USER MANUAL

VIBRATION METER

PCE-VM 20

ENGLISH



User manuals in various languages (français, italiano, español, português, nederlands, türk, polski) can be found via our product search on:
www.pce-instruments.com

SAFETY INFORMATION

Please read this user manual carefully and in its entirety before using the device for the first time. The device may only be operated by properly trained personnel. We assume no liability for damage resulting from failure to follow the instructions in this user manual.

- This measuring device may only be used in the manner described in this user manual. Using the measuring instrument for any other purpose may result in dangerous situations.
- Use the measuring instrument only if the environmental conditions (temperature, humidity, etc.) are within the limits specified in the technical specifications. Do not expose the device to extreme temperatures, direct sunlight, extreme humidity, or moisture.
- Do not expose the device to impacts or strong vibrations.
- Do not expose the device to magnetic fields, corrosive substances, or dust.
- Only qualified personnel from PCE Instruments may open the device housing.
- Never use the measuring instrument with wet hands.
- No technical modifications may be made to the device.
- The device should only be cleaned with a cloth. Do not use abrasive cleaners or solvent-based cleaning agents.
- The device may only be used with accessories supplied by PCE Instruments or equivalent replacements.
- Inspect the device's housing for visible damage before each use. If any visible damage is present, the device must not be used.
- The measuring instrument must not be used in an explosive atmosphere.
- The measurement range specified in the technical specifications must not be exceeded under any circumstances.
- Failure to observe the safety instructions may result in damage to the device and injury to the operator.
- Do not place the sensor on surfaces exposed to high voltages. There is a significant risk of injury.
- Keep the sensor cables away from rotating parts.

We assume no liability for typographical errors or inaccuracies in this manual.
We expressly refer you to our general warranty terms, which can be found in our Terms and Conditions.
If you have any questions, please contact PCE Instruments. The contact information can be found at the end of this manual.

TECHNICAL SPECIFICATIONS

Measurement Range	
Frequency	1 ... 10000 Hz
Vibration Acceleration	0 ... 200 m/s² (RMS and Peak)
Vibration Velocity	0 ... 200 mm/s (RMS)
Vibration Displacement	0 ... 2000 µm (Peak-Peak)
Accuracy	
Vibration	±5 %
Temperature	±0,5 % (0 ... +60 °C) ±1 % (-40 ... +120 °C) ±2 % (-70 ... +180 °C) ±4 % (-70 ... +380 °C)
Rotational Speed	±0,1 % ±1 rpm
Resolution	FFT Spectrum 400, 800, 1600 lines
Operating Modes	Vibration Mode
Measured Quantities	Vibration [Hz], Acceleration [mm/s²], Velocity [mm/s], Displacement [µm], Real-time FFT Spectrum
Units	Metric [Hz, mm/s², mm/s, µm]
Data Transmission	USB 2.0
Memory	4 GB microSD card
Operating Time	Up to 8 hours of continuous operation
Power Supply	Li-Po battery
Display	128 x 160 LCD color display, easily readable in sunlight
Environmental Conditions	-10 ... +55 °C / ≤80% relative humidity, non-condensing
Dimensions	132 x 70 x 33 mm
Weight	150 g

Sensor Specifications	
Sensitivity	100 mV/g
Frequency Response	±3 dB (0,5 ... 15000 Hz) ±10 % (2,0 ... 10000 Hz)
Dynamic Range	±50 g, Peak
Power Supply (IEPE)	18 ... 30 V DC
Constant Current Source	2 ... 10 mA
Spectral Noise	At 10 Hz: 14 µg/√Hz At 100 Hz: 2,3 µg/√Hz At 1000 Hz: 2 µg/√Hz
Output Impedance	<100 Ω
Operating Voltage	10 ... 14 V DC
Housing Insulation	>100 MΩ
Environmental Conditions	-50 ... +121 °C
Maximum Shock Protection	5000 g, Peak
Resonance Frequency	23000 Hz
Housing Material	316L stainless steel
Connection	2-pin MIL-C-5015
Protection Rating	IP68
Weight	90 g

SYSTEM DESCRIPTION

The PCE-VM 20 is a compact measuring device for analyzing vibrations. It measures all vibration parameters (acceleration, velocity, displacement, frequency, amplitude). The machine's vibration is analyzed directly using the Fast Fourier Transform (FFT) and displayed graphically. The graphical display can be switched to the respective vibration mode. In addition, the measured values are evaluated according to the ISO 10816 standard and classified using color codes. The measuring device features a route mode for route-based data acquisition for machine monitoring, and the recorded data can be managed using the computer software.

1- USB 2.0 port
2- TFT LCD color display
3- Membrane keyboard
4- Connector (2-pin MIL-C-5015) for magnetic accelerometer
5- Magnetic accelerometer



Button	Label	Function
	On/Off	Turn the device on/off
	Menu	Navigate to the respective settings
	Back	Back, end measurement
	Enter	Enter, confirm selection, start measurement
	Option key F1	Access additional functions
	Up	Navigate up, change measurement mode in vibration measurement
	Down	Navigate down
	Right	Navigate right, select parameters in the menu
	Left	Navigate left, select parameters in the menu

PREPARATION

Power Supply
The device is equipped with a built-in Li-Po battery. Connect the device to a power source using the USB cable to charge it. When the device is turned off and properly connected, a red LED will light up during charging.

