

Manual of VU-AMS Core ECG & ICG Monitor



Version 3.11

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1 Getting started

1.1 About the VU-AMS Core

The VU-Ambulatory Monitoring System Core (VU-AMS Core) ECG & ICG monitor is a research device for non-invasive measurement of autonomic nervous system (ANS) activity. It is typically used for physiology-based stress and emotion measurement during lab and daily life activities. The device is not intended to be used for medical diagnostic purpose.

The VU-AMS Core is a direct successor of the VU-AMS 5fs, featured in 400+ scientific publications, papers and books.

1.2 Signals and parameters

The VU-AMS Core records as primary signals:

- Electrocardiography (ECG, 1000 Hz) (3 leads, ECG (II), V2ECG (aVF), V3ECG (I – computed in postprocessing))
- Impedance cardiography (ICG, 1000 Hz) (ZO) (DZDT - computed in postprocessing)
- Triaxial accelerometer (1000 Hz) (MXR, MYR, MZR)
- Triaxial gyroscope (1000 Hz) (GyroX, GyroY, GyroZ)
- Triaxial magnetometer (50 Hz) (magX, magY, magZ)

As secondary signals for context and for quality control:

- Air pressure level (5 Hz) (P_sc)
- Temperature of the device (1000Hz T, Temp, 5Hz T_sc)
- Voltage of the current source (1000Hz Visrc)
- Timing of the AD Converter (1000Hz Tickdiff_ADC, Tickdrift_ADC – both computed in postprocessing)
- Battery voltage (1 Hz BAT)
- Device orientation (50 Hz, Roll, Pitch, Yaw – all computed in postprocessing)

From these signals, the accompanying software package computes various parameters relevant to biobehavioural and psychophysiological research over intervals of interest, for example minute-by-minute, hour-by-hour, wake-sleep, or a custom segmentation based on lab condition or EMA prompts.

The main outputs are Respiratory Sinus Arrhythmia, a form of heart rate variability (HRV) synchronized with respiration, as an index of parasympathetic activity, and Pre-Ejection Period as an index of sympathetic activity. A host of other commonly used cardiac features are also available, including heart rate, other HRV indices (e.g. SDNN, RMSSD, LF power, HF power), T-wave amplitude, left ventricular ejection time, cardiac output and stroke volume. Respiration related features include respiratory frequency and tidal volume. The accelerometer, gyroscope and magnetometer allow for posture classification, activity recognition and energy expenditure estimation (beta algorithms are embedded in the data analysis and management software, VU-DAMS).



1.3 What's in this document

This manual explains the essential steps to start working with the VU-AMS Core, a) how to install the software b) how to apply the VU-AMS Core to yourself or another wearer c) how to configure the device and start a recording, and d) how to finish a recording and extract the data for further processing. In-depth information on data processing and feature extraction with the use of the data analysis and management software is provided in a separate manual ([VU-DAMS Manual](#) – note: this manual was written for a previous version of the analysis software so does not cover all the newest features. It also covers hardware operation of the predecessor of the VU-AMS Core device, the VU-AMS 5fs.).

2 Installing the software

2.1 VU-AMS CoreControl: recording manager



VU-AMS CoreControl is the primary app for programming, starting and stopping recordings, live signal viewing, and programming and sending markers with the VU-AMS Core. Its user-friendly interface streamlines these tasks, ensuring efficient and accurate recording and data quality control. It is intended for the researcher to use before and during set-up with a participant. The application is currently only available for iOS on iPhones and iPads. We recommend using an iPad for live data views, as the graphs are not developed for small screens.

If you have received an iPad from us, it comes with the app pre-installed. It may also be installed via download from this website:

<https://vu-ams.nl/vu-ams-core-app-ecosystem/>

Upon first installation of the app, you need to grant permissions since it was not installed through the Apple app store. In your device, go to: Settings -> General -> VPN & Device Management -> Enterprise APP stichting VU-VUMc -> "Trust"

It is advised to install all updates as the app is under active development and this will ensure the most smooth and user-friendly experience. The app sends notifications as soon as a new version is available.

2.2 VU-DAMS: data analysis and management software



VU-DAMS Core is the **D**ata **A**nalysis and **M**anagement **S**oftware for Windows and macOS. With VU-DAMS Core, you import, view the data, clean signals, score parameters, and export your data for statistical analysis. The software can be downloaded from <https://vu-ams.nl/analysis-software-for-vu-ams-core-vu-dams-beta/>.

VU-DAMS Core functions very similarly to the original data analysis and management software release version as developed for the 5fs device. Therefore, the manual for that version can be used. It can be found at <https://vu-ams.nl/support/tutorial-software/>

However, some new features have not yet been fully tested, validated, and/or documented. Please consider any features not described in the manual for VU-AMS 5fs as beta features, and keep a critical eye on any analysis involving those features. A dedicated manual for VU-DAMS Core will be made available soon.

3 Measuring with the VU-AMS Core

Follow the steps of this chapter to set up your device and start measuring.

3.1 Preparing for a recording

1. First, ensure to have the following items ready:
 - VU-AMS Core device with the provided microSD-card
 - Five self-adhesive ECG skin electrodes ; i.e., one 55mm foam electrode (for attachment of the VU-AMS Core) and four smaller and/or non-woven electrodes (for the wires).
 - Skin cleaning alcohol (70% Isopropyl Alcohol) and cotton pad or pre-made alcohol pads (to prepare the skin)
 - iOS computer, iPhone or iPad with VU-AMS app (to configure the device and start/stop the recording)
 - Optional, for after the recording: Adhesive remover (Madivon) and additional cotton patches
 - Measurement tape with mm precision (to measure the distance between the front ICG electrodes)

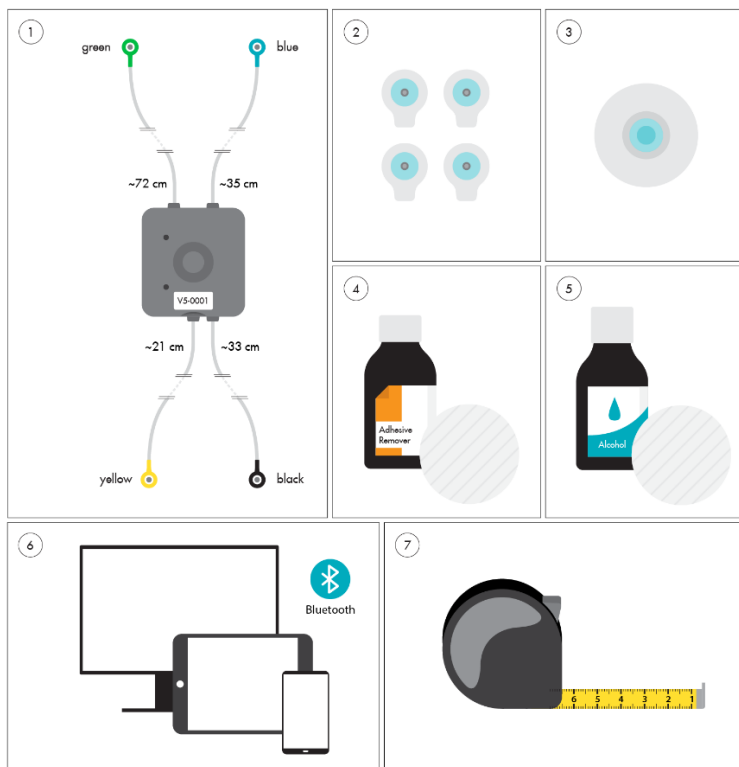
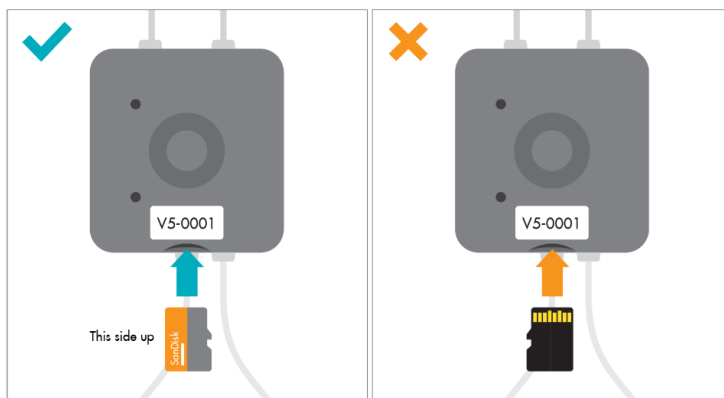


