DIGITLINE

EQUIPMENT AND SERVICES FOR MONITORING, TESTING AND DIAGNOSIS

FASTVIEW®

SOFTWARE FOR INDUSTRIAL APPLICATIONS

Fastview is a software platform for signal processing and analysis, intended for testing, monitoring and diagnosing industrial machines, components and structures.

A wide range of parameters can be acquired at high speed and analyzed with high performance algorithms.

Fastview measures the monitored parameters with high accuracy, using strictly their defiining relationships in the time and frequency domains.
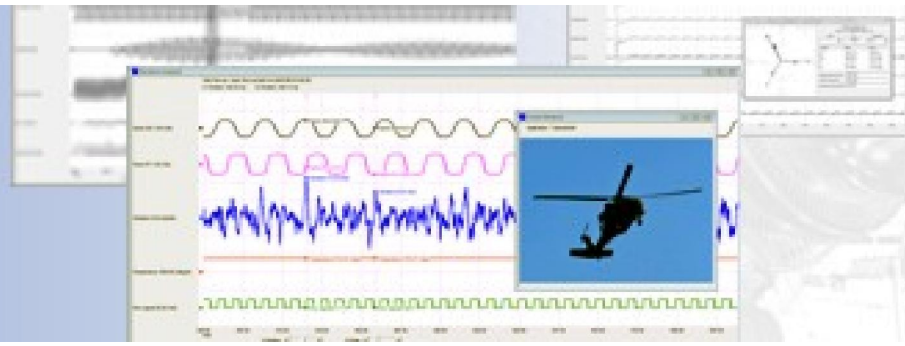
The numerical signal processing functions ensure efficient and unitary monitoring solutions for a wide range of applications in various fields of activity.

Fastview is compatible with a wide range of National Instruments products, equipments that use standardized communication protocols (dataloggers, laser units, accelerometer and inclinometers networks) and the latest versions of Windows.

Fastview is compatible with a wide range of acquisition equipment with USB, Ethernet, or Wireless communication

Overview

In the numerical processing of signals, similar to other fields of technique, two main operations are distinguished: analysis and synthesis.

Analysis represents a process of decomposing a function (or another type of object) into basic components, easy to measure and interpret, while synthesis represents the corresponding operation, of construction.

The analogy between the constructive parts of a machine and a harmonic oscillator (a moving mass on which an elastic force acts) indicates that the primary, free, movement have a sinusoidal form.

Displacements on the monitoring directions, in which the circular or elliptical trajectory of a shaft decomposes, are also sinusoidal.

According to this reasoning, the sine wave was chosen as basic element in analyzing and synthesizing vibration signals.

In case of industrial machine diagnosis, the analyzed signals have a complex form, corresponding to natural composition of several sources of sinusoidal vibrations.

The analysis of vibrations of industrial machines is based on the acquired signals decomposition into sinusoidal signals that were the basis of their generation.

Parameters of sinusoidal components (amplitude, frequency and phase) are used to evaluate the machine status and to detect and identify the defects.

In the energy industry the sinusoidal waveform is used to define electrical characteristics and operating regimes.

Results' accuracy depends on the frequency bandwidth in which the analysis takes place and on the accuracy of determining the parameters specific to each basic component.
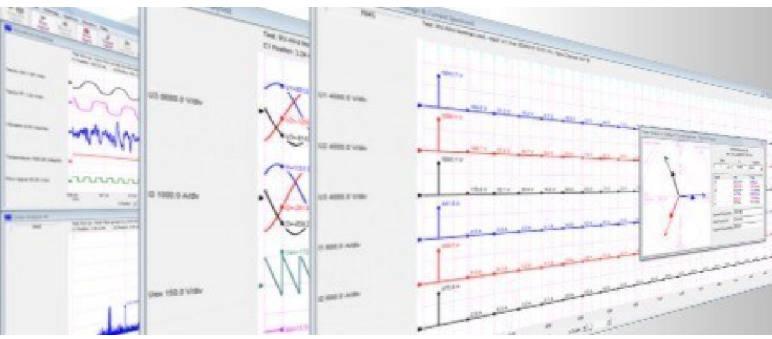
In the numerical processing of vibration signals, there are two main methods: Fourier Transform (FT) for analysis and Inverse Fourier Transform (IFT) for synthesis.

Fast Fourier Transform (FFT) is a fast calculation algorithm for Fourier Transform.

The results of analysis of a signal with a complex evolution in time domain, are presented as a frequency spectrum (each component is represented by a vertical line, of a height proportional to the amplitude and position on the X axis corresponding to its own frequency).

The component, whose frequency is equal to rotor speed or to power line frequency, is called fundamental, and the components with frequencies equal to multiples of the fundamental frequency are called harmonics.

Determining with high-accuracy the harmonic order of each spectral component is essential in identifying the vibrations' source and in diagnosing defects.

Characteristics

- **Continuous data acquisition, processing, recording and playback.**
  Data acquisition, processing, recording and playback are performed continuously (without loss of samples). The initialization sequence is unique, and the results are dynamic and contiguous.

- **Online and offline functioning**
  Fastview uses high-speed processing algorithms, which allow the monitoring of a wide range of characteristics of the analyzed quantities, simultaneously with the acquisition process.
  Raw data recording offers the possibility of post-acquisition use of the entire set of processing and analysis functions.

- **Multichannel architecture**
  Dozens of input channels can be controlled by the acquisition rate, the coupling type (alternatively, continuous, IEPE), the analysis buffer size and the transfer block.

- **Filtering, integration and derivation in the time and frequency domains without phase distortion between signals or harmonics**
  The entire set of processing functions uses algorithms that do not distort the phase relationship between signals or their spectral components. It is thus possible, for example, to simultaneously analyze the waveform of the vibrations' acceleration, velocity and displacement, as well as their composition.

- **Multiple options for synchronization signals processing, channels dedicated to speed and frequency measurement, extraction of speed information from vibration signal**
  Fastview integrates a group of channels designed to synchronize the analysis functions with the vibration sources or the power line.
  The synchronization signals can come from dedicated sensors or they can even be the analyzed signals, processed in parallel and in specific mode.

