



USER MANUAL VT

acoem

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WELCOME TO OUR WORLD

For more than 30 years, ACOEM has helped industries throughout the world to achieve more profitable and sustainable production. We have reached where we are today by having the courage to think beyond the norm and follow slightly unconventional paths. We have had the courage to make mistakes and find new directions. Through our resolve, ambition and knowledge we have become a global player and a leader in innovative, user-friendly reliability solutions.

SUSTAINABLE INNOVATIONS

During our 30+ years in this industry, we have explored, tweaked and tested more than anyone. Some might say we are incurable innovators whereas others might say that we are highly focused. They both probably have a point. If we had not been devoted and ambitious, we would not have been the first in

the field of laser alignment to have a touch screen. Nor would we have been pioneers in the use of visible lasers and dual measurement heads. Nor would we have been the first to bring a wireless vibration sensor for machine diagnostics. We are the now the first to provide our customers with combined alignment and diagnostic solution on standard mobile devices.

Over the years, we have learnt to never compromise on quality, and we are constantly in search of new, unexplored opportunities by combining advanced technology with design and function. By doing so, we have become the leading innovator in our industry. Not only do we minimize wear, production stoppages and costs, we also help save the environment. Natural resources are in short supply and if we can contribute to a more sustainable world by making it a little bit straighter, we couldn't be happier.

TRUE COMMITMENT

One reason for our success is our solid commitment. We have ensured that we remain attentive to constantly pick up on the needs of the market. Our expert employees and dedicated dealers in over 70 countries are undoubtedly our most important asset. Satisfaction and team spirit are of particular importance to us and are consistently at the top of our priority list. With experience from a wide range of industries and manufacturing processes, we are fully aware of the problems and needs of our end-customers. We are passionate about what we do and we are driven by the desire to eliminate anything in the industry worldwide that may be even slightly out of line.

PURE USABILITY

Our design and user-friendliness are carefully interwoven. As we develop new products, they also become cleaner, smarter, more functional and more robust. An industrial environment is demanding, infinitely more difficult to work in and inevitably subject to time pressure. There is no place for equipment with unnecessary functions, complicated interfaces and that is difficult to assemble.

Usability and user friendliness mean everything, not only to us but also to our customers. We have designed products that are easy to learn and can be incorporated quickly. By removing non-essential functions, we make life less difficult for our users – and probably a little more difficult for our competitors.

END USER LICENSE AGREEMENT

The rights to use the software in this product are offered only on the conditions that you agree to all the terms stated below, i.e. the end user agreement. By using this product, you agree to be bound by this agreement. If you do not accept this agreement your sole remedy is to return the entire unused product, hardware and software, promptly to your place of purchase for a refund.

The user is granted a single license to use the software contained in this product. Use is only permitted on the hardware it has been installed on at the time of purchase. The software may not be removed from the hardware. The software contained in the system is the property of ACOEM group, any copying or redistribution is strictly prohibited.

Modifying, disassembling, reverse engineering or decompiling the system or any part thereof is strictly prohibited.

Disclaimer of warranties: To the maximum extent permitted by applicable law, ACOEM and its suppliers provide the software contained in this product 'as is' and with all faults, and hereby disclaim all other warranties either expressed, implied or statutory.

Limited liability: No liability shall exceed the price of the product, and the sole remedy, if any, to any claim shall be a right of return and refund.

ACOEM or its suppliers shall, to the maximum extent permitted by applicable law, not be liable to any indirect, special, incidental, punitive, and consequential damages arising from the use of the system or any part thereof, authorized or unauthorized.

ACOEM group is headquartered in Lyon, France. For more information please visit acoem.com

EC DECLARATION OF CONFORMITY

In accordance with:

2014/35/EU Low voltage Directive

2014/30/EU Electromagnetic compatibility
Directive

2014/53/EU RED (Radio equipment Directive)

2011/65/UE RoHS Directive

Type of equipment

Vibration Tool

Brand name or trade mark

ACOEM

Type designation(s)/Model no(s)

CAC1008000

Manufacturer's name, address, telephone & fax no

ACOEM France SAS

200 chemin des Ormeaux

69578 Limonest Cedex

France

Tel: +33 4 72524800

Fax: +33 4 42901766

Company certification

ISO 14001:2015 – 0027566

ISO 9001:2015 – 0027567

Issued by LRQA France SAS, for and on
behalf of: Lloyd's Register Quality Assurance
Limited

The following standards and/or technical specifications, which comply with good engineering practice in safety matters in force within the EEA, have been applied:

Safety requirements for electrical equipment:

IEC60950-1.

Electromagnetic compatibility:

ETSI EN 301 489-1 v2.1.1, ETSI EN 301 489-17 v3.1.1, EN55032 (2015), EN61326-1 (2013), EN55011(2009) + A1 (2010), EN 61000-3-2 (2014), EN 61000-3-3 (2013), EN 61000-4-2 (2009), EN 61000-4-3 (2006+A1/2008+A2/2010), EN 61000-4-4 (2012), EN 61000-4-5 (2014), EN 61000-4-6 (2014), EN 61000-4-11 (2004), EN 61000-4-8 (2010).

