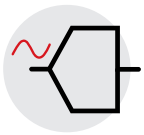
optomet.
LASER VIBROMETRY

SMART MULTI-FIBER

Modular Multi-Fiber system - flexible measurement solution: adaptable, precise, and ideal for diverse industrial applications allowing up to four simultaneous non-contact vibration measurements.

- SMART Laser Doppler Vibrometer for non-contact vibration measurements
- Optomet dual fiber technology for optimum signal quality and maximum flexibility
- Modular and extendable fiber system
- Up to four interferometers for measurements at up to four points simultaneously
- Synchronization with other SMART devices
- Versatile 7-inch touch display
- Improved connectivity: Wi-Fi, Bluetooth & USB

General specifications



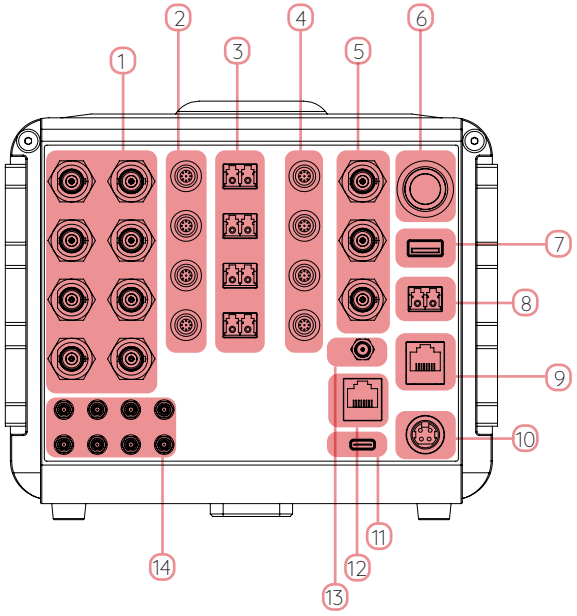
Overview

Measured quantities	Velocity, displacement, acceleration
Max. frequency bandwidth	DC to 50 MHz
Frequency range	Can be chosen individually using a freely configurable band-pass filter for velocity, displacement and acceleration signal
Max. velocity	50 m/s
Measurement ranges	Measurement range limits can be freely adjusted between • 1 mm/s and 50 m/s for velocity • 10 nm and 100 m for displacement • 10 m/s² and 100 Mio. m/s² for acceleration
Signal processing	Digital (FPGA based)
Filter	Low-pass and high-pass filters are defined by the selected frequency range Tracking filter: off / slow / fast
User interface	7” Full HD+ touchscreen with 1000 nits peak brightness
Operating temperature	0 °C to 40 °C
Dimensions	Length × width × height (excluding fiber head): 308 × 192 × 152 mm
Weight	~ 3.3 kg to 4.2 kg + fiber head
Optical fiber cable	2 m by default, optionally available with fiber cables up to 50 m length
Power supply	100 - 240 V AC (50-60 Hz) or 12 V DC
Portability	Convenient all-in-one design for seamless portability and simple setup
Storage temperature	-10 °C to 65 °C
Relative humidity	Max. 80 %, non-condensing
Calibration interval	Every 24 months (recommended)

The exact features depend on the configured options.

Optical fiber	• Up to 4 x optical fiber quick connects to connect fiber heads • Collect vibration data with all four fiber heads simultaneously • Separate placement of fiber heads and device for maximum flexibility in your applications • Choice of compact yet robust fiber heads for measurements in harsh environments • Superior signal quality due to the unique Optomet dual fiber technology with separate optical paths for incoming and outgoing signals
Analog signal inputs	• Up to 12 channel Lemo, ± 1 V / ± 10 V, for synchronous reference signal recording • 24-bit A/D converter per channel • Support for IEPE (Integrated Electronic Piezoelectric), TEDS and DC/AC coupling • Input impedance 1 MOhm ‖ 20 pF (other configurations up to 1 GOhm ‖ 3 pF available on request)
Analog HF signal inputs	• Up to 3 channel (BNC), ± 1 V synchronous high-frequency (HF) signal recording • Input impedance 50 Ohm
Analog signal outputs	• Up to 8 × BNC, ± 2 V • Versatile signal outputs: Analog velocity, displacement, acceleration and arbitrary signal generator • Produce various preset functions (sine, chirp, gaussian, ...) or load arbitrary signals • Configure up to 8 independent signal generator channels • Data rate: 312.5 Msamples/s @ 16 bit • Source impedance 50 Ohm
Digital signal output & PC-Interface	• 10 Gbit RJ45 Ethernet: Data rate: 10 Gbit/s (up to 312.5 MSamples/s @ 48 bit) • Digital data acquisition- and analysis software SMART Lab • Digital remote control of device settings
External trigger	• Digital external trigger in/out via SMB • Configurable with up to 3 x digital trigger inputs and 3 x digital trigger outputs

The exact features depend on the configured options.



