FALCON
USER MANUAL

OneProd
ACOEM Group

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FALCON
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TABLE OF CONTENT

CHAPTER 1. GENERAL PRESENTATION

1.1 INTRODUCTION

We want to congratulate you on your choice and hope that you will be fully satisfied with it. For this reason, we recommend that you read carefully the present user guide and more specifically the safety instructions.

FALCON is the new generation of portable data collectors for condition monitoring, vibration analysis and balancing. Designed to meet industrial requirements for enhancing productivity, FALCON is a portable multichannel instrument coming along with a large touchscreen, a 3-axis wireless sensor and numerous accessories. This innovative all-in-one solution makes condition monitoring available to all users.

The main new functions of the latest versions are listed at the end of this manual: see § 9.3

In case of a problem, please contact our Hotline at oneprod.support@acoemgroup.com

1.2 SAFETY INSTRUCTIONS

The safety instructions delivered with the instrument (printed and on the CDROM) should be carefully followed and the instrument should always be used within the limits specified here.

Instrument and operator safety is at risk when the instrument is used in conditions that are not intended by ACOEM.

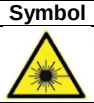
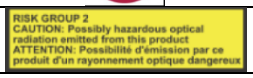
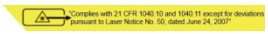
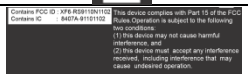
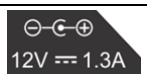
Dismantling the instrument for an internal operation is forbidden. The only parts for which dismantling is allowed are the battery hatch, the battery and the hatch providing access to the connectors.

All the spare parts must be provided by ACOEM.

1.3 LIST OF SYMBOLS AND WARNING ON THE INSTRUMENT

Warning: whenever this symbol is present on the device, refer to the safety instructions and user manuals.

The table below lists the warning signs and security present on the instrument.

Symbol	Signification	Position
	Laser radiation Refer to section "*Laser Class 3R"*	Rear side (bottom)
	Laser radiation class 3R Refer to section "*Laser Class 3R"*	Rear side (bottom)
	Avoid exposure to beam Refer to section "*Laser Class 3R"*	Rear side (bottom)
	Light Hazard Group 2 Refer to section *"High-power white LED flash and stroboscope"*	Rear side (bottom)
	Refer to the safety instructions documentation and the user manual before connecting	Rear side (bottom)
	Laser aperture Refer to section "*Laser Class 3R"*	Rear side (top)
	Battery replacement Refer to section *"Battery pack set-up"*	Battery compartment
	CE certification data. Refer to the copy of the CE APT2069 type certificate	Rear side (center)
	Do not dispose of this product as unsorted household waste. Refer to section *"Dismantling/recycling"*	Rear side (center)
	FCC and IC number. Refer to section *"Radio"*	Rear side (center)
	External power connection: refer to section "*Main Power supply block"*	Rear side (bottom)

1.4 LIST OF SYMBOLS AND WARNING ON WLS

Warning: whenever this symbol is present on the device, refer to the safety instructions and user manual.

The table below lists the warning signs and security present on the WLS sensor.

Symbol	Signification
	Warning: refer to the safety instructions and user manuals
	Use a power source with limited power (=> Mains Power supply bloc)
	=> CE certification data
	=> Dismantling/recycling

1.5 LASER

- **Laser maintenance: the laser does not need maintenance or adjustment excluding cleaning the glass with a cotton swab. Always shut off completely the device Falcon before this operation.**
- **Caution--use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure**

1.6 ELECTRIC CONNECTIONS

All external circuits connected to the instrument must be non-hazardous voltage sources and be energy limited as explained in sections 6.3 and 9.4 of the IEC61010-1 standard

Do not exceed maximum input voltage on the A/B/C/D connectors: maximum input voltage ±24 V DC, ±24 V AC peak.

All external circuits connected to the collector must carry non dangerous voltage as defined in Standard IEC61010-1 (Paragraph 6.6)

Do not exceed maximum input voltage and current intensity for the power supply delivered by the mains block (see chapter “Mains power block” of the safety instructions).

Use the cables designed for the different types of measurement.
If possible, protect the unused connectors using the plastic caps provided.

1.7 FIRST POWER-UP

The instrument turns on automatically a few seconds after being connected to the mains through the power supply module. If the battery level is too low, the charge starts and goes on as long as the instrument is connected to its power supply.

When using a new battery, leave the battery in charge for about 10 hours in order to achieve full charge. Do not use the instrument prior to 2-3 hours of charge. Usual charging time is about 6 hours when instrument is switched off.

- On-Off:
  - Power on: press the On-Off key
  - Power off: press the On-Off key, then message “Shutdown”

- Battery charge:
  - Connect the instrument to the charger
  - Connect the charger on the main. The instrument is automatically powered on. During the charge you can continue to use it. For a faster charge it is recommended to switch-off the instrument. A full charge requires about 6 hours.

It is recommended to disconnect the charger from the main when you are not using it.

1.8 USER INTERFACE

FALCON starts on its “Home screen”. It is a touch screen and a simple pressure on it gives access to the application modules installed on the instrument and to 2 side panels:

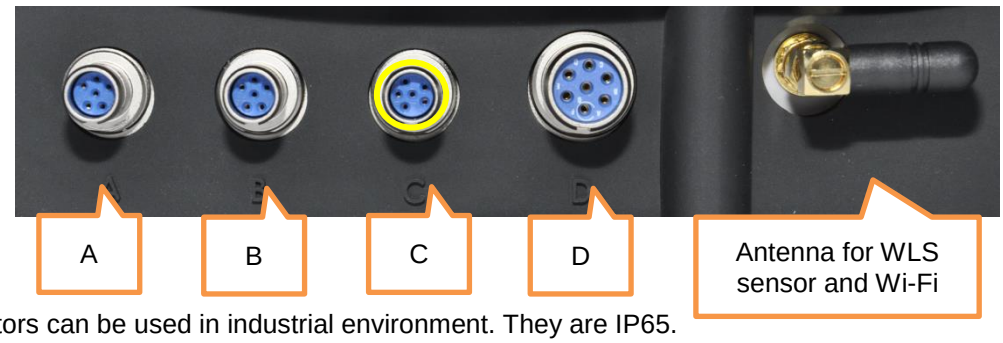
For more details:

- Collect module: see CHAPTER 3
- Analyzre module: see CHAPTER 4
- Balancing module: see CHAPTER 5
- Run-up/Coast-down module: see CHAPTER 6
- Frequency response module – ODS – Cross-phase: see CHAPTER 7
- Status panel: see § 1.13
- Shortcuts panel: see § 1.14

The 2 side panels are accessible from any screen.

1.9 CONNECTIONS

1.9.1 Connectors A to D on the top of the instrument



Those connectors can be used in industrial environment. They are IP65.

- Connector A: channels 1 and 3. Use this connector when the instrument is set in single-channel mode.
  - Contact A:
  - Contact B: Common
  - Contact C: Channel 1 signal input
  - Contact D:
  - Contact E: Channel 3 signal input
  - Contact F: -24 Vdc output

- Connector B: channels 2, 3 and 4. Use this connector with wired triaxial sensor when the instrument is set in multi-channel mode.
  - Contact A:
  - Contact B: Common
  - Contact C: Channel 2 signal input
  - Contact D: Channel 3 signal input

- Contact E: Channel 4 signal input
- Contact F: -24 Vdc output

Notes:

- for 2-channel measurement, use connectors A and B. For 4-channel measurement, you also need Y adaptors.
- If inputs are set as IEPE, the sensor is powered by a 4 mA constant current. The integrity of the sensor is monitored and a warning is issued if peak voltage is out of about 1 to 22 V.

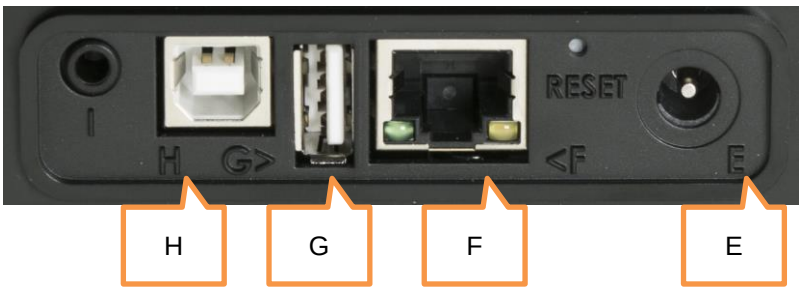
- Connector C: Tachometer input, Stroboscope output, Power supply input. It it is marked in yellow as well as all cables used on this connector
  - Contact A: Common
  - Contact B: Instrument power input
  - Contact C: 5 Vdc output
  - Contact D: -24 Vdc output
  - Contact E: Tacho signal input
  - Contact F: Strob signal output

- Connector D: Ethernet, Microphone input, Audio output.
  - Contact A: Common audio
  - Contact B: Audio output
  - Contact C: Microphone input
  - Contact D: Lan_Tx+
  - Contact E: Lan_Tx-
  - Contact F: Lan_Rx-
  - Contact G: Lan_Rx+

Warning:

- Do not connect channels 1, 2, 3, 4 and tachometer input on a not buffered output or in parallel to other instrument as their impedance is not maintained when changing configuration or when the instrument is switched off.
- Respect the maximum input voltage to the A/B/C/D connectors: maximum input voltage ± 24 VDC, ± 24 volts peak AC.

1.9.2 Connectors E to I behind the trapdoor

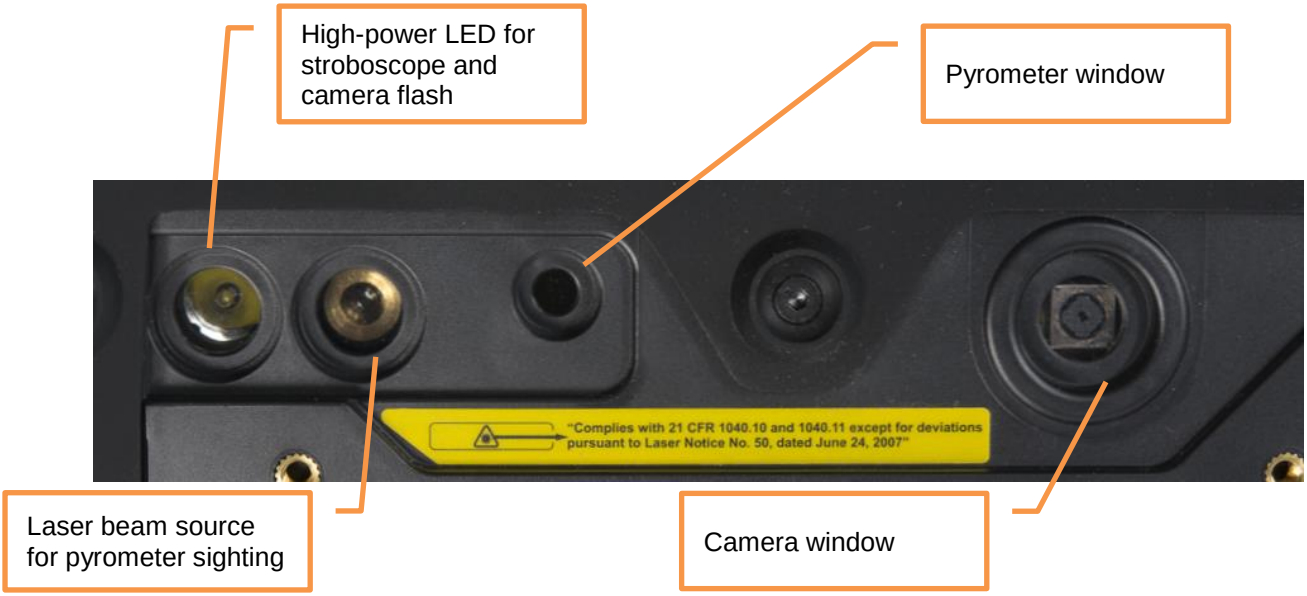


Those connectors are behind a trapdoor. It must remain close in industrial environment to preserve the IP65 protection. Use those connectors only in office environment.

- Connector E: Power supply input ⊖–C–⊕
- Connector F: Ethernet RJ45
- Connector G: USB 2 type A host (for USB memory stick)
- Connector H: USB 2 type B device (direct connection with PC)
- Connector I: serial interface for maintenance purposes only

1.10 BUILT-IN SENSORS

The back of the instrument gives access to the built-in sensors.



For the stroboscope and the pyrometer, please see the safety instructions delivered with the instrument (printed and on the CDROM)

1.11 WLS SENSOR

FALCON can be used with a wireless triaxial accelerometer (WLS Sensor). This chapter described how to use FALCON with this sensor.

1.11.1 WLS sensor battery

Use the USB cable and charger supplied with the sensor. The connector is protected by the rubber cap on the top of the sensor. It can also be charged from any USB interface with power supply (! measurement is not possible if the WLS is connected to a USB PC port). Charging time is 8 hours with the standard 500 mA charge current.

Notes:

- After recharging, the cap must be correctly and fully inserted
- The sensor should not be used without its cap in wet or polluted environment
- Opening of the cap should only be done in clean and dry environment
- If the sensor has been in polluted environment, the cap opening must be done after cleaning and drying, cap facing down to prevent the intrusion of foreign matter
- WLS sensor battery replacement must be done by qualified personnel only.

1.11.2 WLS sensor first connection

- Switch on WLS: press on/off for 2s, until the red LED is on, and wait until the red LED is off and the blue LED is continuously on. See details below concerning LED indication.
- On FALCON from the home screen proceed as follows:
  - Check first if Wi-Fi is enabled in:
    Shortcuts > Setting > > Wi-Fi = enabled
  - Set FALCON to work with a WLS sensor:
    Shortcuts > Setting > > Accelerometer link = Wireless
  - Shortcuts > Setting > Wireless sensor:
    - Input WLS serial number (e.g., 10015)
    - Save the settings
    - Wait for about 30 s until the blue LED is flashing. Then 20 s later, the connection must be set up. It can be seen when there is in the status summary or from the status panel where you can see the sensor identification (e.g., WLS_10015). It can also be checked from Wireless sensor setting with the Test function.

If Wi-Fi is enabled further connections are automatic after switch on of the instrument and the WLS sensor.
Note: it is not possible to connect an instrument with a WLS sensor already connected to another instrument.

1.11.3 WLS sensor switch off

Press on/off for 6s until the red LED flashes on. The sensor is also automatically switched off if there is no connectivity during 10 min.

1.11.4 WLS: LED indication

	Red LED	Blue LED	Significance
WLS connected to the charger	———		Charge in progress (LED brightness = 50%)
	———		Charge completed (LED brightness = 100%)
	- - - - -		Charge error
Switch on (press 2s on/off)	——— (< 10 s)	Off	Start in progress
	——— (> 15 s)	Off	Error
		———	WLS ready and not connected to the instrument
		- - - - -	WLS has detected the instrument. The connection is only effective when you have in FALCON status summary
Switch off (press 7 s on/off)	- - - - -		Stop in progress
	Off	Off	WLS is switched off
Low battery	- - - - -		

Notation:

——— brightness = 100%
——— brightness = 50%
- - - - - flashing
Blank any status

1.12 DATA EXCHANGE WITH PC

FALCON can exchange data with the PC when the Communication module  is run from the home screen. See below the different settings according to the type of communication. Once the communication is established, you can also use the NEST software to upload or download routes. The instrument is also seen as an external drive from the PC (see § 9.1).

1.12.1 Using USB (Connector H)

No settings are required; the PC automatically detects the instrument after its connection.

1.12.2 Using USB memory (Connector G)

It is possible to use a USB memory stick connected on port G to exchange the following data:

- Firmware update: see § 2.12
- Load and download routes: see § 3.3.2 and 3.6.2
- Issue balancing reports: see § 5.13

Note: USB memory stick format must be FAT32, NTFS format is not accepted. It is always possible to reformat it to FAT32.

1.12.3 Using Ethernet (Connector D or F)

- **Direct connection PC- FALCON setting:**
  - On PC: Setup Network
    - DHCP = No
    - Set the IP address: Ex 192.168.1.10
    - Mask = 255.255.255.0
  - On FALCON:

     Shortcuts >  Setting >  Network >
    - DHCP = No
    - Set the IP address = e.g., 192.168.1.12
      Note: the first 3 numbers must be the same (192.168.1) and the last one different from that of the PC (10 ≠ 12)
    - Mask = 255.255.255.0

    Once the setting is done, to access the data use FALCON IP address, e.g., in the Explorer type "\\192.168.1.10\Data".

- **PC- FALCON connection through LAN Network:**
  - On PC: Setup Network
    - DHCP = Yes
  - On FALCON:

     Shortcuts >  Setting >  Network >
    - DHCP = Yes

    Connect Falcon to the LAN, set it in communication mode  and wait until it gets its IP address.

    The IP address can be read in  Setting > About information page.
    If there is a DNS, it is also possible to access the instrument with its name. The name is Falcon_serial_number (e.g., Falcon_10015).

    Once the setting is done, to access the data use FALCON IP address, e.g., in the Explorer type "\\Falcon_10015\Data".

1.12.4 Using Wi-Fi

Check first if Wi-Fi is enabled in:

 Shortcuts >  Setting >  > Wi-Fi = enabled

- **Direct Wi-Fi connection PC- FALCON setting without WLS sensor:**
  - On FALCON:

     Setting >  Network > Wi-Fi part
    - Enabled = Yes
    - Adhoc = Yes
    - SSID = My_ONEPROD_Instrument or other
    - Canal = 6
    - Authentication = none
    - DHCP = No
    - Set the IP address: Ex 192.168.1.16
      Note: the first 3 numbers must be the same (192.168.1) and the last one different from that of the PC (14 ≠ 16)
    - Mask = 255.255.255.0
  - On PC: Setup WIFI network
    - DHCP = No
    - Set the IP address, e.g., 192.168.1.14
    - Mask: 255.255.255.0
    - Scan Wi-Fi networks and select FALCON SSID.

    Once the setting is done, to access the data use FALCON IP address, e.g., in the Explorer type “\\192.168.1.16\Data”.

- **Direct Wi-Fi connection PC- FALCON-WLS setting:**
  - On FALCON:
    - First set the connection FALCON-WLS: see § 1.11.2
    - Wait for sensor connection ( in status summary)
    -
  - On PC: Setup Wi-Fi network
    - DHCP = Yes
    - Scan Wi-Fi networks and select FALCON SSID (WLS_10015).
    - Input the security key: WLS serial number (Ex: 10015)

    Once the setting is done, to access the data use FALCON name, e.g., in the Explorer type “\\FALCON_10015\Data”.

- **Wi-Fi LAN connection PC- FALCON setting without WLS sensor:**

  Note: WLS sensor cannot be used simultaneously with this mode.
  - On FALCON:

    Setting > Network > Wi-Fi part
    - Enabled: Yes
    - Adhoc: No
    - Save the setting

    Setting > Network > Wi-Fi part
    - Scan network until you detect the right SSID
    - Set Authentication, Encryption and Key according to selected SSID
    - DHCP: Yes

    The IP address can be read in Setting > About information page.
    If there is a DNS, it is also possible to access the instrument with its name. The name is: Falcon_serial_number (e.g., Falcon_10015).

  - On PC: the PC must also be connected to the same Wi-Fi LAN

1.13 STATUS INDICATIONS

1.13.1 Status summary

The status is indicated at the bottom of the right hand side of the screen

- General status
  - Date and time
  - Battery level of the instrument
  - If Wireless measurement mode is selected, WLS connection status:
    -  connected
    -  not connected
- During analogic measurement
  - Input overload indication in percentage of time.
  - Sensor integrity indicator
- During wireless measurement
  - Sensor overload indication in percentage of time.
  - Battery level of the sensor

1.13.2 Status panel

If you click on the status summary, the status panel appears on the right hand side of the screen. It shows the following information:

- Wi-Fi:
  - Off: Wi-Fi is disabled in  Shortcuts >  Setting > 
  - Not connected: the instrument is not connected to a WLS sensor or another Wi-Fi network
  - WLS_xxxxx: the instrument is connected to a WLS sensor, xxxxx is the serial number of the sensor.
  - Network: Wi-Fi is connected to a network.
- Sensor battery: this information shows the battery level of the WLS sensor. It is not displayed if the instrument is not connected to a WLS sensor.
- System battery: this information shows the battery level of the instrument.
- The amount of available memory.

1.14 SHORTCUTS PANEL

From any screen, button  opens the Shortcuts panel. It gives direct access to a group of functions. The list of accessible functions depends of the current screen.

1.14.1 Photo

- From the “Collect” module:
  - measurement list or machine view screen: 2 tabs to take inspection pictures or a machine picture (see § 3.5)
  - machine explorer, map mode (see § 3.5.7):
    - at location level: take a location picture
    - at machine level: take a machine picture
- From “Balancing” module, any screen: take a picture for your report (balanced machine, sensor installation, weight mounting)
- From “Run-up / Coast-down” module, Test information screen: take a picture for your report (machine, sensor installation)
- From “Frequency response – ODS” module, Test main screen: take a picture for each measurement (sensor installation)

Take the picture:

 : take the picture. You must not move during few seconds.

 Brightness adjustment.

 Flash on and off.

Stored picture management:

 Add a new picture.

 See previous picture.

 See next picture.

 Add a comment to the current picture.