Radio :

ETSI EN 300 328-1 v2.1.1, EN 62311 (2008)

Additional information

The product was CE-marked in 2020.

As manufacturer, we declare under our sole responsibility that the equipment follows the provisions of the Directives stated above.

Date and place of issue

Limonest, 2020-01-10

Signature of authorized person

Fabien CONDEMINÉ, ACOEM France CEO

SAFETY

Retain and follow all product safety and operating instructions. Observe all warnings on the product and in the operating instructions. Failure to observe the safety precautions and operating instructions can cause bodily injury, fire, and damage to the equipment.

Do not disassemble, modify or use the equipment in other ways than explained in the operating instructions. ACOEM will not accept any liability for such use.

POWER SUPPLY

The CAC1008000 sensor is powered by high-capacity rechargeable Li-Ion batteries mounted in the sensor or by the external power unit. Do not expose the power adapter to rain or wet conditions.

Always unplug the charger from the electrical outlet after charging.

Leaving a sensor with an empty battery for a prolonged time can reduce the capacity of the battery or even damage the battery. If the system is not used for a long time, charge the batteries to approximately 50-75% before storing the system, if kept in storage repeat this every 3-4 month (if needed).

Only use the external power adapters supplied by ACOEM for use with the sensors. Using other power adapters can cause damage to the unit and personal injury.

WIRELESS TRANSCEIVER

The CAC1008000 sensor is fitted with a standard Wi-Fi 2.4GHz communication module

Make sure that there are no restrictions on the use of radio transceivers at the site of operation before using the wireless transceivers. Do not use on aircraft.

UNBOXING

The following packages are delivered with the CAC1008000 wireless sensor: RT-300; VT-300-BD; VT-300-MD

The content of the package related to the CAC1008000 are the following

1. Wireless sensor CAC1008000 with M6 threaded hole
2. M6 Bipolar magnet for mounting the sensor on the machines
3. Tri-axial orientation key for bipolar magnet
4. USB cable for power supply
5. Power supply module and international adapters (VT-300 packages only)
6. Transport bag
7. Probe tip, for use only with the Bearing Defender app in forced single axis mode for narrow locations



CARE

SEALING

The wireless sensor CAC1008000 is rated IP65 with its top rubber in closed position. It is mandatory to keep it closed in operation to avoid any damage of the sensor board resulting from external liquid drops, condensation, and others.

Damages resulting from a bad operation of the sensor without the top rubber in closed position are not covered by the warranty. The top rubber shall only be opened in the office to recharge the sensor battery through its USB connector.

CLEANING

The sensor is delivered with a magnet. It is recommended after operation to dry the magnet with clean cloth to avoid any risk of corrosion of this accessory over time.

CALIBRATION

Our instruments are delivered with a calibration certificate. To provide best diagnostic accuracy, it is recommended to perform inspection and calibration of the vibration wireless sensor CAC1008000 every 24-month.

Calibration must be achieved by ACOEM approved service center.

To benefit of the lifetime warranty accessible with the VT-300-MD package, sensor inspection and calibration is mandatory every 24-month.

INTRODUCTION TO THE APPS

The CAC1008000 tri-axial vibration sensor can be used with different ACOEM apps for specific purposes described hereafter in this manual.



ACOEM Bearing Defender

Art. VT-300-BD



ACOEM Machine Defender

Art. VT-300-MD

Freely download the apps from Google Play or the App Store.



The apps are compatible with the following sensors:

CAC1008000

Make sure you are using a compatible sensor from the type number engraved on the sensor body



Note that the sensor can only be used with one app at a time. Switching from one app to the other may require disconnecting the sensor for good operation.

VIBRATION DIAGNOSTIC AS A RELIABILITY TOOL

Determining the overall health status of a rotating asset can be achieved easily through automatic interpretation of vibration data using the ACOEM apps and their built-in artificial intelligence.

The ACOEM Bearing Defender and ACOEM Machine Defender apps, in combination with the CAC1008000 sensor, aim to provide a first level of autonomy to non-expert vibration users and maintenance teams.

Assessing automatically the health of your assets will help to improve the plant reliability and performance meanwhile reducing maintenance costs, by:

- Detecting suspicious faulty machines and prevent from unexpected shutdown.
- Implementing preventive checks on large amount of assets and get warned on the need to carry out maintenance actions.
- Pro-actively performing acceptance tests before/after repair and after commissioning.
- In combination with the ACOEM Augmented Mechanics Platform, the VT-300-MD also allows for trending and such provide better scheduling capabilities.



