USER MANUAL

4-CHANNEL VIBRATION ANALYZER

PCE-VM 400B

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

PRECAUTIONS

To prevent possible electrical shock, fire, injury, or damage to the device:

- Read the user manual carefully.
- Do not place the sensor on objects subject to high voltage. Failure to comply may result in injury or death.
- The analyzer cannot be used in potentially explosive environments.
- Take measures to prevent cables from getting into rotating parts of machines at the measuring point.
- Do not expose the PCE-VM 400B to strong shocks, high humidity, or extreme temperatures.
- Do not attempt to open the display as this may damage the system and void your after sales warranty.
- The analyzer is serviced by one operator who has undergone special training and safety briefing when working with mechanisms and machines that have rotating parts, as well as when working with laser radiation sources.
- Operation of the analyzer is allowed only after familiarization with this OM.
- The analyzer supplier is not responsible for the misuse of the equipment, nor for the interpretation of the measurement results.

OVERVIEW

The PCE-VM 400B Vibration Spectrum Analyzer (hereinafter referred to as analyzer) is a compact yet powerful instrument for overall vibration measurements, vibration spectrum analysis of rotating equipment, immediate ISO 10816 evaluation, route and off-route data acquisition, balancing of rotary machinery. Route files and data file sharing via email make it ideal for collecting data from remote sites. Easy to use, with free firmware updates, comes with data management and reporting software.

SPECIFICATIONS

Acceleration	
Measurement Range	+0.001 m/s² ... +200 m/s²
Resolution	0.001 m/s²
Accuracy	± 5 %
Velocity	
Measurement Range	+0.001 mm/s² ... +200 mm/s²
Resolution	0.001 mm/s²
Accuracy	± 5 %
Displacement	
Measurement Range	+0.001 µm/s² ... +2000 µm/s²
Resolution	0.001 µm/s²
Accuracy	± 5 %
Optical Rotational Speed	
Measurement Range	+10 rpm ... +200000 rpm
Resolution	1 rpm
Accuracy	± 5 %
General Technical Data	
Number of Measurement Channels	4
Frequency	1 ... 25000 Hz
Display Type	VGA Color Display
Display Size	3.5 inches
Storage Capacity	4 GB
Data Interface	USB
Battery Capacity	3200 mAh
Battery Voltage	3.6 V
Battery Type	Lithium-Ion Battery
Operating Time	8 hours
Selectable Auto Power Off	30 ... 99999 s

Menu Language	German, English, Spanish, Polish, Russian, French, Chinese, Indonesian
Protection Class (Device)	IP20
Power Supply	Battery, Power Adapter
Weight	460 g / 1.0 lb
Device Weight with Accessories	2800 g / 6.1 lb
Device Weight with Accessories and Packaging	2800 g / 6.1 lb
Dimensions (L x W x H)	220 x 100 x 42 mm / 8.6 x 3.9 x 1.6 in
Additional Dimensions	Sensor Cable Length: 140 cm
Operating Conditions	-10 ... 50 °C , 90 % r.H
Storage Conditions	-10 ... 50 °C , 90 % r.H

BASICS

Keypad

» To turn the display unit on and off - press and hold the POWER button for 2 seconds.

» In the event of a system freeze, when the device does not respond to any keys - press and hold the POWER button for 10 seconds, the system will be reset and restarted.

» To close any currently active window without saving, other than the device's main menu, press the MENU button (it serves as the backspace key).

» The START button in most cases is used to apply (save) changes (selection) and exit (from editing windows or from the current window).

Autosave

All procedures are designed with automatic saving. To temporarily interrupt the current work, press MENU key, you will exit to the main menu of the device. The data of the interrupted measurement will be automatically saved, and the device can be turned off.

Battery charging

» The battery can be charged with a USB charger or via the USB port of a PC/laptop.

» Immediately after connecting the charger to the display unit, there are a few seconds to change the charge current - press and hold the POWER button for 2 seconds until the LED changes the flash rate.

» Low speed flash - normal charge / high speed - fast charge.

» Keep in mind that the PC/Laptop USB port can only provide a normal charge.

» When the battery is fully charged, charging will stop, and the LED will turn off. Recharging does not occur even if the USB cable remains connected.

Main Menu
After turning on the device, the main menu is displayed on the screen.
To call a menu item - move the cursor to this item and press the START key.