Figure 1: Required items for applying the AMS Core, (1) VU-AMS Core device with inserted micro SD-card, (2) four small foam electrode, (3) one large foam electrode, (4) adhesive remover and cotton patch, (5) alcohol and cotton patch, (6) iOS device with Bluetooth connection and the AmSapp installed, (7) measurement tape (mm)

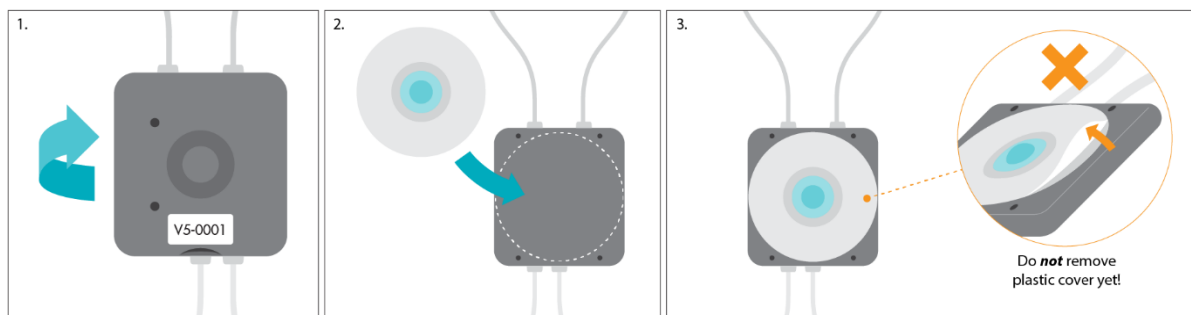
2. If not inserted, insert the microSD-card into your AMS Core device, with the manufacturer logo facing upwards (gold contacts downwards) and press gently to lock the microSD-card in place.



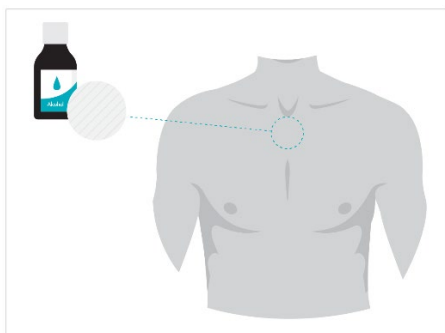
3.2 Applying the VU-AMS Core

While the device can be applied while fully clothed, the application process may be facilitated by asking the participant to remove their upper clothing. Application of the electrodes and the device is easier and faster when the thorax is visible and accessible, especially when still unfamiliar with the process. Electrodes will not connect well on hairy skin, on such occasions move the electrode to a hairless area if present within 2-3 centimetres distance or shave an electrode-sized area at the site with a safety razor.

1. Take the large foam ECG electrode and attach it onto the device by clicking the male connector on the electrode into the female connector on the device. Do not remove the plastic covering from the electrode yet.

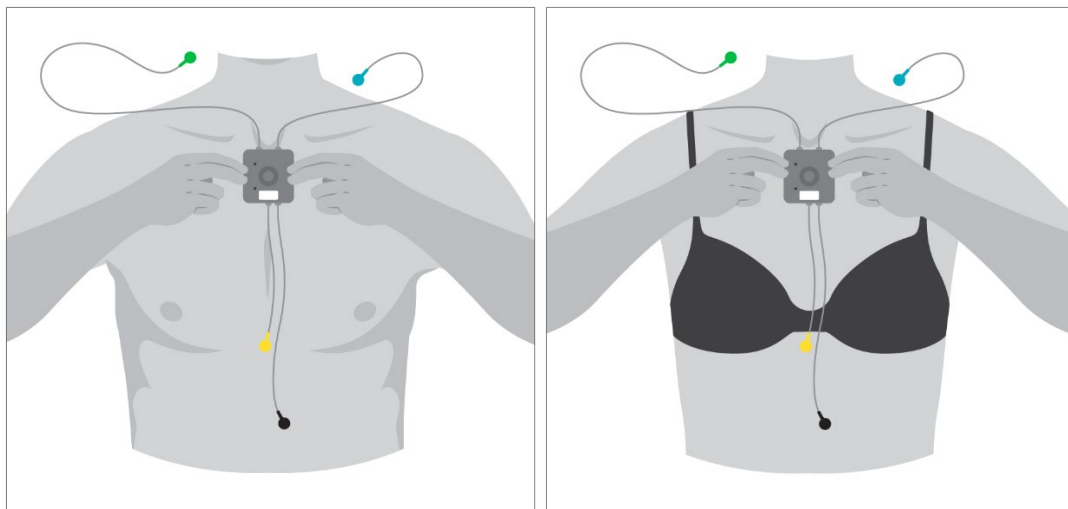
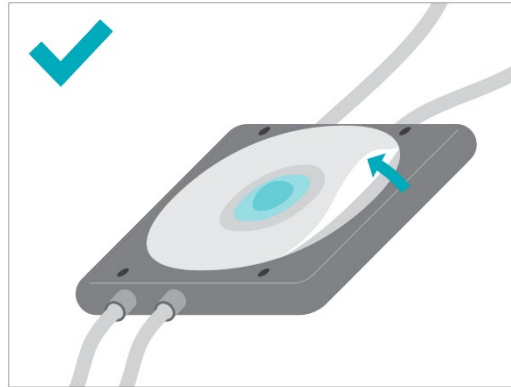


2. Find the dimple between the participant's collarbones (i.e., the suprasternal notch) and clean an area slightly larger than the electrode just below that spot with a cotton pad with alcohol; wipe thoroughly and allow to dry.



3. Take the device, remove the plastic cover from the electrode and place the device onto the cleaned site. Make sure that the short wires (with the yellow and black connectors) exit at the bottom and long wires (with the blue and green connectors) exit at the top. Press firmly for better attachment of the electrode to the skin.