ACOEM BEARING DEFENDER

TARGET APPLICATION

The ACOEM Bearing Defender provides spot diagnostic capability on a single bearing. It relies on the ISO10816-3 standard as well as the ACOEM Defect Factor™ algorithm to provide a first level of indication of the global health status of the bearing, and give an indication of what can be the cause of the detected problems.

It is particularly relevant for common rotating assets such as electric motors, pumps and fans, without gearboxes, and in a speed range of 600 to 6000 RPM.

When needed, results can be shared via email or social network using the screenshot feature.

FAULTS MANAGED



Bearing or lubrication



Misalignment or Unbalance



Miscellaneous defect

TUTORIAL VIDEO

To access to a commented step by step tutorial, please check our video online at <https://www.youtube.com/watch?v=cpCul1q44TU>



WHAT IS NEEDED

To use the Machine Defender application, you will need:

- The free ACOEM Bearing Defender app must be installed on your mobile device on iOS (9.3 or sup.) or Android (4.4.2 or sup.)
- a CAC1008000 wireless sensor

STARTING UP

On your tablet or smartphone:



Start the ACOEM Bearing Defender app.



Turn on the sensor by pressing on the ON/OFF Switch of the unit. The sensor start up time takes approximately 30 seconds.

The sensor is ready to be paired to a tablet/smartphone when only the blue light stays put, and actively connected once the blue light is flashing.



APP MENU

The app menu helps browsing through the different features of the app



Access to the main measurement screen



Access to bearing reference database



Access to wireless sensor information
(only available if a sensor is connected)



Save a screenshot from any screen



Find more from ACOEM



Access to the settings of the app and of
the measurements



Access to the information about the app



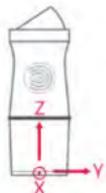
SENSOR MOUNTING

Sensor placement

The tri-axial vibration sensor must be placed on the bearing as close as possible to the load zone to best sense the components vibration.



Note that the X, Y, and Z directions indicated on the app result screen will correspond to the X, Y and Z directions of the sensor.



Using a magnetic base can cause the sensor to hit strongly the machine when approaching it. It can affect the sensor measurement reliability. Always slightly mount the sensor as if you were rolling the magnet on the bearing.



Tutorial video

For more information on sensor mounting best practices, please check our tutorial video online:

<https://www.youtube.com/watch?v=a0K3K3T45eM>



Mounting accessory

It is important to note that the mounting accessory (part between the sensor and the machine) will affect the quality of the vibration measurement. The closer is the sensor to the machine and the better it will sense the vibration.

Several options are available but deliver different results:

- Cementing studs offers the best performances for all types of defects but studs needs to be glued prior to the measurement.
- Magnetic provides ease of use and a compromise on how early faults can be detected.
- A probe tip can help accessing narrow locations with the sensor but it does not permit relevant tri-axial measurement

(sensor has to be forced into single axis mode, see app settings section) and is not suitable for reliable detection of bearing problems and miscellaneous problems.

Mounting Accessory	Bearing Defects	Miscellaneous Problems	Warning	Other
	★★★★	★★★★	★★★★	XYZ
	★★☆	★★★★	★☆☆	XYZ
	X	★★☆	X	Z

Available options for sensor mounting with the ACOEM Bearing Defender



MEASUREMENT ACCESS



Press on the green “Signal” button to start the streaming of the measurement.

About 2 seconds will be needed to stabilize the signal acquisition before values are displayed and refreshed at the startup.



Press on the red Record button to trig the acquisition. It takes about 10 seconds.

This time may vary depending on the distance from the sensor and environment.



If needed, press the graph button to access to the ACOEM ZYXtrum™ display that will be helpful to communicate with reliability teams and vibration experts.

AUDIO LISTENING



To access to the audio listening, feature, first press on the green Signal button to start the streaming.



Once live streaming is started, press on the deactivated “Listening” icon on the top right corner of the app to activate the audio listening



To stop the audio listening, click again on the active listening icon



RESULTS

The results available from the main screen are:

1. The presence of a fault with medium (yellow) or strong (red) severity: Bearing or lubrication; Unbalance or Misalignment; Miscellaneous defect
2. A vibration table displaying the values measured in the three directions of the sensor.



Machine picture

It is possible to replace the picture shown on the main screen. To do so, click on the camera icon and take a picture.

Note that to reset the picture to the standard picture, you must delete the app data from the native features of your mobile device on the app management.

Screenshot



To communicate results of interests, it is possible to take a screenshot on any screen. To do so you can use native features of your smartphone, as well as the screenshot button available from the menu.

The screenshot can then be shared standard features of your mobile device: email, MMS, social media...



ACOEM ZYXTRUM™ DISPLAY

The ACOEM ZYXtrum™ provides a simplified representation of the vibration observed in the three directions according to the frequency domain.

As the ACOEM Bearing Defender helps detecting automatically faulty machines in a simplified format, this feature is aimed to provide a representation that can be shared with reliability teams or vibration experts so that they can better decide if their action is needed.