1	Analog signal outputs (BNC)	8	Optical communication port
2	Fiber head power output	9	Ethernet port: for device communication/data
3	Optical fiber connector (LC-Duplex)	10	Power input
4	LEMO signal inputs (12 Channels)	11	USB port (Type-C)
5	BNC HF signal inputs (up to 50 MHz)	12	Ethernet port: for device communication/data
6	Power button	13	Antenna connector
7	USB port (Type-A)	14	Multi-purpose SMB ports

Configurable options

Connectivity

Optical fiber	4	APC LC-Duplex	Contactless and synchronous vibration data recording with four fiber heads using four interferometers. Ultra-high sample rate of 312.5 MSPS
Analog IN	12	Lemo, ± 1 V / ± 10 V	Synchronous recording of reference signals with 24 bits precision and up to 1.5 MSPS. DC/AC coupling
HF Analog IN	3	BNC, ± 1 V	Synchronously record reference signals up to 50 MHz with 14 bits precision and ultra-high sample rates of 312.5 MSPS
Analog OUT	8	BNC, ± 2 V	Velocity, displacement, acceleration and signal generator output with 16 bits precision and up to 312.5 MSPS
Digital IN	3	SMB	Enables external triggering of the device or PPS
Digital OUT	3	SMB	Trigger external devices or use as PPS
Digital interface	3	• 10 Gbit/s ethernet • 1 Gbit/s ethernet • Fiber optical or copper	• Stream the measurement data over ethernet with up to 312.5 MSPS and control the vibrometer remotely • Use the vibrometer as a control hub for your ethernet-based equipment • Synchronize the vibrometer with other SMART series devices
USB (optional)	2	• 1 x USB-C (USB 3.2) • 1 x USB-A (USB 3.0)	Connect USB devices such as cameras, keyboards or storage devices to the vibrometer for direct data recording
Bluetooth (optional)			Connect human interface devices such as keyboard, mouse or headphones to the vibrometer
Wi-Fi (optional)			Control your vibrometer wirelessly and stream measurement data over the air using the fast W 7 connection
Inertial measurement unit (IMU) (optional)			Record acceleration and orientation of the device for more accurate alignment with your test object and monitoring of vibrations of the vibrometer itself
GNSS module (optional)			GNSS module for precise absolute time and position
Synchronization (optional)	2	SMB	10 MHz output and 10 MHz input for synchronization with other devices + 1 x PPS output and 1 x PPS input

The exact features depend on the configured options.

Frequency options

Basis	Measure frequencies up to 250 kHz, covering the entire acoustic range and beyond	S
High frequency	Measure frequencies up to 5 MHz	O
Master	Measure frequencies up to 10 MHz	O
Ultra	Measure frequencies up to 25 MHz	O
Elite	Measure frequencies up to 50 MHz to the limit of what is technologically feasible	O
Frequency upgrade M	Upgrade the frequency limitation of any option by 500 kHz	O
Frequency upgrade L	Upgrade the frequency limitation of any option by 1 MHz	O
Frequency upgrade XL	Upgrade the frequency limitation of any option by 5 MHz	O

Velocity options

Basis	Continuously adjust the velocity measurement range between 10 mm/s and 15 m/s	S
High speed	Measure velocities up to 25 m/s	O
Master	Measure velocities up to 50 m/s	O
Ultra	Measure velocities up to 50 m/s and get access to the high resolution upgrade with the smallest velocity measurement range of 1 mm/s	O
High resolution upgrade	Best velocity resolution with smallest velocity measurement range 1 mm/s	O
Velocity upgrade M	Increase the maximum velocity of any velocity option by 2.5 m/s	O

Measurand quantities

Velocity	Measure vibrational velocities	S
Displacement	Measure vibrational displacements with continuously adjustable ranges from 10 nm to 100 m	O
Acceleration	Measure vibrational accelerations with continuously adjustable ranges from 10 m/s^2 to 100 Mio. m/s^2	O

Maintenance

Warranty	12 months	S
Warranty extension	Extension of standard warranty to 24 months	O
Extended maintenance	Additional extension of hardware maintenance by 12+ months	O
Recalibration & cleaning	Check, cleaning & realignment of optical parts, check of laser output power, and factory calibration	O