- **Analysis in time and frequency domains with fixed buffer or self-adaptive buffer**
  The time interval corresponding to the analysis buffer, on which depends the measurement accuracy of the signals' main parameters, can be of fixed value or of value adapted automatically to synchronization signals' characteristics.

- **Synchronous harmonic analysis, high resolution of frequency and order, elimination of spectral leakage for the fundamental component and higher harmonics**
  By synchronizing the spectral analysis, the errors due to the FFT leakage phenomenon are eliminated. For analog synchronization

signals, the resolution of frequency and order of each harmonics family becomes infinite.

- **Spectral analysis of signals with variable frequency, run-up and run-down functions (order analysis)**
Run-up and run-down processing functions convert the variable frequency signals (increasing or decreasing) into signals with a constant angular sampling rate.
Transient regimes are analyzed in the order domain, the spectral lines indicating exactly the energy of the respective components.

- **Harmonic identification and tracking with multiple references (computed multi-axis order tracking)**
Fastview offers the architecture and accuracy needed to identify, with high resolution, the families of harmonics present in the analyzed signal. The basic frequencies of the harmonic families can be intercorrelated or independent.
Example of applications: separation of mechanical vibrations from electromagnetic vibrations to electric motors, monitoring of the vibrations of each axis at the gearboxes, measuring the vibrations of the compressor rotor and the free turbine rotor at the turboshaft engine.

- **Composition of absolute vibrations with relative vibrations, measurement of absolute vibrations of the rotor**
Through the mathematical channels are composed the absolute vibrations displacements of the bearings, obtained by the double integration of the acceleration or by the simple integration of the velocity, with the displacements of the relative vibrations of the rotor, obtained through the proximity sensors. The new signals completely describe the absolute vibration of the rotor.

- **Compensation of the deviations of circularity, eccentricity and material of the shafts (runout compensation)**
In order to increase the accuracy of the measurement of relative vibrations, Fastview allows the identification of the spectral components due to the different types of deviations of the shaft and their subtraction from the measured spectral components.

- **Spectral analysis of signals resulting from the composition of two orthogonal sources (*Full Spectrum*)**
The trajectory of the shaft in the bearings is monitored by the composition of two relative vibrations, measured in perpendicular directions. An advanced level characterization of this movement is obtained by evaluating the direct and inverse components associated with the harmonic pairs of the composite signals.

- **Simultaneous analysis of vibrations, sounds, electrical parameters and process parameters**
Numerical signal processing ensures unitary results for a wide range of input quantities.
The obtained results reflect both the individual evolution of the analyzed quantities and the interaction between them.

- **Monitoring and diagnosis of sleeve bearings, baal bearings, pallets, gears, transmission belts, machining tools, electric motors**
Processing, analysis and diagnostic functions specific to the various components of the machines are available. A series of cursors automatically indicates the presence and severity of the defect.

- **Dynamic or static-couple rotor balancing by the influence coefficient method**
The high accuracy in measuring the fundamental component of vibrations and vector-type average, make it possible to

detect and correct mass imbalances of very low level.

The balancing solution is dynamic or static-couple.

The input data, related to the mass imbalance, can be supplemented with data related to the electromagnetic imbalance.

The balancing of the rotors can be performed in the installation or on balancing machines.

- **Rotor balancing without measuring the speed and phase, through the four run method**

  This method calculates the balancing solution according to a procedure based on the graphical representation of the force and displacement vectors. It is intended for use on balancing machines operating at low resonance frequency and in situations where vibration phase monitoring is not possible

- **Ultrasound analysis, testing and diagnostic applications**

  The analyzed signals can come from sensors with output in the ultrasound frequency range or from sensors with output in the audio frequency range (demodulated signals). The simultaneous use of transducers for relative vibrations, absolute vibrations and ultrasound, covers the entire frequency band on which industrial machine defects can occur.

- **Analysis of torsional strain and vibrations, measurement of shaft power**

  Fastview implements functions dedicated to te measurements performed with strain gauge: configuration of the measuring bridges, control of the supply voltage and of the internal calibration shunt, operational sequences of calibration and cancellation of the offset. The strain, forces, torsional vibrations, torque and shaft power are measured and analyzed. The acquisition modules can be mounted on the fixed or rotating parts of the machines, the

communication being carried out by cable or wireless.

- **Data acquisition with dedicated modules, sound cards, accelerometers with USB connection**

  Data acquisition can be done with dedicated acquisition modules (with USB, Ethernet, wireless communication), the computer system sound card and USB digital accelerometers

- **Recording GPS time and coordinates simultaneously with vibration signals**

  In vehicle testing or monitoring applications, vibration signals are recorded simultaneously with the GPS time and coordinates as well as with te moving speed.

- **Local or remote monitoring**

  The configuration of the equipment and the visualization of the results take place directly, through the Fastview interface, or remotely, through the Web type monitoring platform. The Web platform has a modular architecture, takes data from a high number of measurement points and can be installed and exploited in Cloud, in hybrid environments or exclusively in the local network.

- **Export in different formats, copy to clipboard, record in databases**

  The results of each type of analysis can be exported, on request or automatically, to Access and Excel compatible files. The contents of the windows can be retrieved through Copy-Paste commands. The Web platform stores the results in MySQL databases. Other types of databases or the resources of existing database servers can be used upon request.

