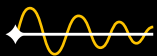




VibroFlex Connect+ //

Preliminary datasheet



Flexible core of the modular
vibration sensing system

The Polytec VibroFlex laser Doppler vibrometer is a modular high-performance solution for non-contact vibration measurement. It offers unrivalled measurement performance and versatility for solving demanding vibration and acoustics tasks in both R&D and industrial quality control.

The VibroFlex family combines the Connect+ front-end with a selection of non-contact laser sensor heads. Together with the VibSoft data acquisition and analysis software, the vibration measurement system is ready to go for transfer function measurements, order analysis and structural dynamics from nano to macro structures, without contact and with laser precision.

At the core of VibroFlex is the Connect+ front-end with latest FPGA-based decoding technology, providing synchronous

digital and analog outputs for velocity, displacement and acceleration. Configure your options freely, upgrade later and stay future-proof. A built-in reference channel and integrated signal generator enable direct excitation and phase-synchronous measurements, while the encoder and tacho input support powerful order analysis and run-ups. Its high-performance signal processing assures reliable measurement data even under challenging conditions. Keep track of all relevant parameters and control the system via PC, web browser or the 7" large touch screen, thanks to Ethernet and WiFi connectivity and a no-touch concept that avoids any influence on the measurement.

VibroFlex – the superior flexibility of laser vibration measurement.

Highlights //

High-performance non-contact vibration measurement solution



Flexible, modular sensor solution that adapts to your needs



Reference channel & signal generator for transfer function measurements



Synchronous output of displacement, velocity and acceleration

Measure from DC to 32 MHz up to ± 30 m/s with highest time resolution



Encoder and Tacho input for order analysis and run-ups



VibroLink digital interface for comfortable measurement data transfer via Ethernet or WIFI (TCP/IP)



Supports QTec sensor heads with patented multi-path interferometer for best SNR

Technical data //

General specifications

Model	VibroFlex Connect VFX-F-120
Interface/display	7" color touch screen with interactive menu guidance for setup of front-end and sensor heads
Dimensions [W x H x D]	285 x 140 x 383 mm (11.2 x 5.5 x 15.1 inch)
Weight	ca. 7.3 kg
Protection class	IP20
Operating temperature	+0...+40 °C (32...104 °F)
Storage temperature	-10...+65 °C (14...149 °F)
Relative humidity	max. 80 %, non-condensing
Power supply	100...240 VAC ±10 %, 50/60 Hz
Power consumption	max. 150 VA

Metrological specifications

Analog signal outputs	3 BNC connectors ($\pm 1\text{ V @ }50\ \Omega$; $\pm 2\text{ V @ }1\text{ M}\Omega$) for simultaneous and phase synchronized output of velocity, displacement ¹ and acceleration ¹ <ul style="list-style-type: none"> • Optional signal generator ² ($\pm 5\text{ V @ }50\ \Omega$; $\pm 10\text{ V @ }1\text{ M}\Omega$, max. frequency 32 MHz) • Optional IQ-output for highly precise displacement measurements and metrology applications • Optional VFX-A-004 Metrology interface, e.g. for use in primary calibration systems
Digital signal outputs	VibroLink digital interface for measurement data (velocity) and signal level, requires VibSoft 6.4 (or newer) data acquisition and analysis software. Optional LVDS output for digital signal output up to 3 MHz frequency bandwidth in real time
Frequency bandwidth	DC to 32 MHz ¹ Up to 16 selectable frequency bandwidths ¹ : 1 kHz, 2 kHz, 5 kHz, 10 kHz, 20 kHz, 50 kHz, 100 kHz, 200 kHz, 500 kHz, 1 MHz, 1.5 MHz, 3 MHz, 6 MHz, 12 MHz, 24 MHz, 32 MHz
Max. velocity	$\pm 30\text{ m/s}^1$
High pass filters	Can be chosen individually for velocity, displacement and acceleration signal: 1 Hz, 2 Hz, 4 Hz, 8 Hz, 15 Hz, 30 Hz, 60 Hz, 120 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 15 kHz, 30 kHz, 60 kHz (depending on selected frequency bandwidth)
Low pass filters	Defined by selected frequency bandwidth (see above)
Tracking filter	4 modes: off, slow, medium, fast

