FALCON

APT2069

Smart Portable Solution

Brand of ACOEM

USE AND APPLICATIONS

Use And Applications

Relying on ACOEM's 25 years of experience (formerly 01dB-Metravib, Stell Diagnostic, 01dB-Stell and then 01dB Acoustics & Vibration) in developing portable instruments for condition monitoring, FALCON includes all the technology to address any set of machines

FALCON is a multifunction instrument that can be used as:

- A smart data collector
- A smart balancer
- A portable vibration analyser (offroute, run-up/coast down, FRF, ODS, X-phase analysis)

Smart Data Collector

The FALCON data collector allows any user to perform periodic monitoring of your rotating machines, based on their vibration signatures. FALCON offers the most efficient solution at each step of the implementation of condition monitoring in your factory. The defects of your rotating machines can thus be detected several months in advance and the maintenance operations can be scheduled, which avoids unscheduled shutdowns and associated production losses.

Suited to non-specialists due to its automatic configuration and diagnosis tool, its advanced measurement capabilities also turn FALCON into the perfect tool for the analysis of the most complex problems:

- Locally with FALCON,
- On the computer with the powerful ANALYST module of the NEST software suite.

Smart Balancer (Option)

This function allows correcting unbalance on your machines. It is possible to balance rotors of any size, from the simplest to the most complex one (1 to 4-plane balancing). Using multi-channel acquisition, parallel measurements are possible on all sensors.

FALCON Balancer includes all tools to guide the operator and control the results during the entire balancing process:

- Easy to use with the "guided" mode
- Graphic display of measurements and weight positions

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- Automatic setup of tachometer
- Trial weight estimation
- Control of the data at each step with recommendation to improve result quality
- Rotation speed control
- Tools to split or merge weights
- Result assessment according to ISO 10816-3 and ISO 1940
- Get a detailed report documented with
- histograms, pictures and spectra

With FALCON, the balancing of your machines is more accurate, more secure and faster.

Main Applications

FALCON is available for all industrial applications where ONEPROD-based condition monitoring is deployed:

- Steel industry
- Mining
- Chemistry
- Petrochemistry
- Power
- Oil & gas
- Cement works
- Paper industry
- Food industry
- Pharmaceuticals
- Water and waste treatment
- Fabrics
- Automotive industry
- Defence
- Wind power
- Air and space
- Teaching/Research
- Other industries...

Condition Monitoring, New Generation

Unique User Comfort

FALCON is the first new generation portable instrument that offers a user comfort unrivalled on the market:

- Large colour touchscreen with high brightness
- Built-in sensors: pyrometer, stroboscope, camera
- Wireless vibration data collector
- Wireless communication with the information system

Accessibility To All

With FALCON, any user can start condition monitoring by following up vibrations. All required functions are accessible, even to non-specialists:

- Automatic configuration module based on the description of machine kinematics. Only the information listed on the identification plate is required! (speed, power...)
- Automatic defect detection and identification based on the embedded automatic diagnosis capabilities

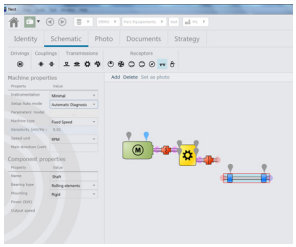
Maximum Productivity

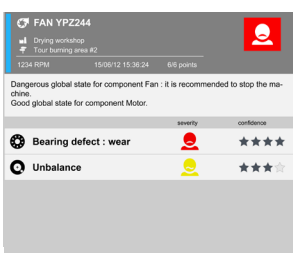
FALCON is the fastest data collection tool on the market and stands out at the scale of an industrial site:

- Synchronous triaxial wireless collection: 3 measurements carried out in a single shot and simultaneously
- Real-time processing: no waiting time before display of the results
- Automatic detection of the measurement points by reading of the bar code: no error is possible
- Documentation of routes allowing guiding the roundsman and making measurement more reliable (pictures of sensor positioning, navigation on a map...)

Suited To Industrial Settings

- Anti-shock design, resistant to a fall of 1.2 m
- Screen protection
- IP65 protection
- Specific FALCON-EX model suited to dangerous areas: ATEX Zone II, IECEX





Description Of Falcon Packages

Several packages are available depending on your own requirements.

The same instrument can contain all or part of the available functions and can easily be upgraded from one package to another.

Falcon Essential

The ESSENTIAL data collector package is especially adapted to all industrialists who want to start condition monitoring on a set of machines and discover the world of vibration analysis step by step.

Falcon Smart

The SMART data collection package is especially adapted to all industrialists who want to improve the reliability of their facilities in a very productive and easy way. With FALCON SMART data collector, the expert is in the box!

Falcon Expert

The EXPERT data collector package is especially adapted to all users who have good knowledge of vibration analysis and can provide reliable diagnosis and maintenance recommendation on their own. The EXPERT data collector package will provide them with the most productive tool of the market, thus helping them to drastically save time.

Accessible Options

The EXPERT data collector package is especially adapted to all users who have good knowledge of vibration analysis and can provide reliable diagnosis and maintenance recommendation on their own. The EXPERT data collector package will provide them with the most productive tool of the market, thus helping them to drastically save time.

- Digital Recorder: This option increases the time signal acquisition capability to ranges of signals up to 4,096 Ksamples or 80 s to be distributed over the number of channels used.
- Offroute Analyser: with the Off-route option FALCON becomes a powerful multichannel spectrum analyser including the possibility to perform ”bump test” measurements.
- Balancing Module: The balancing module can be added as an option to all packages
- Run-Up / Coast down module: with the Run-Up Coast down FALCON provides all tools required to analyze start-up and shut down phases of rotating machine. The Run-Up/Coast Down module can be added as an option to all packages
- FRF - ODS - X phase analysis module: this advanced analyser module allows for the precise determination of the root cause of the most complex vibration problems by measuring vibration on several channels with cross phase information, between a reference channel and the other ones. The FRF - ODS - X phase module can be added as an option to all packages
- Automatic Diagnosis Pack: The automatic diagnosis capabilities, as well as the automatic setup module for automatic diagnosis (required), can be added as option to the ESSENTIAL package. Note: These functions are available as standard functions in the SMART and EXPERT packages.
- Upgradeability: Each FALCON package can be upgraded. You can upgrade your instrument from one package to another at any time.
- Sensor Option: Standard ESSENTIAL, SMART and EXPERT packages are provided with a wireless triaxial accelerometer (classic wired single-axis accelerometer in option). A wired version of these packages (wireless triaxial accelerometer in option) is however available upon request.