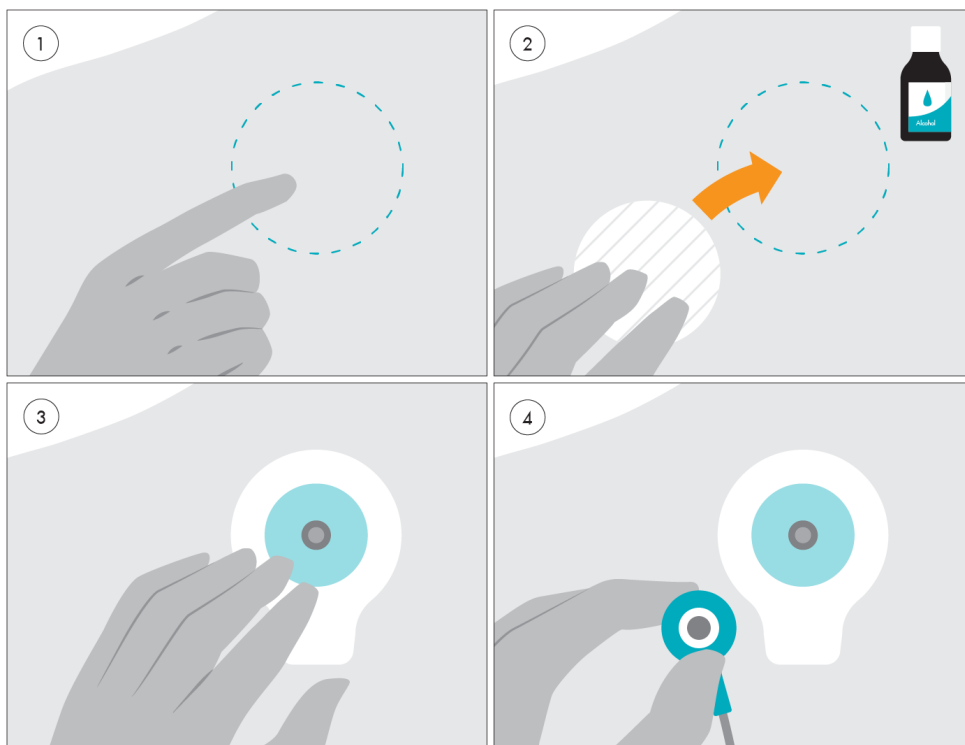
Placement tip: put your finger in the dimple – between your collarbones and perpendicular to your skin – and place the device just below the finger.



N.B.: when you press the centre of the device during this procedure, you turn on the device causing it to vibrate, this is not a problem. When left idle for a while the device will automatically vibrate three times and turn off again.

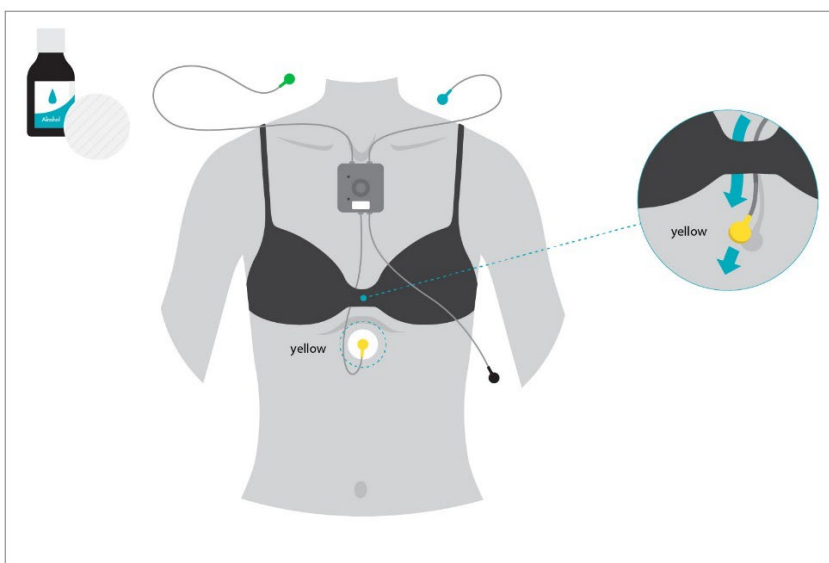
- a. When you have attached the device to the sternum, it is convenient to put the wire of the green and blue electrode over the shoulders; the blue wire over the left and green over the right shoulder (matching the side they exit the device).
4. For the other electrodes follow the following steps:
 - 1) Find the right site to put the electrode. All sites are specified below. (Shave if necessary)
 - 2) Clean the sites with alcohol.
 - 3) Remove the cover, place the electrode on the site and press firmly.

- 4) Attach the wire by clicking the colored female snap-on connector onto the male connector on the electrode.

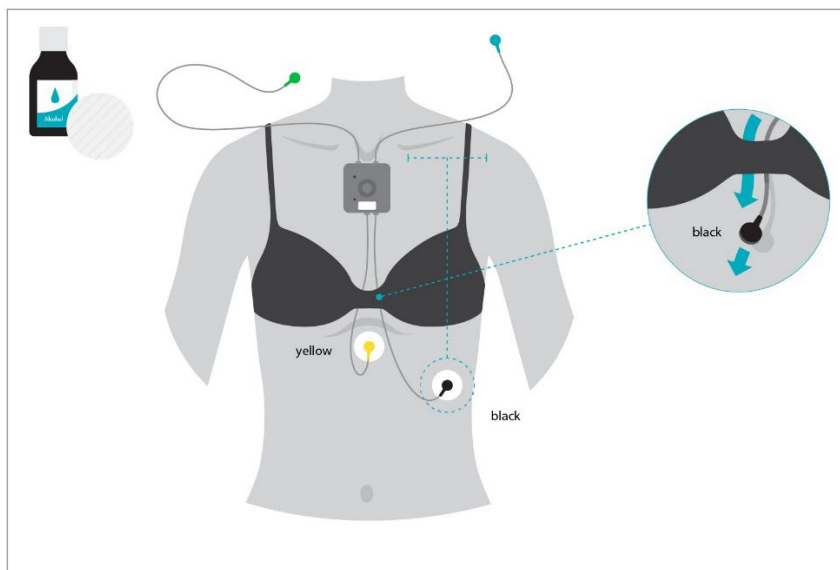


N.B.: if there is hair preventing direct attachment of the electrode to the skin, remove the hair with a razor.

- a. Yellow cable: clean the side just below the sternum with cleaning alcohol; i.e., at the center of the rib cage where there is a section of cartilage. *N.B.: friction may occur between a brassiere and the electrode. In these cases we advise to place the electrode slightly lower to prevent friction from occurring. Additionally, run the wires under rather than over the brassiere to keep them close to the body. This is typically perceived as more comfortable and increases signal quality as there will be fewer occasions where there is tension on the wires.* Place the electrode on the cleaned site and press the center and around the rim firmly so that there are no loose edges. Next, attach the yellow connector (short wire).

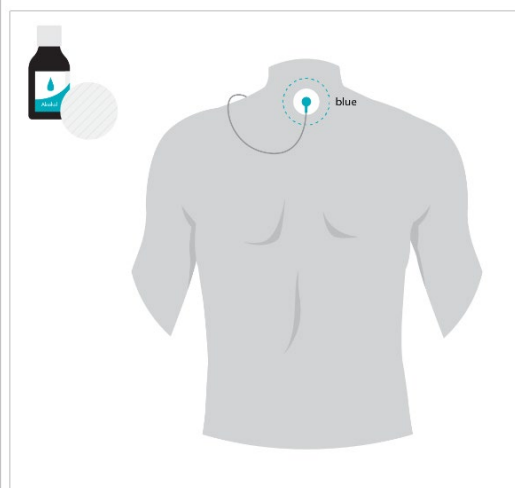
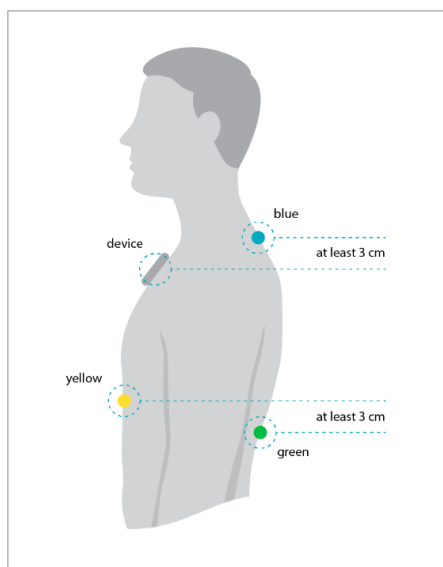


- b. Black cable: clean the site +/- 2-5 cm below the left breast; to be more exact, draw an imaginary line from the middle of the participant's left collarbone downwards; follow this line until you reach the lower edge of the ribcage and check if the connector can reach here without straining the wire. If not, choose a site higher and/or closer to the device, so that the wire will have sufficient leeway. Now clean this area of the end of the rib cage with alcohol. Next, put the electrode here and press firmly (i.e., the electrode is placed in the midclavicular axis around the 7th-10th rib). Press firmly on the rim of the electrode for better skin attachment. Finally, attach the black connector to the electrode.