It is possible to zoom on the graph and plot a cursor to get some information about it.



Note that you must point exactly onto the curve to change the cursor selection

The buttons available on the ACOEM ZYXtrum™ are the following:



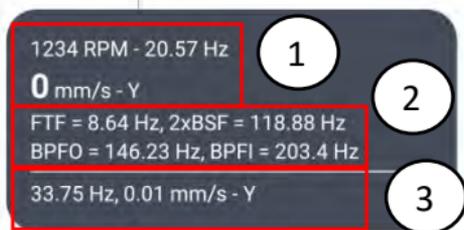
Cursors information display. Note that if a bearing reference has been selected in the bearing database, bearing fault frequencies will be automatically display to help confirming a potential bearing fault.



Save active cursor as machine rotation speed: this action will recalculate automatically the bearing fault frequencies



The cursors information are presented in the following position:



1. RPM info if RPM was recorded
2. Bearing fault frequencies (if bearing reference was set)
3. Current cursor information with frequency (RPM/Hz), and max amplitude with direction in which it was measured

BEARING DATABASE

The built-in bearing database allows automatic calculation of bearing fault frequencies from the bearing reference input. To obtain the correct frequencies

1. Select your bearing reference from the database
2. Enter the RPM of the machine. Note that this RPM value can be collected from the ACOEM ZYXtrum™ interface





APP SETTINGS



Units' selection



Machine RPM range



Machine Power range



Machine foundation (rigid or flexible)



Scale selection for ZYXtrum™ display



Number of axes used

DEF

ACOEM Defect Factor™ algorithm display activation

ACC HF

High Frequency Acceleration Display activation



Wi-Fi channel selection



Note that a change in the Wi-Fi channels reboots the sensor.

It is recommended to only change that setting if transfer time is abnormally slow.

Sensor information

The following information is dynamically updated according to the sensor connected:

- Battery level
- Serial number
- Firmware version of the sensor



FIRMWARE UPDATE

To update your sensor firmware with the latest version available indicated, click on the



button and follow the onscreen guided procedure.





WI-FI CONNECTION

The Wi-Fi Connection on the sensor can be done directly from the standard from the Wi-Fi settings of the smartphone/tablet. The Wi-Fi settings can also be opened from the app clicking on the Wireless sensor icon on the main screen. The wireless sensor appears in the list as “WLS_*serialnumber*”.

The Wi-Fi password requested corresponds to the serial number engraved on the sensor body. Example: “20148”



Once the password is entered, confirm selection by clicking on “Join anyway”.



The communication is successfully established once the blue light is flashing on the sensor. You can then go back to the app, the sensor icon shall switch automatically to green in few seconds.

Important note: once connected on the sensor, other Wi-Fi network access as well as internet will no longer be accessible. You must disconnect from the sensor to retrieve your network connection.



ACOEM MACHINE DEFENDER

TARGET APPLICATION

The ACOEM Machine Defender provides spot diagnostic on a full rotating asset. It relies on the ISO10816-3 standard and the patented ACOEM Accurex™ automatic diagnostic to provide a good understanding of what is the health status of the machines, which faults have been detected and how confident is the system in the presented result, as well as a first level of maintenance recommendations.

It is particularly relevant for most of the rotating assets available in the industries such as electric motors, pumps, fans, centrifugal compressors, alternators, shafts and rollers, that can be direct driven, belt/pulley driven, or gearbox driven, in a speed range of 120 to 12000 RPM.

Full illustrated reports can be edited in pdf on the spot to be shared via email and social media, as well as connected to the Augmented Mechanics Platform at ai.acoem.com to benefit of more services in the cloud.

WHAT IS NEEDED

To use the ACOEM Machine Defender application, you will need:

- The free ACOEM Machine Defender app must be installed on your mobile device on iOS (9.3 or sup.) or Android (4.4.2 or sup.)
- a CAC1008000 wireless sensor with firmware in version 1.40 or more
- a Machine Defender License

Note: an external laser pyrometer could be used when rotation speed is unknown and cannot be detected.



FAULTS MANAGED

-  Bearing or lubrication problem
-  Unbalance
-  Misalignment
-  Structural Resonance
- ISO** Other ISO defect (*Soft foot, Belt wear, Nearby disturbance, Vane pass ...*)
-  Shocks/Modulation (*Looseness, Electrical defect, gear geometric defect, gear localized defect...*)
-  Pump Cavitation
-  Gear wear
-  Suspicious machine
Vibration behavior not healthy but no fault could be automatically identified

DIAGNOSTIC RESULTS

-  Machine Global advice
-  Fault detected per bearing
-  Fault confidence level
- Translated instructions*
- First level of maintenance recommendation



STARTING UP

On your tablet or smartphone:



Start the ACOEM Machine Defender app.