SUMMARY TABLE

	Falcon Data Collector		
Falcon Features	**Essential**	**Smart**	**Expert**
Falcon Hardware Kit	●	●	●
Falcon Data Collection Module	●	●	●
Falcon Offroute Option	●	●	●
Falcon Automatic Diagnosis Option	○	●	●
Falcon Camera Option	○	●	●
Falcon 2 Analog Channels Option	○	○	●
Falcon 2 To 4 Analog Channetls Extension	○	○	●
Falcon Advanced Measurements Option (102.4k Spectra, 64k Waveforms)	○	○	●
Falcon Timewave Recorder Option (4m Samples)	○	○	○
Falcon Balancing Module	○	○	○
Falcon Run Up / Coast Down Module	○	○	○
Falcon X Channel Analysis Module (Phase, Frf, Ods)	○	○	○

● Included ○ Option

Description Of Falcon Packages

Touchscreen
Graphic colour touchscreen
Resolution: 800x480 pixels
Dimension: 154x92 mm (D7")
Adjustable brightness
Can be used in direct sunlight
Icon functions

Touch keyboard
On touchscreen:
- 10 contextual function keys
- Functions are organised for single-hand measurement (left or right)
- Direct access to general functions: Home, Help, Setup, Screen copy, Picture, Bar code reader, Text note, Audio comment, Pyrometer, Stroboscope
- Full keyboard for text input. Several keyboards available: qwerty, azerty, Chinese...

Acquisition
Synchronous on 4 channels + trigger input
24-bits conversion
Sampling frequency:
- 102.4 kHz for each channel
- Up to 204.8 kHz on 1 channel

Antialiasing filter
Wireless acquisition with FALCON WLS triaxial accelerometer
Digital signal processors
Real-time processing:
- 40 kHz on 4 channels
- Up to 80 kHz on 2 channels

Memory: 3.5 GB for measurements

Communication
USB 2 type B device (direct connection to PC)
USB 2 type A host (for USB stick)
Ethernet
Wi-Fi

Battery
Auto test and calibration function
High density Li-Ion type
Rechargeable without removing
Battery lifetime: 10 hours under intense use
Programmable automatic standby mode and switch-off

Analogue Inputs
Up to 4 programmable signal inputs (depending on instrument option):
- Frequency range: 0 - 40 kHz on 4 channels, 80 kHz on 1 channel

- Overload indicator in % with memorisation
- IEPE interface with real time integrity control, range ± 8V (power supply: 4 mA constant current 23 VDC)
- Dynamic signal measurements (acceleration, vibration velocity, absolute displacement, relative displacement, electrical current, etc.)
    - +/- 10 VAC
    - 0, -24 V for proximity probes (a -24Vdc power supply is available on each channel using cable ref FLC1005000))
- Input impedance AC/DC: 100 kΩ
- Accuracy: +/- 1%
- Sensors without electronics with optional charge amplifier
- DC input: from -24 VDC to +24 VDC for measurements of position and process parameters
- AC coupling: 0.3 Hz
- Compatible with triaxial sensor

Trigger input:
Range: +/- 10 V, 0 to +24 V, 0 to - 24 V
Adjustable triggering parameters
Automatic setup function
For rotation speed measurement, synchronous analysis, balancing, order analysis.
Input impedance: 100 kΩ
+ 5 Vdc power supply for tacho probe
-24 Vdc power supply for proximity probes driver using optional cable ref FLC1006000

Microphone input
Microphone input for audio inspection notes

Analogue Outputs
1 headphone output to listen sensor signal, recorded signal or audio inspection notes
1 stroboscope output: TTL
For each channel and trigger input: -24 Vdc power supply for proximity probe

Built-In Pyrometer With Laser-Sighting
Contactless temperature measurement:
- Range: 0 to 200°C
- Accuracy: +/- 3°C for ambient temperature ranging from 18°C to 28°C.
- Resolution: 0.5°C
- Repeatability: +/- 1°C
- Field of view: 5° @ 50% (Ø target ≃ 4 cm @ 50 cm)
- Time response: 1 s
- Fixed emissivity: 95%
-

Built-In Stroboscope
Rotation speed measurement:
- Range: 30 to 15000 RPM
- Automatic setting to machine speed predefined in setup
- Adjustment:
    - ½, x2
    - Fast
    - Fine
- Flash duration: adjustable from 0.5 to 15°
- Can be used independently or to adjust rotation speed in a route or from a spectrum display

Built-in camera
Resolution: 640 x 480
Autofocus
Distance: 20 cm to
Flash mode

Identification of measurement point
Built-in bar code reader
Reading distance: from 20 cm to 50 cm according to code dimension
Bar code format: QRcode
Learning mode to avoid codes manual input

Mechanical/environment
Protection: IP65.
Case with shock protection rubber
Shock protection: 1.2 m drop (1m for EX version)
Standard compliance:
- Safety: IEC61010-1
- EMC: directive 2004-108-CE

Dimensions: 200 x 265 x 65 mm
Weight: 1.8 kg including battery and rubber protection
Operating temperature: -10°C to 55°C
Humidity: 95% no condensation

FALCON-EX, intrinsically safe version:
ATEX certification: EX II 3 G, Ex ic IIC T4 Gc, supplied with certified accessories.

IECEX certification: Ex ic IIC T4 Gc

Note: shock protection: 1m drop. The protection screen accessory cannot be used in dangerous area and is not supplied.

