New Medical Inspiration

EOVE–70

SECRETION MANAGEMENT DEVICE

TECHNICAL MANUAL

102-035 Rev DG _ 13/09/2022 _ Apply from API39 Version

Current version: API39

PAGES	CHANGES AND MODIFICATIONS
71 / 79	Update of preventive maintenance schedule – Pump must be replaced when the counter reaches 1000h
83-84	Preventive maintenance alarms

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INTRODUCTION

1 Warnings

1.1 Warnings and safety rules

This manual is specific to the EOVE-70 (ref EO70) Secretion Management Device (SMD). It provides information for maintenance technicians and operators.

Anyone who installs or conducts maintenance operations on the device must be qualified and trained and must have read and understood the entire manual before beginning any operations. Any temporary personnel or those in training must be supervised by a qualified technician.

For other warnings or safety rules, refer to the user manual.

1.2 Responsibilities

EOVE will not be responsible for damages or injuries caused by non-compliance with safety instructions and other instructions in this manual or by negligence during servicing, maintenance or repair of the ventilator.

1.3 Maintenance and guarantee

The guarantee of the appliance will only apply if maintenance is performed in strict compliance with the instructions in this manual. Maintenance of the appliance is compulsory.

Maintenance and replacement components are guaranteed and delivered by **EOVE**. In case of use of incorrect replacement components**, EOVE** cannot certify and ensure the proper functioning of the ventilator and the safety of the user and their entourage.

Replacement components are available from the **EOVE** catalogue and the **EOVE** Spare Parts List.

2 General information

The EOVE 70 (ref EO70) Secretion Management Device (SMD) provides treatment for patients not able to manage their secretions on their own. It provides Insufflation – Exsufflation mode for adults and pediatric patients as prescribed by an attending doctor.

2.1 Technical description

The EOVE-70 SDM consists of a ventilation module and a housing unit.

FRONT PANEL

EOVE-70 – Removable module

1. EO-Display housing unit	2. Display screen
3. Keyboard	4. SDM module
	5. Circuit port

REAR PANEL

1. Air inlet/outlet filters cover	2. SpO2 plug
3. DC Power plug	4. Remote control plug
5. Standby button	6. USB port 1
7. USB port 2	

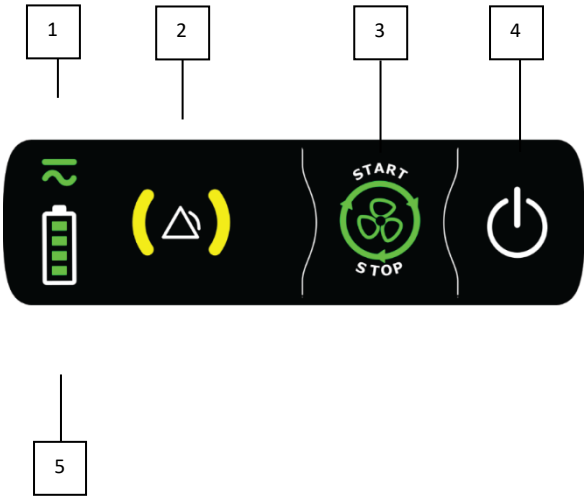
REAR VIEW OF DEVICE WITHOUT DOCKING STATION

1. USB port	2. Electrical connection to housing unit
3. DC Car charger connection	

VIEW FROM BELOW OF EOVE-70 SMD MODULE

1. Module label with serial number	2. Battery flap

KEYBOARD



1. Power source indicator
2. Alarm indicators
3. Treatment start / stop button
4. Power on/off button
5. Battery level indicator

EO-DISPLAY HOUSING UNIT

The EO-Display housing permits to control the EOVE-70 SMD module when it is inserted inside. The screen of the unit displays various information from the EOVE-70 SMD module and enables to set the different parameters.

EO-Display housing unit – Inputs and outputs

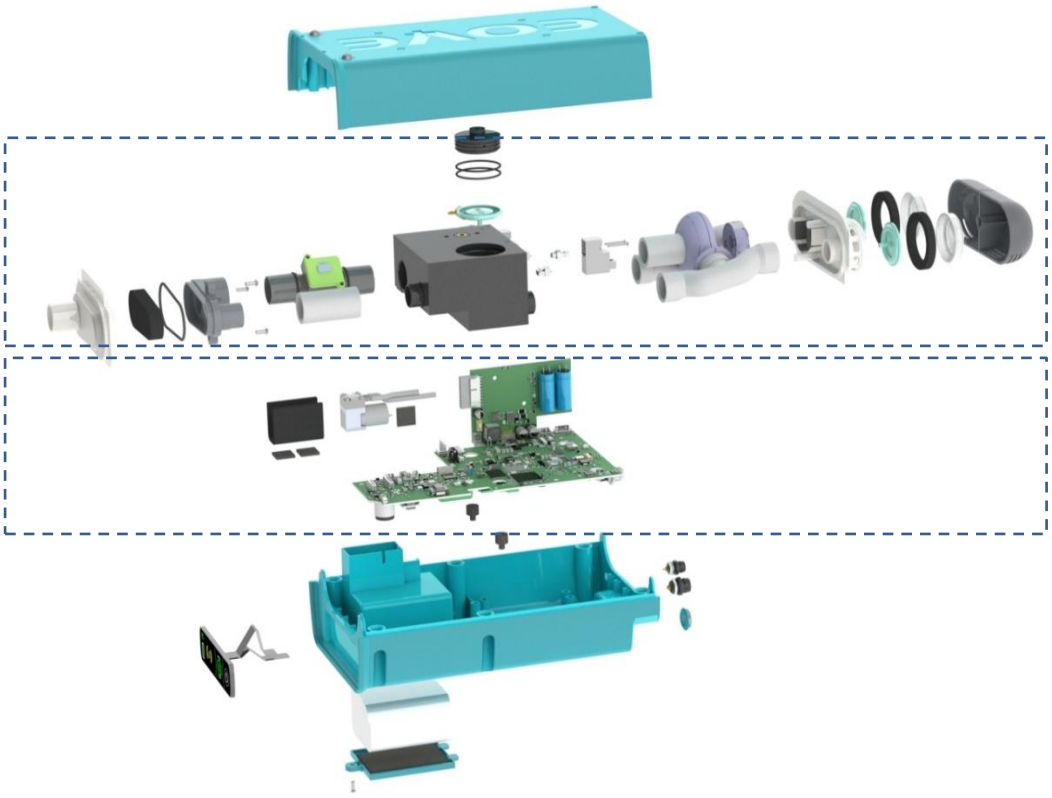
1. DC Plug	4. USB connector
2. On/Off button	5. Display screen
3. Micro USB connector	

2.2 The Technical data

For technical data, refer to the **EOVE-70** user guide.

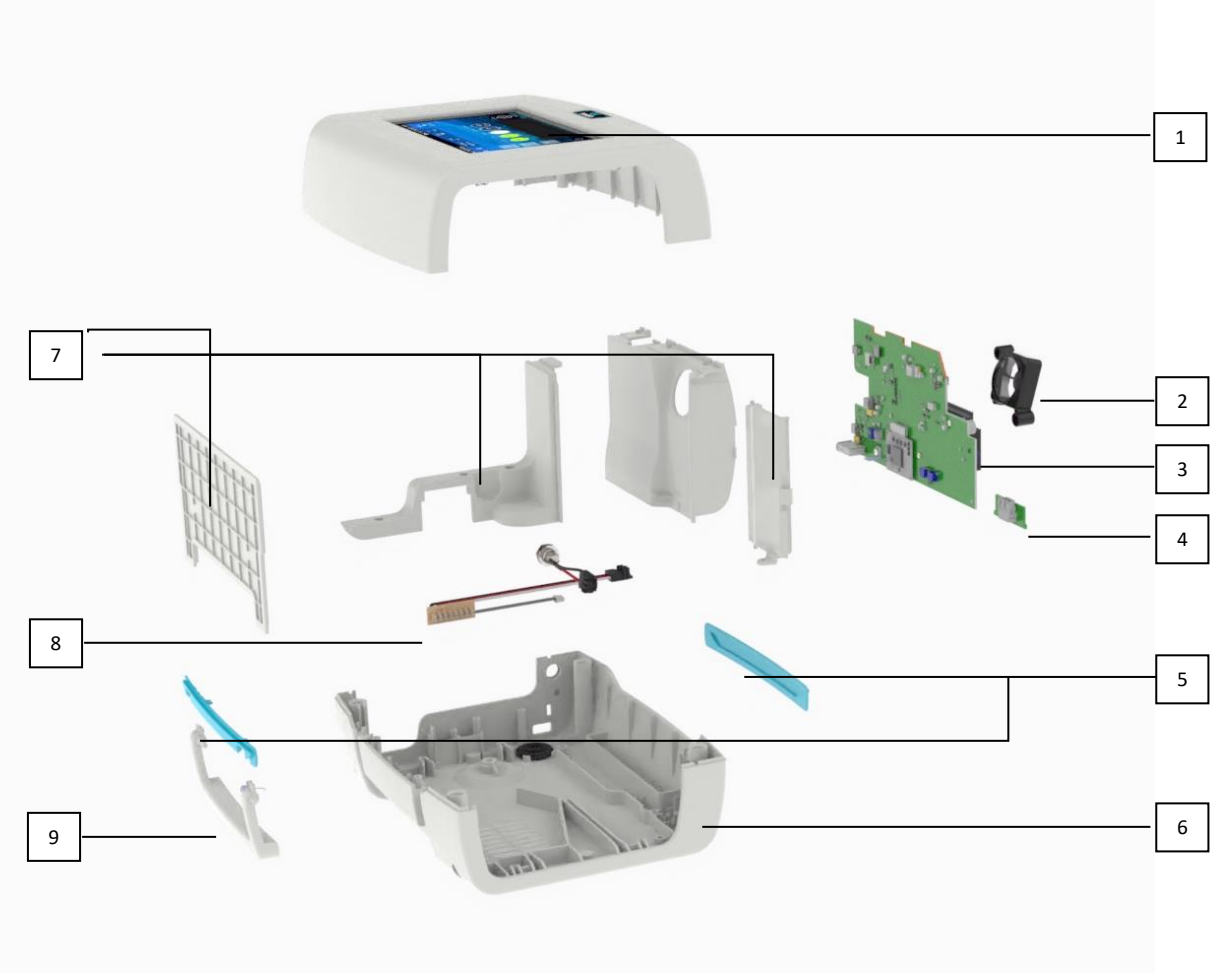
2.3 Structure and operation

2.3.1 EOVE-70 SMD module structure



EOVE-70 SMD module architecture

2.3.2 EO-Display housing unit structure



EO-Display Housing unit architecture

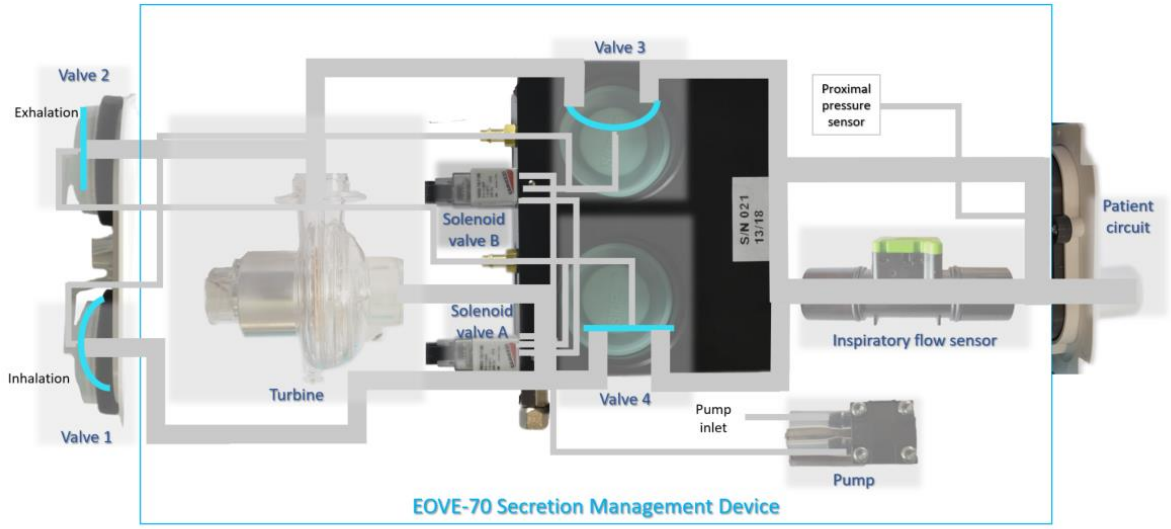
1. Upper shell & display screen	6. Lower shell
2. Cooling fan	7. Covers
3. EO-Display CPU board	8. Connection board & DC plug cable
4. USB board	9. Handle
5. Insert	

2.3.3 Operation of EOVE-70 SMD module

The operation of the EOVE-70 secretion management device is based on a closed control loop of the proximal pressure. There are two distribution mode, automatic and manual. In both modes, a pressure set point is send to the main actuator, the turbine. This pressure set point affects directly turbine speed which is proportional to pressure evolution. A high pressure set point will increase the turbine speed. This pressure is measured by the proximal pressure sensor. Thus, the determination of distribution parameters, especially the flow ramp rate affects the level of the turbine acceleration at the start of each phase of respiratory cycle.

At the same time, the two solenoid valves control the four valves to manage phases of respiratory cycles. A solenoid valve controls two valves during inhalation phase and the other one, the two others during exhalation phase.

The measurement of inspiratory flow completes the system to calculate the peak flow and the tidal volume on each respiratory cycle.

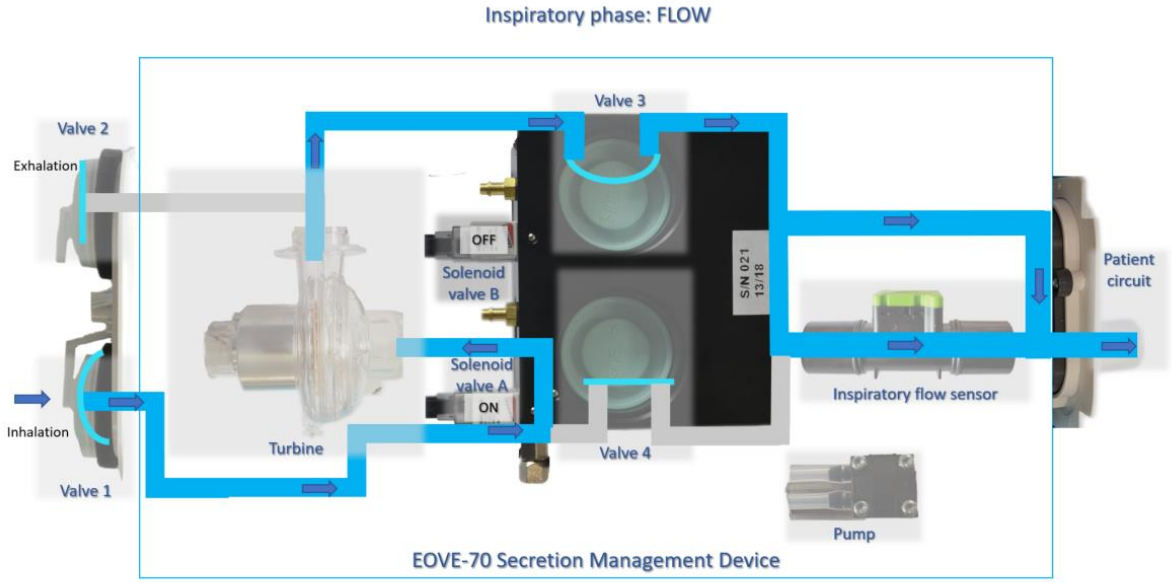


NOTE: When the EOVE-70 SMD is switched on but the ventilation is off, the turbine stills operate to remain cool. There are two speeds for cooling during standby. Below 45°C the turbine speed is low, and above the temperature threshold, the speed is higher. That is why there is always a low ambient noise when the device is on.

Operation of EOVE-70 SMD during inspiratory phase

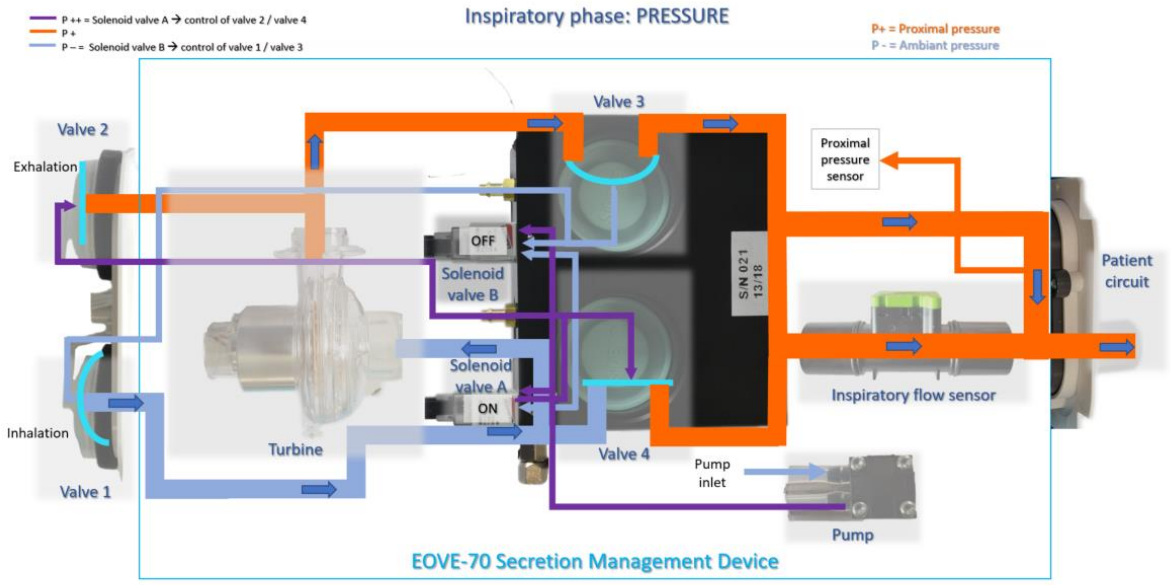
During inspiratory phase, the EOVE-70 secretion management device provides positive pressure to the patient. This pressure value depends on the set point configurated by the user and is proportional to the turbine speed.

The air is inhaled through valve 1, and flows toward the turbine, then the valve 3 and the inspiratory flow sensor.



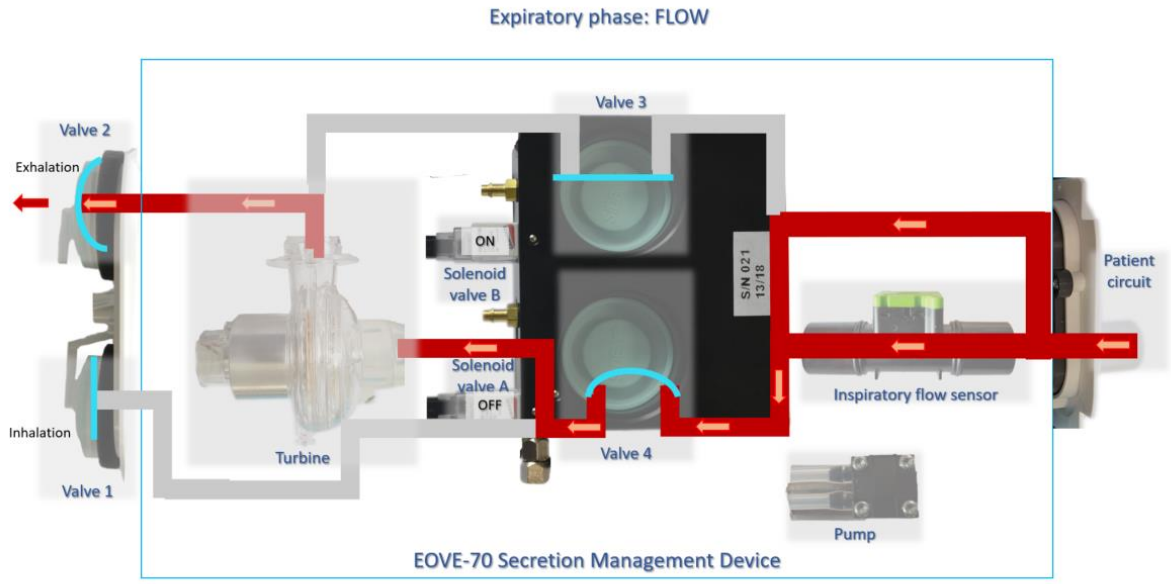
During inspiratory phase, the **low pressure** (**blue circuit** on the drawing below) is equal to the **atmospheric pressure**. The **high pressure** (**orange circuit**) provided by the turbine is equal to the **proximal pressure** received by the patient*. The difference of pressure between the two circuits is positive***.**

Meanwhile, the pump enables to provide additional pressure to the two solenoid valves to control the four valves. The solenoid valve A switches on to close valve 2 and valve 4. The solenoid valve B is turned off, so the valves 1 and 3 are opened to permit the air to flow toward the patient.



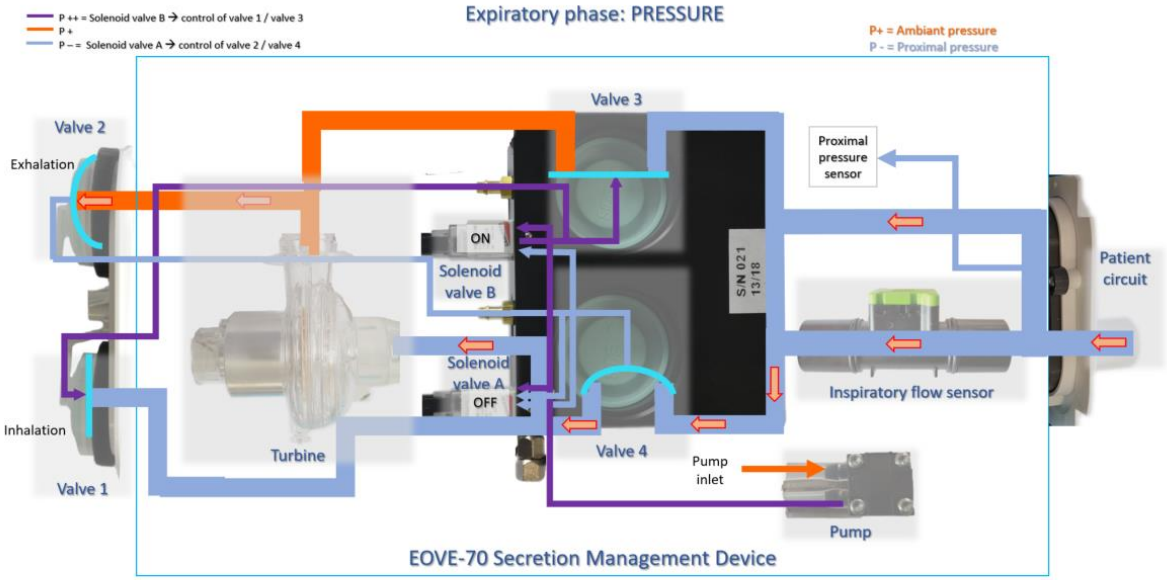
Operation of EOVE-70 SMD during expiratory phase

During the expiratory phase, the EOVE-70 secretion management device creates a suction to assist the patient when he coughs. The air flows through the inspiratory flow sensor, the valve 4, then the turbine and is exhaled by the valve 2.



During the expiratory phase, the **low pressure** is equal to the **proximal pressure** and the **high pressure** is equal to **atmospheric pressure**. *The difference of pressure between the two circuits is negative*.

The pump still provides additional pressure to the two solenoid valves to control the four valves. However, during the expiratory phase, the solenoid valve B turns on to close the valve 1 and the valve 3 and the solenoid valve A switches off to open the valve 4 and the valve 2 to permit the exhalation.

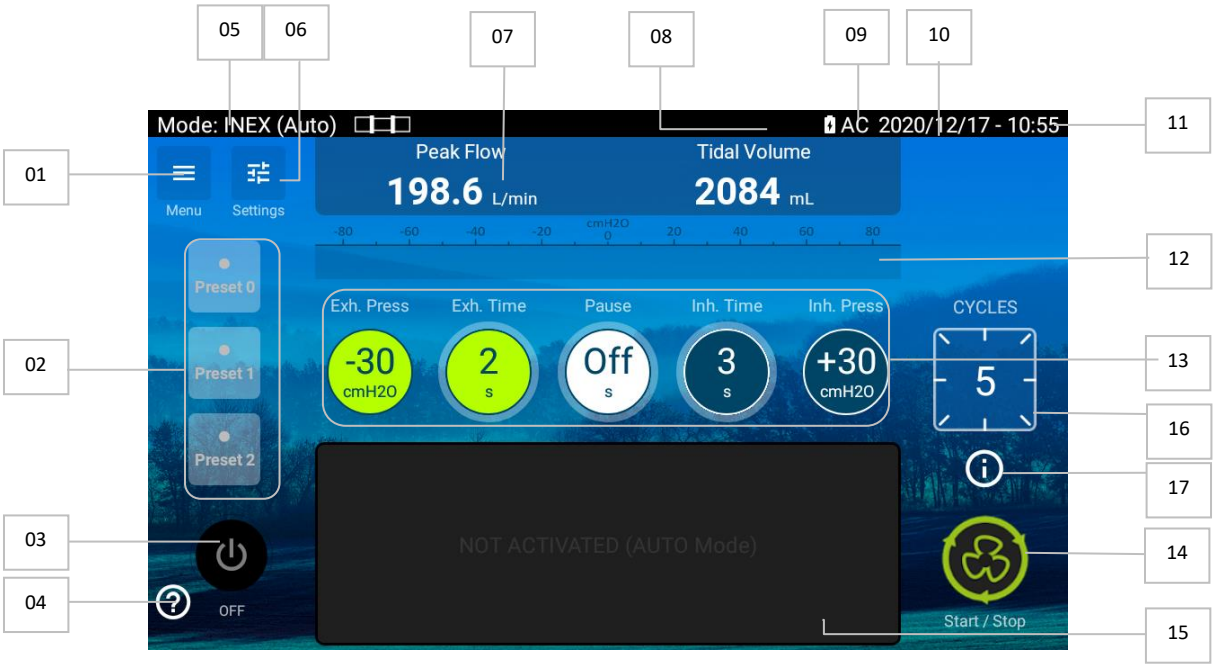


EOVE-70 MANAGEMENT

3 EOVE-70 Interface

3.1 Main menu

The home screen displays various information about current settings, pressure of treatment, power supply mode, etc... It is reachable from all other menus by pressing

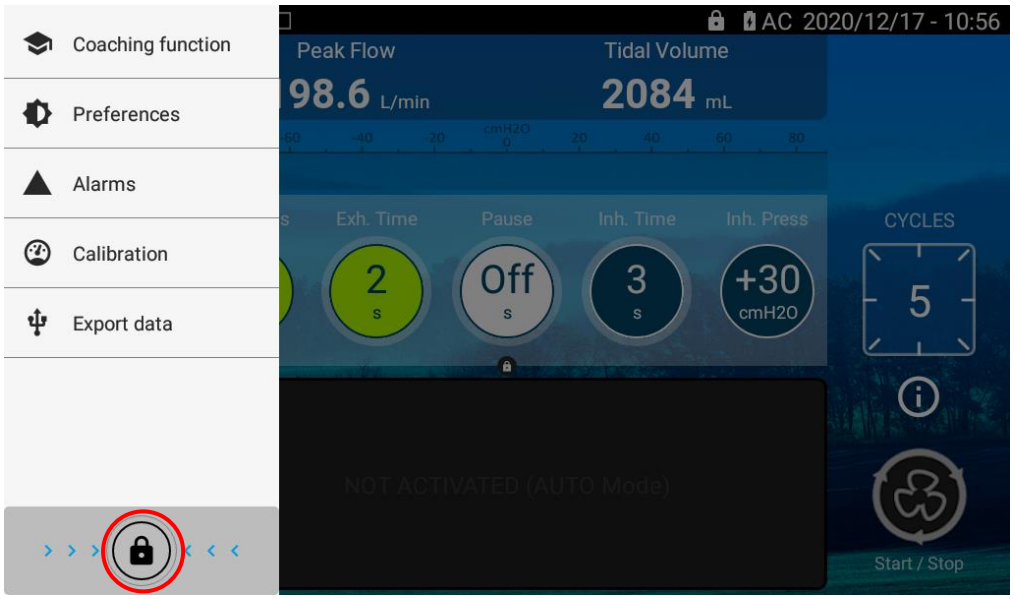


Home screen

1. Main menu access	2. Presets configurated
3. Power off button	4. Access to Help interface
5. Current treatment mode	6. Access to clinical settings
7. Treatment monitoring	8. Battery life indicator & current power source mode
9. Wi-Fi connected	10. Date
11. Time	12. Airway pressure indicator
13. Main settings bar	14. Start/Stop treatment button
15. Touch pad (manual treatment)	16. Cycles counter
17. Access to current settings information pop-up	18.

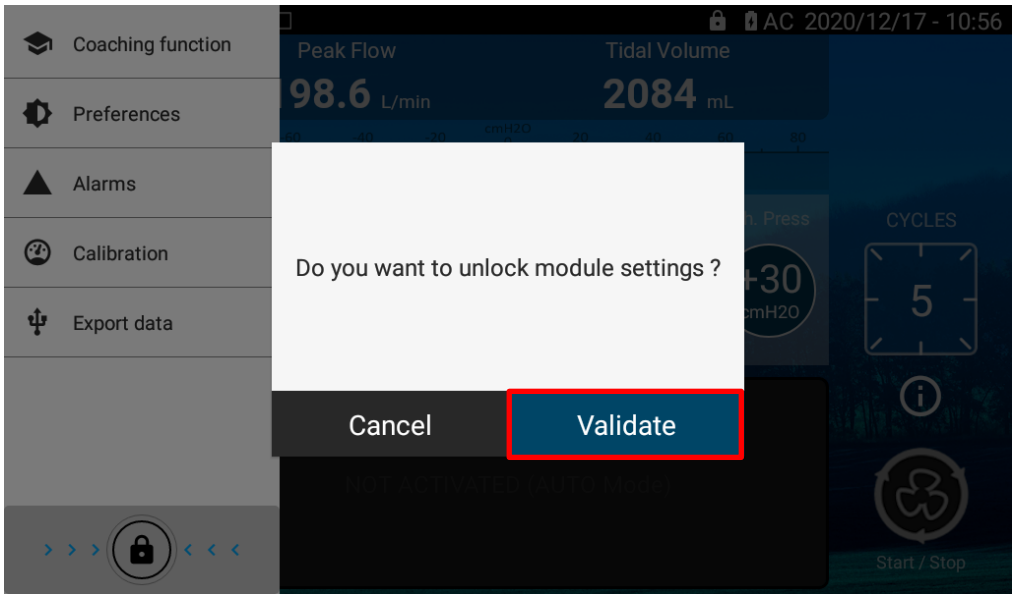
NOTE: Clinical settings and maintenance menu access are locked by default. To unlock both menus, reach the main menu and press on unlock button, then validate.

- To reach the main menu, click on  from the home screen
- Hold unlock button until the validation popup appears



Main menu

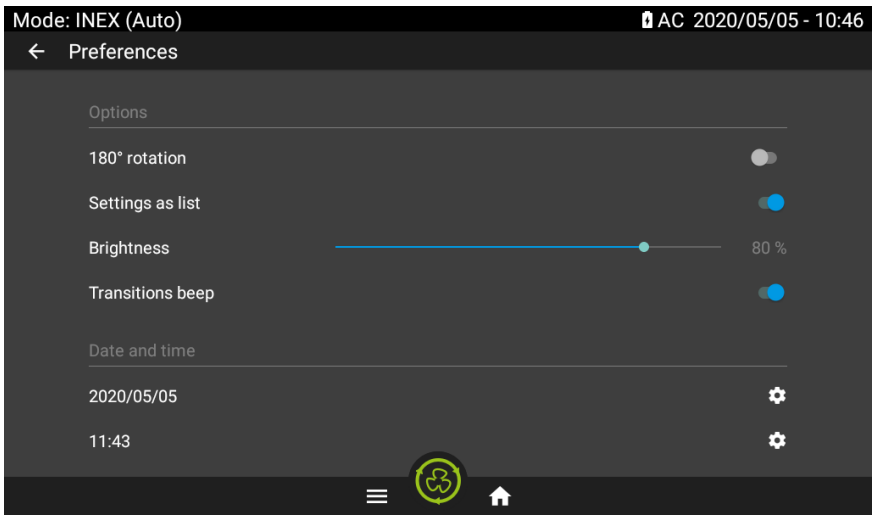
- Validate



3.2 Preferences

Preferences menu enables to set up different parameters and to access to some information about the EOVE-70 SMD and its interface.

- From the main menu, click on Preferences

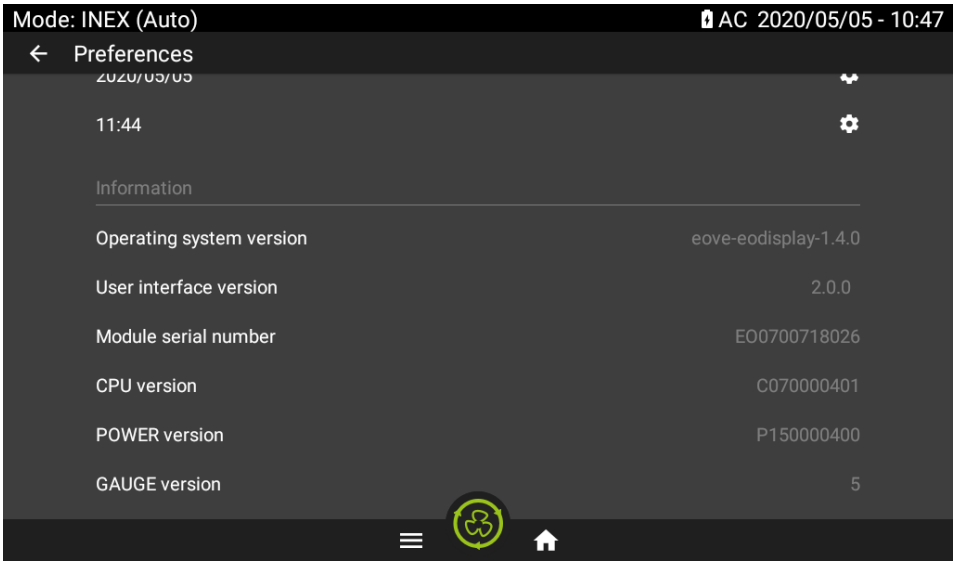


From this menu, the user can adjust the following settings of the device.

Rotation of screen	Allows the screen to be rotated 180°. Press the small circle to rotate the screen.
Settings as list	Select the display mode of the settings menu. To display the settings as list, press the small circle. The circle and the bar will become blue.

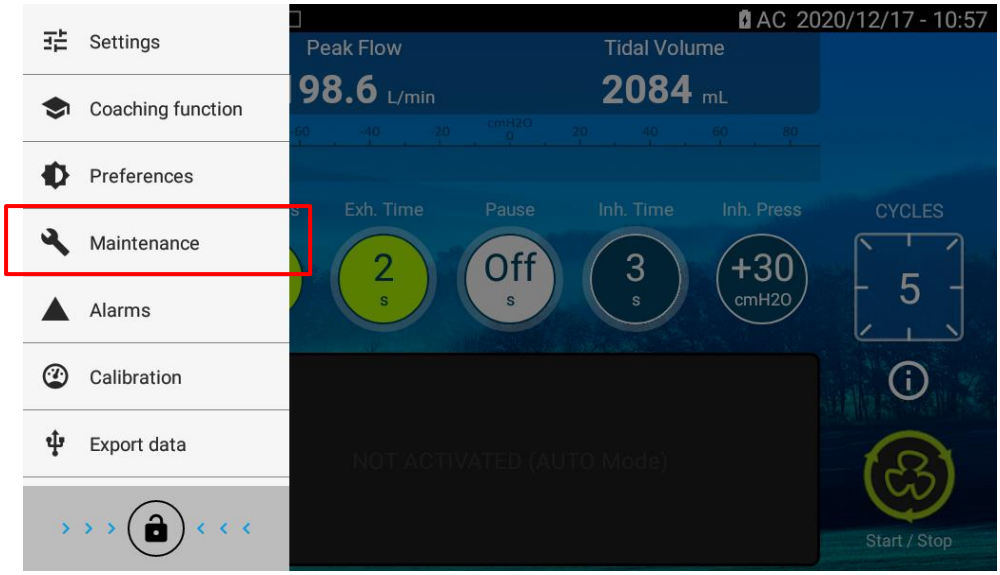
Current Date	Sets the current day, month and year. To set the date, click on the wheel and choose the date from the calendar. Press ok when completed.
Current Time	Sets the current time on 24h clock. To set the time, click on the wheel at the end of the line and choose the time from the dial. Press ok when completed.

Or display some information about tablet status or software versions.



3.3 Maintenance menu

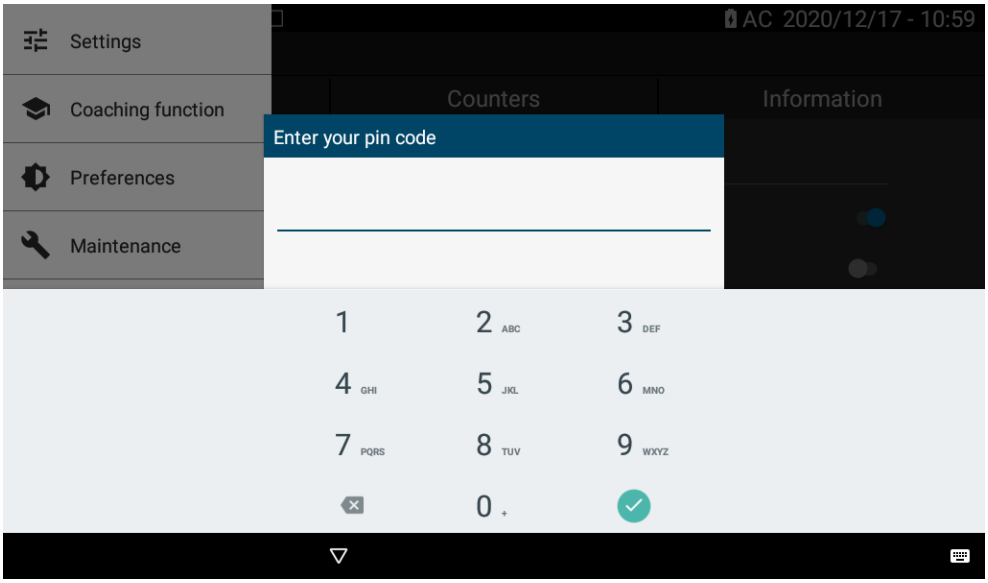
3.3.1 Maintenance menu interface



To access to the maintenance menu, a pin code is required.

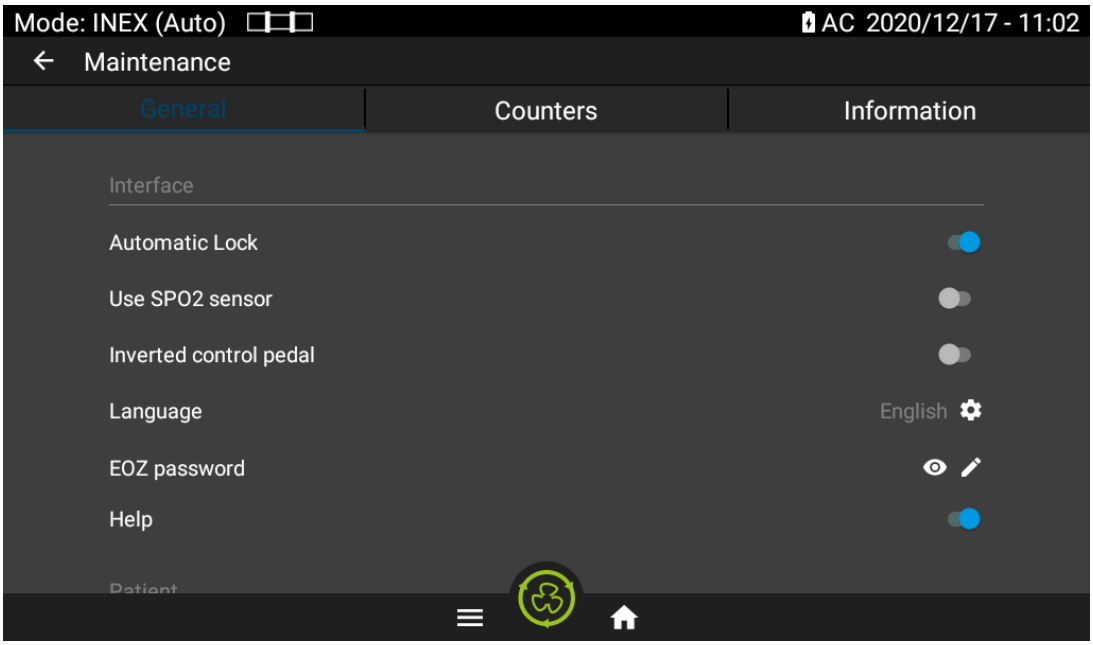
PIN CODE FOR ALL DEVICES: 6666

WARNING: DO NOT GIVE THE PIN CODE TO THE PATIENT.



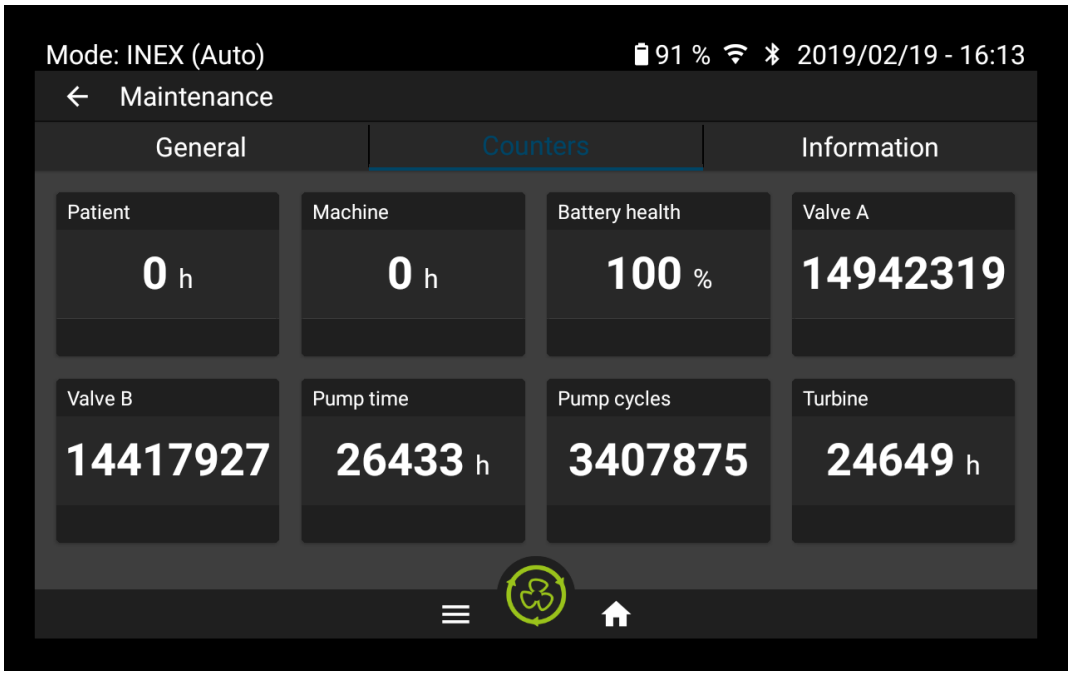
The Maintenance menu is split in three tabs:

- "General" tab:
  - Accessories control
  - Language selection
  - Connectivity
  - Interface app and Operating system versions management

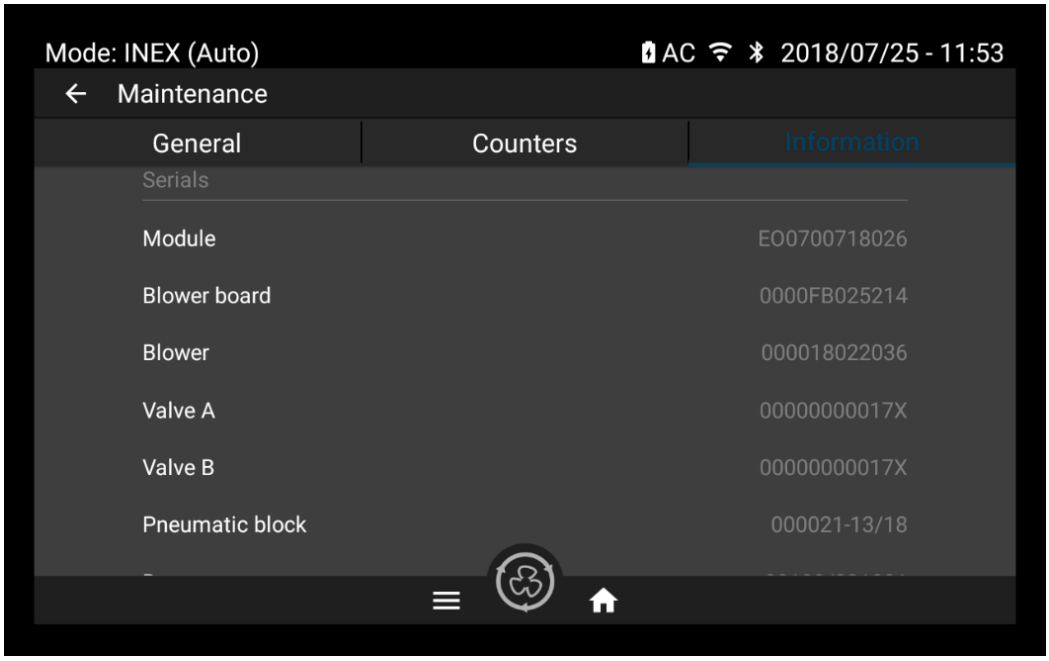


- "Counters" tab: *Display operation time of every component concerned by the preventive maintenance operations*

- Display of various counters (battery ageing – turbine – solenoid valve – machine – patient)



- "Information" tab:
  - Display of serial number
  - Display of the current software versions
  - Display of the operating system information



3.4 EOVE-70 interface servicing

3.4.1 Interface software update

WARNING : THE FOLLOWING PROCEDURE ONLY CONCERN THE INSTALLATION OF THE CLINICAL APP ON THE EO-DISPLAY HOUSING UNIT.

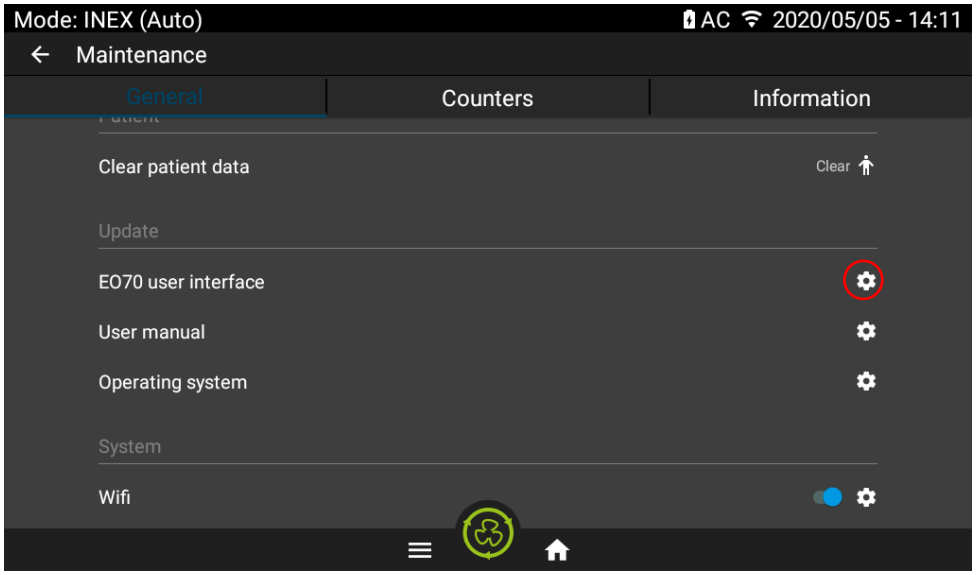
NOTE: Interface update of the EO-Display must not be done while ventilation module is operating.

Copy the interface software version required on a USB Drive and plug it to the USB port 1 of the EO-Display housing unit.