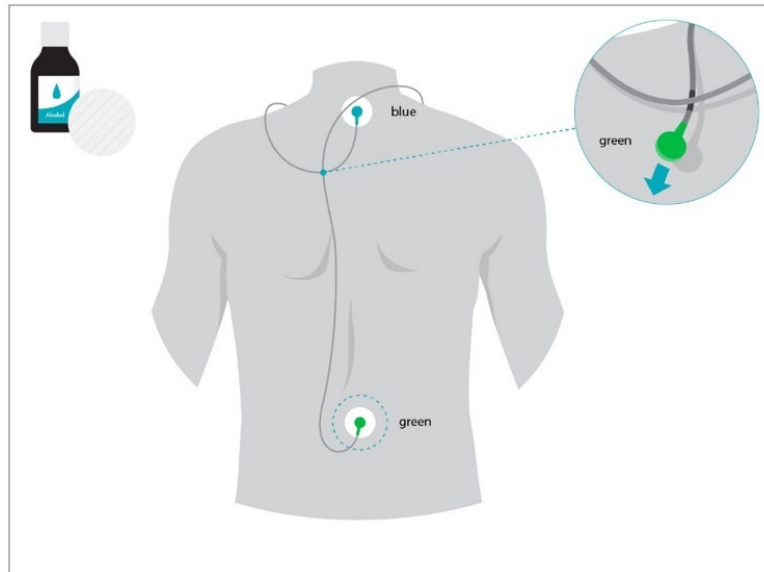
- c. Blue cable: clean the site just below the neck – i.e., just below the highest point of the shoulders so that in most cases it will be covered by clothing – approximately 3cm higher than the level of the device placed in the front (chest). Press firmly on the electrode for better skin attachment, followed by attachment of the blue connector to the electrode.

N.B: If this spinal location features a bony prominence, place the electrode slightly to the left or right.



- d. Green cable: Run the green cable so that it passes under the blue cable – this helps keep it in place – as you guide it downwards to the lower back.

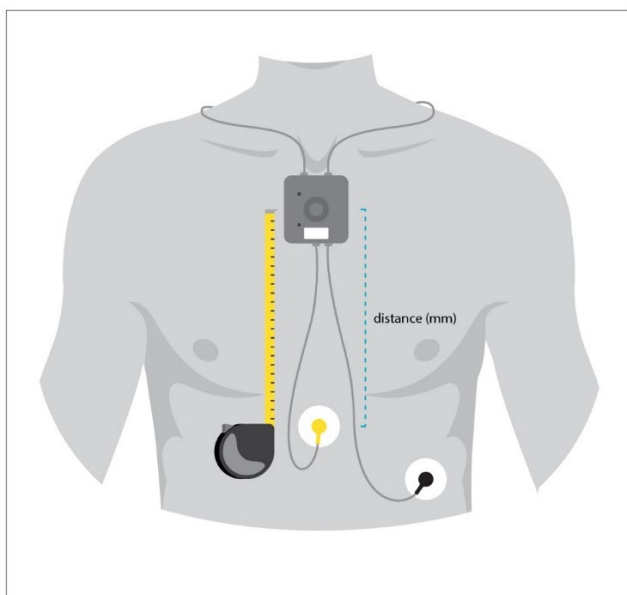
Next, clean a spinal area on the lower back, approximately at belly-button height with alcohol. The location should be at least three centimetres below the level of the yellow electrode (on the front). **N.B.:** *shift the electrode slightly to either the left or right in case this spinal location has a very deep curve and/or features a bony prominence.* Press firmly on the rim of the electrode for better skin attachment, followed by attachment of the green connector to the electrode.



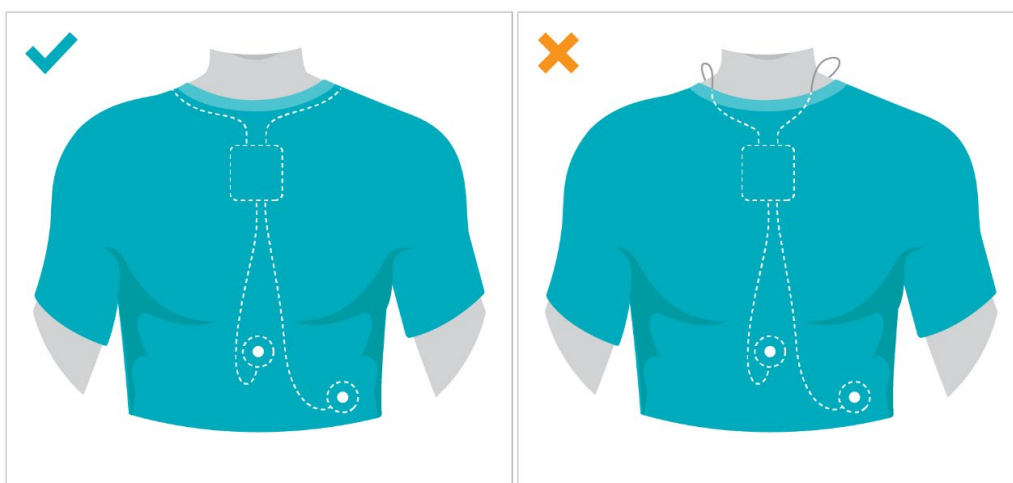
5. To check if wires are all comfortable and allow for complete freedom of movement, ask the participant to move their body (e.g., stretching arms forwards, upwards and backwards, bending and turning the torso) and confirm that the cables do not restrict them in any way. If some are too tight, take a new electrode and place it closer to the device.
6. Finally, turn the connectors so that the cables exit them downwards. This will make the cables feel more snug against the body as well as improve signal quality (due to the loop of excess wire near the connector preventing tugs on the electrode)



7. Measure the distance between the centre of the VU-AMS Core device and the center of the yellow connector, in millimetres. This distance is used in the calculation of stroke volume.



8. The VU-AMS Core device is now in place. If the participant undressed they may now put on their clothing again. Check if there are any visible wires, these can usually still be tucked away by turning the connectors downwards as described above.