¹ Depending on configuration

² Requires VibSoft software or Device communication driver

³ Digital data transfer with WiFi up to at least 3 MHz

⁴ Also supports MLV-I-120 Sensor Head Xtra (might require Firmware upgrade of the sensor head)

Continued table p. 4 ->

Metrological specifications

Signal level	<ul style="list-style-type: none">• Bargraph on touch screen and on sensor head• Output as DC voltage signal (BNC, 0 ... 2 V)
Input signal	<p>REF IN ²: reference signal, ranges: ± 1 V, ± 2 V, ± 5 V, ± 10 V, Resolution: 14 bit</p> <p>TACHO IN ²: tacho or encoder input</p> <ul style="list-style-type: none">• Speed range: max. 20,000 rpm @ 4096 pulses per rotation• Pulse frequency: max. 1.365 MHz,• Logic level: TTL or LVTTTL, differential or single ended• Modes: A+B+(N) or A+(N)• Sensor power supply: +5 V or +12 V / 500 mA <p>CLEAR IN: resets displacement signal to zero (BNC); Analog mode and digital mode (TTL)</p> <p>TRIG IN: Trigger Signal input (3 modes: Data Stream Only, Autofocus and Laser On/Off)</p>
PC interface	Via integrated VibroLink connector and data cable (Ethernet) or WiFi ³ : remote control of the instrument settings and digital transfer of measured velocity data to the VibSoft data acquisition and analysis software (requires VibSoft 6.4 or newer) or Device Communication driver. Also allows remote control via Web Interface when used as a standalone sensor
Compatible sensor heads	<ul style="list-style-type: none">• VibroFlex Neo• VibroFlex Xtra ⁴, VibroFlex Xtra Fiber• VibroFlex Compact• VibroFlex QTec, VibroFlex Range• VibroFlex Fiber
Supported sensor head wavelengths	<ul style="list-style-type: none">• Visible red (633 nm)• SWIR (infrared 1550 nm with green pilot laser)

¹ Depending on configuration

² Requires VibSoft software or Device communication driver

³ Digital data transfer with WiFi up to at least 3 MHz

⁴ Also supports MLV-I-120 Sensor Head Xtra (might require Firmware upgrade of the sensor head)

Configurable options //

The VibroFlex Connect front-end offers a lot of flexibility: thanks to its various options for frequency bandwidth, output signals for measurands (velocity, displacement and acceleration), signal enhancement capabilities and accessories, which can be combined freely with each other, it fits perfectly to your application.

Frequency bandwidth

Choose between 4 different maximum frequency bandwidths from 100 kHz to 32 MHz covering the acoustic and the ultrasonic range.

Option	Description	
VFX-L-BW100k	100 kHz maximum frequency bandwidth	S
VFX-L-BW1M	1 MHz maximum frequency bandwidth	O
VFX-L-BW3M	3 MHz maximum frequency bandwidth	O
VFX-L-BW32M	32 MHz maximum frequency bandwidth	O

Velocity output

The velocity limit of minimum ± 6 m/s can be extended to ± 30 m/s by adding performance options (see also page 8). For ultra high resolution measurements, the smallest standard velocity range of 10 mm/s can be complemented by additional velocity ranges down to 1 mm/s.

Maximum velocity options

Option	Description	
VFX-L-VelMax6	Maximum velocity ± 6 m/s	S
VFX-L-VelMax30	Maximum velocity ± 30 m/s	O ¹

¹ Measuring velocities higher than ± 12 m/s requires sensor head VibroFlex Xtra, Xtra Fiber, QTec or Range

Velocity resolution options

Option	Description	
VFX-L-VelResHigh	High resolution Most sensitive measurement range ± 10 mm/s (peak)	S
VFX-L-VelResUltra	Super fine resolution Extra fine resolution thanks to additional velocity measurement ranges. Most sensitive measurement range ± 1 mm/s (peak)	O

S = Standard / O = Option

Displacement output

In addition to the velocity output, the displacement output option can be added. For resolving smallest movements, ultra fine measurement ranges can be chosen (see also page 10). The included extra large displacement ranges allow measuring up to ± 2.5 m when using a sensor head and front lens with corresponding depth of field.

