



Brüel & Kjær Vibro



VIBROPORT 80

**Vibration Analysis.
Rotor Balancing.
Machine Monitoring.**

VIBROPORT 80

Vibration monitoring and analysis made easy



The new VIBROPORT 80 makes it easy for you to obtain a quick, accurate picture of the condition of your machines.

Professional machinery diagnostics to optimize uptime

Vibration, within expected limits, is an inherent characteristic of all rotating machines. However, vibration levels exceeding tolerance limits, as in the case of a machine defect, can result in machine failure and bring production to a total, unexpected halt. In extreme cases, nearby machines are damaged, toxic compounds released and personnel injured.

Since the early 1970s, Brüel & Kjær Vibro has been successfully developing solutions for maintenance-based condition monitoring and field balancing of all kinds of machines in numerous industrial applications. From the first portable vibration measuring instrument VIBROTEST up to today's VIBROPORT 80, this fundamental design concept continues.

The VIBROPORT 80 is the newest generation of Brüel & Kjær Vibro's portable measuring instruments. Ease of operation and flexibility in demanding applications continues being important functionality, but the VIBROPORT 80 has been designed to be even more powerful than its predecessors and is equipped with an assortment of new analysis functions.

Brüel & Kjær Vibro's VIBROPORT 80 is the ideal portable vibration measuring device for capturing machinery vibration and undertaking detailed diagnostics to determine the nature and cause of many developing faults. Its versatility, flexible modular setup and user-friendly operation makes the VIBROPORT 80 the ideal portable vibration instrument for helping deliver machine uptime to your plant.

VIBROPORT 80

For newcomers and professionals

Flexible modules for every need

The VIBROPORT 80 is modular in construction. For the newcomer, there are two useful starter packages available:

The **Analyzer Select** package is for vibration diagnostics. It includes rotational speed, FFT spectra, and rolling-element bearing fault diagnosis (envelope analysis).

The **Balancer Select** package provides one or two plane field balancing functionality using polar plots.*

A variety of modules are available to the professional user. These include functions for: rotational speed, order analysis, time signals and transfer functions. As a result of this modular flexibility, VIBROPORT 80 is ideally suited for both the simplest measurement tasks and the most demanding monitoring and analysis tasks.

Pre-set and customized setups, together with direct access to predefined measurement tasks, simplify the process of working with the device. An optional auto-range function and predefined Brüel & Kjær Vibro sensor settings complete the overall setup concept.

The large colour monitor, alphanumeric keyboard, quick access keys and colour-coded connections make operation intuitive and easy. The enclosure of the VIBROPORT 80 is especially rugged, sealed to IP65 and is available with certification for use in areas with potentially explosive atmospheres.

The report and analysis software **ReX** running on Windows™ completes the performance package.

**A list of the measurement modules that are contained in the newcomer packages can be found at the end of the brochure.*

★ The VIBROPORT 80 at a glance

- Modular construction - Additional measurement modules that can be added at any time
- Starter packages
- Frequency range: (DC) 0.18 Hz to 80 kHz
- Field balancing with 2-channel polar plots
- Order analysis (phase + amplitude)
- Time signal displayed and saved for post-processing
- Transfer function (for impact hammer modal analysis)
- Up to 4 measurement channels + rotational speed (triaxial measurements possible)
- Cross-channel function (dual channel measurements such as max. X/Y, orbit, etc.)
- Large colour display (VGA)
- Lithium-ion rechargeable battery (8 hours duration)
- Robust, ergonomic housing (IP65)
- ATEX, IECEx and CSA (explosion protection)
- ReX PC vibration analysis software (Windows™)



VIBROPORT 80

Early fault detection for preventing machine damage

Uncorrected faults on bearings, gears, shafts and couplings can lead to machine degradation and catastrophic failure. Vibration analysis with the VIBROPORT 80 Analyzer Select package enables you to detect developing faults at an early stage, diagnose the cause and trend these, so maintenance can be planned ahead time without risking degradation and machine failure.

