



**Eval, Eval Floor et Eval Detect
Devices for Whole-Body Exposure to Vibration
Measurements**

User Manual

PEvalSensorDuo Software for PocketPC

Version 2.0



GLOSSARY

Bluetooth	Set of technologies allowing wireless data transmission over short distances
EMC	Electromagnetic Compatibility
PDA	Personal digital assistant
USB	Universal Serial Bus

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CE Conformity

This device complies with the following European Directives:

- Low voltage directive 73/23/EEC
- EMC directive 89/336/EEC



CE conformity is not guaranteed if used with a battery charger other than the one supplied with the EVEC device

Warnings

Warning related to the battery

The Evec, Evec Floor and Evec Detect sensors contain a rechargeable lithium-ion battery. In order to reduce the risk of fire or burns, do not disassemble, crush, puncture, short external contacts, dispose of it in fire or water. Do not expose the EVEC sensor to temperatures exceeding 60°C (140°F).

Please dispose of this product according to local regulations.



Warning related to direct sunlight

Keep these products away from excessive moisture and extreme temperatures. Do not leave the products in a vehicle or in places where the temperature may exceed 60°C (140°F), such as on a car dashboard, windowsill, or behind a glass exposed to direct sunlight or strong ultraviolet light for extended periods of time. This may damage the products, overheat the batteries, or pose risk to the vehicle.

The sensors of EVEC product range do not contain any user serviceable part inside and must never be opened

The sensors of the Evec Product range do not contain any user serviceable part inside. It must never be opened and must be returned to the after-sale service for any repairs. The same applies for the sensors internal batteries, which can only be changed at the factory. Do never remove the screws closing the boxes as this will damage the sensors.

Section 1 - Description

1.1 General Description

The Evec products range is made of 3 sensors (Evec, Evec Floor and Evec Detect) and the « EvecSensorDuo » software. Alone or in combination, these sensors allow to measure the whole-body vibration exposure for seated and stand-up operators, and allow the calculation of seat's efficiency factors, called S.E.A.T. factors

The **Evec** sensor is a dosimeter for measurement of vibrations transmitted to whole-body. It allows measuring the vibration dose received by a seated operator according to the European Directive 2002/44/EC. The EVEC sensor is a semi-rigid interface to be placed on the driver's seat. It embeds a 3-axis accelerometer and processing electronics. A driver presence sensor is also integrated in the EVEC sensor. This accurately measures the time exposed to vibration and computes automatically normalized values such as A(8), the daily exposure to vibration without particular user action or computing.

The **EvecFloor** sensor (option) is a dosimeter for floor vibration measurements. Used in combination with the Evec Sensor, it allows the calculation of seats efficiency factors, also called S.E.A.T. factors.

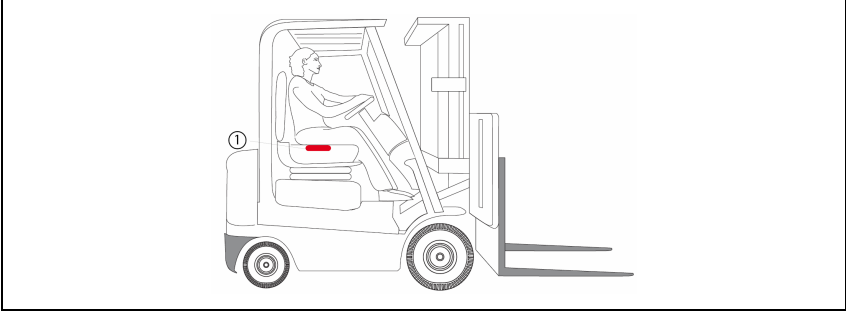
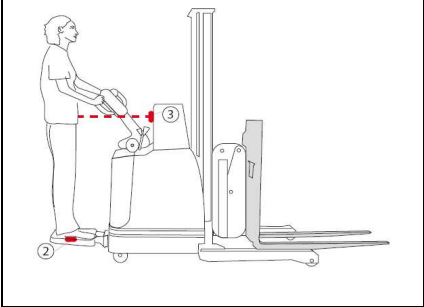
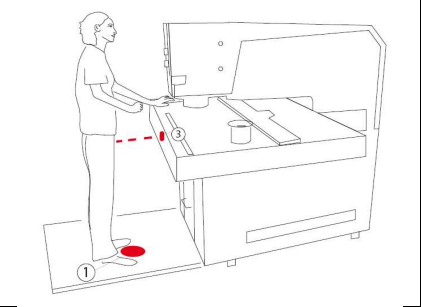
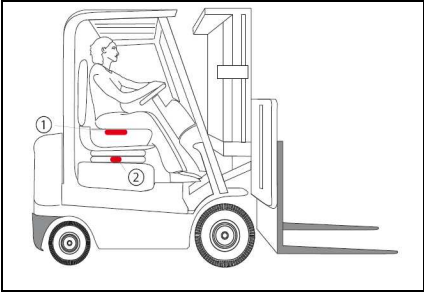
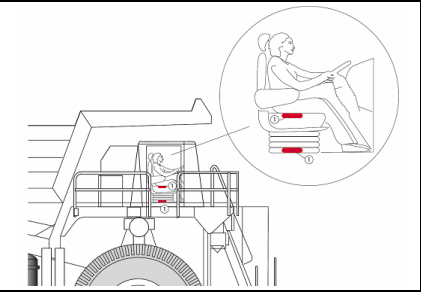
The **EvecDetect** sensor (option) is an external and autonomous presence detector (to be used in combination with EvecFloor or Evec) that allows the calculation of the vibration dose received by a stand-up operator according to the European Directive 2002/44/EC.

These three sensors communicate with the PocketEvecSensorDuo software installed on your PocketPC through a wireless connection. No wiring is needed.

The « PocketEvecSensorDuo » software allows users:

- selecting the configuration of measurement to be realized (seated operator exposure, stand-up operator exposure or seat efficiency measurement)
- getting the sensor(s) ready for measurement following the selected measurement configuration
- accessing – through the wireless connection – measurements made by the sensor(s)
- calculating and displaying directly and in an easy way the final results of the vibration measurements (like the daily vibration exposure $A(8)$ and/or the S.E.A.T. factors for example)

Table 1: Typical Measurement Configurations

Seated operator	
	
Standup operator	
	
S.E.A.T. Factors	
	

- 1 Evec Sensor
- 2 EvecFloor Sensor
- 3 EvecDetect Sensor

Section 2 - Installing and Configuring

This chapter explains how to install and configure the Evec devices.

The sensors only require their internal battery being charged before being used for the first time.

The setup and configuration of the software on a PocketPC consists in the configuration of Bluetooth Wireless links between each sensor and the PocketPC and in the installation of the PocketEvecSensorDuo software on your PocketPC.



If you have purchased a fully configured PocketPC from your distributor, configuration operations have already been performed. You can start immediately using your device (skip to Section 3 - Operation) after having charged them (2.1 below).

2.1 Charging the sensor battery



Always use the charger supplied. Using a charger of a type other than the one supplied may damage the Evec sensor.

The Evec (Evec, EvecFloor, EvecDetect) sensors batteries must be charged before use.

Remove the sensor(s) from the casing and connect it to the charger..

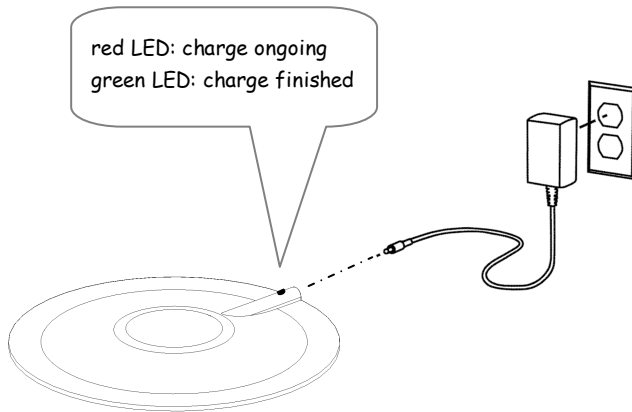


Figure 1: Charging the Evec Sensor Battery

The sensor LED will turn red when charging. It will turn green when the charge is complete.



When the battery is deeply discharged, the LED will turn orange for approximately one minute when connecting the charger, it will then return to the normal sequence: i.e., the LED will turn red during charging, and then green when charging is complete. If the LED remains orange for a long period, the battery can no longer be used.

If the battery was deeply discharged, the green LED could never turn green even after hours of charging. In this case you have to disconnect the sensor from the charger, switch the sensor off and on to reinitialize the sensor. This reinitialization can be done by placing the sensor in the casing and taking it out.

2.2 Prerequisites

Minimum configuration for the Pocket PC :

- Microsoft® Windows Mobile 2005®
- Microsoft .NET Compact Framework 2.0®
- Bluetooth® interface (hardware and software stack)

2.3 Microsoft .NET Compact Framework 2.0

To verify whether Microsoft .NET Compact Framework 2.0 is installed on your PocketPC and whether it needs to be updated, follow these steps:

- Connect your PocketPC to your desktop PC and wait for ActiveSync to start.
- Surf to the Microsoft website (<http://www.microsoft.com/downloads>) on your desktop PC.
- On the Microsoft website, go to the Windows Mobile section
- Locate where you can download the .NET Compact Framework (version 2.0 or higher).
- Select your language and follow the instructions for downloading.

2.4 Configuring the Bluetooth® Wireless link

The PocketEvecSensorDuo software uses a Bluetooth® wireless connection to communicate with one or more sensors.

The Bluetooth® wireless link communication setup is similar to that for any other Bluetooth® peripheral. Please refer to your PC manual or Bluetooth® device manual for detailed instructions.

In practice, the Bluetooth® link configuration consists of the following steps:

- 1) Verify that your PC is equipped with Bluetooth®, and that this has been enabled and correctly setup;
- 2) Execute a "pairing", i.e., create a two-way relationship between your PocketPC and the Evec sensors so that they know each other and how to exchange data.

The Bluetooth® configuration is carried out once for any given PC/sensor pair. Once done, both PocketPC and sensor – even if they have been switched off – will keep this configuration registered in their memory.

The configuration procedure need only to be repeated when a new sensor has been purchased or when installing the PocketEvecSensorDuo software on another PocketPC.

2.4.1 Configuring Bluetooth® on your PocketPC



The configuration of the widely used Widcomm Bluetooth stack is described hereunder. A different Bluetooth stack may be installed on a your PocketPC. Please refer to your PocketPC vendor documentation in this case.

Step 1





Locate the specific icon on the main screen of your PocketPC ( or  if Bluetooth is turned ON,  or  if Bluetooth is turned OFF). Tap this icon to access the Bluetooth menu (Figure 2). Turn Bluetooth ON if not yet activated.



Figure 2: Accessing Bluetooth Settings

Tap on « Bluetooth Settings ».

Step 2

The screen with Bluetooth general settings appears (Figure 3).

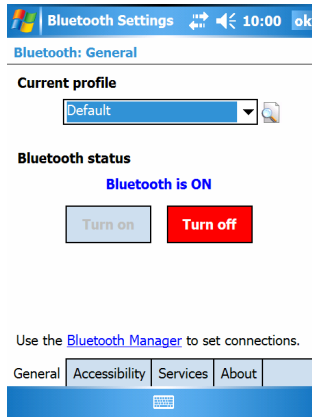


Figure 3: Bluetooth Settings (1)

Tap the « Services » tab.

Step 3

Select « Serial Port » in the list of services. Check the boxes as shown in Figure 4.

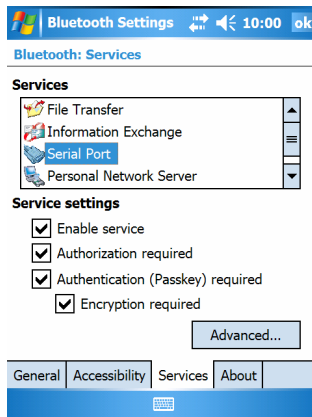


Figure 4: Bluetooth Settings (2)

Tap the « Advanced... » button.

Step 4

The screen shown in Figure 5 appears. Check the « Display the device selection screen... ».

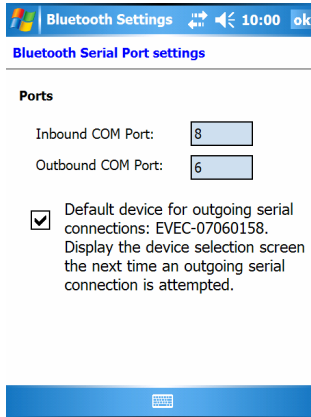


Figure 5: Bluetooth Settings (3)

This screen displays the serial COM ports which are used by your PocketPC to communicate with Sensors offering this type of service (this is the case for Evec Sensors). **Note down the outgoing COM port that has been assigned.**



IMPORTANT: Note down the outgoing COM port that has been assigned. You will have to enter it when using the PocketEvecSensorDuo software for the first time (see section 2.6.1).

2.4.2 Pairing a sensor with your PocketPC

A Bluetooth® wireless communication between 2 devices first requires a 'pairing'; i.e., the 2 devices must "know" each other before they can communicate regularly. During this operation (which is carried out once for any given pair of devices) the 2 devices exchange their basic characteristics. Once the pairing is done, they can detect and recognize each other and then exchange data as soon as they are within transmission range of each other (i.e. they are a few meters away from each other).



The pairing operation is typical of Bluetooth technology; it is required for any Bluetooth device pair you want to have exchange data wirelessly. Hence, this operation is executed using the Bluetooth® utility on your PocketPC.

Step 1



Access the Bluetooth® utility by tapping the Bluetooth icon ( or ). The screen shown in Figure 6 will appear.