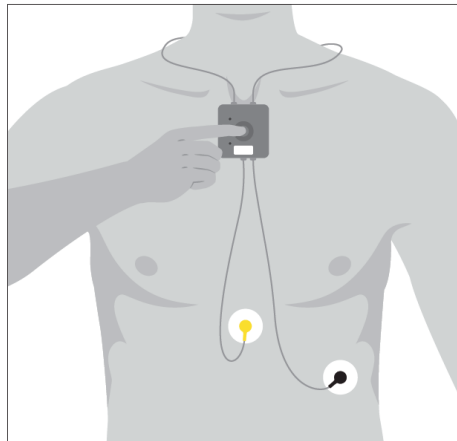
3.3 Starting a recording

3.3.1 Set recording info and start recording in CoreControl app

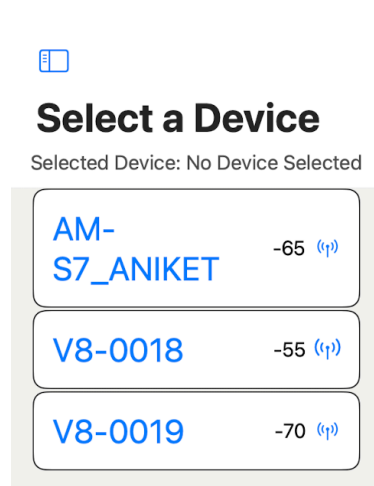
1. Start the CoreControl app.



2. Turn on the VU-AMS Core by pressing in the centre of the device firmly. The device will vibrate when it turns on.



3. In the left bar, the list displays any VU-AMS Core devices around and ready to be connected.
 - a. Select your device (i.e. tap the serial number matching the number listed on the device) to connect it to the CoreControl app.



Upon connection the blue LED light on the device will start blinking, indicating that there is an active Bluetooth connection.

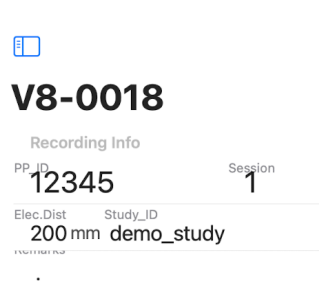
N.B.: if the device is idle for a while, it shuts down to preserve battery. This is accompanied by three vibrations of the device. Simply, restart the device by pressing the centre and continue the connection process.

N.B.: if the device does not show up, check if the microSD-card is inserted correctly, and check if the device may be connected to another iPad/iPhone device from a prior measurement.

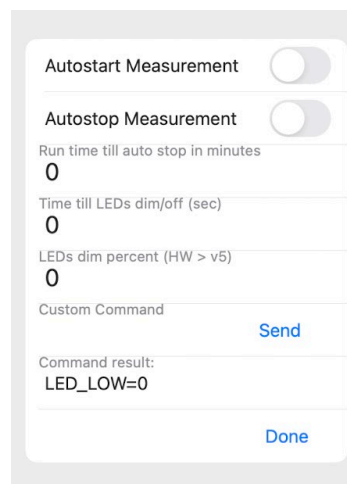
The CoreControl app will connect to the device, enabling you to insert recording info, set advanced settings, and start the recording.

4. Fill in recording info:
 - a. PP_ID: unique participant identification number you set in your study.
 - b. Session: the session number.
 - c. Elec. Distance: the distance in mm as measured in step 3.2.7.
 - d. Study_ID: unique study name.
 - e. Remarks: any notes you find relevant for the recording

The PP_ID, session and study_ID will be included in the file name of the data that is written to the memory card.



5. Optional: advanced settings. Click on the edit-icon (the pen) next to 'advanced settings'. A new settings window opens up:



- a. **Autostart measurement:** activate to automatically start a recording upon turning on the VU-AMS Core. With this setting on, the VU-AMS Core will automatically start a new recording upon turning on the device, with the same recording info (Participant ID and Study ID) as set in step 4. Every time the device is turned on again with autostart measurement function on, a new recording automatically starts and the session number automatically increases by 1. (default: off)
 - i. This function is suitable for settings where participants take the device home and take one or more measurements later. It removes the need for participants to stop and start recordings themselves using the app.

- b. **Autostop measurement:** activate to automatically stop the recording after a set run time. (default: off)
 - c. **Run time till auto stop in minutes** (only applicable if autostop measurement functionality is turned on): the recording run time in minutes. This will automatically stop the recording after the set run time. For a full-day recording set the time to 1440 minutes. (default: 1440)
 - d. **Time till LEDs dim/off (sec):** the number of seconds after which the status indicator lights dim or turn off when recording. The lights will turn on again when a marker is placed using a button press, and dim (default: 60)
 - e. **LEDs dim percent:** set to 0 for low-light conditions, sleep, and daily life studies where the lights may attract attention or act as a burden to the participant. (default: 0)
6. Start the recording.
 7. The Live data view will automatically pop up once a recording is started. If not, click on “show live data” (under the big “Stop Recording” button).
 8. To get to the overview of live signals, click on “TO RAW”.



9. A new screen opens. On the top right corner, click on the "signals" dropdown. Select the following signals from the list: ECG1, Z0, ax, ay, and az:



3.3.2 ECG signal check

In the Core Controller app, change the timing to 5 seconds and look at the ECG signal.

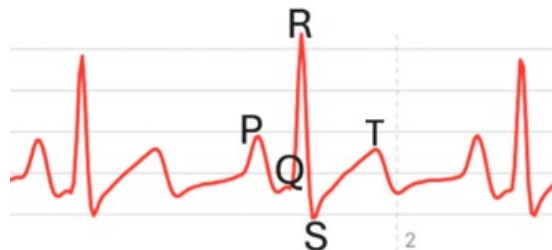
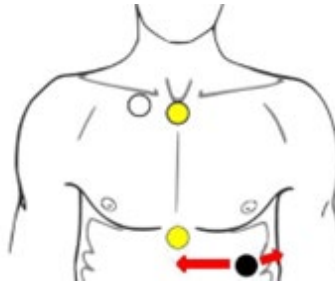


Figure 3: example of a good quality heart rate signal. Your signal should look something like this – with a clearly distinguishable R-peak.



Figure 4: example of a signal where S-wave is of comparable magnitude as R-wave. This signal requires re-attachment of the black electrode until R peak is consistently the largest deflection present in the signal.

If either S-wave or T-wave are of comparable magnitude as the R-peak re-attach the black (+) ECG electrode more laterally or medially (like in the figure below) until the R peak is consistently the largest deflection present in the signal.



3.3.3 ICG signal check

ICG is displayed as Z0. Change the time view to 15 seconds. To check the quality of the ICG, tell participant to take a slow, **deep** breath in for 5 seconds, and out for 5 seconds; the Z0 should increase in amplitude while breathing in, and decrease in amplitude when the participant breathes out.



If the signal does not show this breathing pattern, check the ICG electrodes again.

3.3.4 Accelerometer signal check

The three different axes are represented as ax, ay, and az. To check the signals, tell the participant to bend to the left and right a few times, bend forward and backward, and take a few jumps to confirm the movement is captured in the signals. Movement and posture greatly affect the other signals. Besides providing information on step count and activity type, the movement signals are used to control for the effects of posture changes and physical activity.