Switch on the sensor by pressing on the ON/OFF Switch of the unit. The sensor start up time takes approximately 30 seconds.

The sensor is ready to be paired to a tablet/smartphone when only the blue light stays put.

It is actively connected once the blue light is flashing.

HOME SCREEN BUTTONS



Access the list of existing machines



Create a new machine



Enter the app settings



SENSOR CONNECTION

Using the native Wi-Fi settings of your smartphone / tablet, select the wireless sensor in the list of Wi-Fi available. The wireless sensor appears in the list as “WLS_*serialnumber*”.

The Wi-Fi password requested corresponds to the serial number engraved on the sensor body. Example: “20148”



Once the password is entered, confirm selection by clicking on “Join anyway”.



The communication is successfully established once the blue light is flashing on the sensor. You can then go back to the app, the sensor icon shall switch automatically to green in few seconds.



Important note

Once connected on the sensor, other Wi-Fi network access as well as internet will no longer be accessible. You must disconnect from the sensor to retrieve your network connection.



SENSOR INFORMATION

The sensor status is displayed in different screens of the app as follows:



No sensor connected



Sensor License invalid



Sensor connected with valid license



Once connected, the following sensor information is available in the settings menu:



Sensor Connection status



Battery level



Serial number with app association



License input field



License validity date



Firmware version

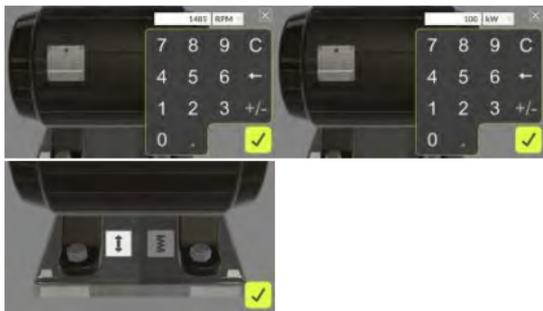


CREATE A NEW MACHINE



To create a new machine, touch the **New Machine icon**.

Enter the motor's information (RPM, power, type of foundation)



You must enter all information requested, which will impact on the set of parameters and rules applied to perform the ACOEM Accurex™ automatic diagnostic.



IMPORTANT WARNING

RPM information is crucial to any vibration diagnostic and will drastically affect the diagnostic quality.

Inputting the value written on the nameplate is usually a good starting point unless your machine is driven by a VFD.

ACOEM Machine Defender can automatically recognize the RPM in a +/-30RPM range from the user input.

If you are not sure of the RPM value you are entering, or the ACOEM Machine Defender app warns of wrong speed input, it is recommended to collect this information using an external laser tachometer for best accuracy, or getting it from the plant operations.



Select the transmission type

You must tell the system if your rotating asset is direct driven (no transmission), belt/pulley driven, or gearbox driven. The default settings is set to direct driven (no transmission component)



In case a transmission is selected, you must input the speed ratio or the exact output RPM.

Enter the transmission properties

The speed ratio OR the output RPM must be entered. If the speed ratio is known, the output speed is calculated automatically. If only the output speed is known, the ratio is calculated automatically



This information must be accurate as it will have a direct impact on the diagnostic results of the components on the output shaft. If you input wrong information, the diagnostic result may be incorrect.



Note about gearbox setup

If the speed ratio information is not available and the output speed is also unknown, it can be calculated from the gears teeth number

*Ratio = Driven Gear Teeth / Drive Gear Teeth
e.g. 30 teeth (output) / 20 teeth (input) = 1.5*

For multiple-stage gearboxes, the global speed ratio is equal to the multiplication of intermediate speed ratios.

For example with the following setup

- Drive Gear (input): 7 teeth
- Intermediate gear: 20 teeth
- Driven Gear (output): 30 teeth

Ratio = (20/7) × (30/20) = 4.3

Select the driven component

The ACOEM Machine Defender can manage Pumps (overhung and between bearings), Fans (overhung and between bearings), Roller, Shaft, Alternator, Centrifugal compressor.

Select the right component accordingly in the list. It is recommended that even if you only measure the electric motor, you create the full asset including the driven component.





Edit Machine Name and Picture



The machine picture will be placed in the report and also saved to the machine properties.



SENSOR MOUNTING

Sensor placement

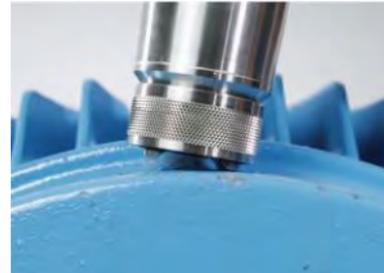
The tri-axial vibration sensor must be placed on the bearing as close as possible to the load zone to best sense the component vibration.



Attention must be paid on position and tri axial orientation of the sensor as it must be input into the app. This information is important as it can affect the diagnostic output.



