



# HRV PREMIUM

**Kubios HRV Premium** is the market leader in heart rate variability (HRV) analysis software for scientific research and professional use. With Kubios HRV Premium, you can turn your ECG device or HR monitor into a powerful tool to probe the cardiovascular system or to evaluate the effect of stress and recovery on heart health. Kubios HRV Premium provides the most detailed HRV analysis on the market with over 40 analysis parameters.

## The gold-standard HRV software

Kubios HRV is a scientifically validated software and is being used roughly at 1200 universities in 128 countries. The software has been developed during the past 20 years and key publications related to the software and its pre-processing algorithms are listed below. These four publications have attracted over 2000 citations and **Kubios HRV software has been used in over 4500 scientific publications.**

1. Tarvainen MP et al. An advanced detrending method with application to HRV analysis. *IEEE Trans Biomed Eng*, 49(2):172-175, 2002.
2. Niskanen J-P et al. Software for advanced HRV analysis. *Comp Meth Programs Biomed*, 76(1):73-81, 2004.
3. Tarvainen MP et al. Kubios HRV – Heart rate variability analysis software. *Comp Meth Programs Biomed*, 113(1):210-220, 2014.
4. Lipponen JA & Tarvainen MP. A robust algorithm for HRV time series artefact correction using novel beat classification. *J Med Eng & Technol*, 43(3):173-181, 2019.

## Designed for research and professional use

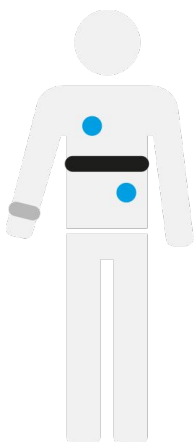
Kubios HRV Premium provides the most detailed HRV analysis on the market with over 40 analysis parameters, including all commonly used time-domain, frequency-domain and nonlinear HRV parameters. Analyze specified time periods or process the whole recording using time-varying analysis. Reliability and accuracy of HRV results is guaranteed by robust beat detection, noise handling and beat correction algorithms.

## Stress and recovery monitoring

Kubios HRV Premium provides detailed and illustrative monitoring of autonomic nervous system activity. With its powerful time-varying analytical protocols, you can easily monitor your daily stress levels or evaluate how exercise and training affects your health.

## Supports your measurement device

Kubios HRV Premium is compatible with most of the HR monitors on the market, with several commonly used electrocardiogram (ECG) devices, and with certain photoplethysmogram (PPG) devices.



HR  
monitor

ECG  
monitor

PPG  
monitor

Data from your device



## Operating system

- Kubios HRV Premium is available for 64-bit operating systems: Windows (7 SP1 or 10), macOS (Mojave, Catalina or Big Sur) and Linux
- Minimum system specifications: 4 GB RAM, 3-5 GB of disk space and screen resolution 1024 x 768 or higher.

## Usability

- Easy-to-use graphical user interface (GUI)
- Adaptable to user needs due to adjustable analysis settings through software preferences.

## Supported data formats and devices

- Inter-beat-interval (IBI) or RR interval data files: Direct export from Polar Flow; Garmin and Suunto FIT files; custom formatted text and CSV files
- ECG/PPG data files: European data format (EDF/EDF+); Cardiology XML; ISHNE Holter ECG data format; Biopac ACQ3; General data format (GDF); Physionet MIT format; and custom formatted text and CSV files
- Supported ECG/PPG devices: Actiwave Cardio, AliveCor Kardia, Biopac, Bittium Faros, Empatica E4, Mindfield MindMaster, Shimmer and several clinical Holter and ECG monitors
- Supported HR monitors: ActiHeart, emWave, Firstbeat Bodyguard, Garmin (Forerunner and Fenix series), Polar (direct export from Polar Flow), Suunto (Ambit and Spartan series), Zephyr BioHarness etc.