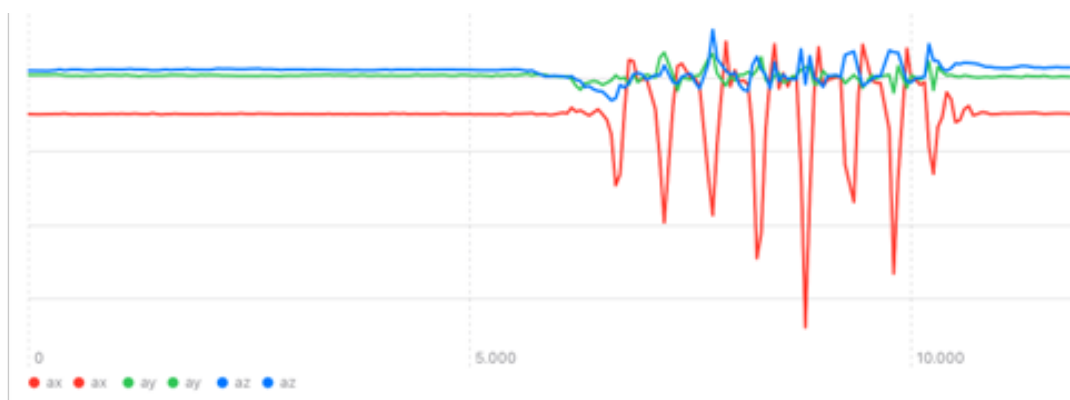


Figure 5: accelerometer signals in CoreControl live view showing changes in the x-axis following lateral movements (bending left and right)

Axis	Direction (Relative to Chest)	Movement Type	Expected Signal Behavior	VU-AMS Line Color
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X-axis	Left ↔ Right (lateral)	Bending left and right	Smooth signal changes from torso tilting side to side Red
Y-axis	Up ↔ Down (vertical)	Jumping up and down	Sharp peaks from vertical acceleration during jump/landing Green
Z-axis	Forward ↔ Backward (sagittal)	Bending forwards and backwards	Smooth signal changes from torso tilting forward and backward Blue

3.4 Placing Markers

Markers can be created in the recording using two methods

1. Pressing the center of the device will create a generic marker (Button press), the device will vibrate briefly to confirm a marker was created
2. Tapping a marker button on the bottom of the live data screen will create a marker with that name, the device will vibrate briefly to confirm a marker was created and a red line will be shown in the graph. Names for markers can be edited using the menu on the left.

Note: When not using live data or sending markers, close the live data screen and return to the app's home screen to conserve battery power.

3.5 Stopping a recording

1. Your VU-AMS Core device will automatically reconnect to CoreControl if the device moved out of Bluetooth range.
2. To stop the recording, first close the Live data view if it was still open. Then, navigate left side of the home screen where you find the 'Stop' button: ... press 'Stop recording' to stop the recording. This will cause the device to vibrate.
3. Lastly, to shut down the device press the 'Shut down Device' button on the left side of the screen. Alternatively, press the centre of the device twice for approximately 3 seconds, within a 10 second window. Subsequently, the device will vibrate three times, indicating it shutting down. Additionally, the lights will turn off. To conserve battery, the device will also shut down after 5 minutes when not recording.
4. Next, the device and electrodes can be removed from the participant.
 - a. Carefully remove the electrodes – ask the participant whether they prefer to remove them themselves or they would prefer your assistance.
 - b. Remove any remaining electrode adhesive from the participants body by wiping the area with a cotton pad with adhesive remover.

3.6 Extracting and saving the data

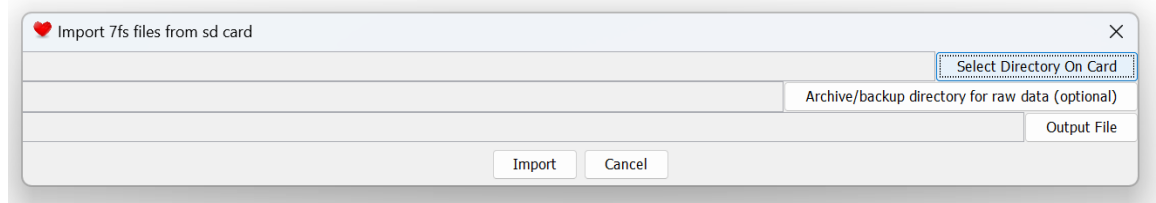
In order to extract and save your data, follow these steps:

1. Remove the microSD-card from your device by pushing the microSD-card slightly into the device so that it clicks, and the release it so that it partially comes out of the device. Then you can carefully grab the card and remove it from the device.
2. Insert the microSD-card (typically with the logo on the card facing down) into the USB microSD-card reader.
3. Open the VU-DAMS Core software on your PC or Mac
4. From the *File* pull-down menu select *Import raw data*
- 5.

Select Directory on Card: Go to the DATA Directory on the Micro SD card and select the directory containing the recording you have just made (recognizable through the Participant ID, Study ID and Session ID)

Archive/backup directory: Choose a directory where the raw (7fs) data files will be copied to for archiving. If you do not select this, the raw data will remain on the memory card, otherwise it will be deleted after copying. We recommend having an empty DATA directory before re-inserting the card into the device

Output file: Choose a location to save the .amsdatai file which will contain your complete recording, and is used for further processing and feature extraction.



6. Press import. This will take a few minutes depending on the length of the recording and the processing power of your computer. A 24h recording may take up to 30 minutes to import completely, during which a variety of status indicator dialog boxes are displayed.
7. The import process will end in the “Overview” screen displaying the entire recording. Use this opportunity to verify if the recording is of the expected length and desired quality.
8. Eject the drive through the functionality of your operating system.
9. Remove the microSD-card from the microSD card reader.
10. Push the microSD-card into the slot of the VU-AMS Core until you hear and/or feel the click and it remains in place. Handle the microSD-card with care, and do not use force.

Note: The raw data format for the VU-AMS Core is .7fs. One 7fs file on the memory card contains up to two hours of data. A two hour file has a size of approximately 400MB. If you have recorded for longer, the data will have been split over multiple two hour files placed together in a folder for the recording. The main data format is .amsdatai. This format is compressed (lossless) and therefore much smaller and faster to work with than .7fs, which should only be used to archive a backup of the raw data (if desired).

3.7 Charging

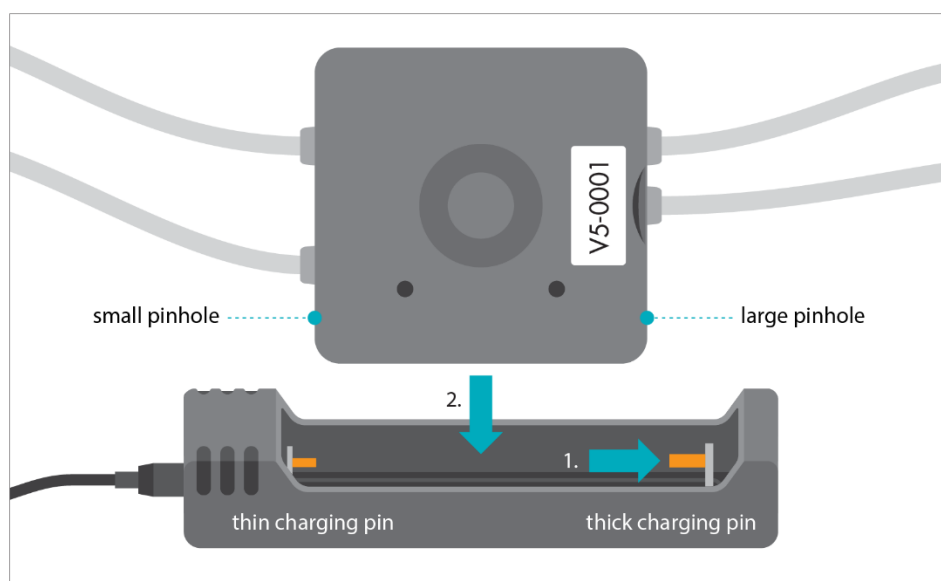
When the device is fully charged, it can measure for up to 28 hours. If you want to measure for longer than 28 hours without pauses, you can swap devices by taking the empty device off and connecting a full device directly to same electrodes.