Specifications

1. Acquisition, recording and playback

- Continuous acquisition, recording and playback of raw data
- Programmable acquisition speed and buffer within wide limits
- Selectable coupling type: *AC, DC, IEPE*
- Control of the supply voltage of the tensometric bridges

2. Preprocessing

2.1. Scaling
- Internal calibration constants
- Scaling according to the characteristics of the transducers
- List of multiple units of measurement
- Internal shunt control for the calibration of tensometric bridges
- Sensitivity and offset calculator

2.2. Mathematical channels
- New signals obtained by mathematical calculations with the samples of the acquired signals
- Virtual channels of voltage, current and instantaneous power
- Composition of absolute vibrations with relative vibrations, measurement of absolute vibrations of rotors

2.3. Synchronization channels
- Channels dedicated to measuring frequency and speed, and synchronizing processing functions
- Configuration options: source channel, transition level, number of pulses per cycle (as real number)

2.4. Time domain filtering
- Continuous filtering, without phase distortion, Smoothing and FIR type, low pass, high pass, high band pass
- Frequency response view

2.5. Time domain integration
- Continuous integration, single or double, without phase distortion
- Simultaneous analysis of acceleration, speed and vibration displacement

2.6. Time domain derivation
- Continuous derivation, single or double, without phase distortion
- Simultaneous analysis of acceleration, speed and vibration displacement

2.7. Triggering
- Programming source channel, level and position
- Single or continuous trigger sequence
- Trigger type: *Positive edge, Negative edge, Entering window, Leaving window, Min hold, Max hold*

3. Time domain analysis

3.1. Frequency measurement
- Measuring the period and frequency
- Cycles counting

3.2. Speed measurement
- Measuring period, speed and peripheral speed

3.3. Waveform analysis
- Graphical representation, autoscaling, autooffset
- Statistical calculation on fixed or self-adaptive buffer (synchronized): *Max, Min, Pk, Pk-Pk, Pk-Pk/2, Mean, Rectified Mean, RMS, RMS*sqrt(2), Variance, Average Deviation, Standard Deviation, Standard Deviation*sqrt(2), SNR, Coefficient of Variation, Crest Factor, Form Factor, Kurtosis Factor, Skewness, Power, Energy, Absolute Deviation, Relative Deviation*
- Statistical calculation for each cycle and on a programmable number of cycles
- Cursors for evaluating instantaneous values and statistical values for the selected time interval
- Multiple cursors for identifying periodic peaks
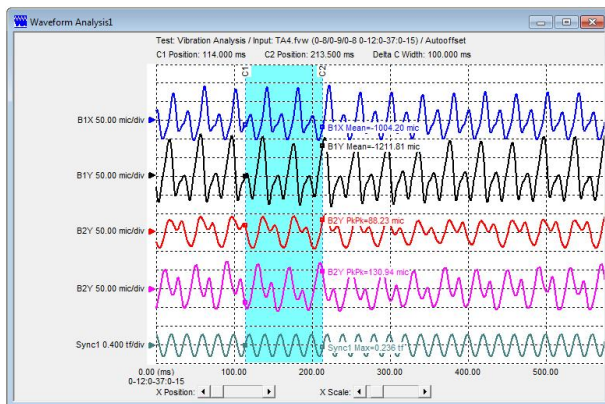
Multichannel waveform analysis, cursors for instantaneous values or time interval

3.4. Circularity
- Circularity plot
- Measurement: *Positive max deviation, Negative max deviation, Pk-Pk deviation*, distributia deviatiilor

3.5. Histogram
- Histogram chart
- Measurement: *Mean, RMS, Standard Deviation, Mode, High, Low, Range, Median, TotalP, MaxP*

3.6. Displacement in the XY plane
- Graphical representation of the displacement or tilt in the XY plane
- Identification of vibration generating deviations within the circular trajectories of CNC machines
- Measurement: *Xmax, Xmin, Xpk-pk, Xmean, Ymax, Ymin, Ypk-pk, Ymean, Smax, Phase of Smax*
- Markers: *Smax, Cursor*

3.7. Overall orbit
- *AC* or *DC* coupling
- Measurement of the parameters of the shaft trajectory: *Xpk-pk, Ypk-pk, Smax, Phase of Smax*
- Measuring the average position of the shaft: *Xmean, Ymean, Eccentricity, Attitude Angle*
- Markers: *Smax, Phase Reference, Precession Direction, Time Cursor*
- Compensation of sensors orientation (0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°)
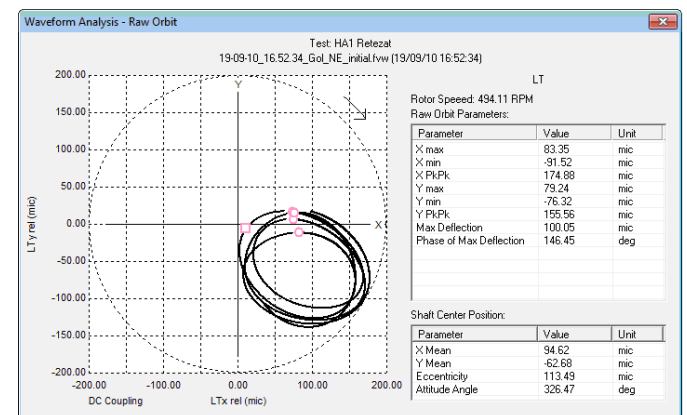
Overall orbit plot, the trajectory and the shaft position parameters

3.8. Waveform edit

- Elimination of disturbing data (eg local damage of the shaft surface when measuring relative vibrations)

3.9. Waveform saving and opening

- Commands for saving and opening Waveform
- Automatically save the waveforms at programmed time intervals or when exceeding the preset limits, parameter of conditioning of the recordings

4. Angle domain analysis

- Resampling in the angle domain
- 2D and 3D graphics versus time, cycle number or speed
- Statistical analysis on the programmable angle or number of cycles: *Max, Min, Pk, Pk-Pk, Pk-Pk/2, Mean, Rectified Mean, RMS, Variance, Average Deviation, Standard Deviation, Crest Factor, Form Factor, Kurtosis Factor, Skewness*
- Instantaneous speed profile
- Specific functions for testing internal combustion engines and piston compressors