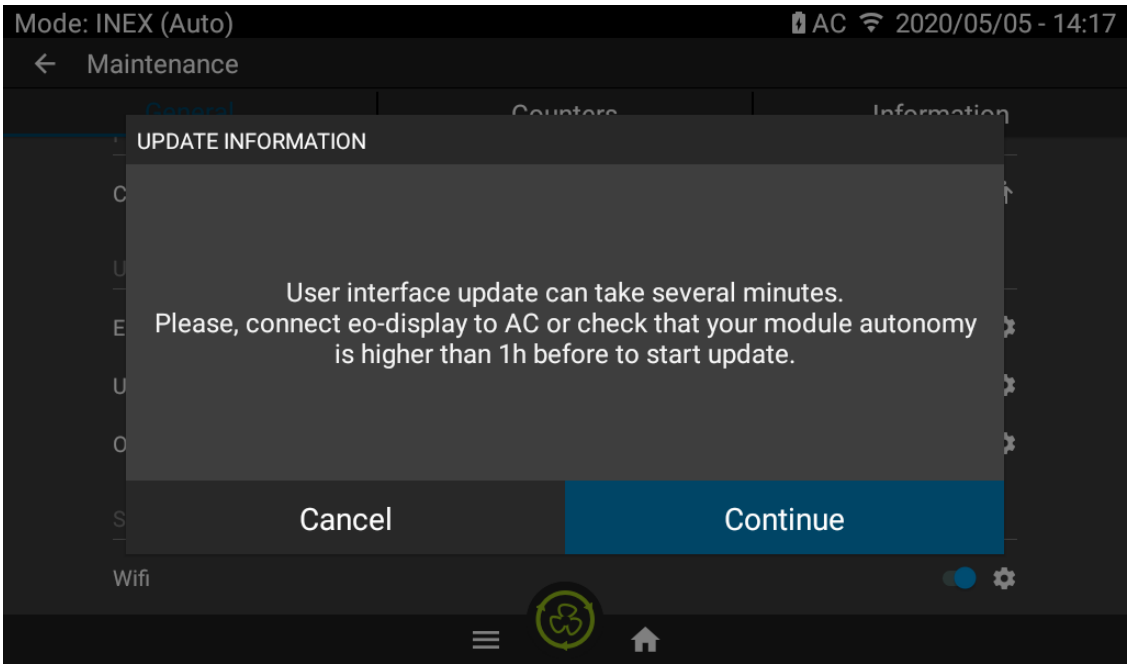
Warning: Only one interface software version must be copied on the USB stick

Note: Use a USB Drive formatted FAT32 / 32Go max / Class 10 / 1 partition

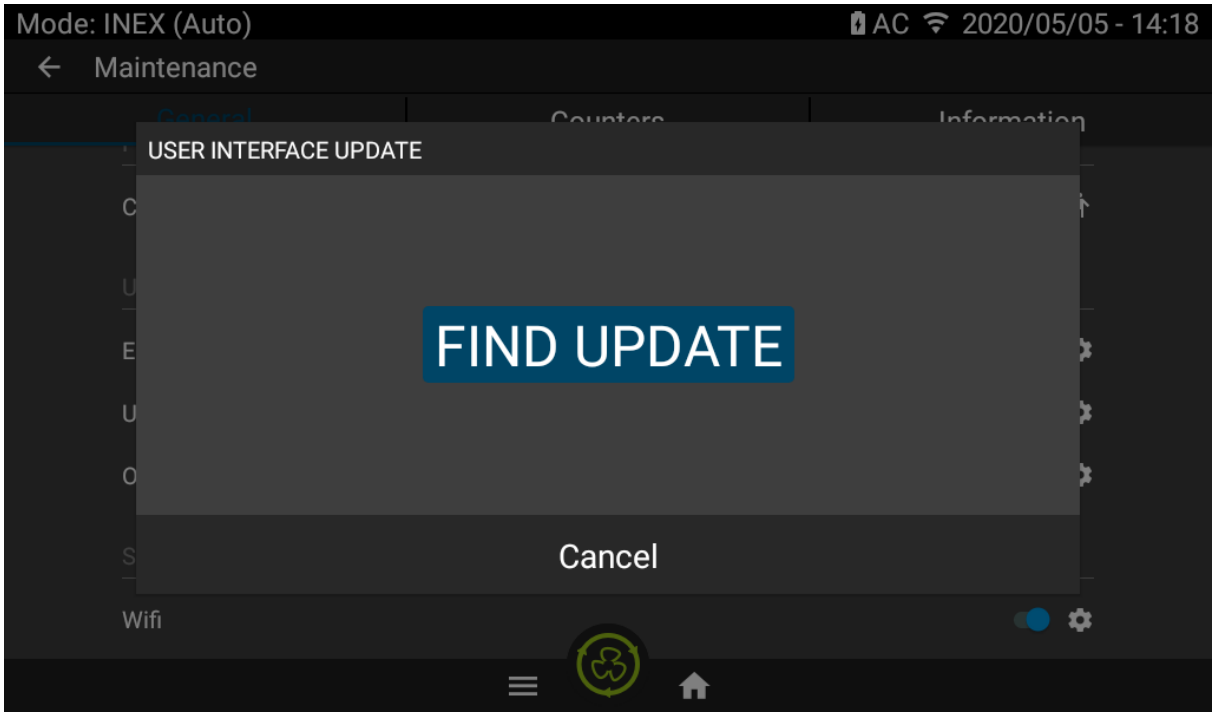
- Click on EO70 user interface



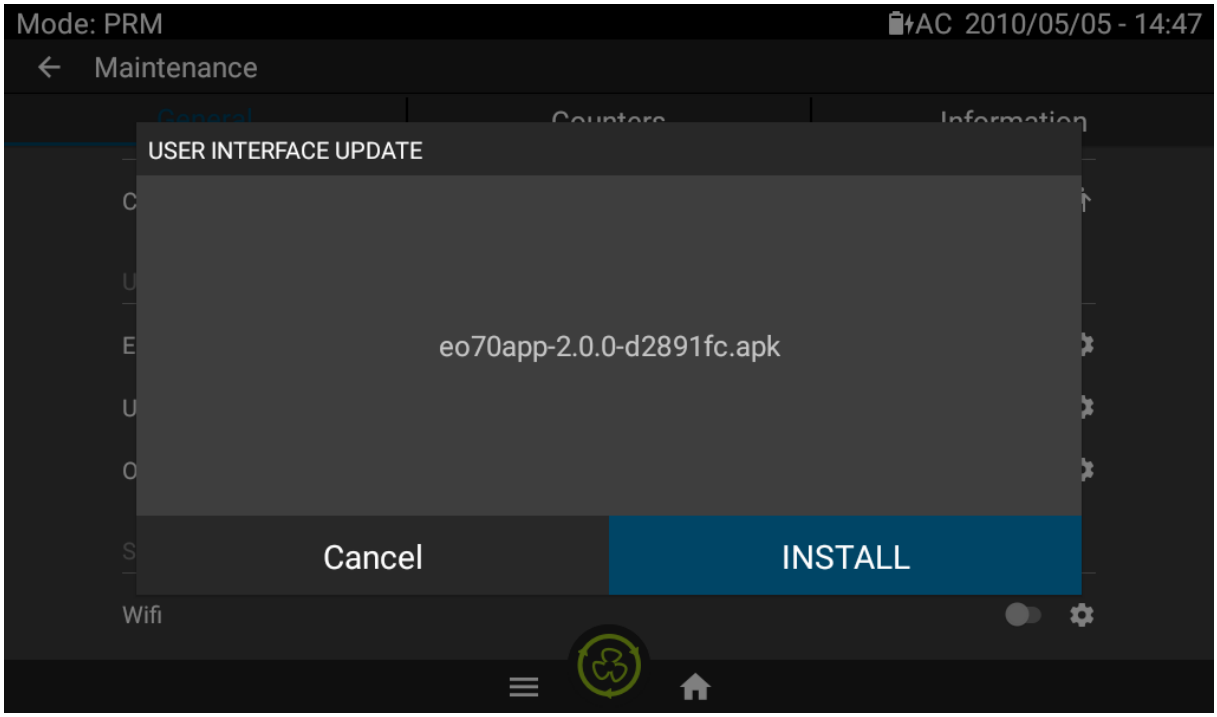
- Check module autonomy and plug the AC if necessary
- Click on *Continue*



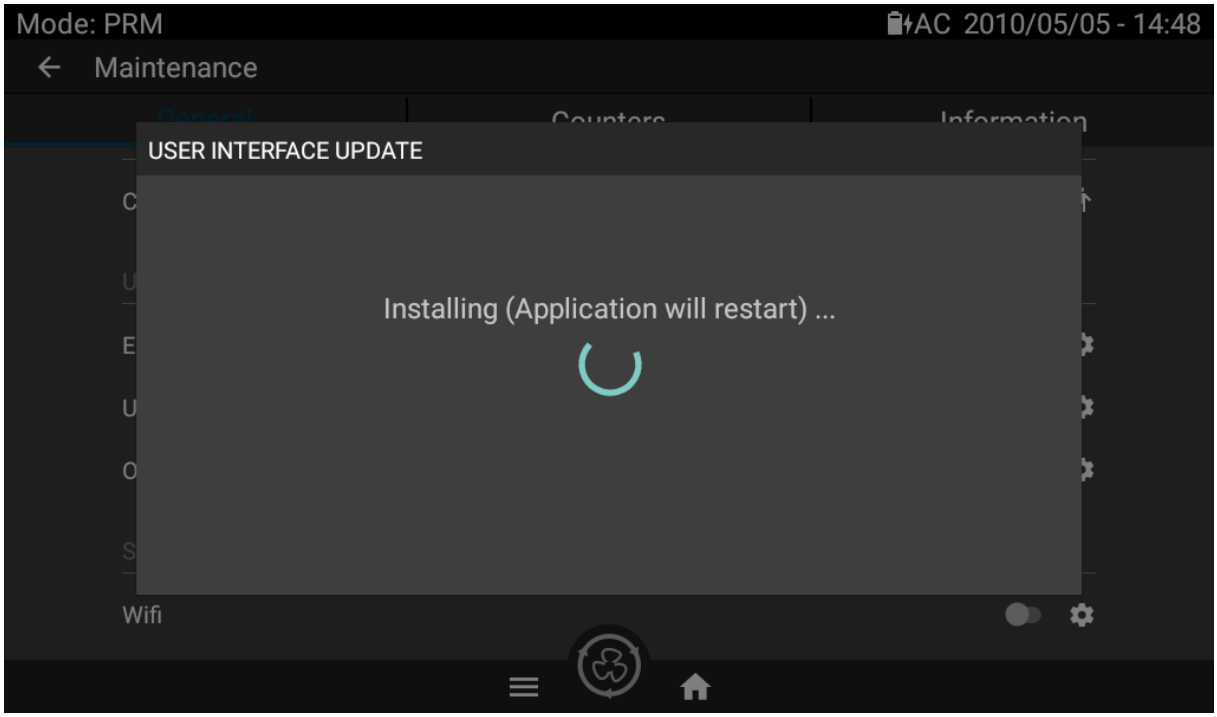
- Click on *Find Update*



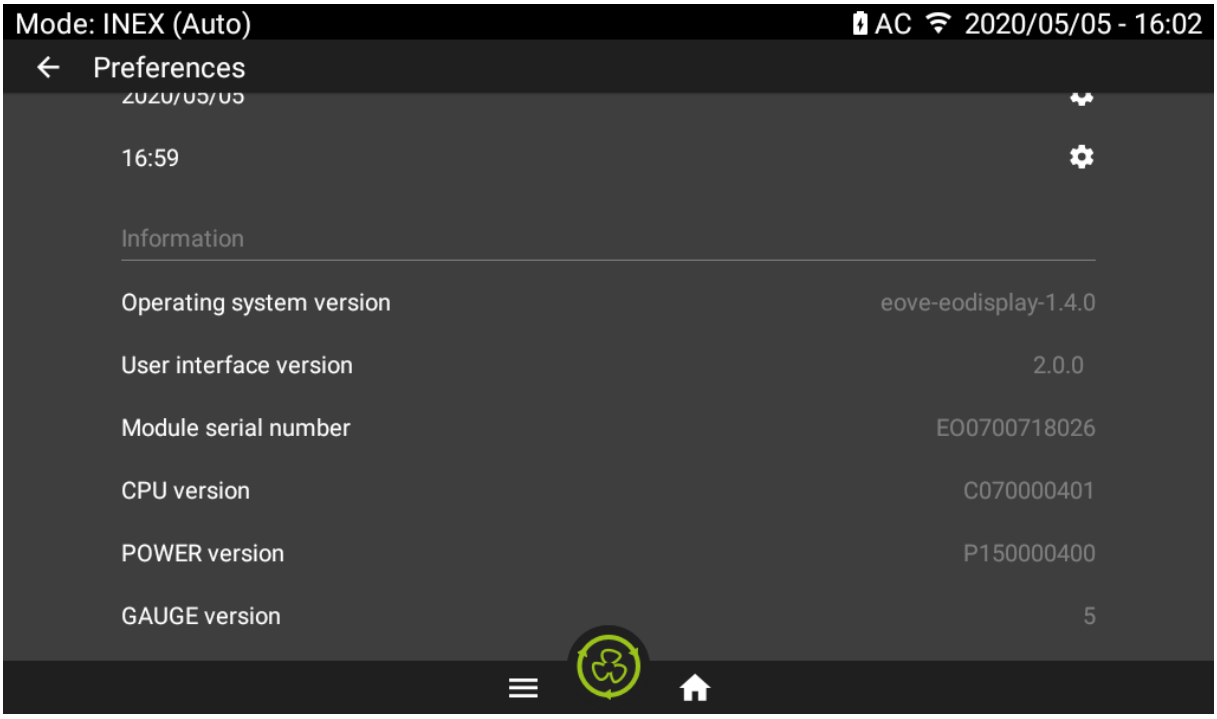
- Verify the version available matches with the one required and click on *Install*



- Wait for the installation until tablet reboot is complete



- Check in PREFERENCES menu that the interface version installed is the one required

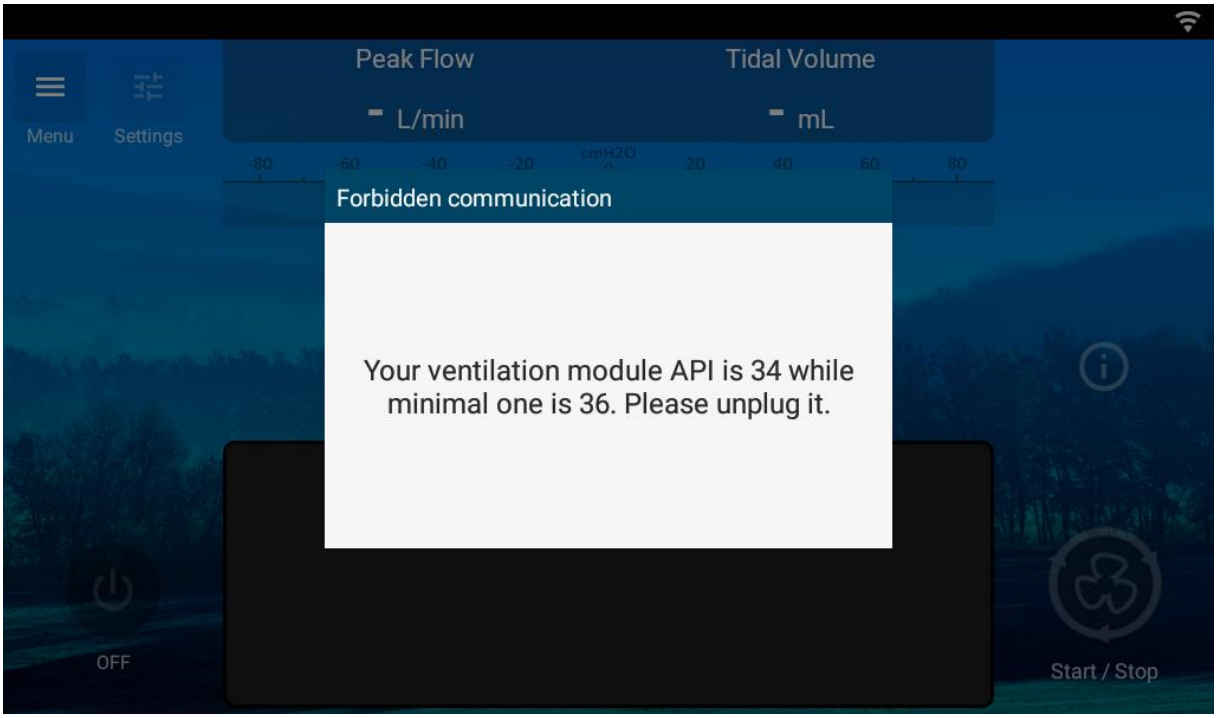


3.4.2 API version change

The device can operate only if the CPU software and the interface are in same API version. In case of API version change, update all the software in the following order:

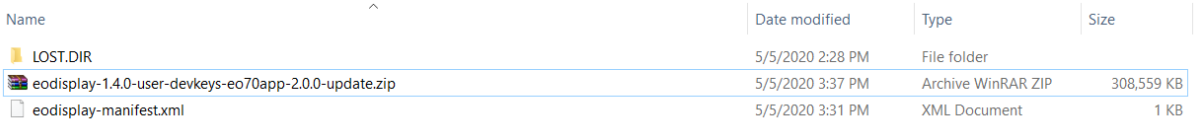
- Upgrade of the CPU software,
- Upgrade of the interface software.

To keep communication between ventilation module and EO-Display, their software must be in same API version. Otherwise the following popup appears.



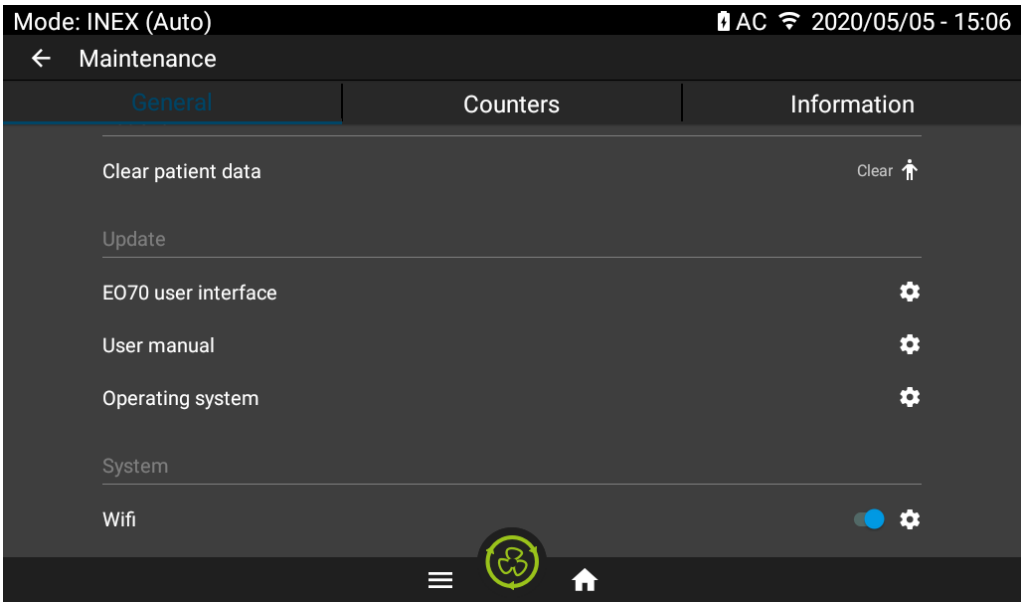
3.4.3 Android system update

- Copy the OS version on a USB flash driver with same specifications as those required for the interface update

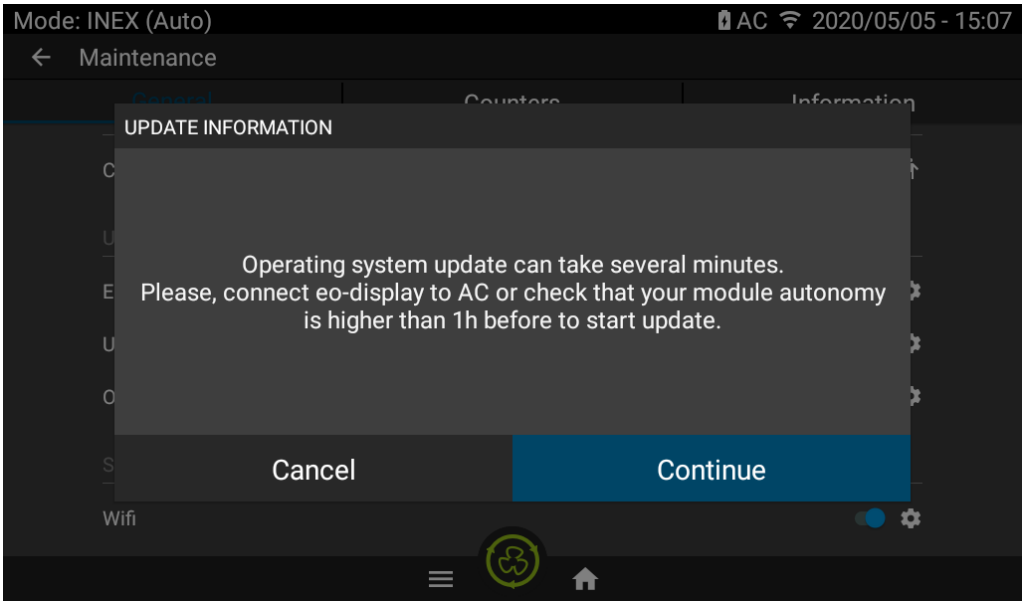


WARNING: Keep OS version and its manifest together and copy them on the USB Drive. Do not modify the manifest which is dedicated to one single version of the OS.

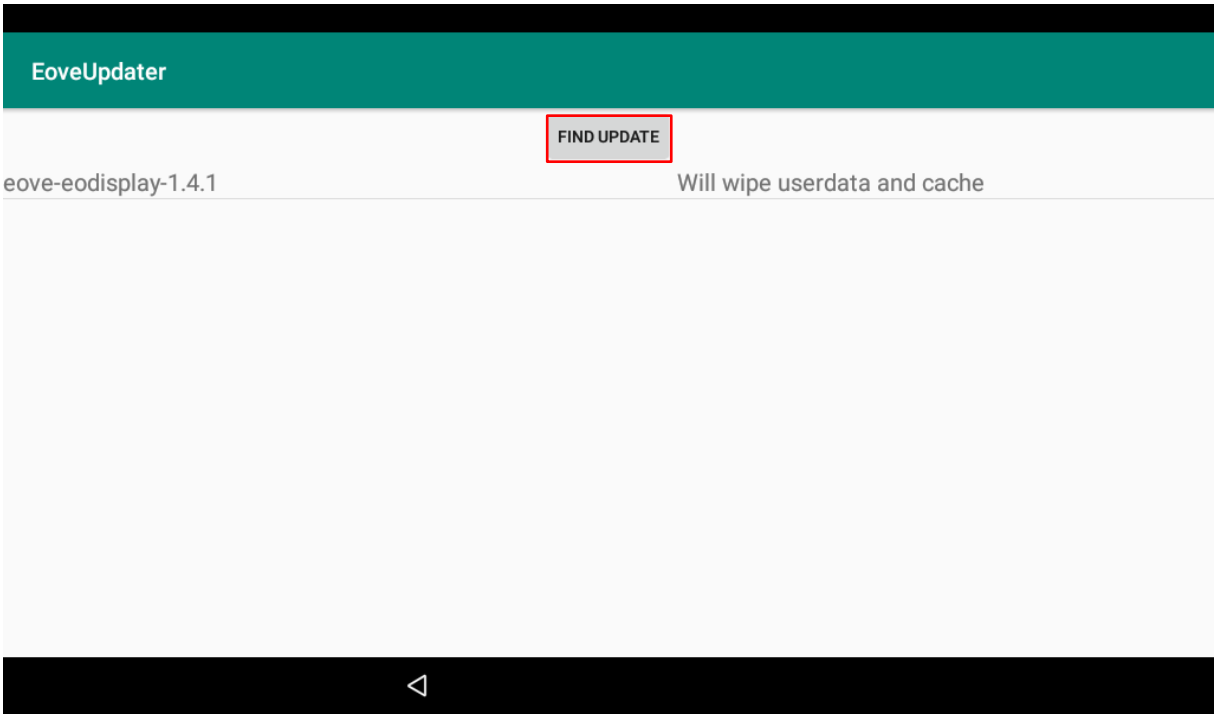
- Plug the USB stick to the EO-Diplay housing unit
- Go to the Maintenance menu and select Operating System



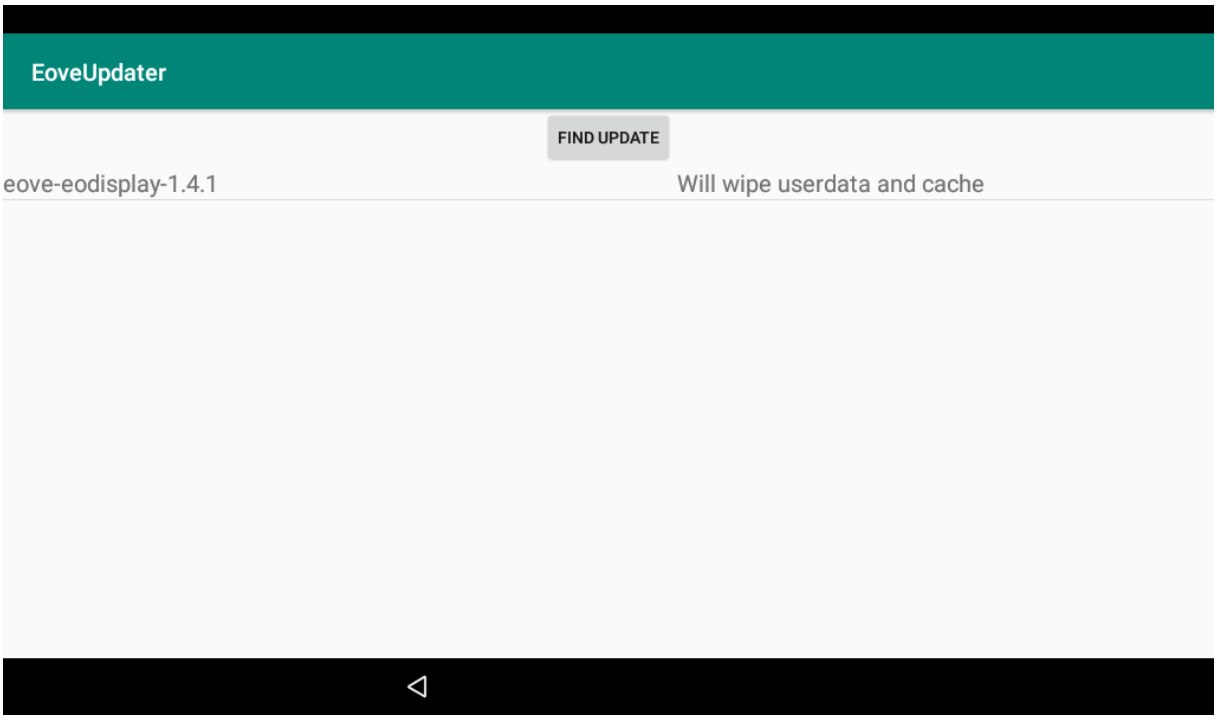
- Follow update recommendations and press Continue



- Click on Find Update

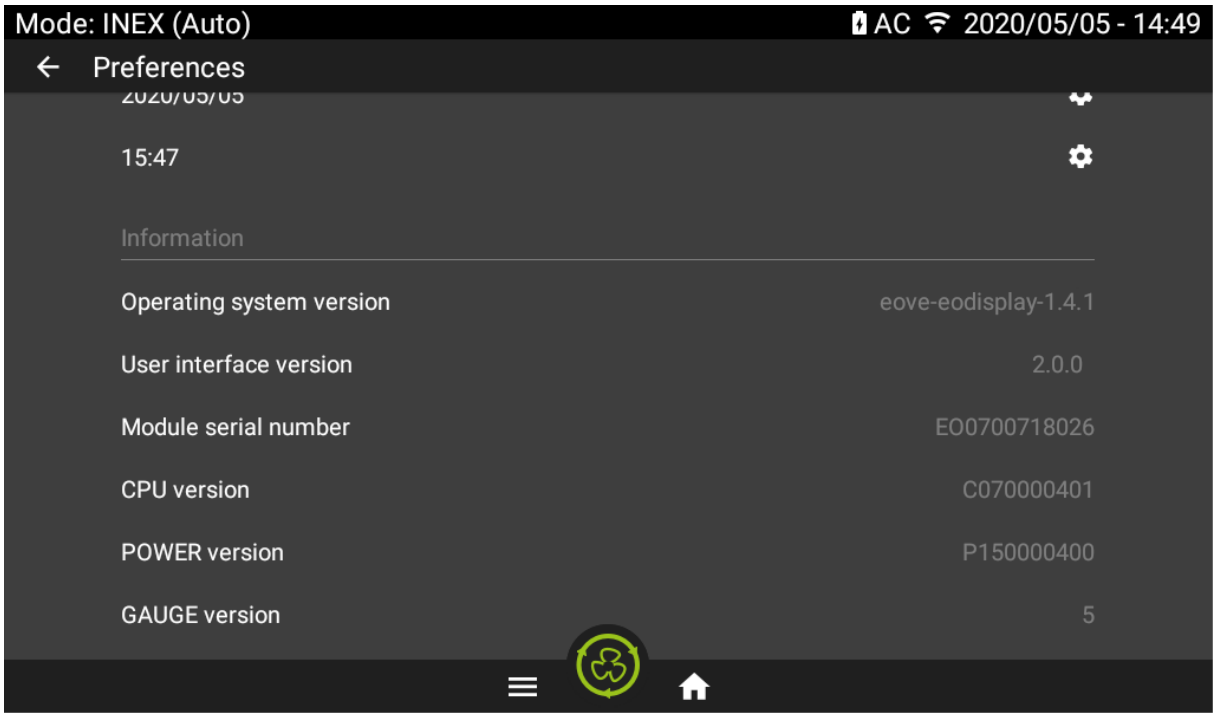


- Check that the version displayed is the one required and click on it to launch the update



- Wait until the installation is complete and the display screen reboots

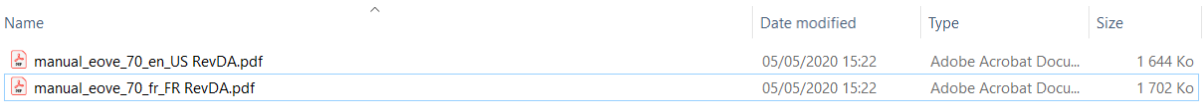
- Verify in PREFERENCES menu the Operating System version



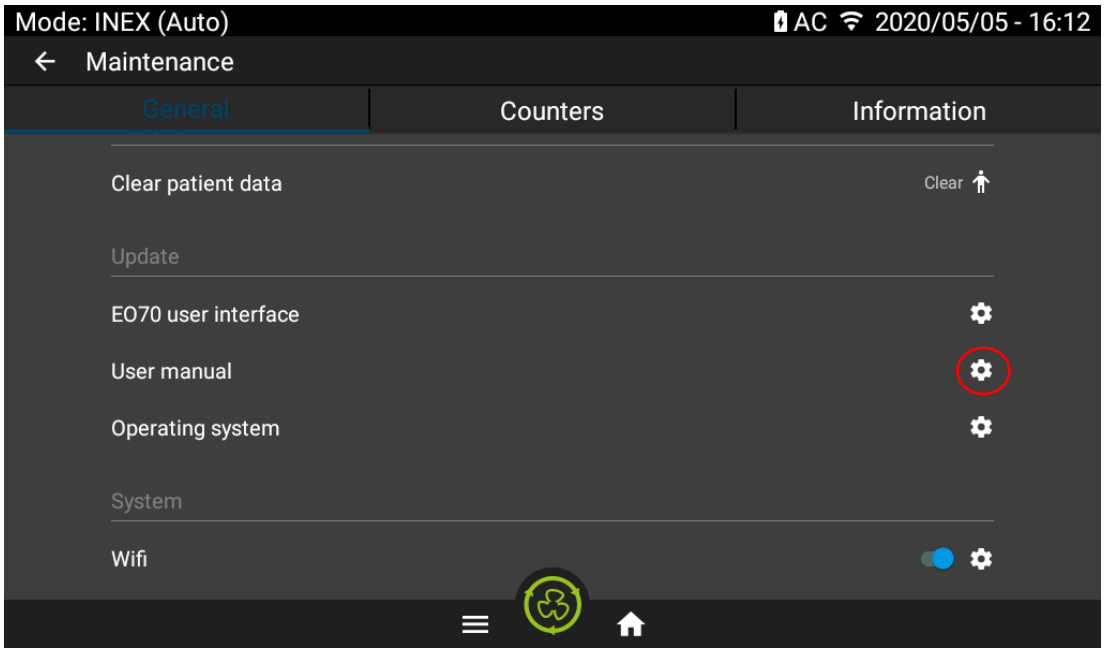
3.4.4 Help interface and user manual update

NOTE: The user manual must be updated in the language selected in the interface

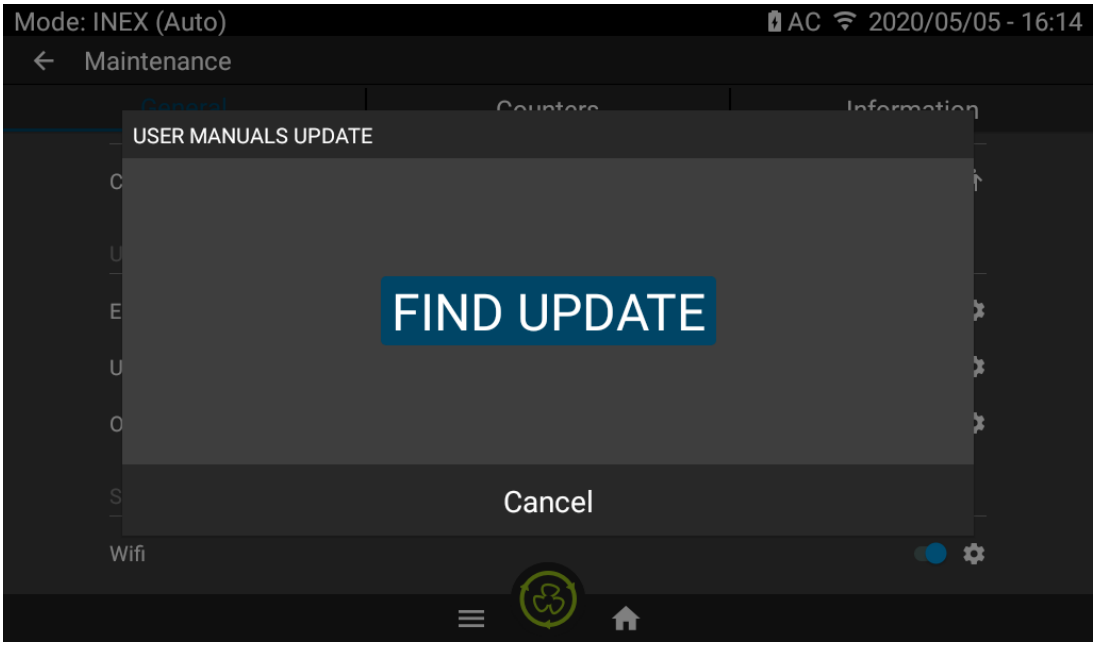
- Download the user manual version in the language required
- Copy it onto a USB stick



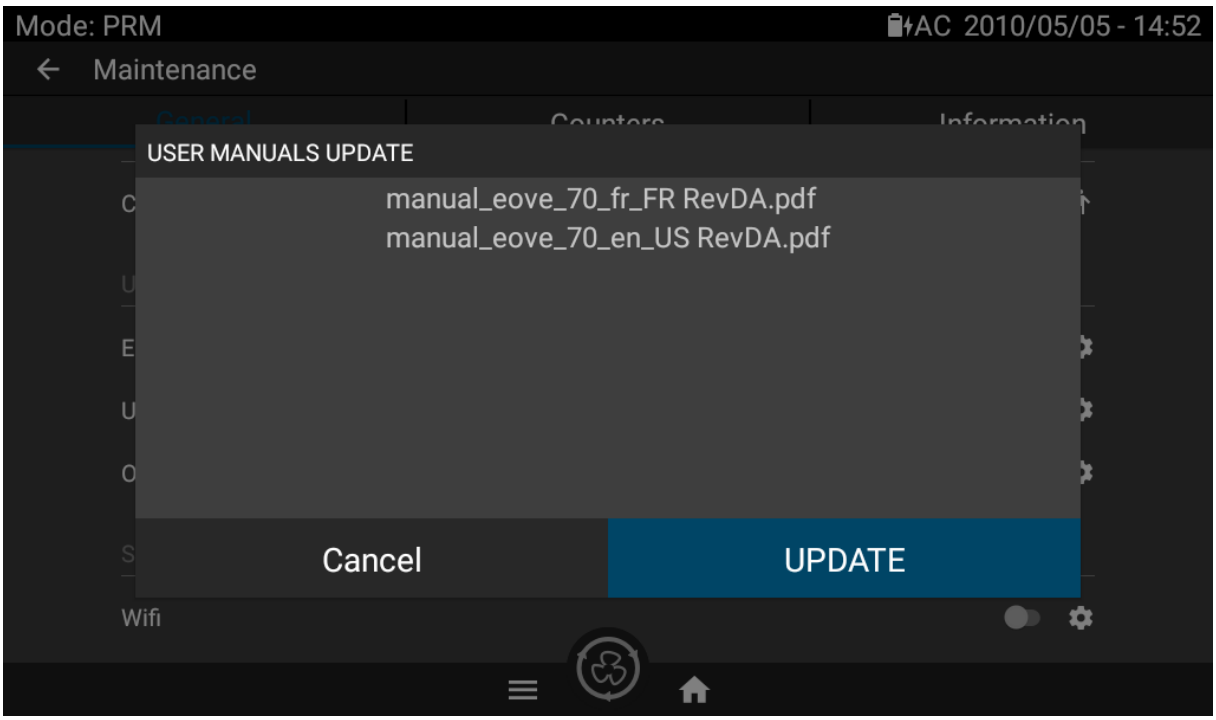
- Go to the maintenance menu and launch the update of the user manual



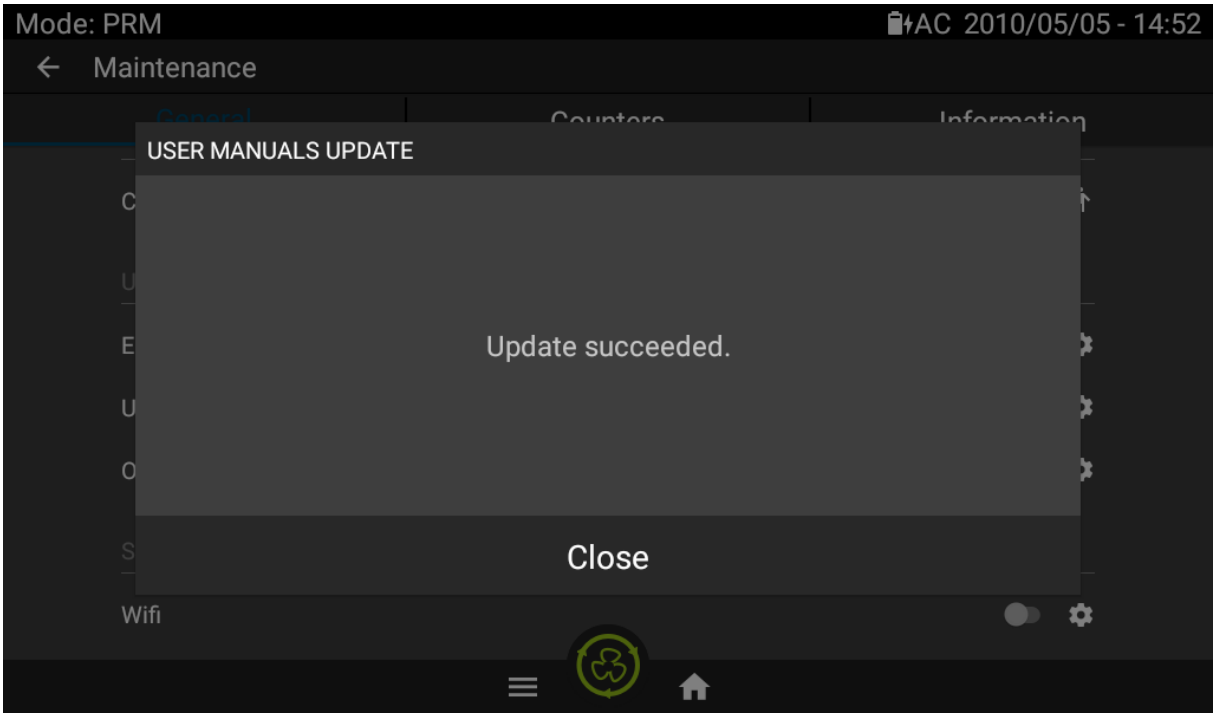
- Click on “Find Update”



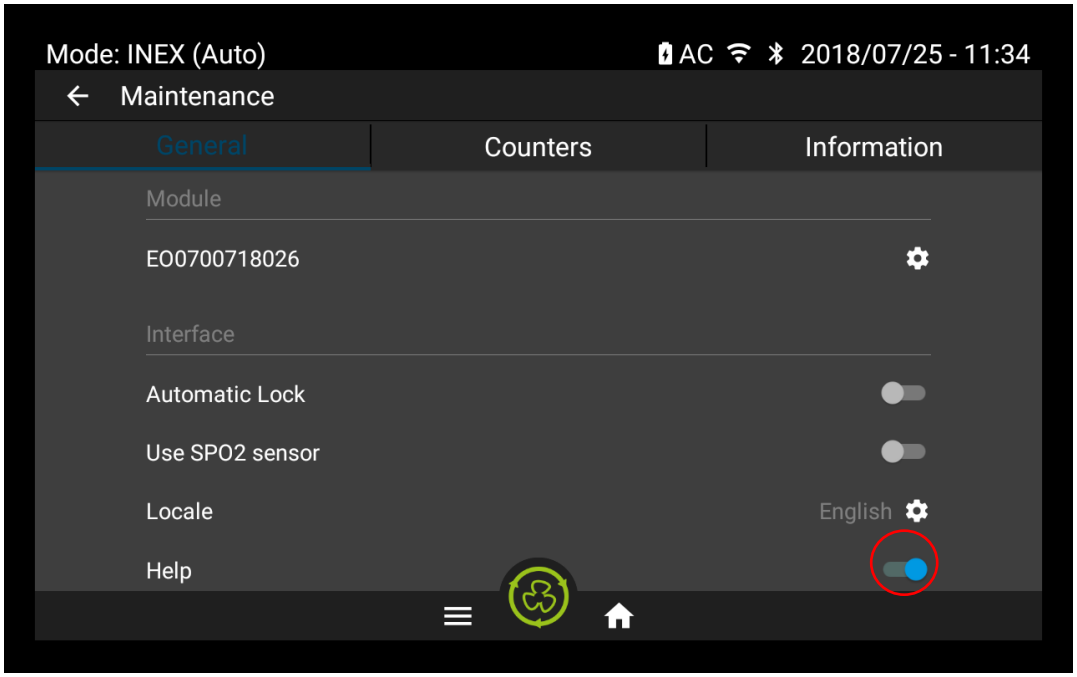
- Select the file required and click on “Update”



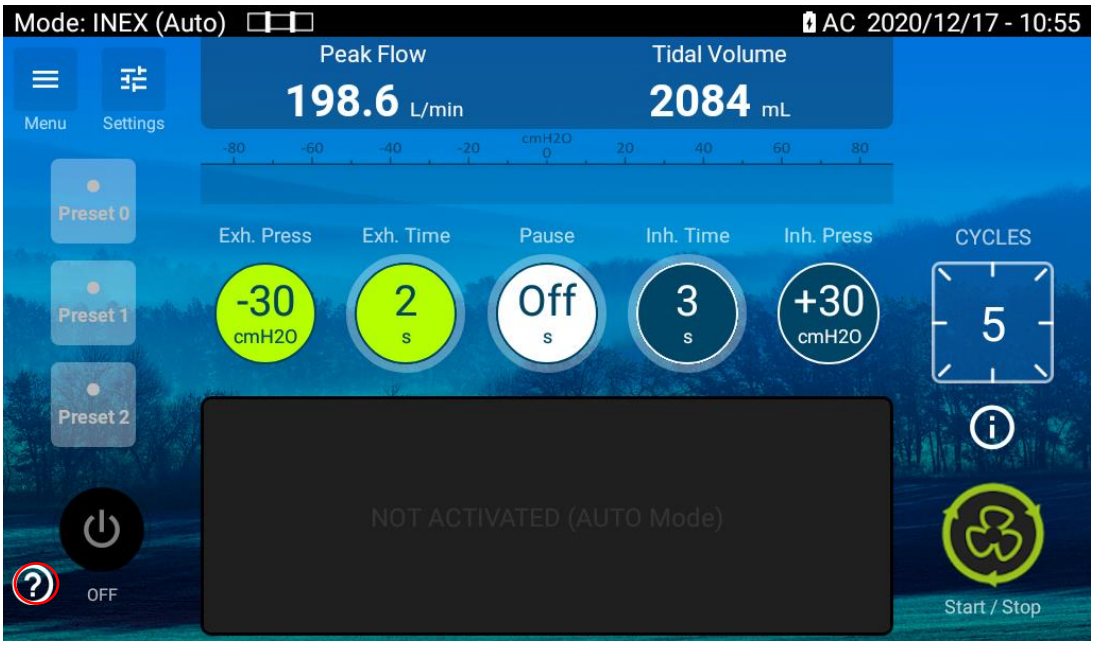
- Wait until the end of the update



- Activate the Help interface



- Check that the Help shortcut is displayed and click on it

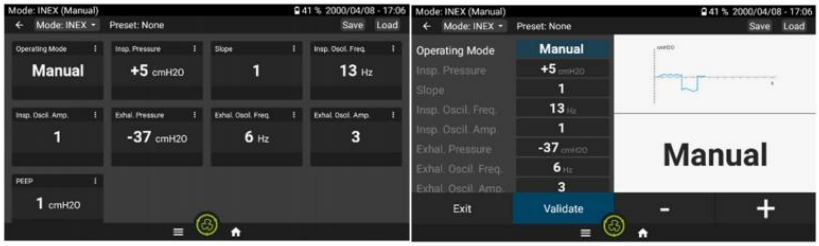


- Look for the information required

NOTE:	If more than one preset has been set up, follow the instructions of your clinician for when and how they should be used.

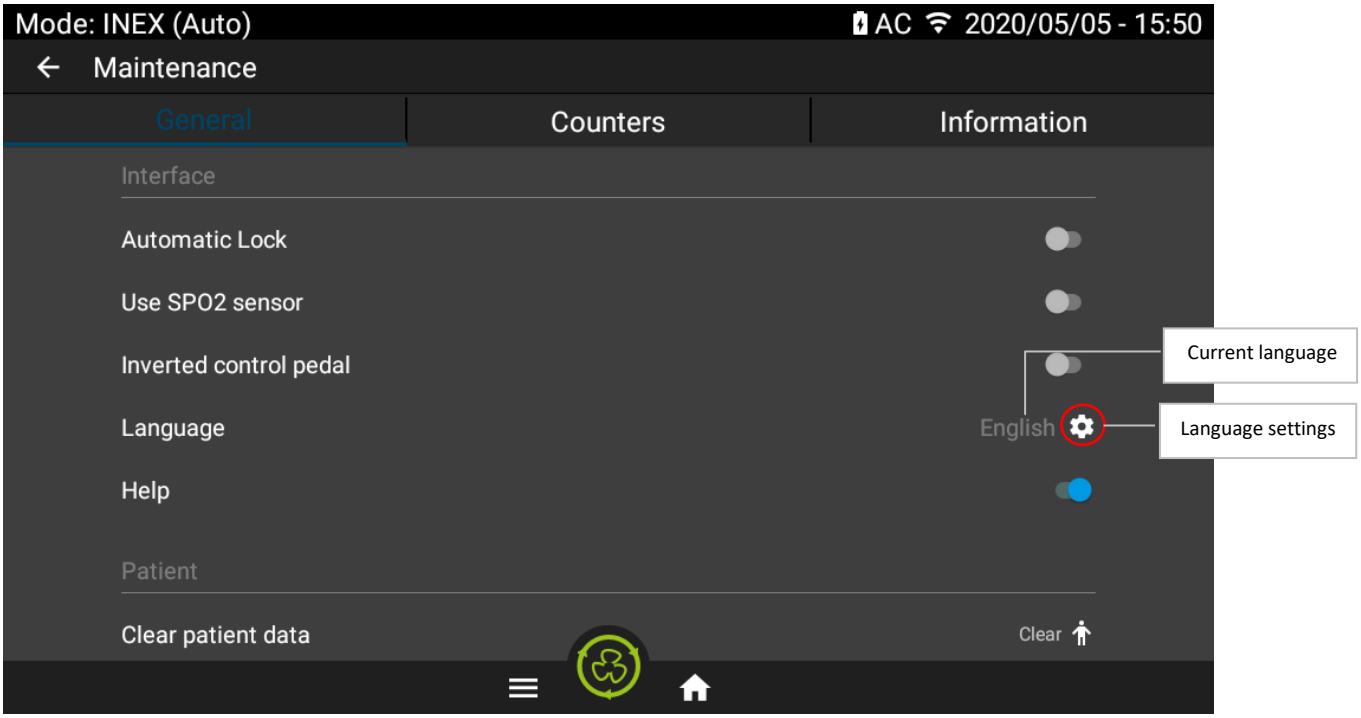
Presets Configuration Access

Access the settings screen (see instruction above).