Accessories

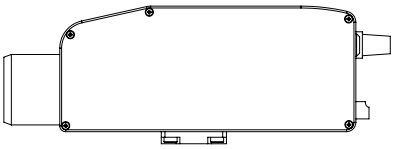
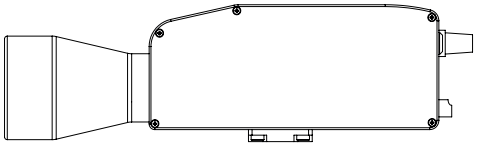
Transport case	• Stable and waterproof Peli case for safe storage and transport of the vibrometer • External dimensions (L x W x H): 62 x 49 x 22 cm	S	
Fiber head transport case	Safely stow and transport your fiber head in a high-quality Peli case	S	
Transport bag	Compact and light transport bag for outdoor measurements	O	
Tripod with fluid head	Precisely align your vibrometer with high-quality tripods by Manfrotto	O	
Positioning stage	Precisely align your Fiber measurement head with a precise positioning stage	O	
IR-detector card	Transforming the invisible infrared light into a spot of visible light	S	

Optical specifications

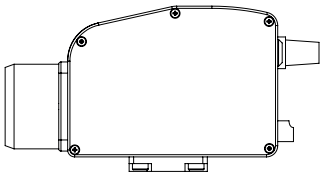
Overview

Working distances	• Variable working distance from 25 mm to 100 m • Choice of various fiber heads
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-, and manual focusing

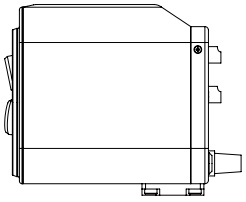
Autofocus fiber head

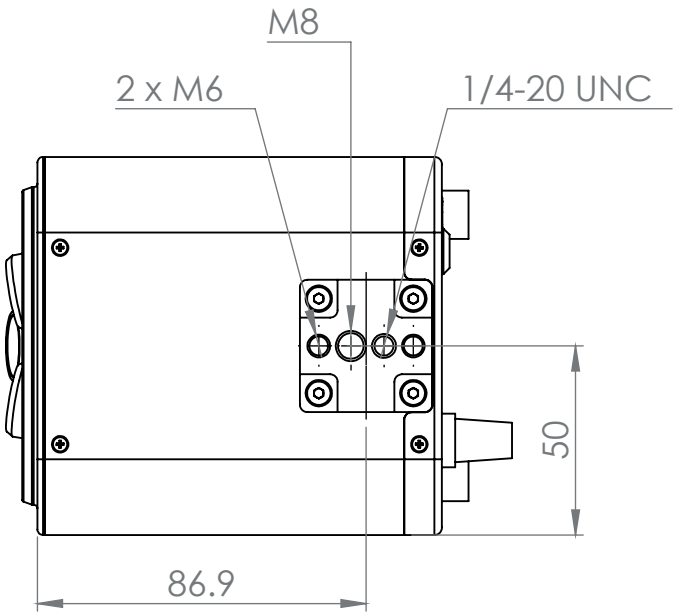
		
	Mid-Range Autofocus	Long-Range Autofocus
	Dimensions (L x W x H): 159 mm x 43 mm x 68 mm (excluding lens)	
Working distance	135 mm to 10 m	450 mm to 100 m
Min. stand-off distance (mm)	135	450
Focal length (mm)	50	100
Spot size at min. stand-off distance (m)	42	72