Remote access
FALCON can be set up so as to communicate with your network through its Ethernet or Wi-Fi interface and used as a remote station. You can then use the applications installed on your computer directly from FALCON (SUPERVISION, CMMS...).

Falcon Signal Processing

Vibration Overall Level

High-pass filters: 2, 10, 3,000 Hz,
Low-pass filters: 300, 1,000, 2,000, 3,000, 20,000, 40,000 Hz
Vibration velocity in accordance with ISO 2954, ISO10816, VDI 2056 standards for rotating machinery, VDI 2063 standard (2-300 Hz) for reciprocating machines
Detection: RMS, true or equivalent peak, true or equivalent peak-to-peak
Rolling element detection: defect factor scale from 0 to 12 for standard rotation speed*
Measurement of Kurtosis (Shock detection for low speed rolling element bearing)*

- High-pass filter: 50 Hz to 20 kHz, 1 Hz step
- Low-pass filter: 500 Hz to 20 kHz, 1 Hz step (LPF > 2 x HPF)

Programmable measurement time: 1 to 99 s
Alarms: 4 alarm types, up to 4 alarm levels, comparison to previous measurement
Display: instantaneous measurement, measured value, alarm limits, previous measurement
Display of measurement and alarm levels as bar-graphs
Integration: none, single or double integration for measurement of acceleration, velocity or displacement
Overall level value in engineering unit and dB

Rotation Speed

External trigger input with direct access to trigger level setup. Automatic setup mode. Range: 12 to 288,000 RPM (0.2 to 4,800 Hz)
With built-in stroboscope
DC input
Keyboard input

Other parameters

Integrated pyrometer with laser-sighting for contactless temperature measurement
Any other parameters (user-defined parameter and unit) with DC input and keyboard input
Machine operating condition

Time Wave

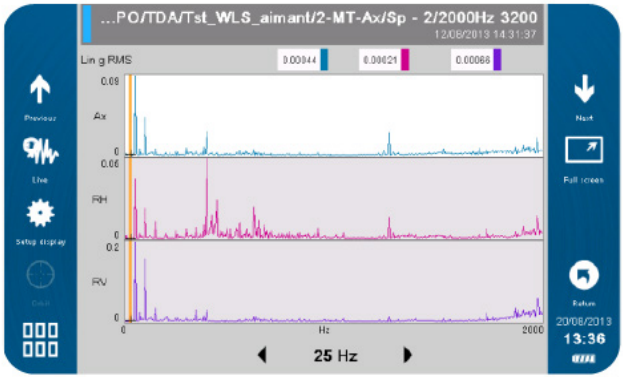
Number of samples: 256, 512, 1,024, 2,048, 4,096, 8,192, 16,384, 32,768, 65,536. Extended number of samples with long time wave option: up to 80 s split over the number of channels or 4,096K samples.
Demodulation of time waveform (band-pass filtered)
Sampling frequency (Hz): 204.8K, 102.4K, 51.2K, 25.6K, 12.8K, 5.12K, 2.56 K, 1.28K, 512, 256, 128
Integration: none, single or double integration for measurement of acceleration, velocity or displacement
Synchronous analysis:

- Triggering on signal or trigger input. Trigger delay programmable from -8192 samples to +20 seconds
- Programmable trigger level on positive or negative slope
- Averaging: from 1 to 4,096

Time analysis on all types of signal: vibration, force, pressure, current... (user-defined parameter and unit)
Orbit display with 2 channel measurement

Spectral Analysis

Number of lines: 100, 200, 400, 800, 1 600, 3 200, 6 400, 12.8k, 25.6k, 51.2k, 102.4k (102.4k only with 2 channels max)
Envelope: spectrum of demodulated time waveform filtered by a programmable band-pass filter (any central frequency, band width = 1/2 to 1/128 of analysis range).
Max number of lines: 6,400
Zoom factor: 2, 4, 8, 16, 32, 64, 128.
Frequency ranges (Hz): 80k, 40k, 20k, 10k, 5k, 2k, 1k, 500, 200, 100, 50
Averaging: from 1 to 4,096 with linear or peak hold mode
Overlap rate: 0, 50, 75%
Real time: up to 40 kHz
Weighting window: Rectangular, Hanning, Flat-top
Synchronous analysis: triggering on signal or trigger input. Trigger delay programmable from -8,192 samples to +20 seconds Programmable trigger level on positive or negative slope



Display: Lin/Log, automatic scaling, engineering unit/dB, RMS/Peak/Peak-Peak amplitude for each type of parameter, Hz, RPM
Display of instantaneous spectrum and averaging during measurement
Spectral analysis on all types of signal: vibration, force, pressure, current... (user-defined parameter and unit)

Vector measurement (phased spectrum)
Number of lines: 100, 200, 400, 800, 1,600, 3,200, 6,400
Frequency ranges (Hz): 40k, 20k, 10k, 5k, 2k, 1k, 500, 200, 100, 50
Synchronous averaging: from 1 to 4,096
Display: Lin/Log, automatic scaling, engineering unit/dB, RMS/Peak/Peak-Peak amplitude for each type of parameter, Hz, RPM
Display of instantaneous spectrum and averaging during measurement

Balancing Specifications

Balancing types

FALCON allows performing 1 to 4-plane balancing.
Rotors from any size can thus be balanced, from the simplest (single-plane balancing) to the most complex (3 or 4-plane balancing, 4-channel option required).

Measurements

Balancing using acceleration, velocity or displacement.
Measurement and compensation of Run Out if balancing using proximity probes.
Parallel measurements (2 or 4 channels), which results in a more accurate, more secure and faster procedure.
Rotation speed: from 12 to 288,000 RPM (from 0.2 to 4,800 Hz).
Amplitude range:

- With 100 mV/g accelerometer: acceleration: 80 g. Measurement is also possible for vibration, velocity and displacement
- With 8 mV/m (200 mV/mil) proximity probe: 1.5 mm (60 mils)

Amplitude: display in physical units or dB
Phase: 4-digit display from 0 to 360° (or any other user-defined unit). Precision: +0.5°

Results display

Indication of rotation speed in Hz or RPM
Display in measurement in table mode and in graphic polar mode

Storage in 2-level tree structure: folder/balancing
Display of trial and balancing masses in table mode and in graphic polar mode. 3D mode for 2-plane balancing.
Metric or imperial units.