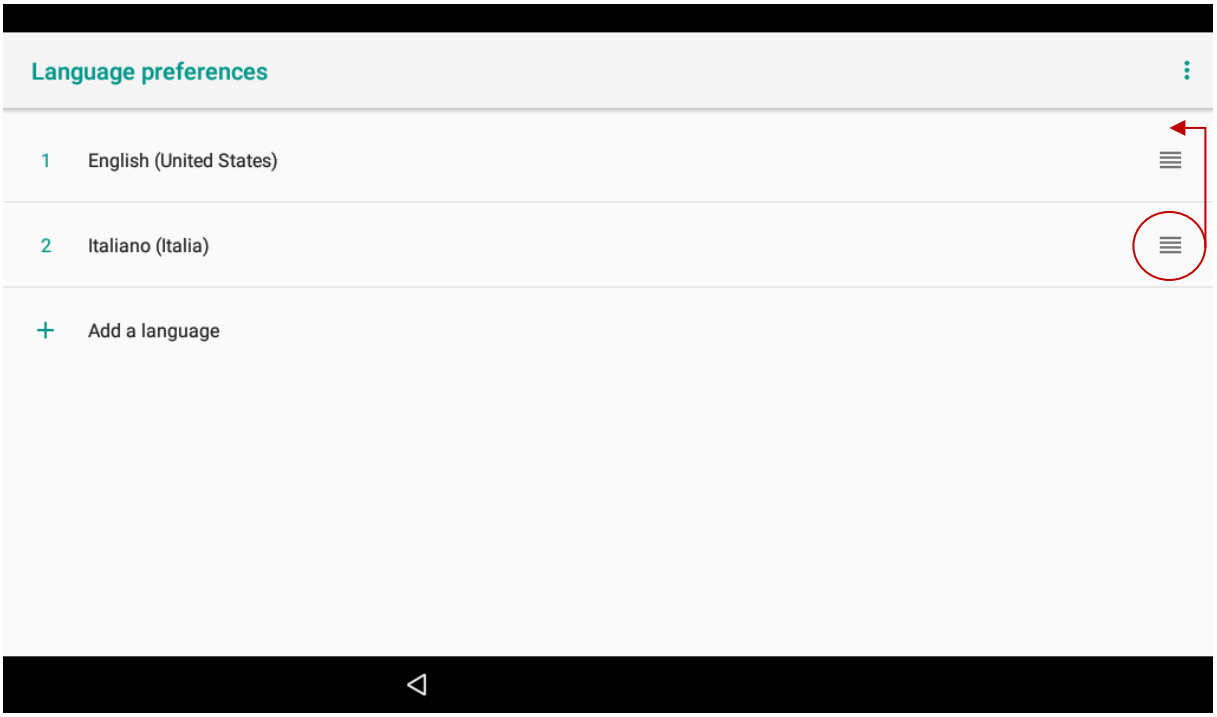


From the upper band of the menu, you can:

3.4.5 Language selection



- Add a language then slide it up to the top

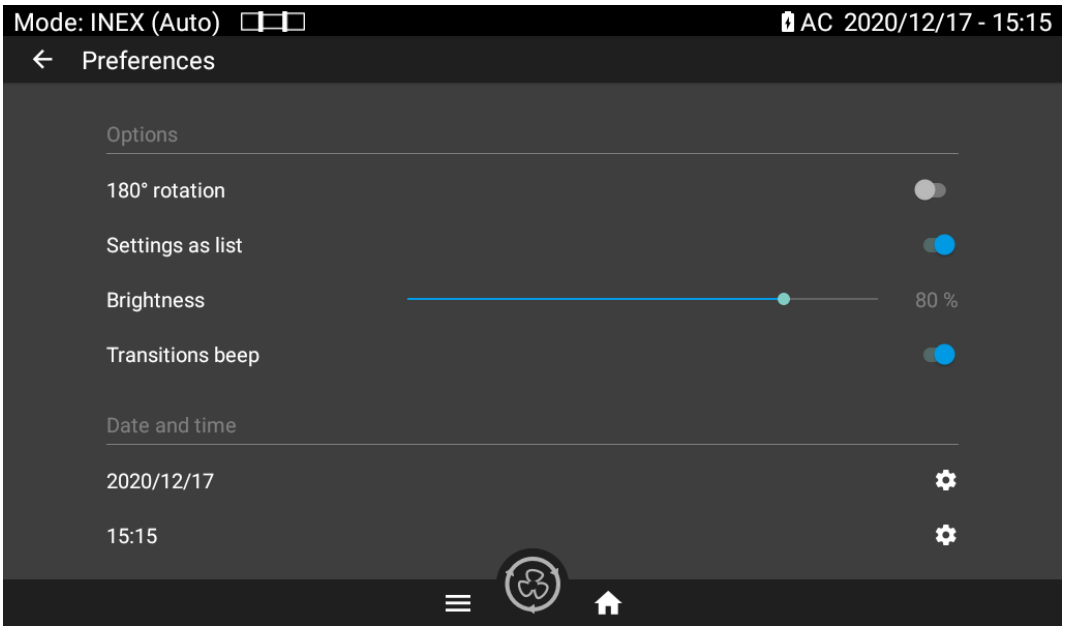


- Click on return button, the application will restart automatically.

NOTE: The default language is English.

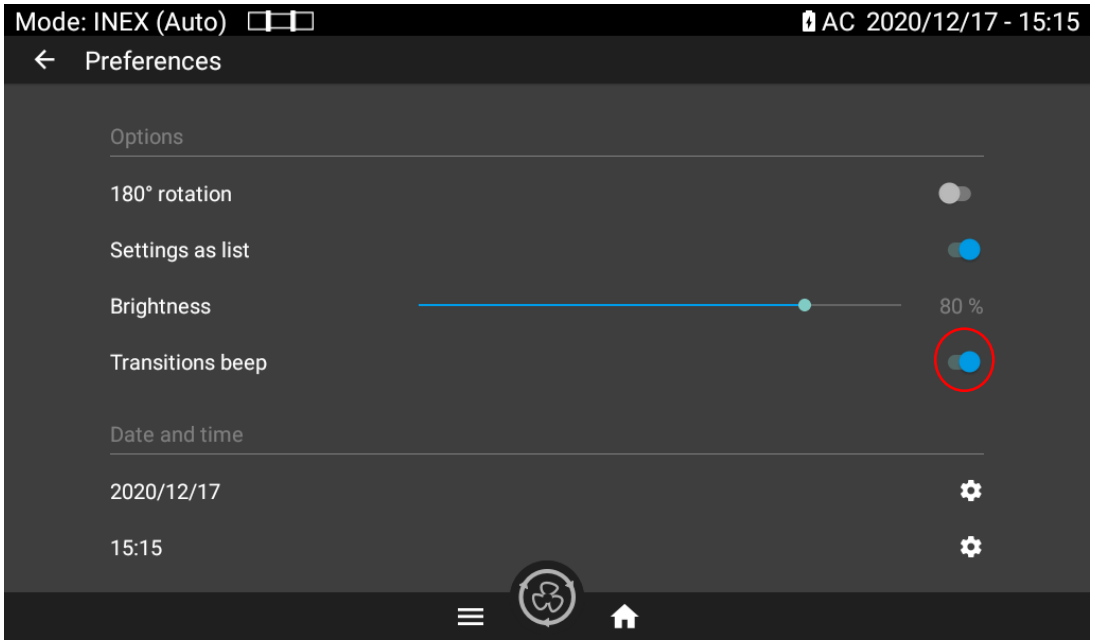
3.4.6 Brightness of the screen

- Go to Preferences menu
- Slide the cursor to adapt the brightness



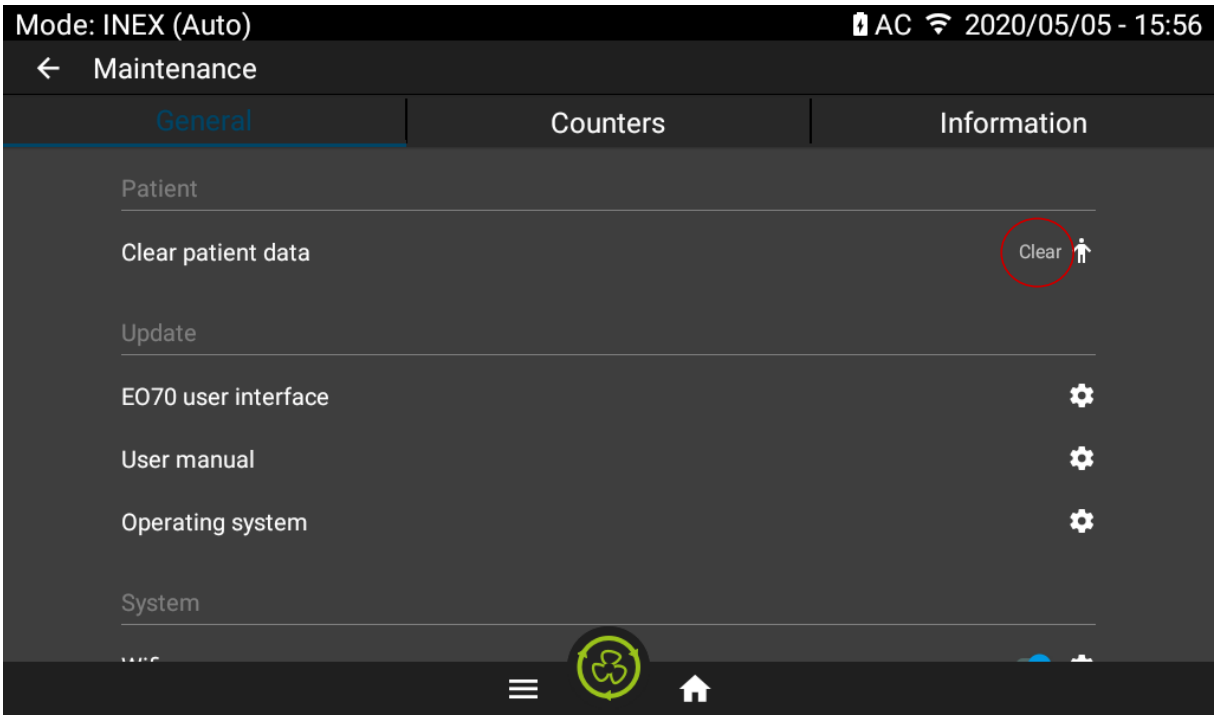
3.4.7 Transition Beep

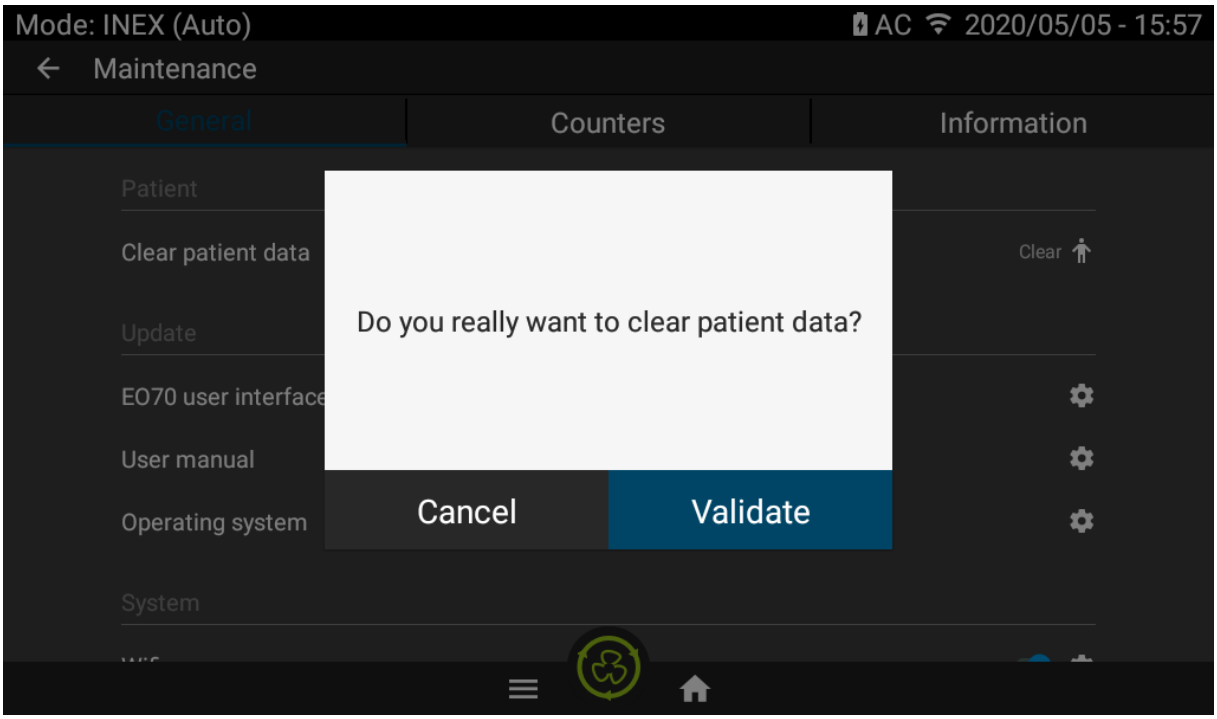
- Go to Preferences menu
- Enable *transitions beep* to allow module to always trigger a beep when a transition between inspiration and expiration occurs.



3.5 Clear patient data

To reset patient data, click on Clear, then Validate



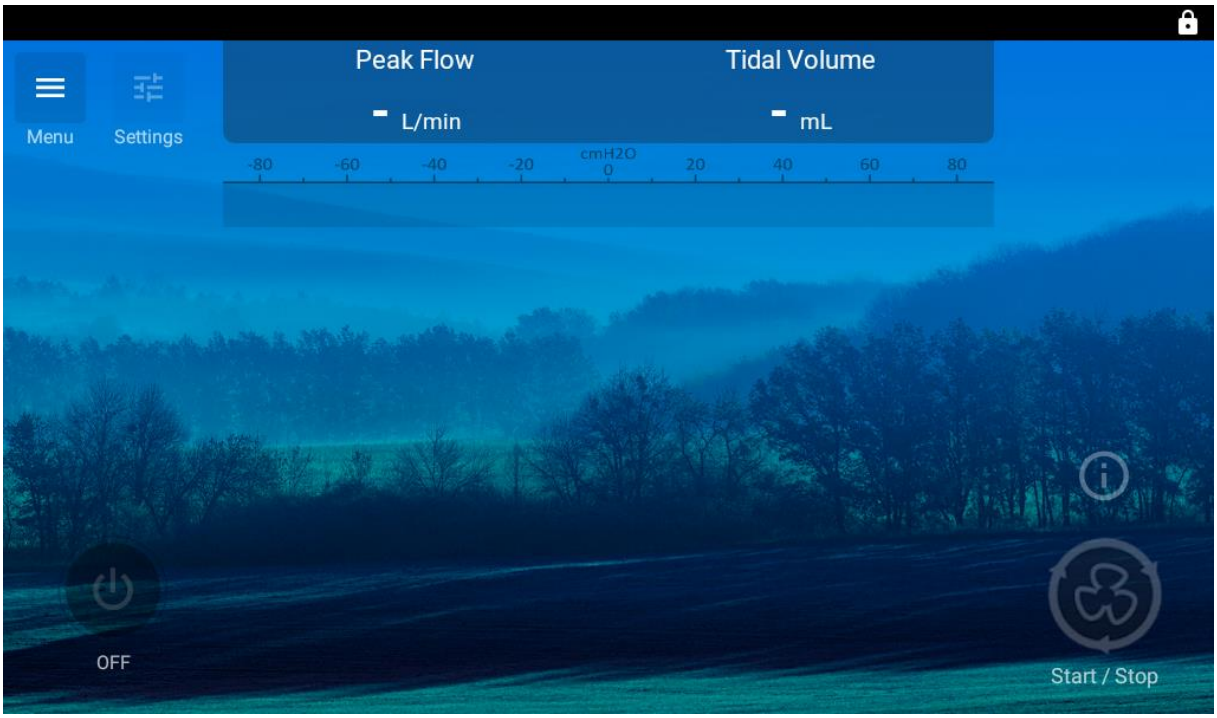


WARNING: A CLEAR PATIENT DATA RESETS PATIENT COUNTER AND ERASES ALL THE EVENTS FROM THE SMD MODULE MEMORY. IT RETURNS THE DEVICE TO FACTORY CONFIGURATION.

4 SMD management

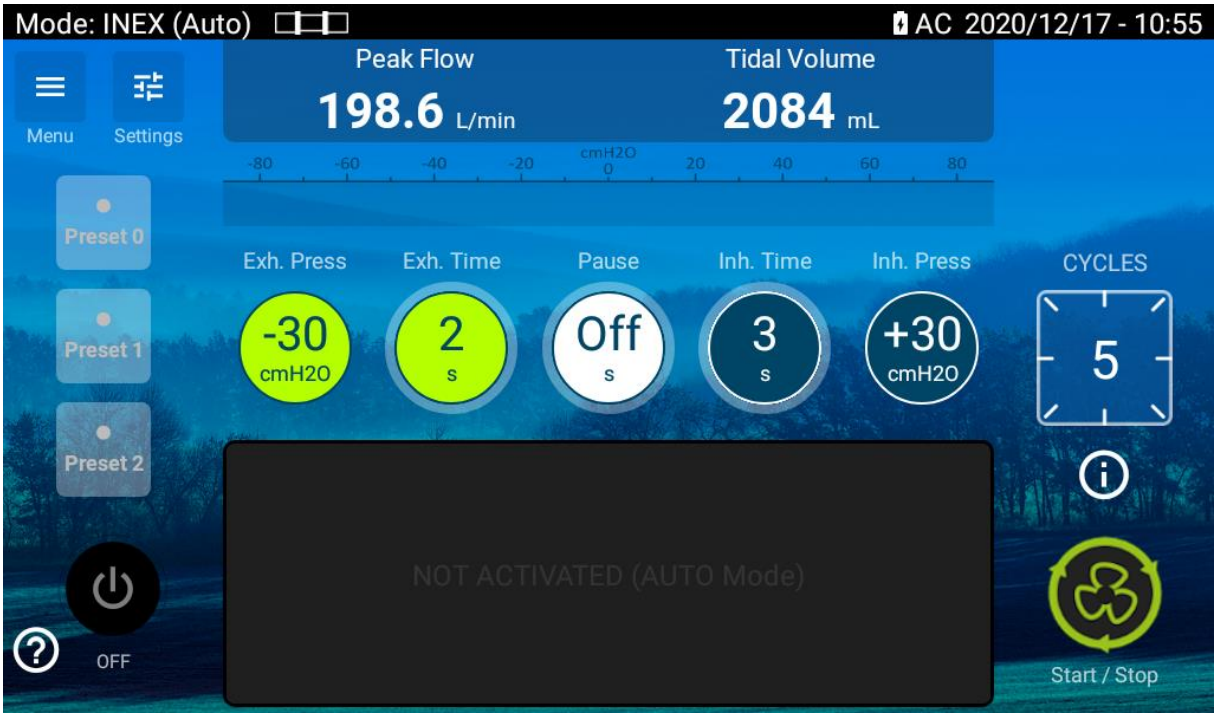
4.1 Communication

Physical connection between EO-70 SMD module and its EO-Display housing unit is carried out by the connection board, so, while the module is inserted into the housing unit.

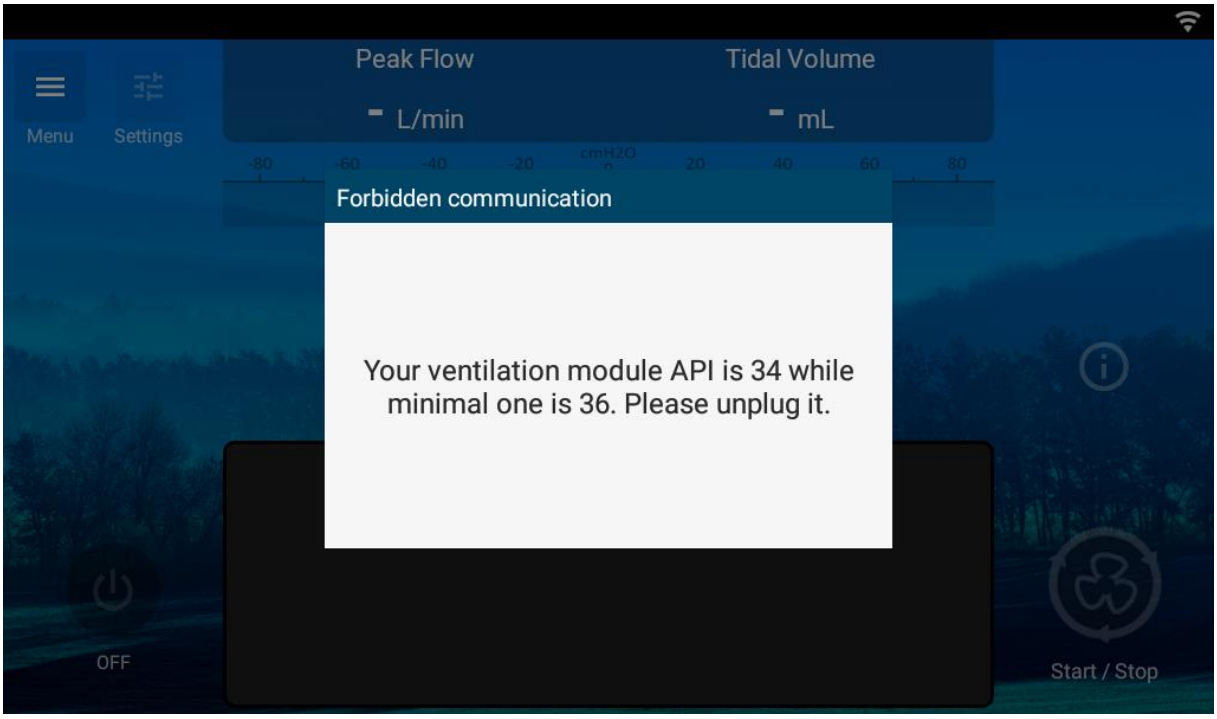


- To connect the display screen to the EOVE-70 SMD module, insert the module into the EO-Display housing unit and switch it on.

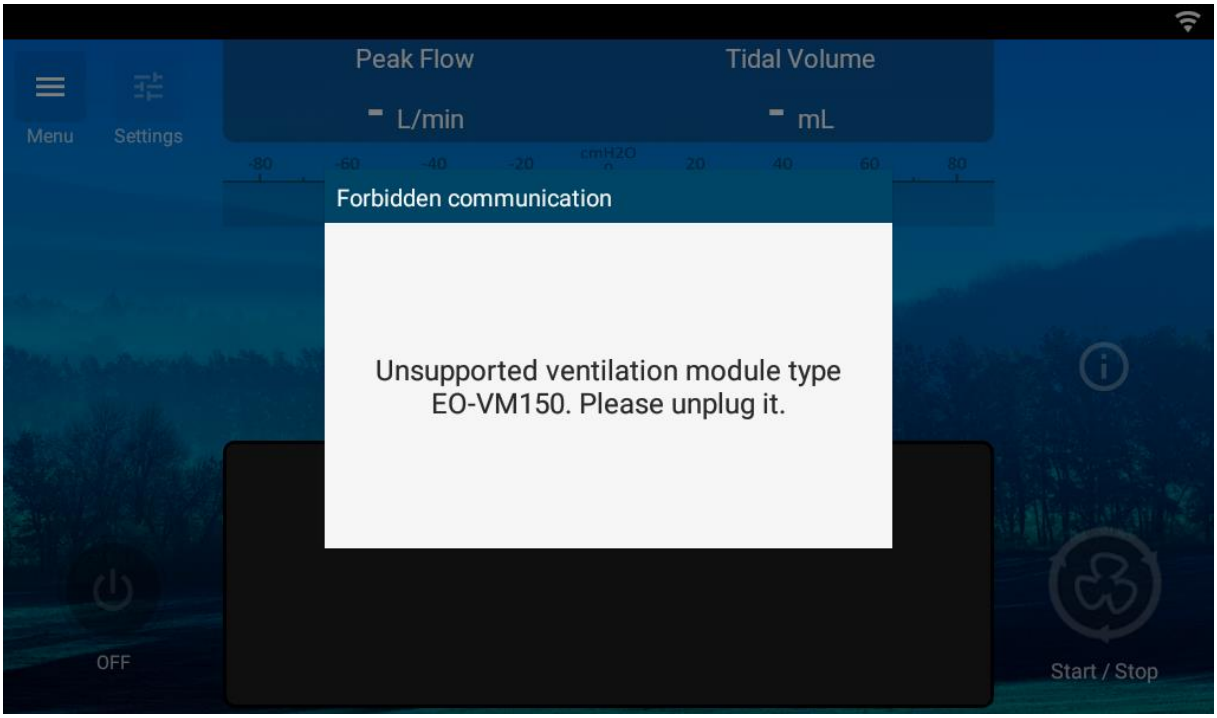
- Check that the module is connected, and information are displayed on the screen



NOTE: API version must match between interface software version and the CPU software version of the ventilation module. Otherwise, a popup appears, and communication fails.



WARNING: EO-Display housing unit dedicated to EO-70 SMD use is not compatible with another ventilation module type such as EO-150 ventilator.

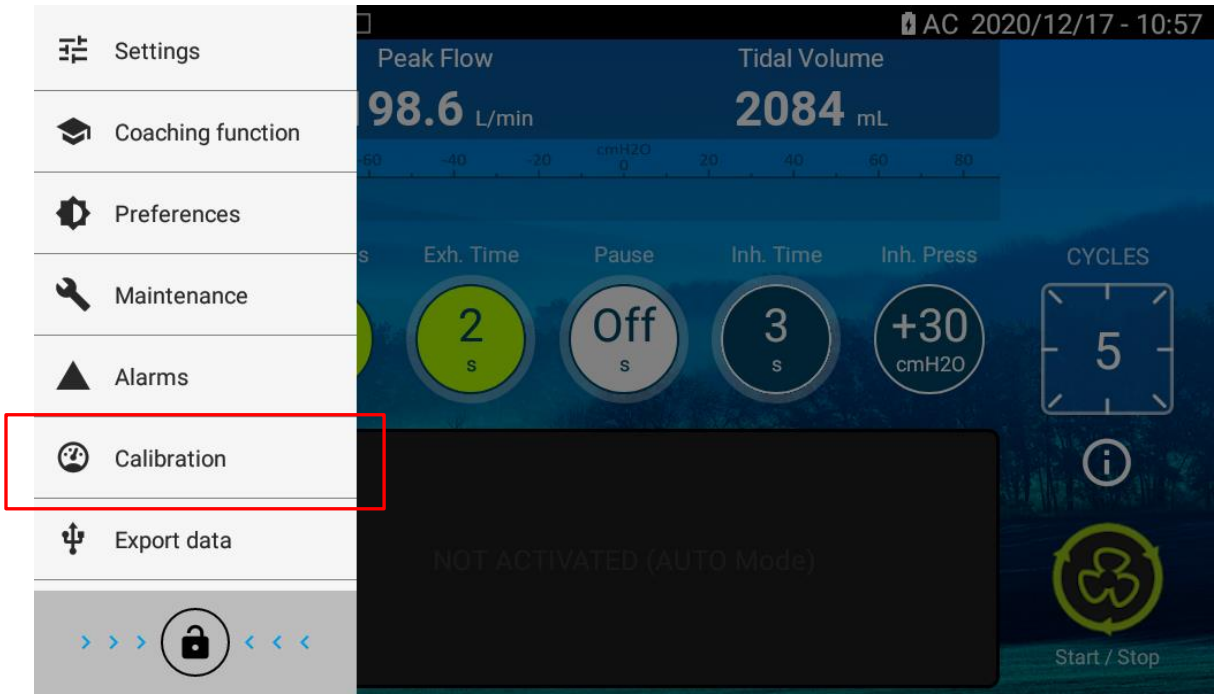


5 Calibration

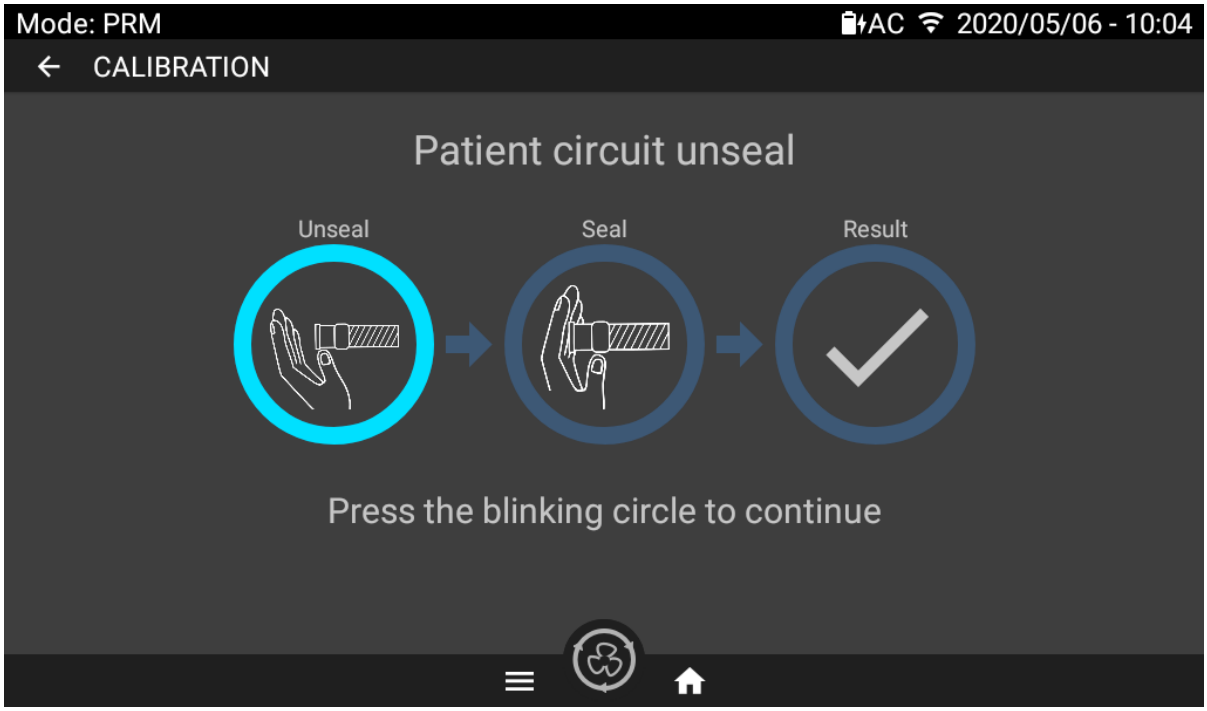
The patient circuit must be calibrated to provide performances in accordance with EOVE70 SMD specifications.

The process detailed below includes two steps which corresponds to the IPPB mode. If the INEX mode is selected, only the first step will be performed.

- Select the mode required and connect the proper circuit and accessories (without patient interface)
- Go to the calibration menu



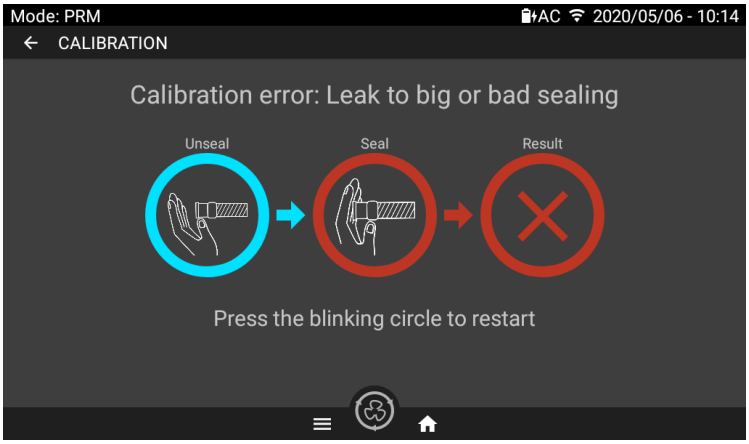
- Launch calibration by pressing “Start”



- Unseal the patient circuit extremity and click on the blinking circle
- Wait until the circle is complete
- Seal the patient circuit extremity and click on the blinking circle
- Wait until the circle is complete
- Reset the calibration menu by pressing on “Validate”

Calibration can be aborted at any moment if necessary (by pressing on “abort”, starting the treatment, or selecting another menu) and data collected during the calibration in progress won’t be saved.

In case of error during the seal or unseal phases, an error informing about the error will be displayed (image below shows an example during Seal step):



Then click on “abort” to restart the calibration process

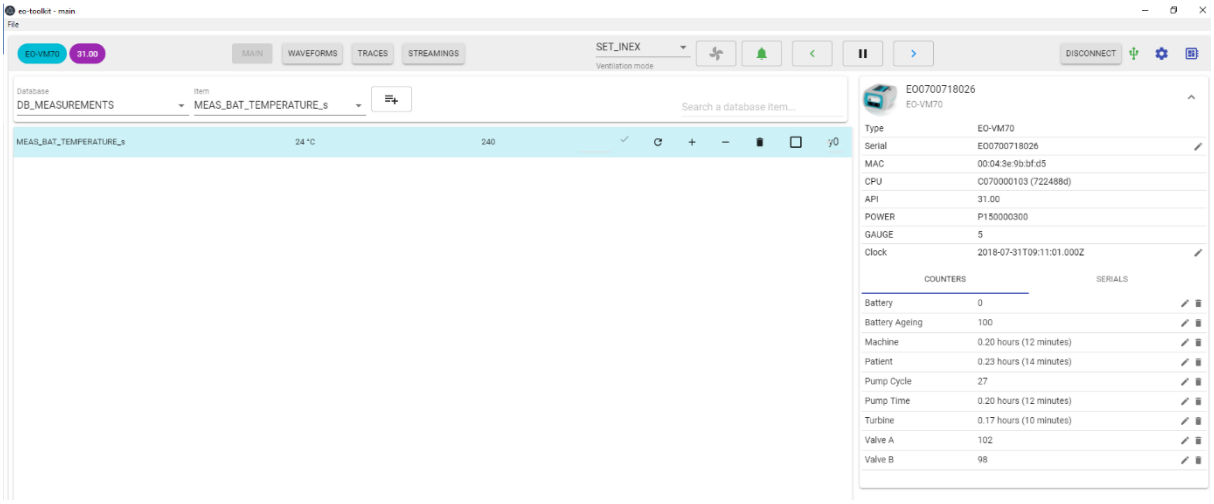
6 EOVE-70 SMD Servicing

6.1 EO-Toolkit presentation & settings

EO-Toolkit is a servicing software which enables to:

- Download the event logs
- Update module software versions
- Manage the counters and serial numbers

Configuration of EO-TOOLKIT

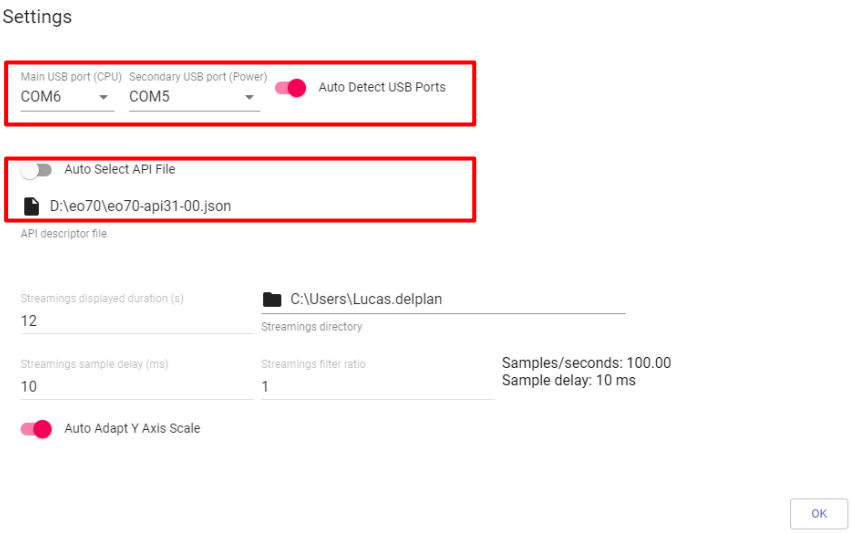


Configuration of EO-Toolkit

- Launch EO-Toolkit
- Click on Settings

- Choose two consecutive usb ports lower than 10

- Select the API file required. It must be accordance with software version which might be updated

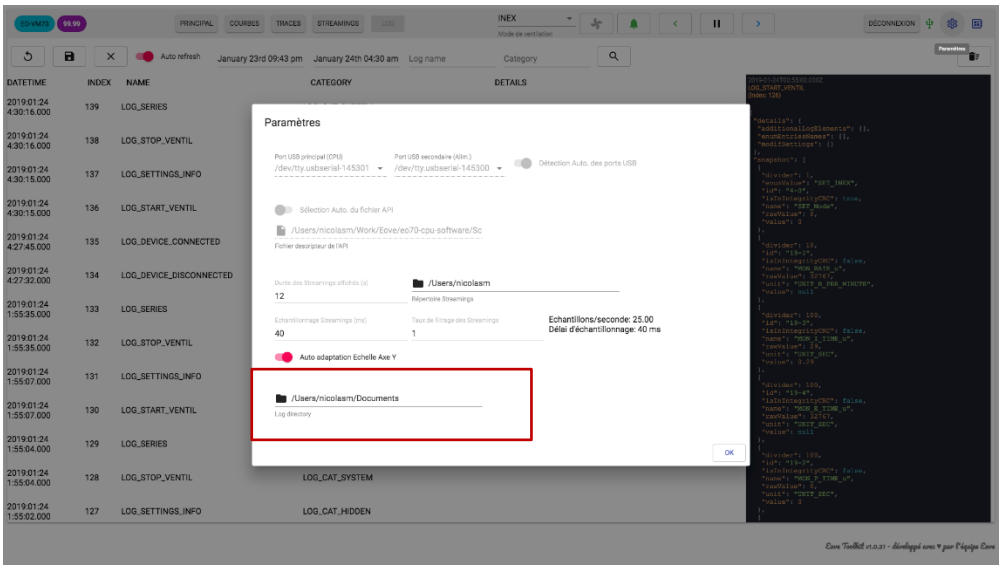


6.2 Events Log menu / Data retrieval

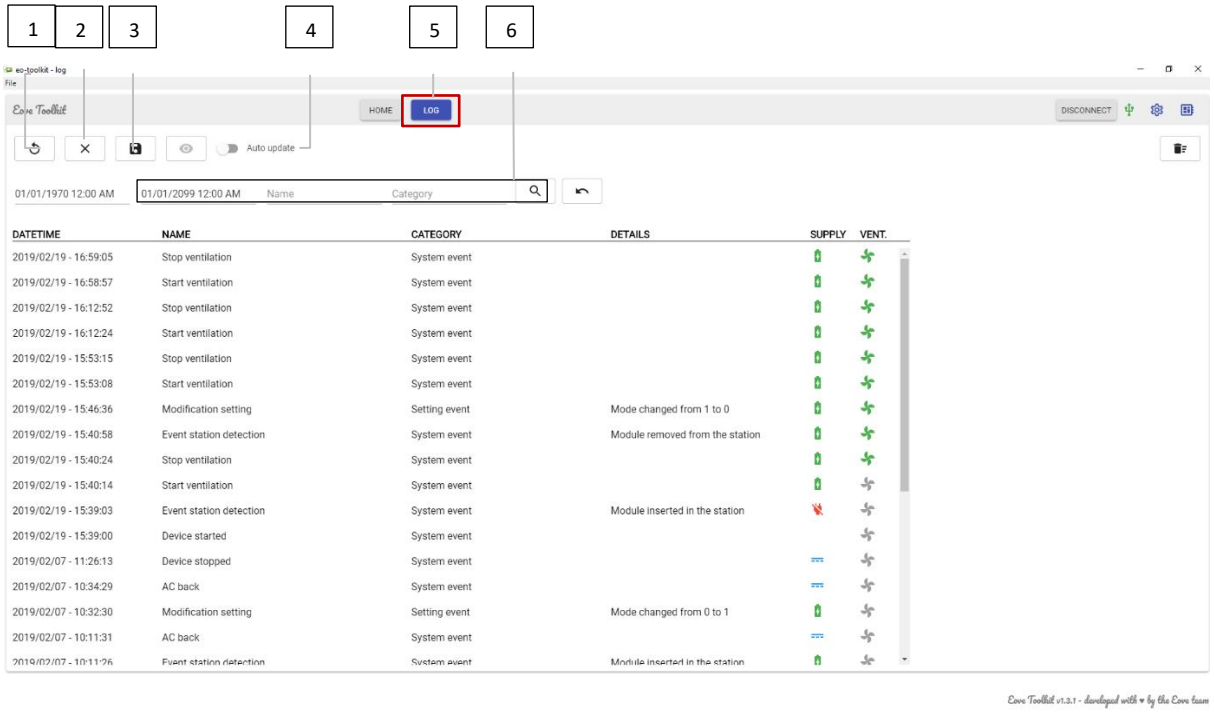
6.2.1 Events log

The EO-Toolkit log permits to retrieve EOVE-70 SMD technical data until 10 000 events. Thanks to the Auto refresh feature, it is also possible to display the events in live.

- First connect the device to the computer and launch EO-Toolkit
- Go in settings and select the file path required to save the events logs



- Click on LOG to display the events



1. Refresh
2. Clean the current log
3. Export the current log in an Excel file
4. Auto refresh
5. Generate the event log
6. Filters

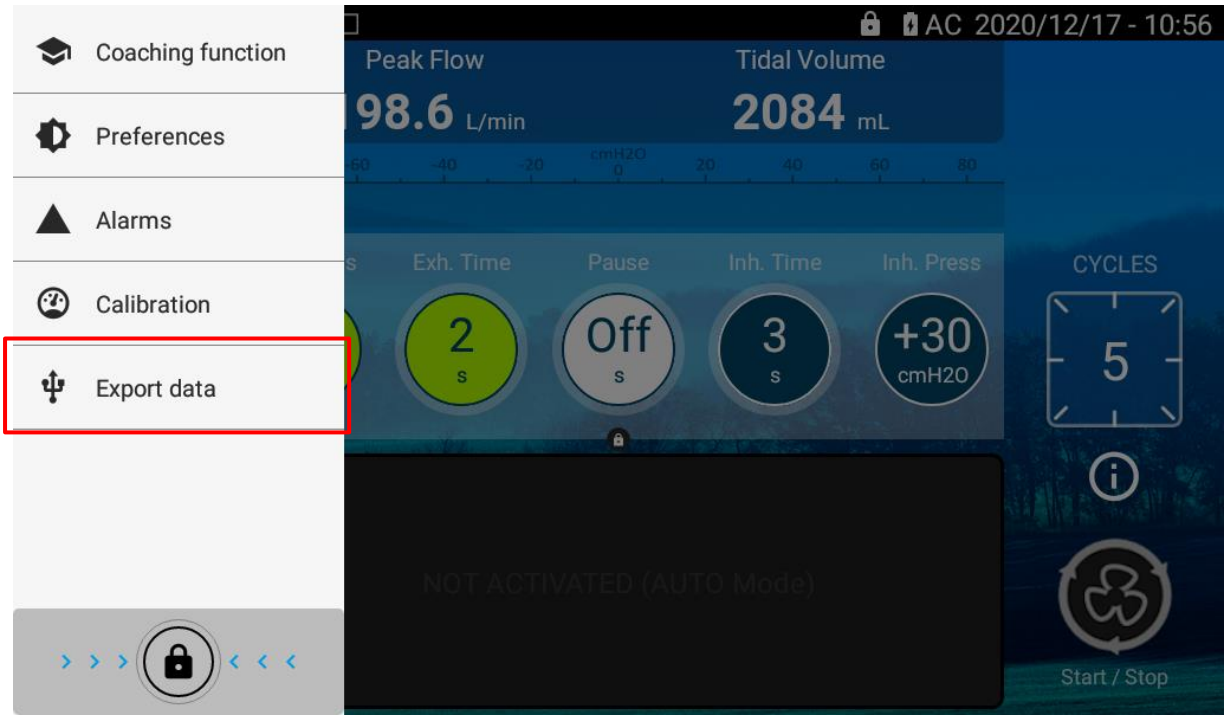
6.2.2 Export Clinical data from EO-Display

Observance until one year of use can be downloaded and displayed in Clinical Software

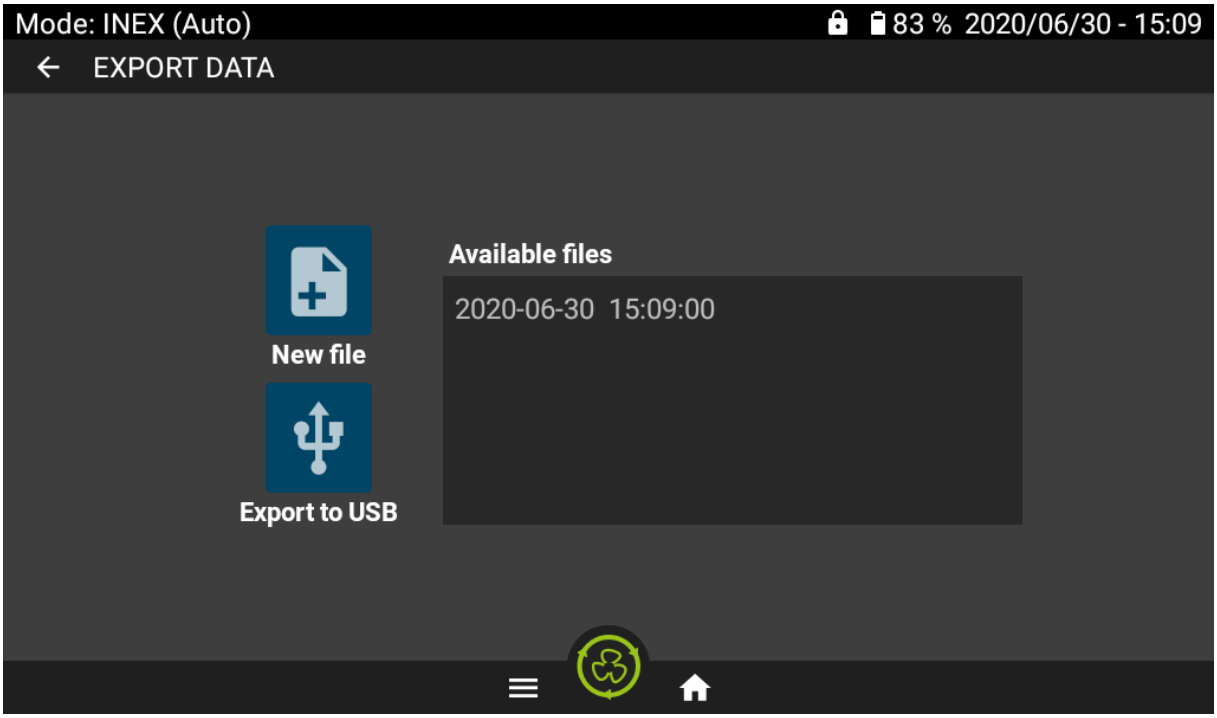
- Connect an USB key to the EO-Display

Note: Use a USB Drive formatted FAT32 / 32Go max / Class 10 / 1 partition

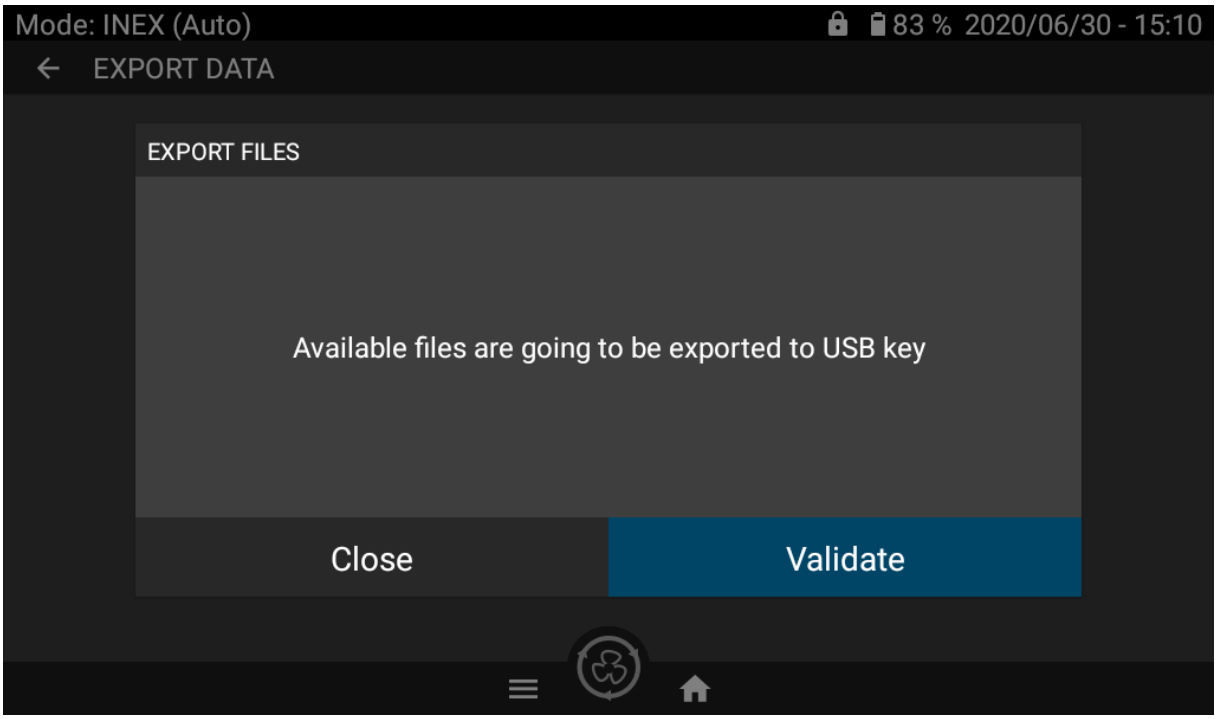
- Go to “Export Data” menu



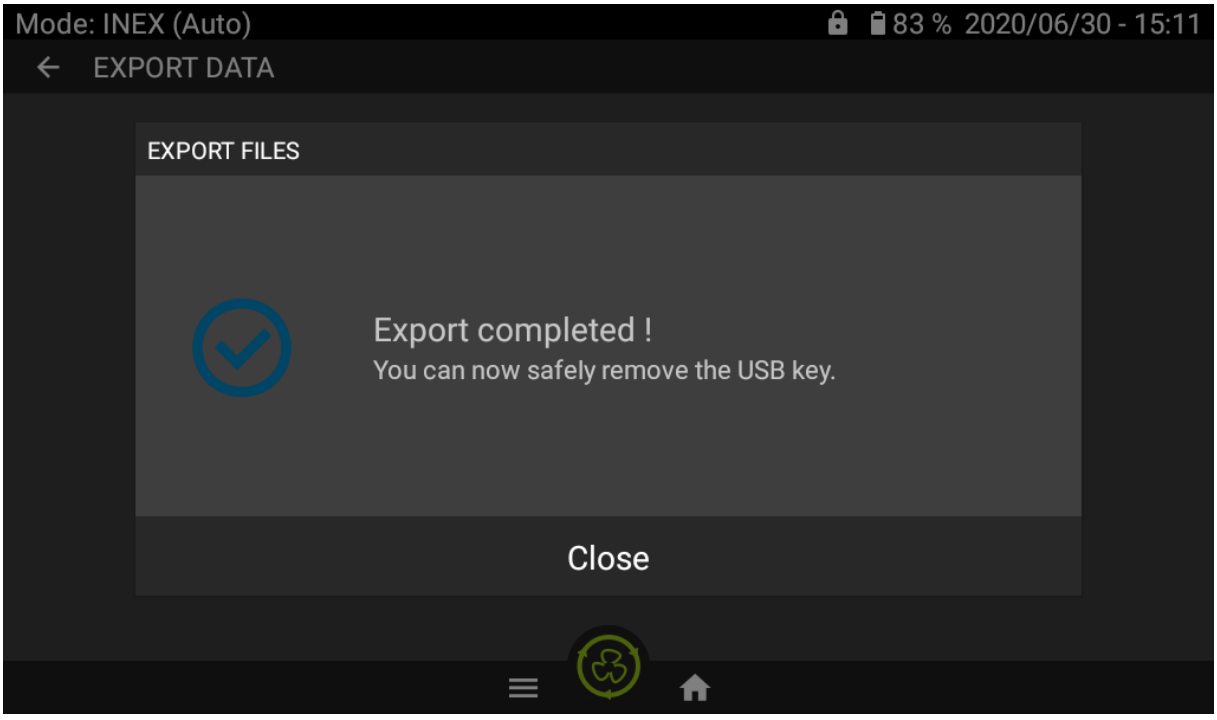
- Generate a new file if necessary, then click on Export to USB



