Multi Channel Fiber

optomet.
LASER VIBROMETRY

3D-Single Point

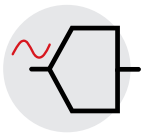
Multi Channel Fiber
- Up to 4 x channels
- Differential measurements

SMART MULTI-FIBER

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

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

General specifications



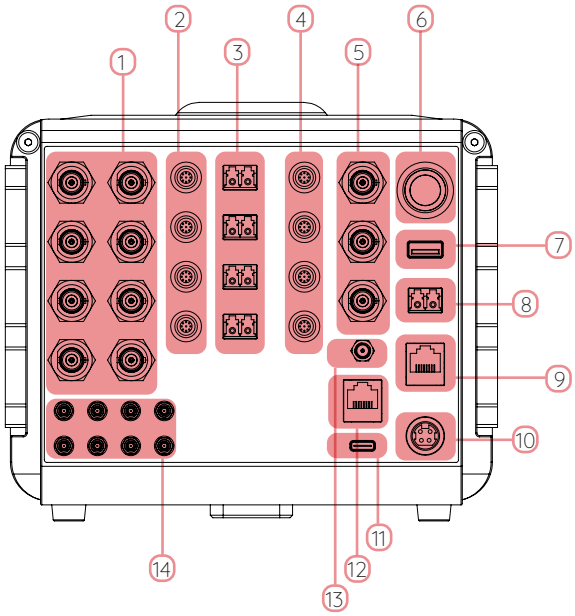
Overview

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 signals
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.

Connectivity

Schematic



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

Inputs and outputs

	Connector type	Characteristics	Description
Optical fiber	Up to 4 x fiber quick connects (LC-Duplex) Up to 4 x fiber head power (LEMO)	Connect up to 4 x fiber heads or 1 x 3D-Fiber head	• 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 signal
Analog signal inputs	Up to 4 x LEMO Up to 4 x 3 = 12 channels	± 1 V / ± 10 V (switchable) 24-bit A/D converter per channel 1.5 MSPS sample rate	• Synchronous reference signal recording up to 750 kHz on 12 channels • Support for IEPE (Integrated Electronic Piezoelectric), TEDS and DC/AC coupling • Input impedance: 1 MOhm ‖ 20 pF (optional 1 GOhm ‖ 3 pF)

	Connector type	Characteristics	Description
Analog HF signal inputs	Up to 3 x BNC	± 2 V 14-bit A/D converter 312.5 MSPS sample rate	• Synchronous HF signal recording up to 50 MHz on 3 channels • Input impedance: 50 Ohm
Analog signal outputs	Up to 8 x BNC Up to 8 independent channels	± 2 V 16-bit D/A converter 312.5 MSPS sample rate	• Versatile signal outputs: Analog velocity, displacement, acceleration and arbitrary signal generator • Generate various preset functions (sine, chirp, gaussian, ...) or load arbitrary signals • Source impedance: 50 Ohm
Trigger inputs	2 x SMB		• Digital external trigger input for the device • Input impedance: 50 Ohm
Trigger outputs	2 x SMB		• Digital trigger output for external devices • Source impedance: 50 Ohm

Digital interface

	Connector type	Characteristics	Description
Ethernet (copper)	Up to 2 x RJ45	1 Gbit/s data rate	• Stream the measurement data over Ethernet with up to 312.5 MSPS and 48-bit • Digital remote control of device settings • Interface with digital data acquisition and analysis software SMART Lab • Use your device as control hub for your Ethernet-based equipment
Ethernet (fiber optical)	Up to 2 x LC-Duplex	10 Gbit/s / 1 Gbit/s data rate (switchable)	• Stream the measurement data over Ethernet with up to 312.5 MSPS and 48-bit • Digital remote control of device settings • Interface with data acquisition and analysis software SMART Lab • PTP-based synchronization with other SMART series devices • Up to 20 km range (up to 160 km on request)

Connectivity options

	Connection type	Description
Synchronization	4 x SMB	• 2 x synchronization inputs (Input impedance: 50 Ohm, 3.3 V or 5 V) • 2 x synchronization outputs (Source impedance: 50 Ohm, 3.3 V) • Frequency synchronization with external devices using 10 MHz signals • Frequency & phase synchronization with external devices via PPS (Pulse per second)
USB	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
Wireless	Bluetooth 5.2 Wi-Fi 7	• Bluetooth: connect human interface devices such as keyboard, mouse or headphones to the vibrometer • Wi-Fi: control your vibrometer wirelessly and stream measurement data over the air
GNSS-module	GPS, Galileo, GLONASS and BeiDou	• Precise absolute time and position information using global navigation satellite systems (GNSS) • External antenna connector
Inertial measurement unit (IMU)		• Synchronous recording of the vibrometer's acceleration and orientation • Vibration monitoring of vibrometer enables detection of disturbances • More accurate alignment with your test object