Assistance to configuration

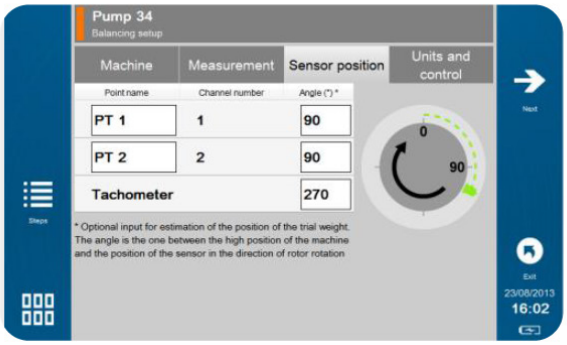
Easy duplication of balancing with copy/paste function: for any stored balancing, it is very easy to do a new balancing operation, by following the previously used procedure.
Direct access to tachometric signal and configuration using an automatic setup function.
Trial values for masses and estimated positions.
Function to distribute masses over two defined angles.
Function to merge additional masses with installed masses.
User-defined angle unit to make mass installation easier.

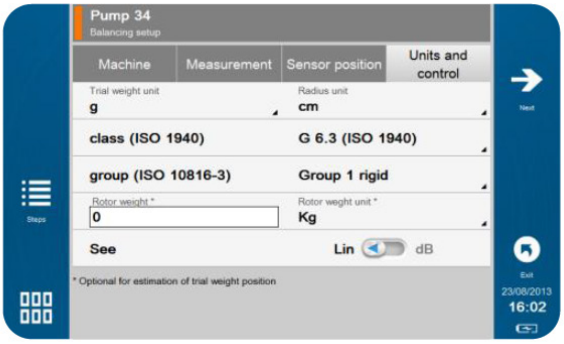
Assistance to measurement

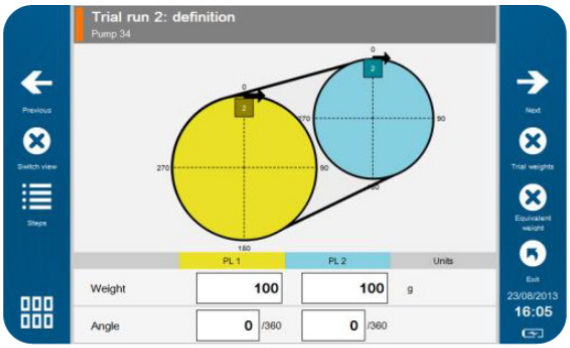
Measurement with programmable averaging to decrease external disturbance.
Display of instant value during averaging.
Balancing in a single operation using stored influence factors.
Calculation of balancing masses for any operation (with or without trial masses).

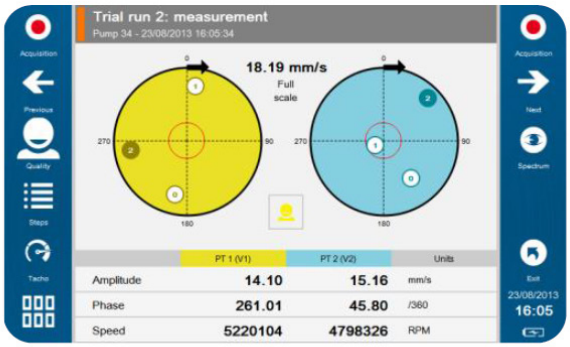
Results reliability

Automatic control of rotation and vibration speeds









dispersion to check measurement reliability.
Display of balancing quality rating (standards ISO 1940, VDI 2060, NFE 90.600).
Display of the limits of standard ISO 10816-3
Step-by-step guiding of the user during balancing: at any moment, the user can know where he/she is in the balancing process and follow the guide step by step.

Balancing report
The report is generated from an entirely user-configurable template in WORD format. It includes:

- Balancing configuration
- Summary of balancing with graphic histogram
- Picture of sensor mounting
- Comment
- Detailed results
- Spectra at the beginning and the end of balancing

Management of interruptions
Possibility to stop and resume balancing as you want
Possibility to repeat any operation without repeating the entire procedure

Run-Up / Coast-Down Module Specification

The ONEPROD FALCON RUN-UP / COAST-DOWN module measures the vibration behaviour of a machine during its run-up or coast-down phases.

The internal forces of the machine then excite the structure at frequencies that are absent at steady state. This type of analysis shows phenomena difficult to observe under stabilised operating: resonance, critical speeds, bearing instabilities... This type of analysis is particularly significant for the control of a new installation in order to check if the machine will operate under acceptable conditions. It is also an interesting complement to the on-site balancing function, making it possible to ensure that measurements are performed in acceptable conditions.

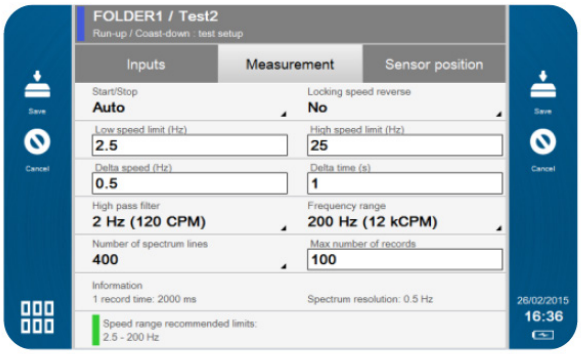
With the 4-channel option, it is possible to analyse the 2 bearings of a machine, in a single operation, each bearing being equipped with 2 perpendicular sensors.

