Deutsch

English

Bedienungsanleitung
User Manual

PCE-VM 20 Beschleunigungsmesser | Accelerometer

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

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v1.0

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Contents

1 Safety notes

Please read this manual carefully and completely before you use the device for the first time. The device may only be used by qualified personnel and repaired by PCE Instruments personnel. Damage or injuries caused by non-observance of the manual are excluded from our liability and not covered by our warranty.

- The device must only be used as described in this instruction manual. If used otherwise, this can cause dangerous situations for the user and damage to the meter.
- The instrument may only be used if the environmental conditions (temperature, relative humidity, …) are within the ranges stated in the technical specifications. Do not expose the device to extreme temperatures, direct sunlight, extreme humidity or moisture.
- Do not expose the device to shocks or strong vibrations.
- Do not expose the meter to magnetic fields, corrosive media or dust.
- The case should only be opened by qualified PCE Instruments personnel.
- Never use the instrument when your hands are wet.
- You must not make any technical changes to the device.
- The appliance should only be cleaned with a damp cloth. Use only pH-neutral cleaner, no abrasives or solvents.
- The device must only be used with accessories from PCE Instruments or equivalent.
- Before each use, inspect the case for visible damage. If any damage is visible, do not use the device.
- Do not use the instrument in explosive atmospheres.
- The measurement range as stated in the specifications must not be exceeded under any circumstances.
- Non-observance of the safety notes can cause damage to the device and injuries to the user.
- Do not place the sensor on surfaces which are subject to high voltages to avoid injuries.
- Keep the sensor cable away from rotating objects.

We do not assume liability for printing errors or any other mistakes in this manual.

We expressly point to our general guarantee terms which can be found in our general terms of business.

If you have any questions please contact PCE Instruments. The contact details can be found at the end of this manual.

2 Specifications

2.1 Technical specifications

Specification	Description
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) Revolutions: ±0.1 % ±1 rpm
Resolution	FFT spectrum 400, 800, 1600 lines
Operating modes	Vibration mode
Measurable parameters	Vibration [Hz], acceleration [mm/s^2], velocity [mm/s], displacement [µm], real-time FFT spectrum
Units	Metric [Hz, mm/s², mm/s, µm]
Data transfer	USB 2.0
Memory	4 GB microSD card
Battery life	Up to 8 h continuous operation
Power supply	Rechargeable lithium polymer battery
Display	128 x 160 colour LCD, easy to read in sunlight
Environmental conditions	-10 … +55 °C / 14 ... 131 °F ≤80 % RH, non-condensing
Dimensions	132 mm x 70 mm x 33 mm
Weight	150 g

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Specifications of the sensor

Model	Specifications	Description
Acceleration sensor AC 102-1A	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
	Bias voltage	10 ... 14 V DC
	Housing insulation	>100 MΩ
	Environmental conditions	-50 ... +121 °C
	Maximum impact protection	5000 g, peak
	Resonant frequency	23000 Hz
	Housing material	316L stainless steel
	Connection	2 Pin MIL-C-5015
	Protection class	IP68
	Weight	90 g

English

2.2 Delivery contents

1 x vibration meter PCE-VM 20
1 x magnetic acceleration sensor with cable (1.8 m / 5.9 ft)
1 x USB cable with charger (100… 240 V AC)
1 x PC software
1 x user manual

2.3 Optional accessories

REFB reflecting tape

3 System description

The PCE-VM 20 is a compact meter for vibration analysis that measures all vibration parameters (acceleration, velocity, displacement, frequency, amplitude). Via Fast Fourier Transformation (FFT), machine vibration is directly analysed and represented graphically. The graphical representation can be adapted to the respective vibration mode. In line with the standard ISO 10816, the readings are also evaluated and classified by colours. For machine monitoring, the meter has a route mode for route-based data acquisition and the collected data can be organised via the computer software.