Figure 6: Accessing Bluetooth Manager

Tap « Bluetooth Manager ».

Step 2

The screen displaying shortcuts to Bluetooth devices appears (Figure 7). **Remove the sensor from the casing** and place it within range of your PocketPC.

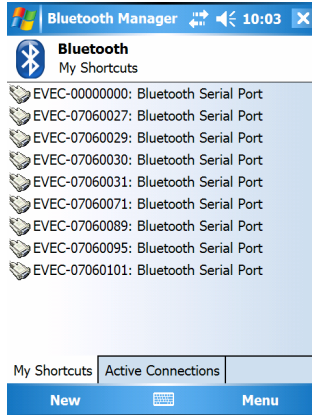


Figure 7: Bluetooth Pairing (1)

Tap the « New » option.

Step 3

Using the connection Wizard, select the « Explore a Bluetooth Device » option (Figure 8).



Figure 8: Bluetooth Pairing (2)

Tap "Next".

Step 4

The Bluetooth Connection Wizard looks for existing Bluetooth peripherals. After a few seconds available Bluetooth devices are listed (Figure 9).

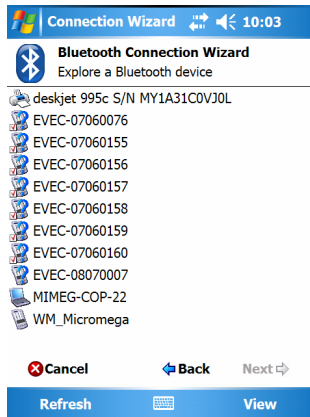


Figure 9: Bluetooth Pairing (3)

The Evec sensor appears in the list under the following name: EVEC-XXXXXXX where XXXXXXXX is the serial number of your Evec sensor. Select it and tap « Next ».

Step 5

The Bluetooth connection wizard connects to the sensor to retrieve the list of available services it offers (Figure 10).

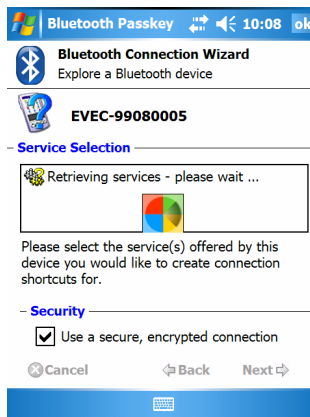


Figure 10: Bluetooth Pairing (4)

Step 6

When the « serial port » service is detected, the Authentication screen appears (Figure 11).

Enter the Passkey that is the serial number of your sensor (8-digit number).
Tap ↵ to validate.

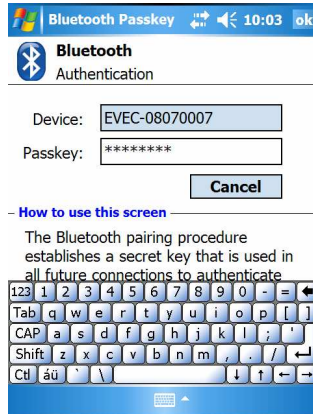


Figure 11: Bluetooth Pairing (5).

Step 7

The screen shown in Figure 12 appears.

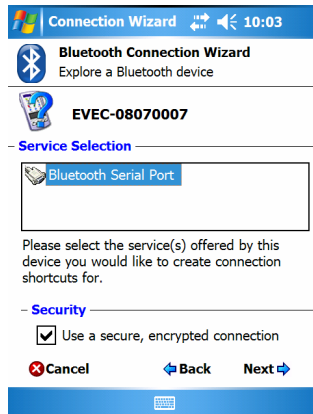


Figure 12: Bluetooth Pairing (6)

Check the « Use a secure, encrypted connection » box. Select the « Bluetooth Serial Port » in the « Service Selection » area.
Tap « Next »

Step 8

The screen shown in Figure 13 appears. The Bluetooth® pairing operation between your PocketPC and your sensor is finished.

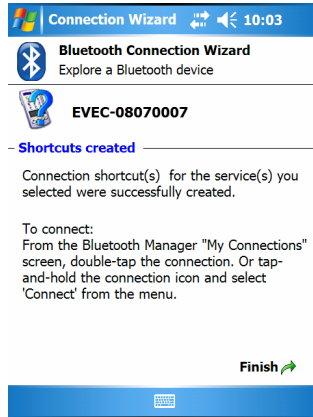


Figure 13: Bluetooth Pairing (7)

Tap « Finish ».
Repeat this procedure for each sensor you want to use.

2.5 Installing the PocketVecSensorDuo software

Connect your PocketPC to a host PC and make sure your PC connects to the PocketPC through Microsoft ActiveSync.

Insert the CD-ROM in the reader on the PC.

The software installation starts automatically (provided autorun is enabled on your computer). Follow the instructions which are displayed.

2.6 Configuring the PocketVecSensorDuo software

2.6.1 Communication Port

Step 1

Run the PocketVecSensorDuo software; the welcome screen will appear (Figure 14).

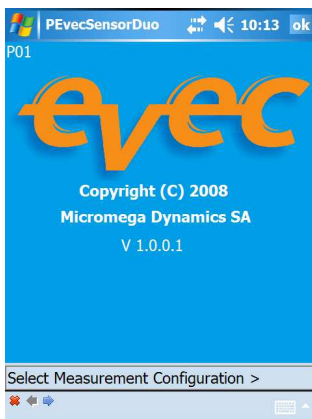



Figure 14: Welcome screen

Tap the arrow  to move to the next screen.

Step 2

The measurement selection screen appears (Figure 15).

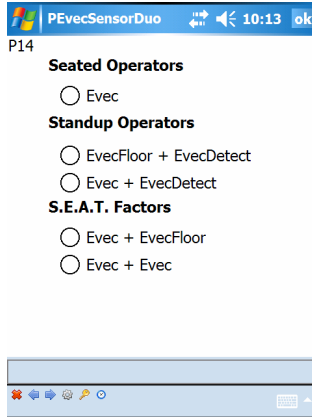



Figure 15: Measurement Configuration Selection

Tap the  icon in the toolbar (there is no importance of the choice for now).

Step 3

The “serial COM port setting” screen appears (Figure 16).

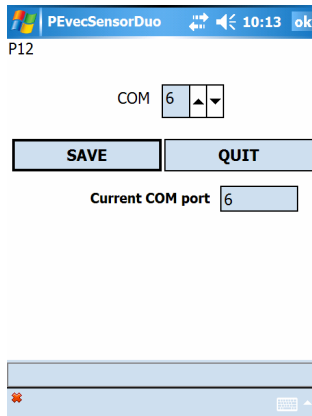




Figure 16: COM port Setting

Select the right port COM number (i.e. the outgoing port shown during the Bluetooth configuration) using the up and down arrows  .

Tap « Save ». The “Current COM port field” is updated accordingly.

Tap the “Quit” button to return to the normal program flow.

2.6.2 Entering a software key (optional step).

You can enter a software key for each sensor you use. This gives you the possibility to generate vibration time histories (also called “Evec files”). Those can be transferred to the PC at a later time where vibration data can then be plotted and analyzed using the « EvecViewerDuo » software.

If no software keys are entered only results related to vibration doses can be saved.

Step 1

Run the PocketEvecSensorDuo software ; the welcome screen will appear (Figure 17).

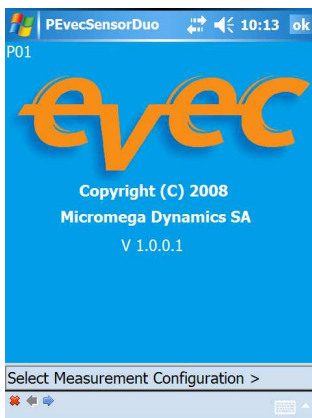


Figure 17: Welcome screen

Tap the arrow ➡ to move to the next screen.

Step 2

The « Measurement Configuration Selection » screen appears (Figure 18).

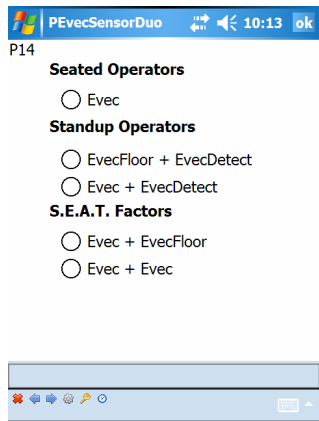


Figure 18: Measurement Configuration Selection

Tap the  icon (there is no importance of the choice for now).

Step 3

The software key management screen appears (Figure 19).

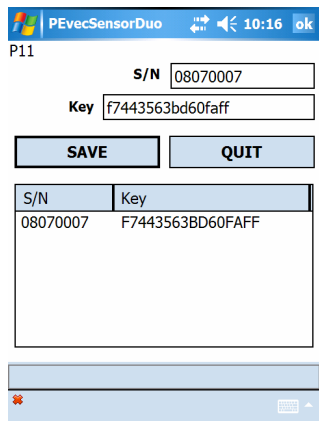


Figure 19: Software Key Manager

Enter the serial number of your sensor (8-digit number) and the corresponding software key obtained from your distributor.
Once entered, tap the « Save » button.

The list of sensor and of their related software key is updated with this new sensor/key pair.

Tap the « Quit » button to return to the program normal flow.

Section 3 - Operation

This section explains how to operate one or more sensors to measure the whole-body vibration exposure of an operator and/or S.E.A.T. Factors.

The «PocketEvecSensorDuo» installed on your PocketPC allows:

- Getting the sensors ready for measurements
- Accessing measurement results from the sensor(s), as well as computing and displaying vibration exposure values and/or S.E.A.T. Factors.

The 3 possible measurement configurations are:

- Measurement of the exposure to vibration of a seated operator
- Measurement of the exposure to vibration of a stand-up operator
- Measurement of seats efficiency (i.e. S.E.A.T. factors)

3.1 Seated operator exposure measurement

3.1.1 Powering on the sensor

When the sensor is placed in the casing it is powered off by a small magnet hidden in the protective foam. It powers on automatically as soon as it is removed from the casing (the green LED briefly goes on to indicate the sensor is running).

3.1.2 Getting the sensor ready for measurements

Step 1

Remove the sensor from its casing and place it within range of the PocketPC on which the software is installed.

Step 2

Run the PocketEvecSensorDuo software; The Welcome screen will appear (Figure 20).

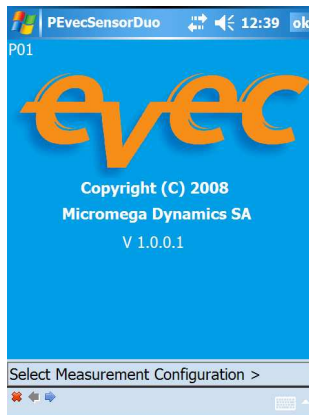


Figure 20: Welcome screen

Tap the arrow ➡ to move to the next screen.

Step 3

The screen where the measurement configuration can be selected appears (Figure 21).

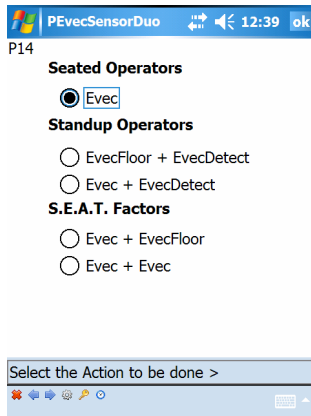



Figure 21: Measurement Configuration Selection

Select the option for Seated Operators and tap the arrow  to move to the next screen.

Step 4

Select the 'Get the Sensor Ready to Measure' option (Figure 22).

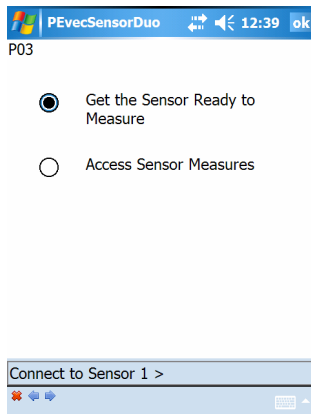



Figure 22: Selection of the operation to perform

Tap the arrow  to move to the next screen

Step 5

Tap the 'CONNECT' button (Figure 23).

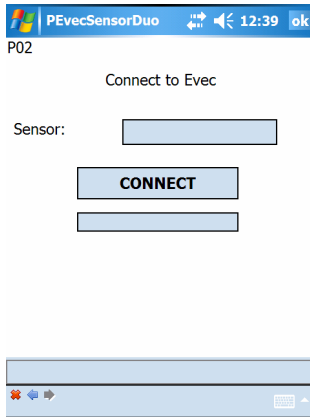


Figure 23: Connection to the Sensor (1)

The connection process between the PocketPC and the EVEC sensor will start.

After a few seconds, the Bluetooth Browser of your PocketPC will be called for you to be able to select the EVEC sensor you want to work with from the list (Figure 24).

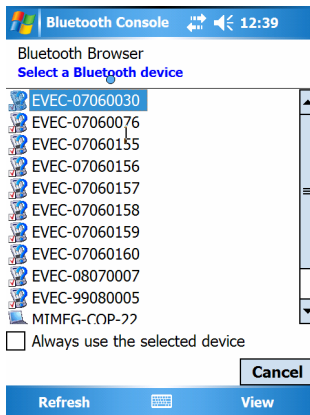


Figure 24: Connection to the Sensor (2)



If the list is empty or if the Bluetooth browser does not appear your Bluetooth utility is probably not correctly configured. Please refer to section 2.4.

Once the PocketPC is connected to the EVEC sensor, the screen shown in Figure 25 appears.