- Click on Validate

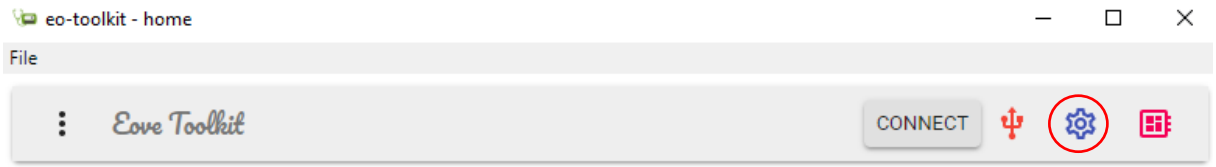


- Wait until the export is complete

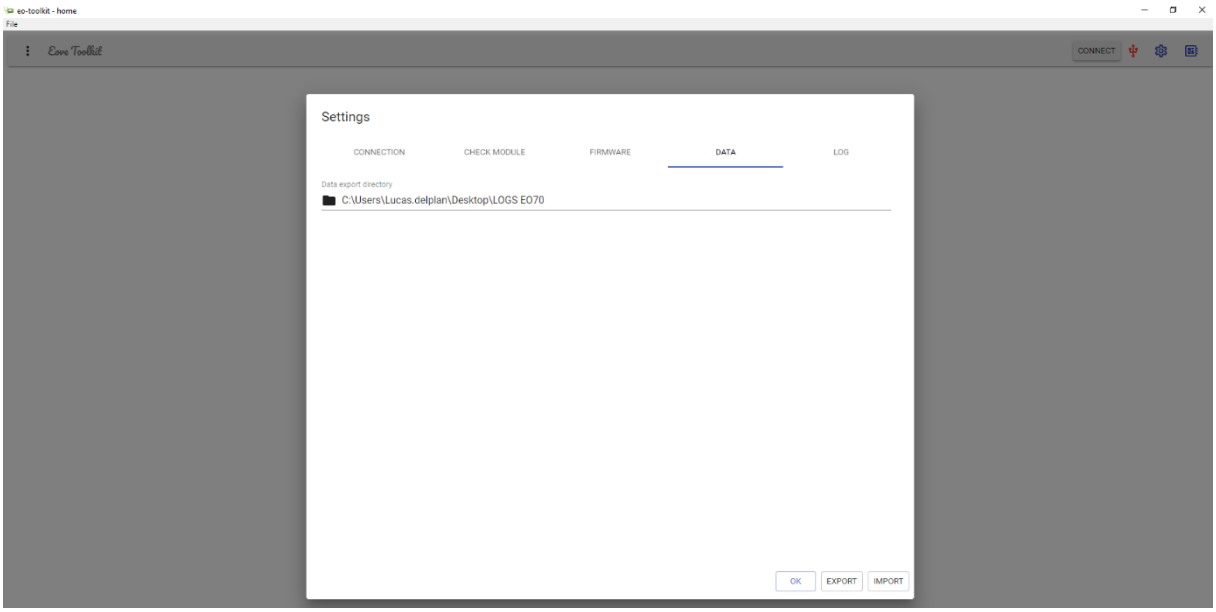


6.2.3 Download Clinical data from EO-Toolkit

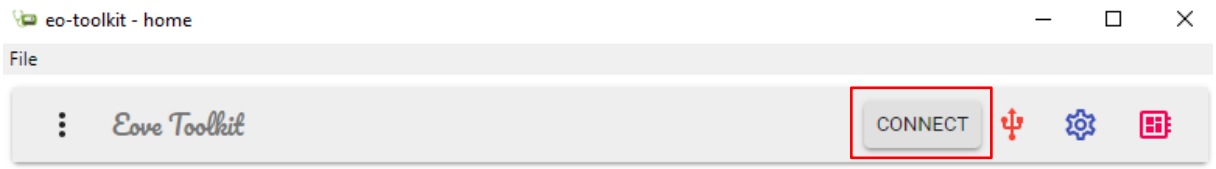
- Launch EO-Toolkit and connect the EO-70 SMD module to the computer by USB
- Click on settings



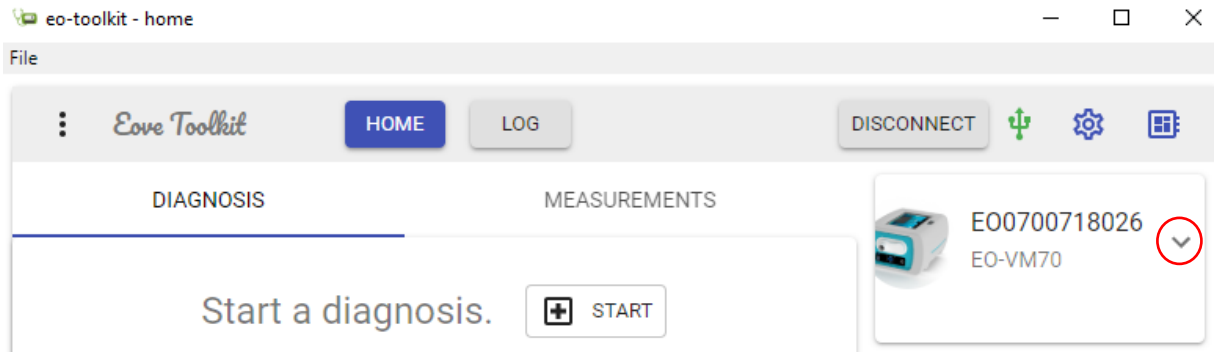
- Select the folder where you want to save data then click on OK



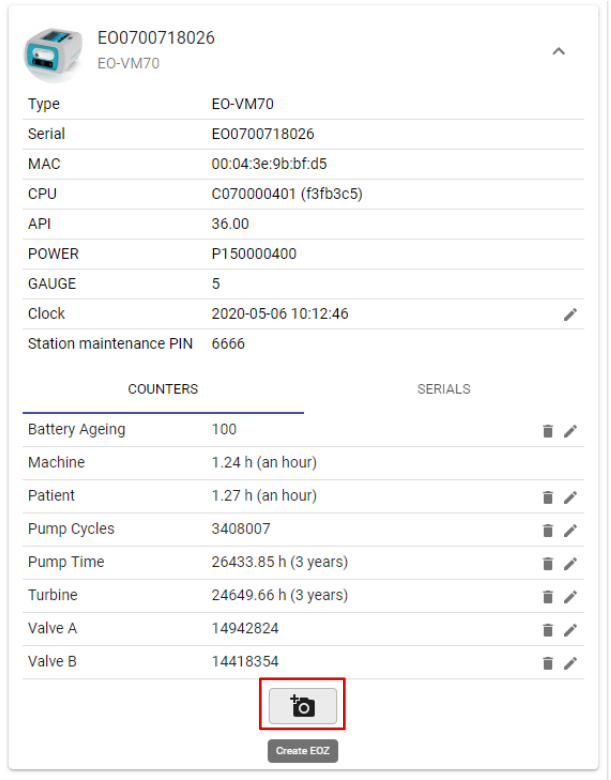
- Click on Connect



- Click on the dropdown menu



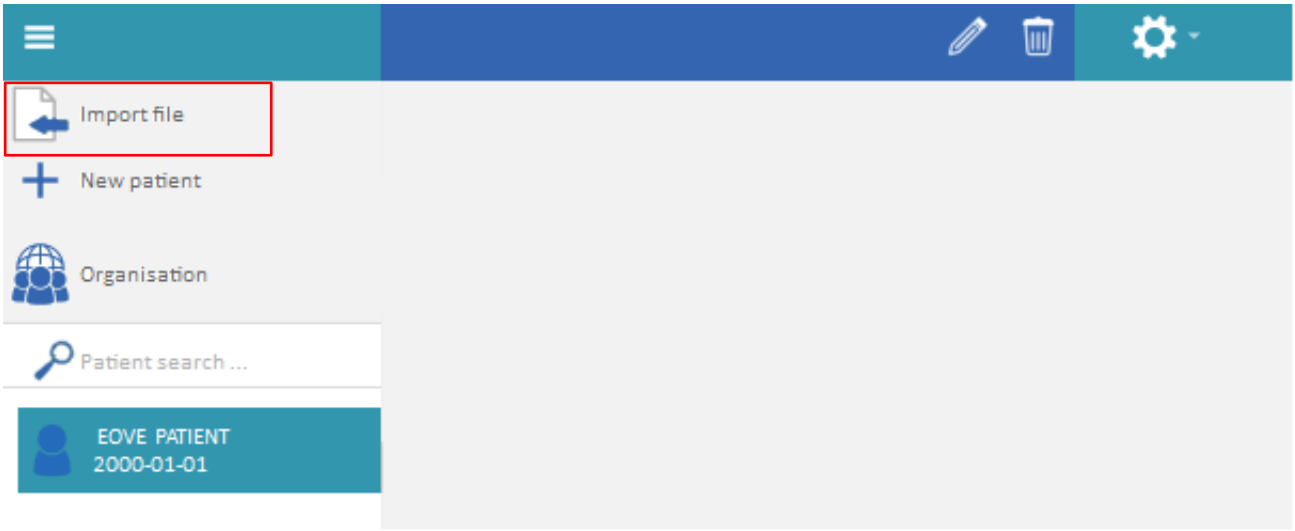
- Click on create EOZ.



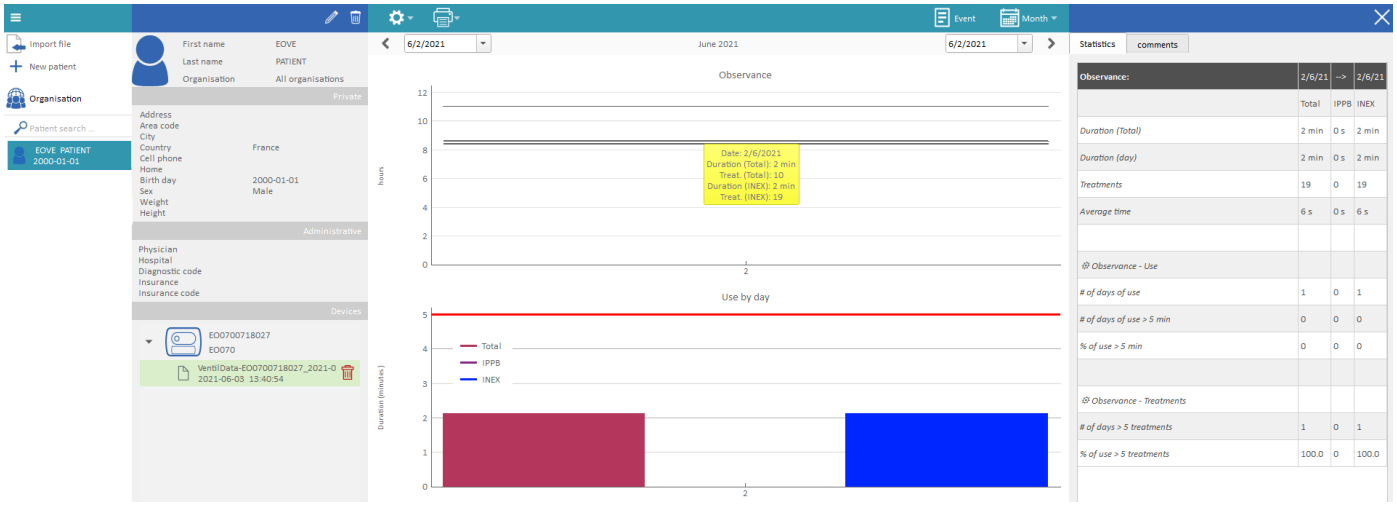
6.3 Display the observance

- Launch Clinical Software (from v1.5.0)

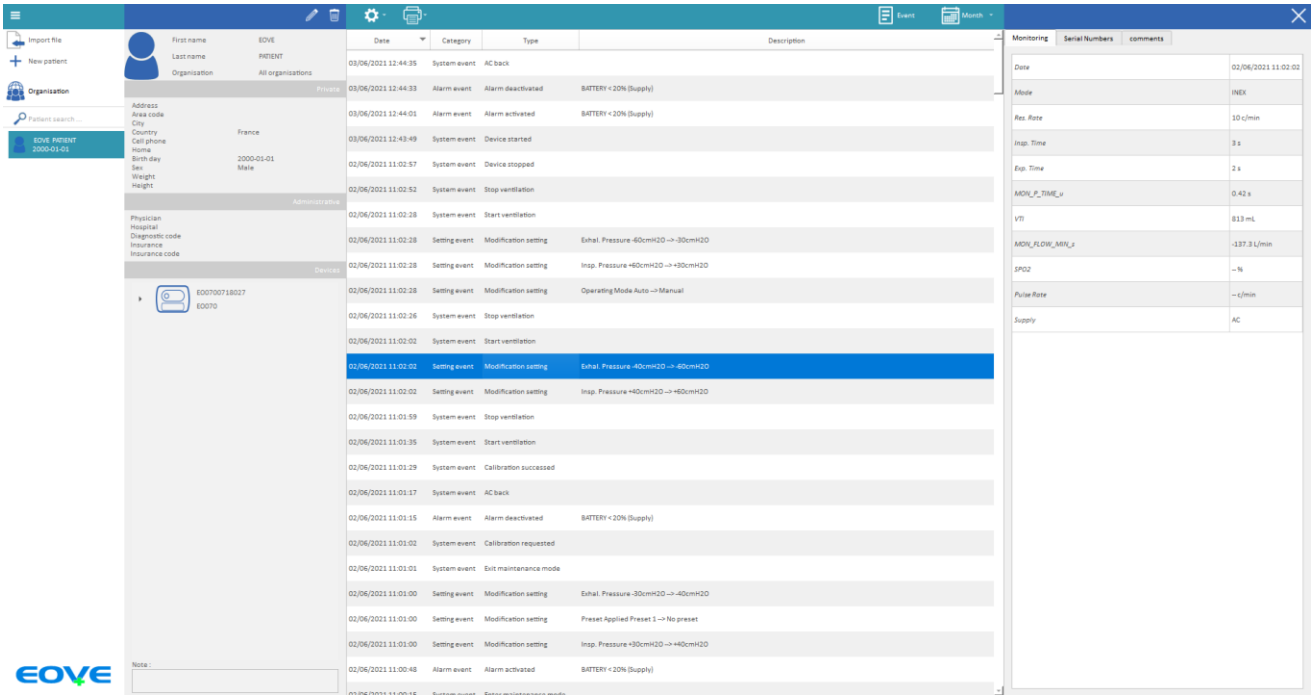
- Import a file and select the appropriate patient. Possibility to add a new patient if necessary (refer to user manual)



- Display the observance



- Display the events



6.4 Software update

WARNING: After an API change, the clinical settings might be lost. We recommend saving settings and trends before performing an update which require an API change.

WARNING: The device can only operate if the CPU software and the interface have the same API version.

- Upgrade of the CPU software,
- Upgrade of the interface software.

Procedure from TOOLKIT

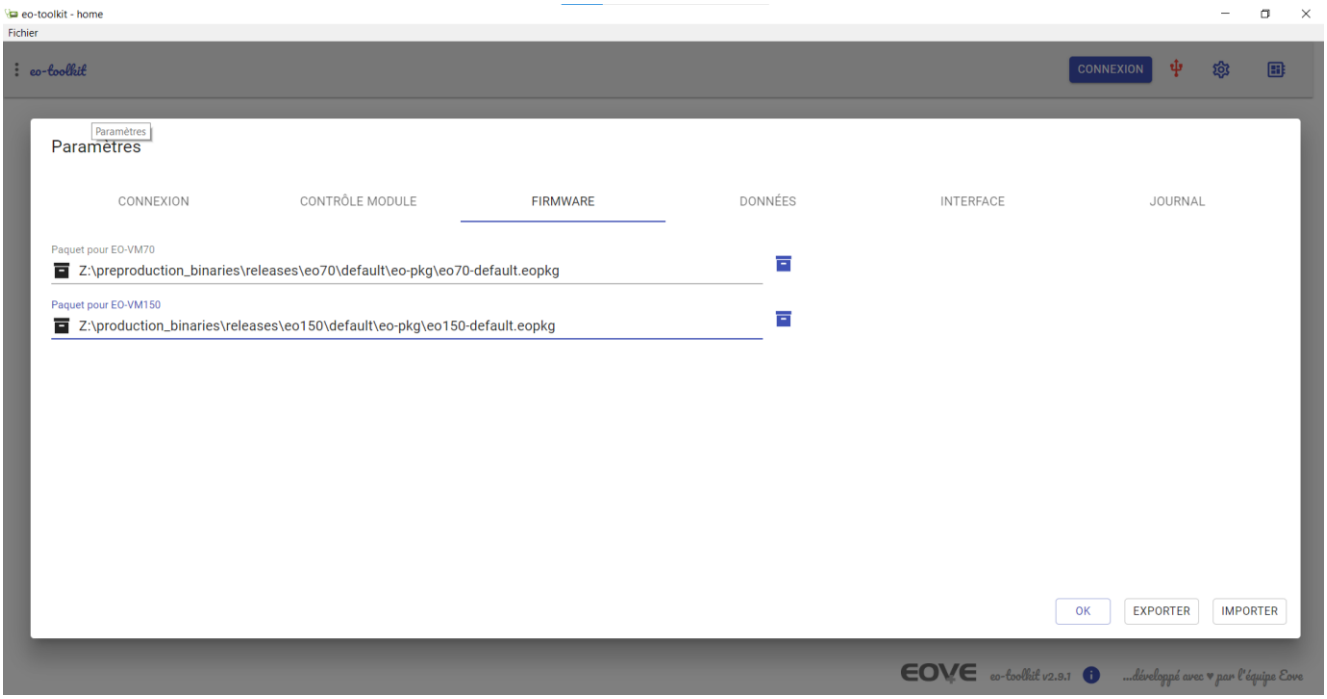
WARNING: WINDOWS 10 IS RECOMMENDED.

WARNING : MAKE SURE TO CONNECT THE VENTILATOR TO A PORT WHOSE NUMBER IS LESS THAN 10

- Launch EO-Toolkit software
- Connect the EOVE-70 module to AC power
- Connect the EOVE-70 module to the computer by usb

- Click on Settings

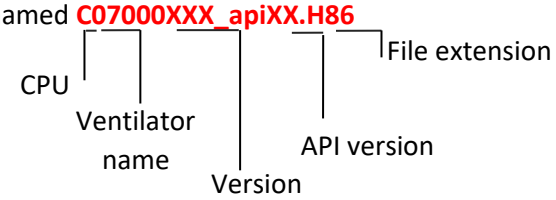
- Go to "Firmwares" tab



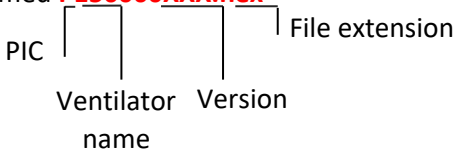
- Select the software package required for the update.

NOTE: The package files include the ventilator software (CPU) and power software (PIC)

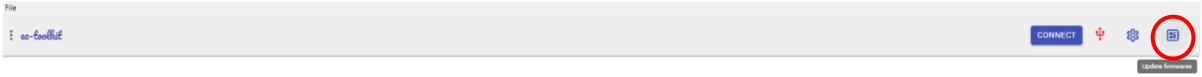
The CPU software file is always named **C07000XXX_apiXX.H86**



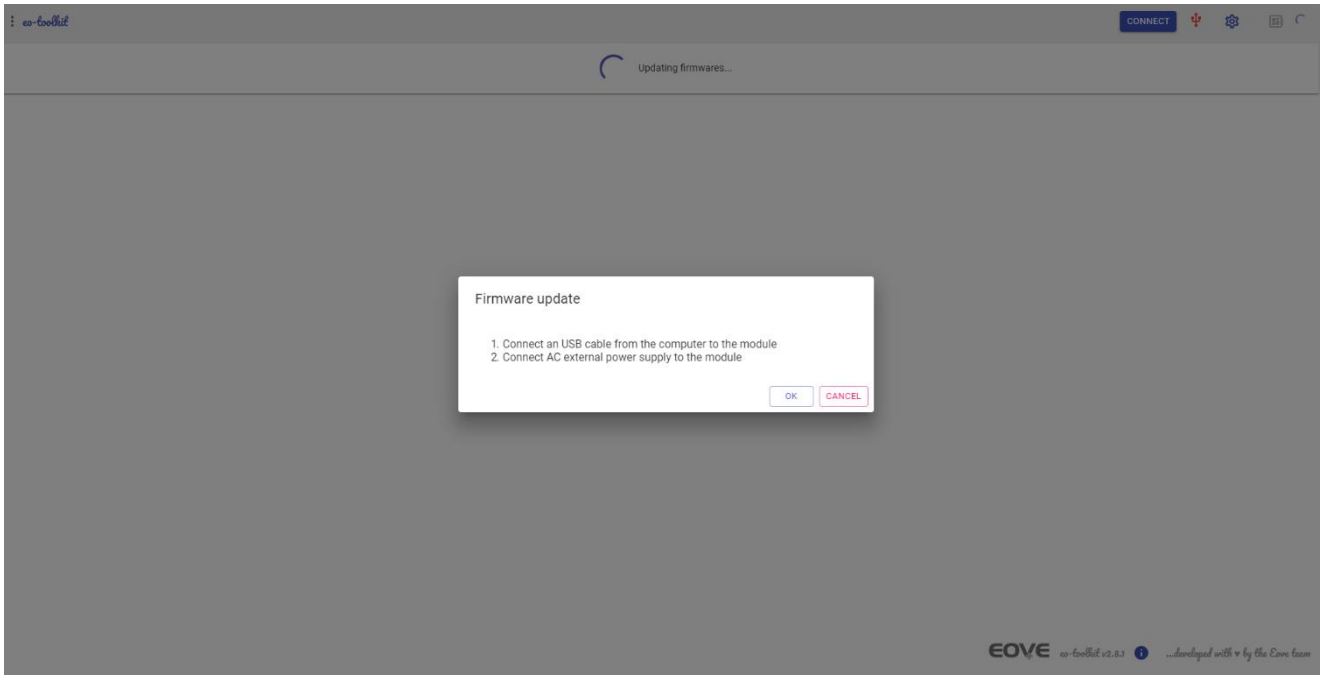
The PIC software file is always named **P150000XXX.hex**



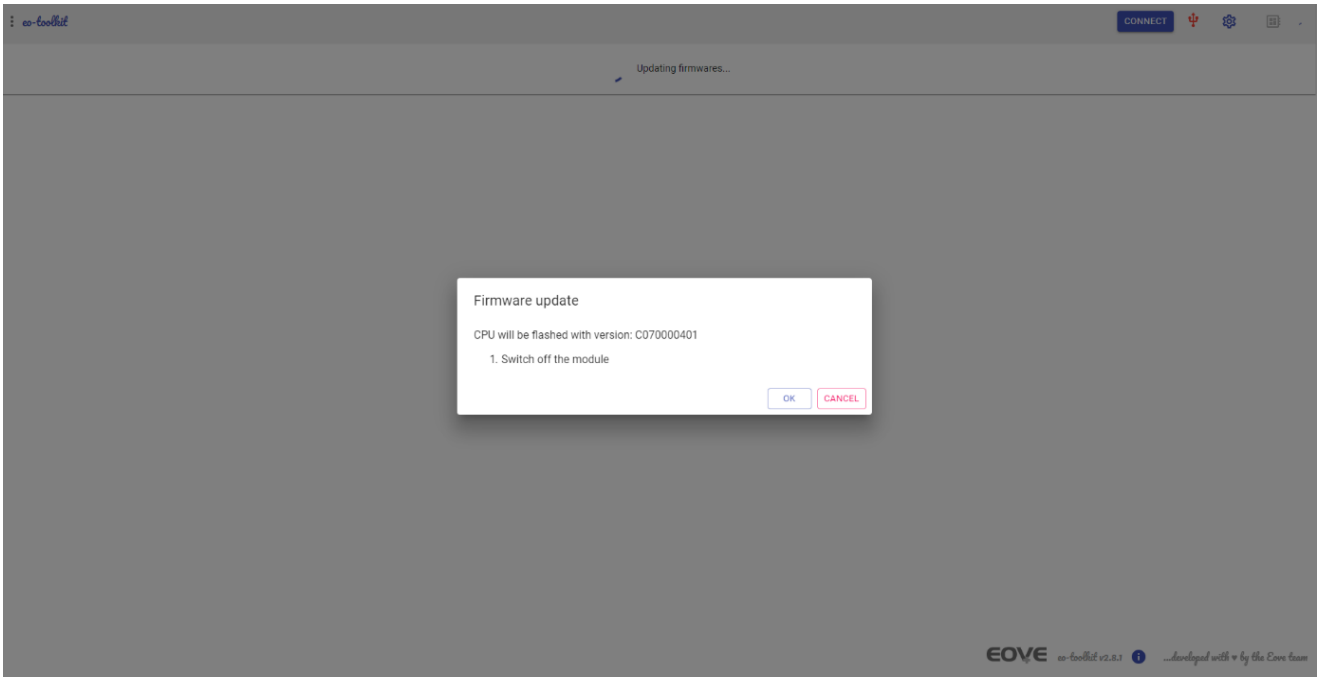
- To update CPU and PIC, click on “Update firmwares”



- Connect the module to the computer by usb
- Connect the AC power to the ventilation module



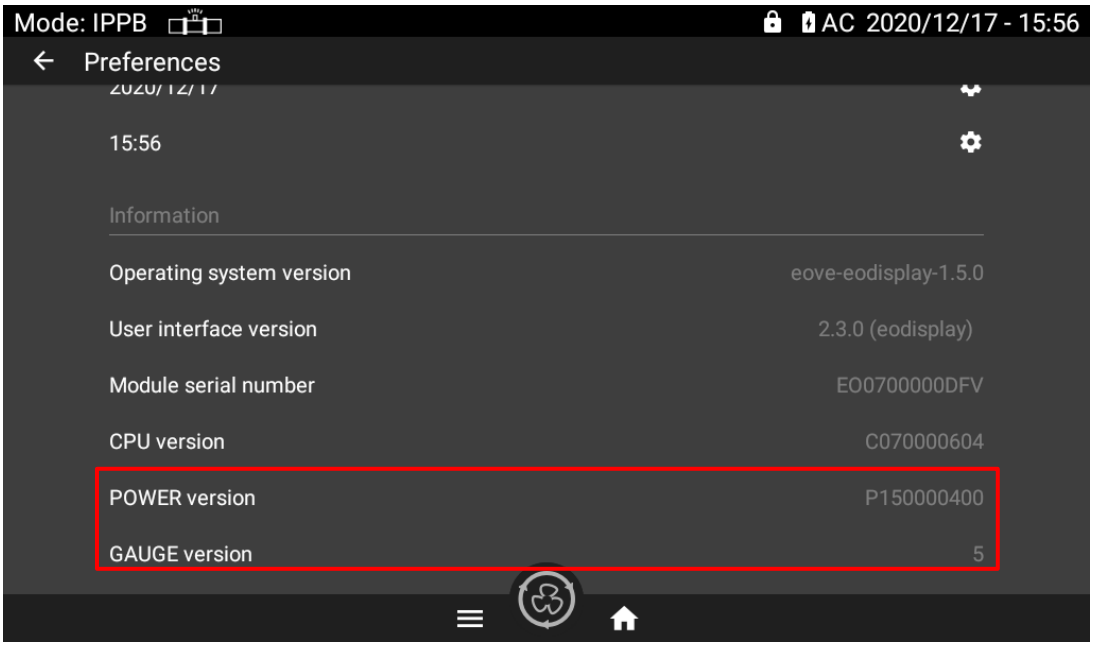
- Switch off the device then click on OK



Checking

Once the update performed:

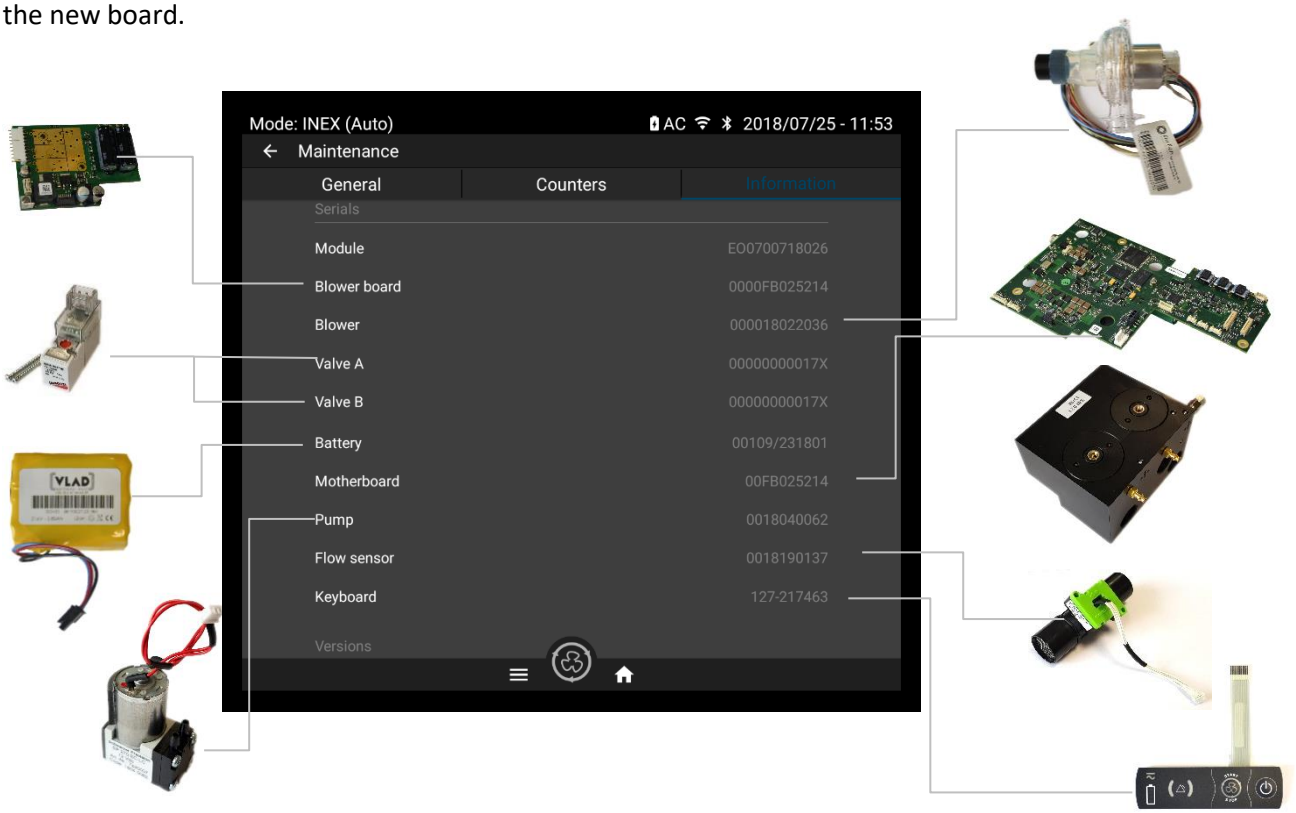
- Pair the EOVE-70 module to the docking station
- Go to Information tab of Maintenance menu or go to Preferences menu to check that the software versions are updated and displayed properly.



6.5 Serial numbers management

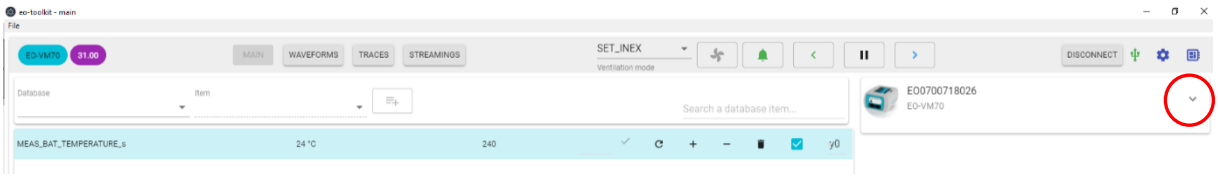
All critical components are tracked by serial number since manufacturing. The serial number must be updated in device memory if the component is replaced during maintenance operation.

NOTE: If the motherboard is changed, it's necessary to read all the serial numbers and update them in the new board.

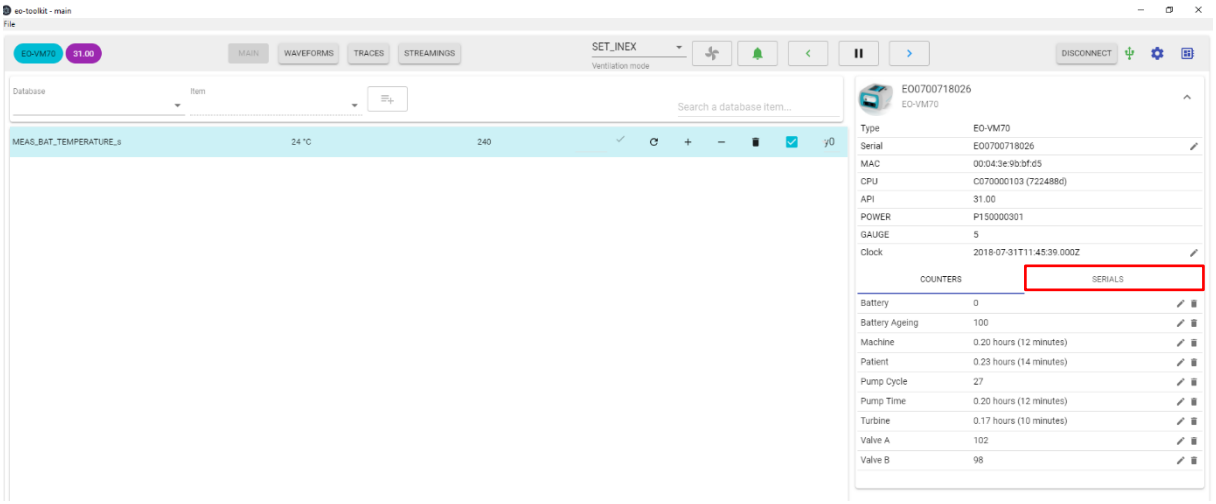


- Launch EO-Toolkit
- Connect the EOVE-70 module to the computer by usb
- Click on "Connect"

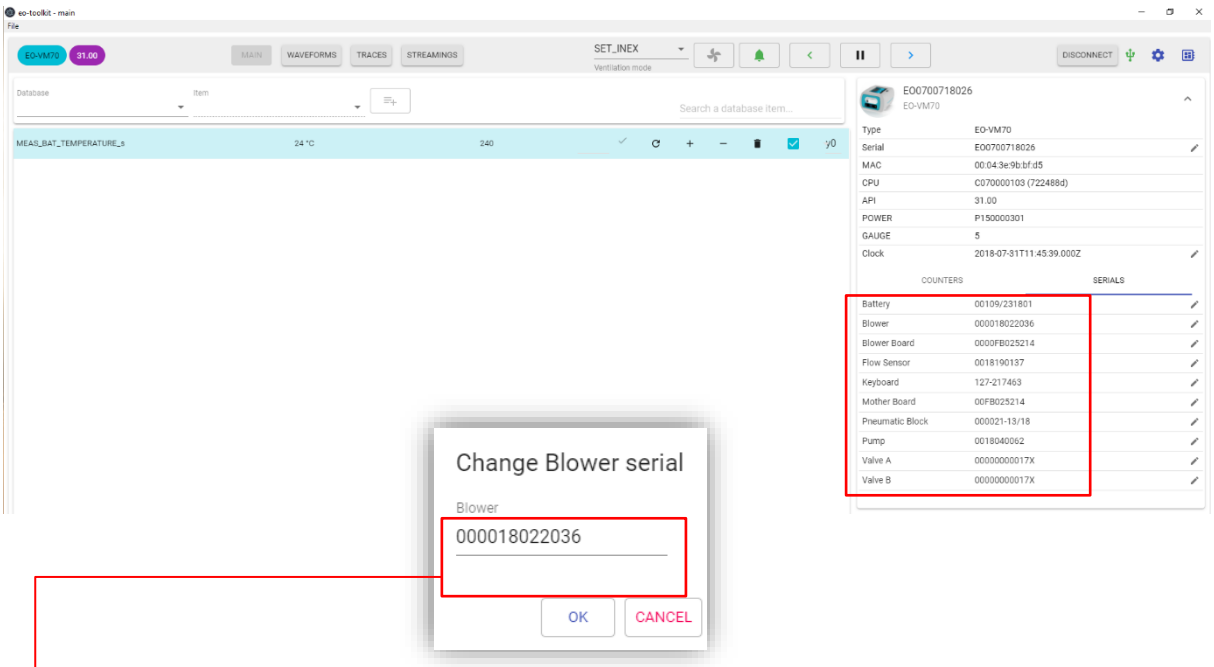
- Click on the dropdown menu to display device information



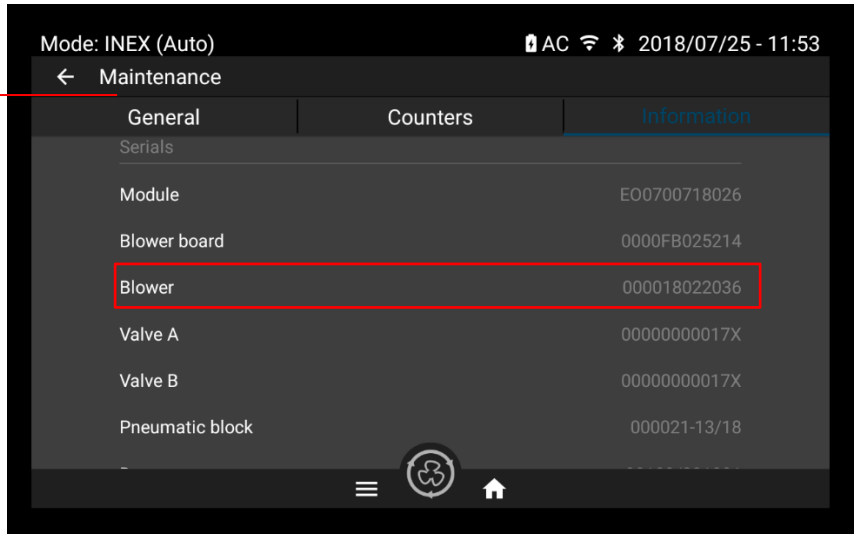
- Click on “Serials”



- Change the serial number required for the update and click on ok



- Check in Information tab of Maintenance menu that the serial number changed is properly updated

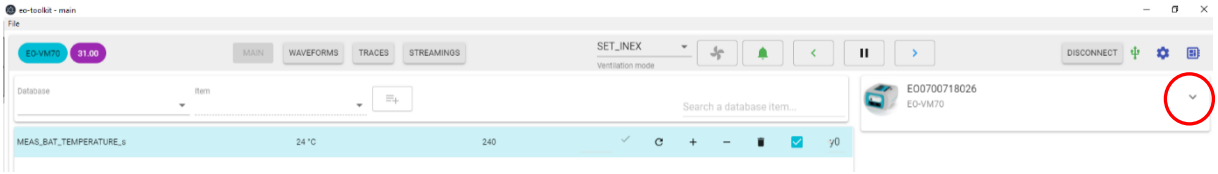


6.6 Counters management

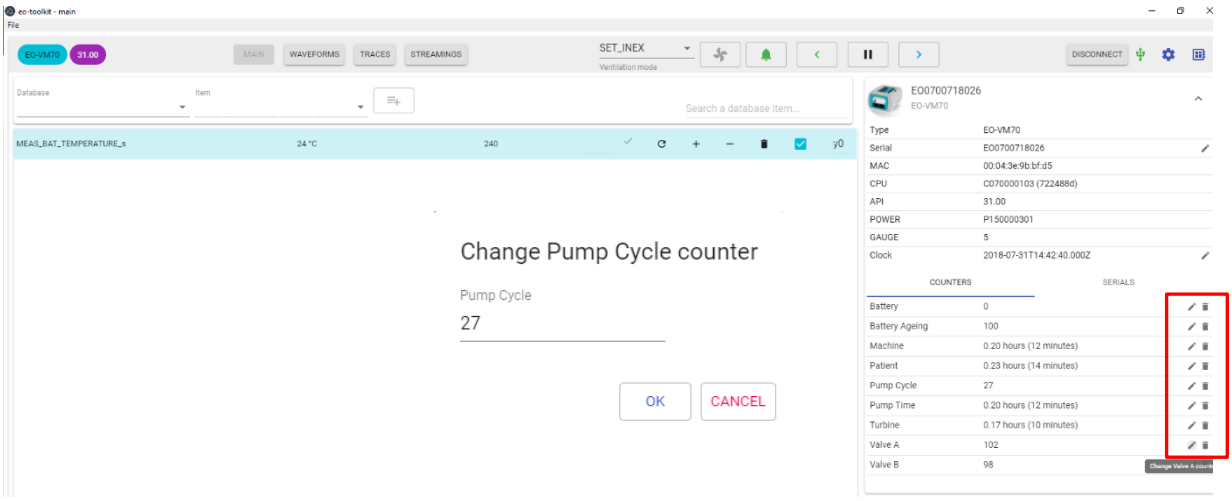
Operating time of critical components concerned by preventive maintenance must be updated in the Counters tab after a replacement.

- Launch EO-Toolkit
- Connect the EOVE-70 module to the computer by usb
- Click on “Connect”

- Click on the dropdown menu to display device information

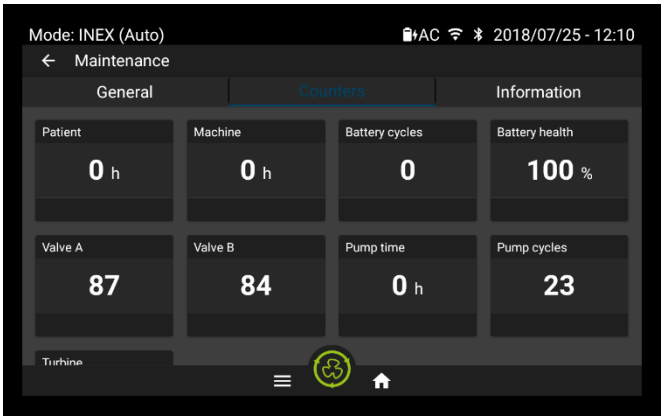


- Change the counter value required



NOTE: The battery ageing is measured by the battery gauge and updated after a full cycle of battery charge and discharge.

- Check in Counters tab of Maintenance menu that the value is correctly updated



MAINTENANCE OPERATIONS

7 Conditions and procedures of the EOVE-70 maintenance

7.1 Preventive maintenance requirements

Preventive maintenance procedures refer to maintenance which must performed regularly. These operations are performed according to the maintenance schedule defined by the manufacturers and **EOVE**.

Any other maintenance operation can be added depending on your own maintenance procedures.

Noncompliance with maintenance recommendations can result in loss of performance, excessive overheating or loss of some features and, in the long term, could undermine the potential sustainability of the ventilator.

7.2 Repair requirements in case of EO-70 SMD failure

In case of failure the device must be returned to the technical service, authorised, and certified by **EOVE**, to perform the troubleshooting and replace the defective components according to the component replacement procedures.

8 Cleaning and disinfection

8.1 Surface disinfection

Cleaning and disinfection of the device should be performed regularly and before any maintenance operation.

- Wipe the exterior of the device with a damp cloth using a mild cleaning solution.
- Inspect the connections and circuit adapters for any moisture or contaminants.
- Replace and clean as necessary using appropriate cleaning solutions.

For all circuit components and hoses, follow the manufacturer's recommendations for cleaning and maintenance.

8.2 Keredusy disinfection

Keredusy is a device allowed for the disinfection of the internal air-conducting parts of the EO70SMD when surface disinfection is not enough. As disinfectant, the Keredusy uses a solution composed of ozone and hydrogen peroxide which will be distributed by the air flow of the EO-70 SMD.

It permits to disinfect the returned EO70SMD in accordance to a validated procedure of Keredusy Manufacturer* before using the device again on patient.

Moreover, it limits the risk of contamination while the technical staff repairs or maintains the ventilator.

Keredusy can only be used on EO-70 SMD after a request of authorization given by EOVE sales department. Furthermore, a maximum number of 5 disinfections can be performed on the EO70SMD.

NOTE: the kit Keredusy EO70 (*ref SP-KRDUSY70*), mainly composed of the turbine, filters and various sealing rings, must be replaced after each disinfection.

* This procedure is under the responsibility of the Keredusy manufacturer. EOVE is not responsible of the disinfection performances

WARNING: As disinfectant the Keredusy uses ozone (O3) as well as hydrogen peroxide solution which will be distributed by the air flow of the respirator. The ozone & hydrogen peroxide solution used is a dangerous and toxic gas for the humans, animals and the environment. For such disinfection process, the rules of safety and cautions defined by the manufacturer shall be formally followed. We recommend minimizing Ozone & hydrogen peroxide solution release by ensuring the complete sealing of the Keredusy installation. Moreover, prevent inhalation by tools and solutions adapted to the risks. In general, it is suitable to control air concentration and use a gas vacuum system at the gas supply as well as general ventilation of the premises.

WARNING: Never perform Keredusy disinfection while EO-70SMD is opened and/or internal pneumatic circuit disconnected.

WARNING: After a Keredusy disinfection process, the waste of the ozone & hydrogen peroxide solution shall be managed in a way to reduce the impact and risk for the environment. The rules defined by the manufacturer shall be formally followed.

In case Keredusy disinfection is not possible, the following part must be replaced to reuse the device on patient:

- SP-PNEUBLOCK-001: pneumatic bloc and patient outlet
- SP-PNEUTUB-001: tubes and sealing rings
- SP-INSFLOWSENS-001 inspiratory flow sensor
- SP-KRDUSY70: Kit Keredusy EOVE-70

8.3 Guarantee of the cleanliness of the appliance

After each cleaning operation, the technician must affix a mark on the device to ensure the user that it is clean and ready for use.

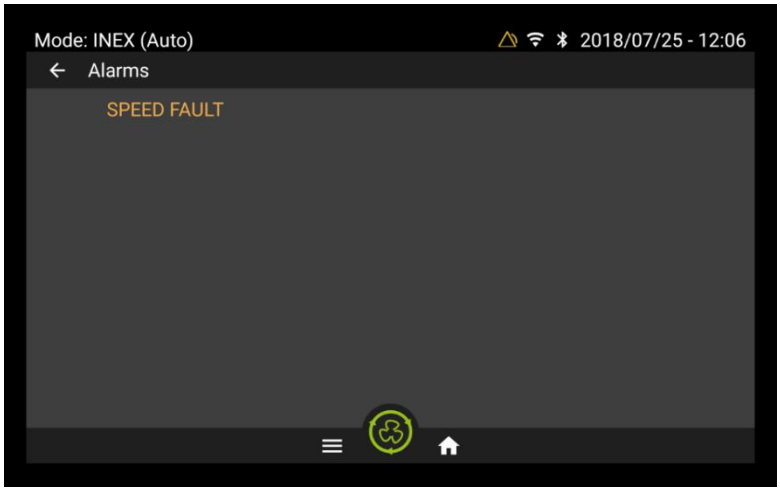
9 Periodical controls

Periodical controls are recommended every year:

- Apply cleaning and disinfection recommendations
- Inspect the condition of the connections and circuit adapters for any moisture or contaminants
- Replace the two air filters (replace earlier if dirty or dusty)

⚠	**CAUTION**
	The air filters cannot be washed or reused.

- Control among the alarms & the events that nothing is unusual



- Check the status condition of the battery. Replace it if there is any sign of impacts or damage.
- Make the EOVE-70 SMD operate on battery mode and AC power source. Full charge the battery if necessary
- Check the software versions and update them if necessary

10 Preventive maintenance operations

The EOVE-70 should be regularly serviced by an authorized EOVE technician according to the following schedule. The SMD device will provide safe and reliable functioning for 10 years provided that it is operated and maintained in accordance with the instructions given in this manual. As with all electrical devices, if any problem arises with your EO 70 device, you should exercise caution, and have it inspected by an authorized EOVE technician.

10.1 Preventive maintenance schedule

Preventive maintenances	**Periodicity**	**Back to technical service**
Storage period	6 months	YES
Cleaning and disinfection	6 months	NO
Replacement of the air filter	1 year	NO
Spare parts - battery storage (battery disconnected)	6 months	YES
Replacement of internal filter and valves	2 years	YES
Replacement of the battery (EOVE1 and EOVE3)	70 % ageing	YES
Replacement of the pump	1000 hours	YES
Dusting of EO-Display fan and heatspreader	2 years	YES
Replacement of sealing rings and hoses	2 years (**OPTIONNAL**)	YES
Replacement of internal flow sensor	4 years (**OPTIONNAL**)	YES
Replacement of the solenoid valves	100 millions cycles	YES
Replacement of the turbine	20 000 hours	YES

10.2 List of required preventive maintenance

WARNING: EOVE is not responsible for the proper recycling of your maintenance waste. Recycling procedures must be strictly followed in compliance with laws in effect in the distributed country. Collection toward a recycling center, must be done by accredited channels able to provide certificate and traceability. Batteries, turbines, electro-valves, and other plastic parts must follow appropriate collection and recycling process in compliance with country regulations.

10.2.1 1-year servicing operation

- Cleaning and disinfection of the device exterior
- Replacement of the two air filters
- Perform periodical controls

10.2.2 2 years maintenance operation

- Replacement of internal filter and the 4 valves

OPTIONAL: Replacement of the tubes and sealing rings (depending on device operating time, cleanliness of tubes which must not be becoming yellow, number of disinfections performed).