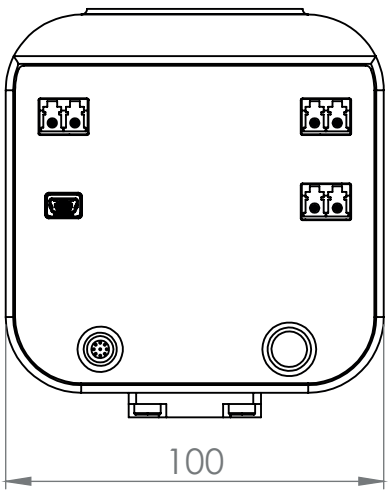
Fixed focus fiber head

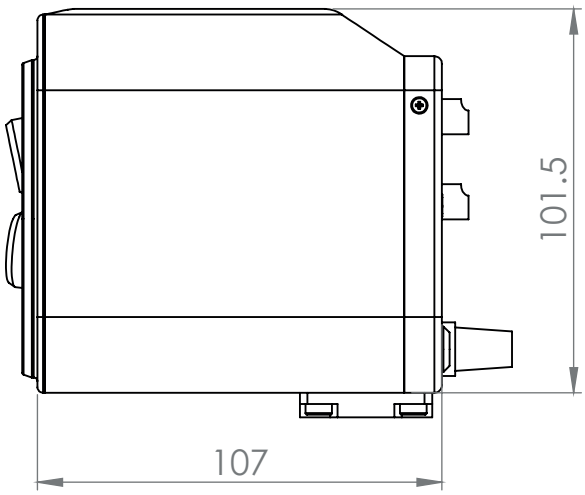
			
	Compact fiber head with fixed working distance		
	Dimensions (L x W x H): 94 mm x 43 mm x 68 mm (excluding lens)		
Lens options	Spot size (µm)	Focal length (mm)	Working distance (mm)
25 mm	25	40	25
37 mm	29	50	37
64 mm	43	75	64
89 mm	61	100	89
139 mm	90	150	139
189 mm	118	200	189

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

	
	Compact 3D fiber head with fixed working distance
	Dimensions (L x W x H): 107 mm x 100 mm x 102 mm (excluding lens)
Working distance	83 mm
Focal length	100 mm







Software

SMART Lab software features

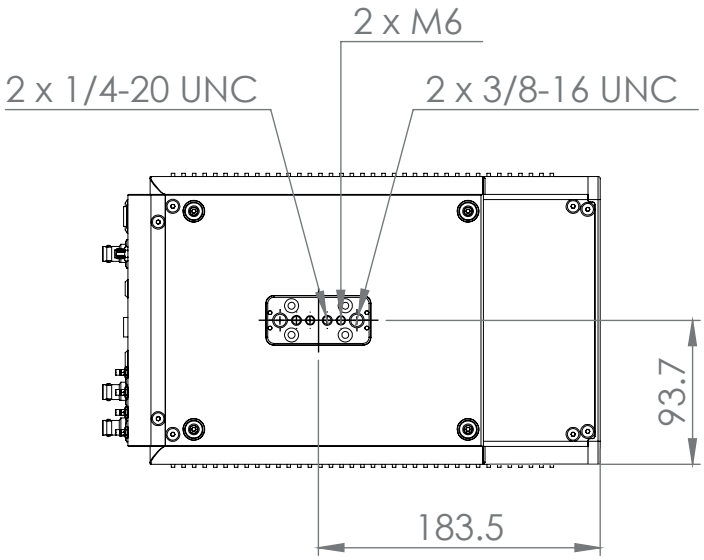
Remote control	• All vibrometer settings via a single ethernet connection • Measurement and pilot laser: autofocus, pilot laser brightness • Multiple vibrometers at once for reference, multipoint and 3D vibration measurements
Data acquisition	• Phase correct acquisition of vibrometer signal and reference channels • Convenient access to all your data in a single software - from vibrometers to multiple reference sensors • Live view of measured time data • Multi-channel arbitrary signal generator to generate predefined signals (sine, sine sweep, rectangle, random, etc.) or custom signals from imported .csv or .wav files • Triggering on measured signals or external triggers • Trace history to record and recall multiple traces of the vel./disp./accel. time data
Measurement analysis	• Real-time Fast Fourier Transform (FFT) for responsive data analysis • Frequency domain representation with up to 536 Mio FFT lines • Fourier boundaries to limit FFT calculations to certain time ranges of the time data • Several window functions for FFT calculations, including rectangular, hanning, hamming, exponential • Phase correct calculation of the frequency response function (FRF) • Live Spectrogram of the ongoing measurements FFT's
Data import and export	• Export time and frequency data to .csv, .h5, or .mat files • Export time data as .wav audio file • Take screenshots from within our software and export with up to 4K resolution • Save projects to and load projects from the native file format

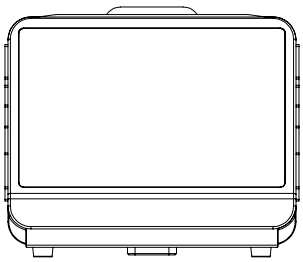
SMART Lab runs on any modern computer with Microsoft Windows.