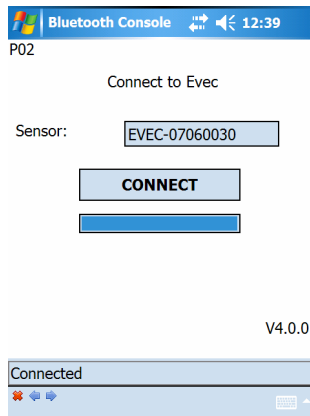


Figure 25: Connection to the Sensor (3)

Tap the arrow ➡ to move to the next screen.

Step 6

Tap the 'Trigger On' button (Figure 26).

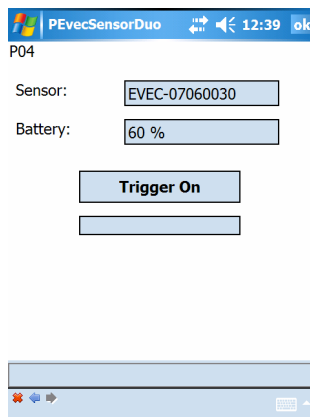


Figure 26: Getting the sensor ready to measure (1)

A pop-up window will appear up telling you that the “Trigger On” process will erase any previous measures that may still be stored in the sensor memory. Confirm your choice. The « Trigger On » process may take a few seconds.

If this process succeeds the screen shown in Figure 27 appears.

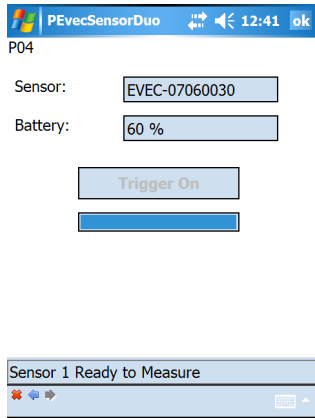



Figure 27: Getting the sensor ready to measure (2)

The sensor is then ready to measure. You can exit the software (❌ icon at the bottom) and install the sensor on the driver’s seat.

	<p>The LED will blink (red color) as soon as the EVEC sensor is ready to measure.</p>
---	---

3.1.3 Installing the sensor on the seat

Standards define 3 axes: the X-axis (to the front), the Y-axis (to the left) and the Z-axis (to the top). Accelerations will be measured along those 3 axes in order to retrieve the driver's whole-body exposure.

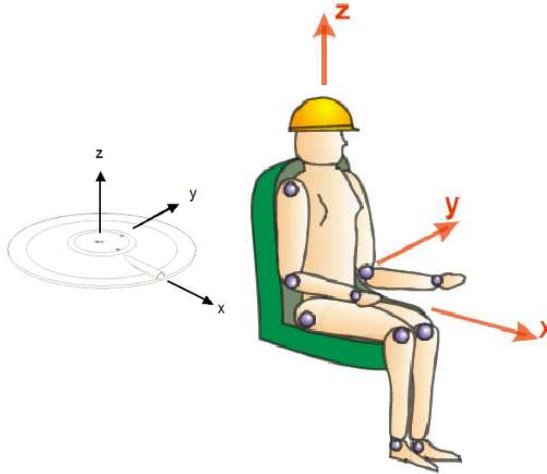


Figure 28: Definition of X, Y and Z-axes – driver's position towards Evec sensor

The sensor must be placed on the driver's seat and oriented as shown in Figure 28. The bump on the top surface of the sensor that houses the charger connector matches the X-axis and must be face forward. The sensor may be kept in place using a strip of adhesive; but this is not required for reliable and accurate measurements.

When sitting the driver must cover the sensor completely.




In some types of vehicles, the driver does not face the driving/moving direction. According to the standard, the X, Y, and Z-axes are referenced to the driver's body, the X-axis matching the back-to-chest direction.



The Evec sensor can be placed on the seat before getting it ready for measurement.

Note that the sensor must be made ready for measurements before the driver sits on it. There is no

	communication possible between the reader software and the sensor when the driver's presence is detected (Bluetooth communication is switch off to reduce power consumption and increase sensor autonomy).
--	--

	<p>When the driver sits on the sensor the LED first turns green for about 4 seconds, and then starts to blink (green) as the driver's presence is detected.</p> <p>When the driver leaves the seat the LED will turn red for about 4 seconds, and then starts to blink (red) until the driver sits again or the user establishes a connection to the sensor using the PocketEvecSensorDuo software.</p>
---	---


3.1.4 Operation

The EVEC sensor then becomes autonomous and stores vibration measures along X, Y and Z-axes during the time the driver uses the vehicle. The time during which the driver is exposed to vibration is also measured thanks to the embedded presence sensor. Once the driver has finished his/her work, the Evec sensor may be taken from the seat and placed within range of your PocketPC and vibration exposure values can be accessed with the PocketEvecSensorDuo software.

3.1.5 Accessing measurement results

Step 1

Place the sensor within range of your PocketPC and run the PocketEvecSensorDuo software

	No communication can be established between the PC and a sensor as long as the driver remains seated on it (driver's presence is detected and Bluetooth® communication is switched off to reduce Evec Sensor power consumption and increase autonomy). As soon as the driver is no longer detected, the Bluetooth communication on the sensor is enabled again. There might be a few seconds delay before Bluetooth® starts running again and the PocketEvecSensorDuo software can start communicating with the sensor..
---	--

Step 2

The Welcome screen will appear (Figure 29).

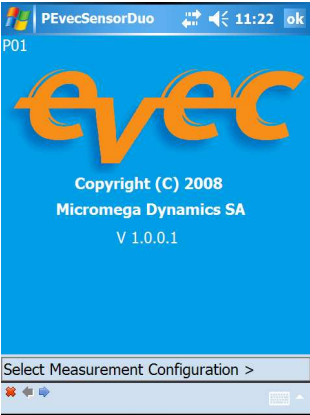



Figure 29: Welcome screen

Tap the arrow  to move to the next screen

Step 3

The screen where the measurement configuration can be selected appears (Figure 30).

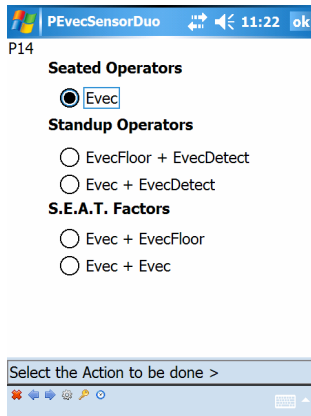



Figure 30: Measurement configuration selection

Select the option for Seated Operators and tap the arrow  to move to the next screen.

Step 4

Select the 'Access Sensor Measures' option (see Figure 31).

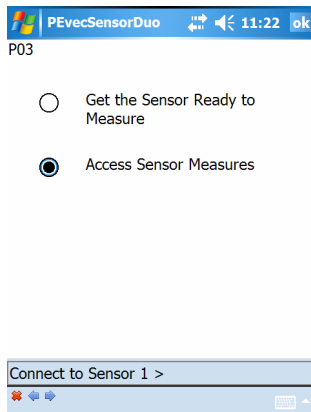



Figure 31: Selection of the operation to perform

Tap the arrow icon () to move to the next screen and access measurement results.

Step 5

Tap the 'CONNECT' button (Figure 32).

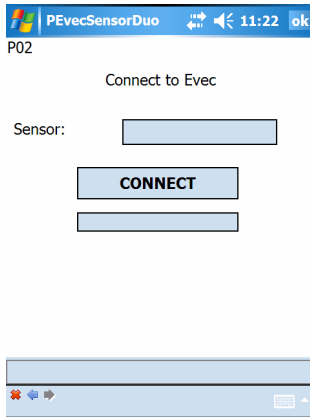


Figure 32: Connection to the sensor (1)

The connection process between the PocketPC and the EVEC sensor will start.

After a few seconds, the Bluetooth Browser of your PocketPC will be called for you to be able to select the EVEC sensor you have worked with from the list (Figure 33).

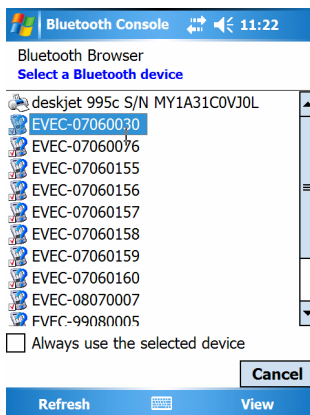


Figure 33: Connection to the sensor (2)

Once the connection is established, the screen shown in Figure 34 appears.

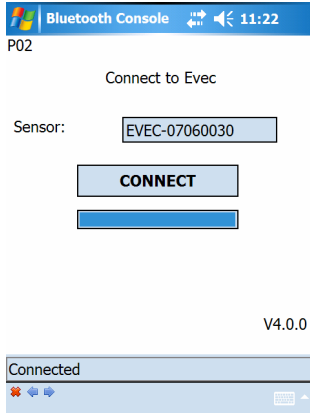



Figure 34: Connection to the sensor (3)

Tap the arrow  to move to the next screen.

Step 6

Tap the 'READ' button to download measurement results from the EVEC sensor.

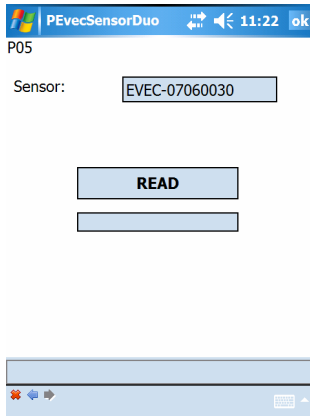


Figure 35: Downloading measurements (1)

Downloading the measures may take a few seconds.

When this process is complete, the screen shown in Figure 36 appears.

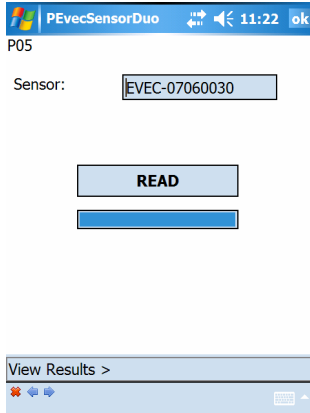



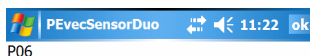
Figure 36: Downloading measurements (2)

Tap the arrow icon () to move to the next screen and indicate the type of measurement that has been made.

Step 7

The EVEC dosimeter is usually used to take measurement throughout the driver's work day/shift (option 1 in Figure 37).

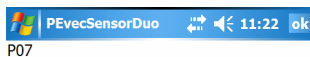
Nevertheless it is possible to assess the exposure to vibration by taking a measurement during a part of the driver's work day/shift only, provided that the driver's work during that period represents driver's usual exposure to vibration. The time period when the driver uses the vehicle during his/her work day/shift must then be estimated and entered manually (option 2 in Figure 37, then Figure 38).



- ☐ Measurement done during a whole work period
- ☒ Measurement done during a part of the work period



Figure 37: Type of measurement selection



Enter the usual utilisation time of the vehicle:

hh mm

3 : 50

VALIDATE

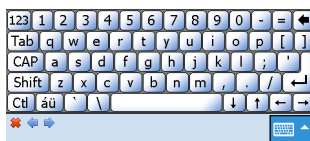



Figure 38: Entering the utilization time (UT)



If there is a large extrapolation, i.e., if the measurement was taken during a short period of time as compared to the driver's usual operation time of the vehicle during his/her work day/shift, a warning window pops up.

Tap the arrow icon () to move to the next screen and display exposure values.

Step 8

Measurement results are displayed (see Figure 39).

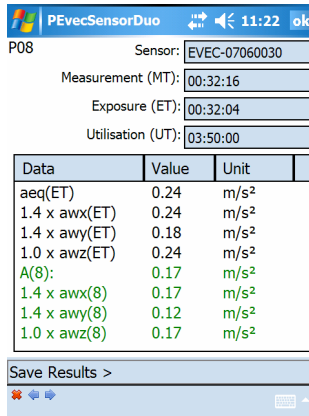


Figure 39: Results display

Measurement Time (MT)

This is the duration from the time the driver first sits to the last time he leaves its seat.

Exposure Time (ET)

This is the time period when the driver is exposed to vibration during the measurement process. This is the measurement time (MT), minus time periods when the driver has left his/her seat, and minus unwanted effect time periods (e.g. shocks generated by the driver when sitting or leaving his/her seat are disregarded).

Utilization Time (UT)

This is the time where the driver uses the vehicle during his/her work day/shift (i.e. the time where he/she is actually present at his/her driving position). If the measurement is taken throughout the time the driver is using the vehicle during his/her work day/shift, the time of use matches the exposure time (ET), which is then automatically measured by the Evtec dosimeter.

$a_{wx}(ET)$, $a_{wy}(ET)$, $a_{wz}(ET)$

These are the RMS weighted accelerations along the X, Y, and Z-axes respectively that have been measured during the Exposure Time period (ET).

$a_{eq}(ET)$

This is the maximum of the (rms) weighted accelerations along the X, Y, and Z-axes ($a_{wx}(PE)$, $a_{wy}(PE)$, $a_{wz}(PE)$) after multiplication by their respective coefficients.

$a_{wx}(8)$, $a_{wy}(8)$, $a_{wz}(8)$


These are the RMS weighted accelerations along the X, Y, and Z-axes respectively that have been calculated for a period of 8 hours.

$A(8)$


The daily exposure $A(8)$ is expressed as the equivalent continuous acceleration over an eight-hour period, calculated as the highest (rms) value along X, Y, and Z-axes after multiplication by their respective coefficients. This daily exposure value is compared to the action and limit values defined in the law (please refer to the transposition of the European directive 2002/44/EC into the law of your country).