Setup Menu
To invoke the configuration menu - move the cursor and press the START button.



date and time setup



auto off delay time. Is disabled when set to 0



to install a license file that enablesmeasurement functions. Press **9**, navigate to the license file, then press ENTER to open and install the licenses.



to switch between wireless/cable transducer's connection.



Language of the user interface.
Use the UP/DOWN keys to select the language, then press START



to switch the device to USB storagedevice mode. By default, a device can be connected to a PC via Microsoft Windows Mobile Device Center. USB storage device mode can be used as an alternate mode.



Adjusting the brightness of the display backlight

VIBRATION ANALYZER. VIBRATION MENU

SETTING SPECTRUM ANALYZER PARAMETERS
To enter the analyzer parameters change menu - press F1.

Units
Move the cursor to Units and press ENTER
Use the UP/DOWN keys to select units of measurement – for example, mm/s and press ENTER to confirm.

Sensor
Move the cursor to the Sensor and press ENTER
Use the UP/DOWN keys to select the type of sensor – for example, ICP and press ENTER to confirm.

Setting the Sensor Conversion Factor
Move the cursor to the Sensor and press *
Use the UP/DOWN keys to select the sensor parameter that you want to change, such as Serial Number (C/N), and then press ENTER. Enter the new value from the keyboard and press ENTER to confirm. To confirm the new sensor settings, press START.
The mV/g value is written on the sensors!

Setting the HPF cut-off frequency
Move the cursor to the HPF and press ENTER
Use the UP/DOWN keys to select the desired frequency of the HPF – for example 2 Hz and press ENTER to confirm.
It is possible to select the preset values of the HPF - 0.5, 1, 2, 5, 10 Hz. To enter an arbitrary value in the range of 1... 720 Hz – select CUSTOM

Setting the LPF cut-off frequency
Move the cursor to the LPF and press ENTER
Use the UP/DOWN keys to select the desired LPF frequency – e.g. 800 Hz and press ENTER to confirm.

Setting the number of FFT lines
Move the cursor to the FFT and press ENTER
Use the UP/DOWN keys to select the required number of FFT lines – for example 6400 and press ENTER to confirm.

Setting the FFT window type
Move the cursor to Window and press ENTER
Use the UP/DOWN keys to select the desired FFT window – for example Hanning and press ENTER to confirm.

Trigger Type
Move the cursor to Trigger and press ENTER
Use the UP/DOWN keys to select the desired type of measurement start – for example Free run and press ENTER to confirm.

Set the Averaging mode
Move the cursor to Averaging and press ENTER
Use the UP/DOWN keys to select the desired averaging type – for example, Lin FD (Linear, Frequency Domain) and press ENTER to confirm. Then select the number of measurements to be averaged and press ENTER to confirm.

Confirmation of Spectrum Analyzer parameters
After the measurement parameter settings are completed, press START to confirm and return to the main menu of the analyzer.

STARTING A MEASUREMENT
Install the sensors on the measurement object and press the START key.

Controls in measurement mode



Switching between FFT and Time functionmodes



stop/resume measurement


select the channel in which the cursoris active


cursor movement (measurement must be stopped by pressing 4)



setting the cursor to the maximum harmonic of the spectrum



cursor type switching – frequency/cycles per minute/harmonic number



change the display mode on the display

Record measurement files

» To save a file - press the key 8 in the results menu.

» Files can be saved on the internal SD card or on the flash drive connected to the USB host connector of the device.

» Use F2 to select a disk.

» Use START CLR LEFT RIGHT UP DOWN to select a folder

» Use START to open a folder

» Use CLR to move up one level

» Use 7 to create a new folder

» Use F4 for on/off generation of reports in PDF format

» Press ENTER or F5 to write a report file with a default name

» Press 8 to edit the file name, then press ENTER to write the file

Route-based measurements

» Use ConSpect software to create a route and upload the route file to the device

» Go to the Vibration/Route menu, press START

» Device will enter the file explorer.

» Open the folder with the route file, place the cursor on the ROUTES.SRC file and press START

» Use LEFT/RIGHT to review or randomly select route points

» Set the sensor at the measurement point and press START. The instrument performs the measurement with the specified parameters and saves the files to the destination folder corresponding to the route point.

BALANCING

Setup Balancing parameters

» Enter Balancing function.