If you want to check the battery of your device, open the Core Controller app, connect your device and the battery charge is shown on the bottom panel. The battery is displayed in percentages and uses a color to indicate the status: green indicates a ‘full battery’ (i.e., the ability to measure for at least 20 to 24 hours), red indicates a ‘low battery’ (i.e., <3800mV, ability to measure 2 to 3 hours) and black indicates everything in between.

Charge the VU-AMS Core device by clicking the charger pins of the provided charger into the holes of the VU-AMS Core device on opposing sites of the device. ATTENTION: the thick charger pin must go into the larger hole of your device, and the smaller pin fits the smaller hole on the VU-AMS pro device (see figure 3, below).

The light on the charger will indicate whether the VU-AMS Core device is fully charged: red = charging, green = charged.

It takes approximately 2-3 hours to fully charge a device with an empty battery.



3.8 VU-AMS Core notifications

Your VU-AMS Core contains two lights at the top of the device, and has the ability to vibrate in different patterns.

3.8.1 Lights of VU-AMS Core

The VU-AMS Core consist of two lights: one connected to the Bluetooth status of the device, and the other indicative of the acquisition status of the device. Note, the light will turn off after a few minutes to save battery and to facilitate sleep studies and any other use in low-light environments (eg. Cinema). When you press the central button of the device, the light will turn on again.

Category	Light	Blinking pattern	Meaning
Acquisition	Red	1 Hz	Running
	Red	0.24 Hz	Stand by
	Red	Off	Device is turned off
Bluetooth	Blue	0.5 Hz	Bluetooth is on
	Blue	Off	Bluetooth is off

3.8.2 Vibration of VU-AMS Core

The vibration pattern of the device uses a morse code approach. See the table below for the exact meaning of each pattern. A ‘.’ in the second columns indicates a vibration and ‘-’ indicates a period of silence. The duration of the vibration (.) is specified in the third column; the duration of the period of silence (-) of that pattern is three times the duration of the vibration (.) . For clarification, the fourth column describes the duration of the entire vibration pattern, with the period of silence in *italics*.

Meaning	Vibration pattern	Vibration duration (i.e., duration . of that pattern)	Time of vibration pattern (in <i>italics</i> is period of silents between vibrations)
Marker (i.e., press at centre of the device to place a marker in the data)	.	50 ms	50 ms
Starting device	- . . -	50 ms	<i>150 – 50 – 50 – 150</i> ms
Shut down	. . .	500 ms	500 – 500 – 500 ms
Start data acquisition	. - .	100 ms	100 – <i>300</i> – 100 ms
Stop data acquisition	. . .	100 ms	100 – 100 – 100 ms
Error (e.g., no microSD-card in device)	. . . - - - . . .	100 ms	100 – 100 – 100 – <i>300 – 300 – 300</i> – 100 – 100 – 100 ms
A ‘.’ Indicates a vibration; a ‘-’ indicates a period of silence, which is always three times the duration of the vibration.			

4 Points of attention

- The device is not yet waterproof. Do not shower or swim with it and keep it out of the rain.
- Only use the provided VU-AMS Core microSD-card; These cards have been tested and formatted specifically for use in the VU-AMS Core device, other cards may not work reliably and carry the risk of data loss.
- You can hard reset your device by pressing the following two buttons simultaneously, for 10 seconds:
 - Use a pin to press through the small hole of the housing
 - Press the button in the centre of your device with your finger.

5 FAQ

1. Is my device still recording when Bluetooth connection is lost?

Yes, your device will keep recording until you either stop the recording manually or until the battery dies. Note that the device won't record if the microSD-card is full.

2. What happens if I forget to stop my recording?

If you don't stop your recording and leave the memory card in, the VU-AMS Core will remain recording until the battery dies. If you take the memory card out, the VU-AMS Core will stop recording, but you will have a file which was not closed properly. This mainly means that the .7fs file will be approximately 600MB in size, regardless of recording length.

3. What happens with my data if the battery dies during my recording?

The system will ensure the data is saved and will perform a regular shut down if the battery dies. Therefore, you'll feel the three long vibrations occurring with the shut down and you can extract the data from the microSD-card.

6 Troubleshooting your VU-AMS Core

6.1 Connectivity issues

If connection issues occur, please check the following items:

1. Is the blue LED of the AMS Core blinking? This indicates the device and the Bluetooth is turned on. *Note: after 5 minutes of recording, the LED will automatically turn off. This doesn't affect the recording or Bluetooth status. The intention is to be less disturbed by the LED – for example during night time – and for saving battery.*
2. Is your CPU (e.g., computer) connected to the Bluetooth of the AMS Core?
 - a. Optionally, try disconnecting and reconnecting to the devices Bluetooth.
3. Try and reconnect VU-DAMS to your AMS Core system.

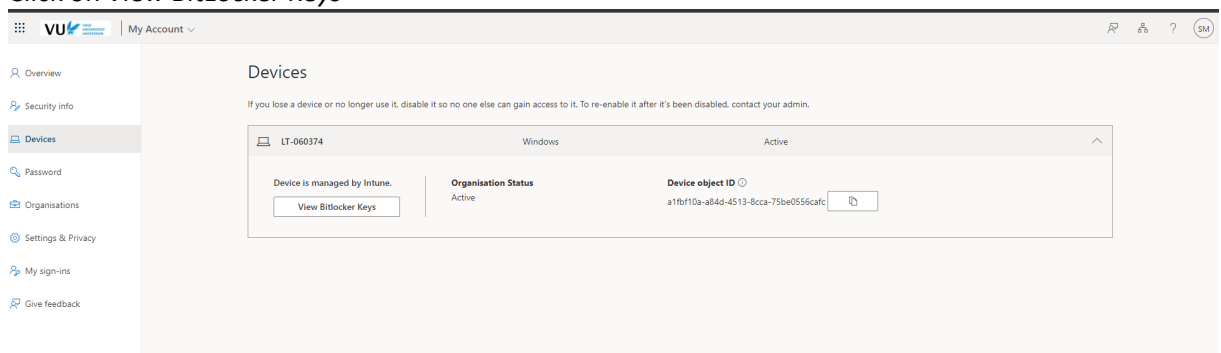
6.2 VU-DAMS crashes and I can't close the program

Go to your task manager – i.e., by pressing 'ctrl + alt + delete' simultaneously – and close the VU-DAMS program via 'End task'. Now you are all set to restart the program.