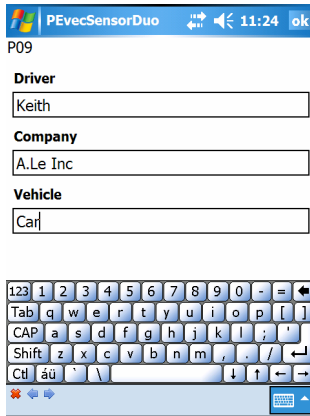
The $A(8)$ is displayed in green if it is less than the daily exposure action value, in orange if between the daily exposure action value and the daily exposure limit value, and in red if greater than the daily exposure limit value.

Tap the arrow icon () to move to the next screen and save results.

Step 9

The text boxes on the two next screens (Figure 40 et Figure 41) allows you entering information about the driver and the measurement context, and saving this information to a file together with vibration data (tap the floppy disk icon  to do so).

If the « save as evvec file » box is checked and if the software key related to the Evvec sensor has been entered (see section 2.6.2) the full vibration history will be saved. It can then be transferred to a PC where vibration data can be plotted and analysed using the “EvvecViewerDuo” software.



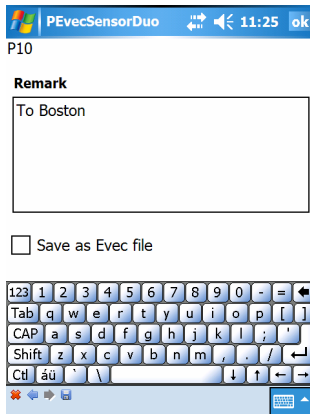
P09

Driver
Keith

Company
A.Le Inc

Vehicle
Car

Figure 40: Saving Results (1)



P10

Remark
To Boston

☐ Save as Evvec file

Figure 41: Saving Results (2)

3.1.6 Switching off the sensor

When you don't use the sensor, place it in its casing. The magnet hidden in the protection foam switches the sensor off automatically to preserve battery power.

3.2 Standup operator exposure measurement.

3.2.1 Powering on the sensors

When the sensors are placed in the casing they are powered off by a small magnet hidden in the protective foam. Each sensor powers on automatically as soon as it is removed from the casing (the green LED briefly goes on to indicate the sensor is running).

3.2.2 Getting the sensors ready for measurements

Step 1

Remove the sensors from their casing and place them within range of the PocketPC.

Step 2

Run the PocketEvecSensorDuo software; The Welcome screen appears (Figure 42).



Figure 42: Welcome screen

Tap the arrow ➡ to move to the next screen

Step 3

The screen where the measurement configuration can be selected appears (Figure 43).

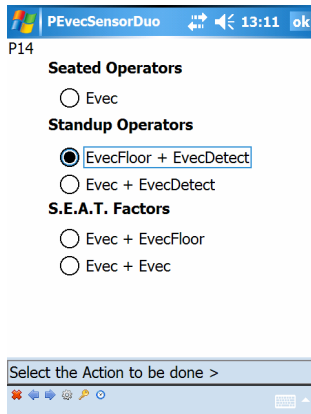



Figure 43: Measurement configuration selection

Select an option for Standup Operators and tap the arrow  to move to the next screen.

Step 4

Select the 'Get the Sensors Ready to Measure' option (Figure 44).

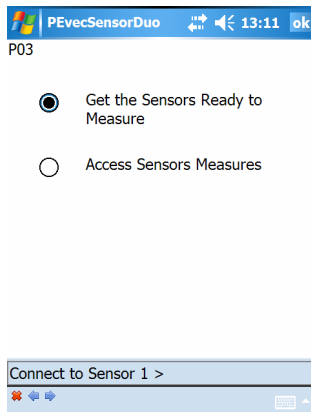



Figure 44: Selection of the operation to perform

Tap the arrow  to move to the next screen and get the first sensor ready to measure.

Step 5

Tap the 'Connect' button (Figure 45).

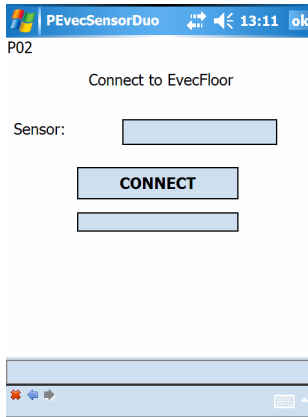


Figure 45: Connection to the first sensor (1)

The connection process between the PocketPC and the sensor will begin. After a few seconds, the Bluetooth Browser of your PocketPC will be called for you to be able to select the first sensor you want to work with from the list (Figure 46).

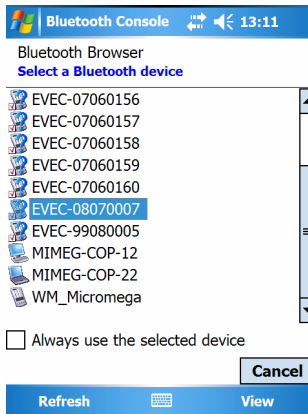


Figure 46: Connection to the first sensor (2)



If the list is empty or if the Bluetooth browser does not appear, your Bluetooth utility is probably not correctly configured. Please refer to section 2.4.

Once the connection with the first sensor is established the screen shown in Figure 47 appears.

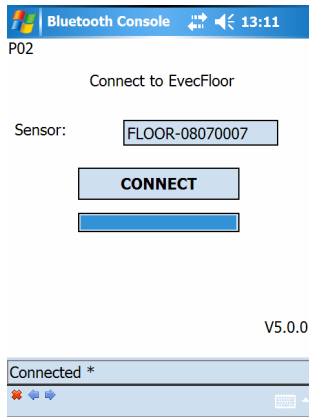



Figure 47: Connection to the first sensor (3)

Tap the arrow  to move to the next screen and get the first sensor ready to measure.

Step 6

Tap the 'Trigger On' button (see Figure 48).

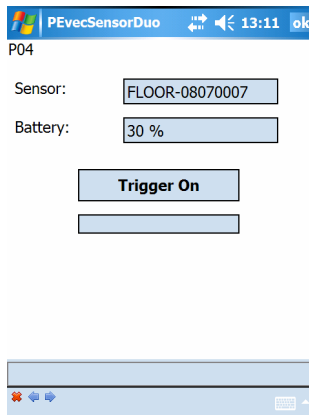


Figure 48: Getting the first sensor ready to measure (1)

A pop-up window will appear up telling you that the "Trigger On" process will erase any previous measures that may still be stored in the sensor memory. Confirm your choice.

The « Trigger On » process may take a few seconds.

If this process succeeds the screen shown in Figure 49 will appear.

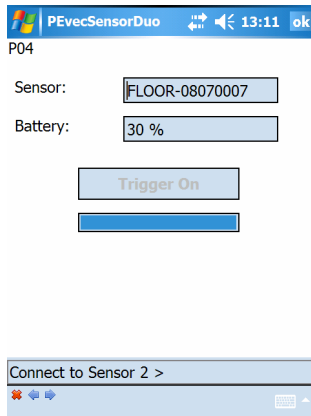



Figure 49: Getting the first sensor ready to measure (2)

Tap the arrow  to move to the next screen and connect to the second sensor.

Step 7

Tap the 'Connect' button (Figure 50).

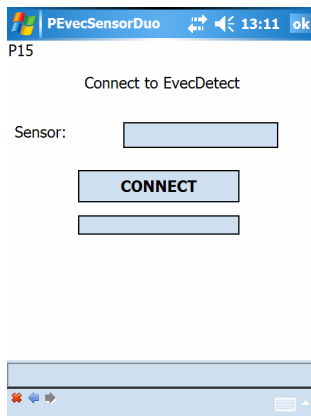


Figure 50: Connection to the second sensor (1)

The connection process between the PocketPC and the sensor will begin.

After a few seconds, the Bluetooth Browser of your PocketPC will be called again for you to be able to select the second sensor you want to work with from the list (Figure 51).

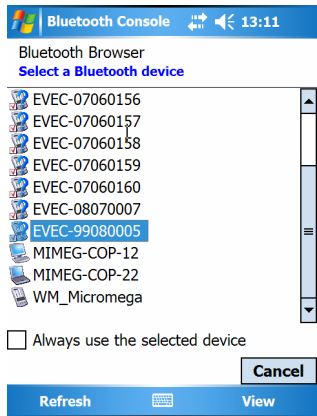


Figure 51: Connection to the second sensor (2)

Once the PocketPC is connected to the second sensor, the screen shown in Figure 52 appears.

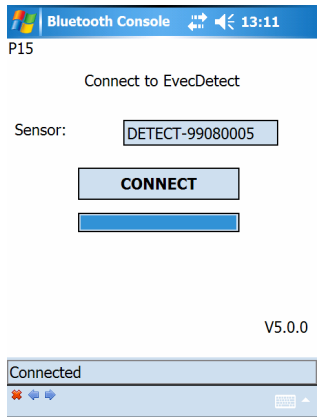



Figure 52: Connection to the second sensor (3)

Tap the arrow  to move to the next screen and get the second sensor ready to measure.

Step 8

Tap the 'Trigger On' (see Figure 53).

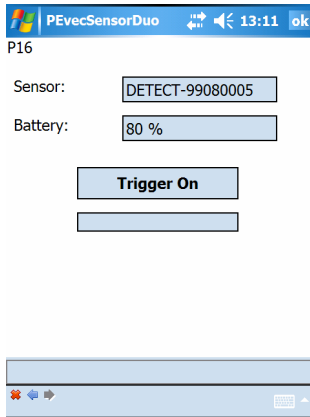


Figure 53: Getting the second sensor ready to measure (1)

A pop-up window will appear up telling you that the “Trigger On” process will erase any previous measures that may still be stored in the sensor memory. Confirm your choice.

The « Trigger On » process may take a few seconds.

If this process succeeds the screen shown in Figure 54 will appear.

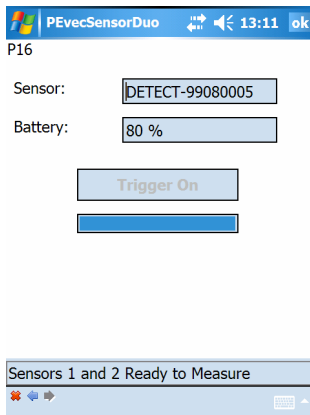


Figure 54: Getting the second sensor ready to measure (2)

The sensors are then ready to measure. You can exit the software (✖ icon at the bottom) and install the sensors for a stand-up operator exposure to vibration measurement.



The LED on the EvtecDetect will blink (red color) as soon as it is ready to measure.

The LED on the EvtecFloor (or Evtec located on the floor) will blink (green color) when ready to measure.

3.2.3 Installing the sensors

3.2.3.1 Installing the sensor on the floor.

Standards define 3 axes: the X-axis (to the front), the Y-axis (to the left) and the Z-axis (to the top). Accelerations will be measured along these 3 axes in order to retrieve the operator's whole-body exposure.

Vibration must be measured on the surface where the feet of the operator are usually located. The sensor on the floor must be firmly fixed on the work platform.

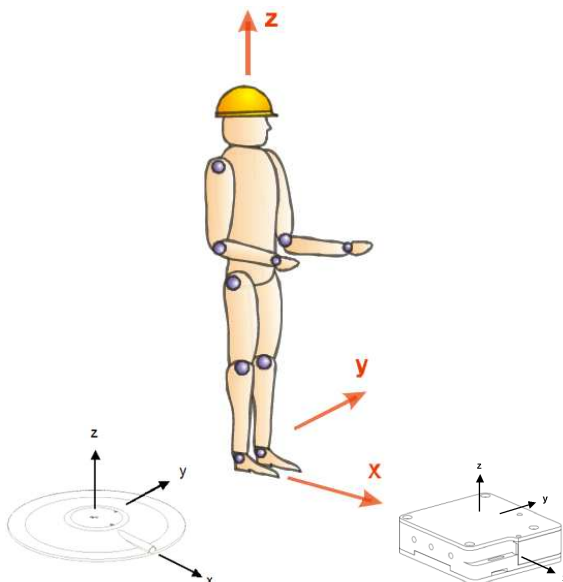


Figure 55: of X, Y and Z axes – driver's position towards sensor

The vibration must be measured in the vicinity of the operator's feet (within a 100mm diameter area).



If an Evec is located on the floor it may be kept in place using a bag full of sand.



If the work platform is covered with resilient material the EvecFloor can be attached (using the supplied magnets) in the middle of a stiff metallic plate (of approximately 300mm x 400mm x 5mm) upon which the operator will take place.

3.2.3.2 EvecDetect

There is no particular rules to follow for the EvecDetect location. It must be located such that detection occurs when the operator work at his/her usual work station.

The EvecDetect is based on the infrared technology. Its detects any object located within its lobe detection, which is illustrated in Figure 56.

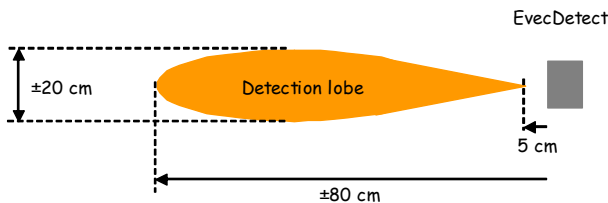


Figure 56: EvecDetect Detection Lobe



When the EvecDetect sensor starts detecting the operator, the LED will turn green for 4 seconds and will blink as long as the operator is detected.

When the operator leaves the detection area, the LED will turn red for 4 seconds and then keep blinking until the operator is detected again or the results are downloaded using the PocketEvecSensorDuo software.



It is more convenient to put EvecDect in place before getting it ready to measure. This will avoid spurious detections occurring when manipulating the sensor.

3.2.4 Operation


EvecFloor measures vibrations along the X, Y and Z axis. EvecDetect works as an remote presence sensor and measures the time when the operator is present at its work position where he/she is exposed to vibration.