3.1 Device

1. TFT LCD colour display
2. Membrane keypad
3. Magnetic acceleration sensor

3.2 Interfaces

1. Connection socket (2-pin MIL-C-5015) for magnetic acceleration sensor
2. USB 2.0 port

3.3 Function keys

Key	Designation	Functions
⏻	On/off	On (3 s) Off (press and release)
ENTER ↵	Enter	Entry, confirmation, start mesurement
▲	Up	Navigate up, change measurement mode during vibration measurement
▼	Down	Navigate down
◀	Left	Navigate left, select parameters in menu
▶	Right	Navigate right, select parameters in menu
F1	Option key F1	Call up additional functions
MENU	Menu	Navigate to relevant settings
↩	Back	Back, complete measurement

4 Getting started

4.1 Power supply

The meter is powered by a rechargeable lithium polymer battery. For charging, connect the meter to the power supply via the USB cable. If the meter is turned off and the connection is correct, a red LED will glow during charging.

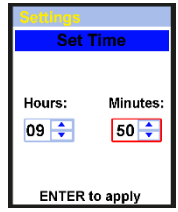
4.2 Start-up

To start the device, press and hold ⏻ for approx. 3 seconds, until the green LED below the PCE logo starts glowing. The main menu will be shown as start screen. Make the following settings first. To do so, go to “Settings“ by pressing the navigation key ▼ and confirm with Enter ↵.

4.2.1 Date and time

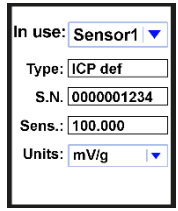
In the sub-menu “Settings“, use the ▲▼ keys to go to “Date/Time“ and confirm with Enter ↵. Press F1 F1 and select the month and year with the ▲▼ keys. Then release F1 F1 and select the day. Confirm with Enter ↵ to get to the time setting.

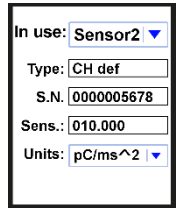
Set the minutes by using the navigation keys ▲▼. Press the Menu key MENU to go to „Hours“. When this field has been selected, it will be bordered in red. Set the hours with the navigation keys ▲▼. Confirm your entry by pressing Enter ↵.



4.2.2 Sensors

The sensor setting is only relevant for vibration measurement. In the sub-menu „Settings“, use the keys ▲▼ to go to ”Sensors“ and confirm with Enter ↵. Use the ▲▼ keys to set the sensor used for vibration measurement. You can choose either the IEPE sensor (Sensor1) or a sensor with charge output (Sensor2). Navigate to further settings with the Menu key MENU. “Type“, “S.N“ and “Sens.“ can be changed via the keys ▲▼ and the respective digit of the value can be selected via the navigation keys ▲▼. Under “Units“, the unit for the respective sensor can be set to mV/g or pC/ms^2.
The IEPE sensor is pre-selected.





4.2.3 Unit

The “Units“ setting is “metric“ and cannot be changed.

4.2.4 Automatische Power Off

In the sub-menu “Settings“, navigate to “Auto OFF“ by using the ▲▼ keys and confirm with Enter ENTER. Set the desired power off time with the ▲▼ keys and confirm your entry with ↩.

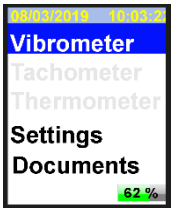
4.2.5 Doc Fields…

The setting „Doc Fields“ is not available.

5 Operation

5.1 Vibration measurement

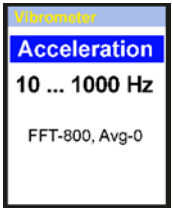
Connect the acceleration sensor AC 102-1A to connection socket 1 of the meter. In the main menu, select “Vibrometer“ by using the ▲▼ keys and confirm your selection with Enter ENTER.