Getting Started
To start the device, press the ON/OFF button for 3 seconds until the green LED below the logo begins to light up. The main menu appears as the startup screen. You should first configure the following settings. To do this, use the DOWN navigation button to select Settings and confirm with ENTER.

Date and Time
In the Settings submenu, use the UP/DOWN buttons to navigate to Date/Time and confirm with ENTER. Press F1 and use the UP/DOWN buttons to select the month and year. Then release F1 and select the day. Pressing ENTER takes you to the time setting.
Use the UP and DOWN navigation buttons to set the minutes. Press the Menu button to switch to the Hours field. The selected field is highlighted with a red border. Use the UP/DOWN navigation buttons to set the hours. Confirm your entry by pressing ENTER.

Sensors
The sensor setting is relevant only for vibration measurement. In the Settings submenu, use the UP/DOWN buttons to navigate to Sensors and confirm with ENTER. Use the UP/DOWN buttons to select the sensor used for vibration measurement. You can choose between an IEPE sensor (Sensor 1) or a sensor with a charge output (Sensor 2). Use the Menu button to navigate to the other settings. Type, S.N., and Sens. can be changed using the UP/DOWN buttons, and the respective digit of the value is selected using the navigation buttons. Under Units, the unit for the respective sensor can be set to mV/g or pC/ms². The IEPE sensor is selected as the default sensor upon delivery.

Unit
The Units setting is fixed to metric.

Automatic Shutdown
In the Settings submenu, use the UP/DOWN buttons to navigate to Auto OFF and confirm with ENTER. Use the UP/DOWN buttons to set the desired shutdown time and confirm your entry with ENTER.

Doc Fields...
The Doc Fields setting is not implemented.

OPERATION

Vibration Measurement
Connect the AC 102-1A accelerometer to connector 1 on the device. In the main menu, use the UP/DOWN buttons to select Vibrometer and confirm with ENTER.

Selection
Now you must select the measurement mode from the four listed modes. To do this, use the UP/DOWN buttons to navigate and highlight the desired mode. If you want to change the settings for the selected measurement parameter first, press the Menu button. If you do not want to change the settings, press ENTER directly to enter the measurement mode.

Measurement Mode	Explanation
Acceleration	Vibration acceleration [mm/s²]
Velocity	Vibration velocity [mm/s]
Displacement	Vibration displacement [µm]
ISO 10816	Analysis mode according to ISO 10816 [mm/s]

The ISO 10816 analysis mode compares the measured values with the attached table in accordance with the ISO 10816 standard. In ISO 10816 mode, as shown in the following images, the meter displays the current root mean square (RMS) value for each color according to the ISO 10816 table.

Machine Vibrations (DIN ISO 10816)									
Group		1		2		3		4	
Definition		Large machines P = 300 kW ... 50 MW, electric machines with an axis height h ≥ 315 mm		Medium-sized machines P = 15 kW ... 300 kW, electric machines with an axis height h = 160 ... 315 mm		Pumps with multi-blade impellers and separate drive P > 15 kW		Pumps with multi-blade impellers and integrated drive P > 15 kW	
Lineup		rigid	soft	rigid	soft	rigid	soft	rigid	soft
Vibration velocity in mm/s 10 ... 1000 Hz, n > 800 min -1 1 ... 1000 Hz, n > 120 min -1	11.00 ... ∞	D	D	D	D	D	D	D	D
	7.10 ... 11	D	C	D	D	D	C	D	D
	4.50 ... 7.10	C	B	D	C	C	B	D	C
	3.50 ... 4.50	B	B	C	B	B	B	C	B
	2.80 ... 3.50	B	A	C	B	B	A	C	B
	2.30 ... 2.80	B	A	B	B	B	A	B	B
	1.40 ... 2.30	A	A	B	A	A	A	B	A
	0.0 ... 1.40	A	A	A	A	A	A	A	A
A – very good, B – good, C – critical range, D – unacceptable range									

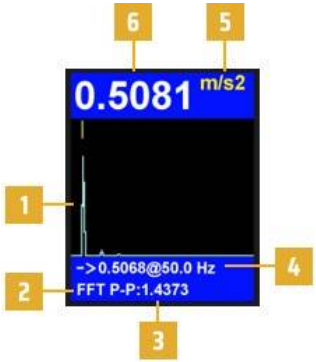
The vibration velocities should be measured in all three axial directions (X, Y, and Z axes) perpendicular to the surface of the machine housing.

Setting the Measurement Mode
When you see the desired measurement mode on the screen, press the Menu button to enter the submenu. Use the UP/DOWN buttons to navigate to the settings you want to adjust, and use the LEFT/ RIGHT buttons to change the values. Then press the BACK button to return to the measurement mode selection.