Displacement output options

Option	Description	
VFX-L-DispOut	Displacement output with most sensitive measurement range ± 0.5 μm (peak) with a resolution of 16 μm	S
VFX-L-DispOutUltra	Displacement output with most sensitive measurement range ± 10 nm (peak) with a resolution of 0.3 μm	O

Acceleration output (VFX-L-AccOut)

Adding the acceleration output option enables measuring accelerations up to 100×10^6 m/s² at frequencies up to 3 MHz (see also page 11). Recommended for measuring frequencies up to 100 kHz.

Digital signal output in real time via LVDS (VFX-L-LVDSOut)

LVDS output for digital signal output up to 3 MHz frequency bandwidth in real time. The option enables output of one or two of the measurement signals velocity, displacement (if available), acceleration (if available) or RSSI. The digital data acquisition via LVDS requires special software and hardware, which needs to be provided by the user. For using the LVDS output, it is recommended to select a frequency bandwidth of 200 kHz or higher.

Data acquisition via Reference Channel (VFX-L-REF1)

The analog data acquisition input channel allows synchronous data acquisition of an additional sensor, e.g. signals of an additional vibration sensor for determining frequency response functions (FRF) or transfer functions up to the maximum frequency bandwidth configured for the laser vibrometer (maximum 32 MHz).


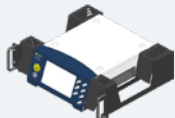

Signal Generator (VFX-L-SigGenOut)

The signal generator output allows an excitation of the sample for analyzing its dynamic behavior. Configuration and control is integrated in VibSoft software or is alternatively possible with the Device Communication driver.

Tacho and Encoder Input (VFX-L-TachoIn)

For analyzing rotating samples depending on rotational speed or rotor position, external tacho or encoder signals can be processed synchronously with the laser vibrometer and reference signal. The signal is transferred digitally to VibSoft software or can be acquired in custom software projects with the Device Communication driver.

Accessories //

Option	Description		
VFX-C-100-S05 Sensor Cable 5 m	Sensor cable with quick lock connectors for connecting a VibroFlex sensor head to the VibroFlex Connect front-end (length 5 m)	S	
VFX-C-100-S20 Sensor Cable 20 m	Sensor cable with quick lock connectors for connecting a VibroFlex sensor head to the VibroFlex Connect front-end (length 20 m)	O	
VFX-C-110-Sxx Sensor Cable xx m	Sensor cable with robust and easy to use push-pull connector for connecting a VibroFlex Range sensor head. Lengths: 5 m, 10 m or 20 m	O	
VFX-C-100-D02 Data Cable	Data cable (length 2 m) for connecting VibroFlex Connect to a computer. Industrial grade connector M12 and RJ45 (Ethernet, X-coded). Allows configuration via web browser and data transfer via VibroLink	S	
VIB-E-715 PTP Junction Box	Allows clock synchronization of digital measurement signals in PTP based data acquisition systems. Currently support for Müller-BBM's PAK live technology.	O	
VFX-A-004 Metrology Interface	The Metrology Interface enables the usage of VibroFlex Vibrometers in primary calibration system	O	
A-RMK-0001 Rack Mounting Kit	Rack Mounting Kit with two handles on the front and additional flanges for mounting the VibroFlex Connect front-end in a 19" rack	O	
VIB-A-CAS22 Transportation Case	Transportation Case for VibroFlex Connect+	O	

S = Standard / O = Option

VibSoft data acquisition and analysis software

VibSoft is a comprehensive and easy-to-use software package for digital vibration data acquisition and analysis. VibSoft closes the gap between raw signal acquisition and profound analysis of vibration measurement data. The VibroLink interface allows for direct and fully digital data acquisition via Ethernet up to 32 MHz. Additional sensor signals from the reference channel as well as tacho and encoder input can be analyzed and controlling the internal signal generator allows exciting the sample. Further options like the powerful SignalProcessor (a Polytec math library for post-processing) and a scripting engine for individual post-processing and control make VibSoft an extremely powerful tool.

Polytec offers a wide range of accessories for setting up and performing measurements. Please contact your local vibrometer sales engineer or visit our website polytec.com/vibroflex for more detailed information.