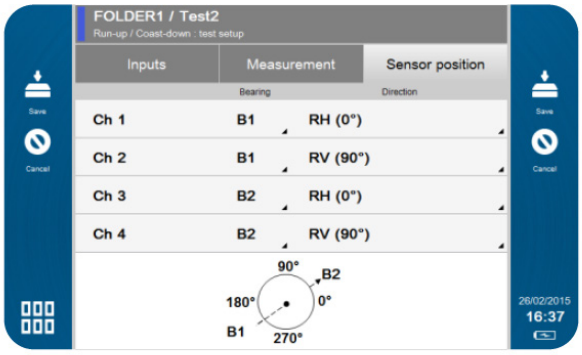
General

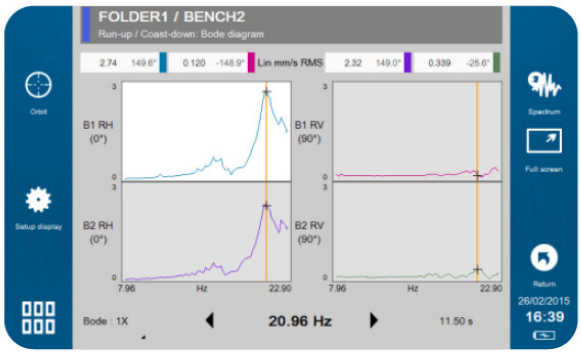
- Up to 4 channels in addition to the tachometer input.
- Test with or without tachometer (If the tachometer is not used, the running speed and the phase are not recorded, but it is still possible to measure a coast-down).
- Running speed limits: 0.15 to 1,000 Hz (9 to 60,000 RPM).
- Possibility to take pictures of the test for the report.
- Easy & reliable critical speed identification using the Bode-Ellipse Spectrum (patented technology), through ONEPROD Vibgraph graphic tool.
- Embedded storage of more than 1,000 tests (based on 4-channel test with 400 lines of resolution and 100 records).

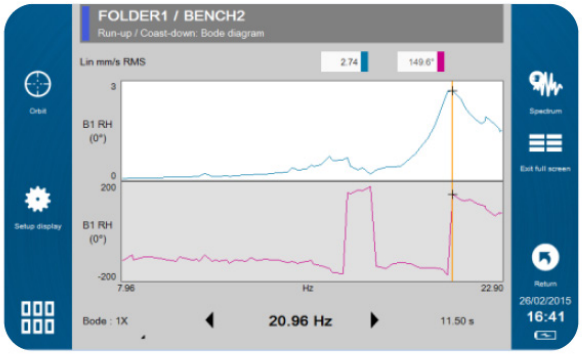
Acquisition & Processing

- Vibration sensors:
  - o IEPE or AC accelerometer
  - o IEPE or AC velocimeter
  - o Proximity probe (probe driver can be power supplied using cable ref FLC1005000)
- Measured parameters: acceleration, velocity or displacement
- Acquisition start and stop: manual or automatic. In automatic mode the acquisition starts when the running speed is within user-defined limits and stops when it is outside.
- Option to interrupt measurement on inversion of rotation speed variation.
- Acquisitions are controlled automatically by both a period of time in s and running speed variation.
- Up to 4 records per s
- Max. number of acquisitions: 512 per test
- High-pass filter: none, 2 Hz, 10 Hz









- Max. frequency: 50, 100, 200, 500, 1k, 2k, 5k, 10k, 20 kHz , 40 kHz
- Resolution: 100, 200, 400, 800, 1,600, 3,200, 6,400 lines

Display

- The instantaneous spectrum is displayed during measurements with a cursor tracking the running speed of the machine*.
- The amplitude, phase* and 1X frequency*, as well as an acquisition counter, are displayed permanently.
- Recorded measurements can be displayed in the form of a Bode diagram (amplitude and phase* versus rotation frequency) for the 1X frequency and up to 5X.
- Using the cursor, it is also possible to point out the spectrum of the corresponding speed.
- With 2- or 4-channel options, it provides access to the orbit plot for a bearing equipped with two sensors that are 90° apart.

Computer post-processing

More detailed reports can be issued using the vib-Graph software after upload of the measurements on a PC:

- Bode,
- Nyquist,
- Waterfall,
- Orbit,
- Position,
- Patented Ellipse Spectrum displays for the characterisation of critical speeds (result is independent of the measurement direction).

FRF - Ods - X Phase Module Specification

ONEPROD FALCON portable analyzer helps you make a better diagnosis with its FREQUENCY RESPONSE FUNCTION (FRF).

It allows for the precise determination of the root cause of the most complex vibration problems by measuring vibration on several channels with cross phase information, between a reference channel and the other ones.

It is used for 3 main purposes:

- Modal analysis (FRF): Identify if the structure has an influence on the machine vibration by impact testing
- Operating Deflection Shape (ODS): Understand the machine behaviour while in operation by visualizing its deflection at particular frequencies.
- Quick cross-channel phase (X phase): Sort more information out of the machine vibration when the diagnosis is uncertain after the analysis of standard measurements.

FALCON offers a unique user experience, including all necessary tools to perform the best analysis in a productive and reliable way:

Quick and easy measurement setup:

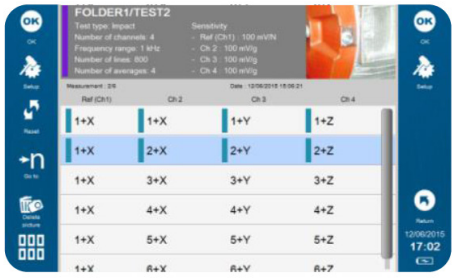
- Automatic measurement plan generation
- Measurement location pictures taken with FALCON, also providing easy report illustration
- Easy setup testing and adjustment (trigger OK, sensor overloading check)

Reliable and productive measurement process:

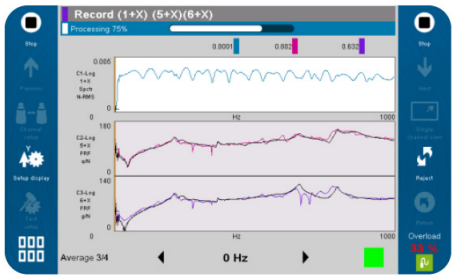
- Easy & instantaneous check of measurement quality: superimposition of each measurement to the mean value. If the vibration footprint does not seem correct, or if the impact was not properly propagated to the structure, easy deletion of the last measurement without having to restart the whole procedure
- Easy measurement validation: FALCON provides easy validation of the measurement by giving an extra hit of hammer at the end of the process!

