MHz
D-DD-5N-24	D-VD-5N-24	19	±122.5 nm	±122.5 mm	0 Hz – 24 MHz[10]

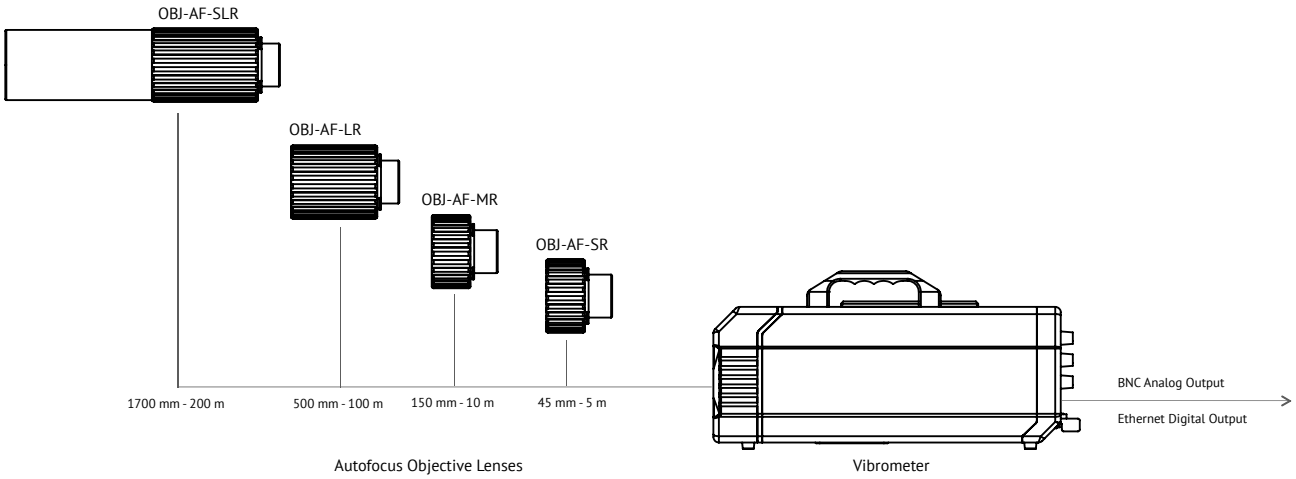
[11] Best displacement resolution: 0.05 pm.

Characteristics of the optional Acceleration Decoder[7]

Decoder	Required Vel.-Decoder	Number Measuring Ranges[5]	Smallest Range[12]	Largest Range	Frequency Bandwidth
D-AD-1N	D-VD-1N	8	±392 g	±1.6 Mg	0 Hz – 500 kHz
D-AD-2N	D-VD-2N	11	±3.9 g	±3.2 Mg	0 Hz – 1 MHz
D-AD-2N-R	D-VD-2N-R	11	±3.9 g	±80 kg	0 Hz – 25 kHz
D-AD-2N-12	D-VD-2N-12	12	±3.9 g	±7.6 Mg	0 Hz – 1 MHz
D-AD-3N	D-VD-3N	11	±392 g	±39.2 Mg	0 Hz – 2.5 MHz
D-AD-4N	D-VD-4N	9	±392 g	±76.8 Mg	0 Hz – 10 MHz
D-AD-5N	D-VD-5N	14	±3.9 g	±78.4 Mg	0 Hz – 10 MHz
D-AD-5N-24	D-VD-5N-24	14	±3.9 g	±78.4 Mg	0 Hz – 24 MHz[13]

[12] Best acceleration resolution: 1.8μg /$\sqrt{}$Hz.
[13] Acceleration limited to 15.3 Mg at frequencies above 10 MHz.