10.2.3 4 years maintenance operation

- Replacement of internal flow sensor
- 2 years maintenance

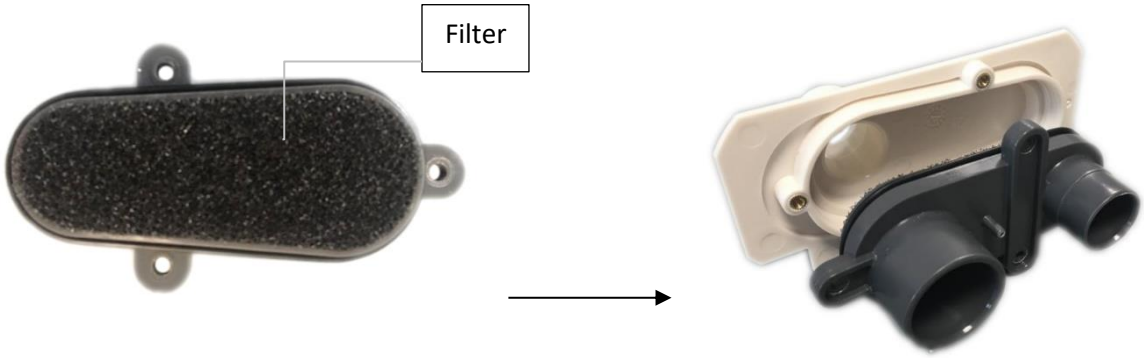
10.2.4 Other maintenance operation

- Replacement of the pump after 1000 hours
- Replacement of the turbine after 20 000 hours
- Replacement of the 2 solenoid valves after 100 million cycles

NOTE: It is recommended to replace the 2 solenoid valves as soon as one of them reaches the cycles limit.

10.3 Filter and valves

The filter and the 4 valves must be changed at least every 2 years.

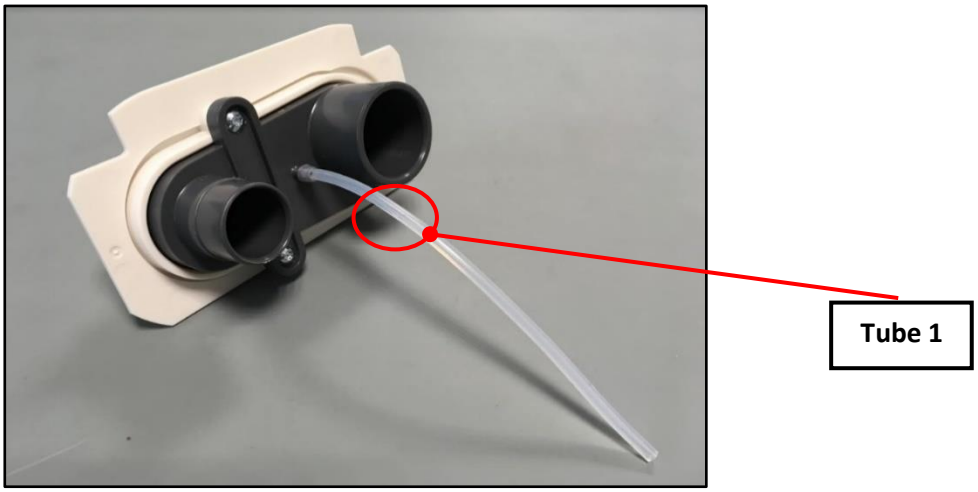


The filters can get clogged more quickly depending on the environment of use. Change the filter more frequently if necessary.

WARNING: The filter cannot be washed or reused.

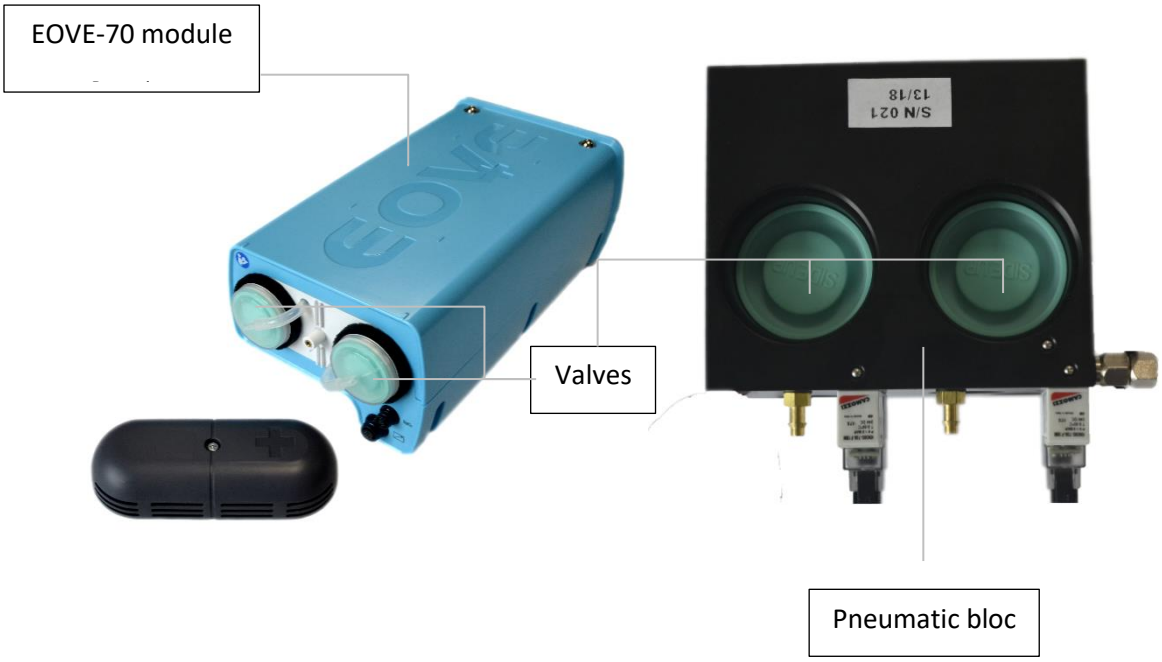
10.3.1 Control the pneumatic sealing of the patient circuit port

- Without any port plugged, apply a pressure on the tube 1.
- Check that the pressure drops



- Plug the various ports with Sealing Test Plugs (SP-SEALPLUG-001) and apply a pressure of 100mbar
- Check that pressure does not drop

10.3.2 Inhalation & Exhalation valves



10.4 Battery

10.4.1 Internal battery information

EOVE-70 SDM which reach a storage period exceeding six months could have undergone degradation on internal battery.

That is why we hardly recommend to fully charging the module at least every six months during a period of inactivity. That will avoid a total discharge and irreversible damages on the battery.

Note that the battery must reach a full charge before storing the device for 6 months.

Internal batteries EOVE1 and EOVE3 (*ref SP-INTBATT-001 and SP-INTBATT-002*) must be replaced when their ageing reaches 70%.

The battery ageing is available in the "Counters" tab.

WARNING: The disposal of defective batteries should be done in compliance with the laws in effect in your country. Lithium-Ion battery, when defective, might present explosion or combustion risks. Used batteries must be stored in closed ratified boxes with appropriate protection (like vermiculite) against impacts and overheating propagation.

Collection toward a recycling center, must be done by accredited channels able to provide certificate and traceability.

WARNING: Environmental accidents such as earthquakes, floods, hurricanes, tsunamis, and safety risks they can cause onto the device on the maintenance center, have no environmental impact except fire. Indeed, Lithium-Ion battery combined with heat exposure may increase fire and explosion risks, and release dangerous and toxic gas for the humans, animals and the environment. Store the batteries away from sun exposure and flammable materials, on a non-combustible surface.

WARNING: Spare parts batteries must only be provided by EOVE.

Batteries supplied as spare parts are shipped with a charge of 30%. They can be stored for 6 months if they are not connected.

In case of a battery replacement, the ageing resets after a full cycle of charge and discharge.

NOTE: After a discharge, we recommend to fully charge the battery before storing the ventilator. Even if the device must be serviced, that will save the battery life.

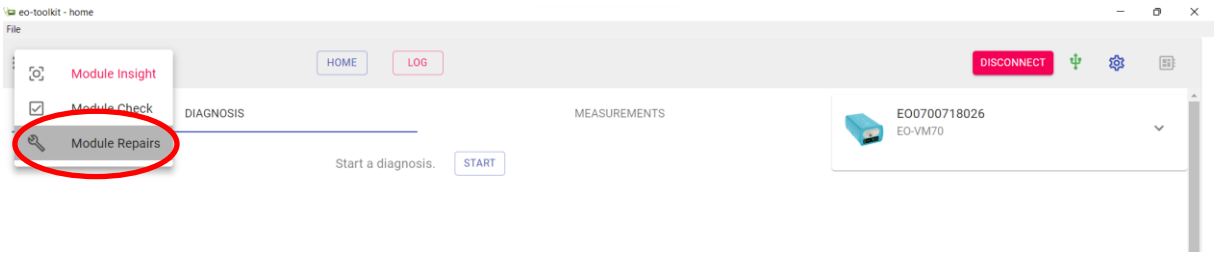
NOTE: We recommend using sometimes the ventilator on battery mode to increase battery life.

10.4.2 Configuration of the new battery

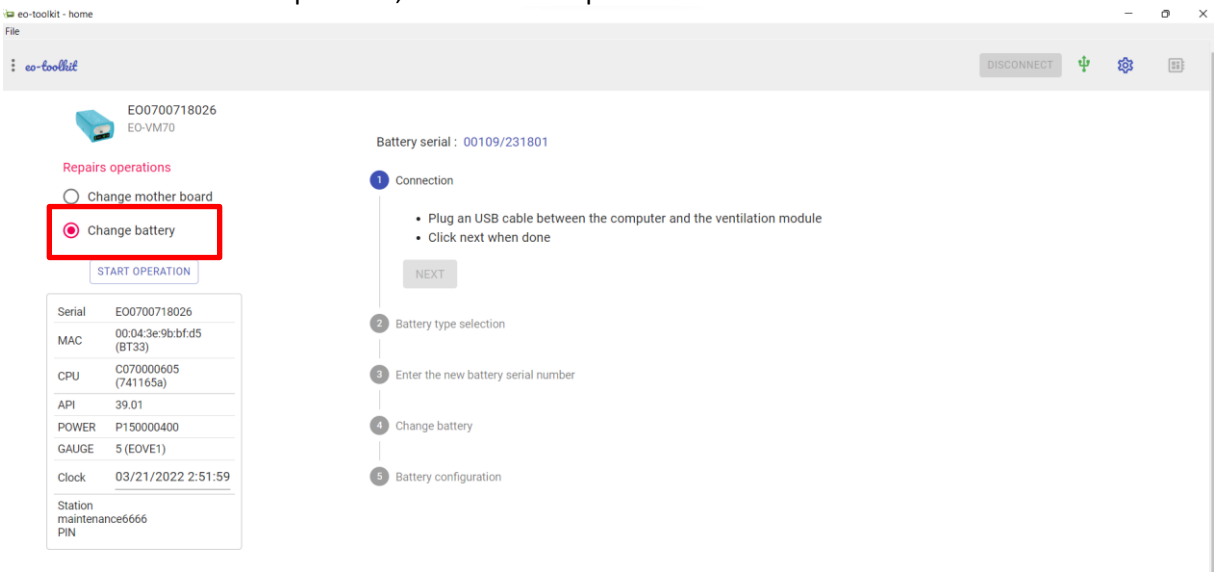
NOTE: The following operations detail the steps of the internal battery replacement.

WARNING: According to the S/N and the battery model, EO-Toolkit wizard performs the recovery or programming of the appropriate battery gauge.

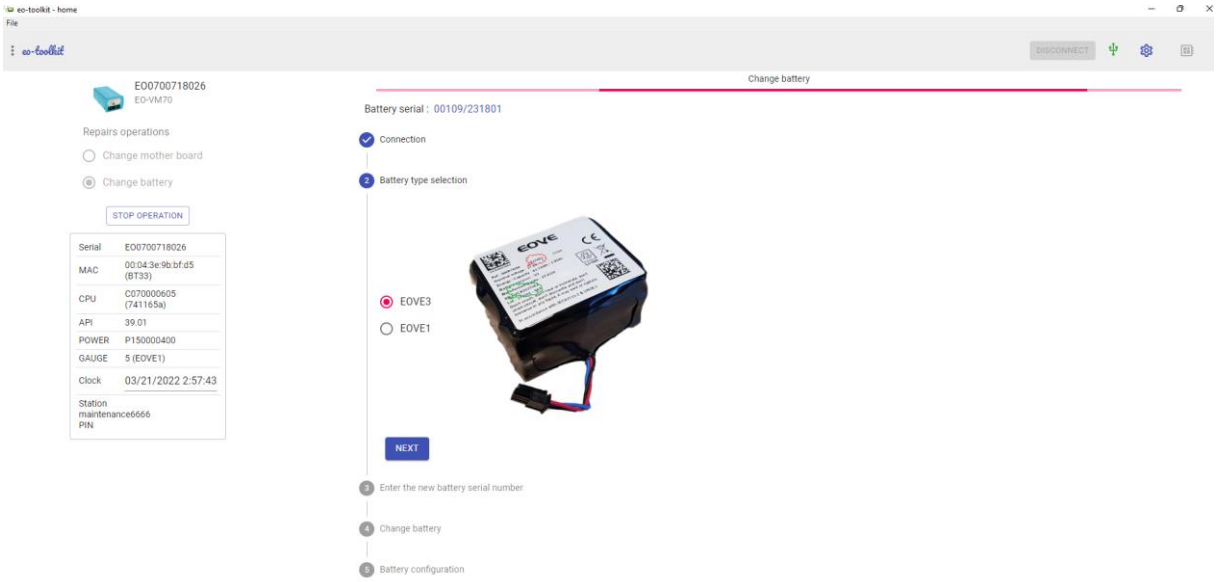
- Connect the module to the computer by usb
- Start EO-Toolkit and click on “Connect”
- Click on the top left corner and select Module Repairs



- Select Change battery
- To launch the operation, click on Start operation

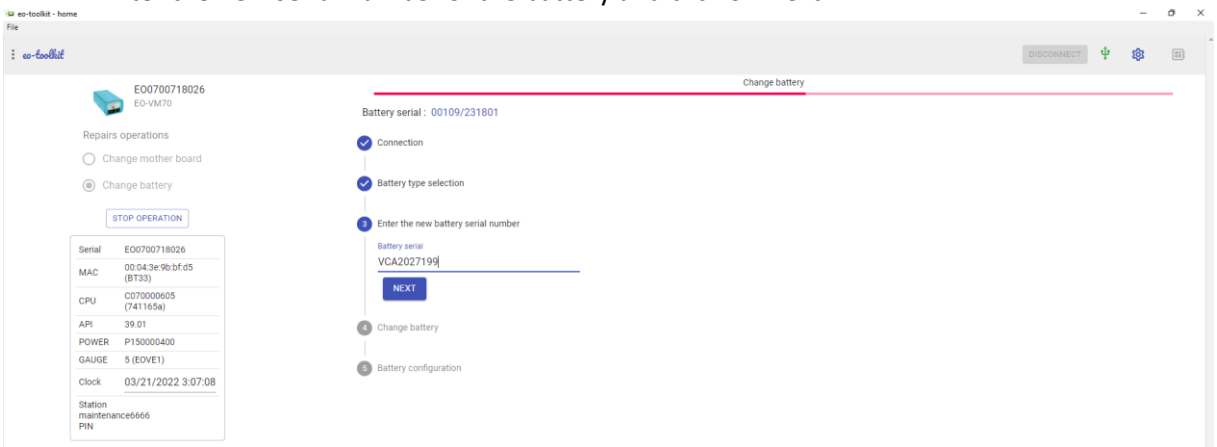


- Select the battery model



NOTE: The 2 batteries models have their own references. Refer to the *Appendix 4: Spare Parts List* to get the references.

- Enter the new serial number of the battery and click on Next

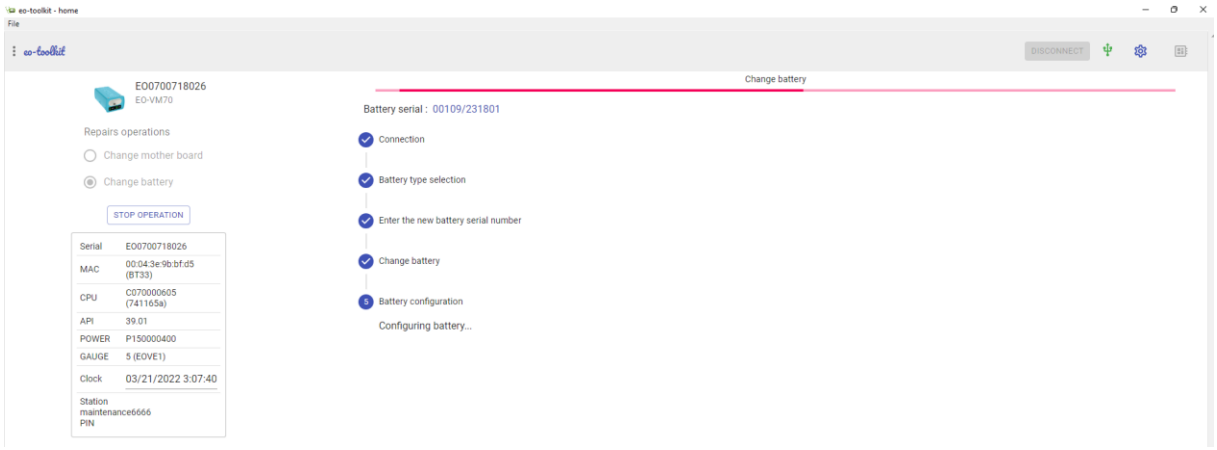


NOTE: To get the correct serial number, refer to the labels of the batteries detailed in the *Appendix 3: Components serial numbers*

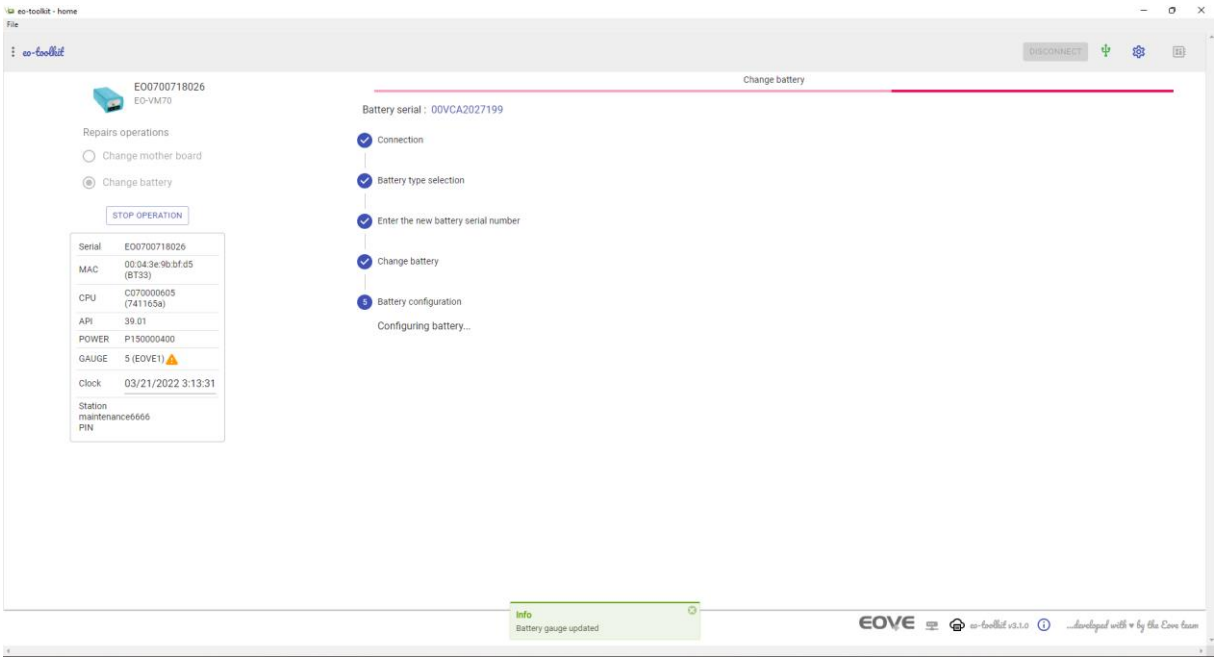
WARNING: Before the next operation, disconnect the ventilator from the AC power source.

- Replace the battery by the new one
- Plug AC to the ventilation
- Connect the ventilation module to the computer by USB

- Click on Next



- During the next step, the wizard proceeds to the “configuring battery”



NOTE: During this operation, the battery gauge configuration is performed, and the battery ageing resets.

NOTE: A notification appears when the battery gauge update is successful.

10.5 Pump

The lifetime of the pump is 1000 hours and an alarm triggers when this duration is reached.

The pump counter is available in the "Counters" tab of Maintenance menu.

10.6 Turbine

The lifetime of the turbine is 20 000 hours and an alarm triggers when this duration is reached.

The turbine counter is available in the "Counters" tab of Maintenance menu.

10.7 Solenoid valve

The two solenoid valves must be replaced after 100 million cycles and an alarm triggers when this duration is reached.

Solenoid valves counters are displayed in the “counters” tab of the maintenance menu (valve A and valve B).

10.8 Inspiratory flow sensor

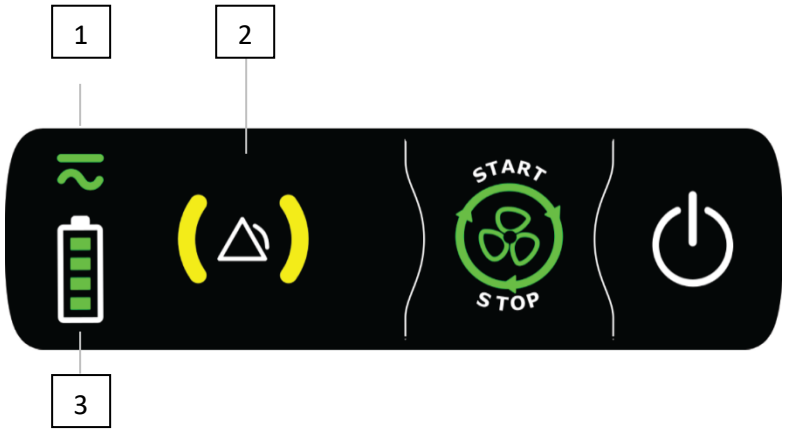
The inspiratory flow sensor can be replaced after 4 years of operating time depending on sensor conditions (dust, offset, water traces). We recommend checking cleanliness of its external filters and the accuracy of the measure by performing the 2-year maintenance operation with device performance controls.

11 Curative maintenance

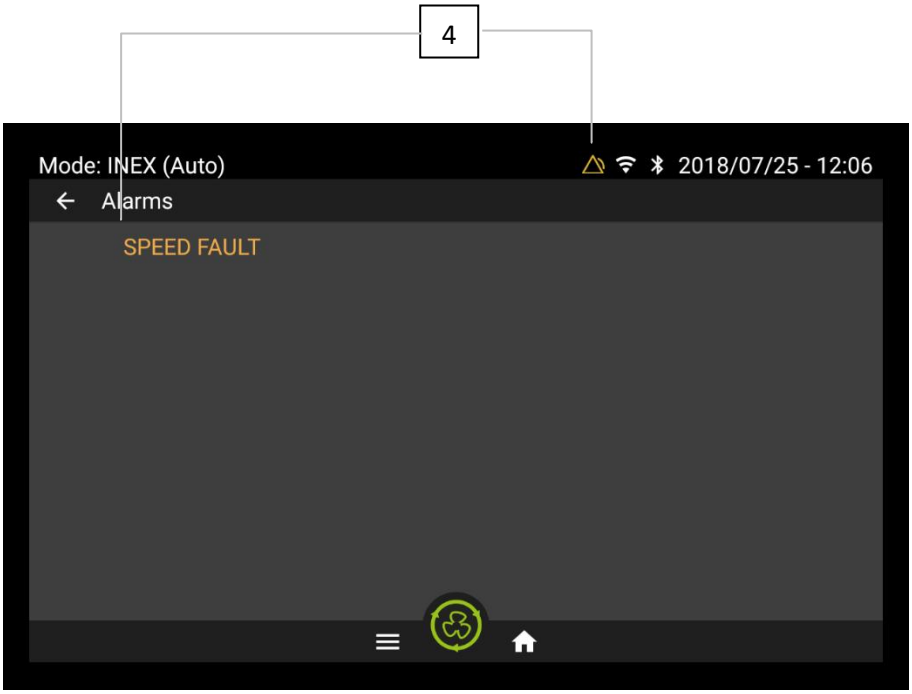
11.1 Alarms

11.1.1 Failure warning alarm

An alarm, lights on the keyboard and a warning message on the display screen warns the patient when there is a technical problem. The user must immediately contact a technician certified by EOVE and the repair should be performed as soon as possible.



1. Power source indicator
2. Keyboard alarm indicator
3. Battery level indicator
4. Interface alarm indicator



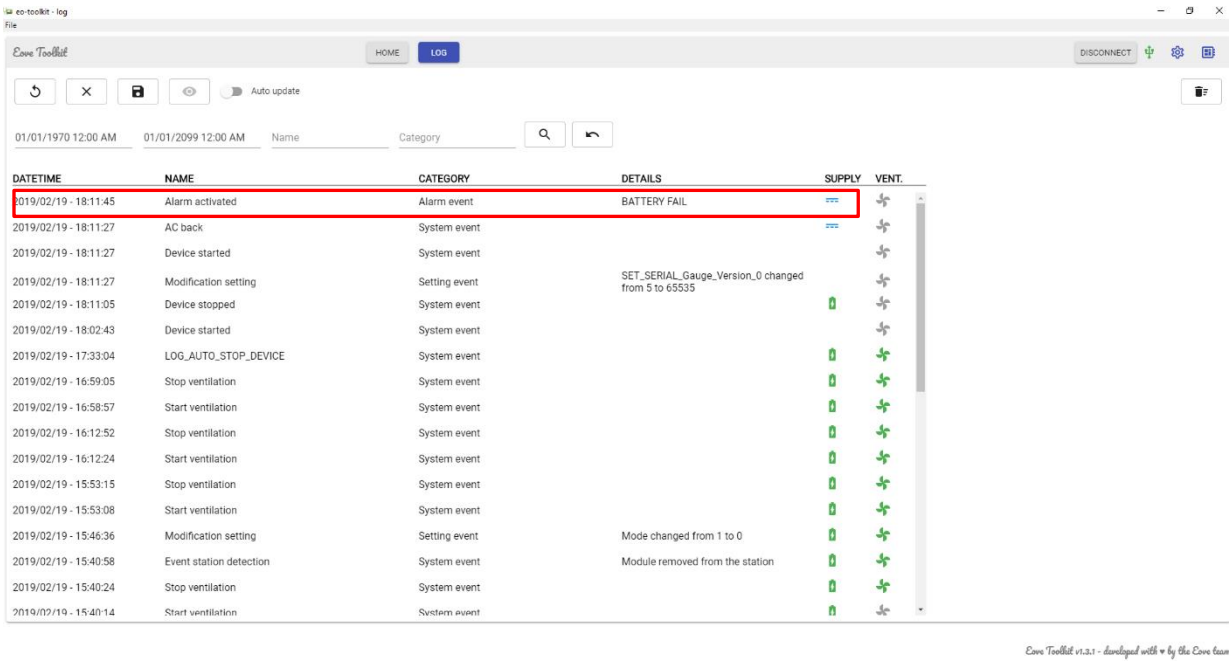
11.1.2 Alarms conditions

Alarm	Condition / Cause	Action
Speed Fault	Speed < 1000 rpm during ventilation	- Check CPU software version - Check the connection between the blower board and the motherboard - Check the inspiratory flow sensor conditions - Control vent. Performances - Replace the defective part according to your inspection
Supply Fail	Communication lost wit h power system	- Try to update PIC & CPU software versions - Control device operation on the different power modes (battery and AC) - Replace the motherboard if the alarm still triggers
Battery Fail	Battery doesn't charge properly or battery out of order	- Check software versions and update if necessary - Replace the battery
CPU Fail	Internal failure	- Replace the motherboard
Check Settings	Discount all values by default (voluntarily)	- Restart the device and check that the alarm disappeared - Control that settings have not been erased after a software update - Set the patient configuration
Memory Fail	Lost setting value or Loss of memorized value	- Restart the device and check that the alarm disappeared - If not, replace the motherboard
Prox. Fail	Sensor out of service	- Replace the motherboard
Keyboard fail	Button pressed longer than 20 seconds	- Check that the keyboard operates properly (LEDs + buttons) - If not, replace the keyboard
Bat. Temp High	Battery temperature out of range during discharge	- Stop using the device on battery mode - Let the SMD cool down for 1 hour - Check PIC software version and update if necessary - Check that the blower turbine isn't too high and so overheats the battery - Start a new treatment - Replace the battery if the alarm still triggers
Turbine Overheat	Blower temperature >80°C	- Check on SDM inlet/outlet that there is no obstruction - Return the device to technical service - Open SMD and check pneumatic block sealing - Check that there is no leak on internal tubes - Control vent. performances - Replace the turbine if it still overheats

Turbine Fail	Blower temperature out of range or temperature not in accordance with speed measure	- Check CPU software version - Return the device to technical service - Open SMD and check pneumatic block sealing - Check that there is no leak on internal tubes - Check the connection between the blower board and the motherboard - Check the inspiratory flow sensor conditions - Control vent. Performances - Replace the defective part according to your inspection
Insp. Flow Fail	Sensor out of service (3 attempts to reinit sensor unsuccessful)	- Check software versions and update if necessary - Replace the inspiratory flow sensor
Abs. Pressure Fail	Sensor out of service	- Replace the motherboard
High Pressure	Pressure >80 mbar	- Check on SDM inlet/outlet that there is no obstruction - Return the device to technical service - Check that the two solenoid valves operate properly - Check that the inhalation/exhalation valves operate properly - Check that there is no obstruction within the pneumatic block and tubes - Check the offset value from EO-Toolkit - Control vent. Performances - Replace the motherboard if the problem still occurs
Bat. Charge Pause (T °>)	Temperature >45° or <0°c during charge	- Check ambient environment and let the SMD cool down in a cooler place - Check software versions and update if necessary - Replace the battery if the problem still occurs in charge
Pressure fault	Difference between pressure measured and pressure expected	- Check on SDM inlet/outlet that there is no obstruction - Return the device to technical service - Check that the two solenoid valves operate properly - Check that the inhalation/exhalation valves operate properly - Check that there is no obstruction within the pneumatic block and tubes - Control vent. Performances - Replace the motherboard if the problem still occurs
BATTERY < 20%	Battery < 20%	- Connect AC external power supply
BATTERY < 10%	Battery < 10%	- Connect AC external power supply
GAUGE COM. FAIL	Battery Gauge not functional	- Plug AC power - Reboot the SMD - If the problem still occurs, replace the internal battery - If the problem occurs again, replace the CPU Board
Battery Maintenance	Battery ageing < 70%	- Replacement of internal battery during preventive maintenance

Turbine Maintenance	Turbine counter > 20 000 hours	- Replacement of turbine during preventive maintenance
Valve Maintenance	Valve counter > 100 millions cycles	- Replacement of exhalation control valve during preventive maintenance
Pump Maintenance	Pump counter > 1000h	- Replacement of pump during preventive maintenance

11.2 EO-Toolkit Event log



11.3 Troubleshooting

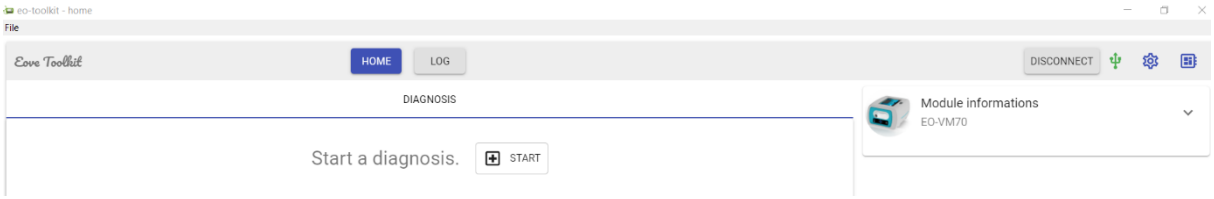
11.3.1 Troubleshooting trees

Check alarms conditions ($9.1.2) and the troubleshooting trees for additional information about the trigger of an alarm and the action to perform.

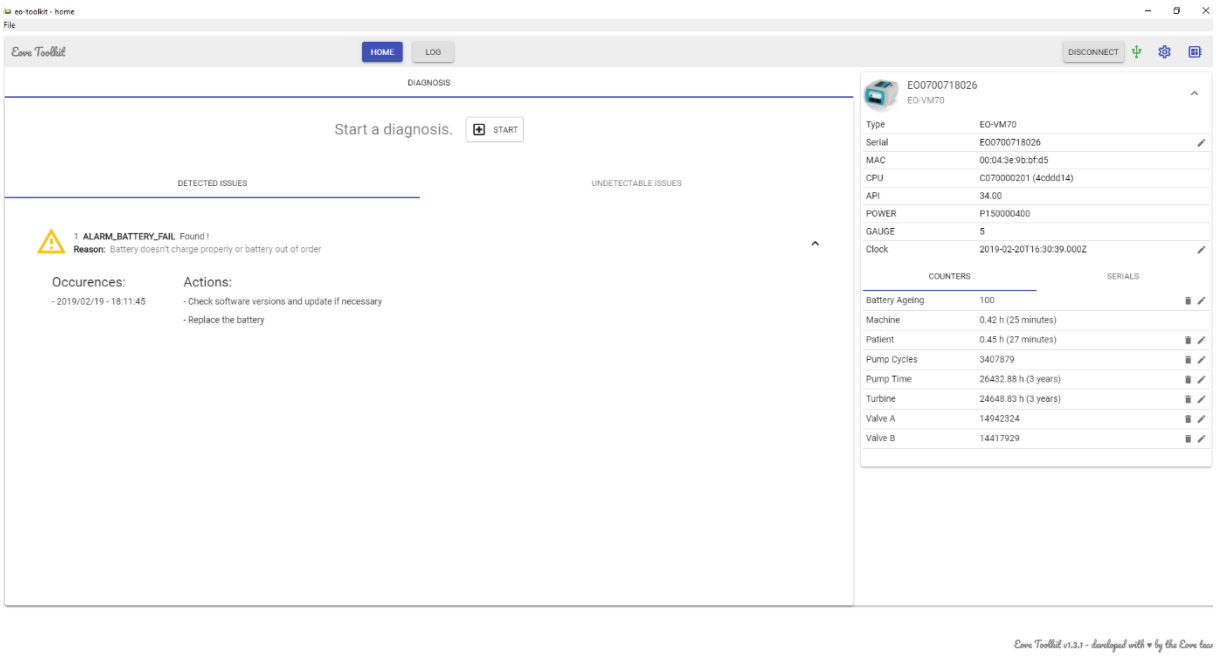
11.3.2 EO-Toolkit troubleshooting assistance

EO-Toolkit can provide technical assistance in case of alarm triggering. The diagnosis feature launches a scan among the event and look for all the alarms which triggered and their occurrence. Then it suggests some actions you might perform to solve the issue.

- Connect the EOVE70 SMD to the computer by usb and switch it on
- Start EO-Toolkit and click on connect
- Click on START to launch a diagnosis



- Check the alarm didn't trigger during some tests or is not an old alarm remaining in the event log
- Check the alarm reason is in accordance with device failure or the failure can be reproduced
- Check if the alarm is triggered by an issue different from the problem reported for the maintenance operation



- Perform the actions advised to fix the issue

11.3.3 Common SMD failure

Regarding EOVE-70 SMD operation, some failure associated to critical components such as the turbine, the motherboard or the battery must trigger alarms, but some breakdowns might not. These breakdowns can cause an unexpected noise or degrade SMD performances. This is a low priority incident but when the user notes something wrong about device operation, it is recommended to return it to technical service to be controlled and fixed if necessary.

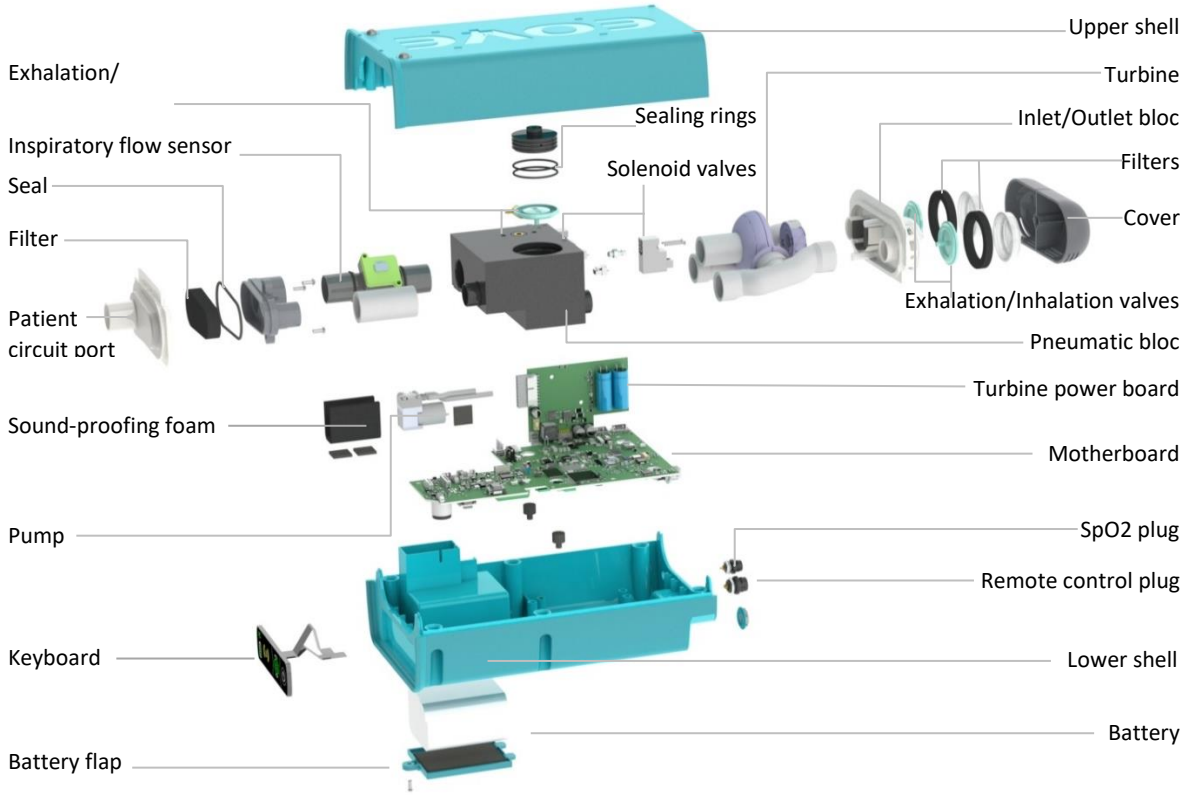
DESIGNATION	CAUSE	INCIDENCE	ACTION
Solenoid valve A electrical default	wires or connector damaged	Solenoid valve A can't operate. No positive pressure and unexpected noise during inhalation phase which can't be satisfactory.	Replace solenoid valve A **NOTE**: We recommend replacing both solenoid valve if you must change one.
Solenoid valve B electrical default	wires or connector damaged	Solenoid valve B can't operate. No negative pressure and unexpected noise during exhalation phase which can't be satisfactory.	Replace solenoid valve B. **NOTE**: We recommend replacing both solenoid valve if you must change one.
Solenoid valve A pneumatic default	tube disconnected, leak or exhalation valve blocked.	Device noisier during inhalation phase and exhalation valve doesn't operate. The EOVE-70 SMD can operate but turbine overheats quickly and need several minutes after treatment stop to cool down.	Replace the defective tube or reconnect it
Solenoid valve B pneumatic default	tube disconnected, leak or inhalation valve blocked	Device can't operate	Replace the defective tube or reconnect it
Error of inhalation/exhalation valves control	tubes between inhalation/exhalation valves and pneumatic bloc mixed.	Device can't operate. Solenoid valves don't control the correct inhalation/exhalation valves	Refer to pneumatic drawing to connect properly the tubes on the right position
Pump pneumatic default	Pump backflow tube disconnected, not seal or pinched	Insufficient pressure during inhalation phase	Replace or reconnect the pump backflow tube
Pump electrical default	Pump electrical power disconnected or damaged (wires or connector).	Insufficient pressure to control the valves. Device doesn't operate properly	Replace the pump

12 EO-70 SMD module: Replacement procedures

12.1 List of components

12.1.1 EOVE-70 SMD module structure

Refer to spare parts list to get the references of components.



EOVE-70 SMD module architecture

WARNING: BEFORE ANY REPLACEMENT OPERATION, DISCONNECT THE BATTERY AND DISCONNECT THE EOVE-70 SMD FROM THE POWER SOURCE.

WARNING: AFTER REPLACING A COMPONENT, YOU SHOULD FILL THE NEW SERIAL NUMBER IN THE SMD MEMORY.

To ensure the proper functioning of the eove-70 secretion management device and the safety of the user and their entourage, the procedures described below must be strictly applied.

The device must be clean before any maintenance operation.

12.2 Air Filter

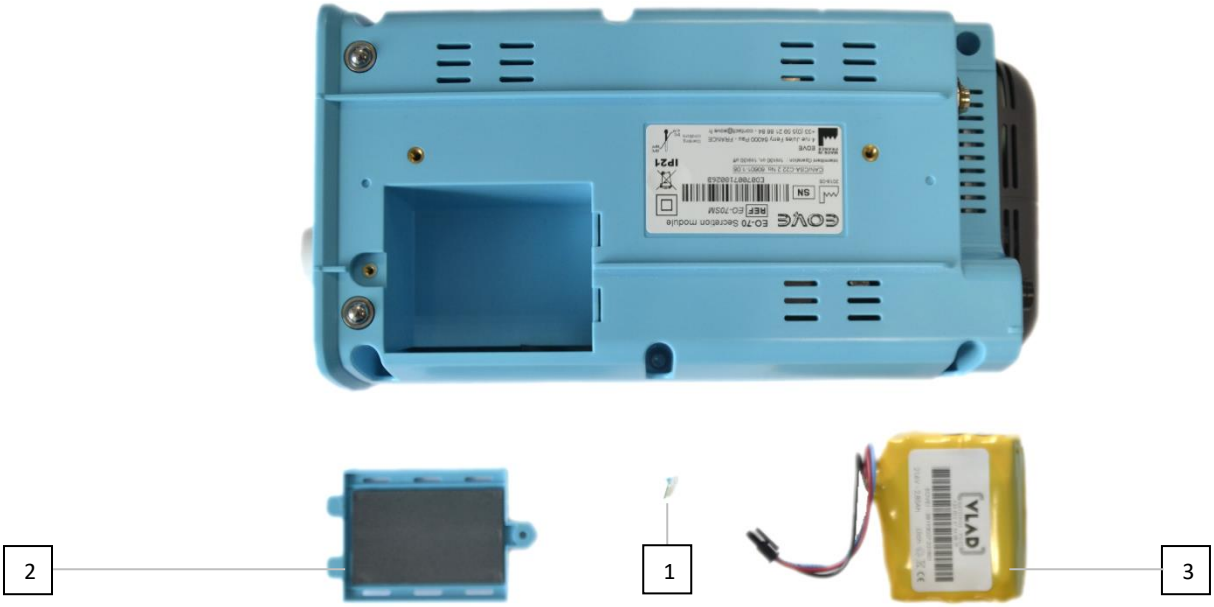
- Unscrew the cover and remove it
- Disconnect the two tubes from the inhalation/exhalation valves
- Remove the two old filters and replace them by new ones
- Connect back the tubes

WARNING: Pay attention to connect the correct tube on the right position

- Place back the cover and screw it

12.3 Battery

- Remove the module from the housing unit and turn it over.
- Remove the fixing screw (1) from the battery flap (2).
- Remove the battery flap and clean it.
- Remove the battery (3) and disconnect it from the extension cable.



- Place the new battery carefully in its housing with the battery facing in the correct direction (label providing battery technical data on the upper side. Label providing serial numbers on the opposite side).
- Position the cover and the fixing screw.
- Check the device is operational on internal battery and perform a battery cycle of charge and discharge.

WARNING: THE BATTERIES MUST BE HANDLED WITH CARE. CHECK THE CONDITION OF THE NEW BATTERY. DO NOT USE IF THERE IS ANY SIGN OF DAMAGE.

NOTE: The new battery must charge for 5 hours before use.

Check the condition of protective foams and replace if necessary.

NOTE: The EO70 SMD can be equipped by the battery model EOVE 001 (SP-INTBATT-001, yellow) or the battery model EOVE3 (SP-INTBATT-002, black) depending on the manufacturing batch.

The battery model EOVE3 (ref SP-INTBATT-002), colored black, is coming in substitution of the battery model EOVE1 (ref SP-INTBATT-001) to overcome its obsolescence.

The disposal of defective batteries should be done in compliance with the laws in effect in each country.

Batteries bought in spare-parts are sent with a charge of 30%. They can be stored for 6 months if they are not connected. In case of a battery replacement, the ageing resets after a full cycle of charge and discharge.

NOTE: After replacing an internal battery, you should fill the new serial number to the SMD memory during the “set serial numbers” test of the performance controls via EO-Toolkit

Refer to the labels of the batteries detailed in the *Appendix 5: Components serial numbers*

NOTE: After a discharge, we recommend to fully charge the battery before storing the device. Even if the device must be serviced, that will save the battery life.

NOTE: Keep the original EOVE-70SMD screw. Pay attention to not exchange it with the one from EOVE-150VNT which is different.

12.4 Module disassembly

Some maintenance operations require to open the EOVE-70 SMD. Be sure to strictly observe EOVE opening and closing instructions.

WARNING: Any operation which requires to open the module must be performed by a qualified technician.

12.4.1 Opening the module

- Remove the module from the docking station
- Turn the module over (lower shell (1) to the top), remove the filter cover and the 6 screws

- Turn the module over again (upper shell (3) to the top) by holding the two shells in position
- Open the module by removing the upper shell

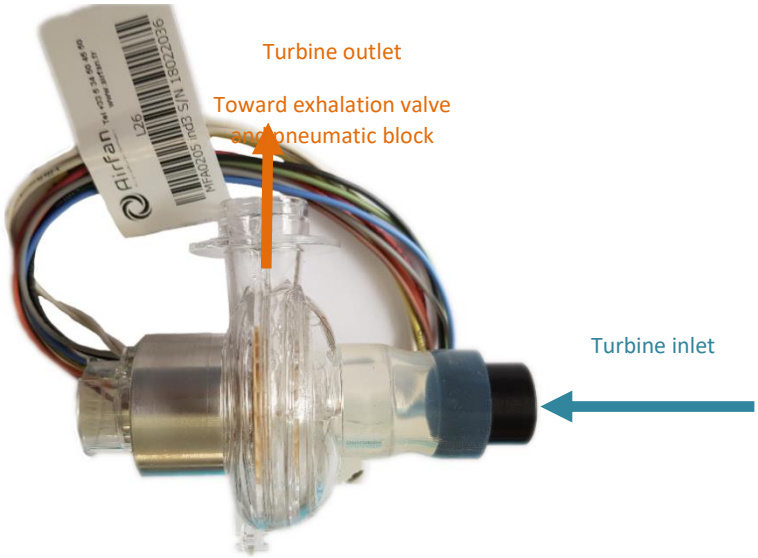
12.4.2 Closing the module

- Place back the upper shell by centering it on the lower shell
- Turn the device over by holding the two shells in position and replace the screws
- Place back the filter cover

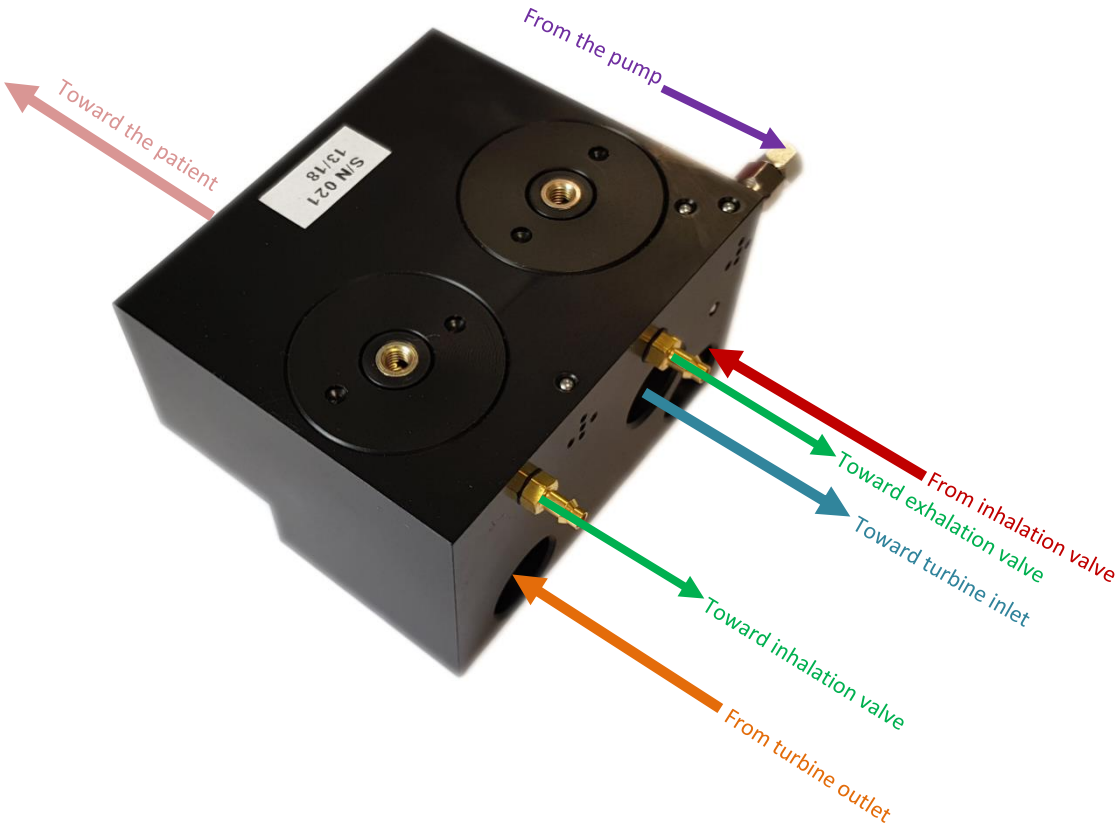
12.5 Pneumatic subassembly

Some maintenance operations require the removal and installation of the tubes. Be sure to strictly observe the installation and removal instructions of the various components by referring to the following instructions.