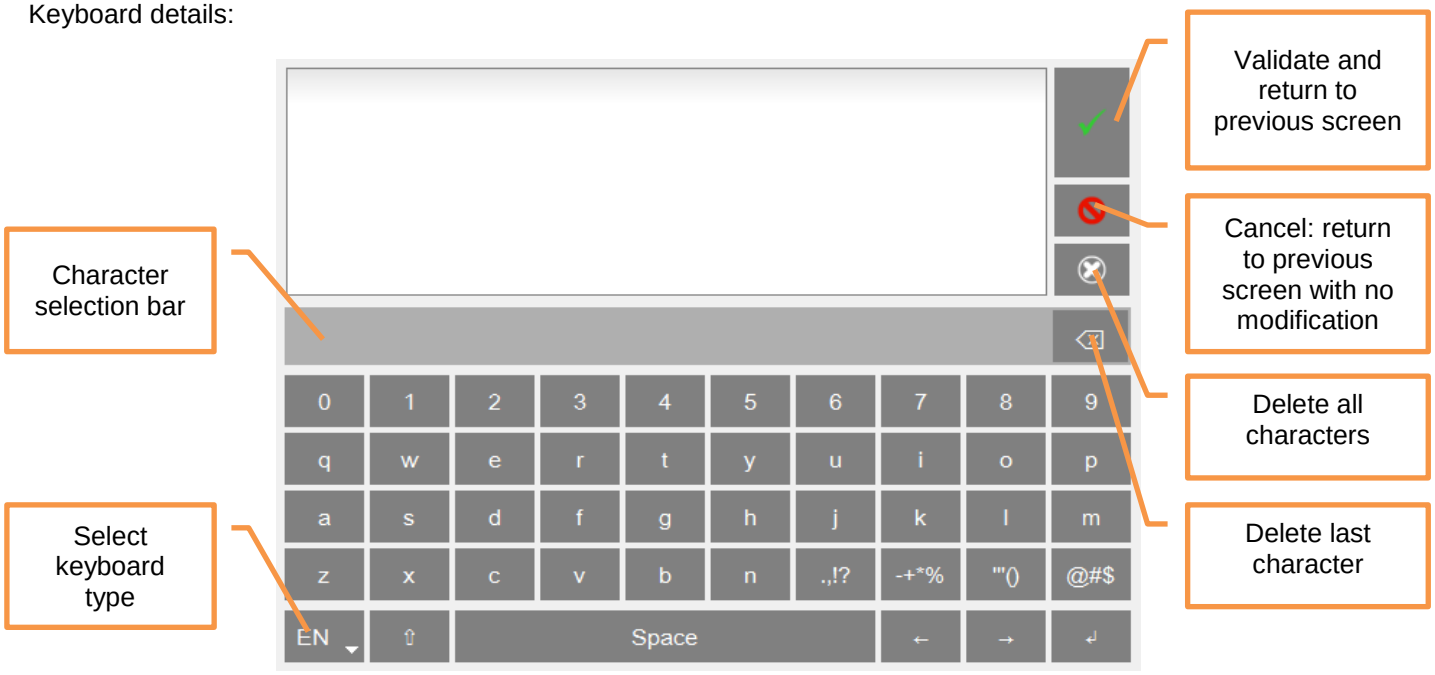
 Delete the current picture.

 The camera must not be used when cables are plugged on connector C or connector D (see chapter Radio of the Safety instructions manual)

1.14.2 Text note

- From Collect module, measurement list screen: input text inspection note directly from the keyboard or from a list of predefined notes. The list of predefined notes is only available if this list is created in PC database (in XPR menu “Libraries/Predefined notes”)
- From Balancing module, any screen: balancing comment for the report

Keyboard details:



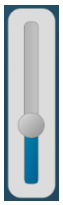
- Keyboard type:
  - EN: English
  - FR: French
  - PT: Portuguese
  - CN: Chinese
- Character selection bar: if one key is used for several characters (e.g., @#$, eéè, …), a long press displays them in the bar for selection.

1.14.3 Help

From any screen, it gives explanation of each command.

1.14.4 Vocal note

Before using a headphone, please read the safety instructions delivered with the instrument (printed and on the CDROM)



From Collect module, measurement list screen: take a vocal inspection note.

 Record: record your comment.

Make sure you set the volume to a low level before starting to listen

 Play: listen to the comment

For this function, you must have the optional 3.5 mm jack adapter on connector D (ref: CPC1229000 - FALCON ECTD-JACKF).

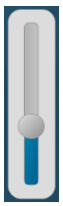
1.14.5 Barcode

From the Collect module, measurement list screen: read the barcode (QR code format):
Notes:

- If the code is unknown, the system suggests associating it to the current point (learning mode). The association is then memorized for a future collection.
- If a point in the route is already associated with the code, the system goes directly to this point.

1.14.6 Listening to the signal

Before using a headphone, please read the safety instructions delivered with the instrument (printed and on the CDROM)



- From the Collect module, measurement list screen: listen to the signal of the sensor
- From the Collect module, time wave display screen: listen to the recorded signal

Make sure to set the volume to a low level before starting to listen

Press  to start and then adjust the level to your convenience.

For this function, you must have the optional 3.5 mm jack adapter on connector D (ref: CPC1229000 - FALCON ECTD-JACKF).

Note: if a triaxial sensor is used, the live output is the Z axis of the sensor.

1.14.7 Pyrometer

For the pyrometer please read the safety instructions delivered with the instrument (printed and on the CDROM)

From any screen, read the temperature with the built-in pyrometer
Notes:

- from the Collect module, measurement list screen: if in Measurement setting, if “Pyrometer” = “Internal”, temperature measurement of the route with input type = DC will be done with the built-in pyrometer
  If there is no temperature measurement, the save function ( ) stores the pyrometer measurement as an additional line in the text note. To display or modify the text note see § 1.14.2
  Example:
  1-MT-NDE = Temperature 83.36 °C
  2-MT-DE = Temperature 80.91 °C
- The pyrometer measures the average temperature in a circle. The diameter of the circle depends on the distance to the target. The diameter is about 4 cm at a distance of 50 cm.
  Warning: due to the distance between the pyrometer cell and the laser source, the circle is decentered by 3 cm.

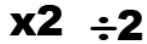
1.14.8 Stroboscope

For the stroboscope please see the safety instructions delivered with the instrument (printed and on the CDROM)

- From any screen, read the rotation speed with the stroboscope
- From the Collect module, measurement list screen: check or adjust rotation speed of the machine.
- From the Collect module, spectrum display screen: check or read rotation speed of the machine.


Fine tune. A continuous press speeds up the modification


Fast tune. A continuous press speeds up the modification


Divide or Multiply the value by 2.


Set the flash duration: default value is 5 degrees. The longer the duration, the brighter the flash, but the fuzzier the target on the rotor. Limits range from 0.5 to 15 degrees.


This function is only accessible in Collect module.

- For machine with variable rotation speed: rotation speed measurement of the machine is updated by the stroboscope value.
- For machine with fixed rotation speed: rotation speed setting of the machine is updated by the stroboscope value. **In this case, when downloading the route, the new rotation speed is used to update the NEST initial setting**

Notes:

- It is recommended to start with a frequency higher than the rotation and decrease gradually until stopping the rotor marker.
- Default unit is set in "Spectrum display" parameters (see § 2.5)
- Once the marker is stopped, to be sure not to be on a sub-multiple of the rotation, use x2 , the marker should appear 2 times. Use ÷2 to return to the initial frequency.

1.14.9 Screenshot

From anywhere, you can save a screen copy. Images are stored in folder “Screenshots”. Connect your PC to FALCON to copy them (see § 1.12).

1.14.10 Settings

See CHAPTER 2.

1.14.11 Home

From anywhere you can go directly to the home screen.

1.15 BATTERY MANAGEMENT

For battery management, please read the safety instructions delivered with the instrument (printed and on the CDROM)

1.15.1 Battery information

- Reference: FLC1007000
- Part number: WILPA2344x
- Configuration: 1S3P INT 176065
- Rated energy: 75 Wh

This battery model and its cells meet the requirement of the current applicable "Recommendations on the Transport of Dangerous Goods, part III, sub-section 38.3, Manual of Tests and Criteria" issued by the United Nations Committee of Experts on the Transportation of Dangerous Goods.

In accordance with the current UN Recommendations on the Transport of Dangerous Goods Model, this lithium battery is assigned for transportation under the following entries:

- If shipped as such, UN Dangerous Goods Entry is: UN 3480
- If shipped contained in the instrument, UN Dangerous Goods Entry is: UN 3481

1.15.2 Battery charge

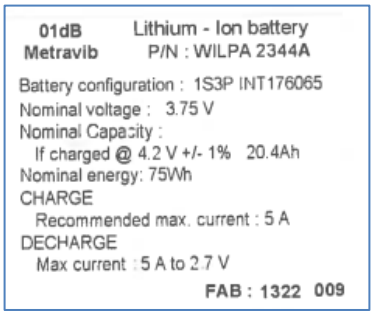
When using a new battery, leave the battery in charge for about 10 hours in order to achieve full charge. Do not use the instrument prior to 2-3 hours of charge. Usual charging time is about 6 hours when instrument is switched off.

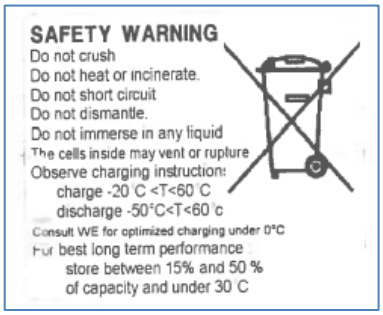
- Battery charge:
  - Connect the instrument to the charger delivered with the instrument.
  - Connect the charger to the mains. The instrument is automatically powered up. During the charge you can continue using it. For a faster charge, it is recommended to switch the instrument off. A full charge requires about 6 hours.

It is recommended to disconnect the charger from the mains when you are not using it.

1.15.3 Battery replacement

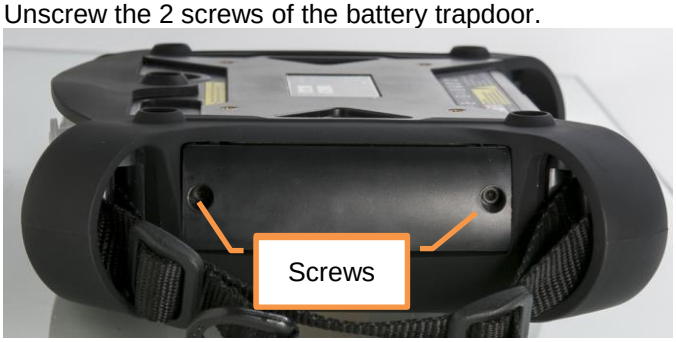
- Safety instructions:
  - Do not use batteries other than type PIL1133 provided for FALCON and identified as 01dB Metravib WILPA 2344A





  - Do not open or disassemble the battery pack. The pack includes protections and an assembly essential for the safety that should be changed in no case.
  - The battery pack is interchangeable only for maintenance purposes. The operating lifetime of the pack is sufficient for a full working day. The pack should not be changed periodically to artificially increase its lifetime. The pack is not intended for this type of use, which would result in a dangerous mechanical wear.
  - Do not short-circuit the terminals of the battery connector. For safety reasons, the battery pack includes an internal non-resettable fuse. A short-circuit makes it unusable.
  - Respect voltage, current and temperature indicated on the label of the battery.
  - Do not expose the battery to water or condensation.
  - Do not place the battery in fire or near any other source of temperature (> 70°C). This can cause overheating or a fire start. Such use may also lead to a loss of performance and a significant reduction of the lifetime of the battery.
  - Disconnect the battery and the charger immediately in the following situation:
    - unusual odor
    - abnormally high temperature

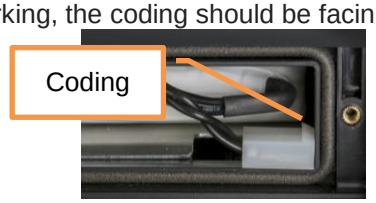
- Replacement instructions:
  - Remove the battery:
    - Unscrew the 2 screws of the battery trapdoor.



    - Remove the connector by gently pulling the two cables. It should come off easily. In the case of an abnormal resistance, do not force and contact our after-sales service.
    - Remove the battery.
  - When setting up the battery, be sure to not pinch or crush the cables.

- Check the orientation of the battery pack. The wire output must be placed beside the connector to avoid crushing by the trapdoor.

- When inserting the battery, make sure not to hurt the pack. The insertion must be done without forcing excessively. When in doubt, pull out the battery and check that nothing is blocking its insertion.
- According to the battery model, check the orientation of the connector:
  - Model without marking, the coding should be facing up:



  - Model with marking, the green arrow should be visible:

- To insert the connector, hold it with the cables.
- Check that trapdoor does not crush the cables by pushing them to the right hand side.

1.16 REMOTE DISPLAY & CONTROL FUNCTION

Procedure to take control of FALCON from a PC:

- Install Real VNC Viewer ® on the PC
- FALCON must be first networked by Ethernet (see § 1.12.3) or by Wi-Fi (see § 1.12.4) with the PC
- To work also with WLS Sensor, use the 'Direct Wi-Fi connection PC- FALCON-WLS setting' configuration.
- To work with 'Wi-Fi LAN connection PC- FALCON setting without WLS sensor', FALCON must not be connected to the WLS (Settings > Measurement > 'Accelerometer link' = 'Wire')
- Run a VNC Viewer
- Set the Input Server address: IP address of FALCON or its hostname (e.g., Falcon_10015) if there is a DNS.
- It is then possible to control FALCON from the PC.

Note: it is possible to protect this access with a password: see § 2.10

CHAPTER 2. GENERAL SETUP

Access: Shortcuts panel > Settings

2.1 COLLECT

- Possibility to protect* the modification of some route data: sensor position pictogram, location or point picture, barcode, rotation speed for measurement done by tachometer
- Possibility to protect* the functions 'Delete' and 'Reset' for routes not downloaded.
- Selection of data type displayed during acquisition: progress bar only, overall level, spectrum or time wave
- Auto advance: if "YES" is selected, the instrument go automatically to the next point once the acquisition is completed (See § 3.5)

* The protection is applied if you define a password on the last line of > Settings > About (See § 2.8)

2.2 MEASUREMENT

- Acquisition power supply permanent or not: If this option is set to YES, the acquisition components are permanently supplied. If it is set to NO, its supply is activated only when a measurement is to be carried out, but it requires a short waiting time before signal stabilisation. The advantage of permanent supply is the speed to carry out numerous measurements. But the current consumption will be a little higher, and so the instrument autonomy will be shorter.
- IEPE stabilisation time: increase pre-measurement delay for IEPE transducers with large stabilisation time.
  Unit = second.
  WARNING: when IEPE input type is selected, a constant current is powered up (current source: 4 mA – 23 DC). It is important to check that the signal source is compatible.
- Pyrometer:
  - External: temperature is measured on DC input
  - Internal: temperature is measured with built-in pyrometer
- Pyrometer unit : °C / °F
- Measurement channel number:
  - Single: measurement is always done on channel 1 (connector A) for wired sensor or on Z axis for WLS sensor
  - Multi: measurements are done on channels 2 to 4 for triaxial compatible accelerometer configuration (connector B) and on channels1 to 4 otherwise (connectors A and B)

  Note: if the instrument is equipped with 1 wired channel option, the mode "Multi" is not effective when "Accelerometer link" is set to "Wire"
- Accelerometer link:
  - Wire: accelerometer is connected to connector A or B
  - Wireless: use the WLS sensor (see § 1.11.2).

  Note: Accelerometer link setting is not used for measurement synchronous with the tachometer input (e.g., Balancing module)

2.3 WIRELESS SENSOR

Instructions for the first connection are presented in § 1.11.2.

If the communication is bad or not possible, check following points:

- Check if the sensor is switched on and if the blue LED is continuously on (searching for connection) or flashing (connected to an instrument)
- Check on FALCON if Wi-Fi is enabled in:
  Shortcuts > Setting > > Wi-Fi = enabled
- Check if FALCON is set to work with a WLS sensor:
  Shortcuts > Setting > > Accelerometer link = Wireless
- Check if the serial number of the sensor is that declared in FALCON
  Shortcuts > Setting > Wireless sensor
- Check with a shorter distance and no obstacle between the sensor and the instrument.
- If the connection is OK and the communication is bad, it may be due to another Wi-Fi network using the same channel. You can try to use another one:
  Shortcuts > Setting > Wireless sensor:
  - Change the channel number only in case of bad quality transmission
  - Select in the list another channel: 1, 6 or 11.
    WARNING: WLS sensor firmware version must be at least v1.20.
    To update the WLS sensor see § 8.6
  - Keep the sensor powered near the device
  - Press "Save".
  - It will take a few seconds for the sensor to restart on the new channel.

You can also use the test function, it returns:

- The status of the test (Successful or Failed)
- WLS firmware version
- WLS hardware version
- Sensitivity for each of the 3 channels.

Default value for WLS auto switch-off is 10 minutes. If a longer time is needed, this screen can be used to adjust it to 30 or 60 minutes.

2.4 TACHOMETER

First tab: Tachometer setup

- Adjustment of tachometer parameters:
  - Input range: select the range according to the tachometer signal : +/-10V, 0/-24V, 0/+24V
  - Coupling:
    - DC: default setting
    - AC: a 0.3Hz high-pass filter is applied. This can be used if the DC component of the signal is changing during measurement (for example: signal from a proximity probe during run-up / coast-down). If AC coupling is selected the automatic setup function is not accessible.
  - Trigger slope: - (trigger on negative slope) or + (trigger on positive slope)
  - Trigger threshold: value in Volt triggering the tacho input. It must be between -24 and +24 and within the selected input range.
  - Hysteresis: value in Volt above (if slope=-) or under (if slope=+) trigger threshold to rearm the system for the next triggering.
- Functions:
  - Auto setup: function to automatically adjust the trigger threshold and hysteresis. This function is not accessible if Coupling = AC.
  - Test: when using this function, the power supply of the sensor is switched on. If the setting is correct, you have green indicator, you must read a correct value of the rotation speed.

Second tab: display the signal. In case of difficult setting, it will help you adjust the parameters and check the tachometer signal.

- Select first the duration in the list according the range of rotation speed.
- See signal: when using this function, the power supply of the sensor is switched on and the signal is displayed.

From both tabs, to store the new setting exit with the function “Save” . “Cancel” exit with no setting change.

2.5 SPECTRUM DISPLAY

Set the amplitude type, unit of spectrum and rotation speed:

- Spectrum amplitude: Linear, Exponential, dB
- Frequency and rotation speed unit: Hz, CPM, Order
  Note: if ‘Order’ is selected, it is necessary to have machine rotation speed different from 0. In this case, spectrum frequency axis is expressed in Hz.
- Acceleration, Velocity, Absolute displacement or Relative displacement amplitude: RMS, Peak or Peak-to-Peak. Select the amplitude type displayed in the spectra for each type of magnitude.
- Acceleration, Velocity, Absolute displacement or Relative displacement unit: select the amplitude unit displayed in the spectra for each type of magnitude.
- Spectrum conversion: None or converted to Acceleration, Velocity or Displacement. This setting is used in the Collect module only.
- Envelope conversion: None or converted to Acceleration, Velocity or Displacement This setting is used in the Collect module only.
- Hide 0Hz envelope spectrum: select Yes to hide the 0Hz for envelope spectrum. This is necessary mainly with a linear scale as the 0Hz line amplitude is usually greater than the other ones.
- Display overall value: None (no display), Uniform weighting, ISO6954 weighting

2.6 CAMERA

Set the access to the barcode reader and the camera. The access to the camera can be protected by password (The protection is applied if you define a password on the last line of  Settings >  About).

2.7 TOUCHSCREEN

- Screen brightness setting
- Screen calibration  : it may necessary to adjust the calibration. Click accurately in front of each cross appearing on the screen with a soft and thin tip, then click once more on the screen. To store the new setting, exit using function “Save”  .

Note: if the calibration state does not allow using the touchscreen, it is possible to connect a mouse on port G and use it to reach the calibration screen. Use then the touchscreen to calibrate it.

2.8 ABOUT

Display of:

- Product version: Main firmware, DSP, Hardware
- Instrument serial number
- Network addresses
- License information:
  - Number of channels: 1, 2 or 4 (for wired sensors only, WLS sensor is always triaxial)
  - Camera: Yes or No
  - Wi-Fi: Yes or No
  - Collector: Yes or No
  - Auto-controller: Yes or No
  - Premium: Yes or No
  - Diagnosis: Yes or No
  - Balancer: Yes or No
  - Frequency response: Yes or No (future version)
  - Run-up/Coast-down: Yes or No (future version)
  - Monitor: Yes or No (future version)
  - Off-route: Basic or Expert
  - Long-time wave: Yes or No
  - Defect factor: Standard or ED (specific)
  - Validity date: the date or unlimited

Input of:

- License number to upgrade the instrument
  Note: the License number is only accessible if this page is open from the home screen.
- Password to protect the access to some settings:
  - In Collect: see § 2.1
  - In Camera: see § 2.6
  - In Network: see § 2.10

2.9 DATE – LANGUAGE

Input of:
- Date: format must be DD/MM/YYYY
- Time: format must be HH:MM
- Time zone: select your time zone in the list
- Daylight saving: Yes or No
- Language: select in the list
- Set date and time format
- Date format: DD/MM/YYYY or MM/ DD/YYYY
- Time format: 12 or 24

2.10 NETWORK

Access by network (“Remote Display and Control” function)
- Password: to protect remote access from a PC (see § 1.16)

Remote access:
- Server address: input the address of the RDP server.
- Login: username
- Password: corresponding password

Ethernet configuration parameters: for more details, see § 1.12.3
- DHCP: Yes or No
- If DHCP is NO, you have access to:
    - IP address
    - Mask
    - Gateway (optional)
    - DNS (optional)

Wi-Fi configuration parameters: for more details, see § 1.12.4
- Enabled: Yes or No
- Adhoc mode: Yes or No
- SSID: Input your SSID or use the function ‘Scan networks’ to list accessible ones.
- Default channel (for Adhoc mode only): 1, 6, 11. Default value is 6.
- Authentication: select in the list
- Encryption: select in the list
- Key: input encryption key
- DHCP: Yes or No
- If DHCP is NO, you have access to:
    - IP address
    - Mask
    - Gateway (optional)
    - DNS (optional)

2.11 DATA MANAGEMENT

Used to delete all data of a particular module (Collect or Balancing) or clear all the data from the instrument.
Note: these functions are only accessible if this page is open from the home screen.