5. Frequency domain analysis

5.1. Frequency spectrum analysis with constant bandwidth

- Free or synchronized FFT processing (triggering on selected signal)
- FFT Window: *Rectangular, Hanning, Hamming, Flattop, Welch, Blackman, Parzen, Exponential*
- Single or double integration
- Single or double derivation
- Average: *RMS, Vectorial, Linear, Exponential*
- Spectrum type: *Peak, Peak-Peak, RMS, Power, Power Spectral Density, Phase*
- Scale: linear, logarithmic, autoscaling
- Display options: maximum value, selected harmonics, even harmonics, odd harmonics,

DC component, exceedance above warning level
- Cursors for evaluating spectral lines, harmonics, frequency bands
- Multiple cursor for identifying harmonic families
- Multiple cursor for sidebands analysis
- Measurement of spectral components, harmonic, interharmonic, subharmonic, sidebands, user-defined frequency bands, frequency, phase, absolute and relative deviations

5.2. Runout compensation

- Compensation of deviations of circularity, eccentricity and material of the shaft when measuring relative vibrations 1X, 2X, 3X harmonics

5.3. Fault frequency cursors

- Cursors for indicating the fault frequencies corresponding to the bearings, gears, or power line
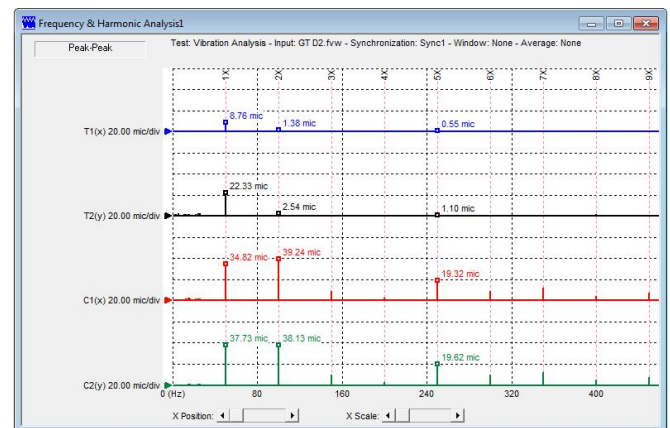
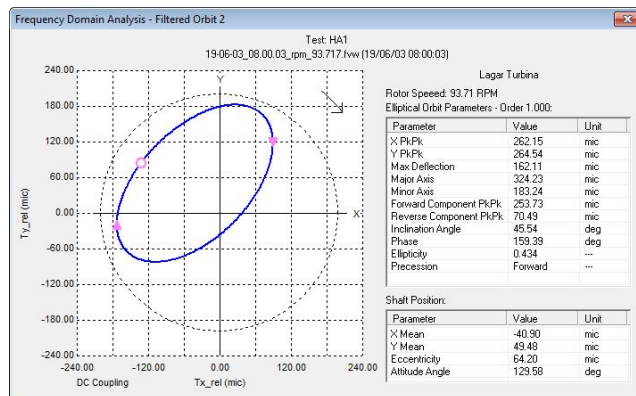*Leakage free frequency and harmonic spectrum analysis*

5.4. Constant percentage bandwidth spectrum

- 1/1 and 1/3 octave analysis

5.5. Filtered orbit

- FFT nX filtering
- User-defined analyzed harmonic
- AC or DC coupling
- Measuring trajectory parameters: *Xpk-pk, Ypk-pk, Max Deflection, Major Axis, Minor Axis, Inclination Angle, Phase, Elipticity, Precession Direction, Forward Component, Reverse Component*
- Measurement of shaft position: *Xmean, Ymean, Eccentricity, Attitude Angle*
- Markers: *Phase Reference, Precession Direction*
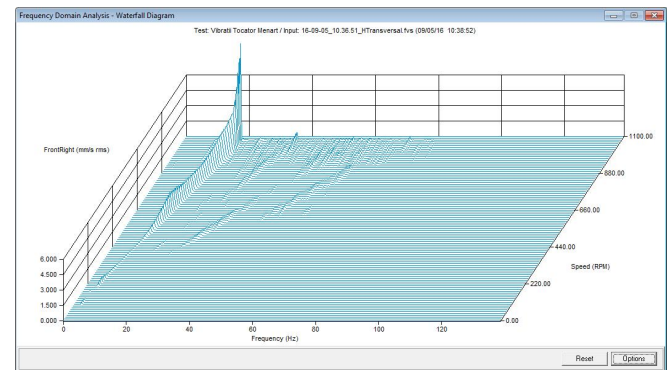- Compensation of sensors orientation

1X Filtered orbit

5.6. Composite orbit

- FFT 1X-4X filtering
- User-defined analyzed harmonics
- AC or DC coupling
- Measuring trajectory parameters: *Xpk-pk, Ypk-pk, Phase, Max Deflection, Phase of Max Deflection*
- Measurement of shaft position:: X mean, Y mean, Eccentricity, Attitude Angle
- Markers: *Smax, Phase Reference, Precession Direction*
- Compensation of sensors orientation

5.7. Polar plot

- Representation of the vectors by amplitude and phase for one or more channels
- User-defined analyzed spectral components
- Masuring *Peak, Peak-Peak, RMS, Phase*
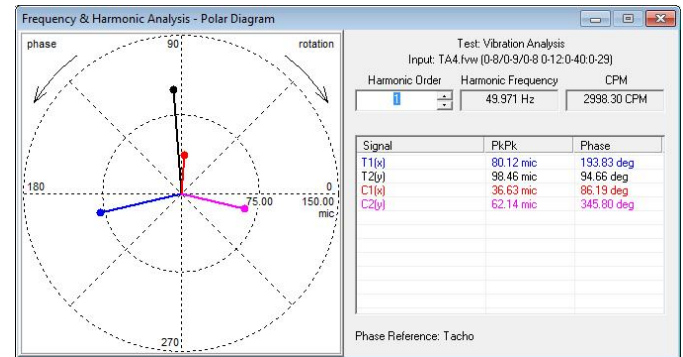
Multichannel, 1X, polar plot

5.8. Waterfall plot

- Dynamic waterfall plot (amplitude-frequency-time / speed)
- Run-up or run-down type
- Evaluation coursors