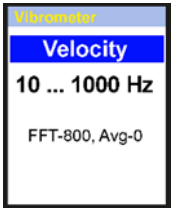


Selection

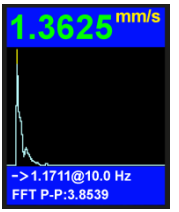
Now select one out of four measuring modes. To do so, navigate up and down with the ▲▼ keys to highlight the desired mode. If you wish to previously change the settings for the selected parameter, press the Menu key MENU (See 5.1.1). If you do not wish to change the setting, directly press Enter ENTER to enter measurement mode.

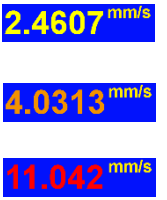
Measuring mode	Description
Acceleration	Vibration acceleration [mm/s^2]
Velocity	Vibration velocity [mm/s]
Displacement	Vibration displacement [µm]
ISO 10816	Analysis mode according to the standard ISO 10816 [mm/s]





In ISO 10816 analysis mode, readings are compared to the following chart according to the standard ISO 10816. As shown in the following images, in ISO 10816 mode the meter will show the current RMS value in the colour it has in the ISO 10816 chart.





Machine vibration (DIN ISO 10816)

Group		1		2		3		4	
Definition		big machines P = 300 kW ... 50 MW, electrical machines with an axle height h of ≥315 mm		medium-sized machines P = 15 kW ... 300 kW, electrical machines with an axle height h of 160 ...315 mm		pumps with multiblade rotors and separate drive P >15 kW		pumps with multiblade rotors and direct drive P >15 kW	
Base		hard	stretch	hard	stretch	hard	stretch	hard	stretch
Vibration velocities 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
	0.00 … 1.40	A	A	A	A	A	A	A	A

A – very good, B – good, C – critical, D – prohibited

Vibration velocity measurements should be made in three axis directions (X, Y and Z axis), vertical to the surface of the machine housing.

5.1.1 Setting the measuring mode

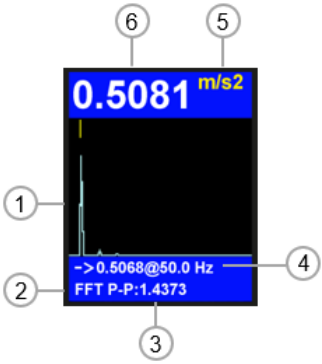
When you see the desired measuring mode on the screen, press the Menu key to enter the sub-menu. Navigate to the settings you wish to make by using the keys and change the values with the keys. Then press the Back key to go back to measurement mode selection.

Function	Description	Values
Low Freq	Lower frequency limit	1, 2, 10 Hz
Hi Freq	Upper frequency limit	200 … 10000 Hz for acceleration measurement 200 … 5000 Hz for velocity measurement 200 … 800 Hz for displacement measurement
FFT lines	FFT resolution	400, 800, 1600 lines
Trigger	Not available	/
Averaging	Averaging	0 … 64 values, 0 = averaging deactivated
Window	Window setting	Hanning, rectangular
ISO Group	ISO setting (Must be adapted to the machine type in line with the chart under 5.1)	R1&3: group 1&3 hard F1&3: group 1&3 stretch R2&4: group 2&4 hard F2&4: group 2&4 stretch

5.1.2 Measurement

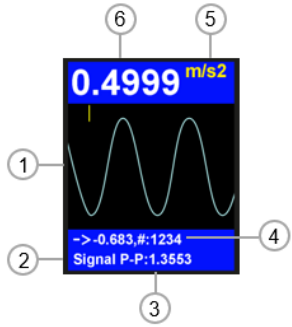
If you have not yet selected a measuring mode, start with chapter 5.1 Vibration measurement. Otherwise confirm your selected measurement mode by pressing Enter. The measurement will be started. In the following image, you can see FFT mode. The display will look the same in any measurement mode. Only the parameters are different.

1. FFT graphic
2. FFT mode
3. Peak-Peak value
4. Max. amplitude and frequency of FFT
5. Unit of measuring mode
6. Current RMS value



Via the F1 key, the chart of measured values can be displayed during the measurement. Via the navigation key ▲, you can switch between FFT analysis and time signal. The time signal is shown in the following image.