 Reset collect: delete all Collect module data

 Reset balancing: delete all Balancing module data

 Reset Run-up/Coast-down: delete all Run-up/Coast-down module data

 Reset Frequency response module: delete all Frequency response module data

 Full reset: delete all instrument data

 Reset setup: return to instrument initial configuration

 **Data are definitively deleted.**

 Export log: create an event log file in the ‘Export’ folder. This file can be used by Acoem support for troubleshooting.

2.12 UPDATE FIRMWARE

 **It is first recommended to make a backup of the instrument memory.**
For more details, see § 8.4

Note: this function is only accessible if this page is open from the home screen.

- Put update firmware (.czip file) on a USB memory key.
  Notes:
  - The czip file must be at the root of the USB memory key
  - It must have only one update file.
  - USB memory stick format must be FAT32, NTFS format is not accepted. It is always possible to reformat it to FAT32
- Connect the system to its power supply.
- Plug the USB memory key in FALCON connector G.
-  Shortcuts >  Setting >  Update firmware
- Click on “Read USB memory”.
- Once the new firmware is detected click on “Update firmware”.
- Wait until the system restart.

2.13 AUTO TEST

Run tests on the main components of the instrument. This operation takes about 3 mn.
Note:

- This function is only accessible if this page is open from the home screen.
- Unplug the power supply
- Unplug all sensors (connector A, B, C and D)
- To check the WLS sensor, it is first necessary to connect it to the instrument (see § 1.11.2).

2.14 CALIBRATION

This screen gives information on the calibration of each channel.

Sensitivity can only be calibrated by authorized personnel.

An internal function ‘Offset calibration’ can be used to improve the accuracy of DC measurements.
Notes:

- this function is only accessible if this page is open from the home screen.
- for this operation, ambient temperature must be between 20 and 25°C.

2.15 BATTERY MANAGEMENT

- Setting of time in min. before standby and switch-off. You can set the value to 0 to disable the automatic standby or switch-off.
- Possibility to disable Wi-Fi to extend the battery life.

CHAPTER 3.
COLLECTOR MODULE

3.1 INTRODUCTION

The Collect module is used to run measurement programs loaded from NEST Predictive Maintenance Software. These measurement programs are commonly called *Routes*. Once the measurements are performed, data are downloaded to the PC for post-processing and storage in the database.

There are 2 levels of functions:
- Advanced
- Premium

There are also 2 possible options:
- Long-time wave to extend the length of acquisition
- Diagnosis: management of machine created with NEST machine setup using the optional mode “Automatic Diagnosis”.

	Advanced	Premium
Overall level	OK	OK
Spectrum *	6400 lines	102400 lines
Envelope	OK	OK
Zoom	No	OK
Vector (phased spectrum)	OK	OK
Time (without long time wave option)	8K samples	64K samples
Long-time wave option *	No	Option
Coast-down profile	No	OK

* For detailed limitations:
- Spectrum: see § 9.2.1
- Long-time wave: see § 9.2.2

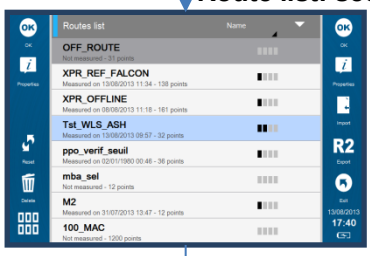
To start, click on  from the Home screen.

For screen organisation, see next chapter.

3.2 MODULE ORGANISATION

Route list: see § 3.4

Acquisition: see § 3.5.2



Diagnosis: see § 3.5.4

Measurement: see § 3.5

Measurement display: see § 3.5.3

Route exploration: see § 3.5.7

3.3 SEND A ROUTE TO THE INSTRUMENT

Refer to NEST or XPR documentation to see how to create a route.

3.3.1 With direct connection to the PC

- On FALCON:
  - Set the connection between PC and FALCON: see § 1.12
  - From FALCON home screen select the “Communication” module: 
- On the PC (for more details see NEST documentation):
  - Run NEST software: 
  - Input your login
  - Load a route with multiple machines:
    - Select Collect module: 
    - “Collector” tab: Select “Direct transfer” and the type of connection:
      - USB: if you connect FALCON connector H with a USB port of the PC. The PC automatically selects the connected instrument and creates it in the list if necessary.
      - Ethernet: if you connect FALCON and the PC on the same network (Ethernet or Wi-Fi). In this case, it is necessary to “Add” or “Modify” a collector in the list with the following information:
        - FALCON serial number (e.g., 10015)
        - Address:
          - IP address (e.g., 192.168.0.1)
            or
          - DNS name (e.g., Falcon_10015)
      - Once the connection is set, the line is highlighted in orange, you can now go in the “NEST → Instrument” tab.
      - “NEST → Instrument” tab: Select the routes to be loaded
      - Click on the function “Send” in the menu bar and wait until the operation is completed.
  - Send directly one machine
    - Connect FALCON connector H with a USB port of the PC
      Note: you can only use the USB connection for direct machine load
    - From Machine supervision module  or setup machine module  , select a machine and click on the contextual function “Send to instrument”.
- On FALCON: exit from the “Communication” module and go to the “Collect” module.

3.3.2 Through intermediate file

- On the PC (for more details see NEST documentation):
  - Run NEST software: 
  - Input your login
  - Select Collect module: 
  - “Collector” tab:
    - Select “Via intermediate files”
    - Select the instrument in the list (create it if necessary with the “Add” function)
  - “NEST → Instrument” tab: Select the routes to be transferred
  - Click on the function “Send” in the menu bar and wait until the operation is completed.
  - NEST creates one file per route:
    - Files are in: My_document/NEST

        - File name is: Route-name_Database-name_Computer-name.zld
    - Copy the file:
        - On a folder “Import” of a USB memory stick
          or
        - Directly in the folder “Import” of the instrument memory (see § 9.1)

- On FALCON:
    - Go to “Collect” module
    - If you are using a USB memory stick, insert it in the port G behind the trapdoor
    - Click on Import
    - Select the route to import.

3.4 ROUTE LIST SCREEN

This screen lists all the routes loaded in the instrument. The first one “OFF_ROUTE” is specific and always there. It is used to take make measurement on machines not loaded from the PC. For more details, see § 3.7
The other routes are listed below. On the top of the screen you can select how to sort the routes as follows:

- Name
- Number of points
- Completed percentage
- Measurement date
- Loading date
- Downloading date

Functions of the screen:

OK: go to the selected route
Note: the Auto-controller version cannot open a route with more than one machine.

Properties: display the properties of the selected route:

- Name
- Source database: name of the computer and of the database
- Loading date
- Measurement date
- Downloading date
- Number of machines
- Number of measured points
- Completion in %
- Total number of points
- Used memory

Import: import a route from a USB memory stick or the internal memory. See § 3.3.2.

Export: export a route to a USB memory stick or the internal memory. See § 3.6.2.

Reset: erase all measurements of the selected route. It is possible to protect this function for the routes which have not been downloaded (see § 2.1).

Delete: delete the selected route. It is possible to protect this function for the routes which have not been downloaded (see § 2.1).

Exit: return to the Home screen.

3.5 MEASUREMENT SCREEN

This screen displays the points and the list of measurements to be done if the function Acquisition is used.

The group of point displayed together depends on:

- The instrument channel number
- The setting of the point done on the PC
- The setting of the instrument

For more details see § 3.5.8.

Functions of the screen:

Acquisition: See § 3.5.2

Previous: Go to previous group of points

Next: Go to next group of points (This function is automatically performed after acquisition if the option "Auto advance" is selected: see § 2.1)

See: See the selected measurement. For more details, see § 3.5.3.
Notes:

- Not accessible from the 'Machine view'
- if the measurement is not done, it will show live acquisition.

Explore: Browse machines and points of the route in list mode or map mode. For more details, see § 3.5.7.

Diagnosis: Get the machine diagnosis directly after your measurement. This function requires that the machine be created with NEST machine setup in "Automatic diagnosis" mode and that the instrument be equipped with the "Diagnosis" option. For more details, see § 3.5.4.

/ Switch 'Machine view' and 'Measurement list mode'

Routes: Return to the list of routes.

Access to additional functions:

Reset: Reset all the measurement of the group of points.

For "OFF_ROUTE" route, with a FALCON including the Expert Offroute option (See § 3.7):

Delete: delete the selected measurement. The last one cannot be deleted.

Add: add a measurement using a template: see § 3.7.54.3

Modify: modify the properties of selected measurement: see § 3.7.64.4

Return to the 1st page of function.

Functions of the screen using the shortcuts :


Inspection or machine picture: see § 3.5.5.


Inspection note: see § 3.5.5.


Inspection vocal note: see § 3.5.5.

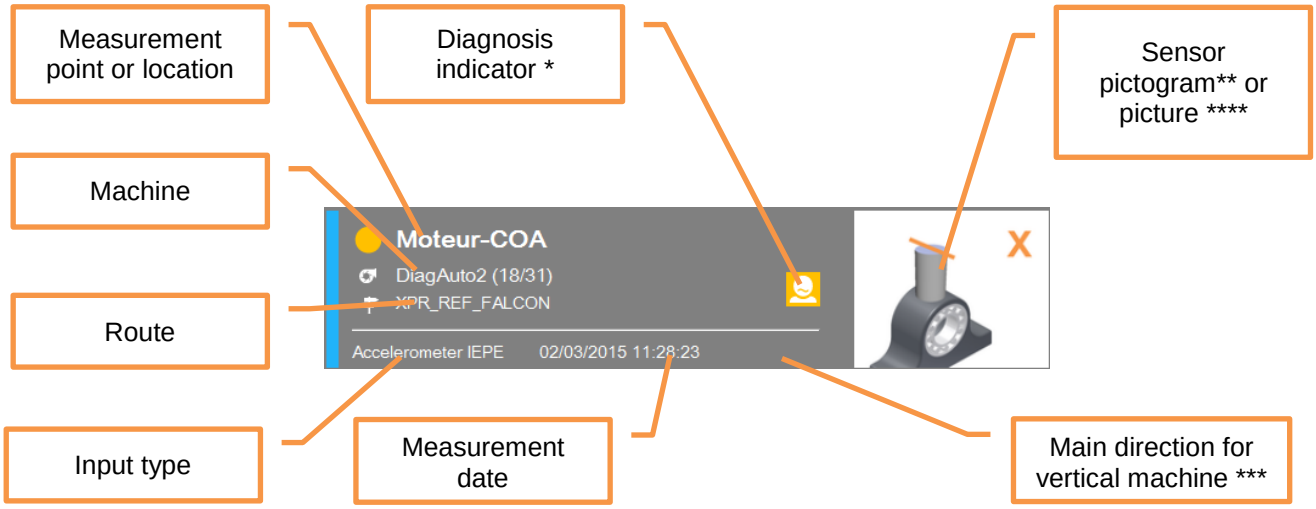

Point identification with QRcode: see § 1.14.5.


Listen sensor signal: see § 1.14.6.


Use the pyrometer for temperature measurement: see § 0.


Use the stroboscope for rotation speed measurement: see § 0.

3.5.1 Header description



Notes:

* Only for machine created with NEST machine setup in “Automatic diagnosis” mode and on instrument equipped with the “Diagnosis” option.

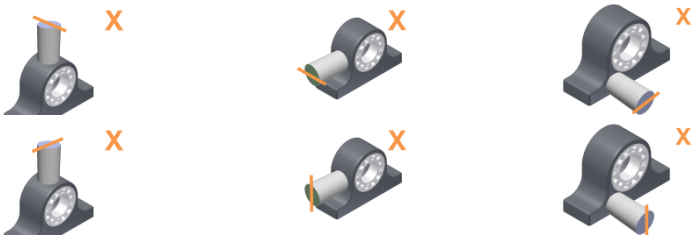
** Sensor pictogram or picture:

- Position pictogram:
  - For tri-axial measurement it is first necessary to select the pictogram indicating the position of sensor on the bearing. It is only necessary to do it during the first measurement as the selection is saved on the PC database when the route is downloaded.

    To set it click on  and select the sensor pictogram corresponding to the position of the sensor on the bearing. For WLS sensor, the X axis is marked by ACOEM logo and a point at the base of the sensor. For wired sensor, wiring is ch 2 = Z, ch 3 = Y, ch 4 = X. Channels 2 to 3 are accessible on connector B (see § 1.9.1)

    - For horizontal shaft:

      Vertical (V) Horizontal (H) Axial (A)

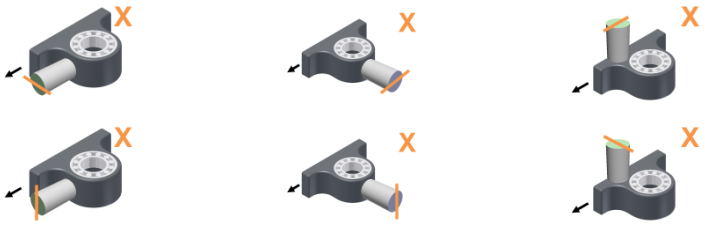
      

    - For horizontal shaft and Axial (A), Radial oblique 1 (1) and Radial oblique 2 (2) directions

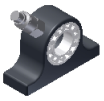
- For vertical shaft:

Parallel (//) Perpendicular (P or ⊥) Axial (A)

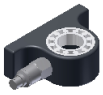


*** In NEST machine setup it is possible to indicate for each machine the definition of the main direction (e.g., North-South…)

- For a single-axis measurement, a pictogram is displayed for information:
  - For horizontal shaft:

Axial (A)  , Horizontal (H)  , Vertical (V)  and Radial oblique 

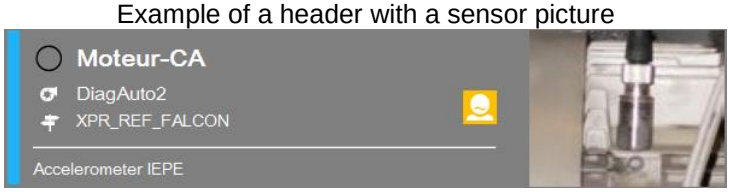
  - For vertical shaft:

Axial (A)  , Radial main (//)  and Radial perpendicular (P or ⊥) 

**** Sensor position picture: it is possible to replace the pictogram by a picture of the sensor:

- Click on the pictogram
- Select “Sensor position picture” tab
- Click on  “New picture” function
- Take the picture 
- Save 

Example of a header with a sensor picture

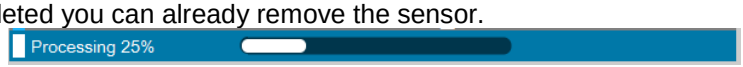


3.5.2 Acquisition

The instrument takes in one shot all measurements with the same input type for all the points grouped together.
The channel association rules are explained in § 3.5.8.

Progress bar:
During the acquisition there is a succession of 2 progress bars:

- The acquisition itself:
  

  The bar is yellow; its duration depends on the configuration of the measurement.
  When this one is completed you can already remove the sensor.
- The processing:
  

  The bar is white. Most of the processing is performed during the acquisition. The remaining processing usually does not exceed 2s.

For the machine with automatic diagnosis, a pop-up message appears during diagnosis specific computation.

Display during the acquisition:
You can select the type of display used during the acquisition (see § 2.1).
The selection is:

- Progress-bar only,
- Overall level,
- Spectrum
- Time wave

By default, the 1st measurement of the selected type is displayed during the acquisition. To display another measurement of the same type, select it before the acquisition.

Status information:
The status is indicated at the bottom of the right hand side of the screen

- During analogic acquisition
  - Input overload indication in percentage of time
  - Sensor integrity indicator
- During wireless measurement
  - Sensor overload indication in percentage of time
  - Battery level of the sensor

Status message:
If a defect is detected during the acquisition a pop-up message is displayed at the end of the acquisition.
It indicates the status of each channel.

3.5.3 See measurements

This function displays the result of the selected measurement. If acquisition is not yet performed, it displays directly the live values.

There are 3 types of display:
- Overall level
- Spectrum
- Time-wave

Each one is available for 1, 2, 3 or 4 channels.

For spectrum and time-wave, a first click on a curve selects it as the current one, a 2nd click sets a cursor. The cursor is automatically positioned on the maximum of the curve around the click area. Then it can be moved with functions ◀ and ▶.

For spectrum, the overall value can be added according to selected option: see § 2.5

Functions of the screen:

 Next measurement: go directly to the next measurement of the measurement list screen.

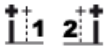
 Previous measurement: go directly to the previous measurement of the measurement list screen.

 Live display: switch to live display mode.  return to stored mode. Live mode is directly selected if there is no acquisition stored.

 Acquisition can be started from the live mode.
Note: live measurement uses the sensitivity of the measurement itself and not the one of the 1st measurement of the group which is used for group acquisition

 Full screen: display the selected curve full screen.  return to to the multi curve display.

 Cursor type selection

- Single (spectrum and time-wave)
  Indications:
  - At the bottom: frequency
  - At the top: amplitude
- Double (spectrum and time-wave)
   Select active cursor
  Indications:
  - At the bottom: the distance between the 2 cursors
  - At the top:
    - Spectrum: RMS or equivalent value between the 2 cursors
    - Time-wave: amplitude
- Harmonic (spectrum only)
  The fundamental cursor is automatically adjusted on the true frequency of a maximun by interpolation. Harmonic frequencies in coincindence with a maximum are marked by a ☐ sign.
  Indications:
  - At the bottom: fundamental frequency
  - At the top: amplitude at the fundamental frequency

- Side band (spectrum only)
  The central cursor and the first side band cursor are automatically adjusted on the true frequency of a maximun by interpolation. Side band frequencies in coincindence with a maximum are marked by a ☐ sign.

   Select active cursor, central frequency or side band
  . Indications:
  - At the bottom: central frequency and distance
  - At the top: amplitude at the central frequency

 Zoom +: apply a zoom factor 2 around the cursor position.

 Zoom -: return back to previous zoom factor

 Setting display: change the setting of the display:
- Scale: linear, logarithmic or dB (for spectrum display only)
- Framing:
  - Multi: the limits of Y axis are the same for all the curves
  - Single: the limits of Y axis are computed independently for each curve
- Unit: acceleration, velocity or displacement (for spectrum display only)

 Orbit display (only when 2 time waves are displayed). If there is a double cusor, the orbit is built from the time wave between the 2 limits.

 Return: return back to measurement list screen.

Functions of the screen using the shortcuts  :

 Listen sensor signal: see § 1.14.6

 Use the stroboscope for rotation speed measurement: see § 0 (for spectrum display only).

3.5.4 Run automatic diagnosis

This function gives directly the machine diagnosis after your measurement. This function needs that the machine is created with NEST machine setup in “Automatic diagnosis” mode and that the instrument is equipped with the “Diagnosis” option.

The diagnosis information is:

- A pictogram giving the general status of the machine:
   The machine is good
   The machine is still acceptable
   The machine is not acceptable
- The rotation frequency and the number of measurement points used to compute the diagnosis
- The comment concerning the general status
- The list of detected defects with for each one:
  - The type
  - The severity:
     Slight defect
     Defect to be monitored
     Defect to be corrected
  - The confidence of the diagnosis:
    * suspected
    ** likely
    *** quite likely
    **** certain

Functions of the screen:

 Next: see directly the diagnosis of the next machine.

 Previous: see directly the diagnosis of the previous machine.

 *Create a report: it is generated in Word format. If a USB memory stick is plugged in connector G, the report is sent on it in a folder named “Export”. Otherwise the report is stored in the instrument internal memory (see § 9.1).*

Note: customized report
Reports are based on templates. The templates are available on the media supplied with the instrument. There is one template per language. The format is docx. To customize a template, use MS Word. You can change the format, add your company logo and remove unnecessary information.
The name of customised templates must be “template_expertise.docx”.
The template must be copied to the instrument internal memory in folder “expertise_report_templates” (see § 9.1).

Return: return back to measurement list screen.

Defect: see the details of the selected defect. The information on the defect is:

- Defect type
- Its severity (see above)
- The confidence (see above)
- The list of component or location of the machine where the defect is visible with for each one the severity.

Functions of the “Defect detail” screen:

Next: go directly to the next defect.

Previous: go directly to the defect.

Return: return back to Diagnosis screen.

Notes: rotation speed is a very important parameter to get a good result. If the actual rotation speed is not correct, it is possible to measure it again for variable speed machine or to adjust it using the stroboscope.
This adjustment is also possible with fixed speed machine. In this case the new rotation speed is used to update the NEST initial setting.

3.5.5 Inspection information

Functions of the screen using the shortcuts:

It is possible to add inspection information using functions accessible through the shortcuts panel:

Inspection picture: see also § 1.14.1.
The pictures are downloaded as attached to the measurement date of the machine and visible in the NEST Expertise REPORT or in XPR “Measurement information” window, “Appendix” tab.