Frequency domain waterfall

5.9. Rotor balancing using the influence coefficients method

- Three runs for balancing machines whose influence coefficients are not known
- A single run for balancing machines whose influence coefficients are know
- Measurements and calculations in the frequency domains
- Vector average
- Display and editing influence coefficients
- Options for the type of weights (add or remove) and the distribution mode (continuous or discrete)
- Options for keeping or removing calibration weights

- Warning at speed values outside the required limits
- Dynamic or static-couple solution
- Determining the quality limits according to the standards in force, measuring and checking the residual unbalance
- Units of measurement in the metric or English system
- Warning when exceeding limits
- Encoder measurement of the angular position of the rotor (depending on the type of equipment)
- Window for large character display of rotor angular position and balancing solution
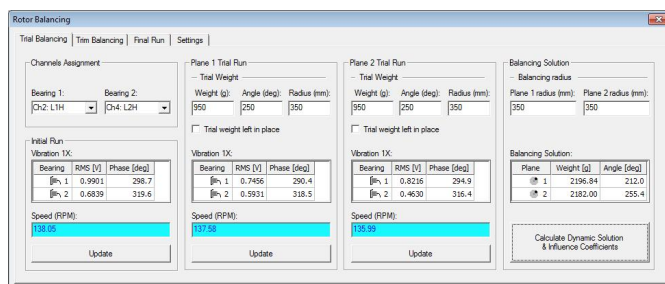
Numerical interface of balancing function by the influence coefficients method

5.10. Advanced balancing functions
- Calculation of the balancing solution according to the result of mass imbalance-electromagnetic imbalance

6. Order analysis

6.1. Harmonic spectrum analysis
- Synchronized FFT processing (triggering on selected signal)
- Run-up and run-down functions for analyzing variable frequency signals
- Single or double integration
- Single or double derivation
- Average: *RMS, Vectorial, Linear, Exponential*
- Spectrum type*: Peak, Peak-Peak, RMS, Phase*
- Scale: linear, logarithmic, autoscaling
- Display options: maximum value, selected harmonics, even harmonics, odd harmonics, DC component, exceedance above warning level

- Coursors for evaluating spectral lines, harmonics or groups of harmonics
- Multiple cursor for identifying harmonic families
- Multiple cursor for sidebands analysis
- Order tracking simultaneously for harmonics from different families
- Measurement of harmonics, inter-harmonics, sub-harmonics, sidebands, user-defined harmonic groups

Order analysis simultaneously for two independent rotors

6.2. Runout compensation
- Compensation of deviations of circularity, eccentricity and material of the shaft when measuring relative vibrations for 1X, 2X, 3X harmonics

6.3. Fault frequency cursors
- Cursors for indicating the fault frequencies corresponding to the bearings, gears, or power line

6.4. Polar plot
- Representation of the vectors by amplitude and phase for one or more channels
- User-defined analyzed spectral components
- Masuring *Peak, Peak-Peak, RMS, Phase*

6.5. Filtered orbit
- FFT nX filtering
- User-defined analyzed harmonic
- AC or DC coupling
- Measuring trajectory parameters: *Xpk-pk, Ypk-pk, Max Deflection, Major Axis, Minor Axis, Inclination Angle, Phase, Elipticity, Precession*

*Direction, Forward Component, Reverse Component*

- Measurement of shaft position: *X mean, Y mean, Eccentricity, Attitude Angle*
- Markers: *Phase Reference, Precession Direction*
- Compensation of sensors orientation

6.6. Composite orbit
- FFT 1X-4X filtering
- User-defined analyzed harmonics
- AC or DC coupling
- Measuring trajectory parameters: *Xpk-pk, Ypk-pk, Phase, Max Deflection, Phase of Max Deflection*
- Measurement of shaft position:: X mean, Y mean, Eccentricity, Attitude Angle
- Markers: *Smax, Phase Reference, Precession Direction*
- Compensation of sensors orientation

6.7. Waterfall plot
- Dynamic waterfall plot (amplitude-order-time / speed)
- Run-up or run-down type
- Evaluation coursors
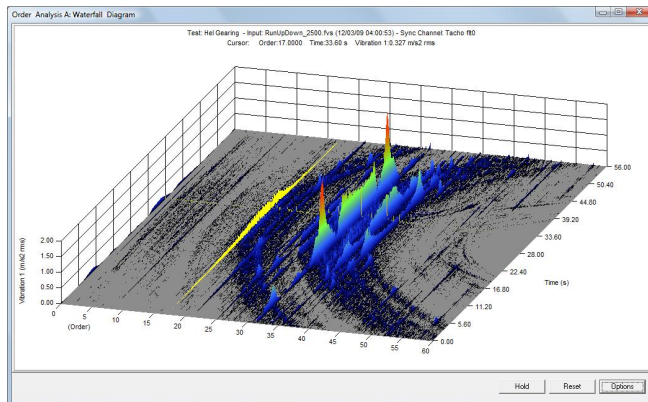
Order domain waterfall

7. Envelope analysis

7.1. Frequency domain enveloping
- Envelope based on the Hilbert transform, unaltered preservation of the amplitude of the shocks due to defects
- Time, frequency and order domains analysis
- User-defined frequency band for each channel, selection cursor for optimizing settings

7.2. Advanced processing functions
- Composite frequency bands
- Options for removing harmonics or inter-harmonics from the analysis band

7.3. Advanced analysis functions
- Shock phase analysis

7.4. Bearing and gearbox diagnostics
- Calculation of fault frequencies
- Fault frequency indication cursors for bearings, gears or power line
- Simultaneous diagnosis of defects specific to several types of bearings associated with a single acquisition channel
- Automatic measurement or manual input of speed