## Pre-processing features

- Built-in QRS detector for accurate detection of ECG R-waves and pulse wave detector for PPG data
- Automatic noise detection to exclude noisy data periods from HRV analysis. Noise detection level can be adjusted and noise markings can be manually edited.
- Automatic beat correction algorithm for correcting missed, extra and misaligned beats from RR interval time series. The algorithm was validated using the MIT-BIH arrhythmia database, showing 97.0% accuracy in detecting ectopic beats and 99.9% accuracy in identifying normal beats
- Smoothness prior's method for removing very low frequency trend components when performing short-term HRV analysis.

## HRV analysis features

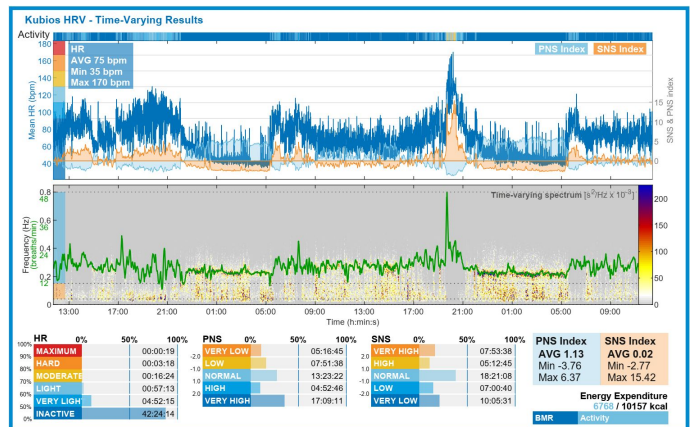
- Indexes for parasympathetic (PNS) and sympathetic nervous system (SNS) activities
- Time-domain parameters: Mean RR and HR, min and max HR, SDNN, RMSSD, pNN50 (with adjustable threshold), HRV triangular index, TINN, Baevsky's stress, and HR deceleration capacity (DC)
- Frequency-domain parameters: Welch's/Lomb-Scargle periodogram and AR spectrum estimates. VLF, LF and HF peak frequencies and band powers, and LF/HF ratio
- Nonlinear parameters: Poincare plot (SD1, SD2, and SD2/SD1), ApEn, SampEn, Detrended fluctuation analysis (DFA), Recurrence plot analysis (RPA), and Multiscale entropy (MSE).

## Respiration rate estimation

- Built-in algorithm for respiration rate. Respiration rate is estimated from RR or IBI fluctuations, but also ECG waveform data is utilized when available. The algorithm has been validated with a large number of exercise and resting HRV data. Respiration rate is an important parameter in exercise physiology, in reliable respiratory sinus arrhythmia (RSA) component estimation, and in individual resonance frequency assessment.

## Time-varying analysis features

- Time trends in the HRV parameters to detect changes in HRV e.g. during a 24-hour recording or during exercise and recovery periods
- Analysis window can be adjusted for investigating long-term or short-term dynamics
- Spectrogram with "Fire" colormap, a graphical illustration of dynamic changes in HRV components, at a glance, one can appreciate how stress affects the cardiovascular system and how therapeutic actions can hasten recovery.



## Reports and exporting results

- ECG printout option for printing the ECG signal (single lead) on a standard paper ECG layout
- PDF reports with detailed HRV analysis results and graphics
- CSV text file export for saving all the analysis results into a structured text file
- Matlab MAT file export for saving the analysis session and the results. Previously performed analysis session can be reopened by opening the MAT file, which enables an easy way to change analysis settings and reanalyse the data
- "SPSS friendly" batch file export to save analysis results into a CSV file, which can be opened in Excel or imported into SPSS.

## Pricing and licensing policy

- Pricing available at [www.kubios.com/hrv-premium](http://www.kubios.com/hrv-premium)
- Kubios HRV Premium purchase price includes access to all software updates for 1-year period. Access to updates after the first year is available by paying an annual maintenance fee
- One license allows you to use the software on one computer. Quantity discounts are available.