

Features

- **Vibration condition monitoring and troubleshooting of rotating machinery**
- **Comprehensive charting tools:**
 - Time Signal · Spectrum · Orbit · Bode Plot · Waterfall
 - Cascade · DC Shaft Center · Trend · Bar Graph
- **Alarm and Event:**

The system allows software-defined alarm thresholds independent of hardware settings, enabling advanced vibration-based warning and event detection.
- **Signal Recording:**

Supports simultaneous manual and automatic recording triggered by predefined vibration alarm levels. Time signal and spectrum plots are stored and available for review.
- **Import / Export:**
 - Supports full and per-channel backup of device settings, with export and import functions for quick transfer, recovery, or deployment across similar projects.
 - Enables exporting previously stored data, including recorded signal plots and trend charts, and importing them for review, analysis, or migration to another system.
- **FFT masking** for zone-based fault identification



Technical data		CMS-PRO Software	
Device Compatibility	VibroRack3000	Minimum system	Dual-core CPU or higher, 4GB RAM (For a 32-channel rack)
Max Channels	32 { up to 28 channel vibration up to 4 channel Tachometer	Deployment	Web-based
Sampling Rate	Up to 4000 samples / sec per channel	Operating System	Recommended: Linux (Ubuntu, Debian) or Windows 10,11(Docker)
Bandwidth	4000 HZ	Browser Support	Chrome, Firefox, Edge (latest versions)
Max FFT Frequency	2 kHz (based on Nyquist)	Access Modes	Localhost, Client Access, Remote Access (via IP public)
High-pass Filter	Starting from 1 Hz	Multi-user Management	Role-based access control (Admin/User)
FFT Window Functions	Hanning, Hamming, Blackman, Flat Top, boxcar	Client Connections	Unlimited web clients
Protocol	Ethernet LAN (TCP/IP) only		
Secure Communication	HTTPS protocol		

Charts and visual analysis

Time Signal Plot

- **Description:** Simultaneous measurement of key vibration parameters, including:
 - RMS, Peak, Peak-to-Peak
 - Crest Factor
 - **Amplitude and Phase** of 1X and 2X components
 - DC voltage or shaft gap is measured for sensors with output offset (e.g., eddy current displacement sensors), allowing tracking of relative shaft position or initial clearance.

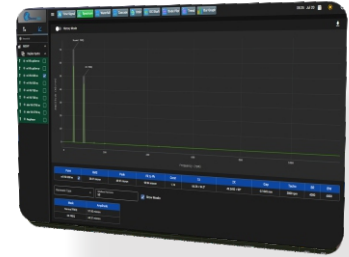


All these parameters, along with the time-domain signal, are fully **recordable**, **storable**, and **reviewable** within the software.

- **Application:** View shocks, peaks and instantaneous, changes in the signal, Detect, shocks, slack, non-uniformity and initial signal analysis

Spectrum Plot

- **Description:** The spectrum plot displays the vibration signal in the frequency domain using Fast Fourier Transform (FFT). It is a fundamental tool for diagnosing mechanical faults such as unbalance, misalignment, looseness, resonance, and harmonics.



Key features of the software include:

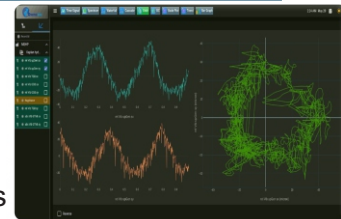
- **Definition of custom frequency masks** across selected ranges of the spectrum
- Display of the individual vibration amplitude within each mask
- Visualization of **trend over time** for each defined **mask**, enabling condition tracking
- **Alert** generation and event logging when the amplitude exceeds the set threshold for **any mask**

Automatic recording of the spectrum plot, along with mask information and amplitude values, for later diagnostics and condition analysis

- **Application:** Detects faults such as imbalance, misalignment, and bearing failure, Displays the frequency range in Hz.

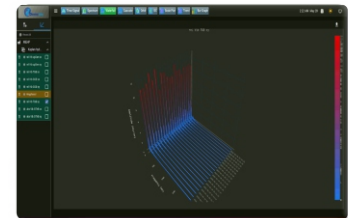
Orbit Chart

- **Description:** Displays the path of motion of an axis (shaft) in two-dimensional space (X and Y).
- **Application:** Displays the phase difference of two vibration signals. Analyzes based on 1x, 2x, and 1/2x times the machine speed.



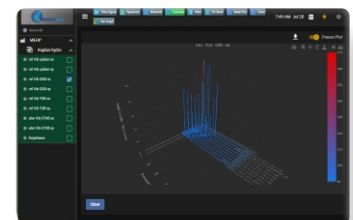
Waterfall Chart

- **Description:** Display multiple frequency spectra over time in three dimensions or multiple layers based on vibration amplitude, time, and frequency.
- **Application:** View trends and changes in FFT amplitude over time



Cascade Chart

- **Description:** 3D graph showing the change in amplitude in frequency and time based on machine speed fluctuations.
- **Application:** Observe machine vibrations during run-up and shutdown processes, Machine resonances



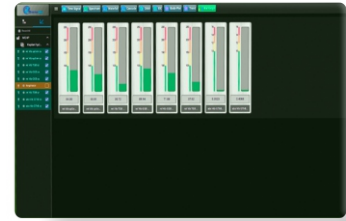
Trend Chart

- **Description:** Automatically trend the vibration signal as long as the device and operating system are on Trend display based on charts: **Rms, Peak, Peak to Peak, Amplitude 1x & 2x, Phase 1x & 2x, Crest, Dc voltage, Main RPM** and All these parameters are simultaneously available for each signal on every channel.
- **Application:** monitoring long-term machine health, detecting early-stage faults, evaluating maintenance effectiveness, and identifying abnormal or load-dependent vibration behavior.



