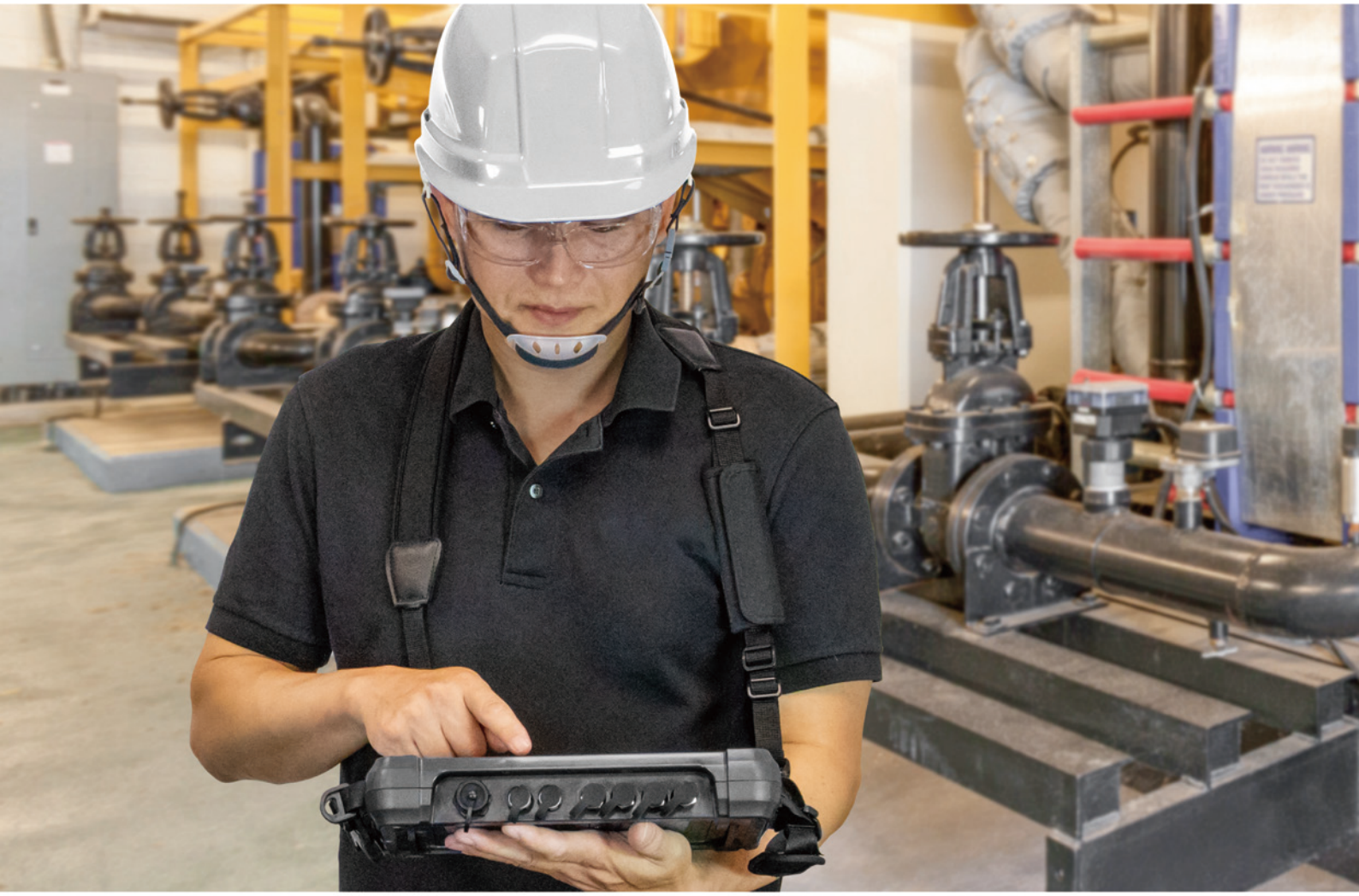
Benstone INSTRUMENTS

impaq Plus

Portable 4 channel dynamic signal analyzer







Born for advanced field testing

Impaq Plus is a fully rugged portable 4 channel real-time analyzer built for advanced noise and vibration measurements in the field. Manufactured with a rugged enclosure by a dual injection molding process and protective sealing to provide an IP 65 rating for measurement in harsh environments. Equipped with a large 10.1" multi-touch color display, information is not only on display, but a more intuitive user interface with keypads on the left side. Impaq Plus acquires measurement signal with precision 24 bit sigma delta AD converters to provide a high dynamic range and a up to 40 kHz maximum bandwidth.