Once the operator has finished his/her work vibration measured can be accessed with the PocketEvecSensorDuo software.

3.2.5 Accessing measurement results

Step 1

Place the PocketPC within range of the sensors


	<p>No communication can be established between the PocketPC and the EvecDetect sensor as long as a human body or an object is present in its detection area. The Bluetooth® communication is then switched off to reduce sensor power consumption and increase autonomy.</p> <p>As soon as the detection area is free EvecDetect enables the Bluetooth communication again. There might be a few seconds delay before Bluetooth® starts running again and the EvecSensorDuo software can start communicating with the sensor..</p>
---	--

Step 2

Run the PocketEvecSensorDuo software; the welcome screen will appear (Figure 57).



Figure 57: Welcome screen

Tap the arrow  to move to the next screen

Step 3

The screen where the measurement configuration can be selected appears (Figure 58).

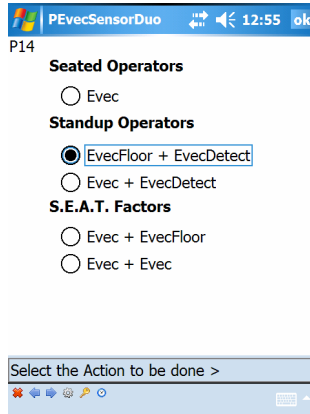


Figure 58: Measurement configuration selection

Select the option for Standup Operators corresponding to the measurement that has been performed and tap the arrow ➡ to move to the next screen.

Step 4

Select the 'Access Sensors Measures' option (see Figure 59).

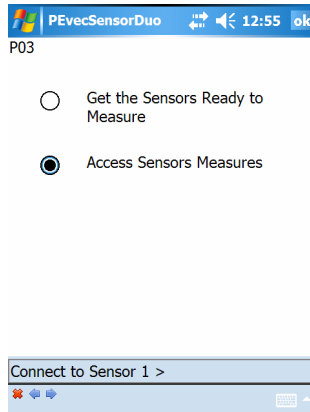


Figure 59: Selection of the operation to perform

Tap the arrow ➡ to move to the next screen and connect to the first sensor.

Step 5

Tap the 'Connect' button (Figure 60).

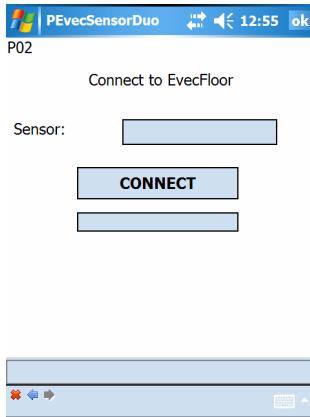


Figure 60: Connection to the first sensor (1)

The connection process between the PocketPC and the sensor will start. After a few seconds, the Bluetooth Browser of your PocketPC will be called for you to be able to select the first sensor you have worked with from the list (Figure 61).

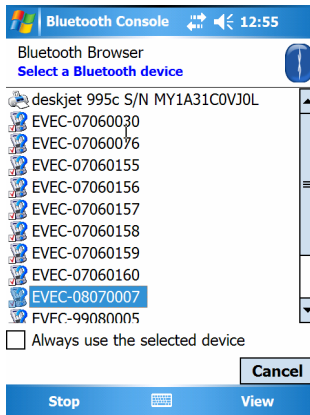


Figure 61: Connection to the first sensor (2)

Once the connection is established, the screen shown in Figure 62 appears.

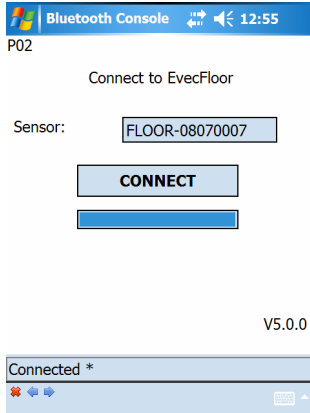



Figure 62: Connection to the first sensor (3)

Tap the arrow  to move to the next screen

Step 6

Tap the 'Read' button to download measurement from the first sensor.

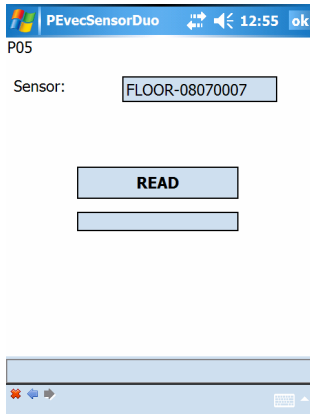


Figure 63: Downloading measurements from the first sensor (1)

Downloading the measures may take a few seconds.

When this process is complete, the screen shown in Figure 64 appears.

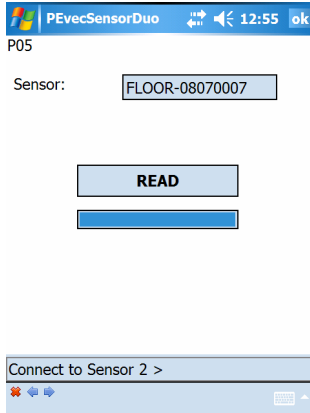



Figure 64: Downloading measurements from the first sensor (2)

Tap the arrow  to move to the next screen and connect to the second sensor.

Step 7

Tap the 'Connect' button (Figure 65).

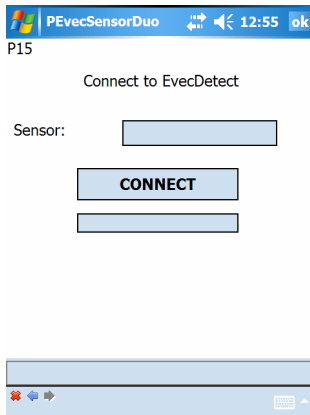


Figure 65: Connection to the second sensor (1)

The connection process between the PocketPC and the sensor will begin.

After a few seconds, the Bluetooth Browser of your PocketPC will be called again for you to be able to select the second sensor you have worked with from the list (Figure 66).

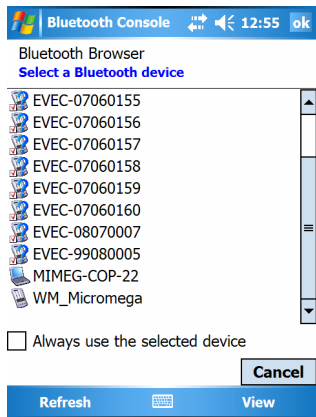


Figure 66: Connection to the second sensor (2)

Once the connection is established with the second sensor, the screen shown in Figure 67 appears.

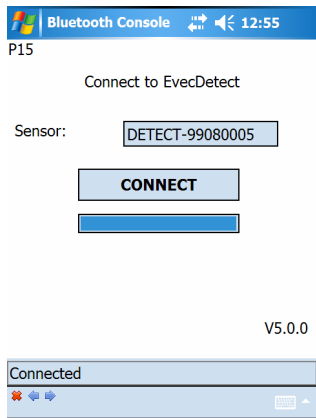


Figure 67: Connection to the second sensor (3)

Tap the arrow ➡ to move to the next screen

Step 8

Tap the 'READ' button to download measurements from the second sensor.

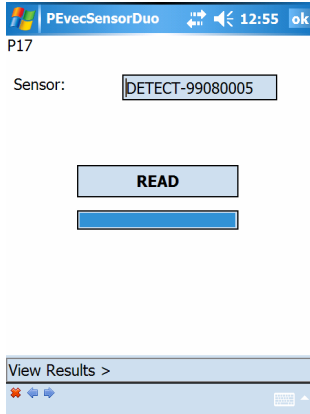


Figure 68: Downloading measurements from the second sensor (1)

Downloading the measures may take a few seconds. When this process is complete, the screen shown in Figure 69 appears.

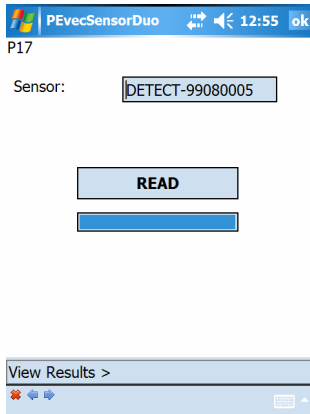



Figure 69: Downloading measurements form the second sensor (2)

Tap the arrow icon () to move to the next screen and indicate the type of measurement that has been made.

Step 9

The EVEC devices are usually used to take measurement throughout the operator's work day/shift (option 1 in Figure 70).

Nevertheless it is possible to assess the exposure to vibration by taking a measurement during a part of the operator's work day/shift only, provided that the operator's work during that period represents operator's usual exposure to vibration. The time period when the operator is present at its work station during his/her work day/shift must then be estimated and entered manually (option 2 in Figure 70, then Figure 71).

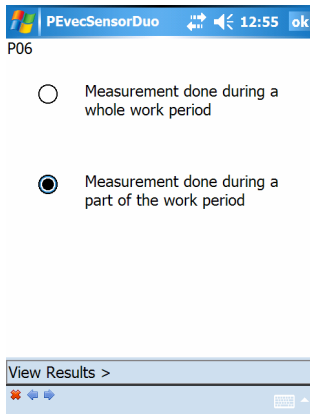


Figure 70: Type of measurement selection

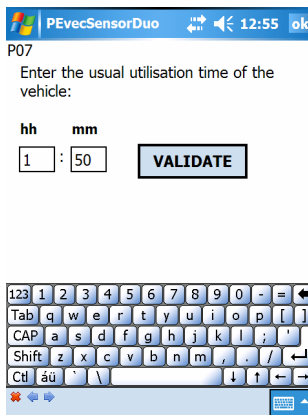



Figure 71: Entering the utilization time



If there is a large extrapolation, i.e., if the measurement was taken during a short period of time as compared to the driver's usual operation time of the vehicle during his/her work day/shift, a warning window pops up

Tap the arrow icon () to move to the next screen and display exposure values.

Step 10

Measurement results are displayed (see Figure 72).

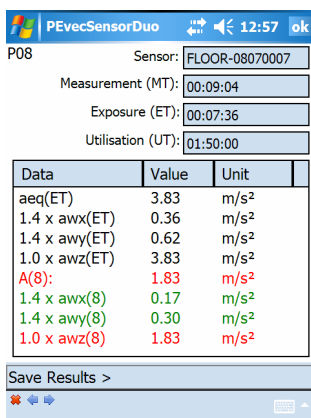


Figure 72: Results display

Measurement Time (MT)

This is the duration from the time the operator first is detected to the last time he is detected.

Exposure Time (ET)

This is the time period when the operator is exposed to vibration during the measurement process. This is the measurement time (MT), minus time periods when the operator was not detected.

Utilization Time (UT)

This is the time where the operator works during his/her work day/shift (i.e. the time where he/she is actually present at its/her work station). If the measurement is taken throughout the time the operator is detected during his/her work day/shift, the time of use matches the exposure time (ET), which is then automatically measured by the EvecDetect sensor.

$a_{wx}(ET)$, $a_{wy}(ET)$, $a_{wz}(ET)$

These are the RMS weighted accelerations along the X, Y, and Z-axes respectively that have been measured during the Exposure Time period (ET).

$a_{eq}(ET)$


This is the maximum of the (rms) weighted accelerations along the X, Y, and Z-axes ($a_{wx}(PE)$, $a_{wy}(PE)$, $a_{wz}(PE)$) after multiplication by their respective coefficients.

$a_{wx}(8)$, $a_{wy}(8)$, $a_{wz}(8)$


These are the RMS weighted accelerations along the X, Y, and Z-axes respectively that have been calculated for a period of 8 hours.

A(8)

The daily exposure A(8) is expressed as the equivalent continuous acceleration over an eight-hour period, calculated as the highest (rms) value along X, Y, and Z-axes after multiplication by their respective coefficients. This daily exposure value is compared to the action and limit values defined in the law (please refer to the transposition of the European directive 2002/44/EC into the law of your country).

Tap the  arrow to move to the next screen and save measurement results.

Step 11

The text boxes on the two next screens (Figure 73 et Figure 74) allows you entering information about the driver and the measurement context, and saving this information to a file together with vibration data (tap the floppy disk icon  to do so).

If the « save as evenc file » box is checked and if the software key related to the Evenc sensor has been entered (see section 2.6.2) the full vibration history will be saved. It can then be transferred to a PC where vibration data can be plotted and analysed using the “EvencViewerDuo” software.

P09

Driver

Mary

Company

QR Inc

Vehicle

Pallet Truck 02

Figure 73: Saving results (1)

P10

Remark

Hall 07

☐ Save as Evec file

Figure 74: Saving results (2)

3.2.6 Switching off the sensors

When you don't use the sensors, place them in their casing. The magnet hidden in the protection foam switches the sensors off automatically to preserve battery power.

3.3 S.E.A.T. factors measurement

3.3.1 Introduction

Exposure to vibration of a seated operator (as if the Evec sensor was used alone) as well as seat efficiency (i.e. S.E.A.T. factors) are measured simultaneously.

3.3.2 Powering on the sensors

When the sensors are placed in their casing they are powered off by small magnets hidden in the protective foam. Each sensor powers on automatically as soon as it is removed from the casing.

3.3.3 Getting the sensors ready to measure

Step 1

Remove the sensors from their casing and place them within range of the PocketPC.

Step 2

Run the PocketEvecSensorDuo software ; The welcome screen will appear (Figure 75).

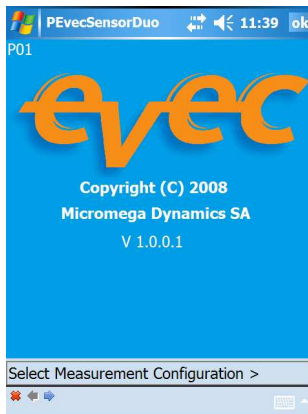


Figure 75: Welcome screen

Tap the arrow ➡ to move to the next screen

Step 3

The screen where the measurement configuration can be selected appears (Figure 76).