Inspection note: see also § 1.14.2.
The text inspection note is downloaded as attached the measurement date of the machine and visible in XPR “Measurement information” window, “Advice” tab.

Inspection vocal note: see § 1.14.4.
The vocal inspection note is downloaded as attached the measurement date of the machine and visible in XPR “Operation” mode, “Archive” tab.

3.5.6 Specific measurements (Pyrometer, Stroboscope)

Temperature measurement using the pyrometer

For the pyrometer please read the safety instructions delivered with the instrument (printed and on the CDROM)

In Measurement setting (see § 2.2), if “Pyrometer” = “Internal”, temperature measurement of the route with input type = DC is done with the built-in pyrometer.

- A warning is displayed before switching on the laser beam. Make sure that nobody stands in its direction.
- Aim the beam at the target (Warning: due to the distance between the pyrometer cell and the laser source the beam is decentered by 3 cm on the right hand side of the target).
- Press to start acquisition

See also § 1.14.7.

Rotation speed using built-in stroboscope

For the stroboscope please see the safety instructions delivered with the instrument (printed and on the CDROM)

If the machine is configured as “Variable speed”, it possible to measure the rotation speed using the built-in stroboscope.

For more details, see § 1.14.8.

3.5.7 Explore the route

This function shows the contents of the route. Two modes are available:

List mode: to see the machines of the route or the points of a machine in the order of measurement.

Map mode: to see machines and sub-location positioned on the picture of their location or the point positioned on the picture of their machine in a similar way as NEST machine supervision.

Symbols used:

- Type of element:
  - Location or sub-location. In the machine list, it indicates the 1st machine of a location.
  - Machine
  - Point
- Measurement completude:
  - Not measured
  - In progress
  - Completed
- Status for Alarm or Diagnosis advice
  - OK or Good
  - Alarm or Still Acceptable
  - Danger or Not Acceptable
  - Error
- Additional indicator in List mode
  - Text inspection note
  - Vocal inspection note
  - Inspection picture
  - Machine configured with diagnosis

Functions of the screen:

Go to “Measurement list” screen corresponding to the item selected in the list or in the map

Go up to next level (point > machine > sub-location > … > location)

Go down to the item selected in the list or in the map.

Go to list mode

Go to map mode. This mode is not available in “OFF_ROUTE” route (See § 3.7)

Search: input a character string and search in the list the next machine name including it. This function is in List mode only

Return to route list

Following functions are only accessible in “OFF_ROUTE” route (See § 3.7)

Delete: delete the selected machine.

Rename: Change the name of the selected machine.

Access to OFF_ROUTE additional functions. This function is in List mode only.

- Create a new machine using a point template: see § 3.7.3
- Copy selected machine to the clipboard. The machine can be then pasted in OFF_ROUTE
- Go to directly OFF_ROUTE
- Return to the 1st page of function.

Functions of the screen using the shortcuts :

Location or machine picture: the new picture is used as background for the map mode display. It is saved in the database when measurements are uploaded to the PC. The position of the items on the picture can be adjusted with NEST software.

3.5.8 Channel organization

It is possible to use FALCON with WLS sensor or with 1 to 4 wired inputs.

The point to channel association depends on:

- Instrument setting: see § 2.2.
  - Wired channel number: Single or Multi
  - Accelerometer link: Wire or Wireless (WLS sensor)

- Number of optional channels of the instrument: see § 2.8, License information

- Measurement input type

- Configuration of measurement points: (horizontal or vertical shaft, location and measurement direction)*:
  - Compatible with triaxial measurement: for triaxial measurement, the instrument groups together 1 to 3 points of the same machine with:
    - the same location
    - direction compatible with triaxial measurement, i.e.:
      - For horizontal shaft:
        - axial, horizontal and vertical measurement direction

Example:

Point	Location	Direction
Pt1-Ax	NDE	Axial (Ax)
Pt1-H	NDE	Horizontal (H)
Pt1-V	NDE	Vertical (V)

or

- axial, radial oblique & and radial oblique 2 measurement direction

Example:

Point	Location	Direction
Pt1-Ax	NDE	Axial (Ax)
Pt1-O1	NDE	Rad oblique (1)
Pt1-O2	NDE	Rad oblique (2)

- For vertical shaft: axial, main radial and perpendicular direction

Example:

Point	Location	Direction
Pt1-Ax	NDE	Axial (Ax)
Pt1-RM	NDE	Rad Main (M)
Pt1-RP	NDE	Rad perpendicular (P)

  - Not compatible with triaxial measurement: all other cases or 4 points on the same location.

Example: 4 points on 2 bearings

Point	Location	Direction
Pt1-H	MOTOR	None (-)
Pt1-V	MOTOR	None (-)
Pt2-H	MOTOR	None (-)
Pt2-V	MOTOR	None (-)

* Machine shaft direction, location and measurement direction are automatically created in NEST Machine setup. For machines created in XPR, it must be done manually and shaft is considered as horizontal.

The rules are the following:

- WLS Sensor (Accelerometer link = Wireless)
    - Measurement input type = Accelerometer IEPE or Accelerometer AC
        - Measurement channel number = Multi
            - Configuration of the points compatible with tri-axial measurement: point-channel association is done according to the sensor position pictogram.
            - Configuration of the points not compatible with tri-axial measurement: measurement is not possible.
        - Measurement channel number = Single: all measurements are done on sensor Z axis. **Note**: in this case it is not necessary to set a location and direction for each point to use WLS sensor.
    - Measurement input type ≠ Accelerometer IEPE or Accelerometer AC: see “Wired inputs”
- Wired inputs (Accelerometer link = Wire)
    - Instrument with 4-channel option and set on “Multi”:
        - Measurement input type = Accelerometer IEPE or Accelerometer AC
            - Configuration of the points compatible with tri-axial measurement: point-channel association is done on channels 2 to 4 (connector B) according to the sensor position pictogram (ch 2 = Z, ch 3 = Y, ch 4 = X)
            - Configuration of the points not compatible with tri-axial measurement: point-channel association is done on channels 1 to 4 according the point order in the route.
        - Measurement input type ≠ Accelerometer IEPE or Accelerometer AC: point-channel association is done on channels 1 to 4 according the point order in the route.
    - Instrument with 2-channel option and set on “Multi”: point-channel association is done on channels 1 and 2 for 2 points with the same location according to the order in the route
    - Instrument with 1 channel or set on “Single”: all measurements are done on channel 1 (connector A)

Notes:

- if there is no location defined, points are measured one by one on channel 1 (Connector A)
- if there is more than 4 points on the same location, points are measured one by one on channel 1 (Connector A)
- MVP 2-channel measurement: measurement is done on channel 1 (Connector A) and channel 2 (Connector B) for instrument with 2 or 4-channel option.
- A point with several input types in the list of measurement is always done on channel 1.
- For multichannel measurement it is recommended to have the same setting for all channels. If it is not the case, the one used is:
    - For wireless measurement: the one corresponding to sensor X direction
    - For wired triaxial measurement: the one corresponding to Z direction
    - For other wired multichannel measurement: the one corresponding to channel 1

Trick: for wired measurement

- If you have to select a triaxial sensor position pictogram measurement is done on connector B (Channels 2 to 3)
- If not, measurements are from left to right on channels 1 to 4.

3.6 UPLOAD A MEASUREMENTS TO NEST

3.6.1 With direct connection to the PC

- On FALCON:
  - Set the connection between PC and FALCON: see § 1.12.
  - From FALCON home screen, select the “Communication” module: 
- On the PC (for more details see NEST documentation)
  - Run NEST software: 
  - Input your login
  - Select Collect module 
  - “Collector” tab: Select “Direct transfer” and the type of connection:
    - USB: if you connect FALCON connector H with a USB port of the PC. The PC automatically selects the connected instrument and creates it in the list if necessary.
    - Ethernet: if you connect FALCON and the PC on the same network (Ethernet or Wi-Fi).

    Once the connection is set, the line is highlighted in orange, you can now go in the “Instrument → NEST” tab.
  - “Instrument → NEST” tab: you can see the route of the instrument. Select the routes to be transferred
  - Click on the function “Send” in the menu bar and wait until the operation is completed.

3.6.2 Through intermediate file

- On FALCON:
  - Go to “Collect” module
  - If you are using a USB memory stick, insert it in the port G behind the trapdoor.
  - Select the route to Export.
  - Click on Export 
  - A file is created in the Export folder of the USB memory stick or in the instrument internal memory if USB is not used. File name is: ONEPROD_xxxx_Route-name_YYYYMMDD-HHMMSS.zdl, where xxxx is the instrument serial number and YYYYMMDD-HHMMSS the last measurement date.
- On the PC (for more details, see NEST documentation)
  - Connect the memory with the zdl file to the PC or copy the file to the PC.
  - Run NEST software: 
  - Input your login
  - Select Collect module: 
  - “Collector” tab:
    - Select “Via intermediate files”
    - Select the instrument in the list (Create it if necessary with the “Add” function)
  - “Instrument → NEST” tab:
    - Click on the function “Add” in the menu bar
    - Select the .zdl file
    - Select the .route to be uploaded
    - Click on the function “Send” in the menu bar
    - Wait until the operation is completed.

3.7 OFF_ROUTE

"OFF_ROUTE" is a specific route. It is used to take make measurement on machines not loaded from the PC.
It is possible at any time to:

- Create a new machine by copying/pasting any machine from a standard route
- Create a new machine by copying/pasting any machine from the "OFF_ROUTE" itself
- *Modify the kinematic data of a machine created with NEST "Automatic diagnosis" mode (Accurex)*
- Create a new machine using a point template
- Create a new measurement on a group of points using a template
- Modify the properties of a measurement.

Notes:

- Measurements done in Off-Route mode cannot be uploaded to NEST without Collect module.
- Off-route does not allow map navigation
- You can load a special route used as template for your OFF_ROUTE measurements

3.7.1 Copy/paste a machine from a standard route

From a standard route, measurement list screen:


Open the route explorer


If you are in map mode, select List mode


If you are in a list of machine points, go up to next level to display the list of machines

Display additional functions

Select the machine to copy in the list


Copy selected machine to the clipboard


Go to directly OFF_ROUTE


Paste the machine at the end of the list. If the machine already exists, 3 digits are added in the name


Use this function if you want to change the name of the machine


Go back to "Measurement list" screen to take measurements

3.7.2 Copy/paste a machine inside OFF_ROUTE

See § 4.1

3.7.3 Modify the kinematic data of a machine

From OFF_ROUTE, measurement list screen:


Open the route explorer


If you are in a list of machine points, go up to next level to display the list of machines

Display additional functions

Select the machine to be modified in the list

Open the kinematic editor.
Note: the function is only available for “Accurex” machines (Automatic diagnosis mode) including no more than 1 driving component + 1 transmission + 1 driven component.

The data are accessible through 3 tabs:

- “Machine” tab:
  - Name
  - Mounting type: Rigid or Flexible.
    Note: the selected type is applied on all components of the machine.
  - Speed reference shaft: if the speed is measured either on the motor shaft or on the driven component shaft.
- “Motor” tab:
  - Power
  - Rotation speed of the motor
- “Transmission” tab (Belt, Chain, Gearbox):
  - Ratio value
    Note: for a gearbox if the detail is known it is also possible to indicate the number of teeth.

Save the modifications in the current machine. It is not accessible if the machine has already some measurements done.

Save the modifications in a new machine.

Cancel: exit with no modification.

3.7.4 Create a new machine inside OFF_ROUTE

See § 4.1 4.2

3.7.5 Create a new measurement on a group of point in Off-route

See § 4.3

3.7.6 Modify a measurement on a group of points in Off-route

See § 4.4

3.7.7 How to import templates in FALCON

New machines or new measurements can be added in the OFF_ROUTE route using point or measurement template from OFF_ROUTE route or any other route stored in the instrument.

A template route with usual measurement examples is supplied on the CDROM in “OFF_ROUTE TEMPLATES” folder. It is available in 2 formats:

- Templates_EN.zld: this route can be imported directly in the instrument:
  - Copy the file:
    - On a folder “Import” of a USB memory stick
      or
    - Directly in the folder “Import” of the instrument memory (see § 9.1)
  - Go to “Collect” module
  - If you are using a USB memory stick, insert it in the port G behind the trapdoor
  - Click on Import 
  - Select the route to import.
- Templates_EN.zip: this file can be imported in XPR (see XPR user manual § 11.4.2). In XPR each measurement properties can be adjusted and then loaded to the instrument as usual machines.

The document “Templates-EN.pdf” gives a description of the route content.

3.7.8 Upload OFF_ROUTE measurements to the PC

Proceed as for a standard route: see § 3.6. When the route is uploaded, machines are created in a specific location named “OffRoute” of the active database. They can be used as new machines or the measurements can be merged with existing machines. For more details, see NEST documentation.

Note: limitations for measurement properties downloaded to the PC

- Labels of “Other parameter” and “Other unit” are not managed in Falcon and are replaced by “-“ character.
- “Velocimeter IEPE” input type is not managed on PC database and it is replaced by “AC-V” input type.

CHAPTER 4. ANALYZER MODULE

The Analyzer module enables to create or modify machines and measurements directly from the device.

It is possible at any time to:

- Create a new machine by copying/pasting any machine
- Create a new machine using a point template
- Create a new measurement on a group of points using a template
- Modify the properties of a measurement.

4.1 COPY/PASTE A MACHINE

From measurement list screen:

Open the explorer

If you are in a list of machine points, go up to next level to display the list of machines

Display additional functions

Select the machine to copy in the list

Copy selected machine to the clipboard

Paste the machine at the end of the list. If the machine already exists, 3 digits are added in the name

Use this function if you want to change the name of the machine

Go back to “Measurement list” screen to take measurements

4.2 CREATE A NEW MACHINE

From measurement list screen:

Open the explorer

If you are in a list of machine points, go up to next level to display the list of machines

Display additional functions

Create a new machine based on a measurement point template selection
The 3 tabs must be completed before to create the new machine:

Tab 1 – Machine definition:

- Machine name: up to 20 characters. If the name already exists, a re-indexed name is proposed when saving the new machine.
- Machine short name: up to 12 characters.
- Number of points per group: measurement points can be grouped by 1, 2, 3 or 4 for simultaneous measurement.
- 3 points group type (only if 3 in the previous field):
  - Ax, RH, RV (Triaxial on horizontal shaft): groups are created to be compatible with triaxial measurement on an horizontal shaft using WLS sensor or a wired accelerometer (channels 2, 3 and 4 on connector B)
  - AX, R=, R⊥ (Triaxial on vertical shaft): same as above but with point direction compatible with vertical shaft.
  - Other (Meas. on ch 1, 2 and 3): simultaneous measurement on channels 1, 2 and 3
- Number of groups: number of point groups to be created. Maximum value: 24.
- Group name: first characters used to name group and point. Up to 10 characters.
- Rotation speed measurement: select if a rotation speed is measured and how it is measured
  - No (Rotation speed is fixed): Rotation speed is not measured.
  - Tachometer: rotation speed is measured with a tachometer on connector C
  - Keyboard: value is input by keyboard.
  - DC: rotation speed is measured from a DC signal on connector A

  Note: in any case, it is possible to adjust rotation speed with the stroboscope.
- Rotation speed Unit: HZ or CPM
- Sensitivity: mv/unit if DC input is selected to measure the rotation speed
- Machine rotation speed: default value of the rotation speed if it is not measured.

Tab 2 – Point list edition: this tab displays the list of points to be created on the machine according to the machine definition of tab 1. If some of them are not necessary, it is possible to unselect them.

Tab 3 – Template point: this tab is for the selection of the template point. The template point can be selected from any other point stored in the instrument. It is possible to unselect some of its measurements. The selection is applied on all the points of the machine.
Notes:

- Machines in automatic diagnosis mode cannot be used as template.

From the 3 tabs, the function “Save” creates the new machine. “Cancel” exits with no creation.

4.3 CREATE A NEW MEASUREMENT ON A GROUP OF POINT

From measurement list screen:

Display additional functions

Add a measurement using a template. The template measurement can be selected from any other point stored in the instrument. The selection is applied on all the points of the group.

Notes:

- For Accelerometer, Velocimeter, and Other dynamic input types, it is also possible to select if the sensor is power supplied (IEPE) or not (AC).
- Machines in automatic diagnosis mode, “Hardware broadband” parameter computed on a spectrum and Running speed measurement cannot be used as template.

The function “Save” creates the new measurement. “Cancel” exits with no creation.

4.4 MODIFY A MEASUREMENT ON A GROUP OF POINTS

From measurement list screen:

••• Display additional functions

 Modify: modify the properties of selected measurement

Notes:

- If there are several points in the current group with different properties, the modification is done on the base of the setting of the 1st point. In this case a warning is displayed to avoid wrong operations.
- If measurement is already done, properties can be displayed but cannot be changed. To make a modification you must first reset all the measurements of the group with  .
- The function “Modify” is not accessible for machines with automatic diagnosis.

Properties are displayed on 2 or 3 tabs:

4.4.1 Tab 1 Input and measurement type:

- Measurement identification: up to 20 characters. If the name already exists, a re-indexed name is proposed when saving the new measurement.

- Input type: select the item corresponding to the used sensor type. The list is:
  - Accelerometer IEPE
  - Accelerometer AC
  - Velocimeter IEPE
  - Velocimeter AC
  - Displacement AC
    Note: if the parameter is Relative displacement or Position (Proximity probe) input range is [-24 to 0V], if the parameter is Absolute displacement input range is [-10 to +10V].
  - IEPE (other)
  - AC (other)
  - DC
  - Tacho input
  - Keyboard: manual input using keyboard

- Input unit*:
  - For accelerometer: g, m/s^2
  - For velocimeter: in/s, mm/s
  - For displacement AC: mils, µm
  - For other input types, the unit is the same as the parameter unit.

- Sensitivity*: for each point of the group in mV/input unit.

  * only accessible for the 1st measurement of a group. The values are used for all other measurement of the group.

- Measurement Type:
  The selection is either to measure one value:
  - Overall level
  - Bearing defect factor (DEF)
  - Kurtosis
  - Position

  … or a signal:
  - Spectrum.
  - Envelope
  - Phased spectrum
  - Time waveform
  - Coast-down profile

  Notes: the list depends of the selected input type:

	Input type						
Meas. type	Accel	Veloc.	Displ.	Other	Tach.	DC	Keyb.
Overall	☑	☑	☑	☑		☑	☑
DEF	☑						
Kurtosis	☑						
Position			☑				
Time	☑	☑	☑	☑			
Spectrum.	☑	☑	☑	☑			
Envelop	☑	☑	☑	☑			
Phased spect.	☑	☑	☑	☑			
C-D profile					☑		

  Tabs 2 and 3 depend on the selected measurement type.

- 0 dB reference: for overall level and spectrum displayed in dB.

- Measured parameter: the selection depends of the selected input type:

Input type	**Parameter**
Accelerometer	Acceleration, Velocity, Absolute displacement Defect factor, Kurtosis
Velocimeter	Velocity, Absolute displacement
Displacement	Relative displacement, Absolute displacement* Position
Other	Other (to manage other type of parameters)
DC	Rotation speed, Pressure, flow, temperature, other
Keyboard	Rotation speed, Pressure, flow, temperature, other
Tacho	Rotation speed, Coast-down duration

  * Absolute displacement choice is only available for Overall Level measurement. The default value for spectrum and time wave is Relative displacement. If spectrum and time wave are associated to an Absolute displacement overall level, measurement will be done with input range [-10, 10 V], otherwise the input range is set to [-24, 0 V].

- Parameter unit: depend on parameter:

Acceleration	g, m/s2
Velocity	mm/s, in/s
Absolute displacement	µm, mils
Defect factor	DEF
Relative displacement	µm, mils
Position	µm, mils
Rotation speed	Hz, CPM
Pressure	Bar, PSI
Flow	m3/s, l/s, kg/s
Temperature	°C, °F
Kurtosis	Ku
Coast-down duration	s
Other	-

4.4.2 Tabs 2 and 3 for "Spectrum" measurement type:

Tab "Spectrum":

- High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  Note: "None" is not accessible in case of integration:
  - Input = accelerometer and parameter = velocity or absolute displacement
  - Input = Velocimeter and parameter = absolute displacement

- Frequency range: 80 kHz (4800 kCPM), 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)

- Number of lines: 100, 200, 400, 800, 1600, 3200, 6400, 12.8k, 25.6k, 51.2k, 102.4k
  Limitations:
  - If license = Advanced: 6400 max
  - If 3 or 4 channels: 51.2k max
  - If zoom≠ 1 : 25.6k max
  - If Analysis mode = Synchronous : 6400 lines

- Weighting window: Hanning, Rectangular, Flat-top

- Averaging: Linear, Peak

- Number of averages: 1 to 4096

- Overlapping: 0%, 50% , 75%
  Note: 100 line spectrum is performed with 0% and 200 line spectrum with 0% or 50%

- Zoom factor: x1, x2, x4, x8, ..., x128

- Zoom central frequency: Value in Hz (If Zoom factor ≠ x1)

Tab "Trigger":

Note: only one triggered measurement is allowed per point. This measurement must be the one displayed during acquisition.

- Triggering source: Free, Signal, Tachometer
  For Tachometer source, triggering parameters are defined in the general configuration: see § 2.4.
  For Signal source,
  - Wired sensor: triggering is done on channel 2 if triaxial mode is used otherwise on channel 1
  - Wireless sensor: triggering is done on sensor Z axis.