With optional software modules, the impaq Plus can conduct FFT spectrum analysis, Order Tracking Analysis and Octave spectrum analysis at the same time. Besides, it can be used as a digital signal recorder for continuous raw data recording and playback analysis. The optional balancing module supports all kinds of field balancing tasks with all the most advanced features.

Multiple Analysis

impaq Plus supports multiple analysis which allows you to run different analysis modules, such as FFT analysis, Octave spectrum, order tracking analysis and raw data recording, at the same time.



Real-time measurements with multiple analysis at the same time.

Modular Software

The impaq Plus's modular software allows for the proper configuration of your analyzer. Optional modules available are raw data recorder, FFT spectrum analysis, 1/3 Octave spectrum analysis, computed order tracking analysis and Rotor balancing.

Optional software modules

- Order Tracking analysis
- FFT spectrum analysis
- Octave spectrum analysis
- Data recorder and playback
- Rotor balancing

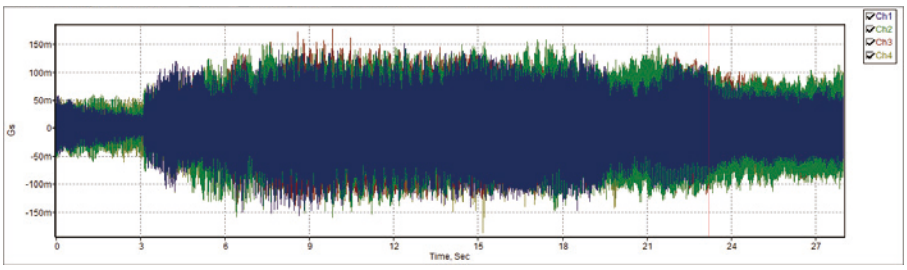




Dual batteries provide 8~10 hours continuous operation.

Raw Data Recorder

The Raw Data Recorder software module allows the user to measure analog signals in the Recorder mode or Real-time + Recorder mode and store the raw data signal directly to the hard drive or memory. Replay the stored raw signal in the playback mode with selected analysis modules as if the signal is from a real-time acquisition.

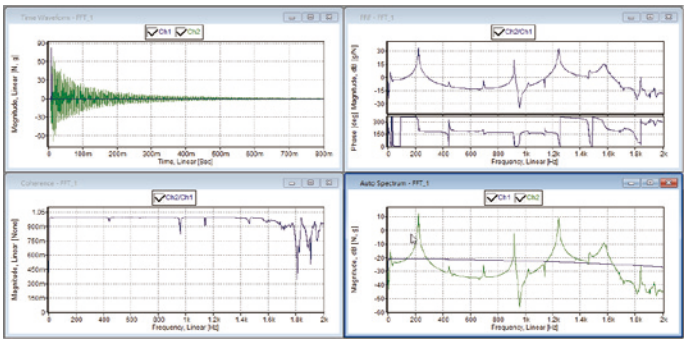


Continuously record the raw signal to the hard drive or memory and replay in playback mode with selected analysis.

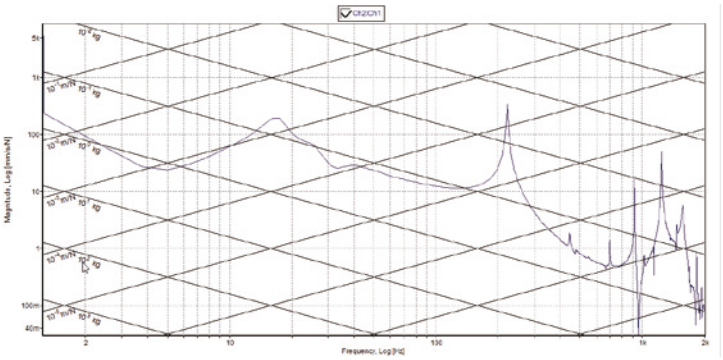
FFT Spectrum Analysis module

The FFT (Fourier Transform) spectrum analysis provides up to 14 different measurement functions for your sound and vibration needs. Continuous start-up/ coast-down spectrum and display the results on a 3D waterfall/ intensity plot. Perform modal, ODS, envelope testing and more.