Characteristic values

The overall condition of a machine and its bearings can be evaluated by means of characteristic values that can then be compared with limit values in accordance with **DIN ISO 10816** or those provided by the manufacturer. Characteristic values are the total root mean square (RMS) value of the vibration components in a defined frequency range. The **FFT Analyzer module** is the perfect tool for determining the individual components, which are vital for correlating with the source/cause of the vibration.

The VIBROPORT 80 **Overalls module** uses up to four vibration measurement channels. This enables triaxial measurements to be carried out in parallel (as stipulated in **DIN ISO 10816**). Naturally, VIBROPORT 80 supports the measurement and display of characteristic values as a function of rotational speed (optional upgrade) and as a function of time.

★ Highlights of the OVERALLS MODULE (Characteristic values)

- Parallel measurement of the condition of the machine and the rolling-element bearings
- Two different methods of measuring the characteristic values of rolling-element bearings (bandpass and envelope)
- Characteristic value measurements as a function of time and rotational speed (optional)
- Simultaneous display of acceleration, velocity and displacement
- Up to 4 input channels + rotational speed (triaxial measurements possible)
- CREST-Factor

FFT Spectrum

FFT analysis resolves the total vibration into its individual frequency components. Each spectral line has its specific frequency and amplitude. The amplitude typically represents the “fault severity” while the frequency represents the “fault location”. This makes it easier to reliably diagnose machine faults such as unbalance, gearbox damage, misalignment and rolling-element bearing damage.

Rolling-element bearing diagnosis

Characteristic values and spectral analysis are methods typically used for the detection and diagnosis of

rolling-element bearing faults. The characteristic values are particularly effective for fault detection and trending, so maintenance can be planned ahead of time.

Spectral analysis techniques such as an FFT and envelope analysis are ideal for diagnosing the type and location of the rolling-element bearing fault. VIBROPORT 80 offers two spectral analysis techniques: BCS (Bearing Condition Signature) analysis and the SED (Selective Envelope Detection) analysis. Both techniques are based on the fault amplitude modulation of a carrier frequency, i.e. envelope analysis. BCS analysis

★ Highlights of the FFT-ANALYZER MODULE (Spectral analysis)

- Envelope spectrum (BCS and SED)
- Simultaneous display of time signal and spectrum
- Up to 4 input channels + rotational speed (triaxial measurements possible)
- FFT frequency range up to 80 kHz and up to 25,600 lines resolution
- Cross-channel phase (Phase difference between two channels without using a tacho)
- Order analysis
- Cursor: single, peak, harmonic



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Field balancing of rotors



relies on the resonance of the accelerometer as a carrier frequency while the SED analysis depends upon structural resonance.

The two newcomer packages, **Analyzer Select** and **Balancer Select** support both techniques.

A significant proportion of all machine faults can be attributed to unbalance of rotors. Although rotors are, as a rule, built into the machine precisely balanced after the manufacturing process, unbalance can result because of mounting tolerances and the residual unbalance of components over a period of time. These machines can be effectively balanced on-site.

For this purpose VIBROPORT 80 offers the **Balancing module**. In-situ balancing of rotors (field balancing) has several advantages:

- No dismantling and transport of the rotor
- Takes into account on-site mounting conditions (e.g. bearing clearances)
- Field balancing is independent of the size and weight of the rotor

The balancing procedure can be viewed on the screen in a tabular form (numerical display with bar graph) or using individual polar plots. Every balancing procedure can also be stored as a report and called up later to save time whenever the balancing procedure has to be repeated.

★ Highlights of the BALANCING MODULE

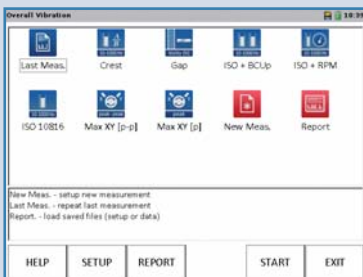
- 1 or 2 plane field balancing (static/dynamic)
- Ultrafast 2-plane balancing through innovative prognosis function
- Large 1, 2-plane polar plot display
- 2-plane balancing with one vibration sensor
- Adjustable target value for residual vibration display (colour coding)
- Free choice of adjustment method (polar, fixed location, fixed mass); arbitrary switching possible between polar and fixed location balancing