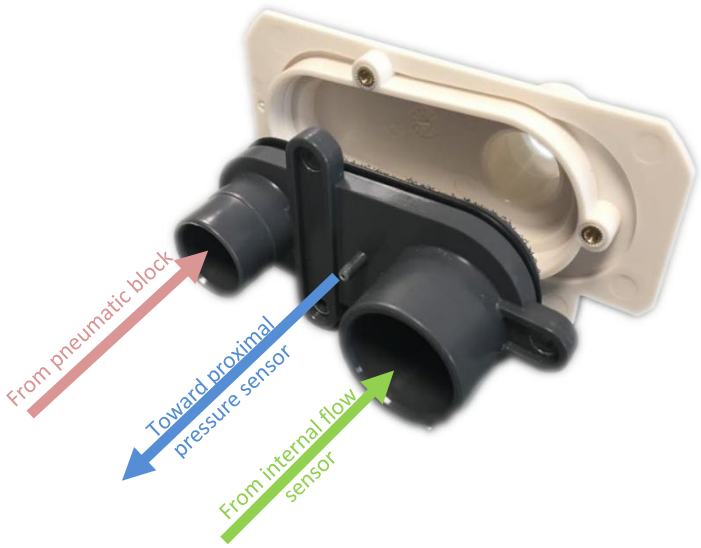
12.5.1 Turbine



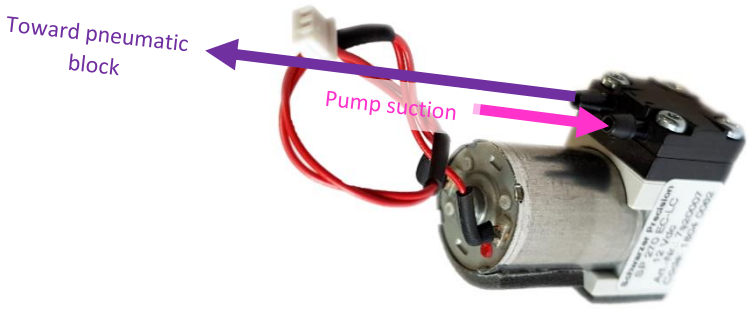
12.5.2 Pneumatic block



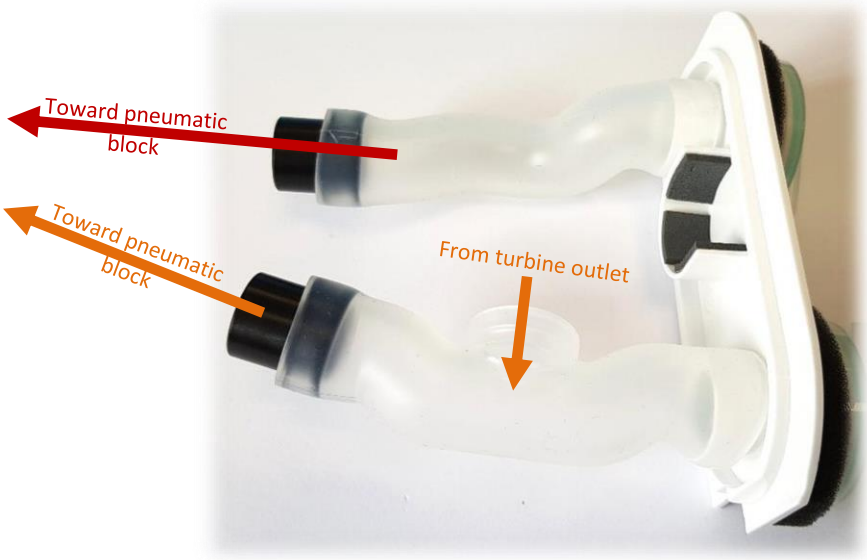
12.5.3 Patient circuit port



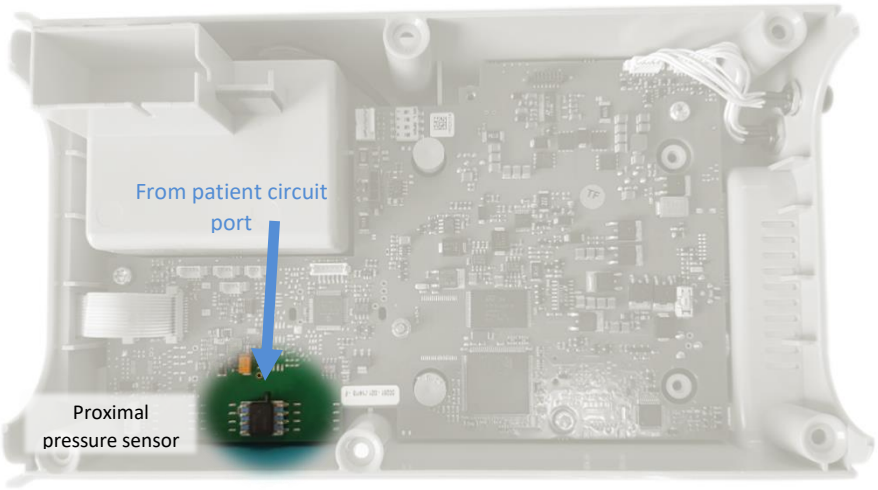
12.5.4 Pump



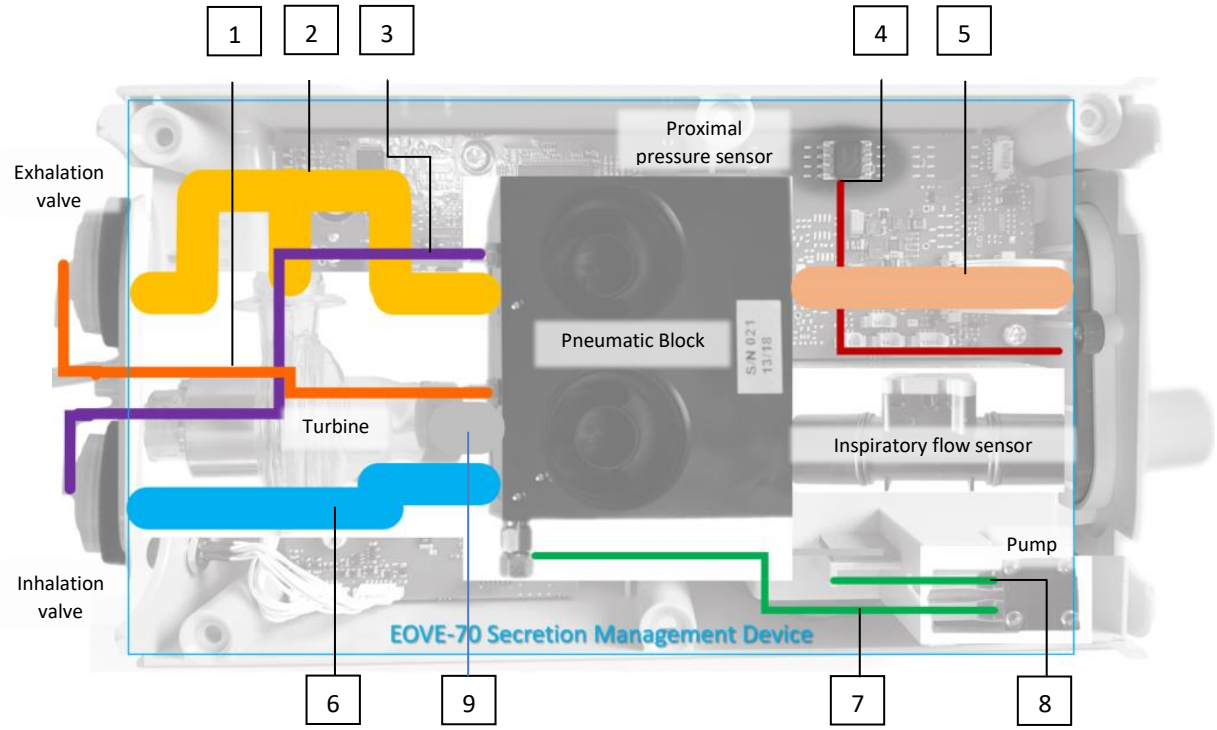
12.5.5 Inhalation/exhalation valves block



12.5.6 Motherboard

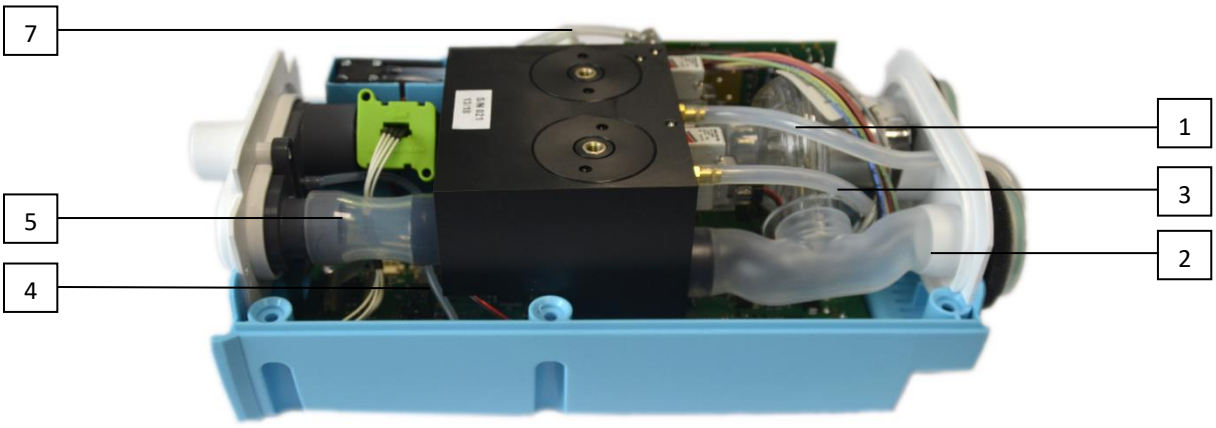


12.6 Pneumatic connections



Référence	Colour	Designation	Size
1		Silicone tube Ø 3x6mm	145mm
2		Curved tube of turbine output	3 connect. points
3		Silicone tube Ø 3x6mm	155mm
4		Silicone tube Ø 1x3mm	100mm
5		Tube of patient output Ø 15x21mm	45mm
6		Inhalation tube	2 connect. points
7		Silicone tube Ø 2x4mm	115mm
8		Silicone tube Ø 2x4mm	65mm
9		Straight tube of turbine input Ø 15x21mm	31mm

12.6.1 Left view of pneumatic block assembled



12.6.2 Right view of pneumatic block assembled

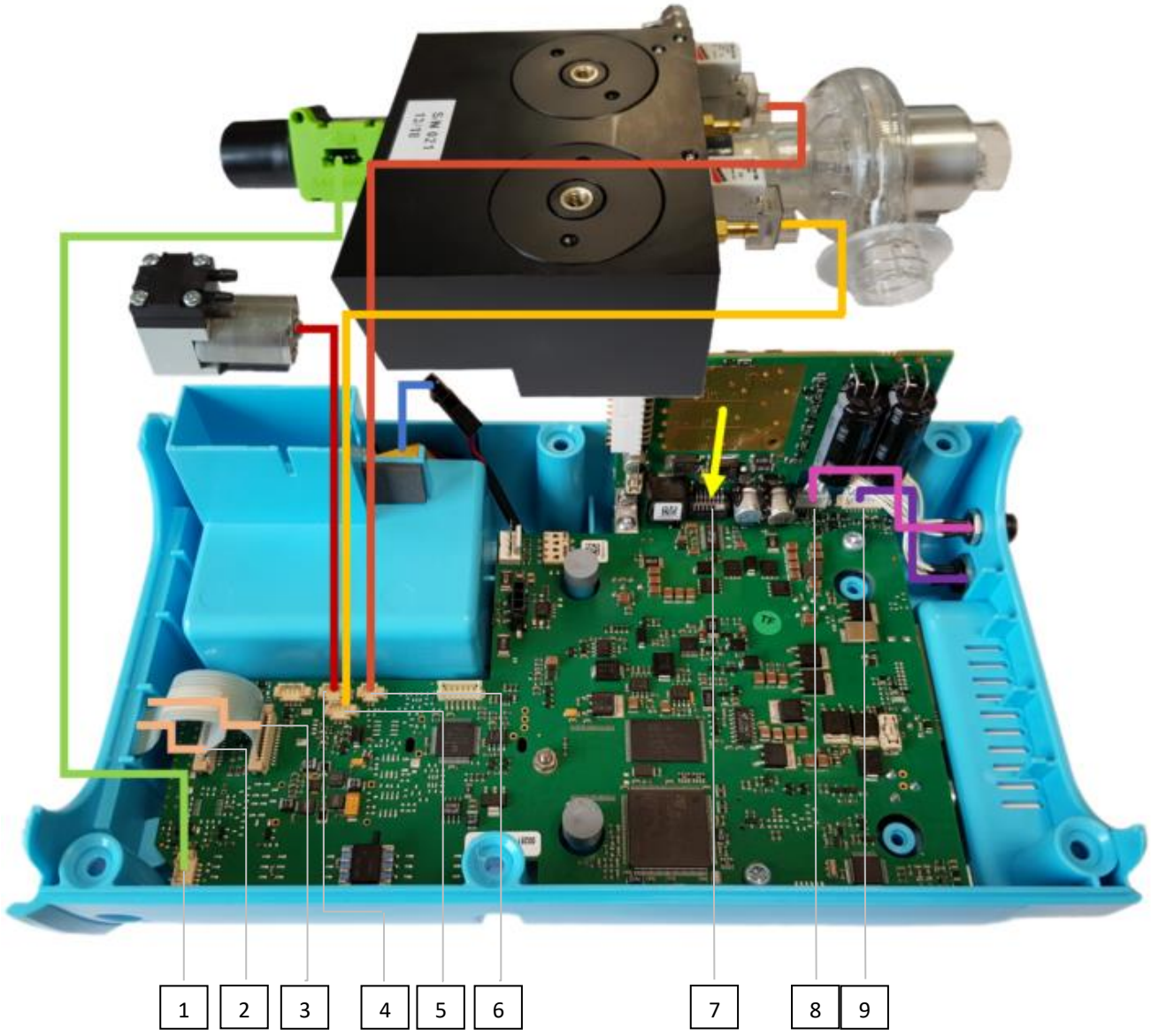
Pneumatic connections between:

1. Solenoid valve A and exhalation valve	2. Pneumatic block and exhalation valve
3. Solenoid valve B and inhalation valve	4. Patient circuit port and proximal pressure sensor
5. Pneumatic block and patient circuit port	6. Inhalation valve and pneumatic block
7. Pump and pneumatic block	8. Pump suction

12.7 Electrical wiring

Some maintenance operations require the removal and installation of the cable harnesses. Be sure to strictly observe the installation and removal instructions of the various components by referring to the following instructions.

12.7.1 Motherboard electrical connections

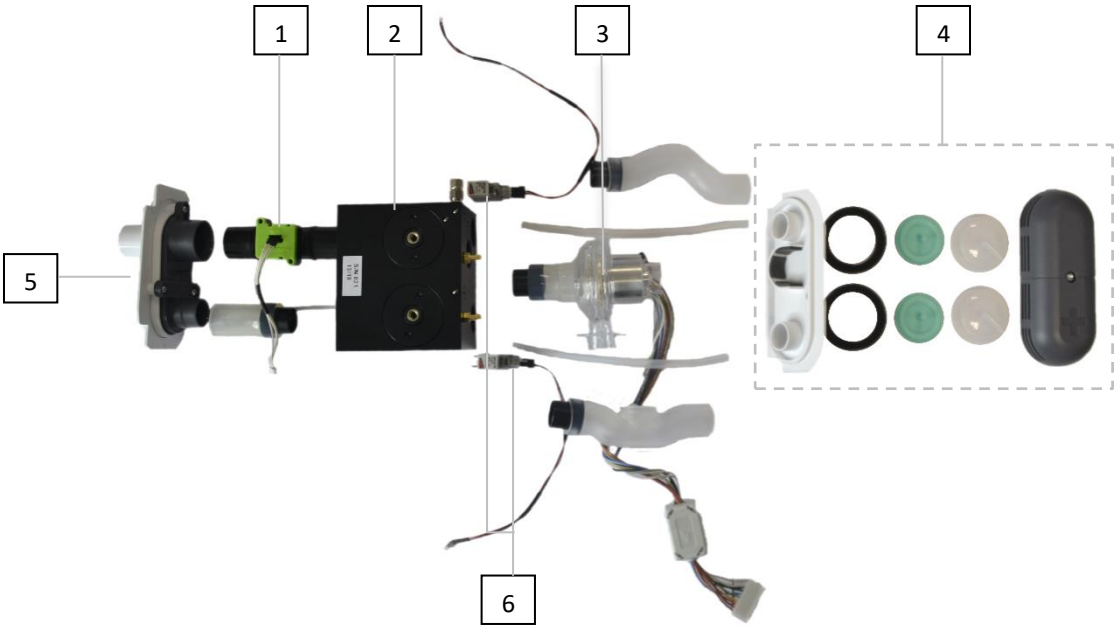


Electrical connections to motherboard:

1. Inspiratory flow sensor	2. Keyboard LEDs
3. Keyboard buttons and battery indicator	4. Pump
5. Solenoid valve B	6. Solenoid valve A
7. Turbine board	8. SpO2 connector
9. Remote control connector	

12.8 Internal pneumatic circuit

The internal pneumatic circuit is composed of the turbine, the inspiratory flow sensor, the pneumatic block with the two solenoid valves, the inhalation exhalation valves block and all the tubes.



1. Inspiratory flow sensor	2. Pneumatic block
3. Turbine	4. Inhalation / exhalation valves block dismantled
5. Patient circuit port	6. Solenoid valves A & B

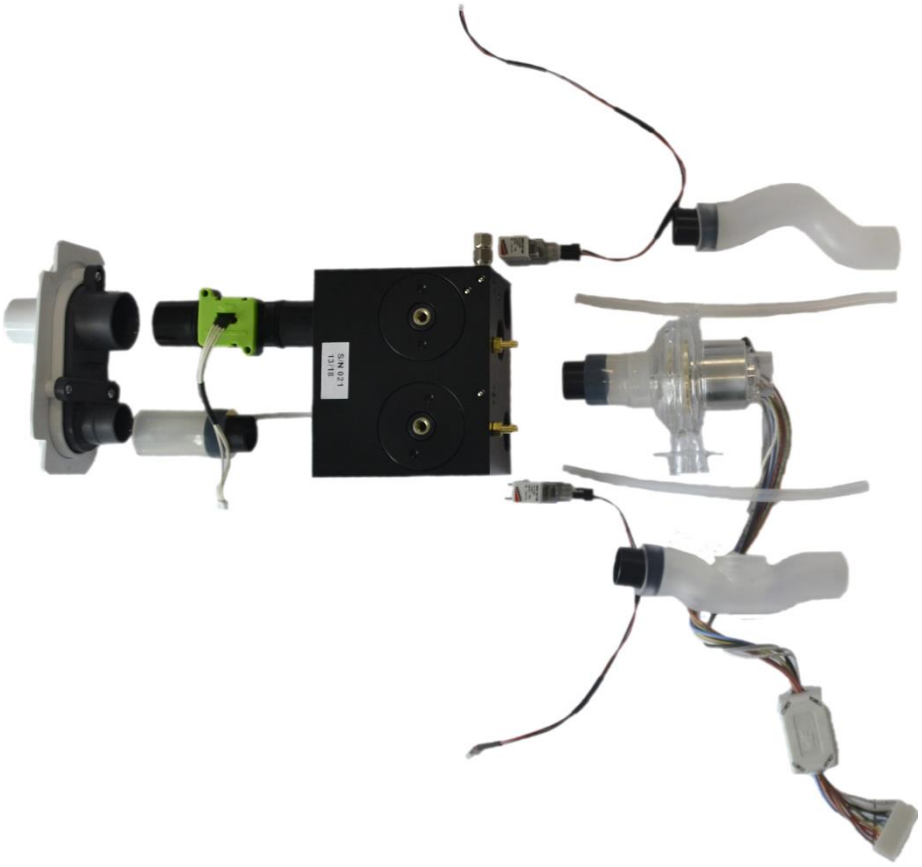
NOTE: For any replacement operation, it is recommended to remove the entire circuit

To remove the internal pneumatic circuit:

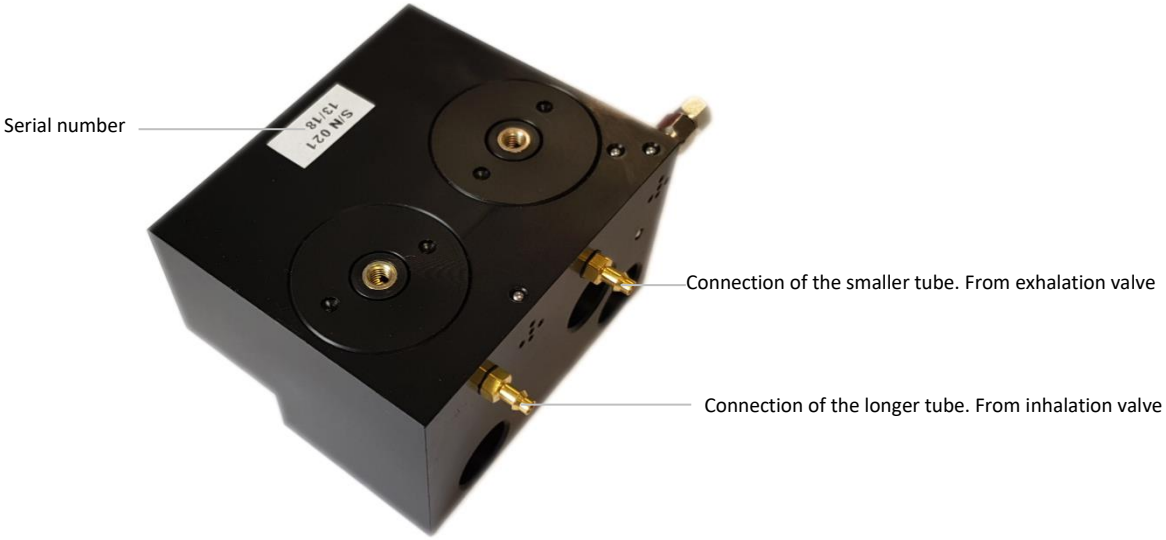
- Disconnect all the cable harnesses from the motherboard
- Disconnect the turbine from the turbine board the and the tube from the proximal pressure sensor on the motherboard

12.9 Pneumatic block

- Remove the internal pneumatic circuit
- Disconnect all the six tubes from the pneumatic block
- Remove the turbine and the inspiratory flow sensor
- Unscrew the two solenoid valves and remove them



- Replace the pneumatic block and note the serial number



- Position the two solenoid valves and screw them

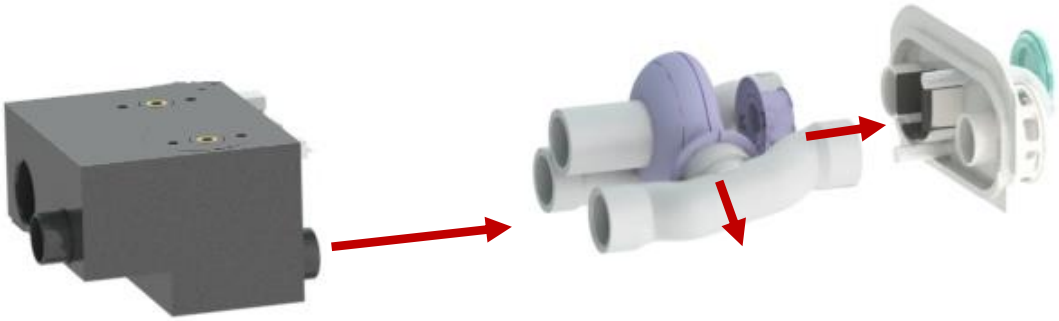
- Connect the inspiratory flow sensor and pay attention to put it in the proper direction (arrow toward patient circuit port)
- Connect the turbine and the 6 tubes (pay attention to the two tubes connected to inhalation/exhalation valves. The longer is connected to Solenoid valve B and inhalation valve)

12.10 Turbine

- Disconnect the turbine from the turbine board

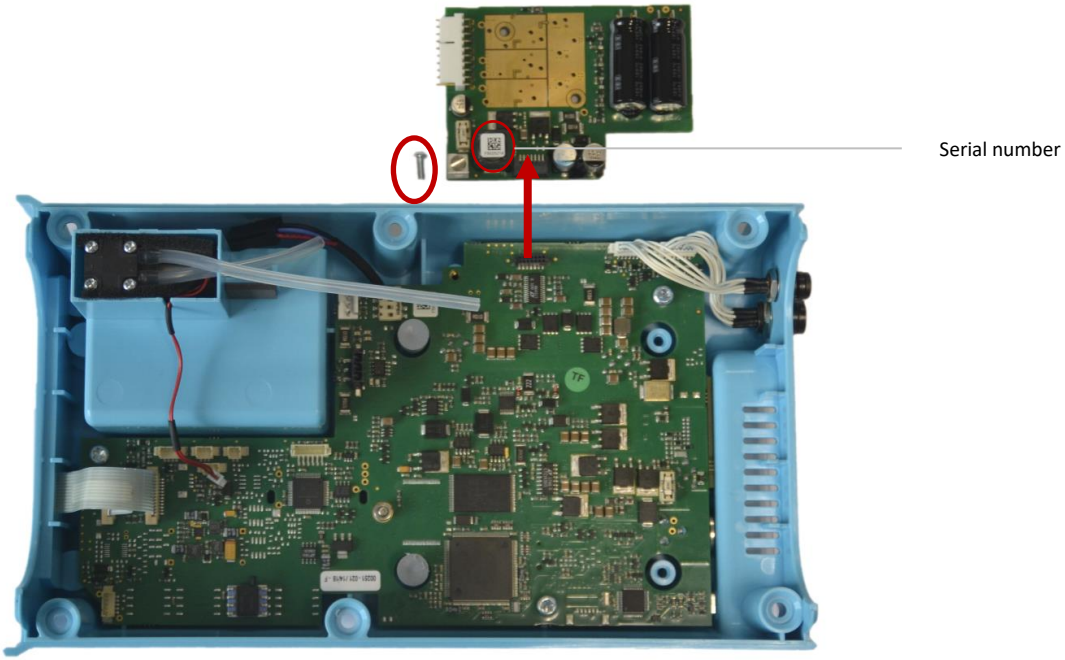
NOTE: Turbine serial number is written on the label affixed on turbine harness

- Disconnect the turbine from the pneumatic block
- Remove the inhalation/exhalation valves block
- Disconnect the tube at the turbine outlet



12.11 Turbine board

- Remove the internal pneumatic circuit
- Disconnect the turbine electrical connection from the turbine board
- Unscrew the turbine board from the motherboard
- Disconnect the turbine board from the motherboard



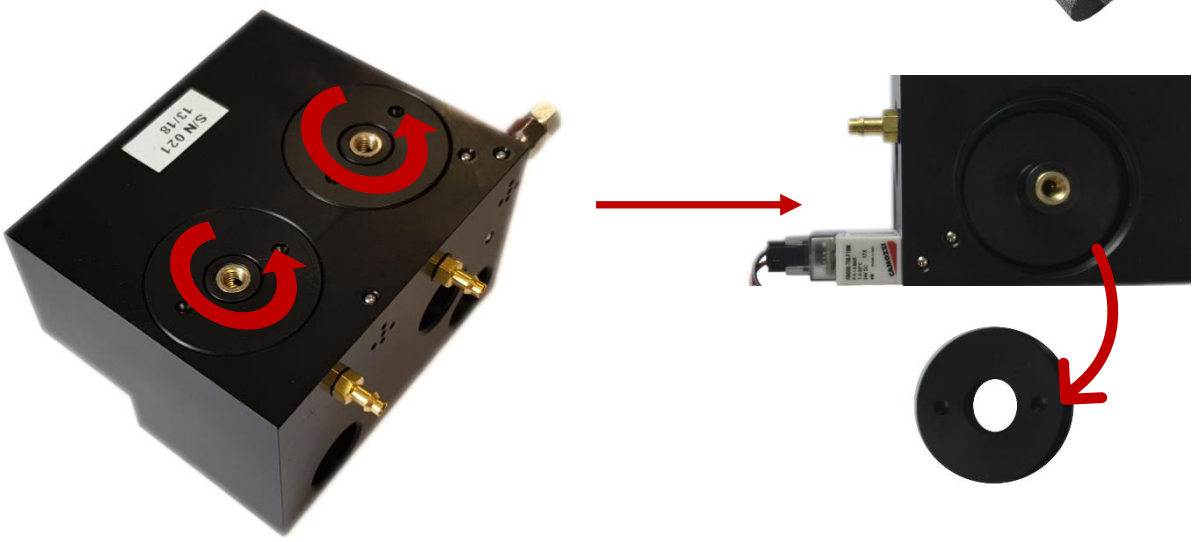
NOTE: Turbine board serial number is written on the label affixed on the front face

NOTE: Keep the original EOVE-70SMD screw. Pay attention to not exchange it with the one from EOVE-150VNT which is different.

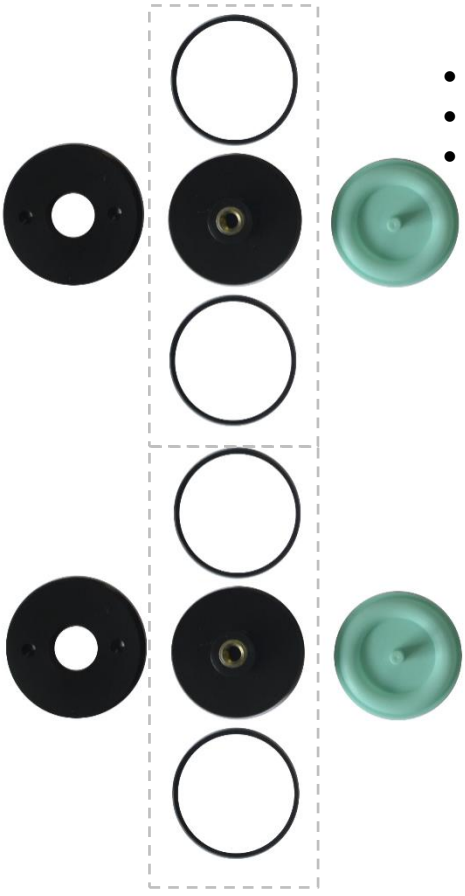
12.12 Inhalation / exhalation valves

12.12.1 Inhalation / exhalation valves installed in pneumatic block

- Unscrew the two covers on the top of the pneumatic block thanks to the dedicated tool and remove them



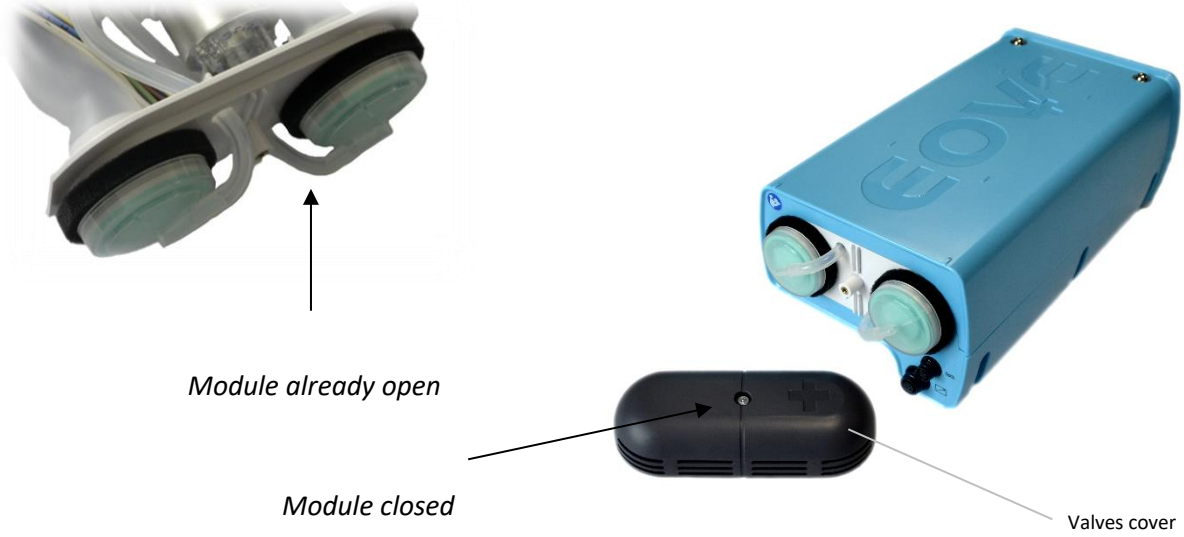
- Remove the valve support with its two sealing rings thanks to the dedicated tool, and the valve for each hole



- Replace the valve
- Position the new valves and their support
- Position the cover and screw it thanks to the dedicated tool

12.12.2 Inhalation / exhalation valves installed in valves block

NOTE: Replacement of inhalation and exhalation valves at the rear of the device can be performed with or without a module opening.

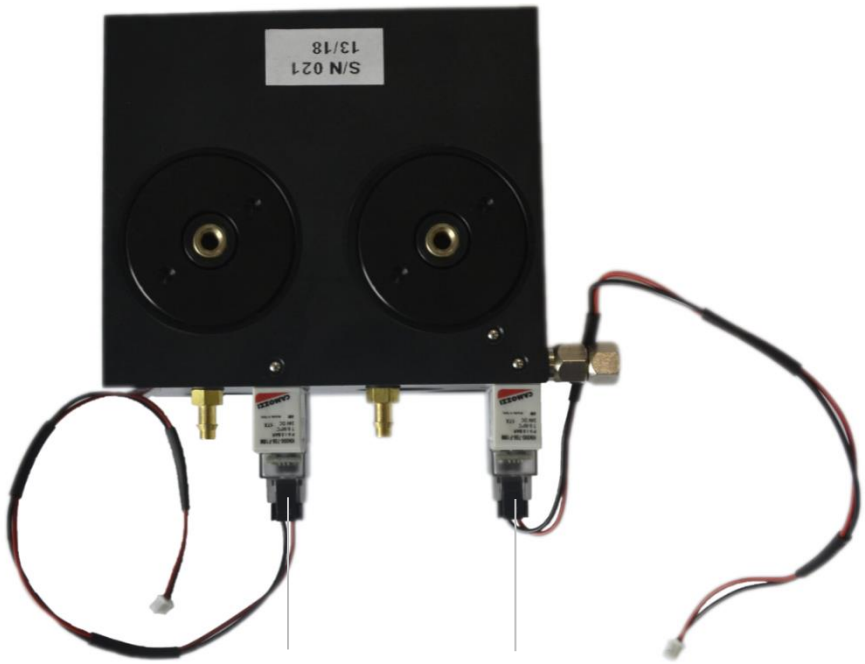


- Unscrew the cover and remove it if necessary
- Remove the tubes connectors
- Replace the valves

1. Inhalation / exhalation valves block	2. Air filters
3. Inhalation / exhalation valves	4. Tubes connectors
5. Cover	

12.13 Solenoid valves

NOTE: We recommend replacing both solenoid valves if the replacement of one of them is required.



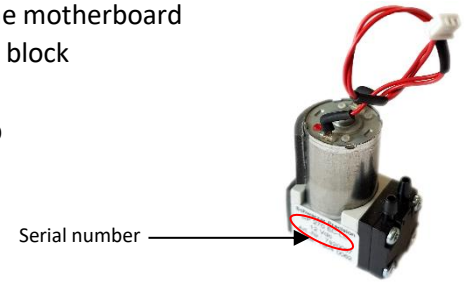
Solenoid valve
Camozzi brand

- Disconnect the electrical harnesses from the motherboard
- Gently unscrew the solenoid valve. Pay attention to not damage the screw thread.
- Remove the solenoid valve
- Position the new solenoid valve
- Gently screw it and pay attention to not damage the screw thread
- Pay attention to the balance of tightening torque between the two screws to keep an efficient sealing
- Note the serial number of the new solenoid valve to update it in device memory
- Connect the electric harnesses (refer to electrical wiring $10.7)

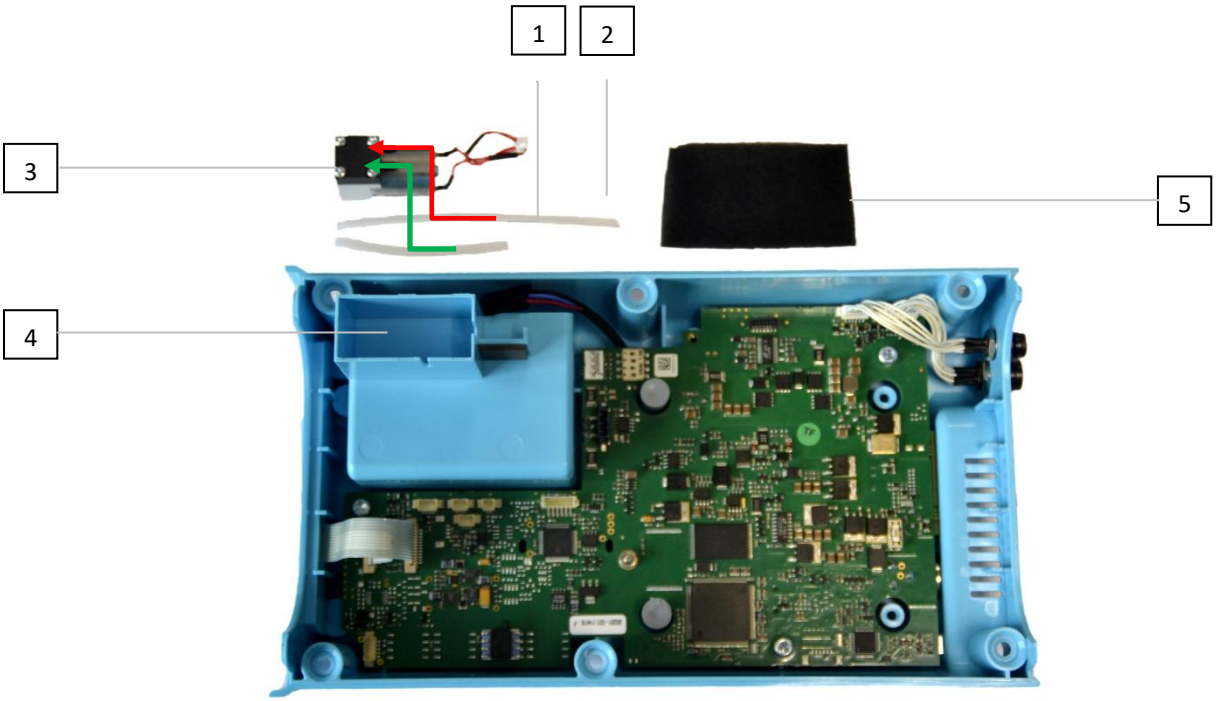
Solenoid valve
Clippard brand

12.14 Pump

- Disconnect the electrical harness from the motherboard
- Disconnect the tube from the pneumatic block
- Remove the pump from its slot
- Note the serial number of the new pump



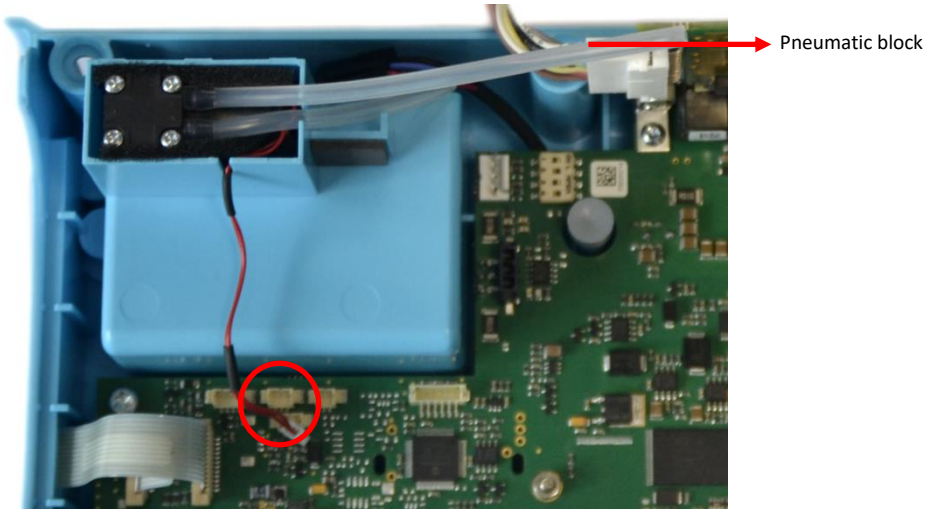
- Connect the two tubes (refer to the image below)



1. Pump suction	2. Pump backflow (outlet)
3. Pump	4. Pump slot
5. Sound-proofing foam	

- Position the sound-proofing foam within the slot
- Position the pump in its sound-proofing foam

- Connect the electrical harness on the motherboard (refer to electrical wiring $10.7)

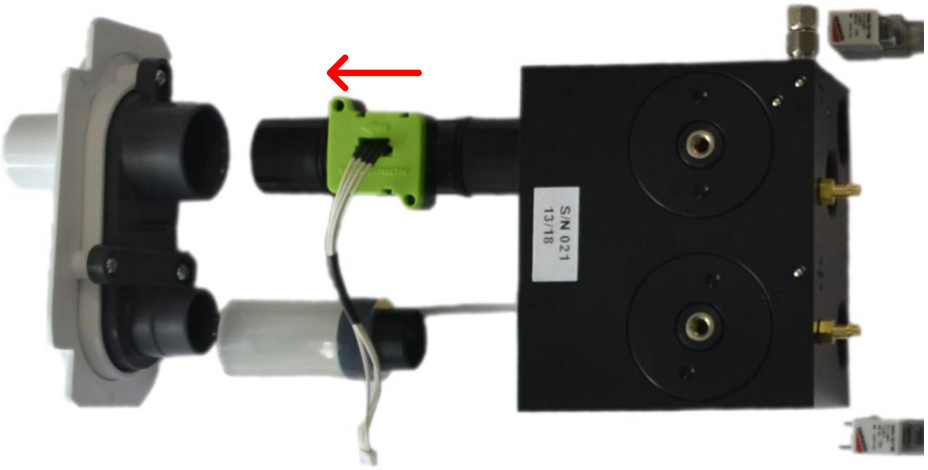


- Connect the tube of the outlet (backflow) to the pneumatic block

NOTE: Position the two tubes so that block them in the shell groove

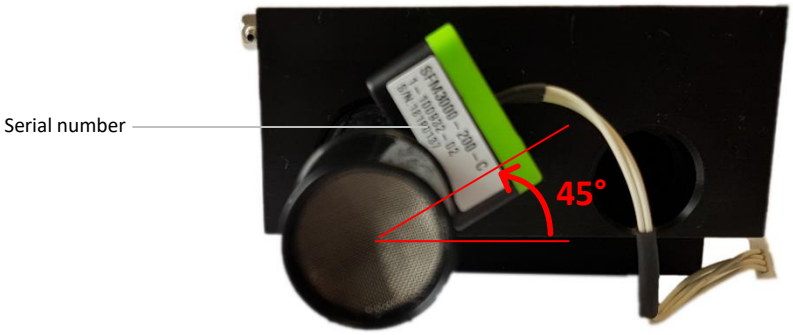
12.15 Inspiratory flow sensor

- Disconnect the electrical harness from the motherboard
- Disconnect the inspiratory flow sensor from the patient circuit port
- Disconnect the inspiratory flow sensor from the pneumatic block



Top view

- Note the serial number of the new sensor
- Pay attention to the direction (arrow toward the patient circuit port) and connect the inspiratory flow sensor to the pneumatic block

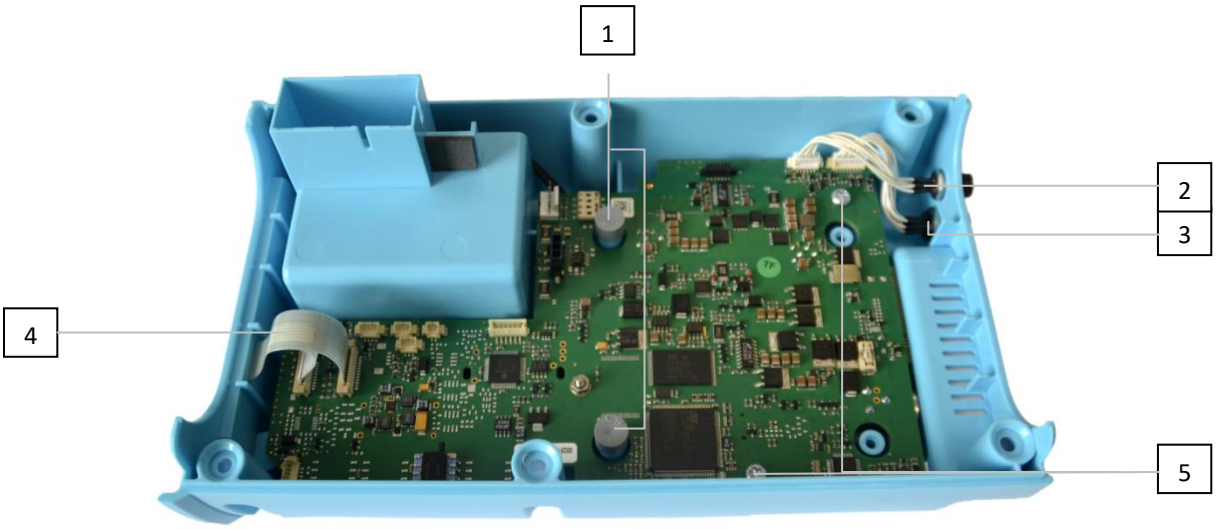


Front view

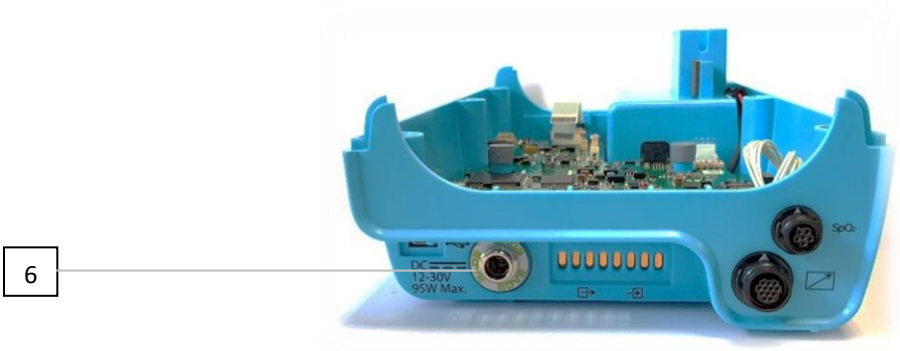
- Connect it to the patient circuit port
- Connect the electrical harness on the motherboard (refer to electrical wiring $10.7)

12.16 Motherboard

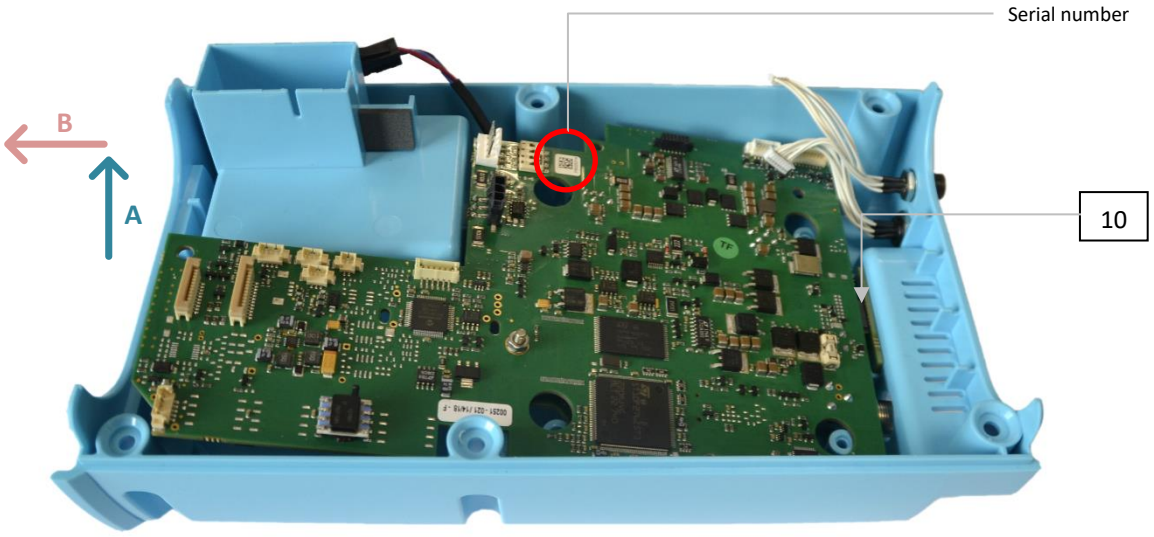
- Remove the internal pneumatic circuit and the turbine board then disconnect the pump, the SpO2 and remote-control harnesses from the motherboard
- Disconnect the keyboard and remove the two turbine feet and the three screws

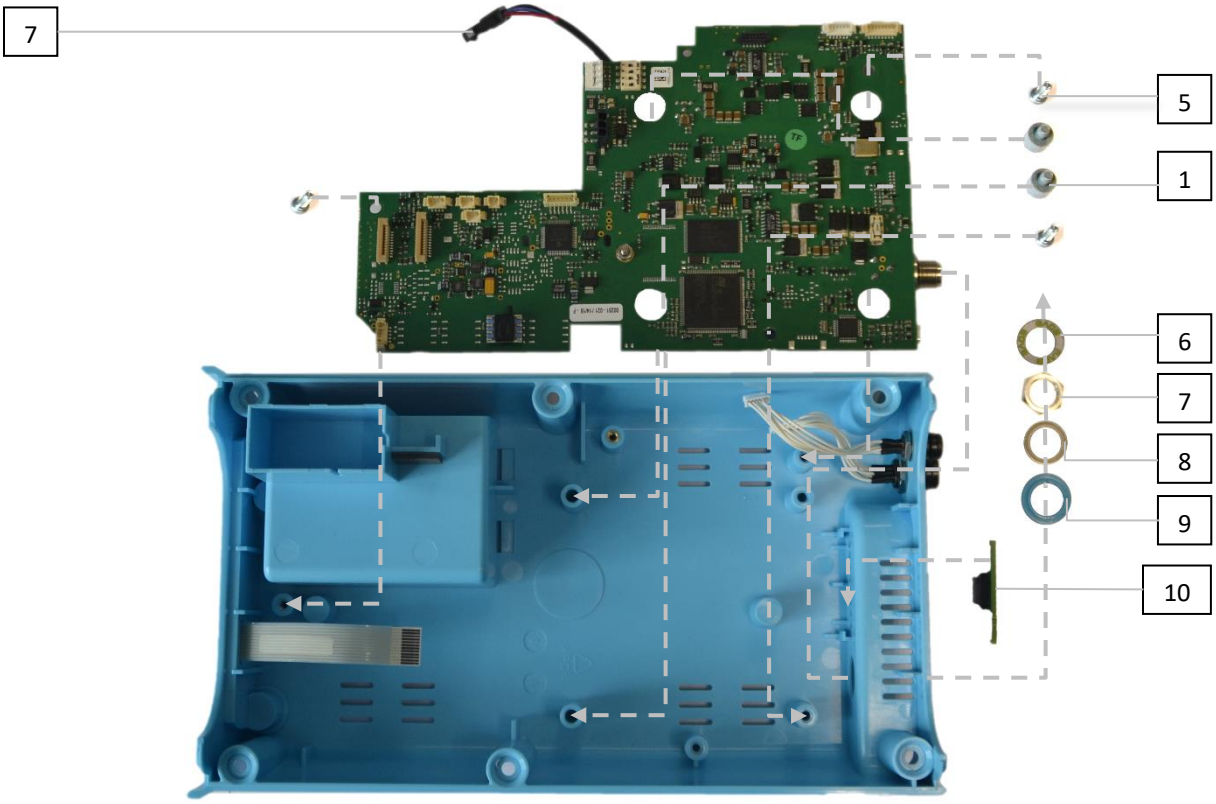


- Remove the insulating washer and the nut from DC connector



- Gently lift (**A**) the motherboard on the left side then pull it to the left (**B**). Pay attention to not coil the docking station connection card





1. Turbine feet	2. SpO2 connector
3. Remote control connector	4. Keyboard harnesses
5. Screws	6. Insulating washer
7. Nut	8. Washer
9. Lock washer	10. Docking station connection board

- Note the serial number
- Position the new mother board in its slot
- Place the washers and the nut of the power source connecter and gently screw it (no more than 1Nm)
- Put the three screws and the two turbine feet
- Connect the new motherboard (refer to electrical wiring $10.7)
- Position the turbine board and screw it
- Position the internal pneumatic circuit

NOTE: After replacing the motherboard, update the serial numbers and counters values of all the other components.