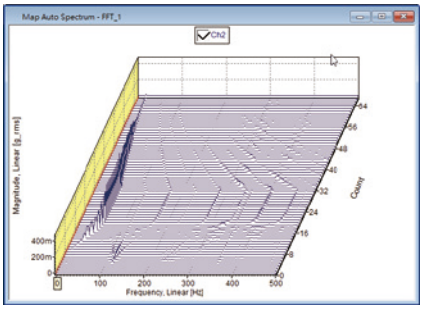
- General sound & vibration analysis
- Modal testing and ODS measurement
- Sound intensity measurement
- Sound and vibration quality measurement
- Stiffness measurement
- Bearing diagnosis (envelope spectrum and waveform)
- Variable speed machine measurement

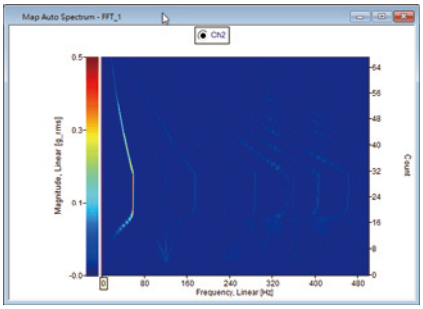


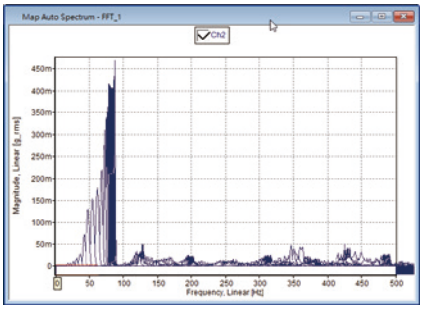
Example: Modal testing to measure time waveform, FRF, power spectrum and coherence functions at the same time.



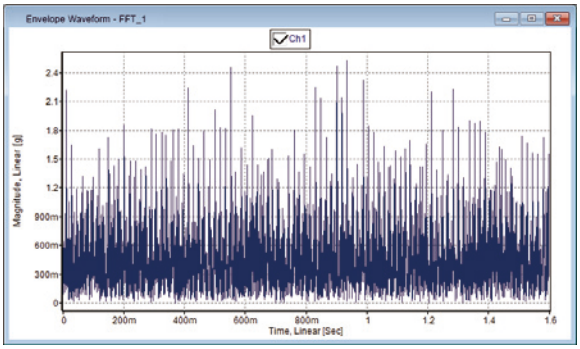
Display of FRF functions in Accelerance, Mobility or Compliance plots to investigate the structure's dynamic stiffness.

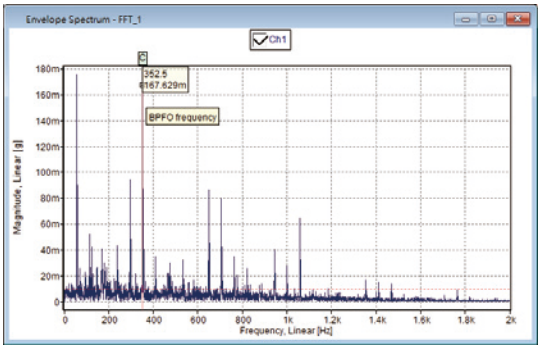






Continuously measure signals in time or rpm step, displaying the results in a 3D waterfall plot, intensity plot or overlapped plots.

