

## UHF-120 Ultra High Frequency Vibrometer

Next generation micro- and nanotechnology devices such as micro-acoustic filters, RF-MEMS and ultrasonic transducers involve high frequency mechanical vibration and wave propagation approaching GHz frequencies. For microscopic devices operating at these frequencies only sophisticated optical techniques can provide the spatial resolution, zero mass loading and vibration sensitivity required for proper characterization.

The Polytec UHF-120 Ultra High Frequency Vibrometer captures real-time, out-of-plane motions of micro devices with picometer sensitivity and a measurement bandwidth of up to 2.4 GHz. Options provide for either a manual point-by-point system (VibSoft) or an automated scanning system (PSV Soft) capturing and analyzing deflection shapes.



### Highlights

- Non-contact, load-free, optical vibration measurement
- Capture transient events in real-time at up to 2.4 GHz
- Time and frequency resolved deflection shapes
- Precise micro-acoustic device and RF-MEMS characterization

## UHF-120 Ultra High Frequency Vibrometer

Non-contact vibration measurement up to 2.4 GHz

Datasheet



# Technical data



## Metrological specifications

Max. vibration frequency	600 MHz	1.2 GHz (optional)	2.4 GHz (optional)
Maximum measurement time	3.906 ms	3.906 ms	1.963 ms
Max. sample rate	40 GSa/s		
Amplitude resolution of UHF-A-120 data acquisition	8 bit		
Displacement-amplitude resolution	1.5 pm at 2.5 kHz resolution bandwidth (corresponds to 30 fm/ $\sqrt{\text{Hz}}$ )		
Max. number of FFT lines for a vibration spectrum	2,343,750	4,687,500	2,343,750
Best frequency resolution	256 Hz	256 Hz	512 Hz
Number of reference channels	1		

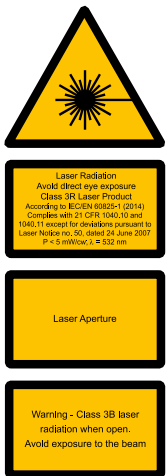
## Optical specifications

Laser type	solid state
Laser wavelength	532 nm, visible green beam
Laser spot diameter	< 2.5 $\mu\text{m}$ ( $1/e^2$ ) <sup>1</sup>
Laser output	< 5 mW <sup>2</sup>
Laser protection class	Class 3R
Camera type	1/4" CCD color board camera
Active pixels (H x V)	510 x 492
Illumination	integrated, bright-field
Objective	20x microscope objective <sup>3</sup>
Field of view	0.71 mm x 0.55 mm (aprox.)
Working distance	20 mm

<sup>1</sup> with 20x microscope objective

<sup>2</sup> with gate function to minimize energy transfer to specimen

<sup>3</sup> interchangeable with optional objectives, see accessories table below



## UHF-120 system configurations

	UHF-120 Ultra High Frequency Vibrometer	UHF-120-SV Scanning Ultra High Frequency Vibrometer
Vibrometer system	<ul style="list-style-type: none"> <li>■ UHF-I-120 Sensor Head</li> <li>■ UHF-E-120 Controller</li> </ul>	
Data acquisition & Data management system	<ul style="list-style-type: none"> <li>■ UHF-A-121 LeCroy Oscilloscope and Digitizer</li> <li>■ PC-I UHF 19" Industrial PC, 24" (61 cm) TFT monitor, keyboard and mouse</li> </ul>	
Software	<ul style="list-style-type: none"> <li>■ VibSoft system software</li> </ul>	<ul style="list-style-type: none"> <li>■ PSV system software</li> </ul>
XY-Stage	<ul style="list-style-type: none"> <li>manual stage (optional)</li> </ul>	<ul style="list-style-type: none"> <li>■ A-PST-200P XY Precision Positioning Stage</li> <li>■ A-CTR-110 Axis Controller</li> <li>■ A-JST-0001 Joystick</li> </ul>
Accessories	<ul style="list-style-type: none"> <li>■ A-CAB-BAS System Cabinet for 19" electronic components</li> <li>■ A-MOB-020X 20x Microscope Objective<sup>3</sup></li> <li>■ UHF-A-SAW SAW Filter test sample</li> <li>■ A-LSG-0532 Laser Safety Goggles</li> <li>■ Hardware manual, software manual and theory manual</li> </ul>	

<sup>3</sup> interchangeable with optional objectives, see accessories table below

<b>UHF-I-120 Sensor Head</b>	
Dimensions [W x D x H]	158 x 129 x 376 mm
Weight	11.4 kg

<b>Specification of motion axes</b>		
<b>XY-Stage</b>	<b>A-SPK-0002 Sample Positioning Kit (optional)</b>	<b>A-PST-200P XY Precision Positioning Stage</b>
Dimensions [W x D x H]	161 x 158 x 116 mm <sup>3</sup>	310 x 310 x 135 mm <sup>3</sup>
Weight	1.8 kg	21.6 kg
Lateral travel range	13 mm x 13 mm, manually actuated	200 mm x 200 mm, motorized
Repeatability (bi-directional)	N/A	+/- 0.5 µm
Tip-Tilt range	+/- 2.5°, manually actuated	+/- 2.5°, manually actuated
Load capacity	0.9 kg	10.0 kg