12.17 Keyboard

- Disconnect the keyboard from the motherboard
- Remove the keyboard from the lower shell
- Note the serial number of the new keyboard
- Stick the new keyboard on the lower shell
- Connect it to the motherboard

13 Performances controls via EO-Toolkit

13.1 Materials requirement

To perform an EOVE-70 SMD final controls, use the materials in the following list or equivalent.

MATERIAL	PROVIDER	REFERENCE	SPECIFICATIONS	REQUIREMENT
Flow analyzer	IMT medical	PF300 / Citrex H4	Air BTPS mode	Necessary
EO-Testing cable if final control is performed via EO-Toolkit	EOVE	SP-TESTCBL-001	N/A	Necessary
Power Supply	Aim-TTi	EX4210R	42V / 10A	Necessary
Aplus precision test lung	GaleMed	6011	RP5	Necessary
Circuit test adulte	Intersurgical	Ref 5804000	D22mm / L=180cm	Necessary
Screwdriver T10	N/A	N/A	T10	Necessary
SpO2 sensor	Nonin	8000AA	N/A	Necessary
Xpod cable	Eove	EO-SPO2CBL	N/A	Necessary
Remote control	Eove	EO-70FSWITCH	N/A	Necessary

WARNING: This chapter details how to run an automatic test via EO-Toolkit. Nevertheless, the following list of controls is non-exhaustive. Refer to the instructions listed in the popups which appear during the test. All the tests must pass to consider the device in accordance with specifications.

13.2 Performance controls

Full performance tests must be performed after each preventive maintenance operation which requires the opening of the ventilation module, or after each repair. It should be performed at least once a year and/or according to your internal quality policy.

- Connect the EO150 ventilation module to the computer by usb
- Connect the flow analyser with the **appropriate cable** to another usb port of the computer

NOTE: EO-Toolkit is only compatible with flow analyser PF300 and Citrex H4. If not possible to use one of these flow analysers, refer to the manual process of performance controls.

NOTE: To run the automatic test, the flow analyser must be connected on the appropriate port using the dedicated cable. Refer to the spare parts & tools list to get the reference.

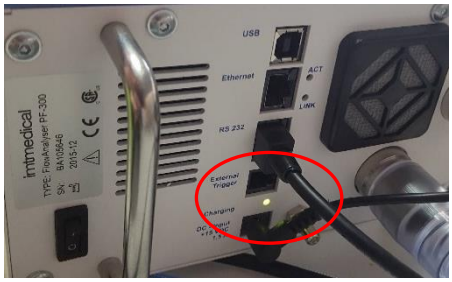
PF300

Cable ref: SP-TESTCBL-001

CITREX H4

Cable ref: SP-TESTCBL-002

NOTE: Connect the testing cable (*SP-TESTCBL-001*) to the Flow Analyser PF300 RS232 port.

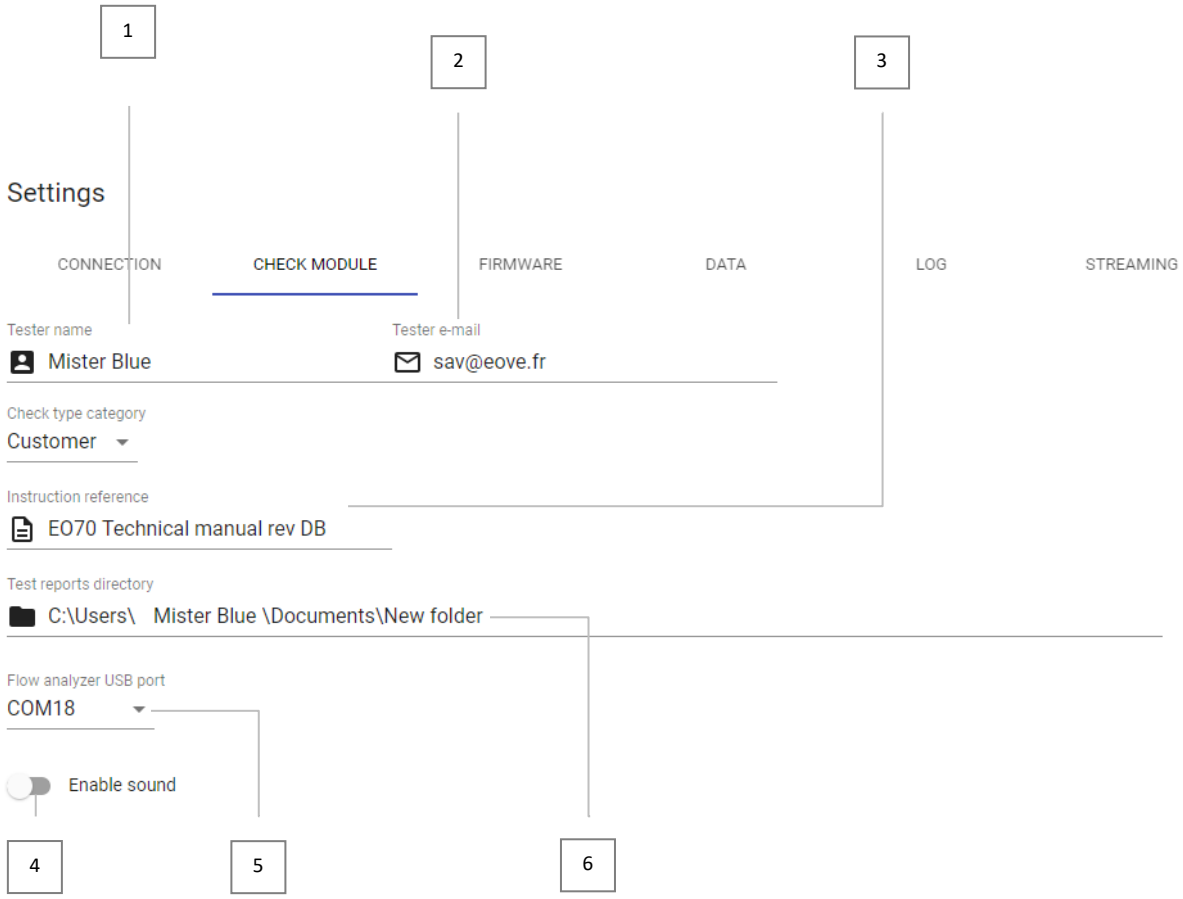


13.2.1 EO-Toolkit Configuration

NOTE: Full installation process is detailed in appendix 2.

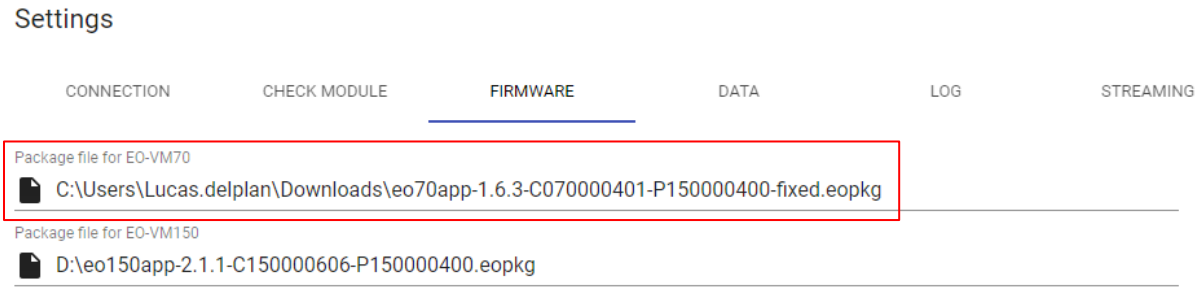
- Launch the EO Toolkit
- Click on settings

- Configurate/check the different settings before beginning a new performance control



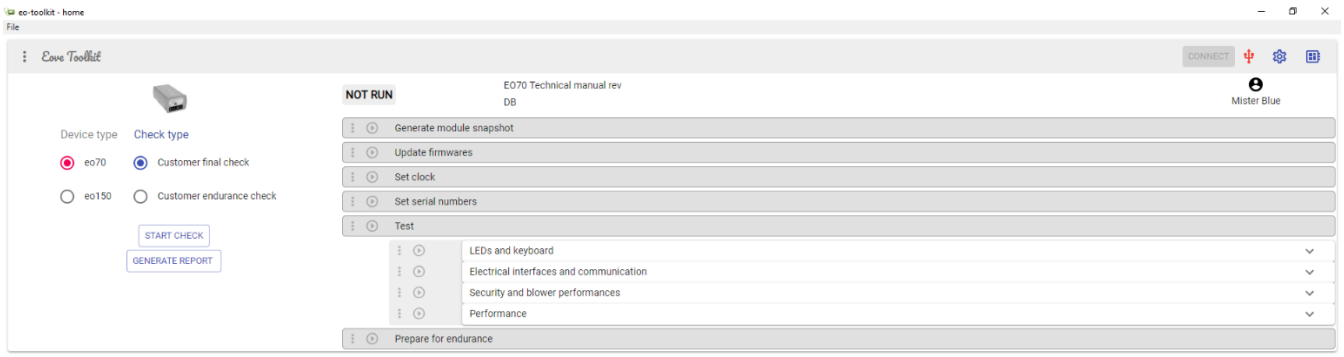
1- Technician	2- User e-mail address
3- Documentation associated	4- On/Off test sound
5- Choice of Flow Analyzer USB port (must be connected first)	6- Destination folder to save Process Value tests

- Select the software package required

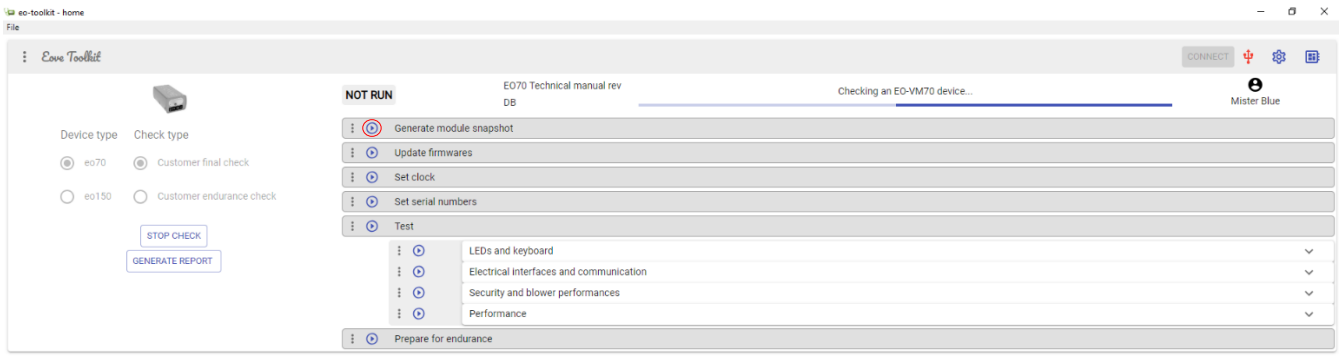


- Click on OK to save the configuration
- Select Module Check

- Choose the performance control required then click on START CHECK



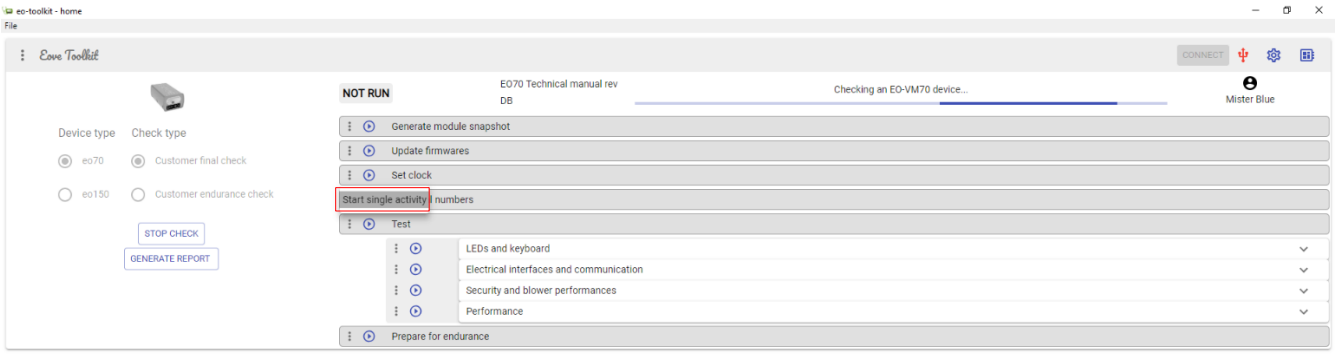
- Select the test and click on start



NOTE: If the full performance controls is required, start from the first test “generate module snapshot”.

If only ventilation performance controls are expected, start the test from “Security and Blower performances”.

It is possible to play a unique test by clicking on Start Single Activity



WARNING: After a maintenance operation, full performance controls are necessary.

13.2.2 Generate a snapshot

The first test permits to generate an events log file and a snapshot of device condition including software versions, components S/N and counters.

Name	Date modified	Type	Size
EO0700718026_logs_2020-06-08-11-16-04.xlsx	6/8/2020 11:16 AM	Feuille de calcul M...	169 KB
EO0700718026_snapshot_2020-06-08-11-16-04.json	6/8/2020 11:16 AM	JSON File	3 KB

EO0700718026_snapshot_2020-06-08-11-16-04.json - Notepad

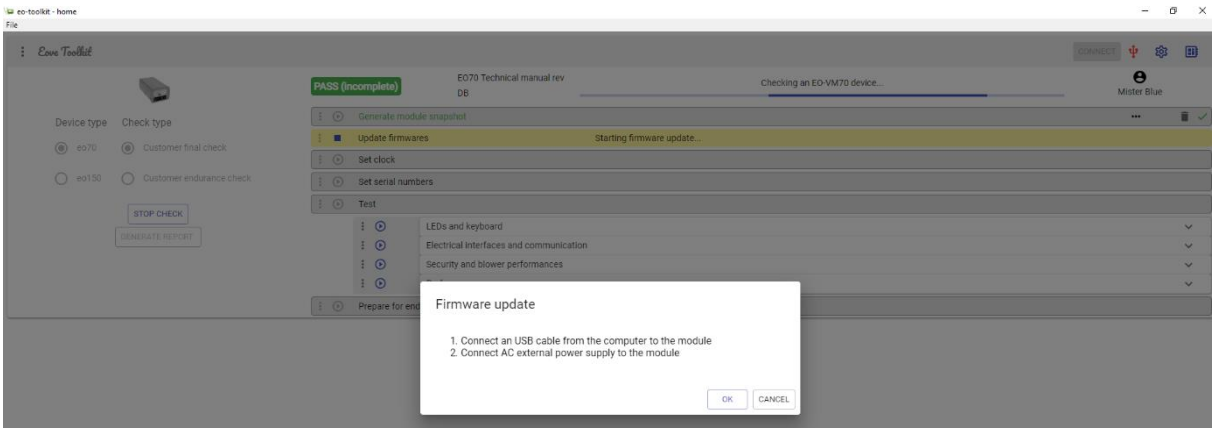
File Edit Format View Help


```
{
    "identification": {
        "deviceType": "EO-VM70",
        "apiVersion": "36",
        "apiMinorVersion": "00"
    },
    "serial": "EO0700718026",
    "serials": {
        "ventilationModule": "EO0700718026",
        "blowerBoard": "0000FB025214",
        "blower": "000018022036",
        "valveA": "00000000017X",
        "valveB": "00000000017X",
        "pneumaticBlock": "000021-13/18",
        "battery": "00109/231801",
        "cpuSoftwareVersion": "C070000401",
        "powerSoftwareVersion": "P150000400",
        "commApiVersion": "36",
        "motherBoard": "00FB025214",
        "pump": "0018040062",
        "flowSensor": "0018190137",
        "keyboard": "127-217463",
        "mac": "00043e9bbfd5",
        "gaugeVersion": "5"
    },
    "counters": {
        "patient": {
            "value": 1.3108333333333333,
            "position": 109,
            "unit": "UNIT_HOUR"
        },
        "machine": {
            "value": 1.2830555555555556,
            "position": 108,
            "unit": "UNIT_HOUR"
        },
        "batteryAgeing": {
            "value": 100,
            "position": 102,
            "unit": "UNIT_PERCENT"
```

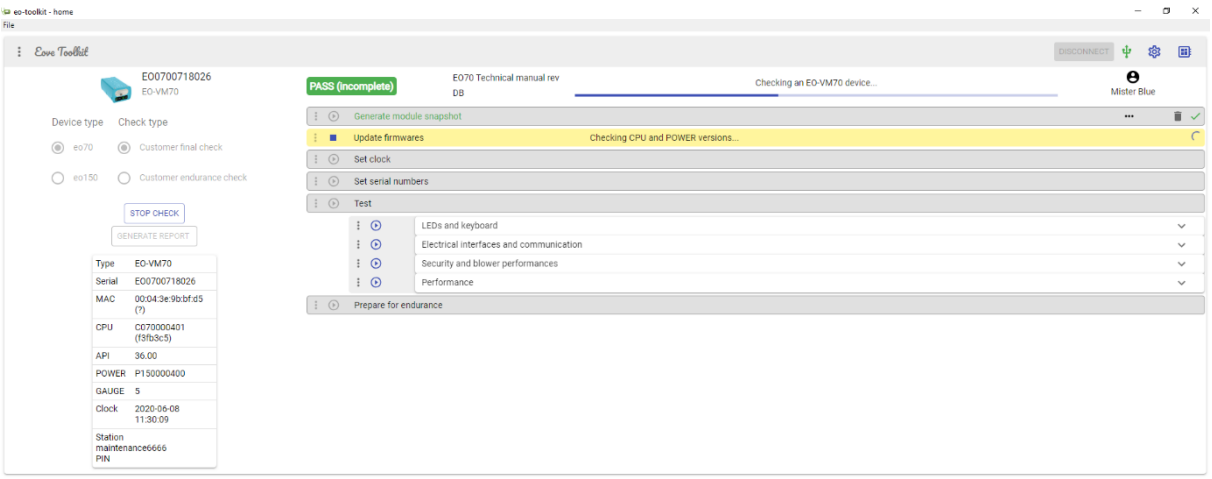

This test can be played alone when the device is returned for servicing and a save is necessary before performing any operation.

13.2.3 Update software versions

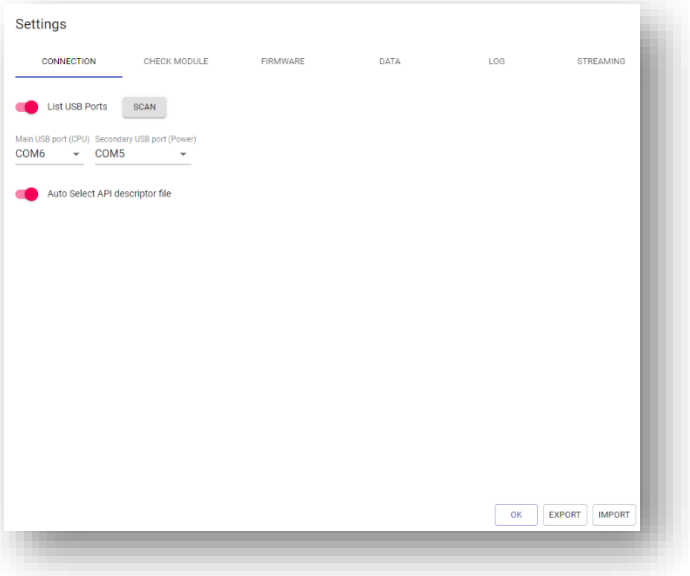
- Connect the module to the external power source
- Follow the various information which appear in the pop-up



NOTE: During performance controls, software update operates by package. If that test is run, both VM software will be updated, the PIC and the CPU.



NOTE: If the update fails, check the usb ports in settings, restart the EO150 VM and try the test again.



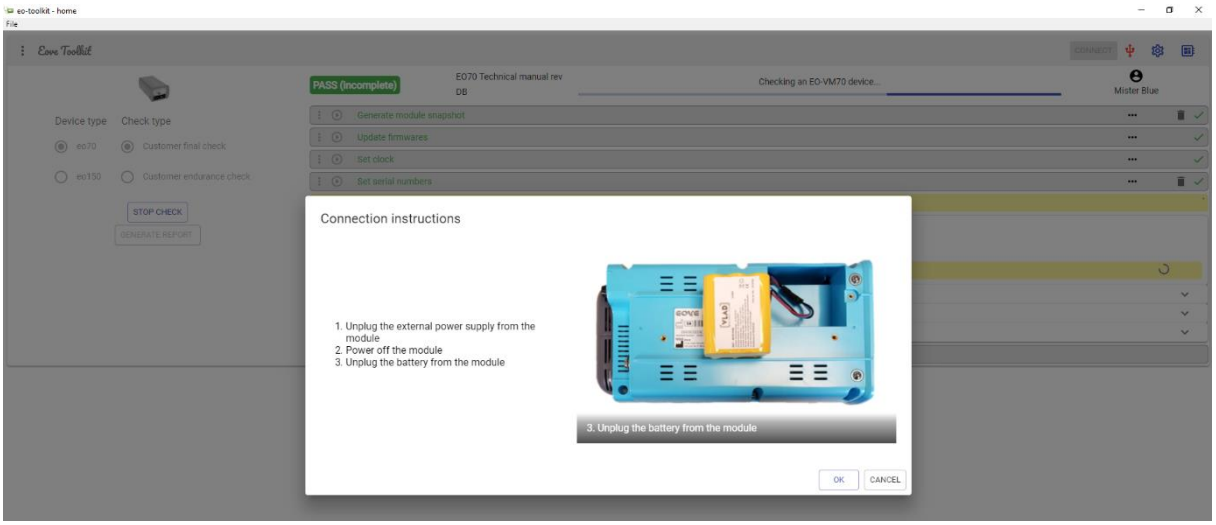
WARNING: Use 2 consecutive USB serial COM ports lower than 10.

13.2.4 Test of the LEDs and the keyboard

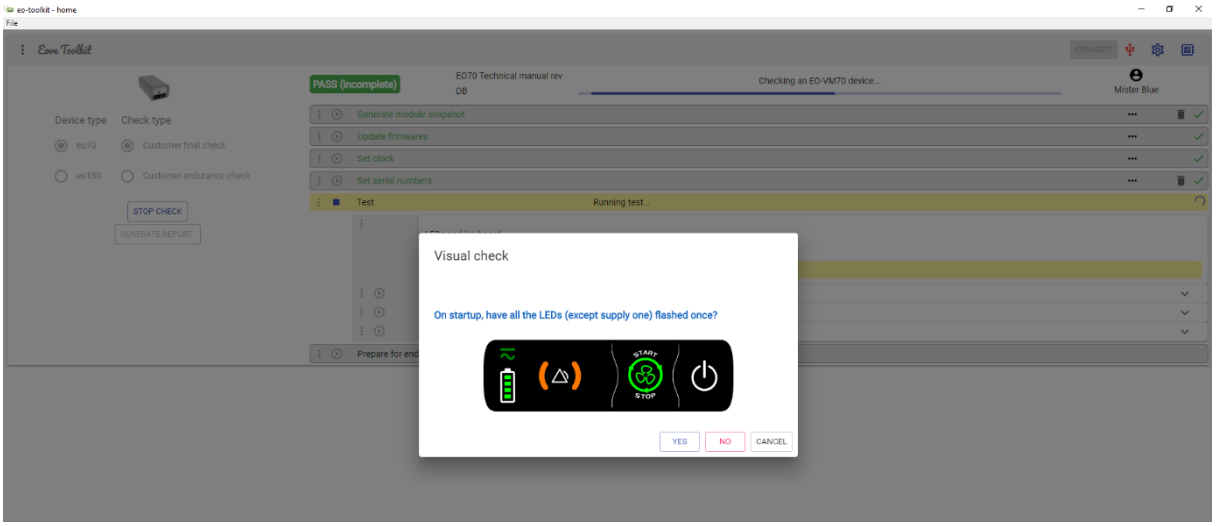
Main purpose of this test is to control that the keyboard operates properly.

Every time an action is required by the technician, a popup appears and details the operations to perform in the proper order.

Follow the instructions step by step. If a test fails, stop the ventilation, restart the EO70 SMD and try the test again.



Popups with instructions in blue expect the operator to check something; LED, buzzer, etc..



13.2.5 Electrical interfaces and communication

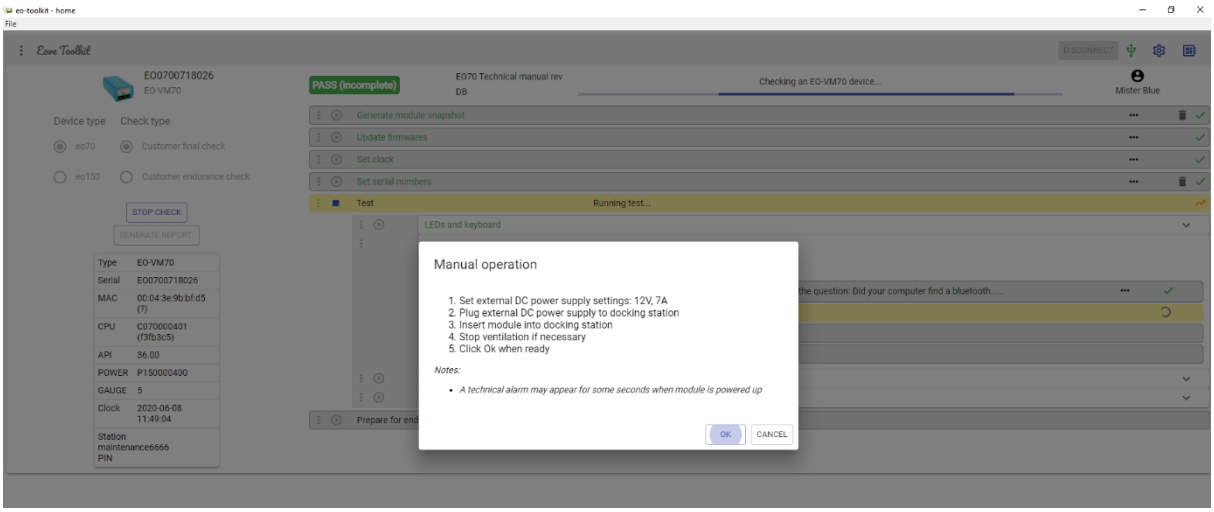
This test permits to check that the ventilation module is operating correctly on the different power modes:

- AC from the external power source
- Battery mode
- DC power from the external battery
- When the module is inserted in the EO-Display

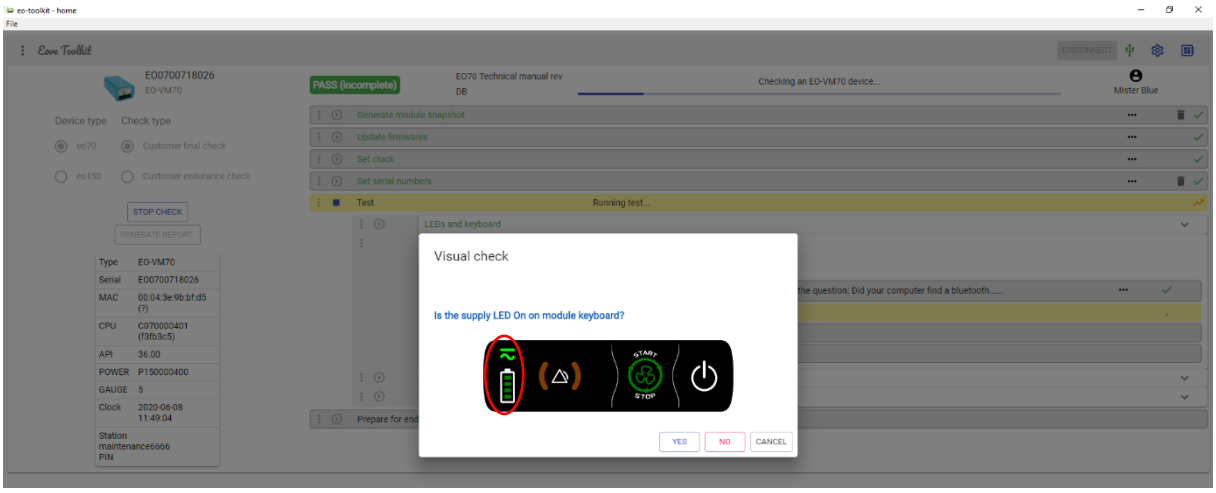
Operation on 12VDC external power source

During this test, the external power supply can be replaced by an external battery EO-BATPCK

OR

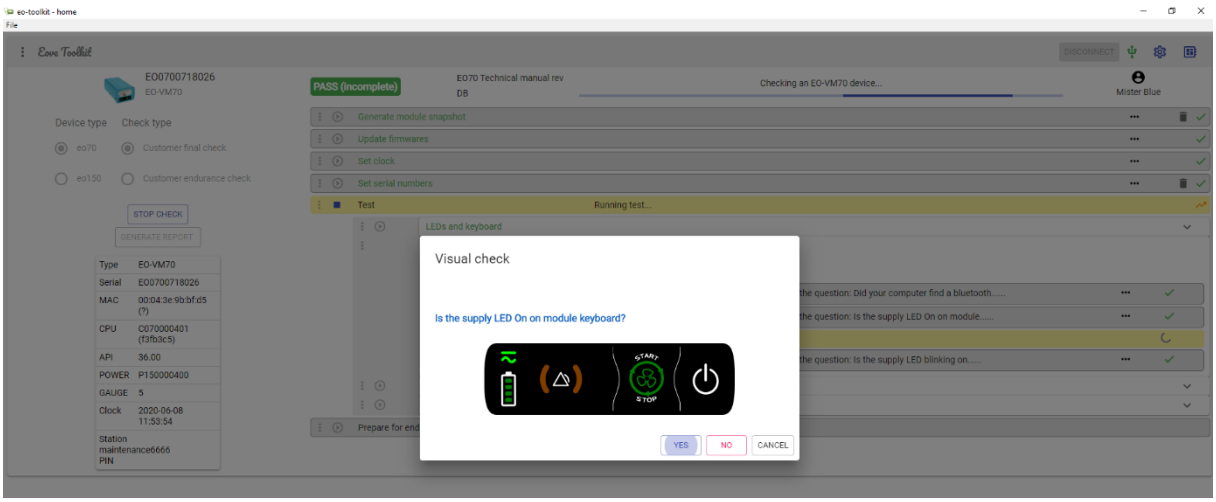


- Check the device is operating on DC power mode



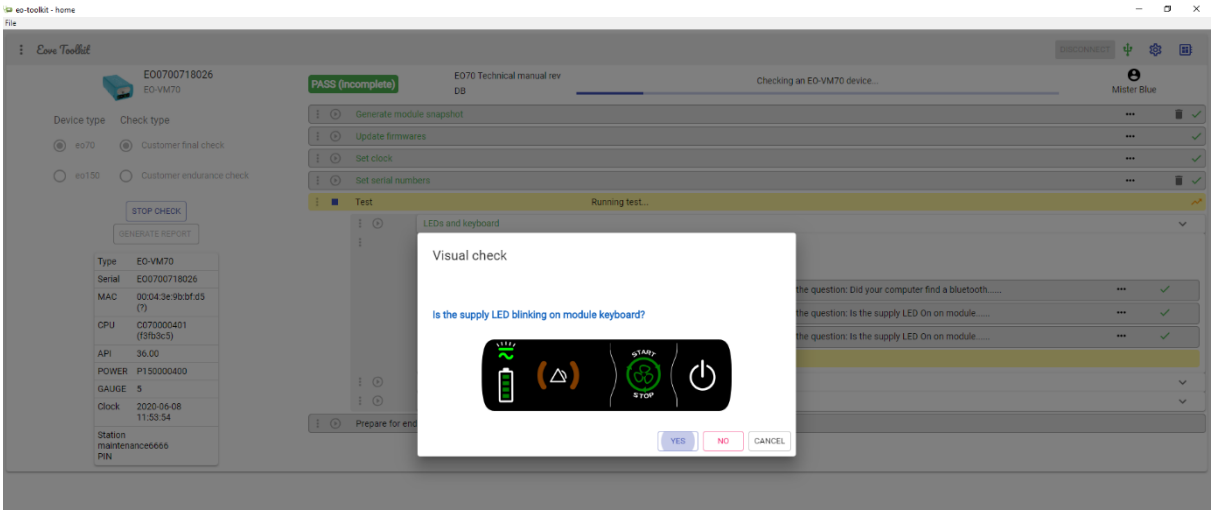
Operation on AC power source

- Control the device is charging its internal battery while inserted in the EO-Display



Operation on internal battery

- Disconnect the external power source from the EO-Display and check that the device is operating correctly on this power mode

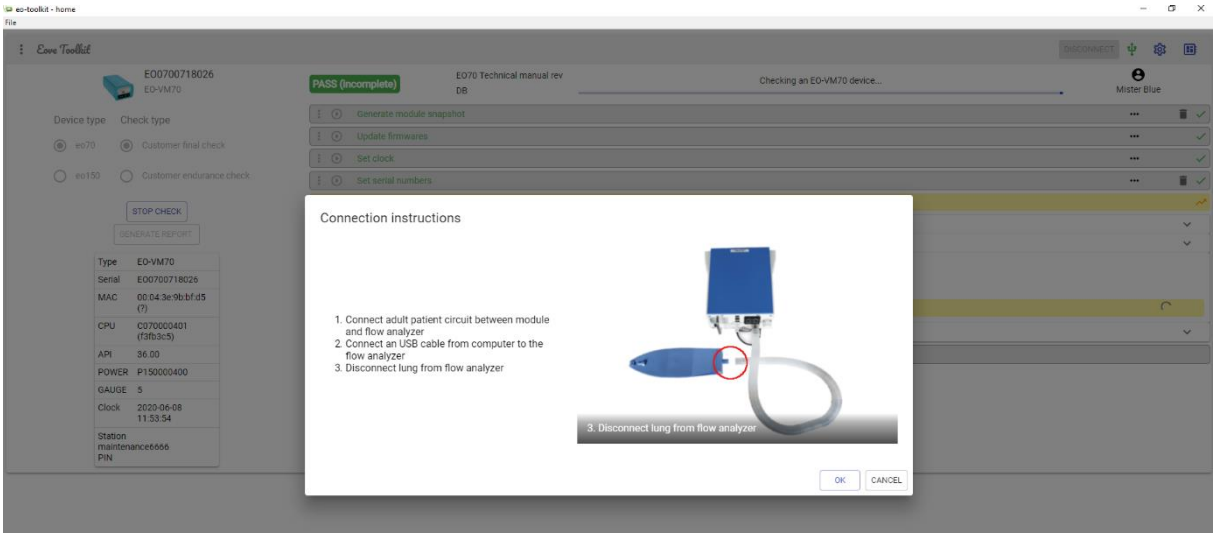


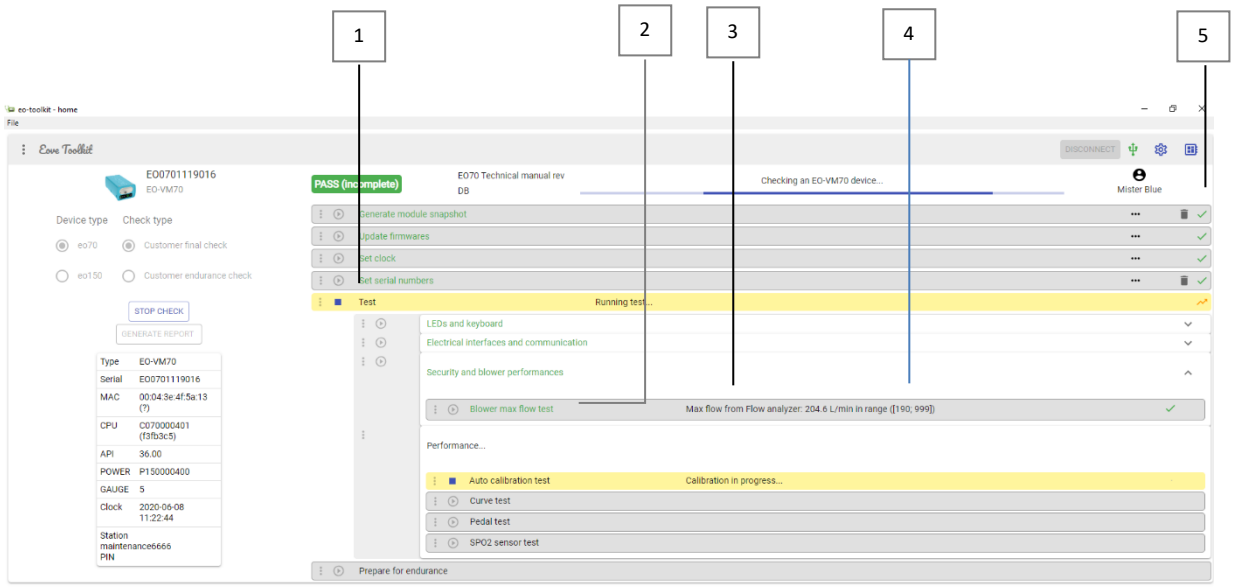
13.2.6 Performance and turbine tests

- Connect a short adult circuit (60cm) between the EO70 SMD and the flow analyser

- Connect a 1L adult test lung to the outlet of the flow analyser

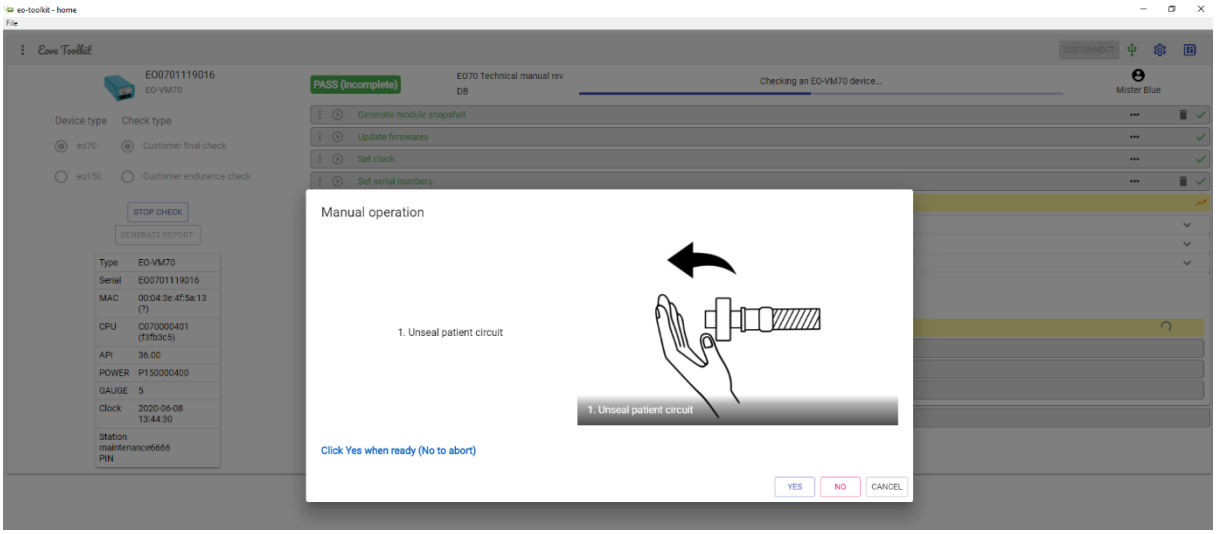
- Follow the instructions which appear on the popup to check turbine performances





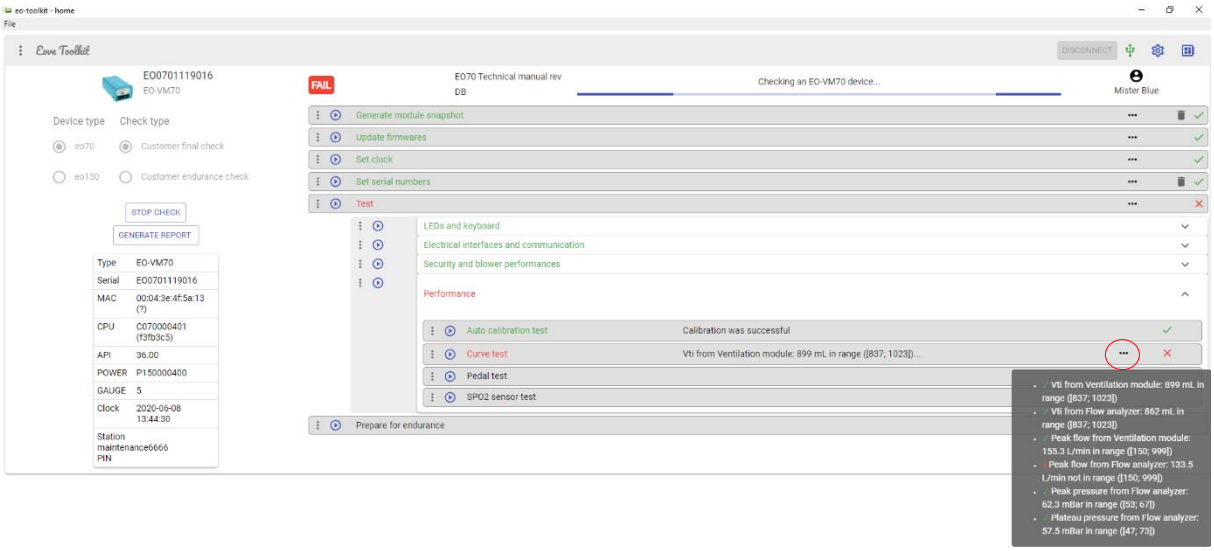
1- Test suite	2- Unit test
3- Measure	4- Range
5- Test result	

- Calibrate step by step according to EO-Toolkit popup

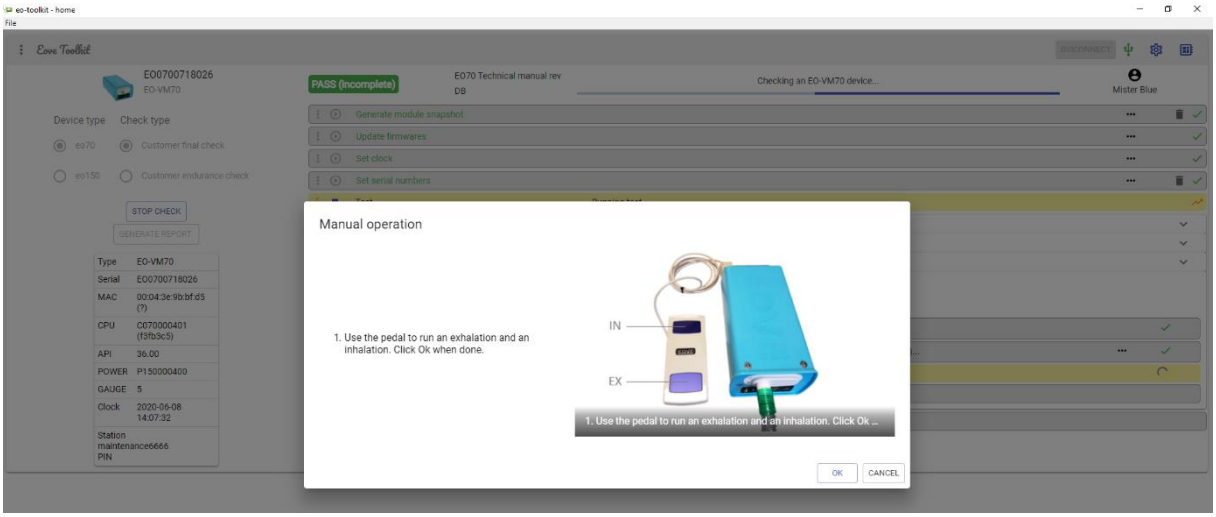


- Continue the test step by step following the operations expected by EO-Toolkit

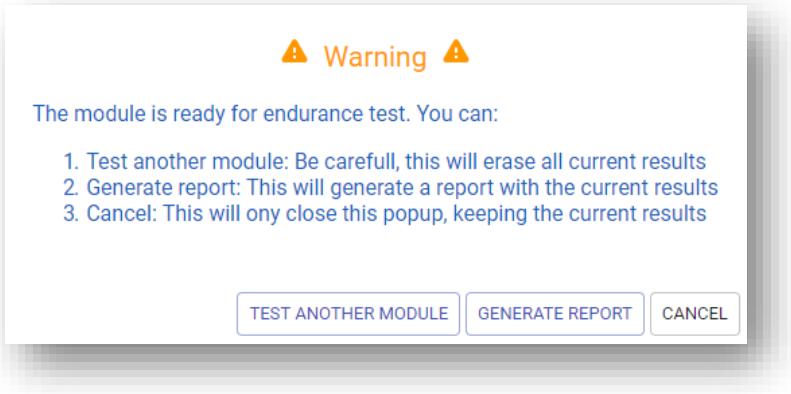
NOTE: In case of failure, if additional information about a test result are necessary, click on ••• to display the measures



- Connect the accessories (footswitch remote control, SpO2 sensor) as required



At the end of the test, a Process Value report is generated, and the device is set into endurance configuration.



NOTE: A report can be generated anytime during the test

EOVE

Customer final check

FAB102-037 Revision E

Serial: EO0700718026
MAC: 00:04:3e:9b:bf:d5
Type: EO-VM70
API: 36.00
Firmwares:
- CPU: C070000401 (hash: f3fb3c5)
- POWER: P150000400
- GAUGE: 5

Configuration:
- Q Exhal Sensor:

Hardware:
- cpu: EO70_00251
- bluetooth: ?

External:
- AC:

PASS

Instruction reference: EO70 Technical manual rev DB
Eove Toolkit:
- Version: 2.7.0-dev.0 (4bb5d573)
- Operating System: win32

Analyzer:
- Serial number: BB104072
- Hardware: 10
- Firmware: 4.9.0

Flasher:
- Version: 1.7.8

Observations:

Operator name: Mister Blue
Date: 2020-06-08 14:46:10
Visa:

[ACT-120] **Generate module snapshot (optional)** PASS
Generated files: C:\Users\Lucas.delplan\Documents\Final Control\EO0701119016_logs_2020-06-08-13-43-53.xlsx, C:\Users\Lucas.delplan\Documents\Final Control\EO0701119016_snapshot_2020-06-08-13-43-53.json

[ACT-010] **Update firmwares** PASS
CPU and POWER firmwares up to date (CPU: C070000401, POWER: P150000400)

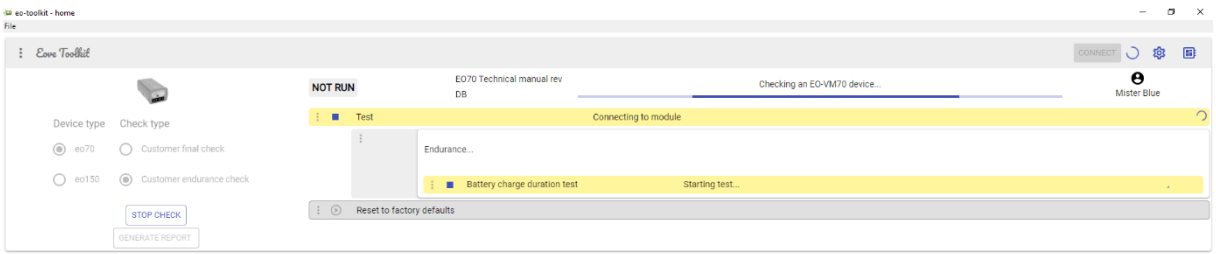
[ACT-020] **Set clock** PASS
Clock set to Mon Jun 08 2020 15:44:24 GMT+0200 (Central European Summer Time)

[ACT-030] **Set serial numbers (optional)** PASS
Previous serial numbers: Battery: 00043-311901, Blower: 000A18302039, Blower Board: 000I0731819, Flow Sensor: 0019330174, Keyboard: 000242448, Mother Board: 00I0680819, Pneumatic Block: 000099-03/19, Pump: 0019070111, Valve A: 00000000050X, Valve B: 00000000050X, Ventilation Module: EO0701119016 ==> Current serial numbers: Battery: 00043-311901, Blower: 000A18302039, Blower Board: 000I0731819, Flow Sensor: 0019330174, Keyboard: 000242448, Mother Board: 00I0680819, Pneumatic Block: 000099-03/19, Pump: 0019070111, Valve A: 00000000050X, Valve B: 00000000050X, Ventilation Module: EO0701119016

13.2.7 Battery charge control

- Connect the module to AC power and check that the charge is in progress on the battery indicator (keyboard 

- Connect the EO70 SMD to EO-Toolkit to verify that the charge is complete before 8 hours.