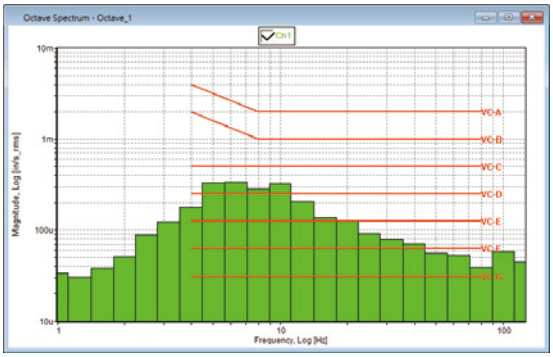




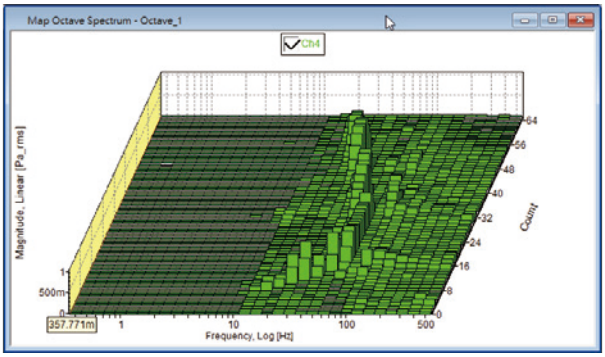
Measure the bearing signal and convert it to an envelope waveform or envelope spectrum for damage diagnosis.

Octave spectrum analysis module

The octave spectrum analysis utilizes parallel time domain filters to generate octave, 1/3 octave or 1/12 octave spectrum. Conforming to IEC 61260 and IEC 61672 standards, this module is suitable for evaluating the sound or vibration severity. Built-in user defined weighting functions supports specific measurements such as: ISO 6954 (vibration on ships), ISO 8041 and ISO 2631 (human vibration) to name a few. Many high-tech factories are concerned about floor vibration. User defined VC curves can be displayed on the Octave spectrum plot to determine the level of vibration.



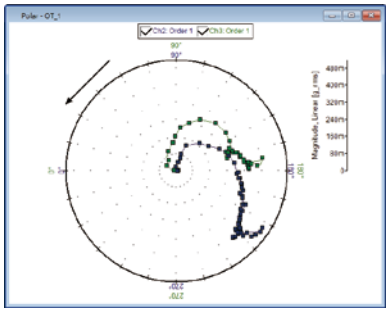
Measure vibration in 1/3 octave spectrum and display the VC curves on it to check the vibration grade of floor in high-tech factories.

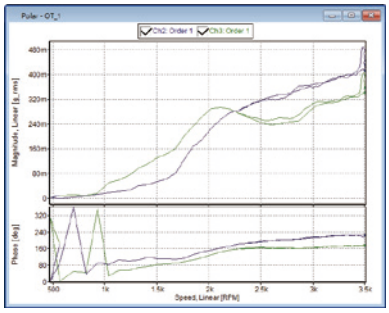


Measure 1/3 octave spectrum continuously and display the results in a 3D waterfall plot, intensity plot or overlap plots.

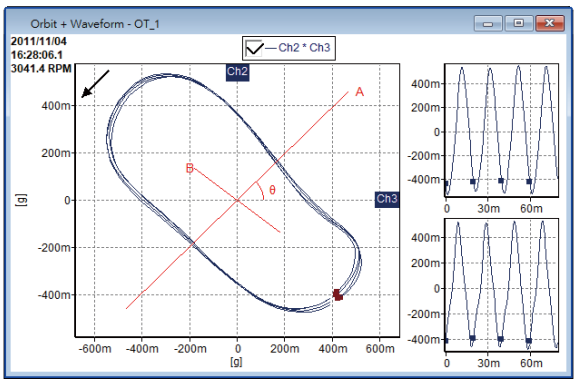
Computed Order Tracking module

The computed order tracking program is designed to measure sound and vibration on varying speed machines. A digital re-sampling algorithm is used to make the spectral resolutions be the same at different rotation speeds. Typical applications for this software module are NVH (Noise, Vibration, Harshness) testing of vehicles or advanced vibration analysis of turbine machines. Order spectrum, order traces, filtered or unfiltered orbits, gap reading, and centerline of a shaft are accurately measured and displayed during a start-up or coast-down process. The user can input geometric position(s) of the vibration sensors to display orbit and shaft centerline motion, which relates to the realistic behavior of a turbine machine.

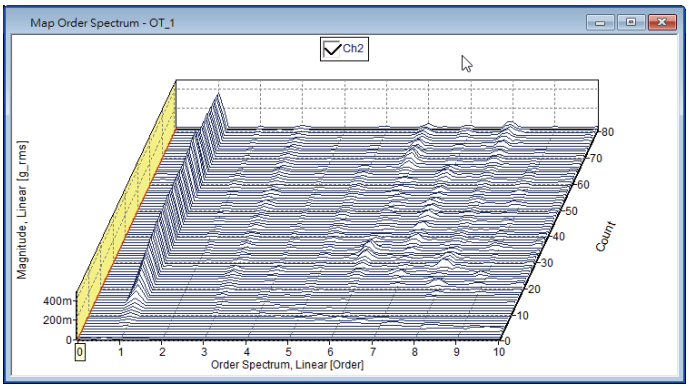




Measure order traces during a start-up or coast-down process and display the results in Linear, Polar, Bode, Real+ Imaginary or Nyquist plots.