- Analysis: normal, synchronous
  If Triggering source = Free, Analysis mode is forced to Normal.
  For synchronous analysis, the spectrum line number is limited to 6400.

- Triggering mode: 1st average only, Each average
  For synchronous analysis, Triggering mode is forced to Each average

- Triggering level: Value in parameter unit
  Used if Triggering source = Signal

- Triggering slope: + or -
  Used if Triggering source = Signal

- Hysteresis: Value in parameter unit
  Used if Triggering source = Signal. It used to rearm the trigger system for the next acquisition and to avoid wrong triggering.

- Triggering delay: value in ms
  Used if Triggering source ≠ Free
  Input a negative value to have a pre-trigger.
  Limitations are 32K samples for pre-trigger and 2M samples for post-trigger

4.4.3 Tab 2 for "Envelope" measurement type:

Tab "Envelope":

- High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  Note: "None" is not accessible in case of integration:
  - Input = accelerometer and parameter = velocity or absolute displacement
  - Input = Velocimeter and parameter = absolute displacement

- Frequency input range: 80 kHz (4800 kCPM), 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)

- Number of lines: 100, 200, 400, 800, 1600, 3200, 6400

- Weighting window: Hanning, Rectangular, Flat-top

- Averaging: Linear, Peak

- Number of averages: 1 to 4096

- Overlapping: 0 %, 50 %, 75 %

- Band-pass filter width: Frequency input range divided by 2, 4, 8 … ,128

- Band-pass filter central frequency: Value in Hz

  Notes:
  - Defined band-pass filter is applied on the signal before demodulation
  - Band-pass filter limits must be between 0 and "Frequency input range"
  - Max frequency of the resulting envelope spectrum is "Band-pass filter width"/2

4.4.4 Tab 2 for "Phased spectrum" measurement type:

Tab "Phased spectrum":

- High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  Note: "None" is not accessible in case of integration:
  - Input = accelerometer and parameter = velocity or absolute displacement
  - Input = Velocimeter and parameter = absolute displacement

- Frequency range: 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)

- Number of lines: 100, 200, 400, 800, 1600, 3200, 6400

- Number of averages: 1 to 4096

  Notes:
  - Phased requires a trigger input used as phase reference
  - Triggering parameters are defined in the general configuration: see § 2.4
  - Only one triggered measurement is allowed per point.
  - It is recommended to have a pulse width at least larger than 2% of the rotation period

4.4.5 Tabs 2 and 3 for "Time wave" measurement type:

Tab "Time wave":

- High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  Note: "None" is not accessible in case of integration:
  - Input = accelerometer and parameter = velocity or absolute displacement
  - Input = Velocimeter and parameter = absolute displacement

- Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz
  Limitations: If Triggering source ≠ Free: 102.4 kHz max

- Number of samples: 256, 512, 1K, 2K, 4K, 8K, 16K, 32K, 64K.
  With long time wave option: 128K, 256K, 512K, 1M, 2M and 4M
  Limitations:
  - If license = Advanced: 8K max
  - If Triggering source ≠ Free: 32K max
  - Extended number of samples with long time wave option: up to 80 s split over the number of channels or 4,096K samples. For more details see § 9.2.2

- Averaging: Linear

- Number of averages: 1 to 4096.
  Average number is forced to 1 if Triggering source = Free

Tab "Trigger":

Note: only one triggered measurement is allowed per point. This measurement must be the one displayed during acquisition.

- Triggering source: Free, Signal, Tachometer
  For Tachometer source, triggering parameters are defined in the general configuration: see § 2.4.
  For Signal source,
  - Wired sensor: triggering is done on channel 2 if triaxial mode is used otherwise on channel 1
  - Wireless sensor: triggering is done on sensor Z axis.

- Triggering level: Value in parameter unit
  Used if Triggering source = Signal

- Triggering slope: + or -
  Used if Triggering source = Signal

- Hysteresis: Value in parameter unit
  Used if Triggering source = Signal. It used to rearm the trigger system for the next acquisition and to avoid wrong triggering.

- Triggering delay: value in ms
  Used if Triggering source ≠ Free
  Input a negative value to have a pre-trigger.
  Limitations are 32K samples for pre-trigger and 2M samples for post-trigger

4.4.6 Tabs 2 and 3 for "Overall" measurement type:

Tab "Overall":

- High-pass filter*: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  Note: "None" is not accessible in case of integration.
  - Input = accelerometer and parameter = velocity or absolute displacement
  - Input = Velocimeter and parameter = absolute displacement

- Low-pass filter*: 300 Hz (18 kCPM), 1 kHz (60 kCPM), 2 kHz (120 kCPM), 3kHz (180 kCPM), 20 kHz (1200 kCPM), 40 kHz (2400 kCPM)

- Detection*: RMS, true or equivalent peak, true or equivalent peak-to-peak

- Peak hold: Yes or No
  Not displayed for input = Keyboard

- Measurement time (s): 1 to 20
  Not displayed for input = Keyboard

* Not displayed for input = DC, Tachometer or Keyboard

Tab "Alarm":

- Alarm type: defines the type of alarm applied on the parameter
  - None
  - High: 

  - Low : 

  - Out window: 

  - In window: 

- Thresholds: values are given in parameter unit.
  Note: values are tested to be decreasing from the top to the bottom of the screen. As example, for "High" alarm type, Danger threshold ≥ Alarm threshold is correct.

4.4.7 Tabs 2 and 3 for "Defect factor" measurement type:

Tab "Defect factor":

- Measurement time (s): 1 to 20

Tab "Alarm": same as for Overall

Recommended values are
- Alarm type: High
- Alarm threshold: 6 DEF
- Danger threshold: 9 DEF

4.4.8 Tabs 2 and 3 for "Kurtosis" measurement type:

Tab "Kurtosis":

- High-pass filter*: Value in Hz

- Low-pass filter*: Value in Hz

* High and low pass filters are keyboard inputs.
High pass: from 50 Hz to half of the value of the low-pass filter.
Low pass filter: from twice the high-pass filter to 20 kHz. Minimum value is 500 Hz

- Cycle time (s): 1 to 5

Tab "Alarm": same as for Overall

4.4.9 Tabs 2 and 3 for "Position" measurement type:

Tab "Position":

- Peak hold: Yes or No.

- Measurement time (s): 1 to 20

Tab "Alarm": same as for Overall

4.4.10 Tabs 2 for “Coast-down profile” measurement type:

Tab “Coast-down profile”:

This tab is available for "signal" measurements with "Tacho" input type. This measurement is used to measure the duration of a machine coast-down phase.
This measurement is only available if license = Premium.

- Beginning speed (RPM): speed value to start recording. Limits: 12 to 60000 RPM
- Ending speed (RPM): speed value to stop recording. Limits: 12 RPM to beginning speed
- Delta time (s): time between 2 trigger points. Limits: 0 to 60 sec *
- Delta speed (RPM): speed variation between 2 points. Limits: from 0-600 RPM *
- Display full scale (RPM): Limits from 12 to 80,000 RPM

* A value is stored as soon as one of two conditions is satisfied. If one of the two values is zero recording is done at maximum speed (each rotation or 0.1 s).

Notes:

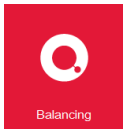
- Procedure for “Coast-down profile” measurement:

  1. Wait until the rotation speed is displayed (message "live data")
  2. Rotation speed must be greater than the Beginning speed (red bar graph)
  3. Press Acquisition.
  4. Waiting about 2 seconds to ensure that the instrument is ready to measure.
  5. Ask the operator of the machine to stop the machine.
  6. The measurement ends on following events:
     - The rotational speed reaches the Ending speed
     - The user presses "Stop"

- Setup Tips:
  - As a general rule, a coast-down profile with about 500 points is accurate enough to interpret the measurement and compare it with a reference curve.
  - The delta time and delta speed parameters must be adjusted, in particular for machines with a high initial rotation speed (> 3000 rpm) and a long coast-down time (> 60 s).
  - For the other machines, delta speed can be set to 0 (maximum resolution with respect to the rotation speed)

- Limits:
  - The maximum number is 1024 samples for a coat-down profile.
  - The ending speed can be set to 12 RPM but the time accuracy will depend on the passing instant for the last pulse of the shaft rotation during the last revolution.

CHAPTER 5. BALANCING MODULE



The Balancing module enables "in situ" balancing of a rotating machine. This means that it is possible to balance the machine's rotor within its own bearings, without having to dismantle it completely and without resorting to a balancing rig.

FALCON is a universal tool that can be adapted to the entire base of machines to be balanced on site, regardless of the size and complexity of the rotors, by managing up to 4 balancing planes:

- Management of accelerometers, velocimeters, proximity probes (run-out compensation)
- Simultaneous measurements on several vibration channels (up to 4 channels) and a tachometer
- Rotation speeds ranging from 12 to 280,000 CPM (indicated in Hz or CPM)
- Management of metric and imperial units.

Simple to use, FALCON supports the operator through every task and controls the reliability of the balancing results. The user is guided through the user-friendly visual interface, step by step, to define the machine, automatically configure the tachometer, define the trial weights and corrective weights, and perform measurements.

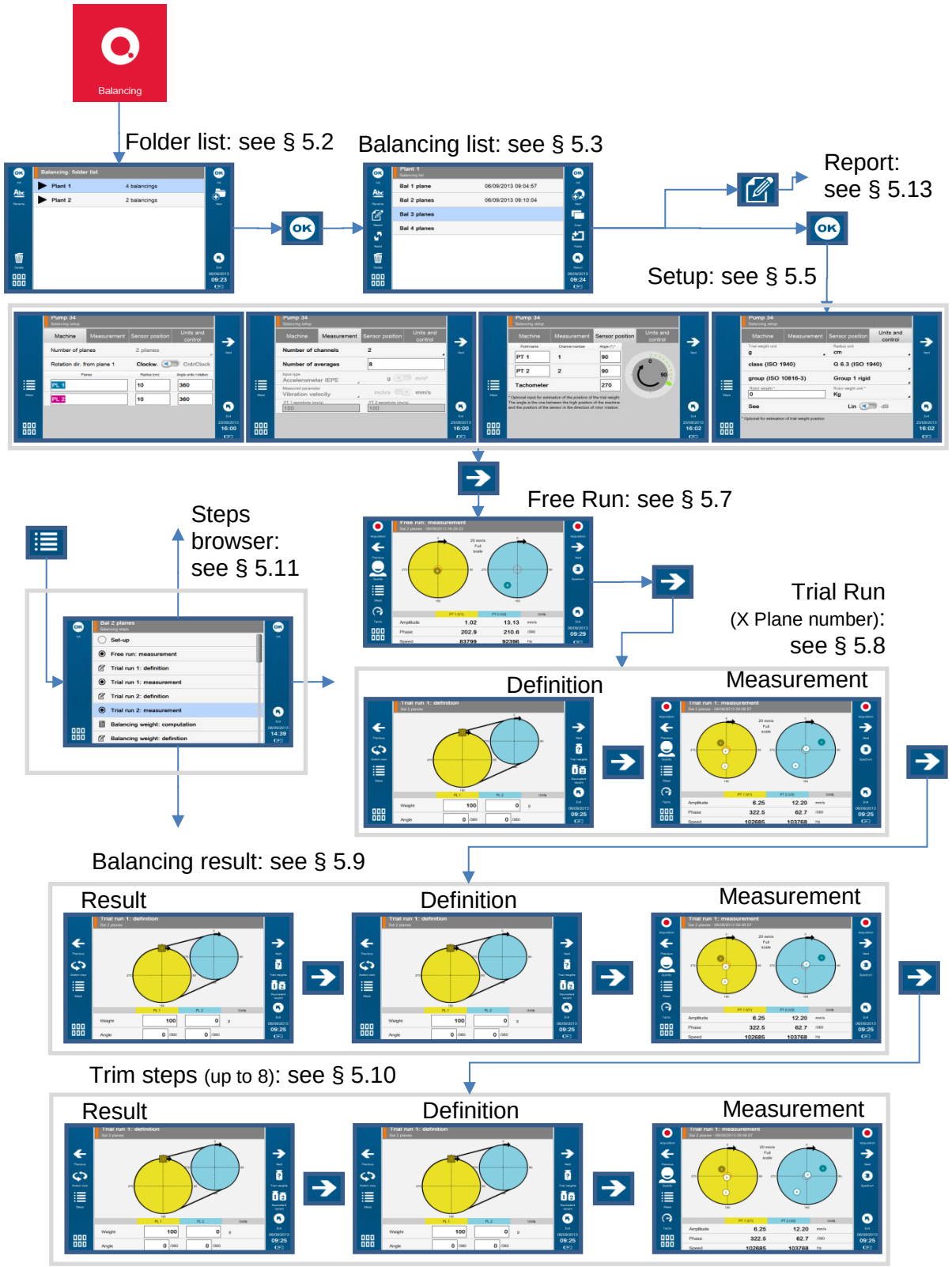
The principle is to add known weights named “trial weights” to a rotor and to assess the resulting variations. This enables the influence matrix to be assessed, as well as the complete set of coefficients characterizing the relationships between the unbalance and the vibrations that it generates. It is then easy to calculate the unbalance generated by the vibration measured on the instrument and, as a result, the weights that can compensate the said unbalance.

Two cases may occur:

- You are balancing the machine for the first time, and you do not know the influence matrix yet, it is then required to make several measurement sets (or runs) with various additional balancing weights
- You have already balanced the machine and just a single additional trim run is then required: see § 5.13

The next chapter gives a general view of different steps of the balancing operations.

5.1 BALANCING MODULE ORGANIZATION



5.2 FOLDER LIST

This creates a management folder used to sort balancing tests. A folder can be used to store, for example, tests on the same machine or all balancing done for a customer.

Functions of the screen:


Go to selected folder: see § 5.3.


Create a new folder in the list.


Change the name of selected folder.


Delete selected folder.


Return to Home screen.

5.3 BALANCING LIST

This screen displays the list of balancing tests of a folder. If a measurement has been done the list shows also the last measurement date.

Functions of the screen:


Go to selected balancing test.


Create a new balancing test in the list.


Change the name of selected balancing test.


Create a report of selected balancing test: see § 5.13.


Copy selected balancing test to the clipboard.


Paste the test from the clipboard into the list. Only the setup is pasted. No measurement or result is copied.


Reset: erase all measurements and results of selected balancing test.


Delete selected balancing test.

5.4 INSTALLING THE EQUIPMENT

To perform the balancing measurements, you should have a triggering device and at least one vibration sensor available. Take care to not change the position of the sensors during the entire balancing process.

5.4.1 Vibration sensor

Note: as phase measurement is required, Balancing module cannot be used with the WLS Sensor. This module does not take in account the setting: Accelerometer link: Wire or Wireless (see § 2.2).

It is possible to use the following type of sensor:

- Accelerometer
- Velocimeter
- Proximity probe

It is advisable to locate the measurement points on the bearings. Indeed, vibrations created by the rotor are transmitted to the frame at this point. The sensor (accelerometer, a velocimeter) must be fixed onto the machine (with a cementing screw, stud or a magnet) in order to obtain a proper connection and a well-determined position for the sensor.

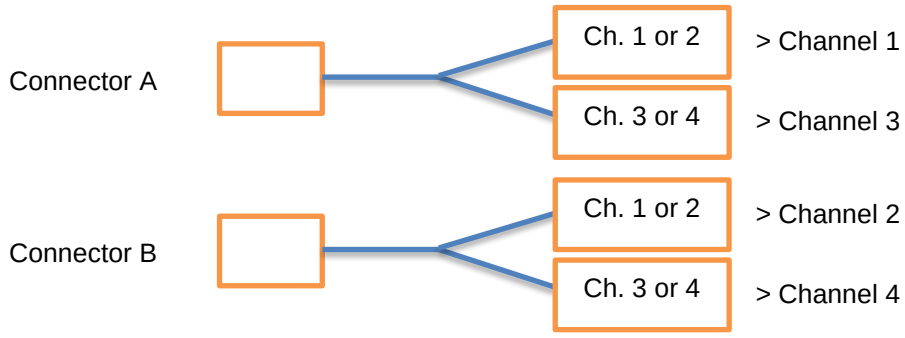
Several measurement points may be needed. The required number of points is related to the type of machine to be balanced.

Connection:

- 1-plane balancing: vibration sensor is connected on channel 1 (Connector A)
- 2-plane balancing:
  - point 1 is connected on channel 1 (Connector A)
  - point 2 is connected on channel 2 (Connector B)

For 3 or 4-plane balancing, 1 or 2 Y adaptors are needed:

- Y adaptor with ECTA output connector: ref FLC1003000 ECT-2ECT-ADPT_Y
- Y adaptor with BNC output connector: ref FLC1004000 ECT-2BNC-ADPT_Y



- 3-plane balancing: 1 Y adaptor is needed on connector A
  - point 1 is connected on channel 1
  - point 2 is connected on channel 2
  - point 3 is connected on channel 3

- 4- plane balancing: 2 Y adaptors are needed
  - point 1 is connected on channel 1
  - point 2 is connected on channel 2
  - point 3 is connected on channel 3
  - point 4 is connected on channel 4

5.4.2 Tachometer / Triggering device

In order to measure the phase, an instrument must be installed, that generates an electric pulse at each rotation.

Use following accessories:

- ACC1072000 OPT-TRG-LAS 5V PWS: optical triggering device with laser sighting (Standard version) or
- ACC1074000 EX-OPT-TRG-LAS 5V PWS: optical triggering device with laser sighting (ATEX version)

- CPC1228000 CABLE ECTC-M12-STR-001.5: 1.5 meter to connect it on FALCON
- CPC1226000 CÂBLE RALLONGE M12 5M: 5 meter cable extension
- 850910 OPTAPE: adhesive reflective tape. 1 cm must be installed on the rotor

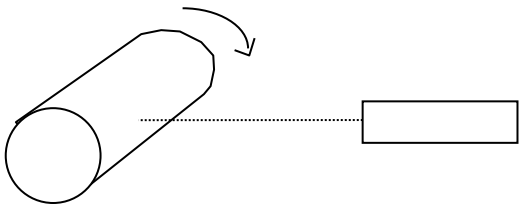
The optical triggering device must be connected to connector C

The optical triggering device can be installed easily with following accessories:

- ACC1055000 Magnetic support
- ACC1056000 Three-finger clamp

For the setting of the tachometer input see § 2.4.

A pulse is sent to FALCON for each rotation of the machine.



Note: it is recommended to have a pulse width at least larger than 2% of the rotation period.

5.5 SETUP

This screen includes 4 tabs. They are used to define the balancing and the type of measurement used to perform the balancing process.
Values can be directly modified. If some modifications have been made, a confirmation message to save them or not is asked before going to another screen.

Once the setup is completed, it is possible to:

Go to the next step: Run out measurement if you are using proximity probes (see § 5.6) or Free run in other cases (see § 5.7)

Go to the steps browser to reach directly any other accessible step (see § 5.11)

Exit: return to balancing test list (see § 5.3)

Notes:

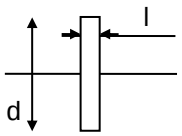
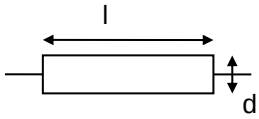
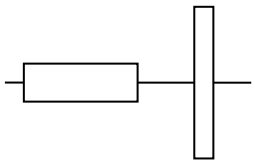
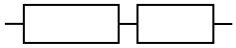
- If some modifications have been made, a confirmation message to save them or not is asked before going to another screen.
- When a measurement is already done, it is normal that some setting cannot be modified.

5.5.1 Machine setup

This tab gives access to following parameters:

- Number of planes: 1 to 4
  This refers to the number of planes on which balancing weights are to be installed. This number also determines the number of measurement points, as well as the number of runs required to perform the balancing:
  - Number of points = number of planes
  - Number of runs = 1 (Free run) + number of planes (Trial runs)

  The following table will enable you to make your selection, where l stands for the length of the rotor and d its diameter:

	l/d	NUMBER OF PLANES	EXAMPLES
	< 0,5	1 if < 1000 CPM 2 if > 1000 CPM	FAN
	>0,5	1 if < 150 CPM 2 if > 150 CPM	ELECTRIC MOTOR
		3 1-plane machine + 2-plane machine	
		4 2 coupled 2-plane machines	

- Direction of rotation rotor viewed from plane 1: clockwise or counter clockwise. This used only for 2-plane balancing for 3D view of the rotor.

- For each plane:
  - Plane identification: up to 10 characters
  - Radius. The radius is used to estimate the trial weight and to calculate the balancing quality grade
  - Number of angle units per rotation. This is used for the weight angular position.
    For instance: 360 for the unit in degree.
    This system enables you to use rotational divisions, which are much more convenient than the degree. As an example: with an 8-blade fan, if you define the angle unit as "8", the said unit then corresponds to the angle that separates two consecutive blades. The original blade corresponds to 0, the following one to 1, and so on, up to 7 (beware of the positive angle convention: see § 5.8.1). If the position of the balancing weight is 2.05, this means that the weight must be added to blade number 2.

    Note: the vibration phase is independent of this setting and is always in degrees.

5.5.2 Measurement setup

This tab gives access to following parameters:

- Number of channels: 1 or 2. This value is only accessible for a 2-plane balancing. If 1 is selected at each run, each point is measured one after the other one. In all other cases, the number of channels is equal to the number of planes.

- Number of average: 1 to 256. Advised value: 8.
  Measurements are obtained by averaging several successive acquisitions. This enables, on one hand, a statistically representative result to be obtained in the case where the vibration resulting from the unbalance is disturbed by other factors, and on the other hand, the measurement is combined with two values resulting from the averaging (dispersion in measurement and rotation speed), which enables the level and the nature of these perturbations to be assessed. If dispersion is important, it is recommended to increase the number of averages.