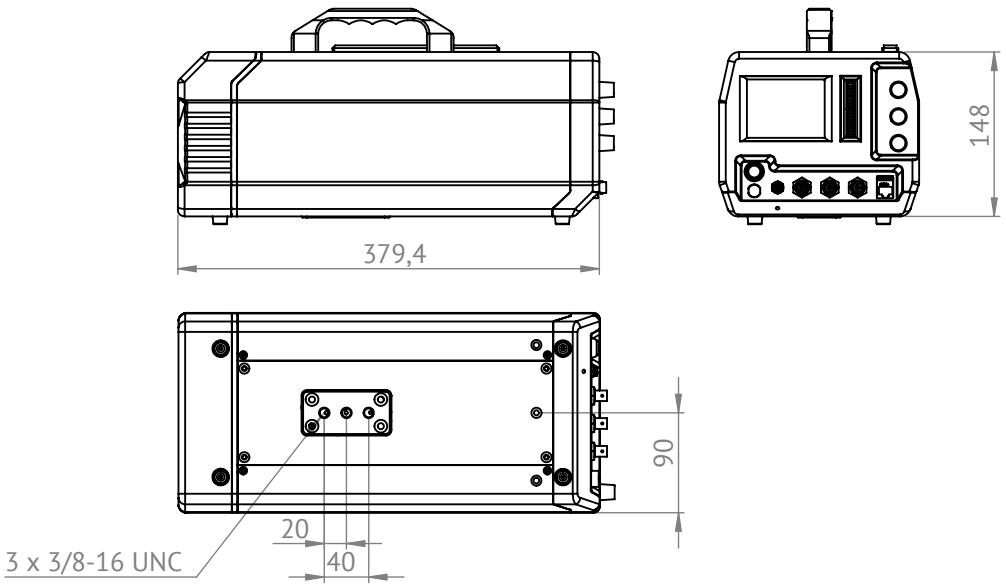
Set-up



Objective lens

Specification	Short-Range Autofocus	Mid-Range Autofocus	Long-Range Autofocus	Super-Long Range Autofocus
Focal length (mm)	25	50	100	200
Min. stand-off distance (mm)	45	150	500	1700
Min. Spot size in µm	20	25	53	69
Working distance	45 mm ... 5 m	150 mm ... 10 m	500 mm ... 100 m	1.7 m ... 200 m

Dimension of the Vibrometer



Accessories

S Standard included, O Optional available

	Transport Case for Single Point Vibrometer Stable and waterproof *Peli* case for safe keeping and transport of vibrometer. External dimension (L x B x H): 61.9 x 49.2 x 22.3 cm	S
	Transport Bag Compact und light transport bag for outdoor measurements or transport as carry-on baggage in an plane.	O
	Telescope For measurements from a greater distance, a telescope makes it easier to find the measuring point. The telescope can be easily mounted on the gauge rail at the top of the vibrometer.	O
	IR-Camera For digital visualizing of the laser point. The camera can be easily mounted on the gauge rail at the top of the vibrometer.	O
	IR-Detector Card Transforming the not-visible infrared light into a spot of visible light.	S
	Mobile Battery Portable battery charger, external battery power bank. For powering the vibrometer when performing outdoor measurements.	O
	Tripod with Fluid Head Precisely align your vibrometer with high quality tripods by *Manfrotto*.	O

Software

	OptoGUI Analysis Software Software for data acquisition, analysis and remote control. Live animation of measured time and frequency data.	O

OptoGUI software includes

Remote control	Remotely control all vibrometer settings via ethernet	**S**
Read-out	Read out data via ethernet with up to 80 MS/s	**S**
Time data	Live animation of measured vel./disp./accel. data	**S**
Export data	Export time data as .csv, .h5, or .mat files	**S**
Fourier-Transformation	-Perform the Fast-Fourier-Transformation of the data while measuring -Display the measured time data in the frequency-domain (spectrum) -FFT can be calculated with up to 8 Mio. FFT lines	**S**
Peak identification	Automatically identify signal peaks in the frequency spectrum	**S**
Fourier boundaries	Limit live FFT-calculation to certain time ranges of the time data	**S**
Signal trigger	Trigger your measurement with the vel., disp., or accel. signal	**S**
External trigger	Trigger your measurement with an external TTL signal (3.3 V)	**O**
Multiple traces	Record and recall multiple traces of the vel./disp./accel. time data	**S**
Arbitrary signal generator	Import file formats: .csv ASCII- or .wav audio files Pre-defined signals: sin, rectangle, chirp, random, ...	**O**

Maintenance Specials

Warranty

Warranty	12 month warranty for all not self-inflicted defects	**S**
Warranty extension	Extension of standard warranty to 24 months	**O**

Software Updates

Software maintenance	Free software updates within warranty period	**S**
Extended maintenance	Additional extension of software updates by 12+ months	**O**

Hardware Maintenance

Hardware Maintenance	Free hardware maintenance within warranty period	**S**
Extended maintenance	Additional extension of hardware maintenance by 12+ months	**O**
Recalibration & cleaning	Cleaning & realignment of optical parts, check of laser output power, check integrity of fiber, redo factory calibration	**O**

Laser product label

DO NOT STARE INTO BEAM Class 2 Laser Product
Laser CLASS 1: invisible, λ=1550 nm, output power: <10 mW
Laser CLASS 2: visible, green laser beam, λ=510-530 nm,
output power: <1 mW

DIGITAL LASER DOPPLER VIBROMETER

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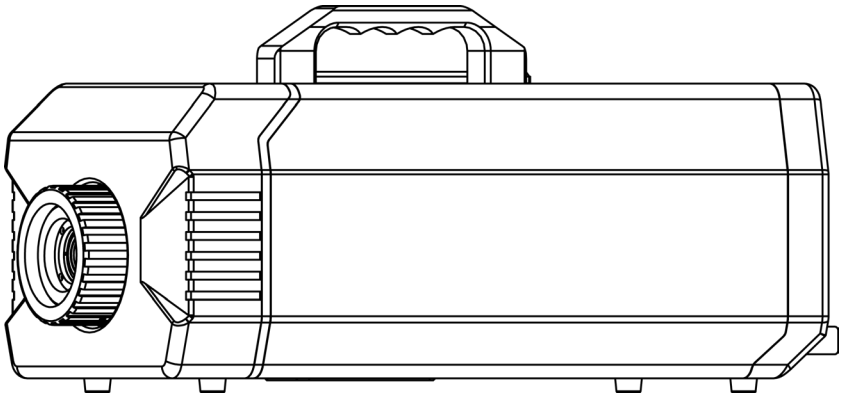

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