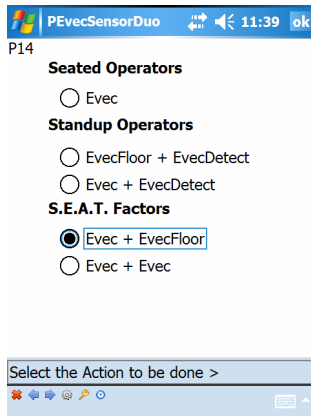



Figure 76: Measurement configuration selection

Select an option for S.E.A.T. factors and tap the arrow  to move to the next screen.

Step 4

Select the 'Get the Sensors Ready to Measure' option (Figure 77).

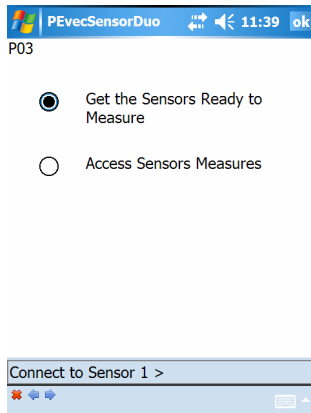



Figure 77: Selection of the operation to perform

Tap the arrow  to move to the next screen and get the first sensor ready to measure.

Step 5

Tap the 'CONNECT' button (Figure 78).

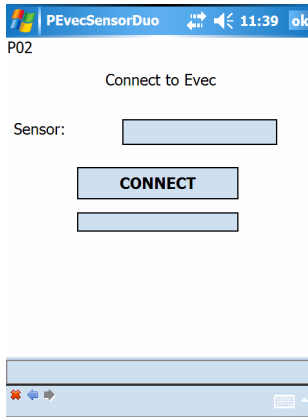


Figure 78: Connection to the first sensor (1)

The connection process between the PocketPC and the sensor will begin. After a few seconds, the Bluetooth Browser of your PocketPC will be called for you to be able to select the Evec sensor you want to work with from the list (Figure 79).

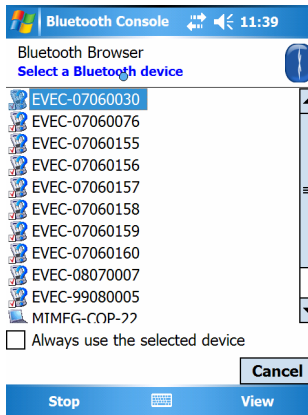


Figure 79: Connection to the first sensor (2)



If the list is empty or if the Bluetooth browser does not appear your Bluetooth utility is probably not correctly configured. Please refer to section 2.4.

Once the connection is established, the screen shown in Figure 80 appears.

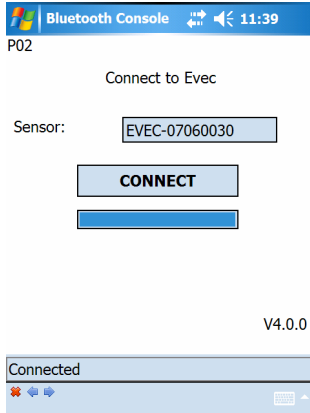



Figure 80: Connection to the first sensor (3)

Tap the arrow  to move to the next screen and get the first sensor ready to measure.

Step 6

Tap the 'Trigger On' button (see Figure 81).

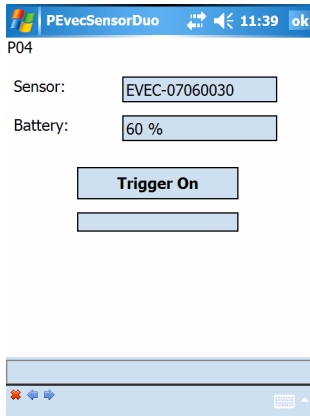


Figure 81: Getting the first sensor ready to measure (1)

A pop-up window will appear up telling you that the 'Trigger On' process will erase any previous measures that may still be stored in the sensor memory. Confirm your choice.

The 'Trigger On' process may take a few seconds

If this process succeeds the screen shown in Figure 82 will appear.

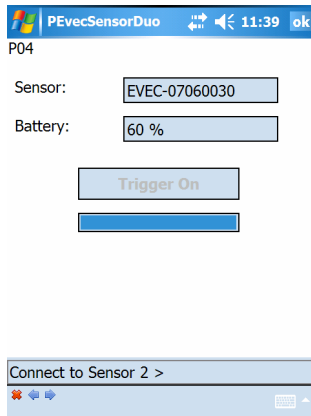



Figure 82: Getting the first sensor ready to measure (2)

Tap the arrow  to move to the next screen and connect to the second sensor.

Step 7

Tap the 'CONNECT' button (Figure 83).

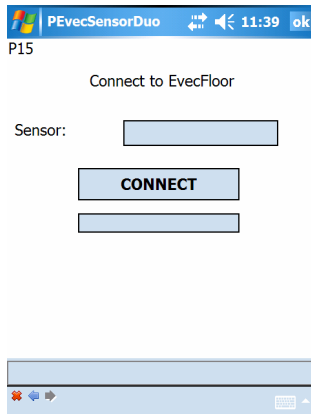


Figure 83: Connection to the second sensor (1)

The connection process between the PocketPC and the sensor will begin.

After a few seconds, the Bluetooth Browser of your PocketPC will be called for you to be able to select the second sensor you want to work with from the list (Figure 84).

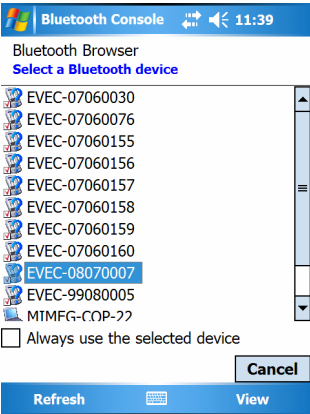


Figure 84: Connection to the second sensor (2)

Once the PocketPC is connected to the sensor, the screen shown in Figure 85 appears.

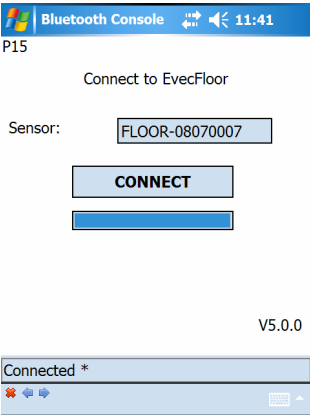



Figure 85: Connection to the second sensor (3)

Tap the arrow  to move to the next screen and get the second sensor ready to measure.

Step 8

Tap the 'Trigger On' button (see Figure 81).

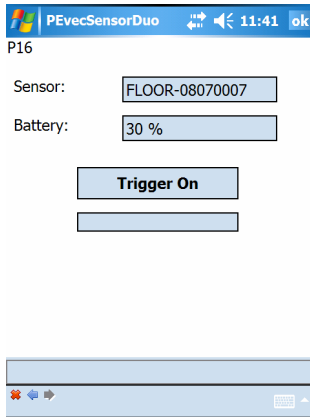


Figure 86: Getting the second sensor ready to measure (1)

A pop-up window will appear up telling you that the 'Trigger On' process will erase any previous measures that may still be stored in the sensor memory. Confirm your choice.

The « Trigger On » process may take a few seconds.

If this process succeeds the screen shown in Figure 87 will appear.

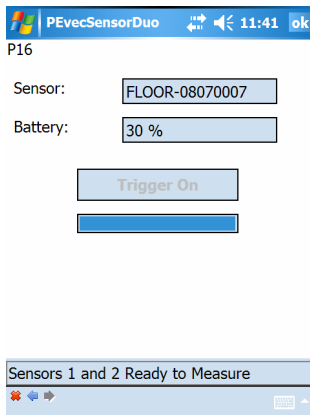


Figure 87: Getting the second sensor ready to measure (2)

The sensors are then ready to measure. You can exit the software (✖ icon at the bottom) and install the sensors on the driver's seat and on the floor.



The LED on the Evec will blink (red color) as soon as it is ready to measure.

The LED on the EvecFloor (or on the Evec if used on the floor) will blink (green color) as soon as it is ready to measure.

3.3.4 Installing the sensors

3.3.4.1 Installing the sensor on the seat.

Standards define 3 axes: the X-axis (to the front), the Y-axis (to the left) and the Z-axis (to the top). Accelerations will be measured along these 3 axes in order to retrieve the driver's whole-body exposure.

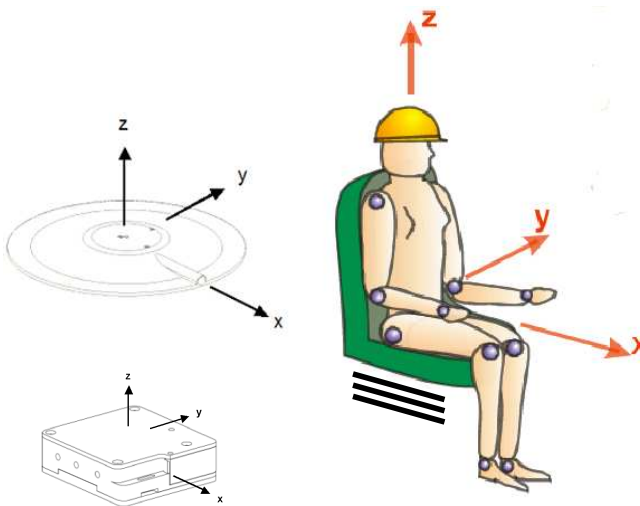


Figure 88: Definition of X, Y and Z axes – driver's position towards sensors

The bump on the top surface of the sensor that houses the charger connector corresponds to the X-axis and must be face forward. The sensor may be kept in place using a strip of adhesive; but this is not required for reliable and accurate measurements.

When sitting the driver must cover the sensor completely.



In some types of vehicles, the driver does not face the driving/moving direction. According to the standard, the X, Y, and Z-axes are referenced to the driver's body, the X-axis matching the back-to-chest direction.



You can install the sensors before preparing them to measure.

Note that the Evec sensor must be made ready for measurements before the driver sits on it. There is no communication possible between the reader software and the sensor when the driver's presence is detected (Bluetooth communication is switch off to reduce power consumption and increase sensor autonomy).



When the driver sits on the Evec sensor, the LED will first turn green for about 4 seconds, and then will start to blink (green) as the driver's presence is detected.

When the driver leaves the seat, the LED will turn red for about 4 seconds, and then start to blink (red) until the driver sits again or the user establishes a connection to the sensor using the PocketPC.

3.3.4.2 Installing the Sensor on the floor

The EvecFloor sensor must have the same orientation as the Evec sensor on the seat; i.e. their X, Y and Z axis must match.

The EvecFloor has to be firmly fixed on the floor and must be located straight above the Evec sensor on the seat.

If this is not possible - for example because there is no room underneath the seat - the EvecFloor can be fixed on the seat framework using the provided magnets. These magnets can be fixed to the side of the sensor in the threaded holes.

If you use an Evec on the floor instead of an EvecFloor, the Evec has to be kept in place to prevent measurement errors (e.g. if the Evec moves on the floor then vibration measures will not be consistent with vibration levels on the floor). This can be achieved – for example - by covering it with a bag full of sand (approximately 10kg).


3.3.5 Operation

The sensors then become autonomous and store vibration measures along X, Y and Z-axes during the time the driver uses the vehicle. The time when the driver is exposed to vibration is also measured thanks to the embedded presence sensor. Once the driver has finished his/her work, the two sensors may be placed within range of your PocketPC and vibration exposure values can be accessed using the PocketEvecSensorDuo software

3.3.6 Accessing measurement results

Step 1

Place the sensors within range of your PocketPC and run the PocketEvecSensorDuo software


	No communication can be established between the PC and a sensor as long as the driver remains seated on it (driver's presence is detected and Bluetooth® communication is switched off to reduce Evec Sensor power consumption and increase autonomy). As soon as the driver is no longer detected, the Bluetooth communication on the sensor is enabled again. There might be a few seconds delay before Bluetooth® starts running again and the EvecSensorDuo software can start communicating with the sensor.
---	---

Step 2

Run the PocketEvecSensorDuo software; the Welcome screen appears (Figure 89).



Figure 89: Welcome screen

Tap the arrow  to move to the next screen

Step 3

The screen where the measurement configuration can be selected appears (Figure 90).

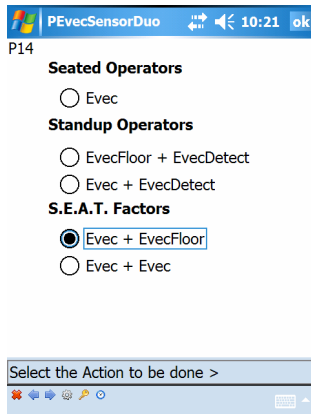


Figure 90: Measurement configuration selection

Select the option for S.E.A.T factors corresponding to the measurement that has been performed and tap the arrow ➡ to move to the next screen.

Step 4

Select the 'Access Sensors Measures' option (see Figure 91).

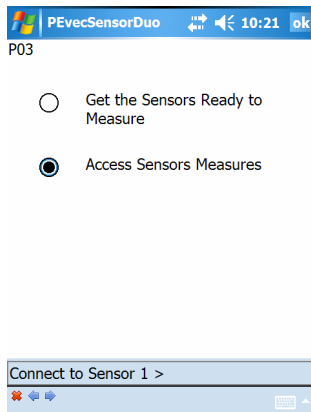


Figure 91: Selection of the operation to perform

Tap the arrow ➡ to move to the next screen and connect to the first sensor.