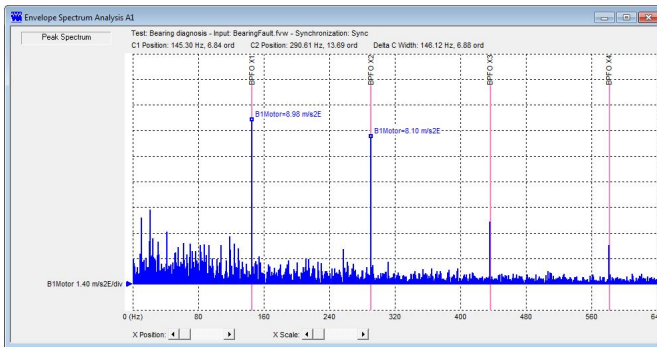## 7.5. Database with fault frequencies
- Database with the fault frequencies of the most used types of bearings
- Registration of new types of bearings
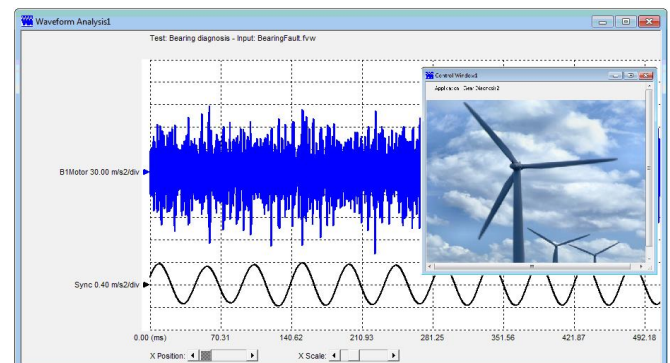
Analysis of bearings vibration waveform, extracting the speed signal from the vibration signal
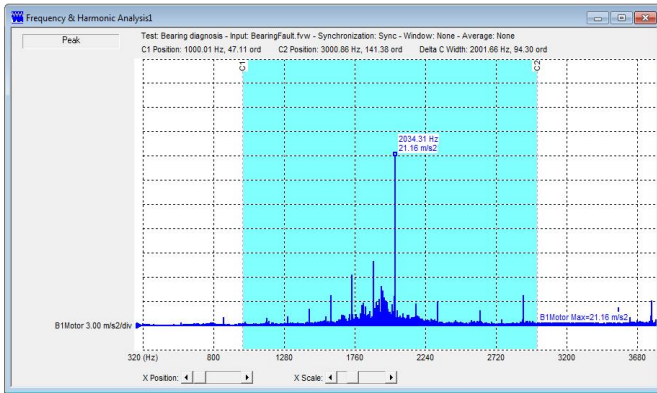
Vibration frequency spectrum
Selecting the optimal frequency band for vibration envelope analysis

Envelope frequency spectrum
Identifying the impact repetition frequency, recognizing the type of fault

8. Cepstral analysis

- Cepstral analysis of noise and vibration
- Gears fault detection functions

9. Frequency response analysis

9.1. Frequency response function

- Types of functions:
  Dynamic Mass (Force / Acceleration), Mechanical Impedance (Force / Speed), Dynamic Rigidity (Force/ Displacement), Compliance (Displacement / Force) Accelerance (Acceleration / Force), Mobility (Speed / Force), Transmissibility (Acceleration / Acceleration)
- Presentation modes: amplitude and phase according to frequency
- Calculation of modal parameters (frequency, damping, shape)
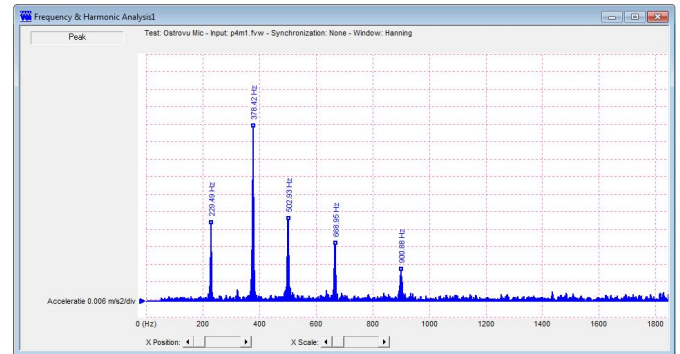
Measurement of natural frequencies

## 9.2. Measurement of natural frequencies (*bump test*)

- Automatic search in the programmed frequency bands
- Automatic measurement of up to 10 natural frequencies
- Support functions for measuring the blades natural frequencies: warning when the blade series is entered incorrectly and when exceeding the programmed limits, counters, recording blade series and measured frequencies in the Excel or Access table, fast operation, optimized for touchscreen devices

10. Electrical parameters analysis

- DC or AC analysis, single-phase or three-phase, star or delta, in time and frequency domains
- Mathematical channels for obtaining new voltage and current signals based on Kirchhoff's laws
- Voltages and currents frequency spectrum
- Amplitude and phase correction of the transducers response

- Measurement of voltage, current, active power, reactive power, apparent power, distortion power, power factor, distortions, imbalances, asymmetries, period, frequency
- Effective values monitoring for entire spectrum, harmonics, subharmonics, interharmonics, side bands, user-defined frequency bands
- Phasor chart, amplitude and phase measurement, analysis of three-phase voltage and current systems by the symmetric components method (direct, inverse and homopolar)
- Diagnosis of electrical machines: analysis of harmonics families of current synchronized with the grid and speed, analysis of harmonic families of vibrations synchronized with the grid and speed
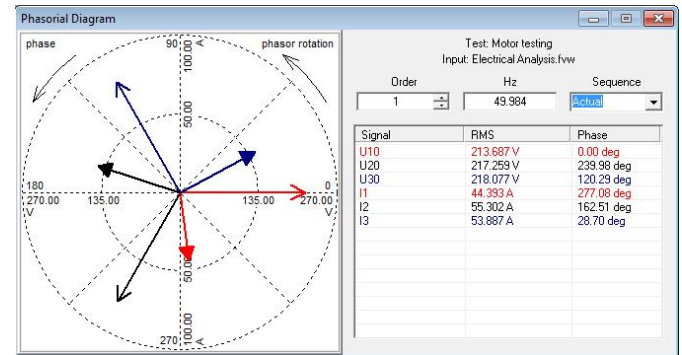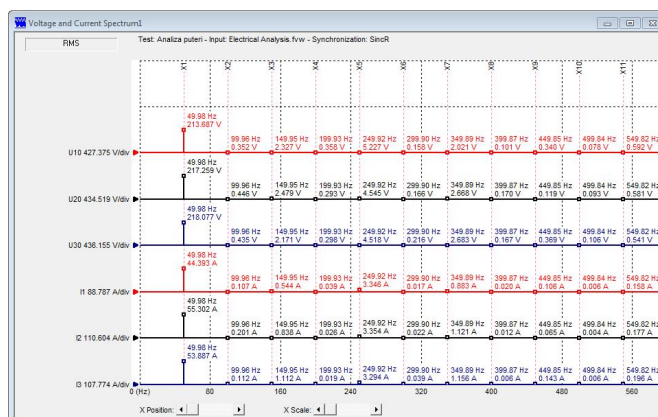