Velocity performance specifications //

Measurement range (peak)	Maximum frequency range ¹	Optimum frequency bandwidth f_{opt}	Typical resolution ² at frequency bandwidth f_{opt} for sensor heads VibroFlex						Range	Maximum acceleration	
			Neo, Compact	Fiber	Xtra ³	Xtra Fiber (F02)	QTec ³				
m/s	kHz	kHz	nm/s √Hz	nm/s √Hz	nm/s √Hz	nm/s √Hz	nm/s √Hz	nm/s √Hz	km/s ²		
0.001	200	1	1.5	9	4	7	8	4	1.250	O ⁴	
0.002	200	2	1.5	6	4	10	10	6	3,140	O ⁴	
0.005	200	5	2	6	6	20	15	12	6,280	O ⁴	
0.01	3,000	10	3	4	8	35	20	15	188	S	
0.02	3,000	20	7	5	12	60	25	25	376	S	
0.05	3,000	50	10	11	30	180	40	75	942	S	
0.1	32,000	100	18	25	80	250	75	120	20,100	S	
0.2	32,000	200	40	40	300	250	120	150	40,200	S	
0.5	32,000	500	70	100	600	300	250	200	100,500	S	
1	32,000	1,000	150	200	600	600	400	350	201,000	S	
2	32,000	3,000	400	450	1,300	1,500	800	750	402,000	S	
5	32,000	6,000	800	900	2,400	2,600	1,200	1,500	1,000,000	S	
6	32,000	6,000	800	900	2,400	2,600	1,200	1,500	1,200,000	S	
10	32,000	12,000	1,600	1,500	5,000	5,000	3,000	3,000	2,010,000	O	
12	200	50	300	400					15,000	O	
	32,000	12,000			5,000	5,000	3,000	3,000	2,400,000		
20	32,000	32,000			10,000	10,000	6,000	6,000	4,020,000	O	
25	32,000	32,000			10,000	10,000	6,000	6,000	5,020,000	O	
30	200	50			1,000	1,000	1,000	1,000	37,600	O	

S = Standard / O = Option

¹ Frequency range from 0 Hz up to given value. Maximum frequency bandwidth depending on system configuration

² The noise-limited resolution is defined as the signal amplitude (rms) at which the signal-to-noise ratio is 0 dB and with 1 Hz spectral resolution
Maximum linearity error: 0.5% for all measurement ranges

³ Values applicable for free beam front lenses VFX-O-SRI and VFX-O-LRI

⁴ Requires option VFX-L-VelResUltra

Displacement performance specification //

Measurement range (peak)	Maximum frequency range ¹	Resolution ²	VFX-L...	
			DispOut	DispOutUltra
µm	kHz	pm		
0.01	32,000	0.31		x
0.02	32,000	0.63		x
0.05	32,000	1.56		x
0.1	32,000	3.13		x
0.2	32,000	6.25		x
0.5	32,000	15.63	x	x
1	32,000	31.25	x	x
2	32,000	62.5	x	x
5	32,000	156.3	x	x
10	32,000	312.5	x	x
20	32,000	625	x	x
50	32,000	1,563	x	x
100	32,000	3,125	x	x
200	32,000	6,250	x	x
500	32,000	15,625	x	x
1,000	32,000	31,250	x	x
2,000	32,000	62,500	x	x
5,000	32,000	156,250	x	x
10,000	32,000	312,500	x	x
20,000	32,000	625,000	x	x
50,000	32,000	1,562,500	x	x
100,000	32,000	3,125,000	x	x
200,000	32,000	6,250,000	x	x
500,000	32,000	15,625,000	x	x
1,000,000	32,000	31,250,000	x	x
2,500,000	32,000	78,125,000	x	x

¹ Frequency range from 0 Hz to the given value. Maximum frequency bandwidth depending on system configuration.

² The resolution corresponds to the quantization step at the analog output. Noise limited resolution: < 30 fm/√Hz for sensor heads VibroFlex Neo and VibroFlex Compact, < 45 fm/√Hz for sensor head VibroFlex Fiber, < 100 fm/√Hz for VibroFlex Xtra, < 570 fm/√Hz for VibroFlex Xtra Fiber (F02), < 230 fm/√Hz for VibroFlex Range and < 125 fm/√Hz for VibroFlex QTec 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 an 1 Hz spectral resolution. It is frequency dependent and specified for frequencies of 50 kHz.