SCREEN DISPLAYS



Main menu

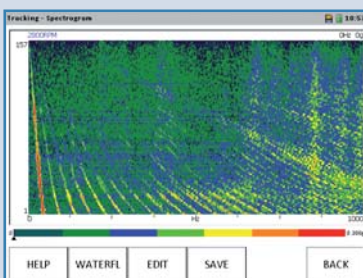


Overalls
with predefined measurement tasks

	Overall [A]	Overall [B]
Channel 1	0.795 [g] Peak 0.608 [mm/s] RMS 17.220 [µm] Pk-Pk	6.870 [m/s²] Peak
Channel 2	3.424 [g] Peak 1.237 [mm/s] RMS 24.360 [µm] Pk-Pk	35.099 [m/s²] Peak

Buttons: AVERAGE, VIEW, PAUSE, STOP, EXIT

Overalls
2-channel with path A & path B



Tracking
Spectrogram

VIBROPORT 80

In time with the machine

Modal analysis determines the natural frequencies, i.e. resonances of machines. For optimal operation of a machine, it is important to avoid (or minimize the duration) with coincidence between the rotational speed frequency and the structural resonance frequencies. This will minimize excessively high vibrational loads during the run up, coast down or steady-state operation of the machine.

These critical frequencies can be determined by two different methods: rotational excitation or impact excitation. Order analysis establishes the resonance frequencies by rotational excitation, induced through the inertial force produced by the residual unbalance during shaft rotation. The transfer function determines the structural resonances by impact excitation on a shaft that is not rotating.

The VIBROPORT 80 facilitates modal analysis by offering both the **Tracking and Transfer Function modules.**

Order analysis (Tracking)

Order analysis is carried out during operation of the machine and serves to analyze the rotor frequency-induced vibration components and their harmonics. The VIBROPORT 80's Tracking measurement module can be utilized for both run-up and coast-down of the machine.

The new feature here is the two-step procedure:

Step 1: During the run-up or coast-down, the raw vibration signal and the rotational speed are recorded by using up to three measurement channels plus the rotational speed.

Step 2: After successful measurement, you select the modal analysis technique to evaluate the recorded signals. Since the raw vibration signal remains available in the unit, you can repeat the analysis as often as you want with different setups. That is a particular advantage if a second measurement is very time-intensive (long machine coast-down times) or if the machine is critical for production and the process should not be interrupted unnecessarily.

★ Highlights of the TRACKING MODULE (Order analysis)

- Identifying machine resonances
- Innovative measurement approach in 2 steps:
 - 1) Recording the raw vibration signal
 - 2) Post-processing the raw signal: Bode, Nyquist, FFT waterfall, spectrogram, table (overall value plus 2 harmonics)
- Up to 3 input channels for vibration signals (triaxial measurements possible)

Transfer function (impact hammer)

For modal analysis of machines with shafts that are not rotating as well as for the analysis of immovable objects such as, for example, foundations or frameworks, the impact method is employed.

The transfer function is determined with an impact hammer having a built-in load sensor. It is the ratio between the input signal (load introduced by the hammer blows) and the output signal (measured vibration).

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Documenting success

Highlights of the TRANSFER FUNCTION MODULE

- Identifying structural resonances using an instrumented impact hammer
- Determination of machine component relative movement
- All conventional evaluation methods available (load, acceleration, displacement)
- Coherence analysis (in percent, with colour coding)
- Up to 3 input channels for vibration (triaxial measurements possible)

VIBROPORT 80 also offers the **Time Signal** and **Acceptance Test modules**.

The Time Signal function enables you to visualize the raw signal and store it in a standard (.wav) format. This format permits subsequent post-analysis by, for example, the ReX software or MatLab™.

The Acceptance Test function is often used for quality inspections in batch production (final acceptance). It compares characteristic values with limits established by standards, such as DIN ISO 10816. The module also allows you to draw on predefined or personally defined measurement tasks (setups).