Measure and display filtered or unfiltered orbits with the time waveform plot.

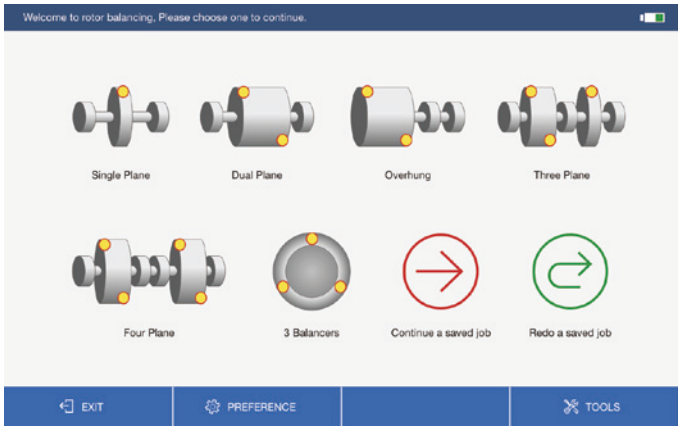


Measure order spectrum continuously and display the results in a 3D waterfall plot, intensity plot or overlap plot.

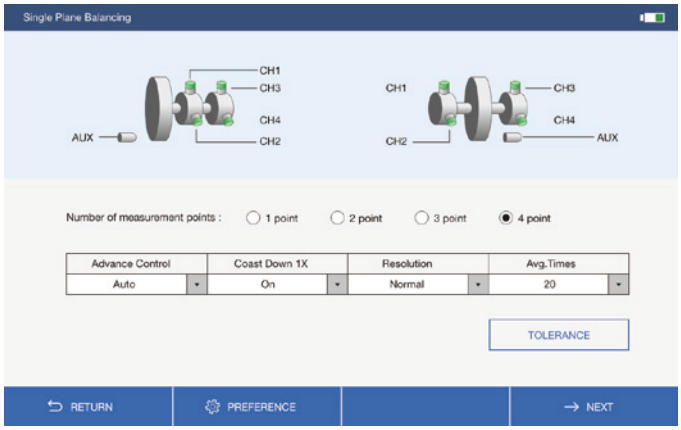
Rotor Balancing module

The Impaq Plus's rotor balancing package can balance your rotating machines in the field with industry leading balancing techniques like; single plane, dual plane, overhung dual plane, 3 plane, 4 plane and 3 weights balancing. This advanced balancing software makes it very simple to balance machines in-field with a very high level of accuracy. Now with multiple-point balancing, vibration in both horizontal and vertical directions are minimized at the same time. By enabling coast-down measurements for 1X vibration, the heavy spot is identified correctly with only one measurement, saving you time, money and increasing safety. This technique prevents the user from danger by putting the trial weights in the wrong place and shortens the time required to balance. Other features / functions are:

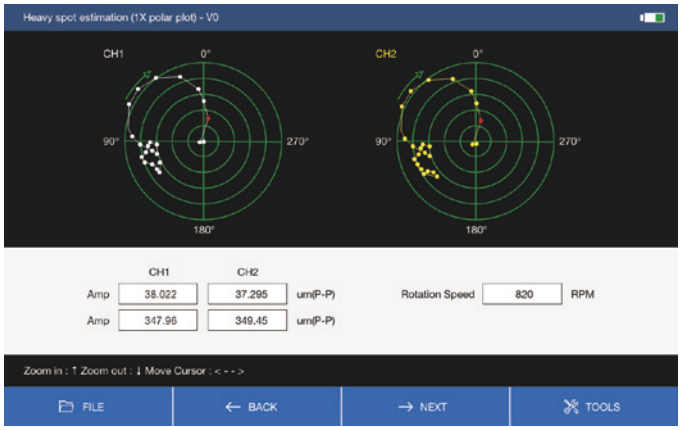
- Multi-point balancing
- Component calculation
- Drill depth calculation
- Allowable residual unbalance calculated from the ISO 1940 standard
- Unequal radii calculation
- Decoupled balancing (couple + static)
- Review historical vibration data on a polar plot.
- Review historical balancing data on a polar plot
- Heavy spot estimation with one shot measurement.
- Redo a previous balancing job with saved balancing factors.