Using a magnetic base can cause the sensor to hit strongly the machine when approaching it and affect the sensor measurement reliability. Always slightly mount the sensor as if you were rolling the magnet on the bearing



Tutorial video

For more information on sensor mounting best practices, please check our tutorial video online:



<https://www.youtube.com/watch?v=a0K3K3T45eM>



Mounting accessory

It is important to note that the mounting accessory (part between the sensor and the machine) will affect the quality of the vibration measurement. The closer is the sensor to the machine and the better it will sense the vibration.

Several options are available but deliver different results:

- Cementing studs offers the best performances for all types of defects but studs needs to be glued prior to the measurement.
- Magnetic provides ease of use and a compromise on how early faults can be detected.

Note that ACOEM Accurex™ requires tri-axial data and good quality measurement to provide accurate results. A probe tip is not

compatible with the need of the ACOEM Machine Defender.



Available options for sensor mounting with the ACOEM Machine Defender



MEASUREMENT

Overall Machine view

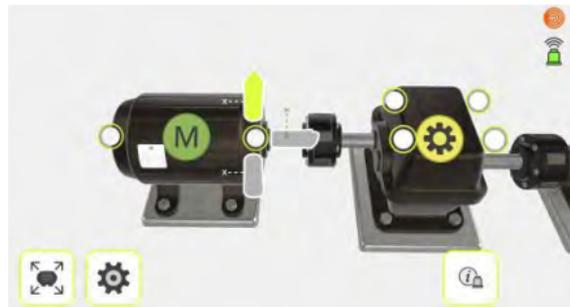


From the machine view select the bearing you want to measure to access to the zoomed view. As the RPM detection is based on the motor RPM input, it is strongly recommended to start measurements from the Motor Side.

To enter a measurement screen, select a point on the machine, the view will be zoomed on this point with access to different features.

Sensor position assignment

Define how the sensor is mounted on the machine: Horizontally, vertically or axially.



Attention must be paid on the tri-axial orientation of the sensor; it will affect the diagnostic results!

Always refer to the X axis dot marked at the base of the sensor.

The X axis must be parallel to the shaft for Horizontal and Vertical direction.



The X axis must correspond to the vertical axis of the machine when the sensor is mounted in axial direction.



Click on the unzoom button to go back to the overall machine view

Measurement point information



Click on the sensor information icon to access to the measurement point detailed information.

It is possible to take a picture of the sensor mounted on the machine, and access to the values of the vibration velocity with alarm status according to the ISO10816-3 standard.

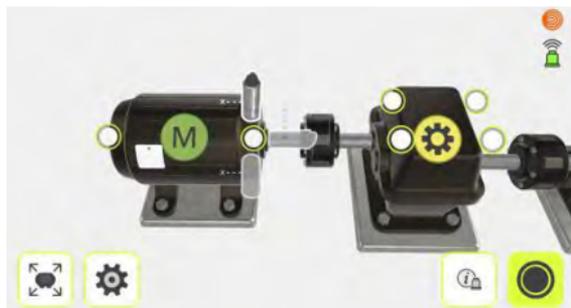




Start a measurement



Once the sensor orientation is defined, the record button to trig the measurement is accessible



Note that the sensor must be connected with a valid license  to access the record button!

If no sensor is available  or if the license is not valid , the record button is not displayed.

Measurement Progress

During the measurement, the following information is displayed:

- Measurement progress in %
- Live alarm status according to the ISO10816-3 standard.



Once a measurement is completed, the point is displayed with a checkmark 



The detailed values of the vibration velocity can be accessed afterwards clicking on the sensor information icon

To go on, simply point to the next measurement point or swipe on the machine and repeat the measurement process until you have collected all accessible points.



RPM auto check

Immediately after the measurement, the RPM is checked vs. the RPM input during the

setup. If it cannot be found, a warning is presented to the user.

Note that the RPM of the machine must be in a range of +/-30RPM of the real rotation speed.

Motor setup modification



If the RPM is not valid on the motor, click on the  button to open its properties and change it.



Note that it will reset all measurements done on the machine.



Transmission properties modification



If the RPM is not valid on the gearbox or on the driven component, click on the button on the transmission  to edit its properties.



Note that this will reset all measurements done on the output shaft (gearbox and driven component). This modification will not affect the measurements done on the motor.

RPM incorrect or not found

If the RPM is cannot be found, the ACOEM Machine Defender app is able to deliver a limited diagnostic. All defects with direct relations to the machine true RPM, such as Unbalance, Misalignment and Structural Resonance, will not be diagnosed correctly. Bearing and shocks problems may still be identified correctly.

In this situation, it is highly recommended to collect the true machine RPM using an external laser tachometer for best accuracy, or getting the information from the plant operations if the machine is connected.



AUTOMATIC DIAGNOSTIC RESULTS



Once a measurement has been recorded, a diagnostic button is accessible from the measurement screen, or from the overall machine view.