Function	Explanation	Values
Low Freq	Lower frequency limit	1, 2, 10 Hz
Hi Freq	Upper frequency limit	200 ... 10,000 Hz for acceleration measurement 200 ... 5,000 Hz for velocity measurement 200 ... 800 Hz for displacement measurement
FFT lines	FFT resolution	400, 800, 1600 lines
Trigger	Not implemented	/
Averaging	Averaging	0 ... 64 values, 0 = average value disabled
Window	Window setting	Hanning (Von Hann), Rectangular
ISO Group	ISO setting (Must be adjusted for each machine type based on the table above)	R1&3: Group 1&3, rigid F1&3: Group 1&3, flexible R2&4: Group 2&4, rigid F2&4: Group 2&4, flexible

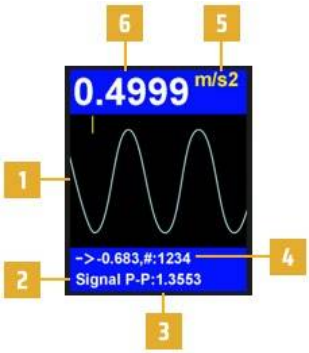
Measurements
If you have not yet selected a measurement mode, start with the Vibration Measurement option. Otherwise, confirm the selected measurement mode by pressing ENTER. The measurement will begin. The FFT mode is shown in the following image. The display is the same in every measurement mode; only the measured quantities differ.

1- FFT Graph
2- FFT Mode
3- Peak-to-Peak Value
4- Max. Amplitude and Frequency of the FFT
5- Unit of the Measurement Mode
6- Current RMS Value



Press the F1 key to access the measurement data table during measurement. Use the UP navigation key to switch between the FFT analysis and the time signal. The time signal is shown in the following figure.

1- Time Signal Graph
2- Time Signal
3- Peak-to-Peak Value
4- Max. Amplitude and Sequential Sample Number
5- Unit of Measurement Mode
6- Current RMS Reading



Additional Measurement Functions
Press the Menu button while a measurement is in progress to access the additional measurement functions. Use the UP/DOWN buttons to navigate to the settings you want to adjust, and use the LEFT/RIGHT buttons to change the values. Then press the Back button to resume the measurement.

Function	Explanation	Values
Save	Save data	/
Format	Graph format	linear, log
Zoom	Zoom in on graph	all, 1 Pixel, 2 Pixel
Audio Out	Adjust volume	0 ... 100 %

Saving Data
- » As described earlier, go to the menu for additional measurement functions and select Save. Confirm your selection by pressing ENTER.
- » The existing folders (**Folder Name) and files (File Name.fft) are displayed. To create a new folder, press F1.
- » By default, the date and time are used as the folder and file names. These names can be changed in the PC software. Navigate to the destination and press the menu button to start the measurement

Route Measurement
The measuring device features a route mode for route-based data collection as part of machine monitoring, and the recorded data can be managed using the computer software. To do this, install the PC software included with the device and connect the device to the PC.

Creating the Route
» Enable the upload function for templates.

» To do this, either click the highlighted tool icon in the toolbar or go to Service > Setup.

» Check the box next to Upload templates as route files to USB devices.

» Confirm your selection by clicking the Save button.

» Create the folder structure as shown in the image (folder TOP1 + three subfolders; folder names can be chosen freely).

» Right-click on the third subfolder, PNT1. Select Add template as shown.

» The Device choice window will open. Select the PCE-VM 20 device and confirm with OK.

» Set the measurement parameters for route measurement. Save the entered data by clicking the Save button. Create as many route files as you need.

» To transfer the files, navigate to the Settings submenu on the PCE-VM 20 device. Select the created route files with the mouse and click the upload selected data to the device icon highlighted in the menu. The route files will be transferred and saved on the device.

Performing the Route Measurement
» Connect the accelerometer to the measurement device's connector and attach the sensor's measuring head to the machine's measurement point. Use the DOWN navigation key in the main menu to go to Documents and confirm with ENTER. Locate the route file (routes.src) in Documents and confirm it with ENTER. The file may also be located in subfolders.

» Use the navigation keys to select the route points. As shown in the images, the route points are numbered in the upper left corner as point 1/2/3/... Start the route measurement by pressing ENTER. The route measurement records the measurement values according to the set parameters.

» Wait until 100% appears on the screen. The file is saved in Documents. Press the Back button to exit route measurement.

DISPOSAL

For the disposal of batteries in the EU, the (EU) 2023/1542 directive of the European Parliament applies. Due to the contained pollutants, batteries must not be disposed of as household waste. They must be given to collection points designed for that purpose. In order to comply with the EU directive 2012/19/EU we take our devices back. We either re-use them or give them to a recycling company which disposes of the devices in line with law. For countries outside the EU, batteries and devices should be disposed of in accordance with your local waste regulations. If you have any questions, please contact PCE Instruments.

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