Acceleration performance specifications //

Measurement range (peak)	Maximum frequency range ¹	VFX-L-AccOut
m/s ²	kHz	
10	3,000	x
20	3,000	x
50	3,000	x
100	3,000	x
200	3,000	x
500	3,000	x
1,000	3,000	x
2,000	3,000	x
5,000	3,000	x
10,000	3,000	x
20,000	3,000	x

Measurement range (peak)	Maximum frequency range ¹	VFX-L-AccOut
m/s ²	kHz	
50,000	3,000	x
100,000	3,000	x
200,000	3,000	x
500,000	3,000	x
1,000,000	3,000	x
2,000,000	3,000	x
5,000,000	3,000	x
10,000,000	3,000	x
20,000,000	3,000	x
50,000,000	3,000	x
100,000,000	3,000	x

Typical resolution for acceleration at 1 kHz:

9.4 $\mu\text{m/s}^2/\sqrt{\text{Hz}}$ (0.96 $\mu\text{g}/\sqrt{\text{Hz}}$) for VibroFlex Neo or Compact

57 $\mu\text{m/s}^2/\sqrt{\text{Hz}}$ (5.8 $\mu\text{g}/\sqrt{\text{Hz}}$) for VibroFlex Fiber

25 $\mu\text{m/s}^2/\sqrt{\text{Hz}}$ (2.6 $\mu\text{g}/\sqrt{\text{Hz}}$) for VibroFlex Xtra

44 $\mu\text{m/s}^2/\sqrt{\text{Hz}}$ (4.5 $\mu\text{g}/\sqrt{\text{Hz}}$) for VibroFlex Xtra Fiber (F02)

50 $\mu\text{m/s}^2/\sqrt{\text{Hz}}$ (5.1 $\mu\text{g}/\sqrt{\text{Hz}}$) for VibroFlex QTec

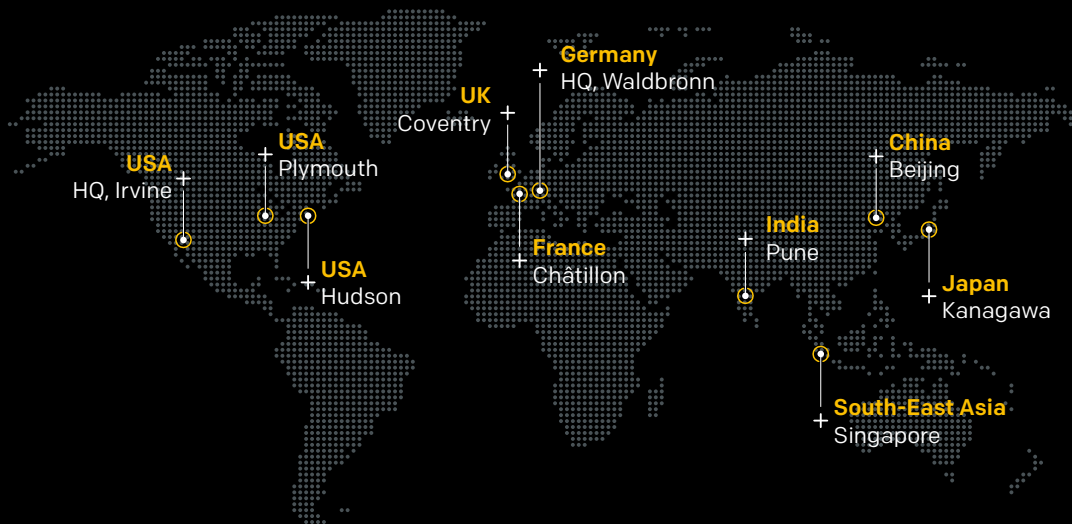
25 $\mu\text{m/s}^2/\text{s}\sqrt{\text{Hz}}$ (2.6 $\mu\text{g}/\sqrt{\text{Hz}}$) for VibroFlex Range

¹ Frequency range from 0 Hz to the given value. Maximum frequency bandwidth depending on system configuration.

For acceleration measurements a maximum frequency bandwidth of 100 kHz is recommended.

Compliance with standards

Laser safety	IEC/EN 60825-1
Electrical safety	IEC/EN 61010-1
EMC	IEC/EN 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
RoHS	IEC/EN 63000



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