Powerful 4-channel live display

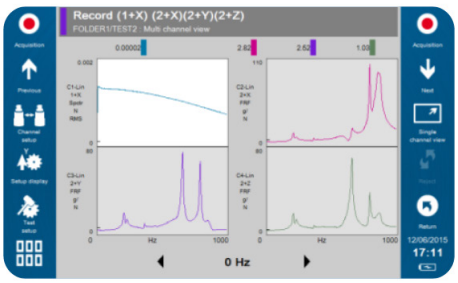
- Optimized 4-channel visualization in the same screen for the best productivity (selectable type of signal for each channel)
- Easy switch to detailed single channel view with a (customizable) 3-signal display in the same interface



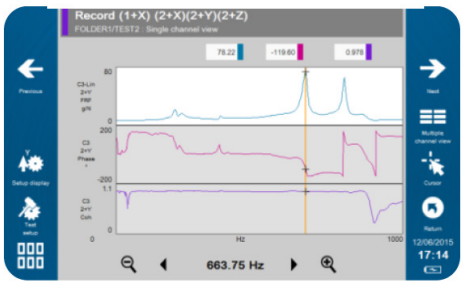
View of the measurement table automatically generated



View of a measurement superimposed to the mean value



4-channel instant view right after a measurement



3-signal display for one channel

General

- Acquisition from 2 to 4 channels, compatible with wired tri-axial sensor measurement
- Possibility to take a picture for each measurement (sensor location)
- Automatic measurement plan generation, with up to 200 locations in 3 directions and location numbering up to 9,999.
- Easy setup adjustment with trigger and sensor saturation indicators
- Easy check of measurement quality with automatic superimposition of each measurement onto the mean value
- Embedded storage of more than 600 tests (based on 4-channel tests with 800 lines of resolution and 100 locations).

Acquisition & Processing Details

- Vibration sensors:
    - o IEPE or AC impact hammer (for impact test)
    - o IEPE or AC accelerometer
    - o IEPE or AC velocimeter
    - o Proximity probe (probe driver can be power-supplied using cable ref FLC1005000)
- Measured parameters: force, acceleration, velocity or displacement
- Units: imperial or metric
- Adjustable overload voltage for impact sensor and response sensor
- Test type : Impact or ODS - Cross phase
- Max. number of locations per test: 200 in 3 directions
- High-pass filter: none, 2 Hz, 10 Hz
- Max. frequency: 50, 100, 200, 500, 1k, 2k, 5k, 10k, 20 k, 40 kHz
- Resolution: 100, 200, 400, 800, 1,600, 3,200, 6,400 and 12,800 lines
- Weighting window: shock, Hanning, rectangular
- Triggering for impact testing
- Number of averages: up to 4,096
- Overlapping: 0, 50 or 75%
- Reject function for impact testing

Display Details

- Two different settings:
    - o During acquisition to check measurements
    - o After acquisition to analyze the results
- Multi-channel view
- Single-channel view with up to 3 simultaneous functions.
- Functions:
    - o Time wave
    - o Instantaneous spectrum
    - o Spectrum
    - o Transfer function N/Ref *
    - o Transfer function Ref/N *
    - o Phase N/Ref
    - o Coherence

    * For impact testing, to help checking each average, the last instantaneous transfer function is superimposed onto the previous stored averaged transfer function
- Cursors: single and harmonic
- Amplitude: linear, logarithmic, dB

Computer Post-Processing Details

More detailed graphics can be generated using the vibGraph software after upload of the measurements on a PC:

- o Amplitude spectrum
- o Power spectrum
- o Cross-spectrum: amplitude, phase, real part or imaginary part
- o Transfer function: amplitude, phase, real part or imaginary part
- o Transmissibility
- o Coherence(7 Ln values)

Format Details

- FALCON generates .CMG files (can be imported in ONEPROD VigGraph analysis tool)
- vibGraph can also generate data in UFF format (compatible with structural analysis software such as ME'scope)

Data Collector/Analyser Specifications

- FALCON generates .CMG files (can be imported in ONEPROD VigGraph analysis tool)
- vibGraph can also generate data in UFF format (compatible with structural analysis software such as ME'scope)

Data Collector/Analyser Specifications

Flexibility of data transfer

Direct connection to PC through USB,
Connection to network or PC via Ethernet or Wi-Fi
USB stick (remote transfer by e-mail...)

User-friendly navigation

Organisation as a tree structure:

- Location,
- Machine,
- Point,
- Measurement

Fast navigation in a route based on list or map navigation modes
(pictures)
Identification: up to 22 characters/level (20 for measurement)

Automatic positioning on points or machines
Learning upon the first route by FALCON
Automatic recognition of point or machine by reading of QR code
labels.

Simultaneous measurement on 1 to 4 channels
Management of wireless triaxial accelerometer
Management of wired triaxial accelerometer
Management of 4 synchronous channels from 4 single-axis wired
accelerometers. This operating mode requires using 2 cables with Yconnectors
to connect to the FALCON ports.

Real-time processing
Parallel processing
Instant display of measurement results, as soon as the time signal
measurement is completed.

Instant access to automatic diagnosis
As soon as the measurement is completed, the result of automatic diagnosis is available, even in collection mode if the machine was configured to do automatic diagnosis.

Visual display of the data on the instrument
Display during measurement of (your selection):
- Progress bar
- Values of overall levels
- Scrolling of time signal

Consultation of data on FALCON for on-site analysis

Input of information during collection
Selection of an inspection note in a predefined list
Input of a free comment (even in Chinese!)
Recording of an audio comment
Picture of the inspection using the built-in camera
Input of the class of operating conditions relative to the measurement. Trends can then be filtered by operating condition
when analysing the data in the powerful NEST ANALYST software module.