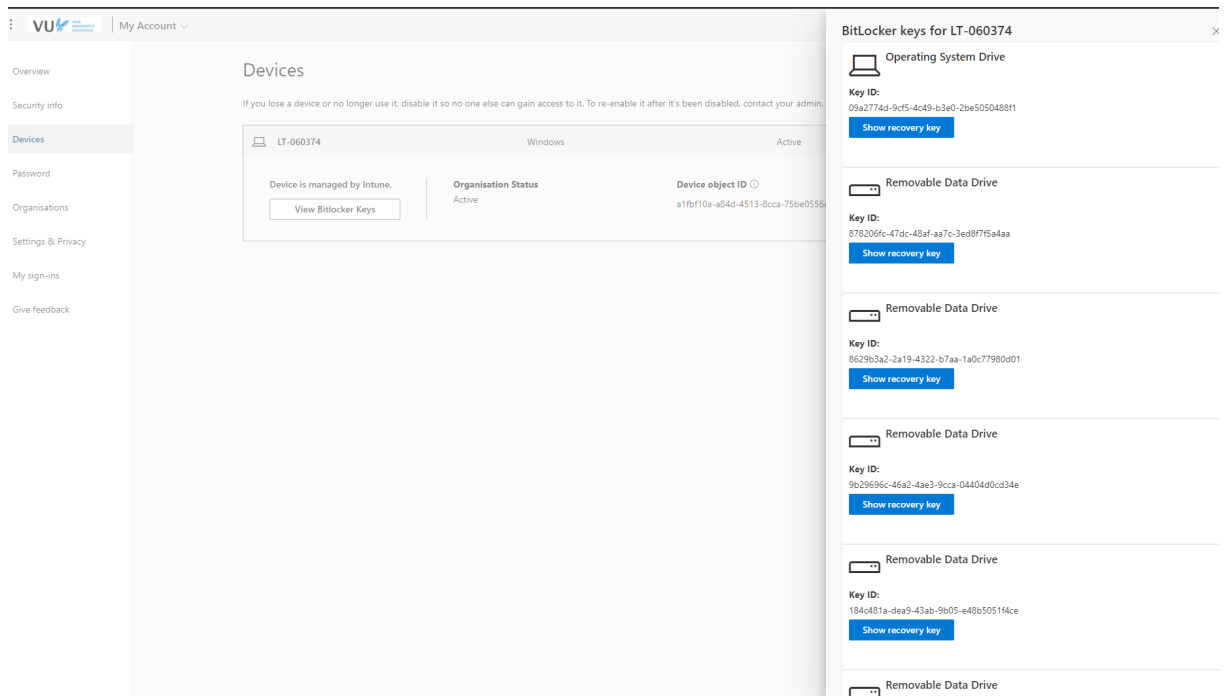
6.3 My microSD-card was accidentally encrypted with BitLocker

When putting the microSD-card into your Windows computer, an automatic safety BitLocker may be put onto the card via your Microsoft account. If this happens, you can find the BitLocker Recovery Key in your Microsoft account. Follow the following steps:

1. Go to your Microsoft account: <https://myaccount.microsoft.com/>
2. Go to your devices list: <https://myaccount.microsoft.com/device-list>
3. Click on *View BitLocker Keys*



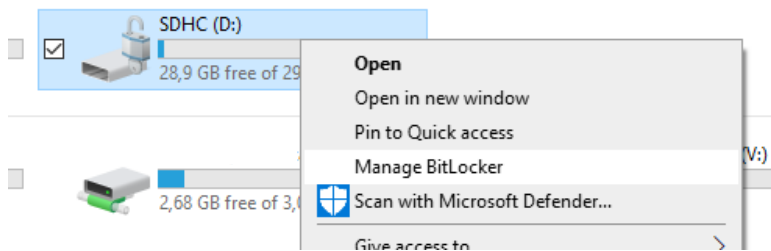
4. Multiple recovery keys will be shown (probably). Try the keys for the removable data drive, i.e., fill the recovery keys in when trying to access the microSD-card. If you found the right key, you can access the microSD-card again.



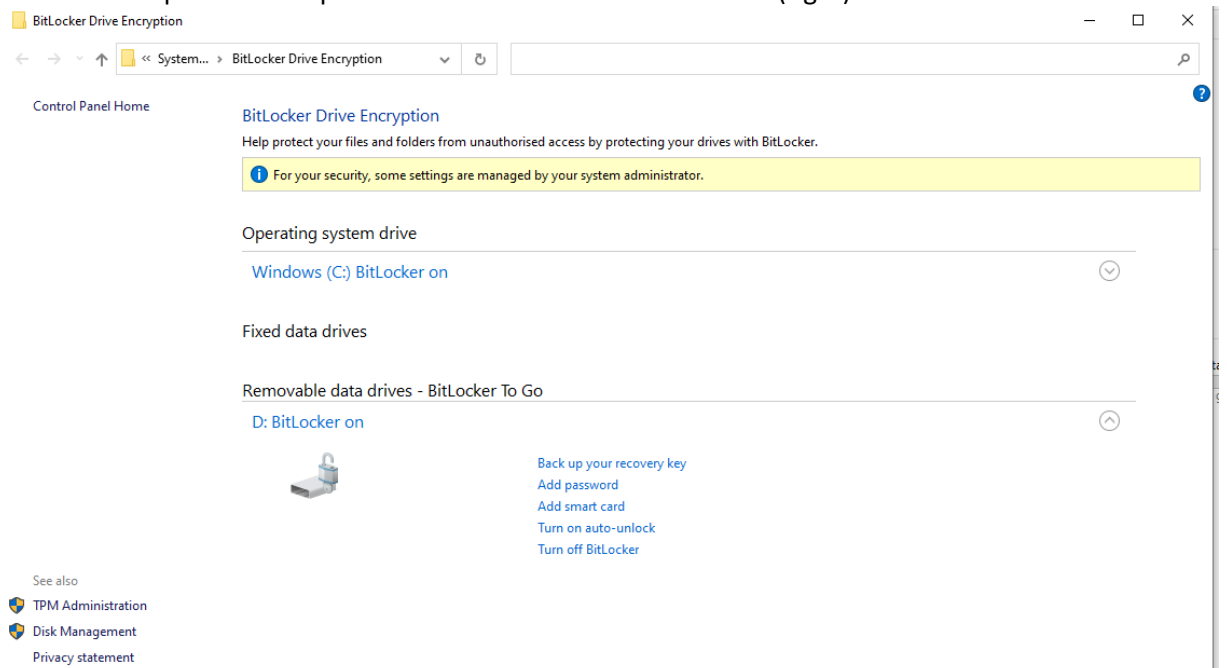
BitLocker keys for LT-060374

Device	Key ID	Action
Operating System Drive	09a2774d-9cd5-4cd9-b3a0-2be5050488f1	Show recovery key
Removable Data Drive	878206fc-47dc-48af-aa7c-3ed8f7f5a4aa	Show recovery key
Removable Data Drive	8629b3a2-2a19-4322-b7aa-1a0c77980d01	Show recovery key
Removable Data Drive	9b29696c-46a2-4ae3-9cca-04404d0cd34e	Show recovery key
Removable Data Drive	184c481a-dea9-43ab-9b05-e48b5051f4ce	Show recovery key

- Now you can access your microSD-card again, remove the BitLocker from the microSD-card by right clicking the microSD-card and go to manage BitLocker.



- This screen opens: and press turn off BitLocker at the bottom (right).



BitLocker Drive Encryption

Control Panel Home

Help protect your files and folders from unauthorised access by protecting your drives with BitLocker.

For your security, some settings are managed by your system administrator.

Operating system drive

Windows (C:) BitLocker on

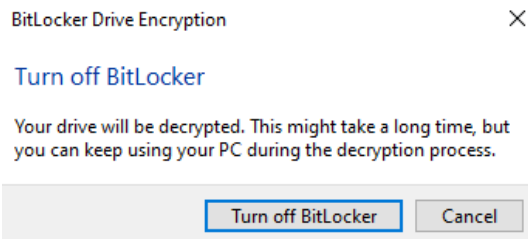
Fixed data drives

Removable data drives - BitLocker To Go

D: BitLocker on

Back up your recovery key
 Add password
 Add smart card
 Turn on auto-unlock
 Turn off BitLocker

See also
 TPM Administration
 Disk Management
 Privacy statement



7.

N.B: By turning off the BitLocker, your device should no longer put the BitLocker on the MicroSD-cards.