Step 5

Tap the 'CONNECT' button (Figure 92).

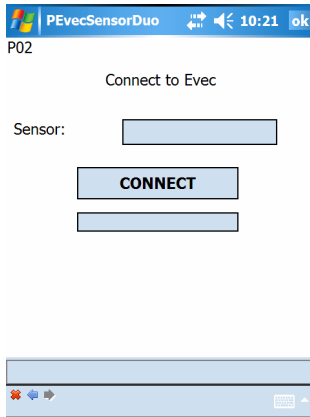


Figure 92: Connection to the first sensor (1)

The connection process between the PocketPC and the sensor will begin. After a few seconds, the Bluetooth Browser of your PocketPC will be called for you to be able to select the EVEC sensor you have worked with from the list (Figure 93).

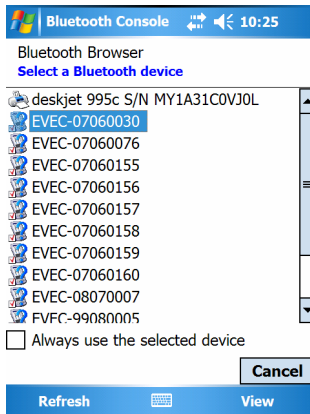


Figure 93: Connection to the first sensor (2)

Once the PocketPC is connected to the EVEC sensor, the screen shown in Figure 94 appears.

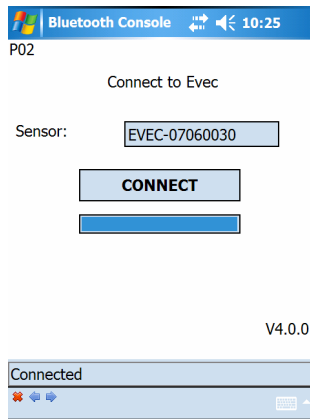


Figure 94: Connection to the first sensor (3)

Tap the arrow ➡ to move to the next screen.

Step 6

Tap the 'READ' button to download measurements from the EVEC sensor.

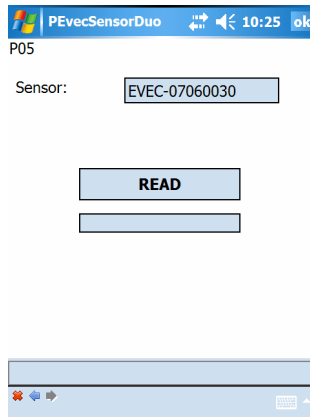


Figure 95: Downloading measurements from the first sensor (1)

Downloading the measures may take a few seconds.

When this process is complete, the screen shown in Figure 96 is displayed.

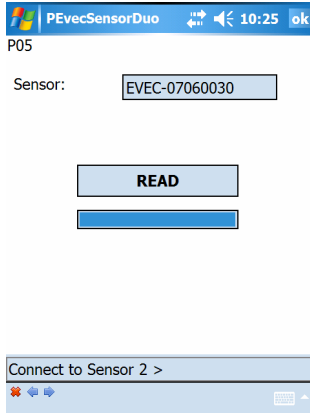



Figure 96: Downloading measurements from the first sensor (2)

Tap the arrow  to move to the next screen and connect to the second sensor.

Step 7

Tap the 'CONNECT' button (Figure 97).

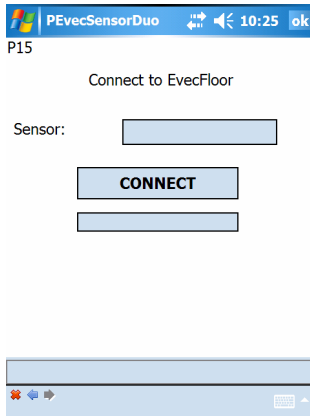


Figure 97: Connection to the second sensor (1)

The connection process between the PocketPC and the sensor will begin.

After a few seconds, the Bluetooth Browser of your PocketPC will be called again for you to be able to select the second sensor you have worked with from the list (Figure 98).

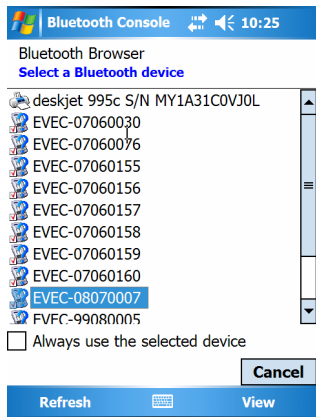


Figure 98: Connection to the second sensor (2)

Once the connection to the second sensor is established, the screen shown in Figure 99 appears.

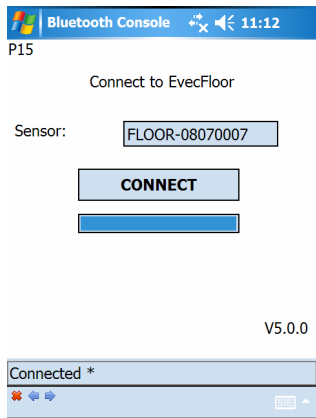


Figure 99: Connection to the second sensor (3)

Tap the arrow ➡ to move to the next screen

Step 8

Tap the 'READ' button to download measurement from the second sensor.

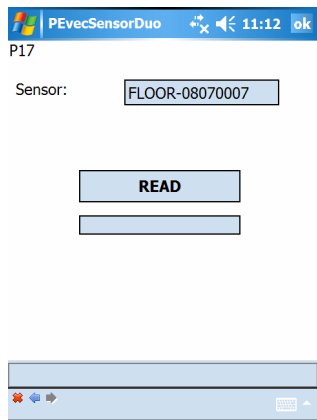


Figure 100: Downloading measurements from the second sensor (1)

Downloading the measures may take a few seconds. When this process is complete, the screen shown in Figure 101 is displayed.

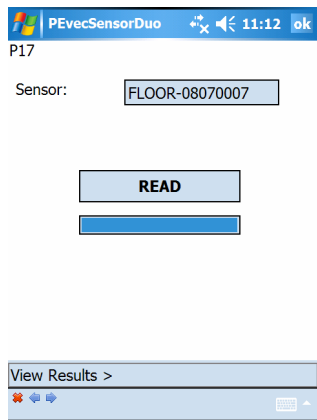


Figure 101: Downloading measurements from the second sensor (2)

Tap the arrow ➡ to move to the next screen and select the type of operation that has been performed.

Step 9

The Evec devices are usually used to take measurements throughout the operator's work day/shift (option 1 in Figure 102).

Nevertheless it is possible to assess the exposure to vibration by taking a measurement during a part of the operator's work day/shift only, provided that the operator's work during that period represents operator's usual exposure to vibration. The time period when the operator uses the machine during his/her work day/shift must then be estimated and entered manually (option 2 in Figure 102, then Figure 103).

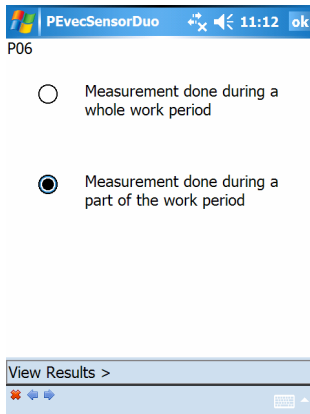


Figure 102: Type of measurement selection

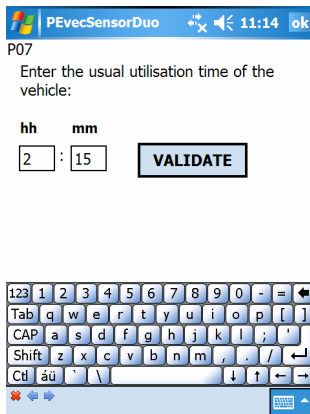



Figure 103: Entering the utilization time (UT)



If there is a large extrapolation, i.e. if the measurement was taken during a short period of time as compared to the operator's usual operation time during his/her work day/shift, a warning window pops up.

Tap the  arrow to move to the next screen and display vibration exposure values.

Step 10

Measurement results are displayed (see Figure 104).

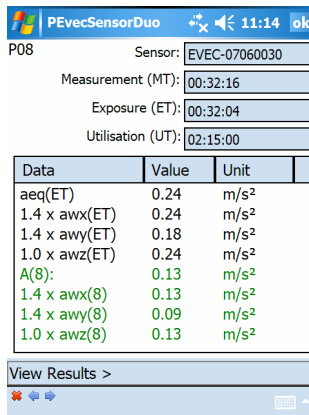


Figure 104: Measurement results (doses)

Measurement Time (MT)

This is the duration from the time the operator first is detected to the last time he/she is detected.

Exposure Time (ET)

This is the time period when the operator is exposed to vibration during the measurement process. This is the measurement time (MT), minus time periods when the operator was not detected.

Utilization Time (UT)

This is the time when the operator works during his/her work day/shift (i.e. the time where he/she is actually present at his/her work station). If the measurement is taken throughout the time the operator is detected during his/her work day/shift, the time of use matches the exposure time (ET), which is then automatically measured by the EvectDetect sensor.

$a_{wx}(ET)$, $a_{wy}(ET)$, $a_{wz}(ET)$

These are the RMS weighted accelerations along the X, Y, and Z-axes respectively that have been measured during the Exposure Time period (ET).

 $a_{eq}(ET)$


This is the maximum of the (rms) weighted accelerations along the X, Y, and Z-axes ($a_{wx}(PE)$, $a_{wy}(PE)$, $a_{wz}(PE)$) after multiplication by their respective coefficients.

 $a_{wx}(8)$, $a_{wy}(8)$, $a_{wz}(8)$

These are the RMS weighted accelerations along the X, Y, and Z-axes respectively that have been calculated for a period of 8 hours.

 $A(8)$

The daily exposure $A(8)$ is expressed as the equivalent continuous acceleration over an eight-hour period, calculated as the highest (rms) value along X, Y, and Z-axes after multiplication by their respective coefficients. This daily exposure value is compared to the action and limit values defined in the law (please refer to the transposition of the European directive 2002/44/EC into the law of your country).

Tap the  arrow to move to the next screen and display S.E.A.T. factors.

Step 11

S.E.A.T. factors are displayed (Figure 105).

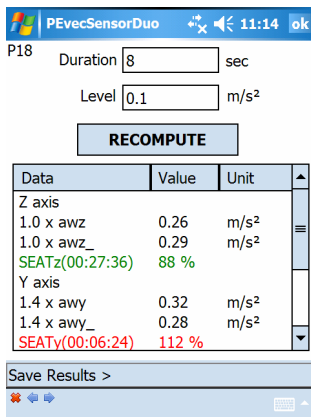


Figure 105: Measurement results (S.E.A.T. factors)

S.E.A.T factors along X, Y and Z axes.

The S.E.A.T factor in a given axis is the ratio – expressed as a percentage – between the RMS value of weighted accelerations on the seat in a given axis and the corresponding RMS value of weighted accelerations on the floor in the same axis.


The weighted accelerations taken into account for S.E.A.T factors computation are those matching the defined criteria for both seat and floor measurement locations. I.e. acceleration values must be above the given threshold for at least the given duration to be included in the computation. This is to prevent loss of accuracy when a ratio is computed from low values.

The cumulated time periods when the criteria is met is also computed for each axis and indicated; e.g. SEATz(HH :mm :ss) for the S.E.A.T factor along the z axis.


Values for both duration and threshold can be modified and S.E.A.T. factors can then be updated accordingly by tapping « Recompute ».



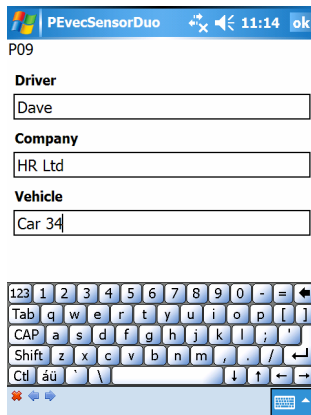
Only the S.E.A.T. factor in the Z axis (vertical axis) is defined in related standards. The S.E.A.T. factors in X and Y axes are given for information only. Their interpretation requires a good level of expertise.

Tap the arrow  to move to the next screen and save measurement results.

Step 12

The text boxes on the two next screens (Figure 106 et Figure 107) allows you entering information about the driver and the measurement context, and saving this information to a file together with vibration data (tap the floppy disk icon  to do so).

If the « save as evrec file » box is checked and if the software key related to the Evrec sensor has been entered (see section 2.6.2) the full vibration history will be saved. It can then be transferred to a PC where vibration data can be plotted and analysed using the “EvrecViewerDuo” software.



The screenshot shows the PVecSensorDuo application interface. At the top, there is a status bar with the application name, signal strength, battery level, and time (11:14). Below the status bar, the text "P09" is displayed. The main area contains three labeled text input fields: "Driver" with the text "Dave", "Company" with the text "HR Ltd", and "Vehicle" with the text "Car 34". At the bottom of the screen, there is a virtual keyboard with various keys including numbers, letters, and function keys like Tab, CAP, Shift, and Ctrl.

Figure 106: Saving results (1)

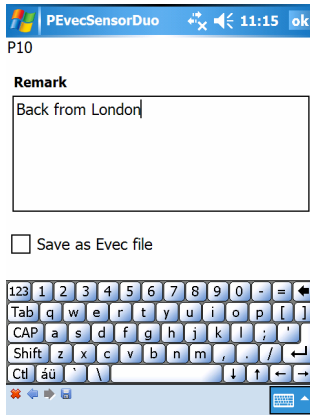


Figure 107: Saving results (2)

3.3.7 Switching off the sensors


When you don't use the sensors, place them in their casing. The magnet hidden in the protection foam switches the sensors off automatically to preserve battery power.