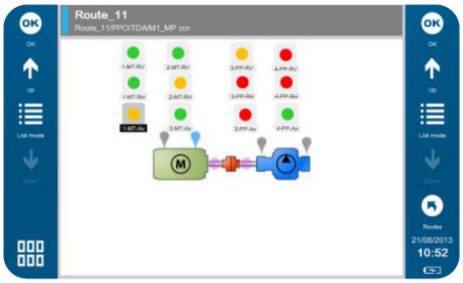
“Off route” mode:
Specific route to carry out measurements that are not programmed in the PC.
Creation made easy with copy/paste of the machines of any route.
Creation of machine, Creation of measurements, modification of
their properties, bump test possibilities
Measurements created off route can be transfered to the analysis
platform for existing machines or into a new machine created
automatically.

Available Collection Levels

Available measurement and processing capabilities for 2 levels of function depending on available FALCON packages:

	Falcon Essential - Smart	Falcon Expert
Acquisition and processing performances		
Analog Channels	1	4
Overall Levels calculation	●	●
Time waveforms of up to 8K samples	●	●
Time waveforms of up to 64K samples	○	●
Spectra of up to 6400 lines	●	●
Spectra of up to 102 400 lines	○	●
Enveloppe	●	●
Zoom	○	●
Vector	●	●
Recorder: time wave of up to 80s (4M samples)	○	○

● Included ○ Option

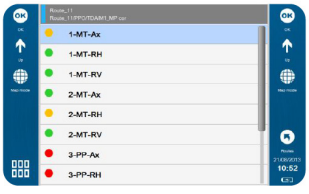


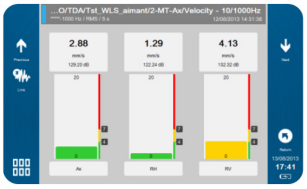
Data Collection Speed Table

Machine Setup	Measurement Type		High Pass Filter	Low Pass Filter	Analysis Freq. Range (Hz)	Sampling Freq.(Hz)	Spectral lines	Time wave samples	Nb of averages	Overlap	TOTAL TIME FOR 3 AXES	incl. Time wave lenght required	Mean time / axis with Tri axial sensor
Basic	**FFT**	Acc	10 Hz		2 000		1 600		8	1	**4 s**	2,2 s	1,3 s
	Time Wave	Acc	10 Hz			5 120		4 k	1				
Fan	**Overall**	Acc	10 Hz	20 kHz							**9 s**	7 s	3 s
	Overall	Velocity	10 Hz	1 kHz									
	FFT	Acc	2 Hz		2 000		1 600		8	1			
	FFT	Acc	2 Hz		20 000		3 200		12	1			
	Time Wave	Acc	2 Hz			51 200		8 k	1				
Dryer	**Overall**	Acc	3 kHz	20 kHz							**9 s**	7 s	3 s
	FFT	Acc	2 Hz		2 000		6 400		6	1			
	FFT	Acc	2 Hz		20 000		800		100	1			
	FFT Env	Acc	2 Hz		20 000		1 600		6	1			
	Time Wave	Acc	2 Hz			12 800		32 k	1				
Crusher	**Overall**	Acc	2 Hz	20 kHz							**9 s**	7 s	3 s
	Overall	Velocity	10 Hz	1 kHz									
	Overall	DEF											
	FFT	Acc	2 Hz		200		800		4	1			
	FFT	Acc	2 Hz		2 000		1 600		8	1			
	FFT	Acc	2 Hz		20 000		800		12	1			
	Time Wave	Acc	2 Hz		20 000		1 600		10	1			
Cooling Tower	**Overall**	Acc	2 Hz	20 kHz							**16 s**	14 s	5,3 s
	Overall	DEF											
	FFT	Acc	2 Hz		200		1 600		4	1			
	FFT	Acc	2 Hz		2 000		1 600		8	1			
	FFT	Acc	2 Hz		20 000		800		16	1			
	FFT Env	Acc	2 Hz		20 000		1 600		10	1			
	Time Wave	Acc	10 Hz			5 120		16 k	1				

Notes:

- All axes are measured synchronously with the same measurement setup as described above.
- Measurement time for 1 axis with mono axis accelerometer will be very similar to 3 axes total time with tri-axial accelerometer, as it has no impact on the time wave length required.
- Measurement setups above are given as examples. Other treatments can be performed embedded in FALCON during the data collection or automatically by post processing in the analysis software after transfer of the data.





Description Of Falcon Automatic Diagnosis

Machine And Components Types

- Electric motors (synchronous, asynchronous, DC)
- Pump
- Fan
- Compressors (Centrifuge, Lobed)
- Gearbox with up to 4 stages
- Bevel gearbox
- Roller
- Shaft

Main Analysed Defects

- Unbalance
- Misalignment
- Bearing and lubrication
- Mounting, clearance, friction
- Gear defects
- Cavitation

Limitations

- Speed: 120 to 12000 RPM
- Types of bearings managed:
    - Roller Bearings
    - Journal Bearing: not all defects are supported for journal bearings (instability...).

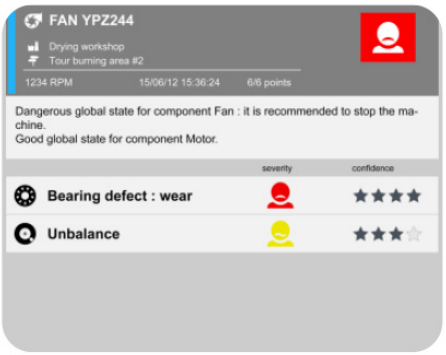
Symptom-Based Approach

FALCON automatically reproduces the behaviour of an expert user in front of vibration data: a symptom-based analysis is performed, thus avoiding limitations of simple thresholds evaluation. Proven in many industrial cases gathered over the years through the ONEPROD measurement and analysis SERVICES activity, FALCON provides results showing unrivalled relevance and reliability.