1. Time signal graphic
2. Time signal
3. Peak-Peak value
4. Max. amplitude and consecutive sample number
5. Unit of measuring mode
6. Current RMS value



English

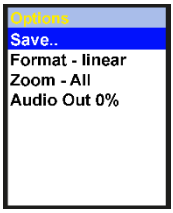
5.1.3 Further measuring functions

Press the Menu key MENU during the measurement to open further measuring functions. Go tot he settings you wish to make by using the ▲▼ keys and change the values with the ◀▶ keys. Then press the Back key ↩ to continue the measurement.

Function	Description	Values
Save	Save data	/
Format	Format of graphic	linear, log
Zoom	Zoom graphic	all, 1 pixel, 2 pixels
Audio Out	Change volume	0 … 100 %

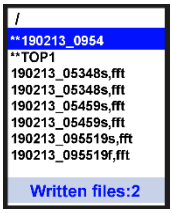
Save data

As described above, go to the menu for further measuring functions and select “Save“. Confirm your selection by pressing Enter ENTER.



The existing folders (**folder name) and files (file name.fft) are displayed. If you wish to create a new folder, press F1 F1.

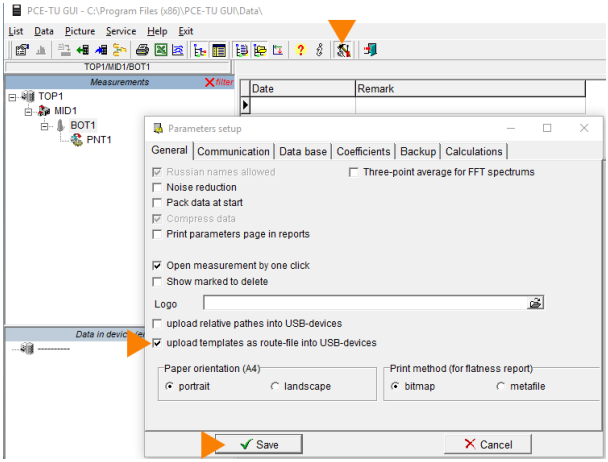
The standard folder and file names consist of the date and time. The names can be changed in the PC software. Navigate to the target and press the Menu key MENU to save the measurement.



5.1.4 Route measurement

For machine monitoring, the meter has a route mode for route-based data acquisition and the collected data can be organised via the computer software. To do so, the PC software that comes with the meter must be installed and the meter must be connected to the PC.

5.1.4.1 Route creation

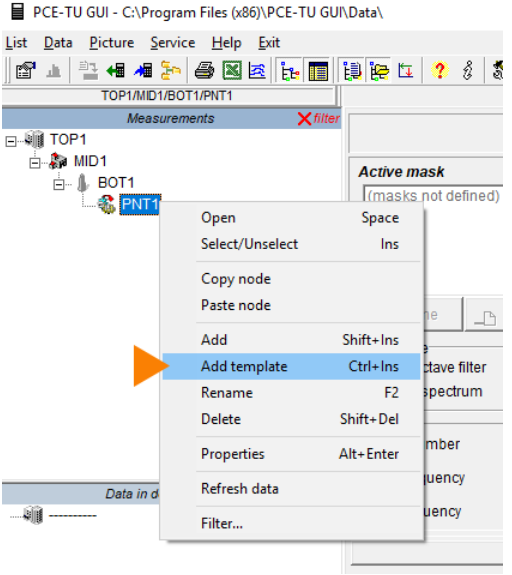


Enable the upload function for “templates“.

To do so, either click on the tool icon (highlighted) in the bar or access the function via ”Service → Setup“.