Phasor diagram, direct, inverse and homopolar component analysis

11. Air gap analysis

- Waveform analysis, statistical calculation
- Polar chart and bargraph with pole profile, current air gap, deviations from the average value, difference of neighboring poles
- Measurement of static and dynamic eccentricity, orbit diagrams
- Measuring the circularity of the rotor and stator
- Graphical representation of stator and rotor shape
- Warning when exceeding limits
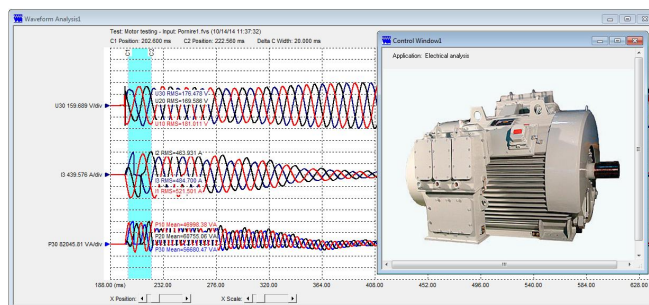
Analysis of voltages, currents and powers in the time domain

12. Measurement and monitoring

12.1 Defining the monitored parameters
- Defining the parameters of the input signals by choosing the channel, analysis and signal characteristics

12.2 Measurement and monitoring
- Display in tabular form
- Large character display window of the main parameters
- Yellow and red warning, when exceeding the limits LL, L, H, HH
- Automatic waveform recording when exceeding the limits

Analysis of voltages and currents in the frequency domain

12.3 Support for automatic diagnosis
- List of user configurable defects
- Association of the defects in the list with the monitored parameters

13. History

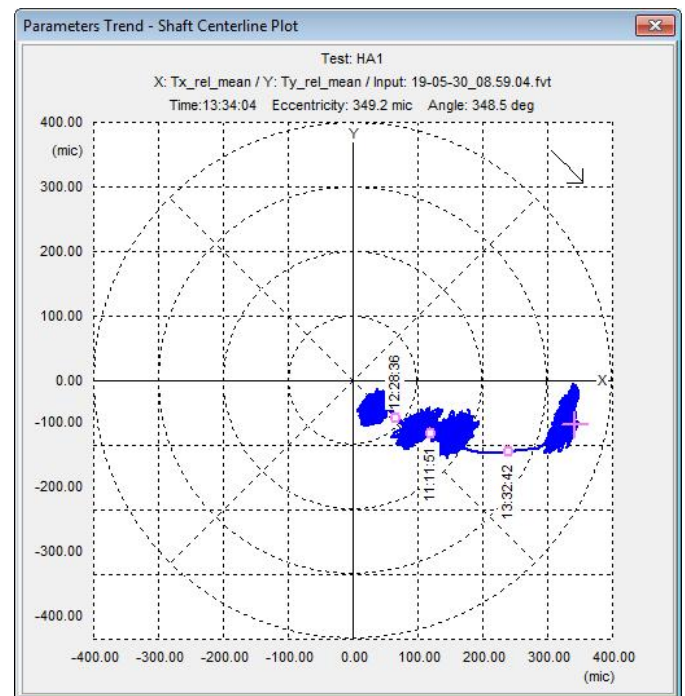## 13.1. Analysis of the evolution of measured parameters
- Trend analysis
- Statistic analysis
- Representation in XY format of the evolution of each parameter depending on time or another monitored parameter
- Evaluation coursors
- Commands for saving and opening trends
- Automatically save the trend at scheduled time intervals