ReX – Report and EXaminer Software

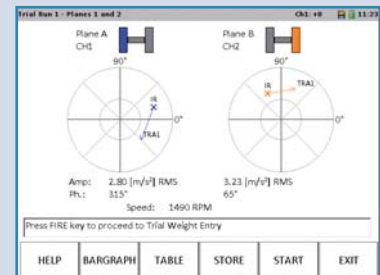
The ReX software supports the VIBROPORT 80's measurement modules. The software can be installed on all current Windows™ PCs and the standard version is included in the **Analyzer Select** and **Balancer Select** packages. Reports can be generated quickly and easily from measurements stored in the instrument. VIBROPORT 80 is connected to the PC via a USB port.

The optional premium version enables you to analyse the previously stored time signal data sets (.wav files) so they can be post-processed for calculating FFT and waterfall spectra. For the analysis of rolling-element bearing defects, ReX provides an OEM database that lists the characteristic fault frequencies of all common rolling-element bearing manufacturers.

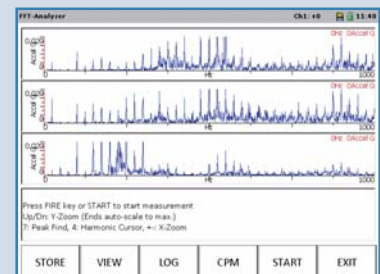
Highlights of the ReX PC SOFTWARE

- Powerful reporting and analysis functions
- Windows™ operating system (up to Windows™ 7, 32 and 64 bit)
- Supports all available measurement modules
- Single and multi-user + client/server
- Premium version
 - Can be retrofitted
 - Supports post-processing of .wav files (time signal) for subsequent calculation of FFT and waterfall spectra
 - Integrated rolling-element bearing data base with error-indicating markers
- Test version running 3 months after initial installation and including premium version functionality

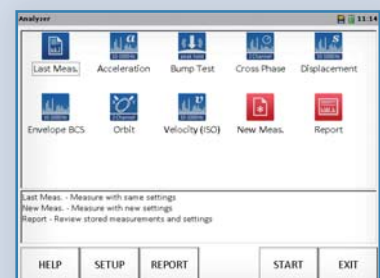
SCREEN DISPLAYS



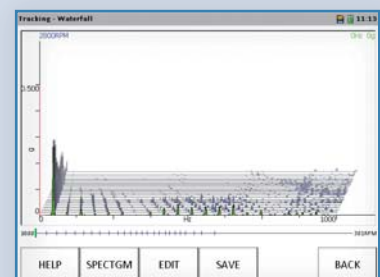
*Balancing
Polar plot (2 planes)*



*FFT-Analyzer
3-channel spectra*



*FFT-Analyzer
with predefined measurement tasks*



*Tracking
3-D waterfall plot*

Contact

Brüel & Kjær Vibro GmbH

Leydheckerstrasse 10

64293 Darmstadt

Germany

Phone: +49 6151 428 0

Fax: +49 6151 428 1000

info@bkvibro.com

Brüel & Kjær Vibro A/S

Skodsborgvej 307 B

2850 Nærum

Denmark

Phone: +45 77 41 25 00

Fax: +45 45 80 29 37

www.bkvibro.com

Technical Data*

1. UNITS AND MEASUREMENT TASKS

Units**

- Acceleration
- Velocity
- Displacement
- Single or double integration

**VP-80 can be switched between metric and imperial units

Measurement tasks

- Overalls (characteristic values)
(Total vibration and rolling-element bearing fault frequencies)
- Overalls vs. rotational speed $f(n)$ and time $f(t)$
- CREST factor
- Max. X/Y (2-channel function)
- FFT spectrum (100 to 25,600 lines)
- FFT window functions: Hanning, Hamming, flat-top, rectangular (overlap 0 to 99%)
- Envelope spectrum (BCS, SED)
- Orbit (2-channel function)
- Time signal (raw signal) of the vibration and the reference signal
- Phase
- Cross-channel phase (2-channel function phase difference)
- Transfer function
- Process value (DC, Volt)
- Gap (DC, Volt)

2. SENSORS AND INPUT CHANNELS

Sensors

- Vibration acceleration
- Vibration velocity
- Vibration displacement
- Process (no sensor supply)
- OK monitoring