Configurable options

Frequency options

Frequency 250 kHz	Measure frequencies up to 250 kHz, covering the entire acoustic range and beyond	S
Frequency 5 MHz	Measure frequencies up to 5 MHz	O
Frequency 15 MHz	Measure frequencies up to 15 MHz	O
Frequency 25 MHz	Measure frequencies up to 25 MHz	O
Frequency 35 MHz	Measure frequencies up to 35 MHz	O
Frequency 50 MHz	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
Pro	Measure velocities up to 35 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	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

Measurement 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

Warranty

Waranty	12 months	S
Warranty extension	Extension of standard warranty by 12 months	O

Maintenance

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

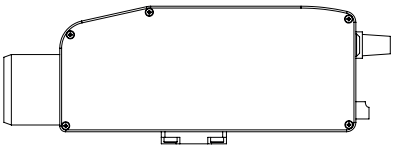
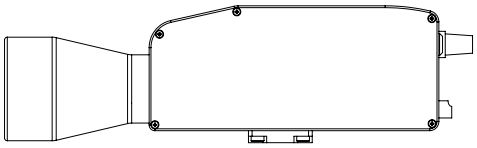
Transport case	• Stable and waterproof Peli case for safe storage and transport of the vibrometer • External dimensions (L x W x H): 62 x 49 x 22 cm	S	
Fiber head transport case	Safely stow and transport your fiber head in a high-quality Peli case	S	
Transport bag	Compact and light transport bag for 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

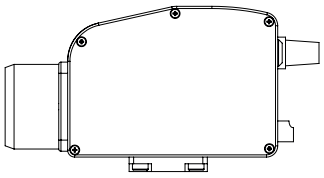
Overview

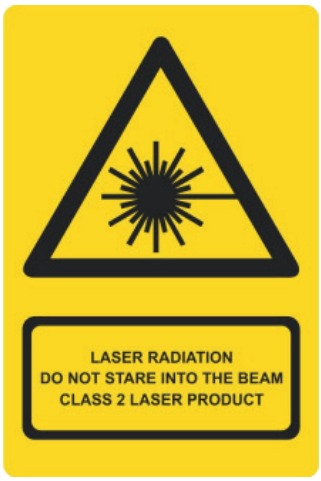
Working distances	• Variable working distance from 25 mm to 100 m • Choice of various fiber heads
Laser wavelength	Measurement laser: 1550 nm, Target laser: 510-530 nm
Laser safety class	• Measurement laser: output power: <10 mW, class 1 • Target laser: output power: <1 mW, class 2
Optics	Auto-, and manual focusing

Autofocus fiber heads

		
	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

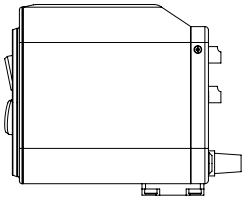
Fixed focus fiber head

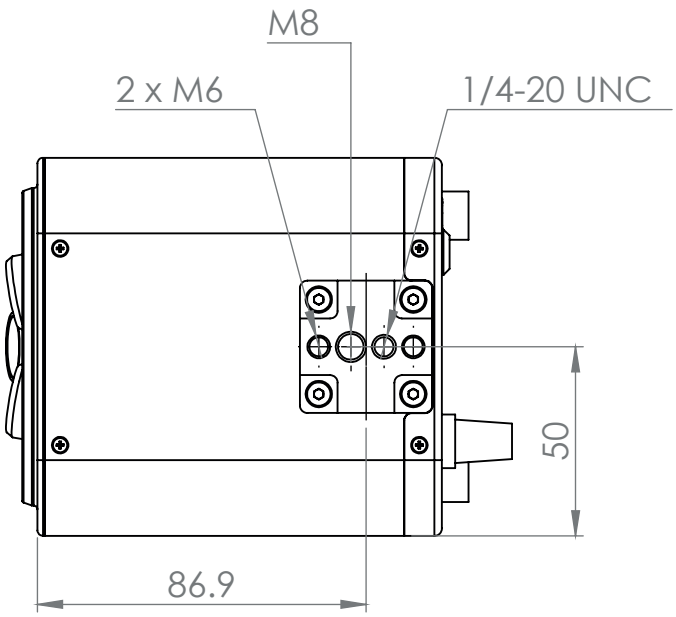
			
	Compact fiber head with fixed working distance		
	Dimensions (L x W x H): 94 mm x 43 mm x 68 mm (excluding lens)		
Lens options	Spot size (m)	Focal length (mm)	Working distance (mm)
25 mm	25	40	25
37 mm	29	50	37
64 mm	43	75	64
89 mm	61	100	89
139 mm	90	150	139
189 mm	118	200	189