13.2. Shaft Centerline
- Analysis of the average position evolution of the shaft center from the bearing center depending on speed, power, time, or other measured parameter
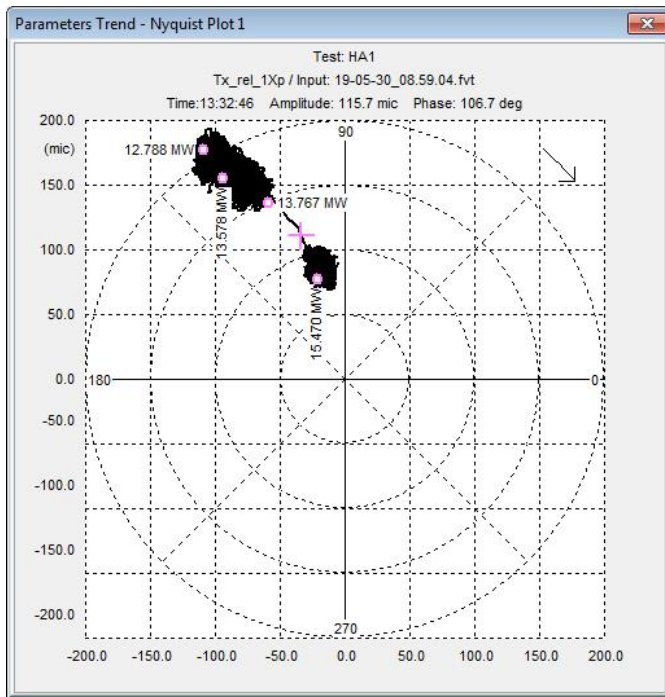- Cursor for eccentricity and angle evaluation
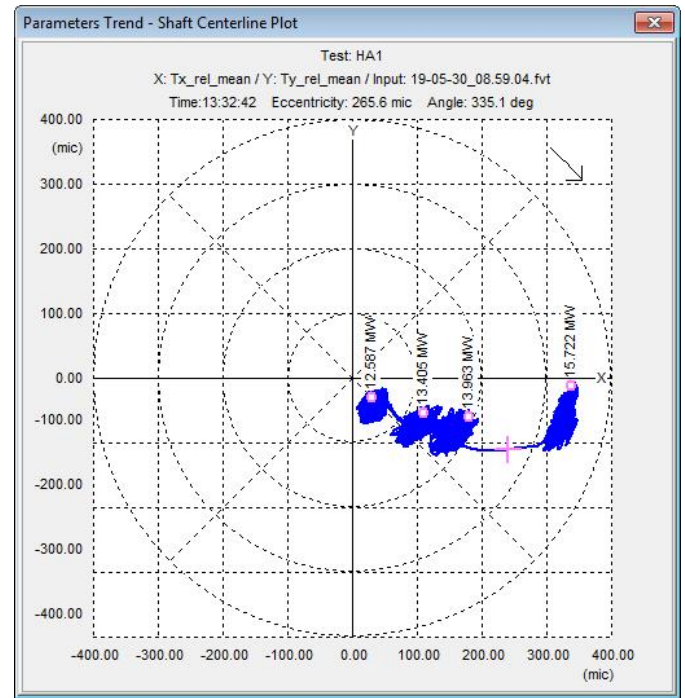
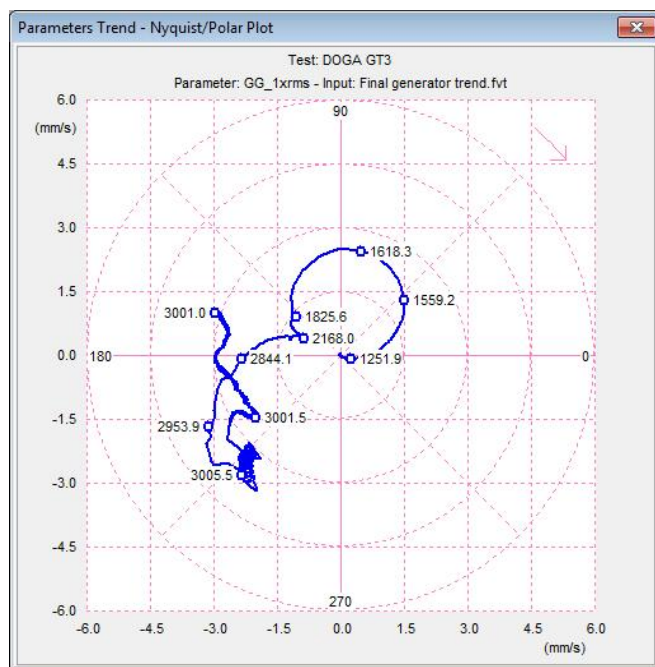*Shaft centerline plot with power as Z axis parameter*

Shaft centerline plot with time as Z axis parameter

13.3. Bode and Nyquist plots

- Analysis of evolution of vibration amplitude and phase depending on time, speed, power, or other measured parameter
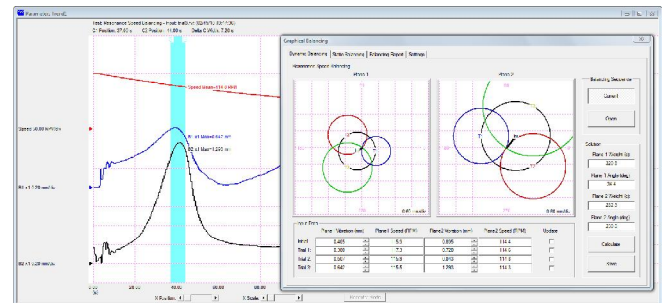- Cursor for amplitude and phase evaluation

Nyquist plot with power as Z axis parameter

Nyquist plot with speed as Z axis parameter

13.4. Rotor balancing using the four-runs method

- Balance at nominal speed or low resonance speed
- No need to measure speed or phase

Dynamic balancing function at low resonance speed

13.5. List of events

- List with the parameter, date and time at which the limit values were exceeded

14. Route type monitoring

- Individual access or automatic sequence of measurement points
- Saving data as waveforms
- Input window for process parameters or defects found by the operator
- Fast operation, optimized for touchscreen devices
- Limit exceeding warning, visible marking of the measuring points in the route
- Display and export status of the route
- View and export history of measurement points
- Configuration specific to each measurement point
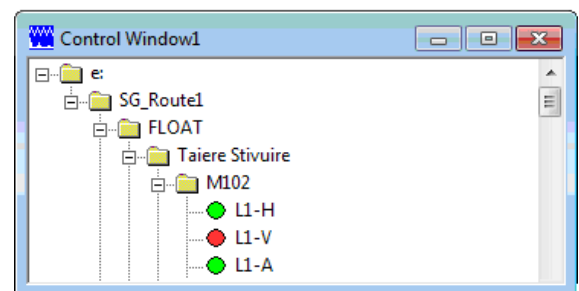
Show online or offline status of the entire

15. Complex testing functions

- Generation of the test sequence, various measurements, databases with test parameters and the obtained results, printing report
- Specific operating interfaces

16. Communication

- Parameter retrieval or results transmission through Modbus RTU, Modbus TCP, Client-Server, SCPI
- Other standardized or dedicated protocols and architectures

17. Export

- Export data in CSV file
- Data storage in Microsoft Access database
- Retrieving the contents of windows through Copy-Paste contextual commands

18. Remote monitoring

- Web type monitoring platform
- Modular architecture
- Browser access
- Authentication through local users, LDAP, Active Directory, Azure Active Directory or an existing SAML provider