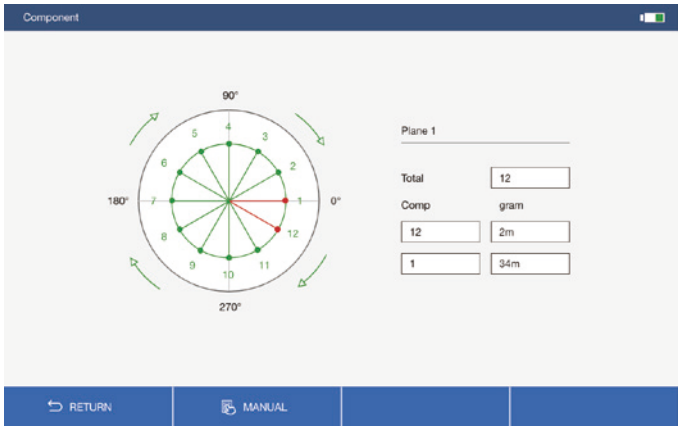
Select the desired balancing function from the main display



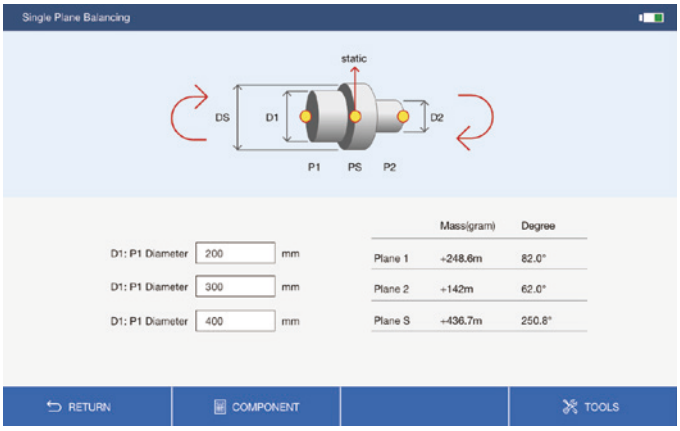
Select up to 4 measurement points for single plane balancing



Find out the heavy spot location from a single coast-down measurement of 1X vibration.



Component calculation for discrete weight locations



Conversion of dual plane balancing into static and couple

Specifications

Hardware Feature	Technical Specifications
Operating system	Windows 10 IoT enterprise
Input channels	4 analog channels and 1 tacho channel
Connector	Channel 1 ~ channel 4: BNC. Tri-axial: Fischer Core Series 103*, 6 pins Tacho input: Fischer Core Series 103*, 7 pins. USB: USB 3.1, Type-A connector
Channel coupling	AC, DC, IEPE
Tacho input	TTL signal, with built-in power supply
CPU	Intel Atom® Processor N4200
Internal memory	256G SSD
Battery	14.4V, 2270mAh, 32.7W* (x2, swappable)
Interface	USB 3.1 type A connector x1
LCD display	1280x800 10.1" multi-touch color screen
Operating temperature	-10 deg C to + 50 deg C
Product approvals	CE, RoHs, REACH, China RoHs, Regulatory Compliance Mark (RCM), UKCA, FCC, KC
Drop test	1.2 meters - MIL-STD 810H
Vibration test	MIL STD 810 transportation
Sealing / Ruggedness	EN60529 IP65
Housing material	Dual material mold injection
Weight	1.9 kg with dual batteries, 1.72 kg with single battery
Size	300 x 195 x 50 mm
Input signal range	± 5Volt, ± 20Volt
A/D converter	24-bit sigma-delta A/D converter
Frequency range	0 Hz~40 kHz (102.4 kHz Max sampling rate)

Feature for Raw Data Recorder	
Recorded data	Raw time data and TTL tacho signal
Monitor display	Recorder mode: Waveform, continuous waveform or spectrum Real-time + recorder mode: same as real-time measurement setting.
Storage media	Internal 256G SSD
Data review	Replay data in Playback mode
Maximum bandwidth	40 kHz with 4 channels on, plus tacho channel
Maximum length of recording	limited by memory space
Recording stop	by time, rpm, file size or manual