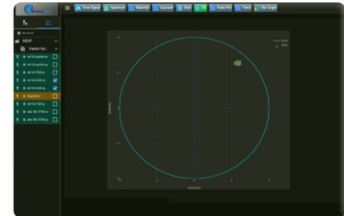
Bar Graph Chart

- **Description:** Displays the amplitude of vibrations simultaneously with the alarm limits.
- **Application:** simultaneous visualization of vibration levels across all channels, monitoring their variations over time, and checking against predefined alarm thresholds.



Dc shaft center Chart

- **Description:** Displays the static position of the shaft relative to the journal center, Two-dimensional chart of the shaft location in the X and Y directions
- **Application:** Checks for initial shaft play and deflection or changes in the center of rotation



Bode plote Chart

- **Description:** Display of phase and amplitude of vibration in terms of rotational speed, Combination of two graphs: phase-speed and amplitude-speed
- **Application:** Analysis of dynamic behavior of the system, Investigation of resonance and dynamic balance.



Measurement and Data Recording Capabilities

- Static (Trended) Data

All static parameters — including overall vibration values, phase, rotational speed (RPM), and harmonic components — are continuously measured and stored as trend data.

- **Recording Resolution:** 500 milliseconds (data updated every 0.5 s)
- **Time Span:** Unlimited, depending solely on the available SSD capacity of the CMS-PRO server. This ensures long-term trending and performance evaluation without any predefined time restriction.

- Dynamic (Waveform and Spectrum) Data

CMS-PRO provides advanced dynamic signal processing and recording with the following capabilities:

- **Data Update Rate:** 1 second (each channel's time-domain and FFT data are refreshed every second).
- **Event Buffering:** Automatic data recording for up to 1800 seconds (30 minutes) before and after any Alarm or Trip event, enabling full pre- and post-event diagnostics.
- **Manual Continuous Mode:** Optional continuous waveform recording mode for extended testing or long-term dynamic analysis.

CMS-PRO – Data Access & Export

CMS-PRO provides full access to raw time-domain data and frequency-domain (FFT) results for all configured channels. Operators can review, download, and export datasets for deeper analysis in third-party tools.

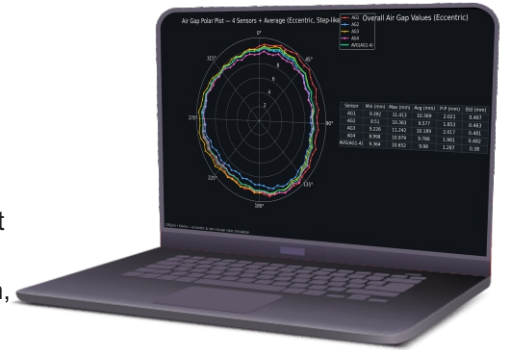
- Per-channel raw waveform access (time signals) and computed FFT spectra.
- Multi-channel export with synchronized timestamps (Keyphasor alignment where applicable).
- Event-based export (pre/post alarm windows) and continuous data export for long-term studies.
- Export formats: CSV and JSON (including channel metadata, sampling rate, units).
- Sampling up to 4 kHz bandwidth per channel with configurable record length.
- Compatible with third-party analysis tools such as MATLAB, Python/NumPy, Octave, and general-purpose DA suites.
- Batch export and operator-initiated on-demand export from the CMS-PRO UI.

Air Gap Polar Plot

Displays measured air gap values over a full rotor revolution, based on each sensor's angular position.

- **Uses:** Detect static/dynamic eccentricity, rotor ovality, pole misalignment or damage.

- **Possible Faults:** Static/dynamic eccentricity, rotor ovality, pole deformation, misalignment.



Gap for Opposite Air Gap Sensors

Compares readings from opposite sensors (e.g., AG1 vs AG3). Large differences indicate rotor center displacement relative to the stator center.

- **Uses:** Detect rotor offset, monitor bearing wear or shaft misalignment, identify partial stator deformation.

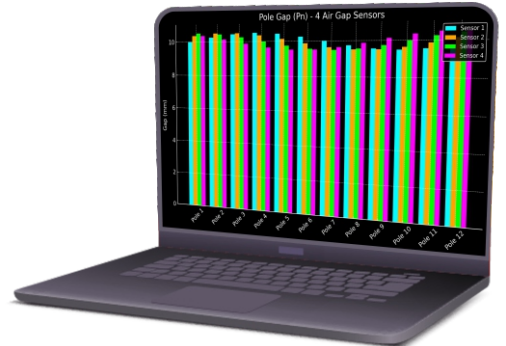
- **Possible Faults:** Rotor offset, bearing wear, stator frame distortion.



Overall Values per Channel

Statistical parameters for each sensor:

- Min Gap: Smallest air gap (risk of rotor-stator contact)
 - Max Gap: Largest air gap (possible eccentricity or looseness)
 - Average Gap: Nominal reference (compare to design)
 - Std: Standard deviation (linked to vibration or instability)
- **Possible Faults:** Rotor-stator contact risk, eccentricity, looseness, vibration-related instability.



Trend of Overall Values

Tracking Min, Max, Average, and Std over time for condition monitoring and early fault detection. Uses:

- Min Trend: Gradual reduction (rotor shift, bearing wear, thermal deformation)
 - Max Trend: Increasing eccentricity or looseness
 - Avg Trend: Slow nominal position change (installation shift, foundation settling)
 - Std Trend: Variations in vibration or instability levels
- **Possible Faults:** Foundation movement, thermal expansion issues, progressive bearing wear, rotor imbalance, gradual stator deformation.