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

3D fiber head

	
	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


M8
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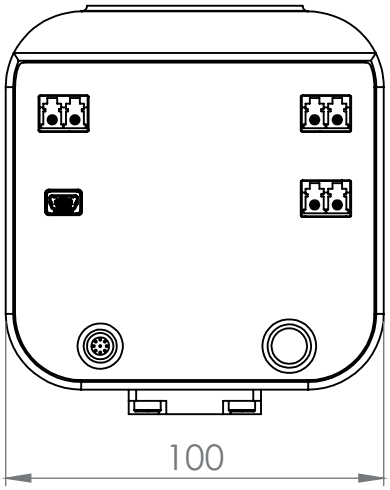
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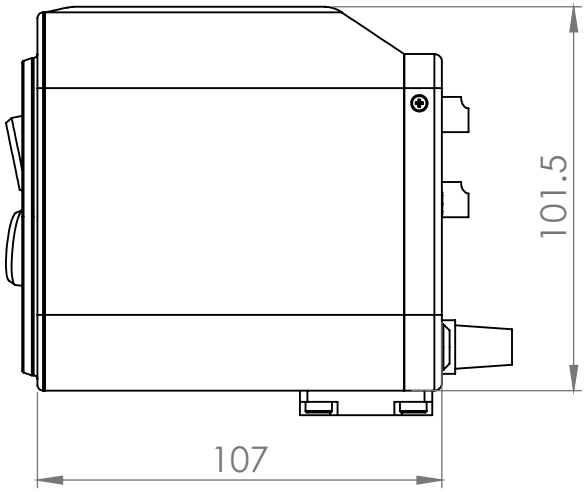
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Software SMART Lab

Highlights

- Lifetime license with no recurring costs
- Installation on any capable computer with Windows 10 / Windows 11
- 1 x license key included (via dongle or online license key)
- Analysis of measurement files for up to 3 users with a single software license
- Connection and control of multiple vibrometers simultaneously for reference, multipoint, and 3D vibration measurements
- Selection of measurement point on loaded 3D-model
- Convenient access to all data in a single software - from vibrometers to multiple reference sensors
- Seamless switching between time and frequency domain representation
- Multichannel arbitrary signal generator for generating predefined signals (sine, sine sweep, square, random, etc.) or custom signals from imported .csv or .wav files
- Real-time signal analysis and enhancement based on speckle tracking and intelligent averaging
- Calculation of various frequency functions: FRF, FFT, auto-spectrum, cross-spectrum, coherence
- Multithreading export of time data, all frequency functions, and reference channel data into the Universal File Format (.uff), Hierarchical Data Format (.hdf5), and MATLAB® file format (.mat)
- Save and load all settings and measurement data in Optomet File Format

SMART Lab - 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
Acquisition module	• 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 and frequency 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 velocity/displacement/acceleration data
Analysis module	• 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 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.

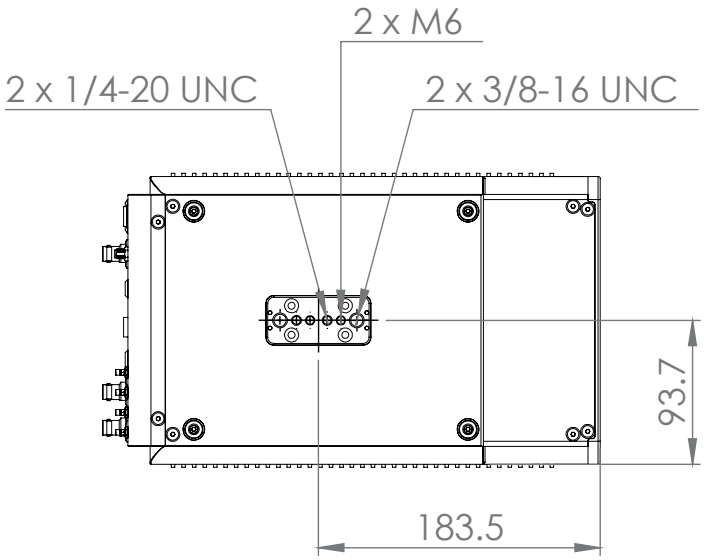
SMART Lab - Software updates

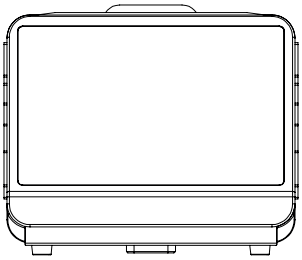
2 years of included software updates	S
Extension of software updates by 2 years	O