Feature for FFT Analysis	
FFT real time rate	40 kHz with 4 channels on
FFT resolution	100-51,200 lines
Spectral map	3D waterfall or intensity plots for continuous spectrum measurements
Time windows	Hanning, hamming, flattop, rectangular, force, exponential Bartlett, Blackman, Kaiser
Analysis functions	Complex spectrum, power spectrum, cross power spectrum, FRF, time waveform, envelope waveform, envelope spectrum, coherence, PSD, Cepstrum, overall level, mean trend, rate trend, rotation speed.
Engineering units	Automatic units transform with pre-defined conversion table
Zoom FFT	Yes
Average	Off, Linear, exponential, time, peak hold
Trigger	On/Off, triggering source, pre/ post triggering, triggering slope and triggering level
Map functions	Time waveform, complex spectrum, auto spectrum, cross spectrum
Control of Map measurement	Free run, by total count, total time, armed by time step or RPM step.
Cursor	Single, harmonic, dual, side band, peak cursor, cursor marker
Envelope filters	500~2kHz, 1k~2.5kHz, 2k~5kHz, 5k~10kHz or user defined.
2D Plot format	Linear, Polar, Bode, Real+Imaginery, Nyquist, Accelerance/Mobility/Compliance
3D Plot format	Waterfall, intensity map, overlapped
Mathematic operation	Unit conversion, FFT, iFFT, integration, differentiation, band pass filter, high pass filter, low pass filter, band notch filter, scaling, weighting, window, reciprocal, detrend, redo, undo

Feature for Octave Analysis

Measured functions	Waveform, Octave, 1/3 octave and 1/12 octave spectrum
Maximum band	20 kHz
Integration time	1/128, 1/64, 1/32, 1/16, 1/8, 1/4, 1/2, 1, 2, 4 and 8 seconds
Detection method	Fast, slow, impulse, linear
Trigger sources	Off, external, input channels, manual Average type
Average type	Off, Linear, exponential, peak hold
Average time	1/128, 1/64, 1/32, 1/16, 1/8, 1/4, 1/2, 1, 2, 4 and 8 seconds
Weighting	A, C, flat ISO 2631, 6954, 8041 and user defined
2D Plot format	Linear, bar
3D Plot format	Waterfall, intensity map, overlapped

Feature for Computed Order Tracking

Measurement types	Order trace, order spectrum, spectrum map, RPM profile, orbit, gap and shaft centerline
Measurement control	Manual, time step, rpm step or both time and rpm step
Rotation speed	6 rpm to 480,000 rpm
Order resolution	1/2, 1/4, 1/8, 1/16 order
Order traces	User selectable orders plus overall traces
Max. order	800 order
Waterfall cursor	X, Y, dual X, dual Y, Slant, Slant + XY cursor
Y-Axis of order traces	Linear, log, dB, real, image, phase, number and polar plot
Geometry setting	Selectable angular location of sensors
Order trace plot format	Linear, Polar, Bode, Real+ Imaginary, Nyquist
Orbit plot format	Orbit, filtered orbit, orbit+ waveform, gap, shaft centerline
3D Plot format	Waterfall, intensity map, overlapped

Feature for Rotor Balancing

Rotor type for balancing	Single plane, dual plane, 3 plane, 4 plane, overhung dual plane, 3 weights balancing
Balancing speed	60 rpm to 300,000 rpm
Order resolution	Low, normal, high, 0.03, 0.015, 0.008, and 0.004 order
Average number	10, 20, 50 and 100
Balancing grade	Built-in ISO 1940 standard or user defined
Multi-point balancing	Single plane: 1, 2, 3 or 4 points Dual plane: 2 or 4 points Display projected vibration vectors
Tools	1X coast down order trace, decoupled balancing (static and couple), unequal radii, component calculation, drill depth, vibration history, balancing history

Benstone INSTRUMENTS

www.benstone.com/tm

Benstone Instruments USA
32905 Northland Court.St.Paul,MN 55045
TEL: 651-257-6500

Benstone Instruments Asia
2F.-2,No.83,Sec.2,Gongdao 5TH Rd.,Hsinchu,TAIWAN
TEL: 03-5722555