Input channels

- Channel CH1: measurement channel 1 or Triax 1, 2, 3 (vibration)
- Channel CH2: measurement channel 2 (vibration)
- Channel USB HOST/ CH R: measurement channel 4 (vibration), impact hammer, head phone (audio out)
- Channel USB DEV / TRIG/PWR: Rotational speed/reference, USB (out)

3. MEASUREMENT RANGE

- Input channels: Nominal maximum +/- 25 Volts peak-to-peak (Over-voltage protection +/- 50 V, transient)
- Input range: sensor units, auto-range or maximum 25 V
- Dynamic range: >90 dB
- Frequency range: (DC) 0.18 Hz to 80 kHz (max. frequency dependent upon number of channels)
- Rotational speed: 1 to 99,000 rpm (limited by standard reference sensor, higher rotational speed possible)

4. MEASURING INSTRUMENT

Enclosure

- Dimensions: 220 x 220 x 71 mm
- Weight: 1.54 kg
- Display: 6.4" TFT VGA, LCD, Backlight (640x480, 18-bit colour)
- LED: blue, green, yellow and red
- Rechargeable battery: Li-Ion 6600 mAh (operating time 8 hours)

Storage

- Internal: 128 MB DDR SDRAM
- External: max.16 GB SD/SDHC card

Environment

- Protection class: IP65 (dust and water spray, EN60529)
- Drop height: 1.2 m (4 ft) – in accordance with MIL STD-810F
- Operating temperature: -10 to +60 °C (+14 to +140 °F)
- Storage temperature: -20 to +60 °C (-4 to +140 °F)
- Humidity: 10 to 90% relative humidity, not condensing 0 to +50 °C (+32 to +122 °F)
- Shock/vibration: according to MIL STD-810

Approvals/Certificates

- CE, RoHs, C-Tick

Explosion protection

- ATEX and IECEx
II 3G Ex ic IIC T4 Gc
Ta= -10 °C to +50 °C in conformity with 94/9/EC (only VP-80 E)
- CSA Class I, Div 2 Groups A, B, C & D, temperature code T4A@Ta=50C (only VP-80)

5. SYSTEM

Communication

- USB (directly on the measuring instrument or via the docking station)
- Microsoft® ActiveSync®
- Mobile Device Center (Windows™ 7)
- Operating system: Microsoft® Windows™ Embedded CE 6.0
- Processor: Marvell 806 MHz PXA320
- DSP: Motorola Freescale DSP56311

*A detailed specification can be found in the download section of our website at www.bkvibro.com

Included in the newcomer packages

VIBROPORT 80 – “Analyzer Select“ Package consisting of:

One VIBROPORT 80 measuring instrument with standard accessories in a carrying case AC-7101 with a license for ReX Standard/client (USB dongle)

- Rechargeable battery AC-7003 (built-in)
- SDHC-storage card 4 GB (enclosed)
- Docking station AC-7307
- Mains power supply AC-7001
- USB connection cable (PC) AC-1390
- Y-cable USB-Power AC-1389
- Shoulder strap AC-7309
- Protective case AC-7305
- Hand straps (2x) AC-7308
- Leather bag for small parts AC-7306
- Protective covers for input sockets AC-7301
- One vibration acceleration sensor AS-063 (with threaded bolt AC-350)
- One magnet AC-273
- One measuring aluminium probe AC-272
- One sensor connection cable AC-1384/0050 (5 m, flat)

Includes the following modules:

Overalls (basic characteristic values): Module 1.1

FFT-Analyzer: Modules 2.1 and 2.2 (Envelope spectrum BCS/SED)

2-channel function: Module 4

VIBROPORT 80 – “Balancer Select“ Package consisting of:

same as VIBROPORT 80 – “Analyzer Select“ and, in addition,

- Second vibration accelerometer AS-063 (with threaded bolt AC-350)
- Second magnet AC-273
- Second sensor connecting cable AC-1384/0050 (5m, flat)
- Option 806 (reference sensor P-98 with accessories)

Includes the following module:

Balancing: Module 7

*Additional modules, as described in this brochure, can be retrofitted at the owner's option. For more detailed information on this, please see the **Order Information for VIBROPORT 80** that you can get from our sales representative or by sending an e-mail to info@bkvibro.com.*