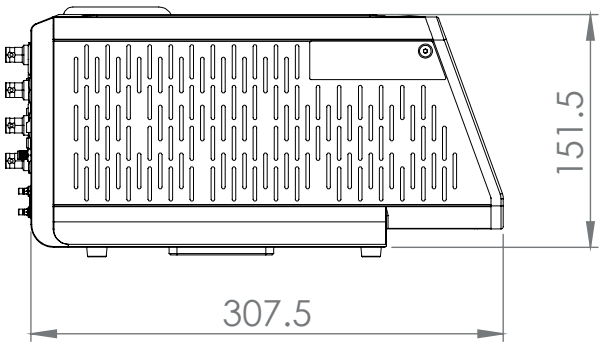
Mechanical parameters

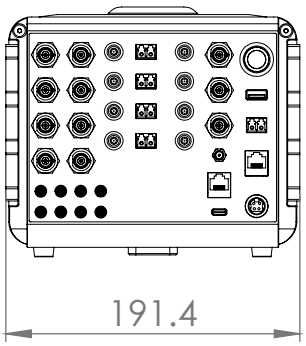
Multi-Fiber

Dimensions	Length × width × height (excluding fiber head): 308 × 192 × 152 mm
Weight	~ 3.3 kg to 4.2 kg + fiber head
Operating Temperature	0 °C to 40 °C
Storage Temperature	-10 °C to 65 °C
Relative Humidity	max. 80 %, non-condensing

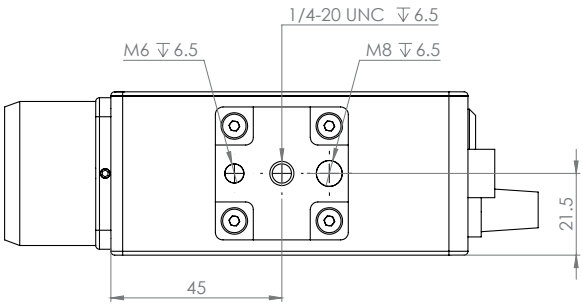


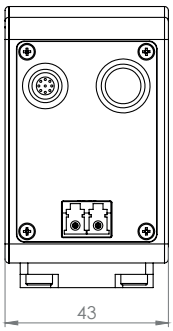


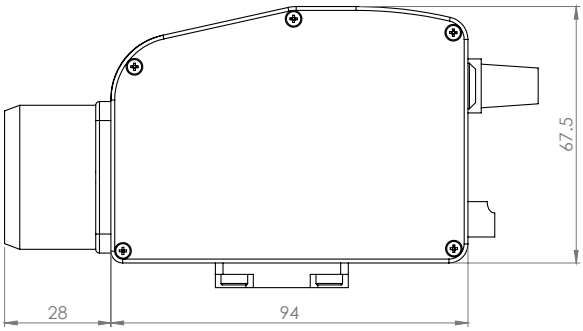




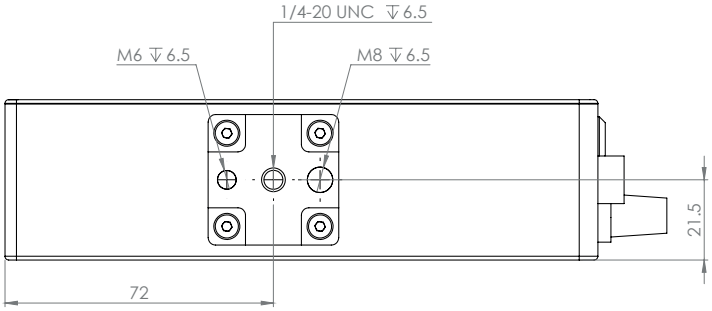
Fixed focus fiber head

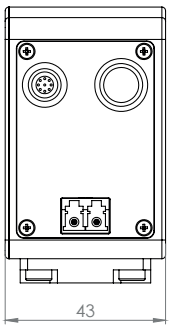


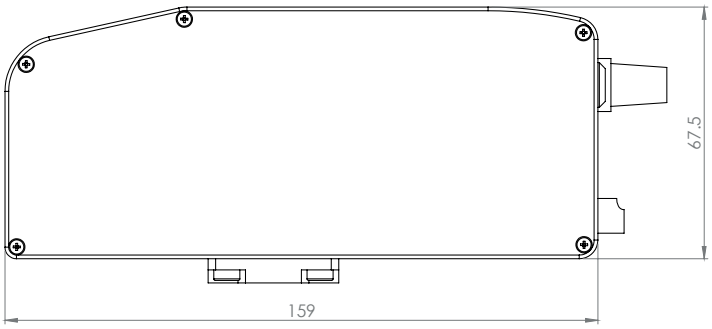




Autofocus fiber head







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