<b>General specifications</b>	
Power	100 VAC... 240 VAC ±10%, 50/60 Hz 500 VA (typical)
Environmental conditions	Operating temperature: +18 °C ... +30 °C (64.4 °F ... 86 °C); Storage temperature: -10 °C ... +65 °C (14 °F ... 149 °F); Relative humidity: max. 80%, non-condensing

<b>Compliance with standards</b>		
Electrical safety	Norm1: IEC/EN 61010-1:2011-07	Norm2: IEC/EN 61326-1:2013-07
	Emission: FCC Class A, 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	

<b>Options and accessories</b>	
A-ESG-0001 External Signal Generator	Signal generator (Rhode & Schwarz) for sample excitation, at frequency range 9.0 kHz - 3.2 GHz, includes baseband generator with digital modulation (real-time) and 120 MHz RF bandwidth
Stands	<ul style="list-style-type: none"> <li>■ A-STD-BAS-02 Base Stand with manual z-stage</li> <li>■ A-STD-TST-01 Test Stand with motorized z-Stage, required for auto focus</li> </ul>
Tables	<ul style="list-style-type: none"> <li>■ A-TAB-AIR-01 Optical Table, pneumatically controlled</li> <li>■ A-TAB-ELC-01 Optical Table, electronically controlled</li> </ul>
Breadboard	<ul style="list-style-type: none"> <li>■ A-WST-001 Workstation</li> </ul>

<b>Bright-field objectives</b>	<b>Magnification</b>	<b>Working distance (WD) mm</b>	<b>Spot diameter (1/e<sup>2</sup>) µm</b>	<b>Field of view mm x mm</b>
A-MOB-001X	1x	11	< 50	14.2 x 11
A-MOB-002X	2x	34	< 21	7.10 x 5.50
A-MOB-03X6	3.6x	53	< 12	0.39 x 3.00
A-MOB-005X	5x	34	< 10	2.84 x 2.20
A-MOB-010X	10x	34	< 4.5	1.42 x 1.10
A-MOB-10LD	10x	49 <sup>1</sup>	< 4.5	1.42 x 1.10
A-MOB-020X	20x	20	< 2.5	0.71 x 0.55
A-MOB-050X	50x	13	< 2	0.28 x 0.22
A-MOB-100X	100x	6	< 1	0.14 x 0.11

<sup>1</sup> For measurements at a vacuum measurement station with a 6 mm thick glass window, the first glass element can be removed to increase the working distance (WD) up to 56 mm.

<b>i</b>	<b>Software options</b>	<b>UHF-120</b>	<b>UHF-120-SV</b>
	APS Professional for microsystems	For arbitrary definition of measurement points and individual object properties	– S
	Geometry data import	Geometry module for importing geometry data to the PSV software for defining the scan points	– O
	High resolution scan	Up to 512 x 512 scan point density for higher spatial resolution	– S
	Time domain animation	Time domain data are acquired while scanning. Allows for “slow motion” animation e.g. of surface waves propagation or switches. <sup>1</sup>	– S
	Extended FFT lines	Max. number of FFT lines 2,343,750 (4,687,500 with optional bandwidth extension 1.2 GHz).	S S
	Bandwidth extension 1.2 GHz	Extends the acquisition bandwidth to 1.2 GHz	O O
	Bandwidth extension 2.4 GHz	Extends the acquisition bandwidth to 2.4 GHz. <sup>2</sup>	O O
	Signal processor	The user interface to the math library included in the PSV software, designed as an easy-to-use spreadsheet	S S
	UFF interface export filter	Universal File Format data conversion from and to major modal analysis and Finite Element packages	S S
	Data export to ME’scope	Software package for modal analysis including data interface	O O
	Desktop analysis version	Desktop version of the system software for offline post processing and presentation of measurement results	O O
	Macro programming	WinWrap® Basic Engine: Visual Basic® for Applications (VBA) compatible. Allows automation of test routines.	S S
	Polytec file access	API for retrieval of Polytec data via external applications supporting Microsoft’s Component Object Model (COM), e.g. Visual Basic .NET®, C#, MATLAB®, LabVIEW™	S S
<b>Software maintenance package</b>			
	Software maintenance basic	Basic 1-year software maintenance and support including all software updates for the first year of ownership.	S S
	Extended software maintenance	Extended software maintenance and support including all software updates, provided in 1-year increments.	O O
	University program	Lifetime update license for universities and educational institutions (terms and conditions apply)	O O

<sup>1</sup> Time domain acquisition and animation restricted to frequencies up to 1.2 GHz

<sup>2</sup> Requires vibration amplitudes not to exceed the single digit nm range, resonances below 1.2 GHz must be known or negligible  
S: Standard; O: Option; –: Not available

## Shaping the future since 1967

High tech for research and industry.  
Pioneers. Innovators. Perfectionists.

Find your Polytec representative:  
[www.polytec.com/contact](http://www.polytec.com/contact)

**Polytec GmbH · Germany**  
Polytec-Platz 1-7 · 76337 Waldbronn