- Input type: select the item corresponding to the used sensor type. The list is:
  - Accelerometer IEPE
  - Accelerometer AC
  - Velocimeter IEPE
  - Velocimeter AC
  - Displacement AC

- Input unit:
  - For accelerometer: g, m/s^2
  - For velocimeter: in/s, mm/s
  - For displacement AC: mils, µm

- Measured parameter:
  - For accelerometer: Acceleration, Velocity, Absolute displacement
  - For velocimeter: Velocity, Absolute displacement
  - For displacement AC: Relative displacement

- Parameter unit:
  - Acceleration: g, m/s^2
  - Velocity: in/s, mm/s
  - Absolute or relative displacement: mils, µm

- Sensitivity for each measurement point in mV/input unit

5.5.3 Sensor position setup

This tab gives access to following parameters:

- For each point:
  - Point identification: up to 10 characters
  - Channel number: for information
  - Angular position of the sensor: Optional input for estimation of the position of the trial weight. The angle is that between the high position of the machine and the position of the sensor in the direction of rotor rotation
- For the tachometer:
  - Angular position of the sensor: Optional input for estimation of the position of the trial weight. The angle is that between the high position of the machine and the position of the sensor in the direction of rotor rotation

5.5.4 Units and control setup

This tab gives access to following parameters:

- Trial weight unit: g, kg, lb, oz
- Radius unit: mm, cm, m, in
- Machine class (ISO 1940): select the machine type in the list (G0.4 to G4000). The balancing result is compared with the selected class.
- Machine group (ISO 10816-3): select the machine type in the list. On each measurement screen you can compare the vibration level generated by the unbalance (vibration at rotational speed) with the selected group limit. At the end of the acquisition the red circle indicates this vibration limit. The limit used is the one between zone B and C i.e. when the machine is “normally considered unsatisfactory for long-term continuous operation”.
- Rotor weight: it is used to estimate the trial weight and to calculate the balancing quality grade
- Rotor weight unit: g, kg, lb, oz
- 0 dB reference: for spectrum displayed in dB.

5.6 RUN-OUT MEASUREMENT

Note: this step is only accessible if the input type is “proximity probe”.

Definition of the run-out
The proximity sensors operating with eddy current probes are sensitive to irregularities of the surface pointed by the sensor (shape, cracks, carbon inclusions, magnetized areas, etc.).
The signal provided by the Run-Out is at the rotation frequency of the machine and is thus merged with the unbalance phenomenon.
If the Run-Out level is high, it must be taken into account, otherwise the values of the weights calculated by the program will compensate the Run-Out signal (which has no effect on the machine) by an unbalance (noxious effect on the machine).

Measurement of the Run-Out
The run-out can be measured while the machine is rotating very slowly. In fact, the run-out amplitude remains unchanged when the rotation speed varies, whereas the unbalance effects are negligible at low speed, and make their presence felt only when the speed increases.

Run-Out Measurement screen
The screen is similar to any other measurement screen, see next chapter for more details. This measurement must be performed at the lowest possible speed.

Run-Out compensation
On the result step (Balancing or Trim), there is an option to compute the balancing weight with the Run-out compensation.

5.7 FREE RUN

After installing the vibration sensor and the tachometer, run the machine at its usual speed. This run measures the vibration at the rotation speed.

Functions of the screen:

Tachometer setup.
Note: the free run is usually the first measurement, use this function to set tacho parameters (see § 2.4).

Acquisition: wait for the machine to reach its steady state before starting the acquisition. During the acquisition, a dot is displayed for each average. If dots are not all in the same place, it shows that vibration dispersion may be too high. At the end of the acquisition the red circle indicates the vibration limit corresponding to the ISO 10816-3 selected in the setup.
Note: if it is a 2-plane balancing done using only one channel, click on the circle to select the measured point.

Spectrum measurement without tacho: if there is no tacho on the machine, it is possible to use this function to measure the spectrum and check if the machine is unbalanced. If an important level is seen at rotation speed, you can then stop the machine, install the tacho and proceed to balance it.

See spectrum.
Note: it is important to display the spectrum after the free run to confirm that the problem of the machine is unbalance. The amplitude at the rotation must be larger than the other ones. If not there are certainly other actions to do on the machine before balance it.

Quality of measurement: gives access to the dispersion of vibration and rotation speed. FALCON includes an automatic analysis of the measurement. If an abnormal event is detected the measurement screen display an alert pictogram (). If it is displayed the quality screen gives additional information:
Rotational speed unsteady during measurement

- Measurement dispersion is important.

For the other runs, there are also following messages:

- Trial weight insufficient: measurements are too close from a previous one
- Rotational speed too far from the free run's one

Go to previous step

Go to next step

Go to the steps browser to reach directly any other accessible step (see § 5.11)

Exit: return to balancing test list (see § 5.3)

Symbols used on measurement screen:

- Free run: 
- Trial runs:  , …
- Balancing run: 
- Trim runs:  , …

Note: 3 and 4-plane balancing is displayed in tabular mode only.

5.8 TRIAL RUN

Known unbalance is added on the rotor to compute the relation between measured vibration and rotor unbalance. The number of trial runs is equal to the number of balancing planes.

5.8.1 Trial run definition

You must indicate the value of the weight and its angular position in each of the balancing planes. Carefully observe the angle convention (direction of rotation = positive direction of angles). The angle unit defined in the setup is recalled on the left hand side of the input field. Generally, the first trial run is performed one with the weight in plane 1, the second one with the weight in plane 2 and so on until all the runs are completed.

 Go to previous step

 Go to next step.

 See the rotor from the other side (for 1 or 2-plane balancing only)

Trial weight estimation:
This function estimates a trial weight value to avoid adding a too high unbalance which could damage the machine.
The result is only indicative. It is not required to add a weight exactly identical to the calculated value.
The trial weight must at least change the vibration amplitude by 20% or its phase by 20 degrees. If the weight is not sufficient, a warning indicates it after the trial run measurement. In this case, it is recommended to increase the weight value and to repeat the measurement.

Principle:
A usually adopted method involves the calculation of a weight m, which generates a force equivalent to one tenth of the weight of the rotor to avoid adding too high an unbalance, which could damage the machine.

$$m = \frac{1}{N} x \frac{1}{r} x \frac{M}{10} x \frac{9{,}81 x 3600}{4\pi^2} x \frac{1}{V^2}$$

With:

r	radius at which the trial weight m is located
M:	weight of the rotor in kg
V	rotation speed in CPM
N	number of planes
m	trial weight in kg

If the sensor position has been defined in the setup and if the dephasing due the bearing structure can be evaluated, this tool also gives an estimation of the angular position in opposition with the unbalance to avoid increasing the vibration.
Note:

- the origin of angular position on the rotor must be in front of the triggering position (the reflective adhesive tape for instance)
- for a measurement with accelerometer or velocimeter, there is an additional error for low-speed machine (< 300 CPM) due to the phase shift between signal input and tachometer input.

Equivalent weight:
Tool to compute the weight equivalent to 3 weights W1, W2 and W3 positioned on the selected plane

Go to the steps browser to reach directly any other accessible step (see § 5.11)

Exit: return to balancing test list (see § 5.3)

Symbols used on definition screen:

- Trial runs: 1, 2, …
- Balancing run: B
- Trim runs: T1, T2, …

Note:

- Negative weight is symbolized by a white square. Example: 2
- Weights of other runs are symbolized with fine borders and parentheses: (2)
- 3 and 4-plane balancing is displayed in tabular mode only

5.8.2 Trial run measurement

Once the trial weights are installed, restart the machine.
The operating mode is the same as for free run: see § 5.7.

5.9 BALANCING RESULT

5.9.1 Result

After the last trial run, the instrument displays computed balancing weights. It is possible to select:

- The reference run: indicate the run to which balancing weights are to be added. Generally, it is either the free run (run without any trial weight), or the last run (run with all trial weights) when it is difficult or impossible to remove trial weight.
- Run-out: Yes or No. For measurement done with proximity probe only: see § 5.6.


Go to previous step


Go to next step


See the rotor from the other side (for 1 or 2-plane balancing only)


Go to the steps browser to reach directly any other accessible step (see § 5.11)


Exit: return to balancing test list (see § 5.3)

5.9.2 Balancing run definition

The screen is initialized with the computed balancing weights of the previous step.
It is necessary to input the value and angular position weight effectively installed on the rotor.

Tools for balancing weight definition:


Equivalent weight: 2 tools are available:

- Split: If the weight cannot be installed at the required position, it is possible to choose 2 other positions on both sides. This tool computes weights to be installed at these 2 positions.
- Combination: This tool let you combine 1 or 2 weights already present (W2, W3) with the correction weight (C), to replace them by a single weight (M)

The equivalent correction will be automatically used in the weights definition screen.


Simulation: show the theoretical vibration expected for the set of defined weights.

5.9.3 Balancing run measurement

Once the balancing weights installed, start again the machine and measure to control the vibration level.
The use is the same as for free run: see § 5.7.
Go to next step to display the balancing quality grade.

5.10 TRIM STEPS

The trim steps are used to iterate up to 8 additional measurements used to improve the result of the balancing.

5.10.1 Trim result

This screen shows:

- The balancing quality grade estimation.
  Notes:
  - To display the quality, it is necessary to have the rotor weight and radius not equal to 0.
  - The quality is computed only for 1 or 2 plane balancing.
- The weights to add on the rotor to try improve the balancing quality.

5.10.2 Trim definition

The screen is initialized with the computed trim weights of the previous step.
It is necessary to input the value and angular position weight effectively installed on the rotor.
The operating mode is the same as for balancing run: see § 5.9.2.

5.10.3 Trim measurement

Once the trim weights installed, start again the machine and measure to control the vibration level.
The operating mode is the same as for free run: see § 5.7.
Go to next step to display the new balancing quality grade.

5.11 STEPS BROWSER

This screen list all the steps of the balancing process and gives access to any steps already completed. A step is not accessible if the previous one is not done.

5.12 ONE RUN BALANCING

If a balancing has already been done on a machine, it is possible to perform a balancing procedure with only one run.
It is important that this new run is performed under the same conditions as the initial runs, i.e.:

- The rotation mark in the same angular location on the rotor,
- The same angle origin on the rotor,
- The same rotation speed,
- The same location for sensors,
- The same type of measurement equipment,
- The same instrument setting.

In the first instance, start the machine and take a measurement for each point, using the last trim Measurement option. The trim weight calculation can then be requested.
If this method does not provide good results, the complete balancing must be performed again. This means that the machines' influence matrix has changed. This can come either from changes in the conditions under which measurements are taken, or from an internal modification of the machine (wear, suspension ageing, dismantling and assembling with new seals or different tightening rates).

5.13 REPORT

5.13.1 Picture and comment

Before generating the report, you can document the balancing with pictures and a comment. From any step of the balancing, from the shortcut panel , you can use following functions:

Add a picture. You can take up to 6 pictures to document the report: global picture of the machine, sensor installation, weight installation… (see §1.14.1)

Add a comment. This comment appears in the balancing report (see § 1.14.2)

5.13.2 Generate report

The report is generated from the balancing list screen (see § 5.3) with function .
If a USB memory stick is plugged in connector G, the report is generated on it in a folder named “Export”. Otherwise the report is stored in the instrument internal memory (see § 9.1).

5.13.3 Customized report

Reports are based on templates. The templates are available on the CDROM supplied with the instrument. There is one template per language and per number of balancing planes.
The format is docx. To customize a template, use MS Word. You can change the format, add your company logo and remove unnecessary information.
The name of customised templates must be “template_N-plane.docx”, where N is 1, 2, 3 or 4 and equal to the number of balancing planes.
The template must be copied to the instrument internal memory in folder “balancing_report_templates” (see § 9.1).

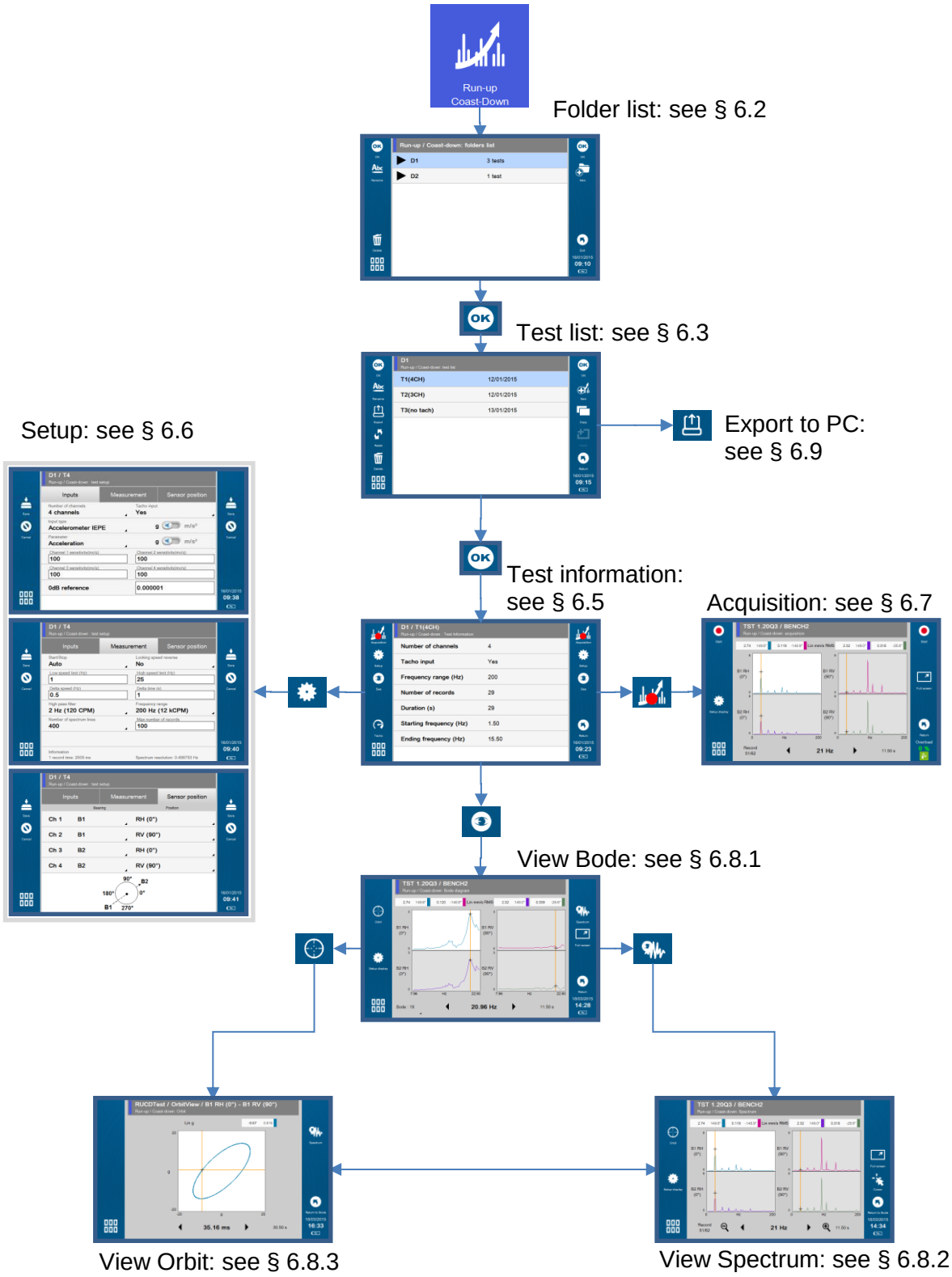
CHAPTER 6. RUN-UP/COAST-DOWN MODULE

The “Run-up/Coat-down” module enables the measurement of the vibration signal of a machine from 1 to 4 channels (depending on the configuration of your instrument) during a run-up or coast-down phase. A tachometer signal is required to determine the running speed of the machine and to reference the phase of the vibration. If the tachometer signal is not available, the measurement is possible but limited to vibration amplitude spectrum.

The different functions are used to set up acquisitions, launch and control measurements and view results. Stored data can be exported in a CMG file compatible with the vibGraph analysis software.

The next chapter gives a general view of “Run-up/Coat-down” module organisation.

6.1 RUN-UP/COAST-DOWN MODULE ORGANIZATION



6.2 FOLDER LIST

This creates folders used to sort Run-up/Coast-down tests. A folder can be used to store, for example, tests on the same machine or all tests done for a customer.

Functions of the screen:


Go to selected folder: see § 6.3.


Create a new folder in the list.


Change the name of selected folder.


Delete selected folder.


Exit Run-up/Coast-down module and return to Home screen.

6.3 TEST LIST

This screen displays the list of tests of a folder. If a measurement has been done the list shows also the last measurement date.

Functions of the screen:


Go to selected test.


Create a new test in the list.


Change the name of selected test.


Export: export selected test to a USB memory stick or the internal memory. The exported file is in CMG format compatible with vibGraph software. Pictures taken from the test information screen are also exported.


Copy selected test to the clipboard.


Paste the test from the clipboard into the list. Only the setup is pasted. No measurement or result is copied.


Reset: erase all measurements of selected test.


Delete selected test.


Return to folder list.

6.4 INSTALLING THE EQUIPMENT

To perform the measurements, you should have at least one vibration sensor available and if possible a triggering device.

6.4.1 Vibration sensor

It is possible to use the following type of sensor:

- Accelerometer
- Velocimeter
- Proximity probe

Note: this module cannot be used with the WLS Sensor. This module does not take in account the setting 'Accelerometer link: Wire or Wireless' (see § 2.2).

It is advisable to locate the measurement points on the bearings. Indeed, vibrations created by the rotor are transmitted to the frame at this point. The sensor (accelerometer, a velocimeter) must be fixed onto the machine (with a cementing screw, stud or a magnet) in order to obtain a proper connection and a well-determined position for the sensor.

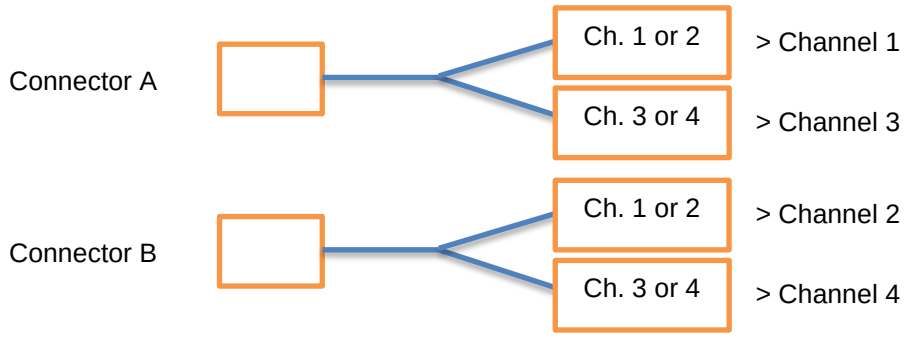
Measurements can be done with up to 4 channels.

Connection:

- 1 channel measurement: vibration sensor is connected on channel 1 (Connector A)
- 2 channel measurement:
  - channel 1 (Connector A)
  - channel 2 (Connector B)

For 3 or 4 channel measurement, 1 or 2 Y adaptors are needed:

- Y adaptor with ECTA output connector: ref FLC1003000 ECT-2ECT-ADPT_Y
- Y adaptor with BNC output connector: ref FLC1004000 ECT-2BNC-ADPT_Y



- 3 channel measurement: 1 Y adaptor is needed on connector A
  - point 1 is connected on channel 1
  - point 2 is connected on channel 2
  - point 3 is connected on channel 3

- 4 channel measurement: 2 Y adaptors are needed
  - point 1 is connected on channel 1
  - point 2 is connected on channel 2
  - point 3 is connected on channel 3
  - point 4 is connected on channel 4

6.4.2 Tachometer / Triggering device

In order to measure the phase and the running speed, an instrument must be installed, that generates an electric pulse at each rotation.

Use following accessories:

- ACC1072000 OPT-TRG-LAS 5V PWS: optical triggering device with laser sighting (Standard version) or
- ACC1074000 EX-OPT-TRG-LAS 5V PWS: optical triggering device with laser sighting (ATEX version)

- CPC1228000 CABLE ECTC-M12-STR-001.5: 1.5 meter to connect it on FALCON
- CPC1226000 CÂBLE RALLONGE M12 5M: 5 meter cable extension
- 850910 OPTAPE: adhesive reflective tape. 1 cm must be installed on the rotor

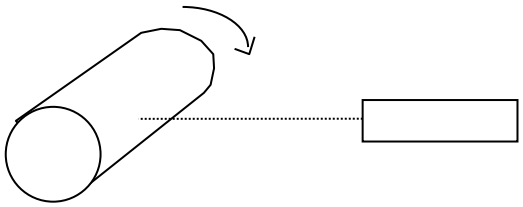
The optical triggering device must be connected to connector C

The optical triggering device can be installed easily with following accessories:

- ACC1055000 Magnetic support
- ACC1056000 Three-finger clamp

For the setting of the tachometer input see § 2.4.

A pulse is sent to FALCON for each rotation of the machine.



Note: it is recommended to have a pulse width at least larger than 2% of the rotation period.

6.5 TEST INFORMATION SCREEN

This is the main screen of the selected test. It gives access to the setup, to the acquisition and to the display of the measurements.

Functions of the screen:

 Access to the setup of the test: see § 6.6

 Access to the acquisition screen: see § 6.7

 Display measured data: see § 6.8

 Tachometer setup: if a tachometer is used for the test, be sure that its configuration is correct before launching the acquisition. For more detail see § 2.4

 Return to test list.