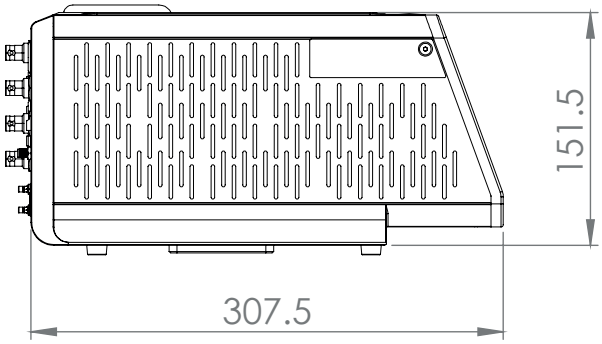
Mechanical parameters

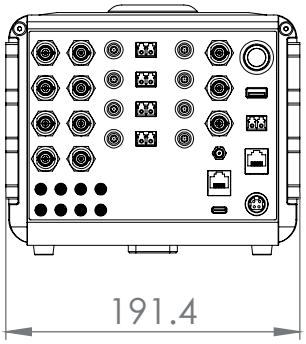
SMART Multi-Fiber

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

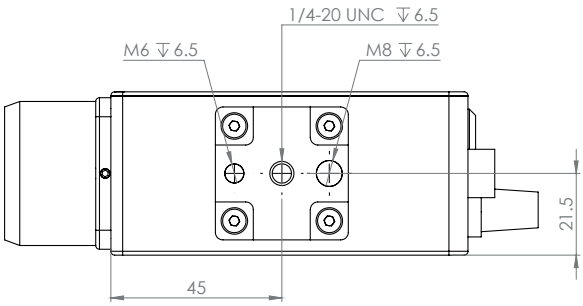


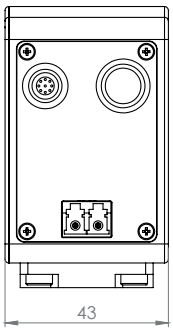


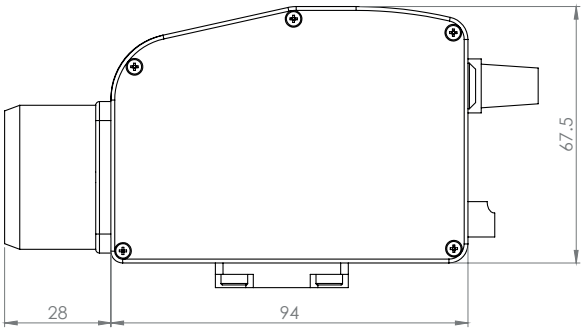




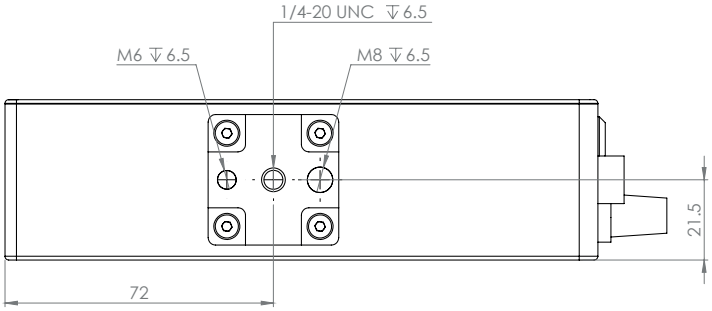
Fixed focus fiber head

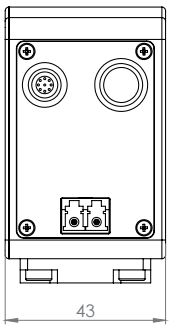


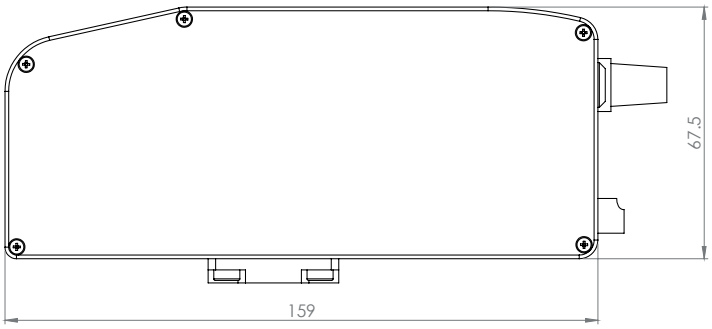




Autofocus fiber head







Optomet GmbH
Pfungstaedter Strasse 92
64297 Darmstadt
Germany

Tel.: +49 6151 38432-0
Fax: +49 6151 3688460

sales@optomet.de
https://www.optomet.com

optomet.
LASER VIBROMETRY