» Use UP/DOWN to choose parameter to setup. Press ENTER to edit parameter value.

» Set RPM of the machine at which balancing will be conducted.

» It is also possible to run tachometer measurement to get actual machine RPM. Press F2 to do so, then press ENTER to apply measured RPM.

» **NOTE:** If actual RPM and balancing RPM differs by more than 5% device will display error message while measurement is in progress

» Set number of Planes (where correction weights will be attached) and number of Points (where the accelerometer will be measuring the vibration levels)

» Set number of channels used to take readings.

» Balancing weights can be preset to Add or Remove.

» Correction weights can be attached at any angular position - Free Loc. Or at Fixed Locations (e.g., at the fan blades). Number of Fixed locations can be set in the range of 3 to 18 locations.

» **NOTE:** Balancing program assumes that angles (and fixed location numbering) are aways calculated counter wise machine rotation direction!

» Data source should be set to Sensor.

» Choose sensors used to take readings. Press START to confirm.

» Now all is set, and device is ready for measurement. Press START to start measurement.

Balancing in one plane



SAFETY PRECAUTIONS

» Vibration measurement and balancing involves measurement on rotating machines. Always keep a safe distance to rotating parts and secure transducers and transducer cables from rotating parts.

» Balancing involves mounting of trial and balancing weights on the rotor. Always secure the start switch with a locker and use the emergency switch for double safety before working with the rotor.

» This is especially important when the machine is remote controlled.

» The device manufacturer cannot take responsibility for any accidents on people and machines.

» Heed all warnings and recommendations to prevent data loss, data inaccuracy, damage to the instrument, or injury to yourself!

One-Plane Balancing Procedure Overview

» Run 0 - the initial vibration (unbalance) measurement.

» Run 1 – vibration measurement with trial weight attached in plane A

» Stop the machine, attach calculated correction weight at the specified angle on balance planes A.

Trim run 1... – Start the machine and measure residual vibration level. Once measurement stopped device will calculate trim weight, to further reduce the vibration. If residual vibration is higher than target value – attach trim weight and perform another trim run. Repeat trim runs until required vibration level is achieved.

Example: Balancing procedure flow (one plane, two points)

» Set Balancing parameters.

» Place accelerometers at measurement points. Run the machine. Press START

» Wait reading to stabilize. Press START

» Confirm reading is accepted. Press START. Stop the machine.

» Attach the trial weight. Enter trial weight and angle, at which it is attached. Press START

» **Start the machine.**

» Press START. Wait reading to stabilize.

» Press START. Confirm reading is accepted.

» **Stop the machine.**

» Now one needs to decide whether to keep or remove the trial weight from Plane #1.

» E.g. trial weight can remain attached if vibration levels decreased.

» Chose option and press START

» Device displays calculated correction weight to be attached to eliminate disbalance.

» Residual vibration can be measured now.

» **Start the machine.**

» Press START. Wait reading to stabilize.

» Confirm reading is accepted. Press START

» **Stop the machine.**

» Device displays calculated trim weight to be attached to further eliminate disbalance.

SAFETY PRECAUTIONS



Be sure the machines to be measured, cannot be started unintentionally as this can cause injuries. For this purpose, before the mounting of equipment, either block the power switch in the **Off position** or remove the safety fuses. These precautionary rules must be followed until the measuring system is dismantled from the measured machine.

LASER SAFETY PRECAUTIONS



The alignment system is the class II laser device at typical wavelength of 650nm, delivered output power of less than 1 mW and maximum radiant energy per pulse of 0.1 mJ. The Class II laser comply with requirement outlined by USA's FDA as well as international ANSI, BS 4803 and IEC 825 standard. Be sure to follow the following safety precautions to avoid personal injuries and damage to the system

Do not look directly into the laser beam at any time!
Do not direct laser beam on to the people's eyes!

ATTENTION!
Do not expose parts to heavy impacts, high humidity and extreme temperature.
Do not try open / dismantle measuring units and the display unit – this can damage the system, and your after-sales service warranty will come void.

INJURY RESPONSIBILITY DISCLAIMER
Neither PCE Instruments nor our authorized dealers are liable for the damages caused to machinery or equipment by use of the system. We carefully check text of this manual to eliminate errors, nonetheless there may be mistakes or inaccuracy involved. We will be grateful for your reporting to us about any error, and we will be able to correct them in the subsequent editions of the manual.

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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