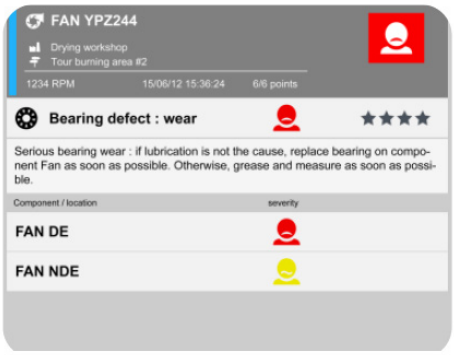
Results

From the analysis of the symptoms observed on your rotating machines, FALCON provides, in a fully automatic mode:

- Advice and recommendation on the global condition of the machine, taking into account all measurement points
- Automatic detection of multiple defects on the same machine
- Automatic detection of multiple defects on the same measurement point
- Supply of a result, even with an incomplete measurement, as soon as the first point is measured
- For each defect:
    - Localisation of the defect on the machine
    - Severity of the defect
    - Confidence level given by FALCON
    - 1st level of recommendation for maintenance action



Automatic Result of the global health status of a machine



Detailed information on a defect with identified location

FALCON WLS Wireless Tri-Axial Accelerometer

Physical

- Dimensions: Ø40 x H115 mm
- Weight: 373 g
- Resistance to shocks: 5 000 g
- Mounting: M6 threaded hole
- Mounting accessories:
    - o Fixing studs
    - o Magnet for planar surfaces, to be used with flat bases
    - o Indexed magnet for automatic positioning of axes on planar surfaces, to be used with indexed bases
    - o Bipolar magnet for all surfaces

Battery

- Type: Li-ion
- Operating life: 8 hours
- Rechargeable through USB
- Automatic stand-by mode: after 10 min

Metrology

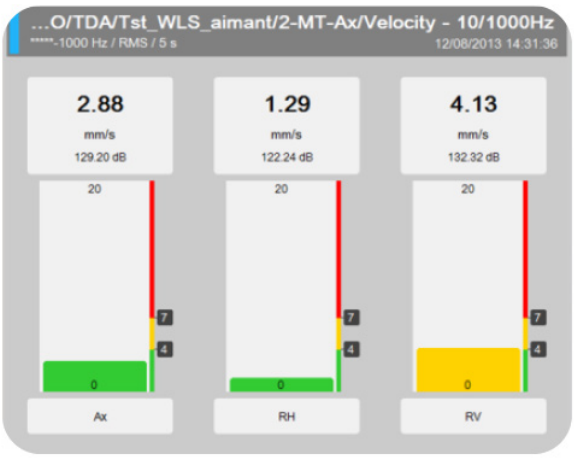
- Synchronous 3-axis acquisition (X, Y, Z)
- Bandwidth: 20 kHz on all axes
- Frequency range at 3 dB:
    - o 15 kHz (Z)
    - o 6 kHz (XY)
- Full scale: 80 g
- Signal-to-Noise ratio: 80 dB
- Accuracy: +/- 3%

Environment

- Operating temperature: from -20°C to +60°C
- Protection: IP65
- ATEX certification for zone II area / IECEX certification

Communication

- Automatic sensor detection by FALCON
- FALCON detection time upon power up of sensor (ON/OFF): 30s
- Pairing: association of sensor to one FALCON at a time
- Coexistence:
    - o Several FALCON-WLS systems scan operate together in the same area.
    - o FALCON operates with one triaxial wireless sensor at a time.
- Wireless protocol: Wi-Fi 2.4GHz
- Range from 10 m to 20 m depending on the environment



Falcon Packages And Kits

Falcon Standard Hardware Kit

- Carrying case
- A built-in rechargeable battery pack
- A mains power supply unit: 110/220 V 50/60 Hz
- 1 voltage input cable
- Safety harness
- USB cables
- Quick start manual
- User manual on CD
- Safety instructions
- 1 screen protection (not included for EX version)

Data Collection Sensor Kits (Your Selection)

- FALCON WLS wireless triaxial sensor kit
    - o 1 x triaxial wireless sensor with wrist strap and built-in rechargeable battery pack
    - o 1 x USB charger including a mains power block: 110/220 V 50/60 Hz + USB cable
    - o 1 x magnet for FALCON WLS wireless triaxial accelerometer, M6 mounting

- ASH wired sensor kit
    - o 1 x ASH201-A accelerometer
    - o 1 x spiral cable (0.75 m wound, 2 m unwound)
    - o 1 x M6 magnet for ASH sensor
    - o 1 x M6 contact point

Balancing Kits

- 2-plane balancing sensor kit
    - o 2 x ASH201-A accelerometers
    - o 2 x M6 magnets for ASH sensors
    - o 2 x 5-m straight cables for ASH201
    - o 1 x optical trigger device for phase measurement with laser sighting, including:
        - 1 x optical trigger input
        - 1 x 1.5-m straight cable
        - 1 x 5-m extension cable
        - 1 x self-adhesive reflecting tape (1 meter)
        - 1 x magnetic base for the optical triggering device
- 4-plane balancing sensor kit
    - o 4 x ASH201-A accelerometers
    - o 4 x magnets for ASH201-A
    - o 4 x 5-m straight cables for ASH201
    - o 2 x 20-cm Y ECTA/ECTA adaptors for connecting 2 sensors on a FALCON channel
    - o 1 x optical triggering device for phase measurement with laser sighting, including:
        - 1 x optical trigger input
        - 1 x 1.5-m straight cable
        - 1 x 5-m extension cable
        - 1 x self-adhesive reflecting tape (1 meter)
        - 1 x magnetic base for the optical triggering device

Note: All packages are available in EX version certified for use in ATEX Zone II 3 G Ex ic IIC T4 Gc, IECEx: Ex ic IIC T4 Gc.

DOCUMENTREFERENCEHERE

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CREATING ENVIRONMENTS OF POSSIBILITY

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