3.4 Setting T0

The Evec devices store data acquired at high-speed at every T0 time interval. The default value for T0 is 4 seconds. This default setting gives enough details for most usages.

In some situations where operators frequently leave and return their work position (e.g. operators working with pallet trucks and collecting goods from a storage area) the 4 seconds T0 default value may be too high. The built-in automatic artifact rejection algorithm automatically discards measurements intervals at the beginning and at the end of the operator detection process. These transient periods often correspond to vibration that are not generated by the machine but by the driver accessing or leaving its work position and must not be taken into account for vibration dose computation. On the other hand - if the operator is only present at its work position for a few seconds – discarding these T0 intervals may lead to the exposure time to be under evaluated.

That is the reason why shorter T0 value can be selected in the 'PocketEvecSensorDuo' software.

From the measurement configuration selection screen (Figure 108) tap the  icon in the toolbar at the bottom of the screen.

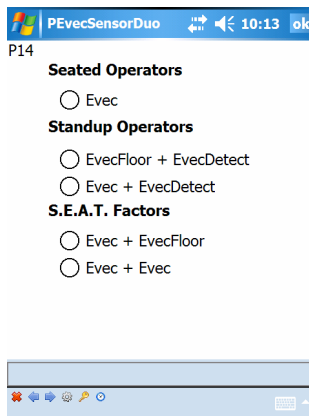


Figure 108: Measurement configuration selection screen

The screen shown in Figure 109 appears.

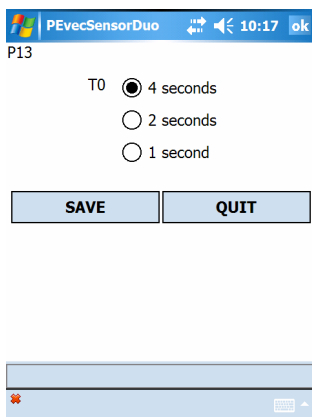


Figure 109: T0 settings

Select the T0 interval duration you need to tap « save ». Tap « Quit » to return to the normal flow of the software.



The new value for T0 will be taken into account at the next measurement as the T0 value is sent to the sensor(s) when you get them ready to measure.



Some Evec sensors can only be configured with a time interval of 4 seconds. If the time interval T0 you have selected is not supported by your sensor you will receive an alert message and T0 will be forced to 4 seconds. The Evec sensor firmware can be updated to be able to handle different T0 values. Please contact your distributor if you need this update.

3.5 Charging the sensors battery



Always use the charger supplied. Using a charger other than the one provided may damage the Evec sensor(s).

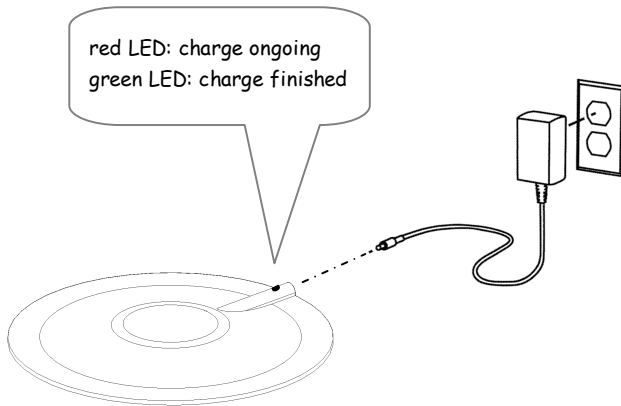


Figure 110: Charging the EVEC Sensor Battery

The sensor LED turns red when charging. It turns green when the charge has completed.



When the battery is deeply discharged, the LED will turn orange for approximately one minute when connecting the charger, it will then return to the normal sequence: i.e., the LED will turn red during charging, and then green when charging is complete. If the LED remains orange for a long period, the battery can no longer be used.

If the battery was deeply discharged, the green LED could never turn green even after hours of charging. In this case you have to disconnect the sensor from the charger, switch the sensor off and on to reinitialize the sensor. This reinitialization can be done by placing the sensor in the casing and taking it out.

Section 4 - Characteristics of Evec

4.1 Compliance with standards

- The EvecSensor whole-body vibration dosimeter has been developed in partnership with INRS (Institut National de Recherche et de Sécurité en France – Research Center for Safety, France) under agreement 5061249. INRS has verified that this device can be used for whole-body vibration exposure measurements.
- Acceptance testing has been carried out according to EN ISO 8041:2005, section 12.
- Each manufactured device is tested according to ISO 8041:2005, section 13.

4.2 Frequency Weightings

The following frequency weightings are implemented in the EvecSensor.

- W_d frequency weightings along X and Y-axes
- W_k frequency weightings along the Z-axis

Those frequency weightings comply with ISO 2631, the standard referred to for whole-body vibration exposure measurements.

4.3 Extrapolation – Partial Measurement

In some cases, the user may take a measurement during a period of time that lasts less than the usual time the driver uses the vehicle during his/her work day; this is to provide a general idea of the driver's exposure to vibration more quickly. For example, this is possible when the driver's work is repetitious or cyclic; the driver's working conditions and particularly his/her exposure to vibration being the same from one cycle to another. The user must then estimate the full utilization time period (UT) of the vehicle by the driver (i.e. the period of time when he/she is present at his/her driving position during his/her work day).

The computation for the daily exposure value A(8) is then the following:

$$A(8) = a_{eq}(ET) \cdot \sqrt{\frac{UT}{8}}$$

- where $a_{eq}(ET)$ is the maximum of the 3 weighted (rms) accelerations along the X, Y and Z axes measured over the Exposure Time (ET); the maximum being evaluated after multiplication by the normalized coefficients for each axis:

$$a_{eq}(ET) = \max(k_x \times a_{wx}(ET); k_y \times a_{wy}(ET); k_z \times a_{wz}(ET))$$

- where UT is the utilization time period of the vehicle by the driver during his/her work day

4.4 Sensor Dynamics

Parameter	Conditions		Min.	Typ.	Max.	Unit
Error - weighted accelerations along X, Y and Z	Sine Wave Amplitude : 1 m/s ² Frequency : 15.915Hz t ₀ = 23°C				±4	%
Sensitivity to temperature - weighted accelerations	T from -10°C to 50°C	Ambient temperature			±5	%
		Surface temperature			±4	%
Frequency weighting and response	T = 23°C	f ≤ 0.2512Hz	-100		+26	%
		0.2512Hz < f < 0.631Hz	-21		+26	%
		0.631 ≤ f ≤ 63.1Hz	-11		+12	%
		63.1 Hz < f < 158.5 Hz	-21		+26	%
		158.5 Hz ≤ f	-100		+26	%
Linearity error- Amplitude	T from -10°C to 50°C				6	%
Linear operation range	T from -10°C to 50°C		60			dB
Response to normalized pulses – Tolerance on rms values	T = 23°C				±10	%
Resolution of exposure time measurements	T from -10°C to 50°C		1			s
Time measurement accuracy	T from -10°C to 50°C		0.1			%
Electrical crosstalk	T = 23°C				0.5	%
Mechanical crosstalk	T = 23°C				5	%
Accelerometer resonant frequency	T = 23°C		800			Hz
Shocks resistance	T from -10°C to 50°C		1000			m/s ²

4.5 Storage Capacity and Autonomy

- Sensor storage capacity:
 - 36 hours of measurement (T0=4sec.)
 - 18 hours of measurement (T0=2sec.)
 - 9 hours of measurement (T0=1sec.)
- Autonomy when measuring (Bluetooth® disabled): > 20 hours
- Autonomy (Bluetooth® enabled) : > 10 hours
- Minimum number of allowed battery charge cycles : 500

4.6 Sensor Physical Characteristics

Dimensions: diameter: 205mm
 height: 12mm
 (complies with ISO10326-1)

Weight: 350 grams

4.7 Environment

Sensor temperature operating range: from -10°C to 50°C (from 0°C to 40°C when charging).

4.8 Measurement results

- Maximum error on RMS weighted accelerations over an 8-hour period:
0.05 m/s²

4.9 Charger

Input: 100~240 VAC 50~60 Hz 150 mA

Output: 5 VDC 1000 mA

4.10 Wireless Link

- Bluetooth® Class 2
- Communication up to 30 m (open field)
- Nominal Emission Power: +4dBm
- Nominal Sensitivity: -84dBm
- ISM Band 2.4GHz

4.11 Electromagnetic Compatibility

- Radiated emissions tested according to EN 55022.
- Immunity tested according to EN 61000-4-8/6/2/3.

Section 5 - Characteristics of EvecFloor

5.1 Compliance with standards

- The EvecFloor has been developed in partnership with INRS (Institut National de Recherche et de Sécurité en France – Research Center for Safety, France) under agreement 5061249. INRS has verified that this device can be used for whole-body vibration exposure measurements.
- Acceptance testing has been carried out according to EN ISO 8041:2005, section 12.
- Each manufactured device is tested according to ISO 8041:2005, section 13.

5.2 Frequency Weightings

The following frequency weightings are implemented in the EvecFloor

- W_d frequency weightings along X and Y-axes
- W_k frequency weightings along the Z-axis

Those frequency weightings comply with ISO 2631, the standard referred to for whole-body vibration exposure measurements.

5.3 Sensor Dynamics

Parameter	Conditions		Min.	Typ.	Max.	Unit
Error - weighted accelerations along X, Y and Z	Sine Wave Amplitude : 1 m/s ² Frequency : 15.915Hz t ₀ = 23°C				±4	%
Sensitivity to temperature - weighted accelerations	T from -10°C to 50°C	Ambient temperature			±5	%
		Surface temperature			±4	%
Frequency weighting and response	T = 23°C	f ≤ 0.2512Hz	-100		+26	%
		0.2512Hz < f < 0.631Hz	-21		+26	%
		0.631 ≤ f ≤ 63.1Hz	-11		+12	%
		63.1 Hz < f < 158.5 Hz	-21		+26	%
		158.5 Hz ≤ f	-100		+26	%
Linearity error- Amplitude	T from -10°C to 50°C				6	%
Linear operation range	T from -10°C to 50°C		60			dB
Response to normalized pulses – Tolerance on rms values	T = 23°C				±10	%
Resolution of exposure time measurements	T from -10°C to 50°C		1			s
Time measurement accuracy	T from -10°C to 50°C		0.1			%
Electrical crosstalk	T = 23°C				0.5	%
Mechanical crosstalk	T = 23°C				5	%
Accelerometer resonant frequency	T = 23°C		800			Hz
Shocks resistance	T from -10°C to 50°C		1000			m/s ²

5.4 Storage Capacity and Autonomy

- Sensor storage capacity:
 - 36 hours of measurement (T0=4sec.)
 - 18 hours of measurement (T0=2sec.)
 - 9 hours of measurement (T0=1sec.)
- Autonomy when measuring (Bluetooth® disabled): > 20 hours
- Autonomy (Bluetooth® enabled) : > 10 hours
- Minimum number of allowed battery charge cycles : 500

5.5 Sensor Physical Characteristics

Dimensions: Length: 65 mm
 Width: 62 mm
 Height: 20 mm (with fixing magnets)

Weight: 120 grams (with fixing magnets)

5.6 Environment

Sensor temperature operating range: from -10°C to 50°C (from 0°C to 40°C when charging).

5.7 Measurement results

- Display resolution for RMS weighted accelerations: 0.01 m/s²
- Maximum error on RMS weighted accelerations over an 8-hour period: 0.05 m/s²

5.8 Charger

Input: 100~240 VAC 50~60 Hz 150 mA
Output: 5 VDC 1000 mA

5.9 Wireless Link

- Bluetooth® Class 2
- Communication up to 30 m (open field)
- Nominal Emission Power: +4dBm
- Nominal Sensitivity: -84dBm
- ISM Band 2.4GHz

5.10 Electromagnetic Compatibility

- Radiated emissions tested according to EN 55022.
- Immunity tested according to EN 61000-4-8/6/2/3.

Section 6 - Characteristics of EvectDetect

6.1 Compliance with standards

- The EvectDetect has been developed in partnership with INRS (Institut National de Recherche et de Sécurité en France – Research Center for Safety, France) under agreement 5061249. INRS has verified that this device can be used for whole-body vibration exposure measurements.

6.2 Dynamic device characteristics

Detection Range: from 5 to 80 cm of the case of the sensor.

6.3 Storage Capacity and Autonomy

- Sensor storage capacity:
 - 36 hours of measurement (T0=4sec.)
 - 18 hours of measurement (T0=2sec.)
 - 9 hours of measurement (T0=1sec.)
- Autonomy when measuring (Bluetooth® disabled): > 20 hours
- Autonomy (Bluetooth® enabled) : > 10 hours
- Minimum number of allowed battery charge cycles : 400

6.4 Sensor Physical Characteristics

Dimensions: Length: 65 mm
 Width: 62 mm
 Height: 38 mm

Weight: 195 grams (with fixing magnets)

6.5 Environment

Sensor temperature operating range: from -10°C to 50°C (from 0°C to 40°C when charging).

6.6 Charger

Input: 100~240 VAC 50~60 Hz 150 mA
Output: 5 VDC 1000 mA

6.7 *Wireless Link*

- Bluetooth® Class 2
- Communication up to 30 m (open field)
- Nominal Emission Power: +4dBm
- Nominal Sensitivity: -84dBm
- ISM Band 2.4GHz

6.8 *Electromagnetic Compatibility*

- Radiated emissions tested according to EN 55022.
- Immunity tested according to EN 61000-4-8/6/2/3.

Section 7 - Support

If you encounter any problem installing or operating the equipment, you can get support:

- By contacting your local distributor
- By visiting the <http://www.body-vibration.eu> web site
- By sending an email to support@body-vibration.eu

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