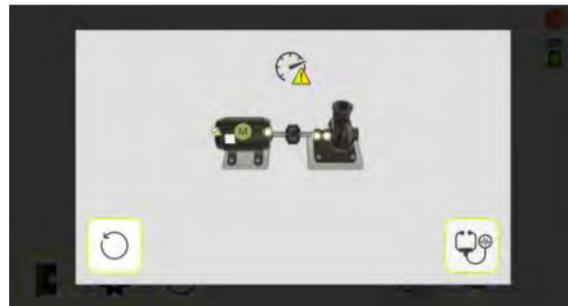
Measurement completion warning



The more measurement can be taken, the more accurate can be the system. It is proposed to go back to the machine overall view to continue measurements or confirm the diagnostic with limited number of points. The

warning is shown only if <80% of the points have been measured.

RPM warning



The incorrect RPM warning is given immediately after the measurement. It is also reminded at the moment of the diagnostic as it can have a big impact on the diagnostic accuracy and types of faults managed.

It is proposed to go back to the machine overall view to make new measurement or confirm the diagnostic with erroneous RPM.



ACOEM Accurex™ Global Advice

A global advice is given on the machine health to indicate to the user if an action is required or not. The results are presented as follows:



No action required



Machine to be monitored or action conceivable during next scheduled shutdown



Maintenance action needed as soon as possible

ACOEM Accurex™ Detailed Diagnostic



An interactive display of the machine is provided to the user. Each fault is presented with:

1. **Severity**
2. **Confidence level** (stars rating)
3. **Location on the machine** (interactive picture with colored bullets)
4. **Maintenance recommendation** (expand fault details)



REPORT

From the diagnostic view, a PDF report can be generated.



Touch the PDF icon to create a PDF report.

Add information to the report

Machine Health Report	
Report Date:	2019-12-12
Site:	Building B2
Machine:	MP-1001
Operator:	Anders
Comment:	abnormal noise

Information can be added or edited prior to the report edition, such as:

- Site
- Machine name
- Operator
- User comment

Touch the white fields to edit the information.

Generate and save the PDF report



Touch the save icon to generate and save the PDF report.

The PDF report will then be shown using native pdf reader of the smartphone/tablet, for further handling. It can be shared using standard features of the smartphone (email, social media...)

It can also easily be accessed afterwards from the machine list (see next chapter)



MACHINE LIST



From the home screen of the ACOEM Machine Defender app, click on the machine list icon to access existing machines.

For machines which have not been connected to the ACOEM Augmented Mechanics Platform, the information available for each machine is the following:

1. **Machine name**
2. **Creation date**
3. **ACOEM Accurex™ global advice**

Touch a line for more details:

4. **Machine Picture**
5. **Setup info** (motor RPM, power and foundation type)
6. **Quick access to the report** previously edited
7. **Delete** the machine





For machines which have been connected to the ACOEM Augmented Mechanics Platform, an extra set of information is available for each machine:

8. Work order status:

-  Work order to realize not started
-  Work order soon overdue (<1 week)
-  Work order closed
-  Work order overdue and not uploaded

9. Due date (replaces creation date)

10. Cloud Sync. status:

-  New data to be uploaded
-  Transfer in progress



It is possible to order the machine list depending on each column status by touching the column header. For example:

- In order to bring on the top of the list all overdue work orders which have to be managed urgently, click on the work order column header.
- In order to bring on the top of the list all machines with critical diagnostic, click on the diagnostic column header



CLOUD SYNCHRONIZATION

Accessing the ACOEM Augmented Mechanics Platform allows for easy collaborative work, sharing machines, results, and providing a centralized multi-technical view (alignment, vibration) for a more effective decision making on maintenance action and plant performance.

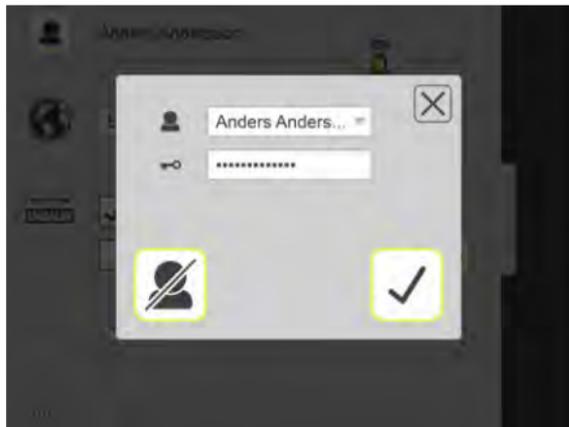
User authentication

To exchange data between the ACOEM Machine Defender app and the cloud, the user must be logged in with a valid login and password. To do so, it is possible to authenticate from the app settings.

Click on the User icon and fill in your login and password that were provided at the creation of your account on the ACOEM Augmented Mechanics Platform (ai.acoem.com)



Note that the validity of your information will be checked every time a synchronize action is triggered from the app.