 > Pictures taken from this screen are stored with the test.

Listed information:

- From the setup:
  - Number of channels
  - If tachometer is used or not
  - Frequency range

- From the measurements (not displayed if acquisition is not done):
  - Number of records
  - Duration of the measurement in s
  - Starting frequency (if tachometer is used)
  - Ending frequency (if tachometer is used)

6.6 SETUP

This screen includes 3 tabs. They are used to define the run-up/coast-down test.

6.6.1 Input tab

This tab gives access to following parameters:

- Number of channels: 1 to 4. It can be limited to 1 or 2 according to the license of the instrument.
- Tacho input: Yes or No. It must be set to Yes to have running speed and the phase of vibration.
- Input type: select the item corresponding to the used sensor type. The list is:
  - Accelerometer IEPE
  - Accelerometer AC
  - Velocimeter IEPE
  - Velocimeter AC
  - Displacement AC
- Input unit:
  - For accelerometer: g, m/s^2
  - For velocimeter: in/s, mm/s
  - For displacement AC: mils, µm

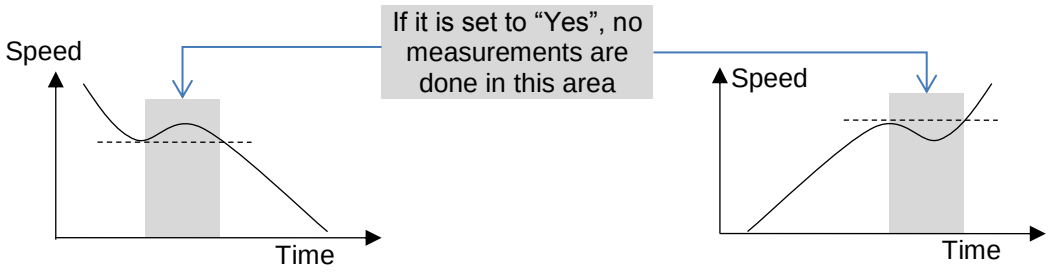
  Note: time wave saved for orbit display is in input unit
- Sensitivity for each channel in mV/input unit
- Measured parameter:
  - For accelerometer: Acceleration, Velocity, Absolute displacement
  - For velocimeter: Velocity, Absolute displacement
  - For displacement AC: Relative displacement, Absolute displacement

    Note: if the parameter is Relative displacement (Proximity probe) input range is [-24 to 0V], if the parameter is Absolute displacement input range is [-10 to +10V].
- Parameter unit:
  - Acceleration: g, m/s^2
  - Velocity: in/s, mm/s
  - Absolute or relative displacement: mils, µm
- 0 dB reference: for Bode amplitude and spectrum displayed in dB.

6.6.2 Measurement tab

This tab gives access to following parameters:

- Start/Stop: Auto or Manual.
  - Auto: measurement is started automatically when running speed is within speed limits and stopped when it is out. (Not accessible if 'Tacho input' = 'No')
  - Manual: measurement is started and stopped manually by the operator.
- Locking speed reverse**:** Yes or No. (Only for test with 'Tacho input' = 'Yes')
  - If Yes, acquisition is paused as soon as speed variation sign changes.



- Low speed limit and High speed limit: define the speed limits used by the automatic start/stop mode.
  - Values must be within 0.15 Hz to 1000 Hz.
  - High speed must be lower than 95% of selected Frequency range
  - It is recommended to have low speed greater than 5*spectrum resolution.

- Delta speed and Delta time:
  - Delta speed: Not displayed for test with 'Tacho input' = 'No'.
    The value must be within 0 and 100 Hz.
  - Delta time: value in s. The value must be within 0 and 128 s

  A new record is performed as soon as one of the 2 conditions is reached. If one value is equal to 0 recording is done at maximum speed. The time between 2 successive records is always greater than the record time showed at the bottom of the screen. It cannot be less than 0.25 s.
  Note: triggered values accuracy in time and speed depends of the occurrence of acquisition process and tachometer signal.

- High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  Note: "None" is not accessible in case of integration:
  - Input = accelerometer and parameter = velocity or absolute displacement
  - Input = Velocimeter and parameter = absolute displacement

- Frequency range: 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)

- Number of lines: 100 to 6400 according to following table:

Frequency range (Hz)	Spectrum line number						
	100	200	400	800	1600	3200	6400
50	✓	✓	✓	✓			
100	✓	✓	✓	✓	✓		
200	✓	✓	✓	✓	✓	✓	
500	✓	✓	✓	✓	✓	✓	✓
1000	✓	✓	✓	✓	✓	✓	✓
2000	✓	✓	✓	✓	✓	✓	✓
5000	✓	✓	✓	✓	✓	✓	✓
10000		✓	✓	✓	✓	✓	✓
20000			✓	✓	✓	✓	✓
40000				✓	✓	✓	✓

- Max number of records: it is used to stop the acquisition when defined value is reached. The value must be within 2 and 512. It depends also of the number of channel and the number of spectrum lines

Max number of records							
	With tachometer				Without tachometer		
Number of lines	800	1600	3200	6400	1600	3200	6400
1 channel	512	512	512	449	512	512	512
2 channels	512	512	449	224	512	512	287
3 channels	512	512	299	149	512	383	191
4 channels	512	449	224	112	512	287	143

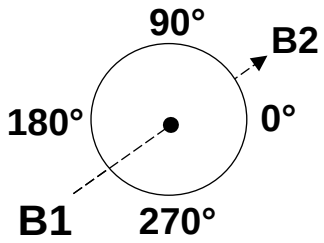
6.6.3 Sensor position tab

This tab gives access to the definition of each sensor position:

- Bearing: B1, B2, B3 or B4
- Direction: RH (0°), RO1 (45°), RV(90°), RO2 (135°), RH (180°), RO1 (225°), RV(270°) or RO2 (315°)

The convention for direction is:

- Bearings are numbered starting from the driving element to the driven element.
- Machine viewed along the bearing 1 – bearing 2 direction:
  - 0° is at 3 o'clock
  - 90° is at 12 o'clock



That information is used to label the result. The orbit view takes in account the direction of the sensor.

6.7 ACQUISITION

The screen displays the live spectrum for each channel. If a tachometer is used the cursor is locked on the running speed.

Functions of the screen:

Start:

- If the “Start/Stop” mode is “Manual” the acquisition starts immediately.
- If the “Start/Stop” mode is “Automatic” the acquisition starts as soon as the running speed is within Low speed and High speed limits.

The record counter indicates the number of record stored.
Acquisition is stopped on one of the following events:

- The maximum of record number is reached
- Running speed is greater than 95% of the spectrum maximum frequency.
- For automatic “Start/Stop”, if running speed is outside of Low speed and High speed limits
- The operator actives the Stop function 

Stop: active during the acquisition to stop it manually.

Data stored for each record are:

- Running speed (if “Tacho input” = “Yes”)
- Time since 1st record
- For each channel:
  - Spectrum in amplitude and phase(Phase if “Tacho input” = “Yes”)
  - Corresponding time wave

Setting display: change the setting of the display:

- Scale: linear, logarithmic or dB
- Framing:
  - Multi: the limits of Y axis are the same for all the curves
  - Single: the limits of Y axis are computed independently for each curve
- Unit: acceleration, velocity or displacement

6.8 SEE MEASUREMENTS ON THE INSTRUMENT

This part gives access to the stored data. It can display:

- Bode diagrams
- Spectra of a specific record
- Orbit of a specific record

6.8.1 Display Bode diagram

The Bode diagram represents the amplitude and phase of a component of a vibration signal (1X, 2X, … 5X) versus rotation speed. It can be used to analyse critical speeds of a rotating machine and requires a phase reference using the tachometer input.
If the tachometer is not available, the diagram displays the overall amplitude of the spectrum versus time. The overall amplitude is computed from the frequency line number 5 up to spectrum maximum frequency. In this case the phase information is not available.

If the test uses more than 1 channel, the phase curve is not displayed. To see the phase, select a view and display it full screen ()

Functions of the screen:

A first click on a curve selects it as the current one, a 2nd click sets a cursor.
It can be moved with functions  and  .

Selection box for the harmonic used to build up the Bode diagram: 1X, 2X, … 5X


Full screen: display the selected curve full screen. If the tachometer is used phase plot is also displayed.  return to the multi curve display.


See spectrum of the record selected by the cursor, see § 6.8.2


Orbit display: display the orbit of the record selected by the cursor, see § 6.8.3. (only if there are 2 perpendicular sensors on the same bearing)


Return to current test information screen.

6.8.2 Display Spectrum

Orbit display: display the orbit of the corresponding record, see § 6.8.3. (only if there are 2 perpendicular sensors on the same bearing)

Full screen: display the selected curve full screen.  return to the multi curve display.

Cursor type selection

- Single
  Indications:
  - At the bottom: frequency
  - At the top: amplitude (and phase if a tachometer is used)
- Harmonic
  The fundamental cursor is automatically adjusted on the true frequency of a maximun by interpolation. Harmonic frequencies in coincindence with a maximum are marked by a ☐ sign.
  Indications:
  - At the bottom: fundamental frequency
  - At the top: amplitude at the fundamental frequency (and phase if a tachometer is used)

Setting display: change the setting of the display:

- Scale: linear, logarithmic or dB
- Framing:
  - Multi: the limits of Y axis are the same for all the curves
  - Single: the limits of Y axis are computed independently for each curve
- Unit: acceleration, velocity or displacement

Return to Bode diagram screen.

6.8.3 Display Orbit

This screen displays the orbit built from the selected sensor and from the other sensor perpendicular on the same bearing (see § 6.6.3). The display takes in account the direction of the sensor. The orbit is displayed in input unit

See spectrum of of the corresponding record, see § 6.8.2

6.9 SEE MEASUREMENTS ON A PC

It is possible to export data from the instrument to a file in CMG format compatible with vibGraph software:

- Go to the test list (see § 6.3)
- If you are using a USB memory stick, insert it in the port G behind the trapdoor.
- Select the test to Export.
- Click on Export 
- A subfolder is created in the Export folder of the USB memory stick or in the instrument internal memory if USB is not used. Folder name is: ONEPROD_serial-number_RU-CD_date_time. It contains:
    - The CMG file
    - The pictures done with the camera from the test information screen.
- Copy the CMG file to your computer
- Open it with vibGraph
- Select “Multiple signal” tab.
- If a single line is selected in the list you can then display:
    - Bode diagram
    - Nyquist
    - Amplitude(C*CPM)
    - Waterfall

  (Above curves give access to spectrum and time wave of selected records)
    - Speed(t)
    - Position(t)
    - Position(CPM)
- If 2 lines corresponding to 2 perpendicular sensors on the same bearing are selected in the list you can then display:
    - Ellipse Bode
    - Emax waterfall
    - Position

  (Above curves give access to Ellipse spectrum and orbit plot of selected records)

Note: vibGraph does not manage test with Chinese characters
For more details see vibGraph documentation § 5.6.

CHAPTER 7. FREQUENCY RESPONSE MODULE

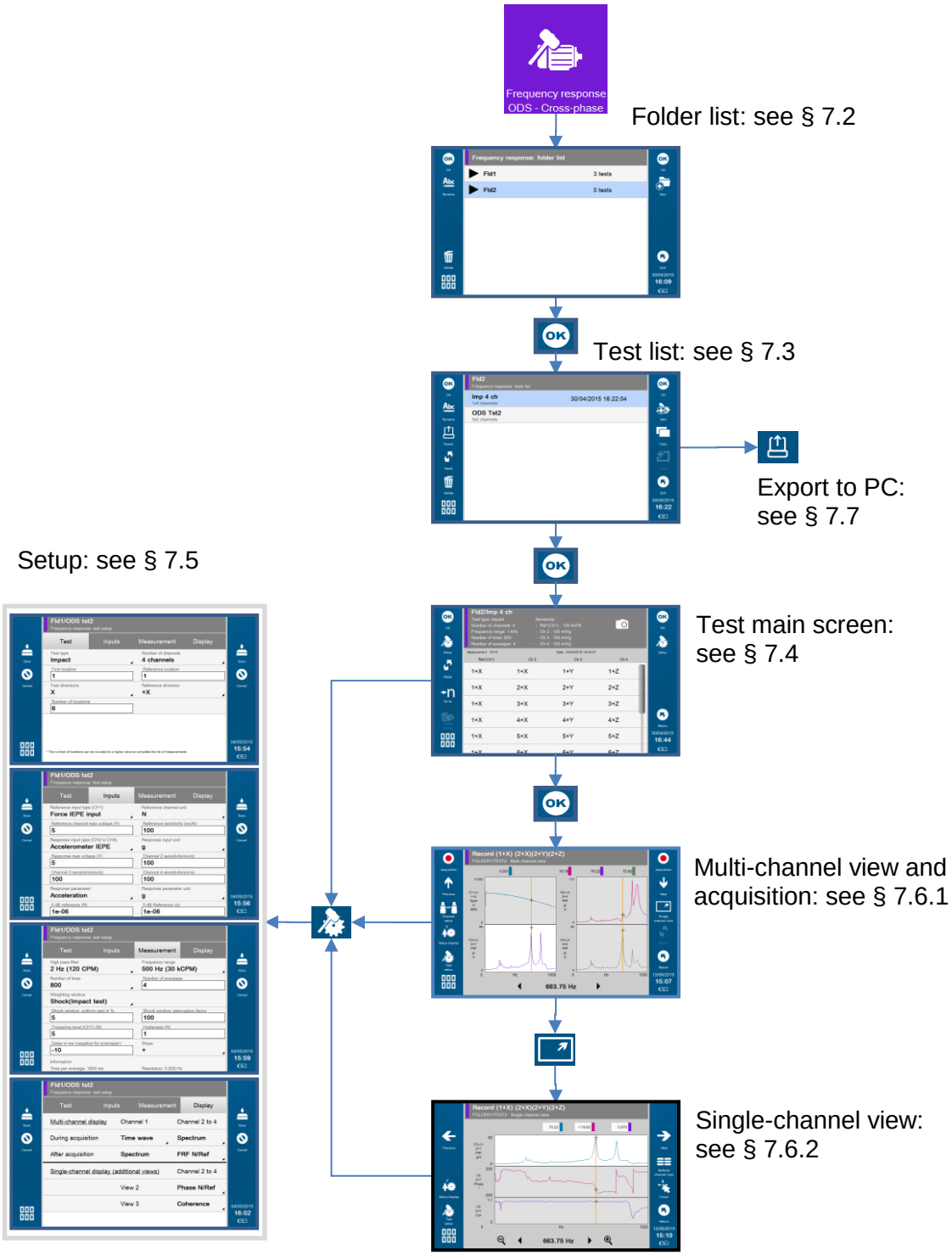
The frequency response function (FRF) is used to make vibration spectral measurements on several channels with cross phase information between a reference channel and other channels. It is used for three main purposes:

- Modal analysis: measurement of transfer functions by impact testing for structure analysis
- Operating Deflection Shape (ODS): measurement of the machine in operation in order to visualize its deflection at particular frequencies.
- ODS mode is also a tool to make a quick cross-channel phase measurement for machine diagnosis.

The functions are used to set up acquisition, launch and control measurements and view results. Stored data can be exported in a CMG file compatible with the vibGraph analysis software. vibGraph can also generate data in UFF format. This format is accepted by software dedicated to structure analysis and deflection shape display such as ME'Scope.

The next chapter gives a general view of "Frequency response - ODS" module organization.

7.1 FREQUENCY RESPONSE MODULE ORGANIZATION



7.2 FOLDER LIST

This creates folders used to sort FRF tests. A folder can be used to store, for example, tests on the same structure or all tests done for a customer.

Functions of the screen:


Go to selected folder: see § 7.3


Create a new folder in the list.


Change the name of selected folder.


Delete selected folder.


Exit Frequency response module and return to Home screen.

7.3 TEST LIST

This screen displays the list of tests in a folder with the number of measurements performed and the number of channels used. If measurements have been performed, the list shows also the last measurement date.

Functions of the screen:


Go to selected test: see § 7.4


Create a new test in the list. The name can have up to 9 characters.


Change the name of selected test. The name can have up to 9 characters.


Export: export selected test to a USB memory stick or the internal memory. The exported file is in CMG format compatible with vibGraph software. Pictures taken from the test main information screen are also exported.


Copy selected test to the clipboard.


Paste the test from the clipboard into the list. Only the setup is pasted. No measurement or result is copied.


Reset: erase all measurements and pictures of selected test.


Delete selected test.


Return to folder list.

7.4 TEST MAIN SCREEN

This is the main screen of the selected test. It gives access to the setup, the list of measurements of the test and, for each measurement, to the acquisition and display screen.

Functions of the screen:

 Access to the setup of the test: see § 7.5

 Access to the acquisition and display screen of the selected measurement: see § 7.6

 Reset: erase measurement of the selected line.

 Go to: select directly a line by its number.

 Picture (Right hand side of the header): take a picture for the selected measurement.

 Delete the picture of the selected measurement

 Return to test list.

Listed information:

- In the header: summary of the setup and the picture of the selected measurement.
- List of measurements: for each measurement and each channel
  - Measurement indicator: ▌done, ▌ overloaded
  - Location number
  - Sensor direction sign (+ or -)
  - Sensor direction (X, Y or Z)

7.5 SETUP

This screen includes 4 tabs. They are used to define the Frequency response or ODS test.

7.5.1 Test tab

This tab gives access to following parameters:

- Test type:
  - Impact: channel 1 is set to be used with an impact hammer and the other one with vibration sensors. Parameters are selected to perform a triggered measurement.
  - ODS - Cross phase: all channels are used with vibration sensors. Channel 1 is dedicated to be the reference of each measurement.

- Number of channels: 2, 3 or 4. It can be limited according to the license of the instrument.

- First location: number of the first location (9999 max)

- Reference location: number of the reference location (9999 max)

- Test direction: X, Y, Z, XY, XZ, YZ, XYZ (Sign is set at +). Directions to be measured on each location.

- Reference direction: + X, - X, + Y, - Y, + Z, - Z. Direction with its sign of the reference sensor (channel 1) used for each measurement.

- Number of locations: number of locations to be measured on the structure (200 max).
  Notes:
  - This value cannot be changed once measurements are done in the test. It is recommended to input a larger value in case additional locations are required. It is also possible to create a new test to measure the additional locations.
  - The number of locations can be rounded to a higher value to complete the list of measurements.

  Note: This setting is used to automatically generate the table of measurements displayed on the test main screen.

7.5.2 Input tab

This tab depends on the test type selected in the previous tab.

7.5.2.1 For Impact test:

- Reference input type (CH1): select the item corresponding to the impact hammer used:
  - Force IEPE
  - Force AC
- Reference channel unit: N, lbf
- Reference channel max voltage: 1 to 10 V. This value is used to control the overloading of the reference sensor.
- Reference sensitivity: value in mV/Reference input unit
- Response input type (CH2 to CH4): select the item corresponding to the sensor type used. The list is:
  - Accelerometer IEPE
  - Accelerometer AC
  - Velocimeter IEPE
  - Velocimeter AC
  - Displacement AC
- Response input unit:
  - For accelerometer: g, m/s^2
  - For velocimeter: in/s, mm/s
  - For displacement AC: mils, µm
- Response max voltage: 1 to 10 V. This value is used to control the overloading of the vibration sensors.
- Sensitivity for each channel in mV/response input unit
- Response parameter:
  - For accelerometer: Acceleration, Velocity, Absolute displacement
  - For velocimeter: Velocity, Absolute displacement
  - For displacement AC: Relative displacement, Absolute displacement
    Note: if the parameter is Relative displacement (Proximity probe) input range is [-24 to 0 V], if the parameter is Absolute displacement input range is [-10 to +10 V].
- Response parameter unit:
  - Acceleration: g, m/s^2
  - Velocity: in/s, mm/s
  - Absolute or relative displacement: mils, µm
- 0 dB reference: for reference channel and vibration channels. Used when data are displayed in dB.

7.5.2.2 For ODS - Cross phase test:

- Response input type (CH1 to CH4): select the item corresponding to the sensor type used. The list is:
  - Accelerometer IEPE
  - Accelerometer AC
  - Velocimeter IEPE
  - Velocimeter AC
  - Displacement AC

- Response input unit:
  - For accelerometer: g, m/s^2
  - For velocimeter: in/s, mm/s
  - For displacement AC: mils, µm

- Response max voltage: 1 to 10 V. This value is used to control the overloading of the vibration sensors.

- Sensitivity for each channel in mV/response input unit

- Response parameter:
  - For accelerometer: Acceleration, Velocity, Absolute displacement
  - For velocimeter: Velocity, Absolute displacement
  - For displacement AC: Relative displacement, Absolute displacement
    Note: if the parameter is Relative displacement (Proximity probe) input range is [-24 to 0 V], if the parameter is Absolute displacement input range is [-10 to +10 V].

- Response parameter unit:
  - Acceleration: g, m/s^2
  - Velocity: in/s, mm/s
  - Absolute or relative displacement: mils, µm

- 0 dB reference: for vibration channels. Used when data are displayed in dB.