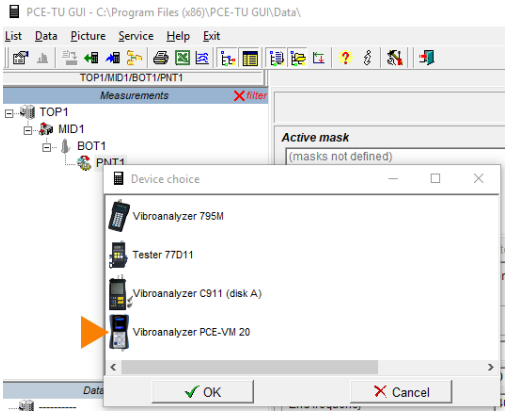
Tick the box in front of “upload templates as route- file into USB-devices“.

Confirm your entry by clicking on the “Save“ button.

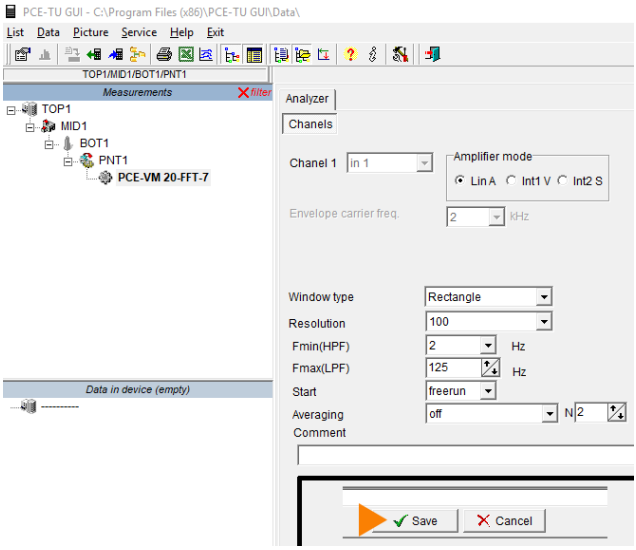


Use the same folder structure as in the image (Folder „TOP1“ + three subfolders, folder name is irrelevant).

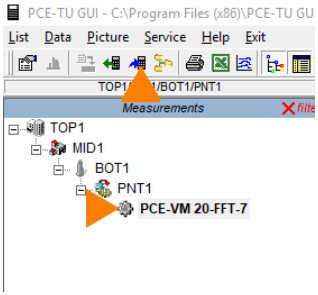
Right-click on the third subfolder “PNT1“. Click on “Add template“, as in the picture.



The “Device choice“ window will open. Click on ”PCE-VM 20“ to select the device.



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

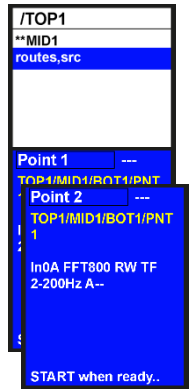


Select the created route files with you mouse and click on the icon “upload selected data to the device“ which is highlighted in the menu. The files have now been transferred and saved to the meter.

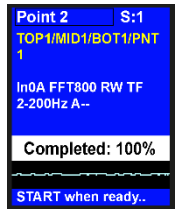
English

5.1.4.2 How to make a route measurement

Connect the acceleration sensor to connection socket 1 of the meter and attach the measuring head of the sensor to the measurement spot on the machine. In the main menu, use the navigation key ▼ to go to ”Documents“ and confirm with Enter ENTER. Find the route file (routes.src) in “Documents“ and confirm with Enter ENTER. The file could be in a subfolder.



Select the route point with the ▲▼ keys. As you can see from the images, the route points are numbered by “point …” in the upper left corner. Start the route measurement by pressing Enter ENTER. In route measurement mode, the readings are collected in line with the set parameters.



Wait until “100 %“ is displayed on the screen. The file is saved to “Documents“. To leave route measurement, press the Back key ⊃.

6 Warranty

You can read our warranty terms in our General Business Terms which you can find here: https://www.pce-instruments.com/english/terms.

7 Disposal

For the disposal of batteries in the EU, the 2006/66/EC 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.

English

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English

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

Specifications are subject to change without notice.