Upload a machine for the first time

All machines are originally created on the app. After its first creation, the machine can be uploaded to the cloud.

To do so, from the machine list, display the machine details and click on the button upload 

At the next time, this machine will be downloaded to the app as a work order. It will be possible to manage the upload from the global synchronization button

Upload all completed work orders



From the machine list, pressing on the cloud synchronization button will upload all validated work orders.



Once the machines of the validated work orders have been uploaded successfully, they are deleted automatically from the app.

The results remain accessible through the cloud interface, and the machine setups can be resent to the app through new work orders.

Download available work orders



From the machine list, pressing on the cloud synchronization button will automatically download all work orders assigned to the user

logged on the app.

Machines to be measured with due date will then appear in the machine list.



Completing a work order

Once a job is performed, the work order has to be closed by the user prior to the upload to the cloud.

Once the work order is closed, its status  is automatically updated in the machine list.

It means that the machine results and report are ready to be uploaded to the cloud and shared with other users.

A work order can be closed:

- from the machine details in the machine list by clicking on the work order validation button 
- from the diagnostic result screen 



APP SETTINGS

User Manual



Download the latest user manual online.

Note: as an internet access is required, you must not be connected to the sensor to download the user manual

Measurement unit



Select mm mode or inch mode.

This user settings impacts on:

The vibration velocity unit displayed (mm/s or inch/s), the power unit displayed (kW or hp), and the date format.

Language



Select the language in which will be displayed the ACOEM Accurex™ maintenance recommendations



SENSOR CAC1008000

USER INTERACTIONS

1. ON/OFF button (press few seconds)
2. Mini USB for charging protected by top rubber
3. Communication indication LED (blue)
 - Continuously ON when not paired to any device
 - Flashing when successfully paired with device
4. Battery status LED (red)
 - Continuously ON during charging and power up phase
 - Flashing when low battery
 - Flashing with different intensity during firmware upgrade



POWER SUPPLY

The CAC1008000 sensor is powered by a high-capacity rechargeable Li-Ion cell, or by the external power unit.

The operating time of the batteries is approximately 8 hours when the system is used for a typical vibration measurement activity

The CAC1008000 unit can be charged with the supplied USB charger

When the external power supply is connected, the unit will automatically start charging the batteries. This will be indicated by the first battery status LED turning red, when the unit is fully charged the LED will switch off.

The charging time is approximately 8 hours for fully drained batteries. The charging time will be longer if the unit is turned on while being charged.

TECHNICAL SPECIFICATION – CAC1008000

Part. No. VT-300-BD and VT-300-MD Packages

Housing Material	Stainless steel
Operating Temp	-20°C to 60°C (-4 to 140°F)
Storage Temp	-20°C to 60°C (-4 to 140°F)
Long term storage temp	Room temp. 18 to 28°C (64 to 82°F)
Battery Charging Temp	0 to 35°C (32 to 95°F)
Relative humidity	0-95%
Resistance to shocks	5,000 g peak
Resistance to continuous vibration	500 g peak
Protection	IP65
Weight	373g (13,16 oz)
Dimensions	Ø42 x H116 mm
Mounting	M6 threaded hole
Battery Type	Li-Ion, USB rechargeable
Operating time	8 hours
Battery charging time	8 hours with the 500 mA charge current
Automatic stand-by	10 min if no connection has been established
Environmental protection	IP65
Number of axes for vibration measurement	3
Acquisition type	Synchronous acquisition in all axes (X, Y, Z)
Sampling frequency	51.2 kHz on all axes (Fmax 20kHz)

Sensing element	Piezoelectric / Annular shear mode
Sensing element internal sensitivity, 24°C	100mV/g (numerically converted)
Sensitivity adjustment	Factory-calibrated and adjusted
Full scale	80 g
Signal-to-Noise ratio	> 80dB
Amplitude non-linearity	1% max
Frequency response ± 3 dB (Z)	0.4 Hz – 15 kHz
Frequency response ± 3 dB (XY)	0.4 Hz – 6 kHz
Full bandwidth	20 kHz on all axes
Accuracy	+/- 5% @ 120 Hz, 1g
Transverse response sensitivity (120Hz, 1g)	< 5% (< -26dB)
Electrical noise 0 Hz–5 kHz	< 5 mg
Electrical noise > 1 Hz	< 20 μ g/ \sqrt Hz
Electrical noise Peak velocity (after 1 integration)	< 0.13 mm/s
Interface	ON/OFF Switch Keyboard
Wireless communication	Wi-Fi Point to point 2.4 GHz, WLAN b/g/n
Communication range	Up to 25 m (82 ft) line of sight
Wi-Fi communication channel	User setting: 1, 6, 11
Radio certifications	EC, FCC, IC, MIC
Patented Technology	Patent US 9,921,136

Specifications are subject to change without notice.



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