7.5.3 Measurement tab

This tab gives access to the following parameters:

- High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  Note: “None” is not accessible in case of integration:
  - Input = accelerometer and parameter = velocity or absolute displacement
  - Input = Velocimeter and parameter = absolute displacement

- Frequency range: 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)

- Number of lines: 100 to 12800
  Note: the value can be limited by the choice of the frequency range :
  - 50 Hz: 1600 line max
  - 100 Hz: 3200
  - 200 Hz: 6400

- Number of averages: 1 to 4096

- Weighting window:
  - For impact test: Shock, Rectangular
  - For ODS test: Hanning, Rectangular

- Overlapping: 0%, 50% and 75%. Only accessible for ODS test. 75% is not accessible for 3 or 4 ch with 12.8k lines and with 40 kHz frequency range

- Parameter for impact testing:
  - Shock window parameters*:
    - Uniform part in %
    - Attenuation factor (1000 max)
  - Triggering level (CH1): Value in reference channel unit
  - Hysteresis: Value in reference channel unit
    Used to rearm the trigger system for the next acquisition and to avoid wrong triggering.
  - Triggering slope: + or -
  - Delay: value in ms
    Enter a negative value to have a pre-trigger.

* Setting of the shock-type window:

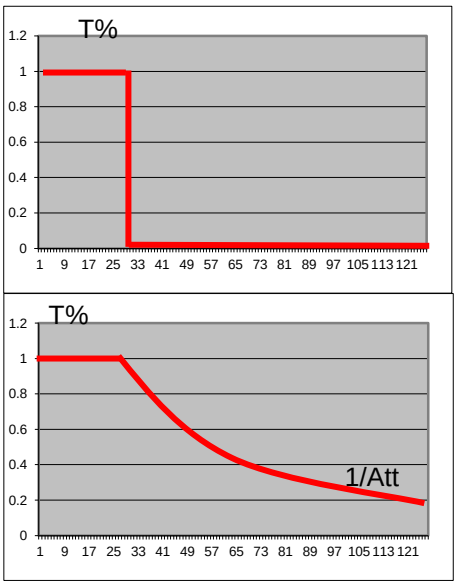
Reference channel (CH 1) is assigned using a rectangular window the length of which is defined as a percentage of the total acquisition duration. It is equal to 1 on the first T% of the acquisition and to 0 for the rest of the window. This window is used to cancel interfering signals after the shock.

Response channels 2 to 4 have a two-part window:

- The first part is equal to 1 a over duration of T% of the total length of the acquisition range.
- The second part decreases exponentially until the end of the acquisition range. Setting is performed by indicating the attenuation factor Att to reach at the end of the acquisition.

The operator enters:

- The uniform part T in % (value ranging from 1 to 100).
- The attenuation factor Att (value ranging from 1 to 1000).



7.5.4 Display tab

This tab is used to select the functions to be displayed according to the following situations:

- Multi-channel view
  - During acquisition
    - Channel 1 (reference channel)
    - Channels 2 to 4

    Select here the functions to check the acquisition; this is particularly helpful for impact testing to check the shock signal of each average and then decide whether to reject it or not.
  - After acquisition
    - Channel 1 (reference channel)
    - Channels 2 to 4

    Select here the functions to be displayed once the acquisition is completed.
- Single-channel view: after acquisition, it is possible to display two additional views (view 2 and view 3) for the selected channel.

List of available functions:

List of functions:	Acquisition		Channel	
	During	After	CH1	Ch2 to Ch4
Time wave	✓		✓ (1)	
Instantaneous spectrum	✓		✓	
Spectrum	✓	✓	✓	✓
Transfer function H1 (FRF)	✓(2)	✓		✓
Transfer function 1/H1 (FRF)	✓(2)	✓		✓
Phase H1	✓	✓		✓
Coherence	✓	✓		✓

(1) If Shock weighting window is selected, only the uniform part is displayed to automatically zoom the view around the impact.

(2) For impact test, to help to check each average, the last instantaneous FRF (in color) is superimposed with the previous stored averaged FRF (black in the background).

7.6 ACQUISITION AND DISPLAY

7.6.1 Multi-channel view

This screen displays, for each measurement channel, the views which have been selected in the setup display tab (see § 7.5.4). If the acquisition has not yet been performed, it shows live data.
For the impact test, you can make some tests with the hammer and adjust the triggering parameters (see § 7.5.3)

Functions of the screen:


Acquisition: start measurement

- For ODS test:
  - Acquisition continues until the end of averaging or until the operator actives the Stop function ■
  - Once acquisition is completed, the view is switched to the one selected for “After acquisition” (see § 7.5.4)
- For Impact test:
  - The ■ indicator shows that the system is ready to trigger
  - The ■ indicator shows that the system has triggered
  - Once the signal is displayed you can decide to reject the current average or strike again on the structure to proceed with the next average
  - To accept the last average you can either active the Stop function ■ or strike one more time on the structure


Go directly to the previous line of measurement


Go directly to the next line of measurement


Channel setup: adjust the channel versus direction and sign assignment which has been generated automatically by the test setup


Single channel view: display in one screen up to three functions for the selected channel (see § 0)

Setting display: change the setting of the display:

- Scale: linear, logarithmic or dB (For spectrum or transfer function only)
- Framing: (For spectrum only)
  - Multi: the limits of Y axis are the same for all the curves
  - Single: the limits of Y axis are computed independently for each curve
- Unit: acceleration, velocity or displacement (For spectrum only)


Reject: used for impact test to cancel the last average and perform it again.


Test setup: direct access to the test setup. This screen is mainly used to adjust triggering parameters (see § 7.5.3) or the displayed functions (see § 7.5.4)

7.6.2 Single-channel view

This screen displays up to three functions for the selected channel.

Functions of the screen:

 Previous: Go to previous channel

 Next: Go to next channel

 Multi-channel view: return to the multi-channel view (see § 7.6.1)

 Setting display: change the setting of the display:

- Scale: linear, logarithmic or dB (For spectrum or transfer function only)
- Unit: acceleration, velocity or displacement (For spectrum only)

 Cursor type selection

- Single
  Indications:
  - At the bottom: frequency
  - At the top: amplitude
- Harmonic
  The fundamental cursor is automatically adjusted on the true frequency of a maximum by interpolation. Harmonic frequencies in coincidence with a maximum are marked by a ☐ sign.
  Indications:
  - At the bottom: fundamental frequency
  - At the top: amplitude at the fundamental frequency

 Test setup: direct access to the test setup. This screen is mainly used to change the displayed functions (see § 7.5.4)

7.7 SEE MEASUREMENTS ON A PC

It is possible to export data from the instrument to a file in CMG format compatible with vibGraph software:

- Go to the test list (see § 7.3)
- If you are using a USB memory stick, insert it in the port G behind the flap.
- Select the test to Export.
- Click on Export 
- A subfolder is created in the Export folder of the USB memory stick or in the instrument internal memory if USB is not used. The folder name is as follows:
  ONEPROD_ serial-number_test-name_FRF_AAAAMMJJ-HHMMSS. It contains:
  - The CMG file
  - The pictures taken with the camera from the test information screen.
    The pictures are named as follows:
    ONEPROD_ serial-number_test-name_FRF_AAAAMMJJ-HHMMSS _measurement-number.jpg.
- Copy the CMG file to your computer
- Open it with vibGraph
- Select “2 chan. spectra” tab.
- Each line gives access to measurements performed on channels 2 to 4 with the corresponding reference channel (CH1). It is possible to display following functions:
  - RMS spectrum ch1 (ref channel)
  - RMS spectrum ch2 (second channel)
  - Power spectrum ch1 (ref channel)
  - Power spectrum ch2 (second channel)
  - Cross-spectrum: amplitude, phase, real part or imaginary part
  - Transfer function ch1/ch2: amplitude, phase, real part or imaginary part
  - Transfer function ch2/ch1: amplitude, phase, real part or imaginary part
  - Transmissibility ch1/ch2
  - Transmissibility ch2/ch1
  - Coherence

Note: vibGraph does not manage test with Chinese characters
For more details see vibGraph documentation § 5.5.

CHAPTER 8. MAINTENANCE

8.1 RESET

Open the connector trapdoor. The reset button is in front of the small hole. Press it with a thin tip (a paperclip for example) during 5 or 6 seconds. The instrument restarts on the home screen. No data are deleted with this operation.

8.2 CLEANING

To clean up the instrument, use only soft products (lightly soaped water). For delicate surfaces (screen, pyrometer, tachometer and laser lenses), use only clean compressed air to remove particles. If needed, gently wipe the surface using a soft, damp cloth.

8.3 CALIBRATION

See § 2.14.

8.4 BACKUP OF INSTRUMENT MEMORY

Connect first the instrument to the PC (see § 1.12). You can now copy the data from the instrument to your PC for backup purpose. The detail of the organization is explained in Appendix 1 (see § 9.1).

8.5 INSTRUMENT FIRMWARE UPDATE

See § 2.12.

8.6 WLS SENSOR FIRMWARE UPDATE

- FALCON must be switch off during this operation
- Switch on the WLS sensor: press on/off for 2s
- Connect it to a PC using the USB cable (Don't disconnect the USB cable unitl the end of the update)
- Wait until its drive is visible from the PC
- Copy the new firmware file (.czip file) in the 'Update' folder
- With Windows command, eject the corresponding drive (right click on  in the task bar)
- Switch off the sensor: press on/off for 6s
- Switch on the sensor, the red LED is flashing during the update (about 30 s).
- When the update is completed, the blue LED turns on. The .czip file is deleted. A report file 'update_report_x.xx.txt', where x.xx is the version number, is located in the root. The content of the file is 'UpdateDone: x' with x=0 in case of an error.

Notes:

- After updating, the cap must be correctly and fully inserted
- The sensor should not be used without its cap in wet or polluted environment
- Opening of the cap should only be done in clean and dry environment
- If the sensor has been in polluted environment, the cap opening must be done after cleaning and drying, cap facing down to prevent the intrusion of foreign matter

8.7 SCREEN FRAME PROTECTION

A screen protection frame is supplied with FALCON. It is recommended to install it before using the instrument in an environment that can damage the screen (mainly dust).
Installation instructions:

- If necessary, clean the screen and the area on which the frame applies. Use only a soft cloth dampened with lightly soaped water.
- Remove the screen film protection from the frame.
- Remove the film protection from the adhesive part around the screen.
- Put the protection frame in place on the instrument.
- Press the edges to ensure contact of the adhesive.
- Screw the 4 screws supplied with the screen without excess.

Spare part reference: FLC1002000

The screen protection frame must not be used with FALCON EX.

CHAPTER 9. APPENDIX

9.1 APPENDIX 1: DATA STORAGE ORGANIZATION

When the instrument is connected to the PC (see § 1.12), you can see the contents of its memory. The organization is as follows:

- 'Balancing': Data base including all the balancing tests
- 'balancing_report_templates': copy to this folder the customized balancing report templates
- 'Collect': there is one database for each route. It is stored in a tree structure 'PC_server/Data_base/Route'
- 'expertise_report_templates': copy to this folder the customized expertise report template
- 'Export':
  - Measured route files (.zdl files) exported from the Collect module. This type of file can be downloaded in the PC database with NEST Collect module.
  - Reports (.docx files) generated from the Balancing module.
  - CMG files with test pictures exported from Run-up/Coast-down module.
  - CMG files with test pictures exported from Frequency response module.
  - Log files
- 'Import': copy to this folder the route files (.zld files) to be imported from the Collect module. This type of file can be generated by NEST Collect module.
- 'RUCD': Data base including all Run-up/Coast-down tests.
- 'FRF': Data base including all Frequency response tests.
- 'screenshots': includes all the screenshots generated with the shortcut  .

9.2 APPENDIX 2: SPECIFICATIONS

For the main specification see FALCON technical datasheet ref TDS3143

9.2.1 Spectrum measurements

The following tables indicate the maximum overlapping available according to:

- Number of simultaneous channels
- Analysis frequency
- Number of frequency line

Max Overlapping in % for **1** channel		Number of FFT lines								
		100K	50K	25K	12800	6400	3200	1600	800	400
Analysis frequency	80 kHz	50	75	75	75	75	75	75	75	75
	40 kHz	75	75	75	75	75	75	75	75	75
	20 kHz	75	75	75	75	75	75	75	75	75
	10 kHz	75	75	75	75	75	75	75	75	75

Max Overlapping in % for **2** channels		Number of FFT lines								
		100K	50K	25K	12800	6400	3200	1600	800	400
Analysis frequency	80 kHz	0	50	50	50	50	75	75	75	75
	40 kHz	50	50	75	75	75	75	75	75	75
	20 kHz	75	75	75	75	75	75	75	75	75
	10 kHz	75	75	75	75	75	75	75	75	75

Max Overlapping in % for **3** channels		Number of FFT lines								
		100K	50K	25K	12800	6400	3200	1600	800	400
Analysis frequency	80 kHz		0	0	0	50	50	50	50	75
	40 kHz	0	50	50	50	75	75	75	75	75
	20 kHz	50	75	75	75	75	75	75	75	75
	10 kHz	75	75	75	75	75	75	75	75	75

Max Overlapping in % for **4** channels		Number of FFT lines								
		100K	50K	25K	12800	6400	3200	1600	800	400
Analysis frequency	80 kHz		0	0	0	0	50	50	50	75
	40 kHz	0	0	50	50	75	75	75	75	75
	20 kHz	0	50	75	75	75	75	75	75	75
	10 kHz	75	75	75	75	75	75	75	75	75

9.2.2 Long time-wave measurement (option)

The following tables indicate the maximum number of samples and time wave duration according to:

- Number of simultaneous channels
- Analysis frequency

There are two cases to consider:

- Each point has only 1 time wave in the measurement list (1)
- There is also an overall level measurement in the list (2)
  Depending of the configuration, if the time wave is displayed during the acquisition, the limit can be extended to the one of the previous case.

(1) Only one time wave measurement per channel

Analysis/sampling frequency	Max number of samples / acquisition time (s)			
	1 channel	2 channels	3 channels	4 channels
80 / 204.8 kHz	4M / 20 s	2M / 10 s		
40 /102.4 kHz	4M / 40 s	2M / 20 s	1M / 10 s	1M / 10 s
20 / 51.2 kHz	4M / 80 s	2M / 40 s	1M / 20 s	1M / 20 s
10 / 25.6 kHz	4M / 160 s	2M / 80 s	1M / 40 s	1M / 40 s
5 / 12.8 kHz	4M / 320 s	2M / 160 s	1M / 80 s	1M / 80 s
2 / 5.12 kHz	4M / 800 s	2M / 400 s	1M / 200 s	1M / 200 s

(2) Time wave measurement with an overall level measurement in the list

Analysis/sampling frequency	Max number of samples / acquisition time (s)			
	1 channel	2 channels	3 channels	4 channels
80 / 204.8 kHz	2M / 10 s	2M / 10 s		
40 /102.4 kHz	2M / 20 s	2M / 20 s	1M / 10 s	1M / 10 s
20 / 51.2 kHz	2M / 40 s	2M / 40 s	1M / 20 s	1M / 20 s
10 / 25.6 kHz	1M / 40 s	1M / 40 s	1M / 40 s	1M / 40 s
5 / 12.8 kHz	512K / 40 s	512K / 40 s	512K / 40 s	512K / 40 s
2 / 5.12 kHz	128K / 25 s	128K / 25 s	128K / 25 s	128K / 25 s

9.3 APPENDIX 2: MAIN NEW FUNCTIONS

9.3.1 Version 1.50

Each new function listed below is described in the corresponding chapter. To help you identify the enhancements from this new version within a chapter, *they are written in italics*.

- Standalone Analyzer module: see CHAPTER 4
- Improvements in Collect module
  - for machine created with NEST “Automatic diagnosis” mode (Accurex):
    - In Off-route, machine duplication with kinematic adjustment: see § 3.7.3
    - Built-in diagnosis report in Word format: see § 3.5.4
  - Save pyrometer measurement as a text note: see § 1.14.7
- WLS firmware (v1.21):
  - improvement in Wi-Fi communication stability
  - Faster USB detection with Windows 10

WARNING: compatible versions

- **WLS**: version **v1.21** recommended
  To update see § 8.6
- **NEST v3.0.6 / NEST ANALYST v4.7.1 (needed to use the new function of collect module)**
  or
  NEST i4.0 v1.0.0

9.3.2 Version 1.47

- Corrections in Collect module:
  - Downloading of machines in automatic mode copied to Off-route with NEST 3.0 / NEST ANALYST 4.7.1
  - Temperature measurement storage in °F with the pyrometer

WARNING: compatible versions

- **WLS**: WLS firmware must be updated to version **v1.20**
  To update see § 8.6
- **NEST v3.0.1 / NEST ANALYST v4.7.1 (recommended)**
  or
- **NEST 2.23 / NEST ANALYST v4.6.7**

9.3.3 Version 1.46

- Improvement in Collect module: new management of inspection and machine pictures: see § 1.14.1

9.3.4 Version 1.45

- Improvements in Collect module
  - Auto advance option: see § 2.1
  - New type of measurement: “Hardware broadband” computed on a spectrum, the instrument can now display overall values in any user defined frequency range. (It needs NEST ANALYST (XPR) v4.7.1 and NEST v2.25 or v3.0)
  - Start acquisition from live display : see § 3.5.3
  - Display of the overall value with uniform or ISO 6954 weighting on Spectrum screen: see § 2.5, 3.5.3
- Improvement in Balancing module: the function “See the rotor from the other side” is now also available for 1 plane balancing: see § 5.8.1 et 5.9.1
- Improvement of communication stability with WLS sensor (WLS firmware must be updated to version v1.20)
- Status summary: new WLS connection indicator: see § 1.13.1
- PC WIFI Communication with WLS is now using DHCP: see § 1.12.4

WARNING: compatible versions

- **WLS**: WLS firmware must be updated to version **v1.20**
  To update see § 8.6
- **NEST**: NEST software must be updated to version **v3.0**
  To update see NEST user manual § 2.4
- **NEST ANALYST (XPR)**: XPR software must be updated to version **v4.7.1**
  To update see XPR installation manual
  "DVD_XPR\Cd5XprTools\Documents\ AMERICAN_InstallationGuide"

9.3.5 Version 1.42

- Modification of FALCON IP address (192.168.1.2) when connected to WLS sensor. : see § 1.12.4
- "Frequency response" module: correction of the cmg export when measuring vibration velocity with an accelerometer.
- Automatic reset of battery gauge

9.3.6 Version 1.40

- Improvements in Collect module
  - "Coast-down profile" measurement: see § 4.4.10
  - Correction: FALCON Expert is no more limited to 8 K samples but to 64 K samples..

WARNING: compatible versions

- **NEST**: NEST software must be updated to version **v2.21**
  To update see NEST user manual § 2.4
- **NEST ANALYST (XPR)**: XPR software must be updated to version **v4.6.7**
  To update see XPR installation manual
  "DVD_XPR\Cd5XprTools\Documents\ AMERICAN_InstallationGuide"

9.3.7 Version 1.30

- New "Frequency response – ODS – Cross-phase" module: see CHAPTER 7
- Improvements in Collect module
  - On the measurement screen, switch 'Machine view' / 'Measurement list' mode : see § 3.5
  - To speed up measurement in auto-diagnosis mode, the diagnosis is computed only on user request or when the user quits the machine.
    Note: for machines measured with a previous version the diagnosis will require few seconds to be displayed the 1st time.
  - Measurement list screen indicates the channel number for each measurement point.
  - Possibility of adjusting the duration before switch-off for the WLS sensor: see § 0
  - More detailed message for measurement configuration error.

WARNING: compatible versions

- **NEST**: NEST software must be updated to version **v2.17**
  To update see NEST user manual § 2.4
- **NEST ANALYST (XPR)**: XPR software must be updated to version **v4.6.6**
  To update see XPR installation manual
  "DVD_XPR\Cd5XprTools\Documents\ AMERICAN_InstallationGuide"
- **vibGraph v7.12**: required to manage "Frequency response – ODS – Cross-phase" cmg files. The setup to update vibGraph is supplied with FALCON.

9.3.8 Version 1.20

- New “Run-up/Coast down” module: see CHAPTER 6
- Improvement in Collect module
  - Possibility to take location or machine picture from the map mode display: see § 3.5.7
  - New organisation of sensor position pictograms: see § 3.5.1
  - Possibility to manage several temperature measurements on the same point.
  - Map mode navigation: if items position is not set on the map mode picture, it is automatically positioned.
  - Possibility to add the long-time wave option for FALCON Essential and Smart

WARNING: compatible versions

- **NEST**: NEST software must be updated to version **v2.16**
  To update see NEST user manual § 2.4
- **NEST ANALYST (XPR)**: XPR software must be updated to version **v4.6.6**
  To update see XPR installation manual
  “DVD_XPR \Cd5XprTools\Documents\AMERICAN_InstallationGuide”
- **vibGraph v7.11**: required to manage “Run-up/Coast down” cmg files. The setup to update vibGraph is supplied with FALCON.

9.3.9 Version 1.11

- New Off-route functions (only for license with Expert Off-route):
  - Function to create a machine in Off-route: see § 3.7.3
  - Function to create a new measurement on a group of point in Off-route: see § 3.7.5
  - Function to modify a measurement on a group of point in Off-route: see § 3.7.6
- Possibility to use the WLS sensor as a single axis sensor: see § 3.5.8
- The choice of Wi-Fi channel for the WLS sensor has been change from 1, 5, 9, 13 to 1, 6, 11 to meet international requirements: see § 2.3

WARNING: compatible versions

- **WLS**: It is required to update the WLS sensor to firmware version **v1.08**.
  To update the WLS sensor see § 8.6
- **NEST**: NEST software must be updated to version **v2.13**
  To update see NEST user manual § 2.4

About ACOEM

ACOEM Group
Reduce your environmental impact

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- Contribute to the development of effective, robust & noiseless products
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