At the end of data analysis, EO-Toolkit generates a second report with the results of the endurance test.

14 Manual performance controls

14.1 Inspection sheet

After each maintenance operation, we recommend performing a final control of the EOVE-70 SMD. Refer to the following procedure and fill the inspection sheet below after each operation (full size available in annex 3).

EOVE New Medical Inspiration	INSPECTION SHEET EOVE-070	SAV100-12 REV A
Serial number:	Software CPU: Software PIC:	Customer: Intervention:

DOCUMENTS/APPEARANCE	Result	Comments
Verification of work sheet		
General appearance inspection: filet, cover, shell, fastenings		
Labels: power source, USB, SpO2, remote control, SN		

OP1: SOFTWARES CONTROLS	Result	Comments
PIC software version		
CPU software version		
Interface software version		

OP2: LEDs & KEYBOARD (battery disconnected)	Result	Comments
OP2-1: 28VDC/4A: Lighting control of the LEDs power source and the red battery LED		
OP2-1: Control of the button ON/OFF & control of the alarm LED, ventilation LED		
OP2-2: Connect the battery		

OP3: ELECTRICAL INTERFACES & COMMUNICATION WITH DOCKING STATION	Result	Comments
OP3-1: 12VDC/7A: Functionning on external power source (into the docking station) & lighting indicator		
OP3-2: EOVE Power supply: Functionning on AC power source (outside the docking station) & lighting indicator		
OP3-3: Functionning on internal battery (into the docking station) & lighting indicator		
OP3-3: Switching from battery mode to AC power mode		
OP3-3: Communication with docking station (bluetooth)		

OP4: PERORMANCE CONTROLS		Result	Comments
Automatic mode	OP4.1: Peak Flow (monitored on interface) 140 l/min ±10%		
	OP4.1: Tidal volume (monitored on interface): 880ml ±10%		
	OP4.1: SpO2 (monitored on interface): 95% ±5%		
	OP4.1: P.peak (monitored on Flow analyser): 60mbar ±2mbar		
	OP4.1: Pplateau (monitored on Flow analyser): 55mbar ±2mbar		
	OP4.1: PF Exp. (monitored on Flow analyser) Peak Flow Exp: 140l/min ±10%		
	OP4.1: Vti: 880 mL ±10%		
	OP4.2: Trigger control		
	OP4.3: Remote control operation		
	OP4.4: Turbine performance controls: Flow 200 L/min ±10%		

OP5: BATTERY CHARGE CONTROL	Result	Comments
OP5-1: Control that the battery is fully charged < 8h		

OP6: DOCKING STATION	Result	Comments
Setting of clock / date / language		
General appearance inspection: shell, display screen		
Labels: power source, serial number		
Check the interface software version		
Pair with module		

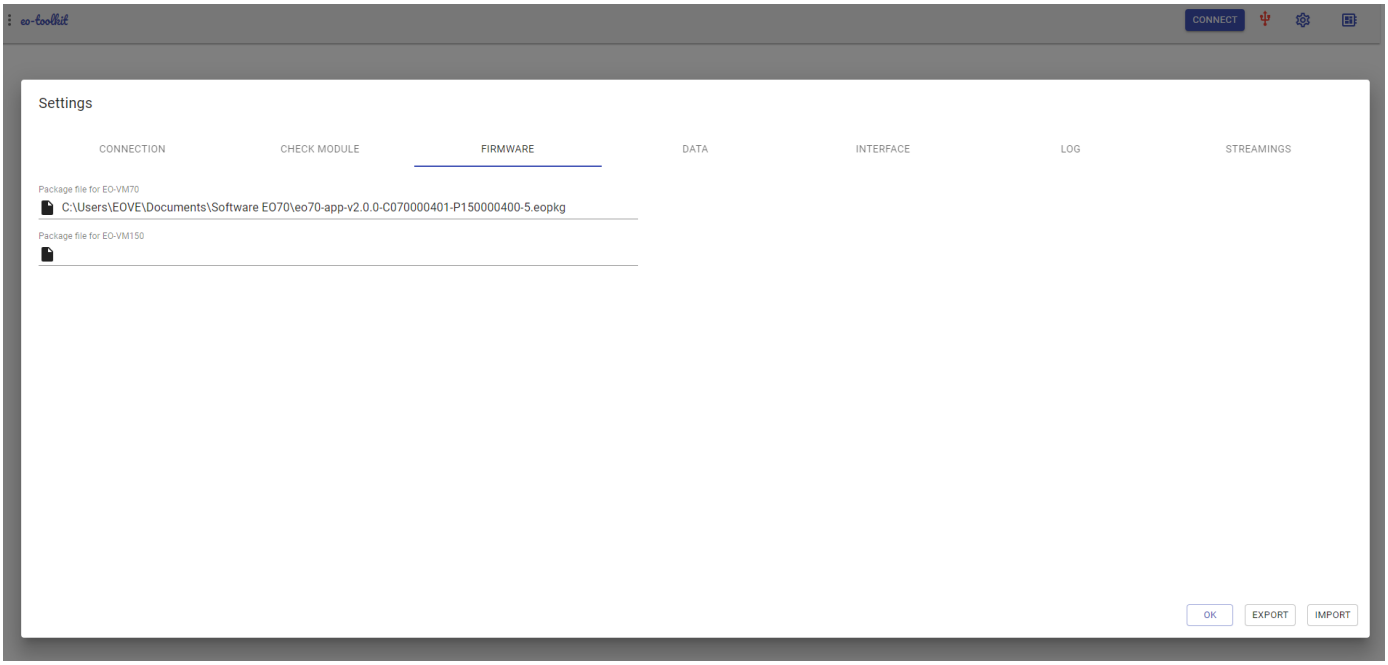
14.2 OP1: Software controls

Procedure from TOOLKIT

-
- Launch EO-Toolkit software
- Connect the EOVE-70 module to AC power
- Connect the EOVE-70 module to the computer by usb

- Click on Settings

- Go on "Firmwares" tab



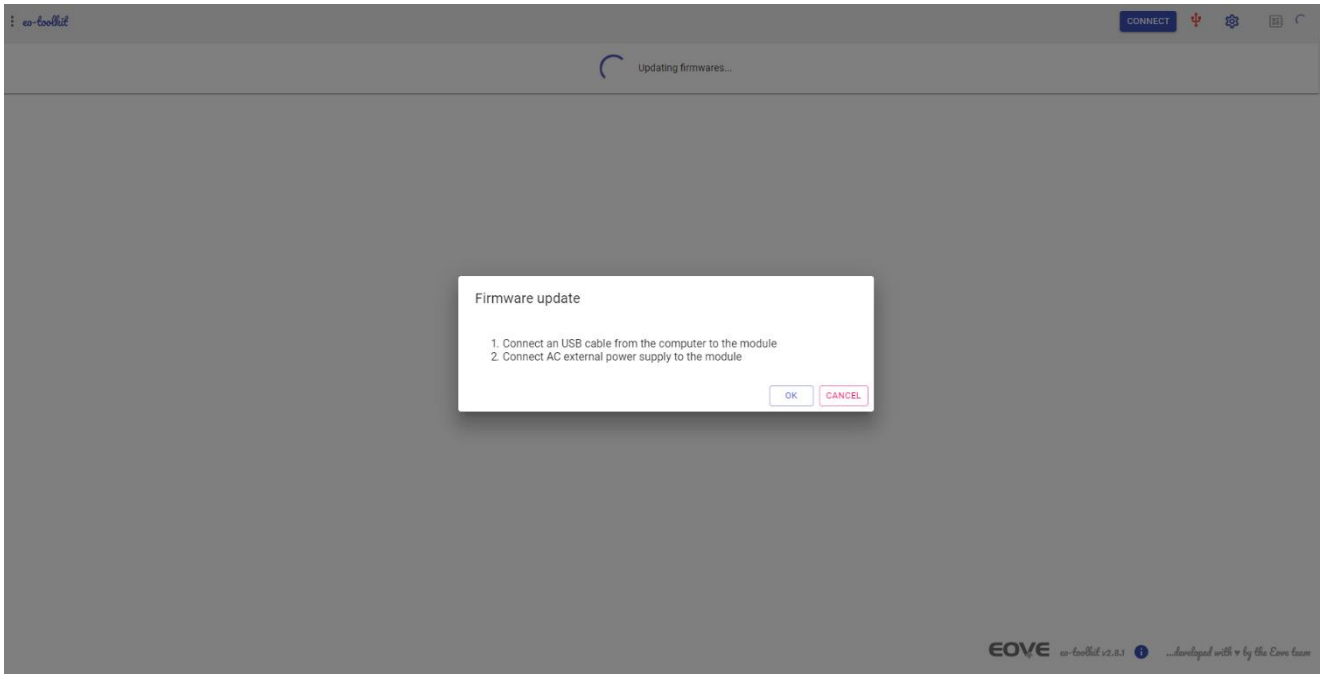
- Select the software package required for the update.

NOTE: The package files include the ventilator software (CPU) and power software (PIC

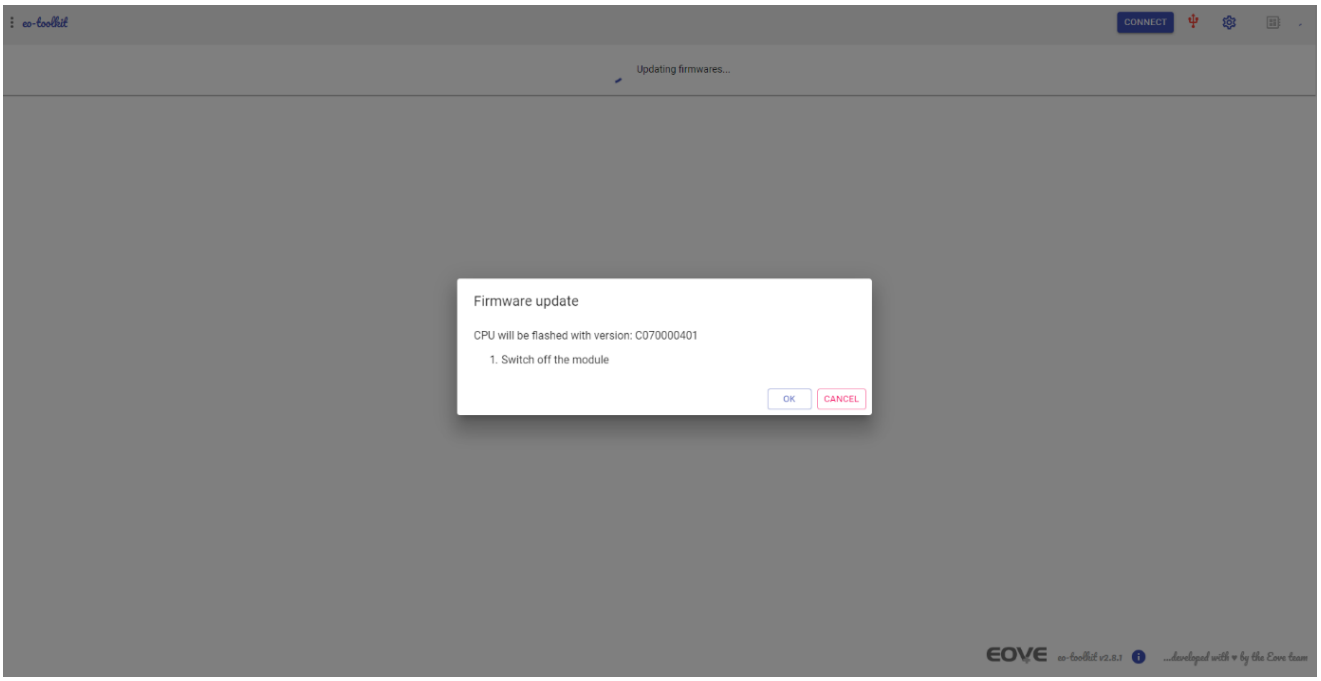
- To update CPU and PIC, click on “Update firmwares”

- Connect the module to the computer by usb

- Connect the AC power to the ventilation module



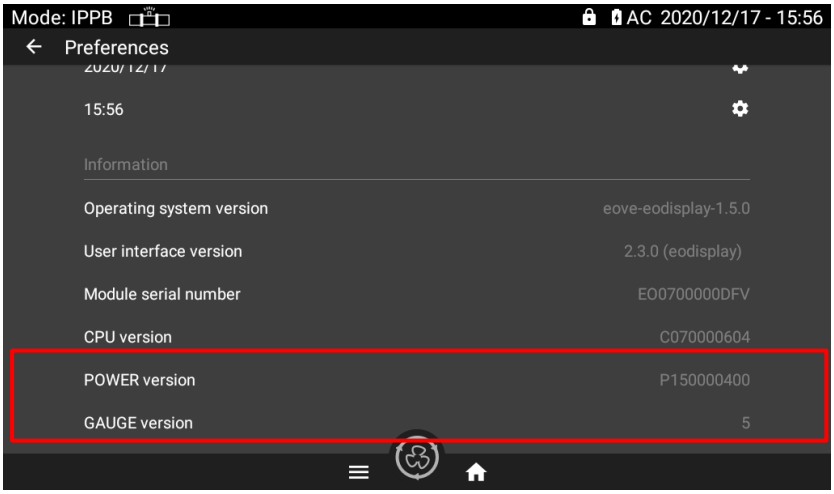
- Switch off the device then click on OK



Checking

Once the update performed:

- Insert the EOVE-70 module into the EO-Display housing unit
- Go to Information tab of Maintenance menu or go to Preferences menu to check that the software versions are updated and displayed properly.



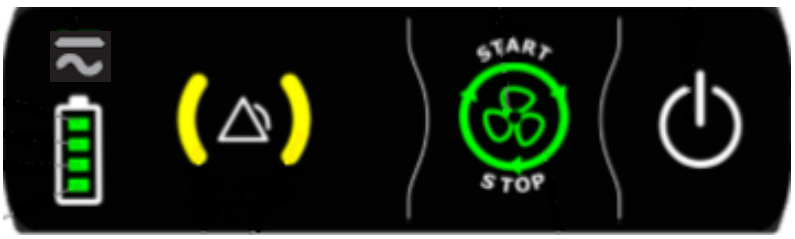
14.3 OP2: Control of keyboard LEDs and buttons

- Module switched off, the keyboard must appear like the image below

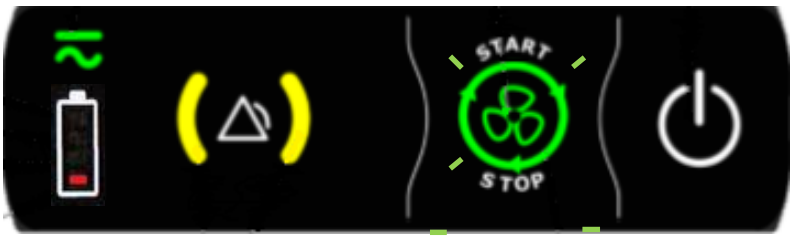
Keyboard turned off

14.3.1 OP2-1: Turn on and configurate external DC power on 28V - 4A.

- Disconnect the internal battery
- Connect DC power to the module and check that all the keyboard LEDs switch on but not AC indicator, blink once when the module starts



- Then control that AC indicator switch on and battery charge indicator increments
- Check that after 20 seconds, the battery red LED and the alarm indicator are switched on and the ventilation LED blinks



14.3.2 OP2-2: Press the ventilation button on the keyboard

- This LED stops blinking and stays on and the ventilation starts 

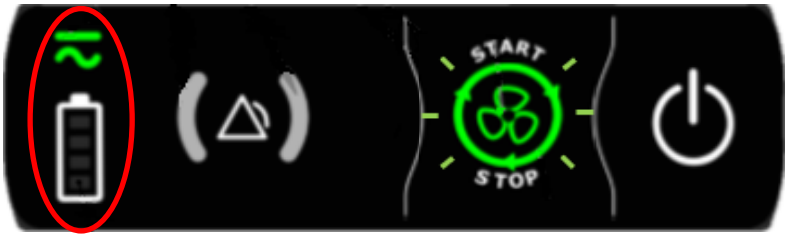
- Press the button  en a beep sounds, and ventilation stops
- Connect the battery

14.4 OP3: Control of electrical interfaces and communication with docking station

14.4.1 OP3-1: Operation on 12VDC power

- Switch on external DC power and set it on 12V - 7A.
- Connect the external DC power to the docking station then insert the module inside

- Control module operation by checking the following LEDs



- Start the ventilation to control module operation on this power source
- Stop the ventilation

14.4.2 OP3-2 : Operation on AC power

- Connect AC power on the docking station

NOTE: We recommend using the AC charger provided with the EOVE-70 SMD to control it at the same time.

- Control module operation by checking the following LEDs

- Start the ventilation to control module operation on this power source
- Stop the ventilation

14.4.3 OP3-3 : Operation on internal battery

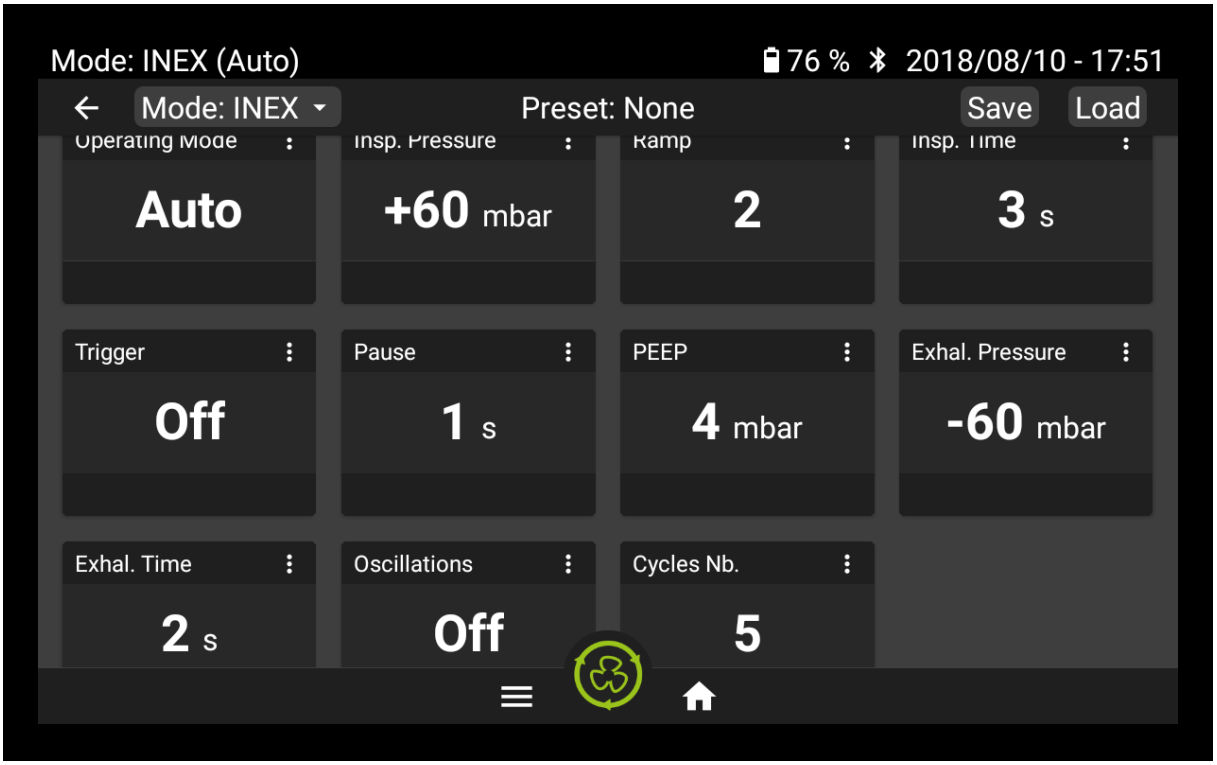
- Disconnect AC power source from the docking station
- Control module operation by checking the following LEDs

- Start the ventilation to control module operation on this power source
- Stop the ventilation
- Connect AC power on docking station and check that the module switches properly on AC mode
- Pair the docking station with the module and check the connectivity
- Set date and time
- Remove the module from the docking station

OP4: Performance controls

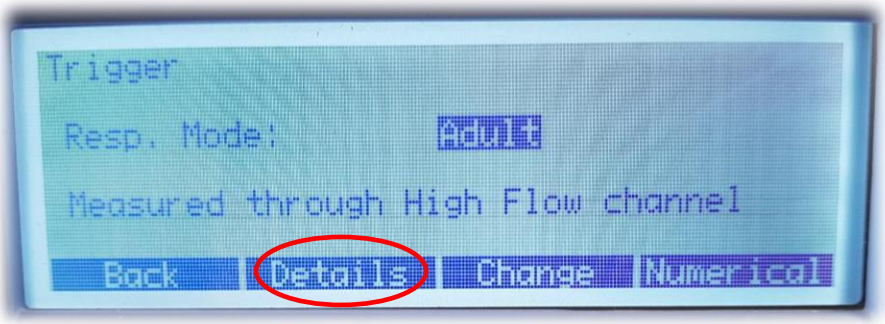
14.4.4 OP4-1: Set point ± 60 mbar in automatic mode

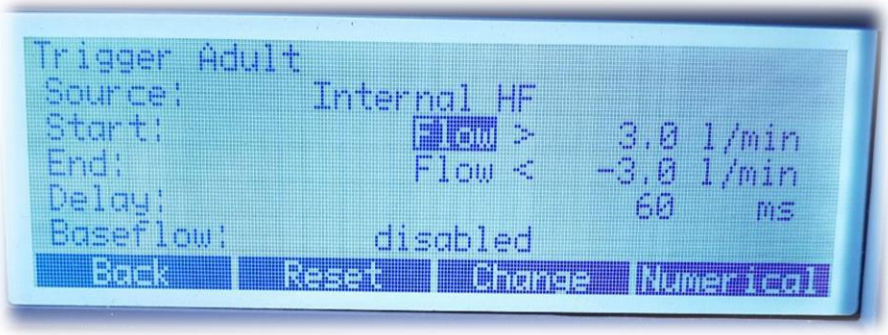
- Set the following configuration
  - **Mode: INEX**
  - **Operating Mode: Auto**
  - **Insp. Pressure: + 60 mbar**
  - **Ramp: 2**
  - **Insp. Time: 3 s**
  - **Trigger: Off**
  - **Pause: 1 s**
  - **PEEP: 4 mbar**
  - **Exhal. Pressure: - 60 mbar**
  - **Exhal. Time: 2 s**
  - **Oscillation On: Off**
  - **Cycles Nb. : 5**

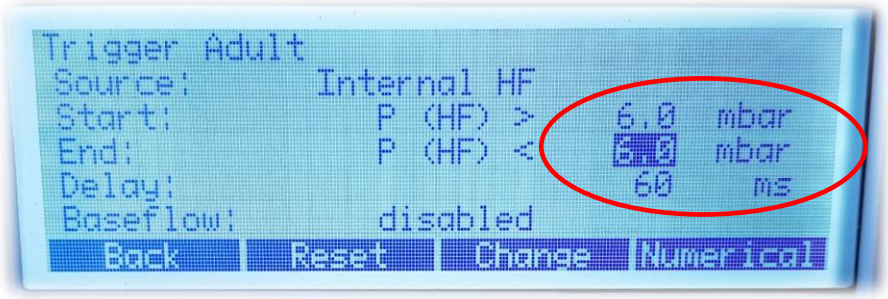


- Connect a short single limb (60cm) circuit between EOVE-70 module and the flow analyzer
- Connect the back of the flow analyzer to an adult test lung
- Connect a SpO2 sensor to the dedicated connector of the module and activate the function on the interface

- Set the following configuration on the flow analyzer:
    - Go in **Menu** then **Trigger**
    - In **Details**, set the following parameters







- Start the ventilation from the interface
- From the third cycle of operating, read the following measures on the interface
    - **Peak Flow**
    - **Tidal Volume**
    - **SpO2**
- Read the following measures on the flow analyzer
    - Ppeak
    - Pplateau
    - PF Exp (Peak Flow Exp)
    - Vti

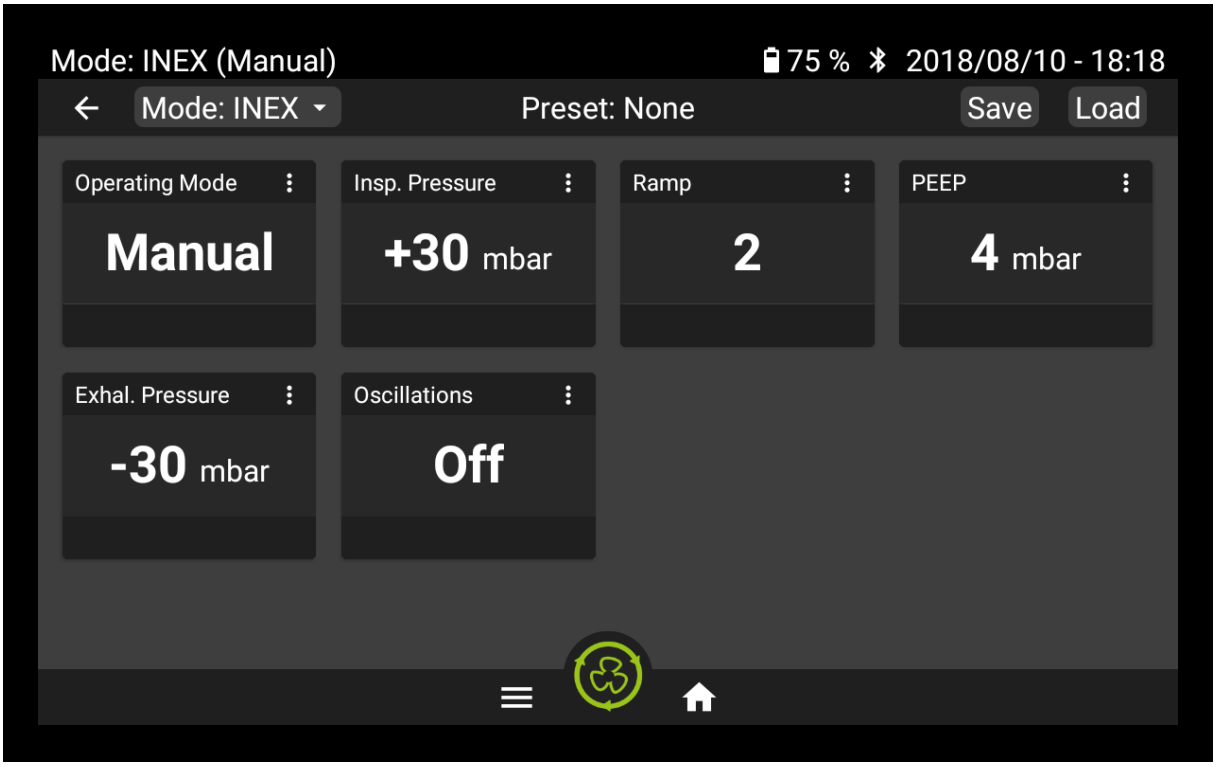
14.4.5 OP4-2: Inspiratory trigger control

- Be sure that during previous operations there wasn't any inspiratory auto-trigger
- Stop the ventilation

14.4.6 OP4-3: Set point ± 60 mbar in manual mode

- Set the following configuration

  - **Mode: INEX**
  - **Operating Mode: Manual**
  - **Insp. Pressure: + 30 mbar**
  - **Ramp: 2**
  - **PEEP: 4 mbar**
  - **Exhal. Pressure: - 30 mbar**
  - **Oscillation On: Off**



- Connect the remote-control pedal or equivalent at the back of the module on the dedicated connector

- Disconnect the SpO2 sensor

- Start ventilation from the interface
- Switch the manual remote control from a side to another and check the correct operation of the module respiratory phases

14.5 OP4-4: Turbine performance controls

- Disconnect the patient circuit connected at the rear of the flow analyzer
- Switch the manual remote control to a side
- Read the flow measure on PF300
- Stop the ventilation and switch the treatment into automatic mode

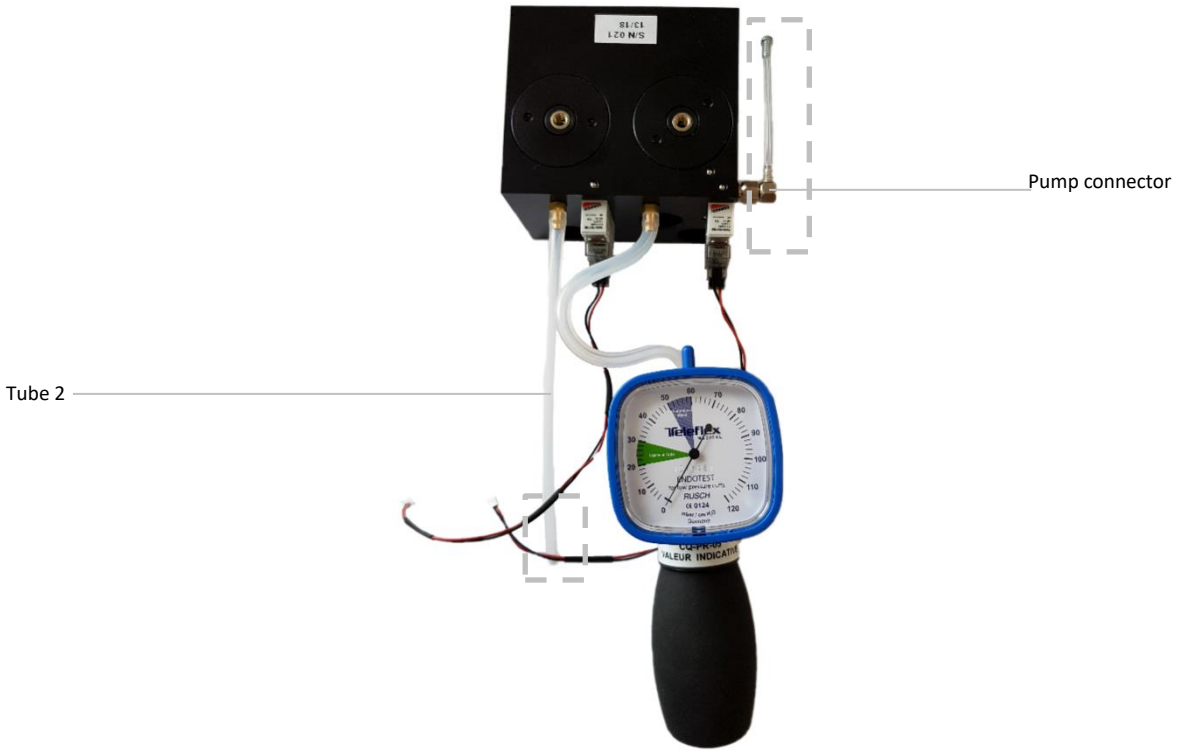
14.6 OP5: Battery charge control

- OP5-1: Connect the module to AC power and check that the charge is in progress on the battery indicator (keyboard 
- Control that the charge is complete before 8 hours.

15 Test of the pneumatic block

15.1 Pneumatic sealing control

- Plug the pump connector and the tube 2

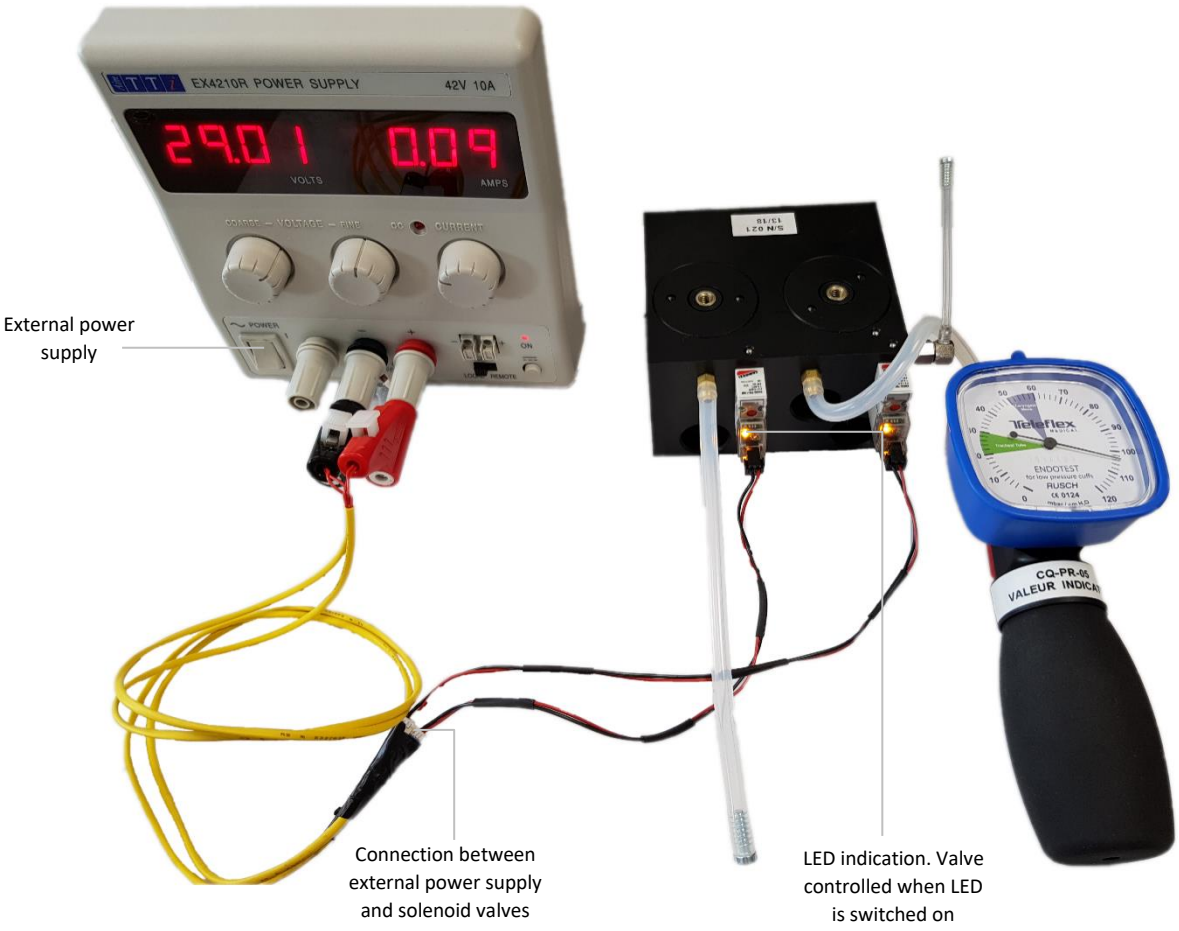


- Press the red button of the solenoid valve A with a screwdriver or something similar and apply a 100mbar pressure from a pressure gauge on the tube 1

- Check that the pressure doesn’t drop down
- Perform the same test on the solenoid valve B

15.2 Solenoid valves electrical operation

- Connect an external power source (29Vdc/0,5A) on each connector of the solenoid valves



- Release the power and check that the solenoid valves are closed, and their LED switched on
- Check the solenoid valve controlled is closed by applying a 100mbar pressure like during the previous test.

16 Test of rear valves block

16.1 Pneumatic sealing of the rear valves block subassembly

- Apply a pressure of 100mbar on each valve cap thanks to a pressure gauge

- Check that the pressure remains steady during at least 5 seconds
- Increase the pressure by pressing on the gauge 4 or 5 times and verify that the cap stays on position

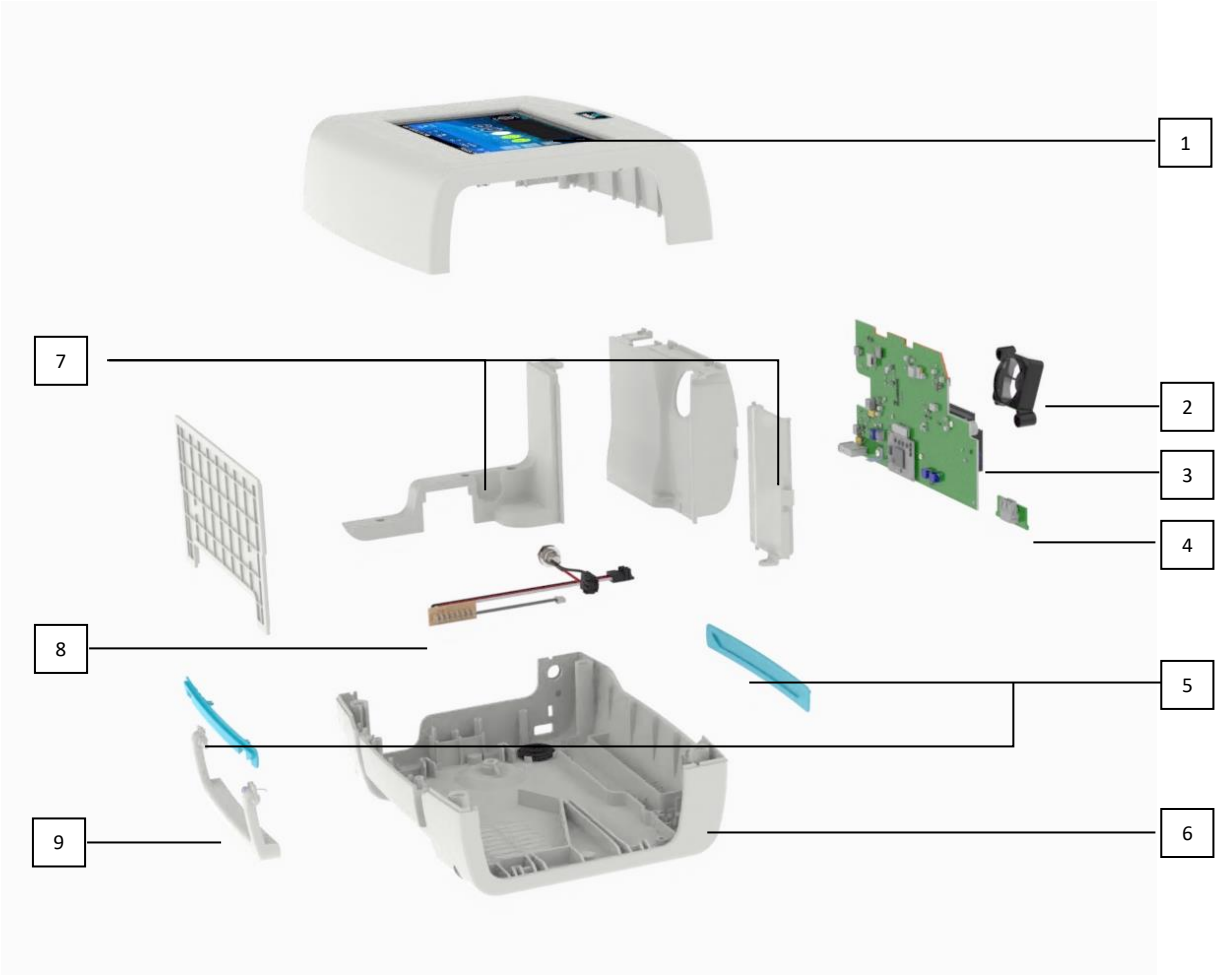
17 EO-Display housing unit: replacement procedures

17.1 Opening and closing the EO-Display housing unit

Maintenance operations on the housing unit require opening the device. Be sure to strictly observe the opening and closing instructions of the various components by referring to the following instructions.

WARNING: Any operation that requires opening the docking station must be performed by a qualified technician.

17.1.1 Docking station structure



EO-Display Housing unit architecture

1. Upper shell & display screen	6. Lower shell
2. Cooling fan	7. Covers
3. EO-Display CPU board	8. Connection board & DC plug cable
4. USB board	9. Handle
5. Insert	

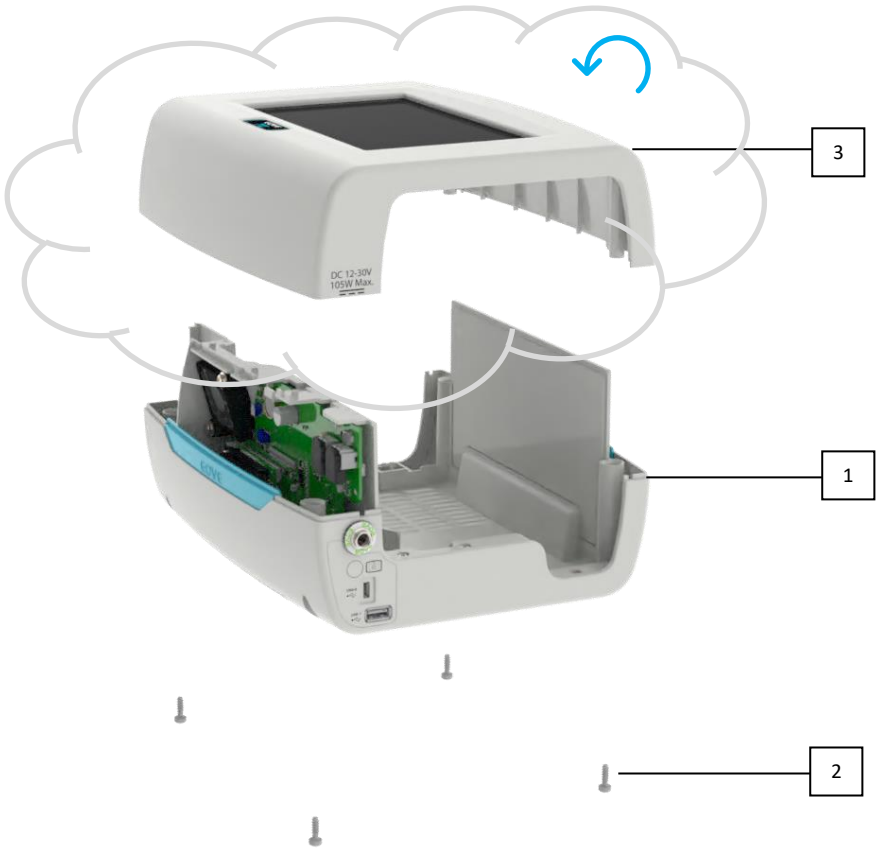
17.1.2 EO-Display Opening

Be sure to strictly observe the opening and closing recommendations of the various components by referring to the following instructions.

WARNING: Any operation that requires opening the EO-Display should be performed by a qualified technician.

- Remove the module from the EO-Display housing unit.
- Turn over the unit (lower shell (1) to the top) and remove the four screws (2).
- Turn the device over again (upper shell above) by holding the two shells in position.

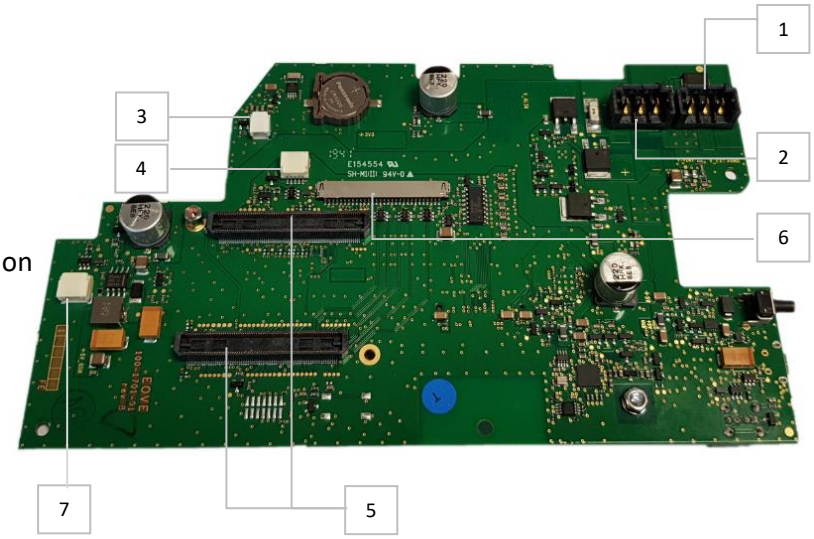
Flip the upper shell (3) on the left side.



WARNING: Pay attention to the cables connecting the upper shell to the CPU board (left side).

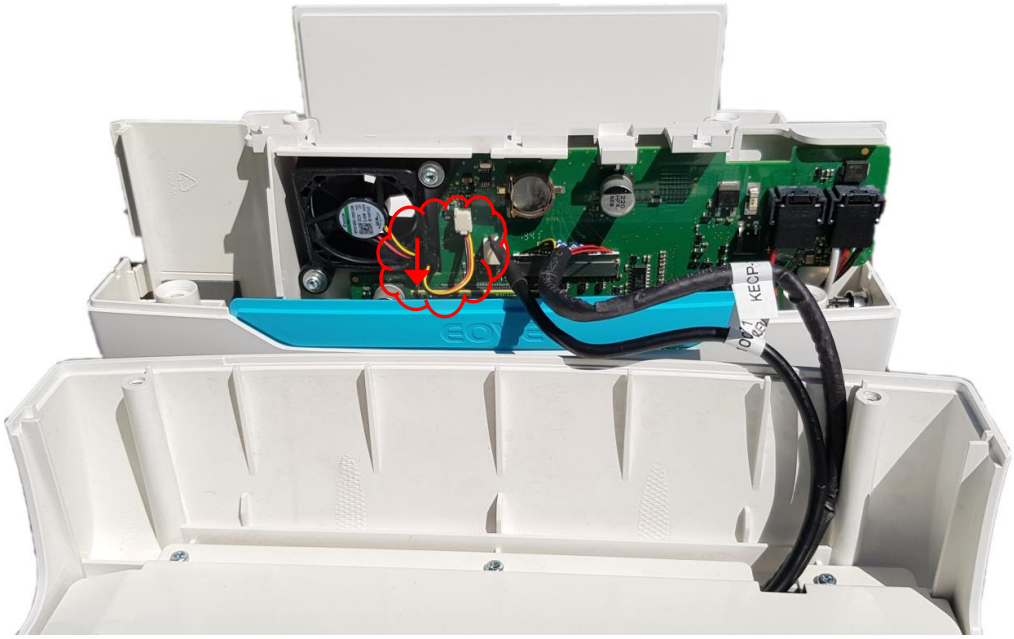
17.1.3 EO-Display CPU Board electrical connections

1. Pistons board connection
2. DC power plug connection
3. Cooling fan connection
4. Touch screen cable connection
5. SOM connection
6. LVDS cable connection
7. USB board connection

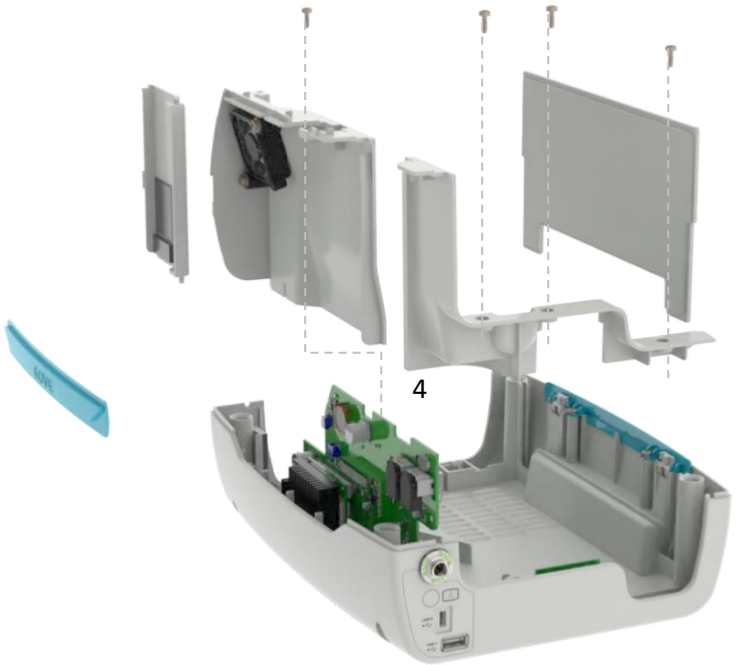


17.1.4 Electronic boards removal

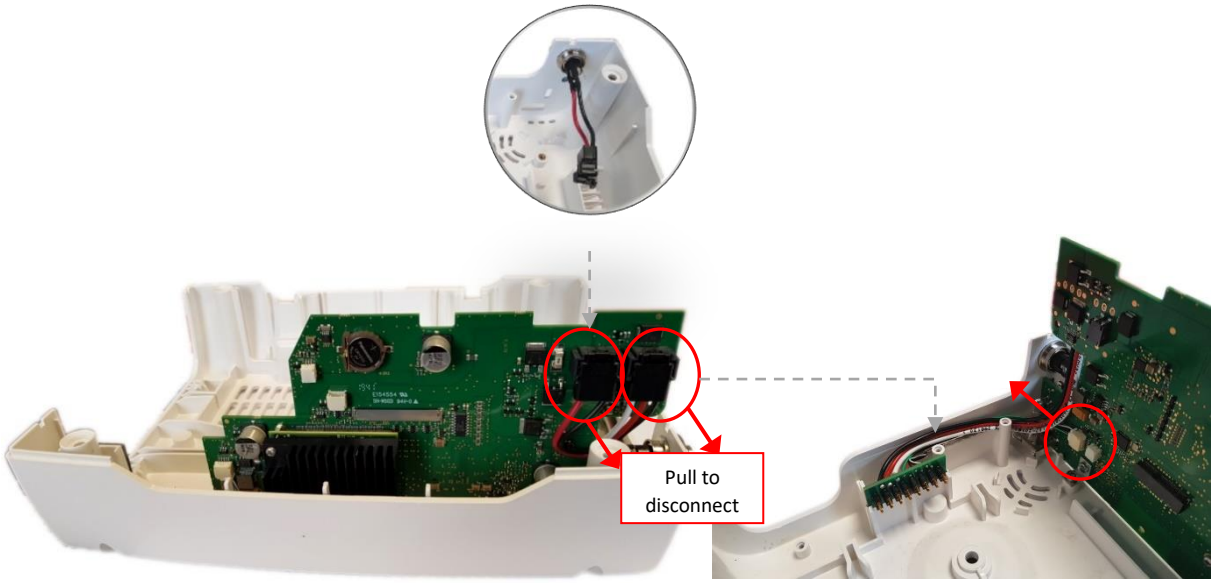
- Disconnect the cable of the cooling fan from the CPU board
- Then, disconnect the touch screen cable and the LVDS cable



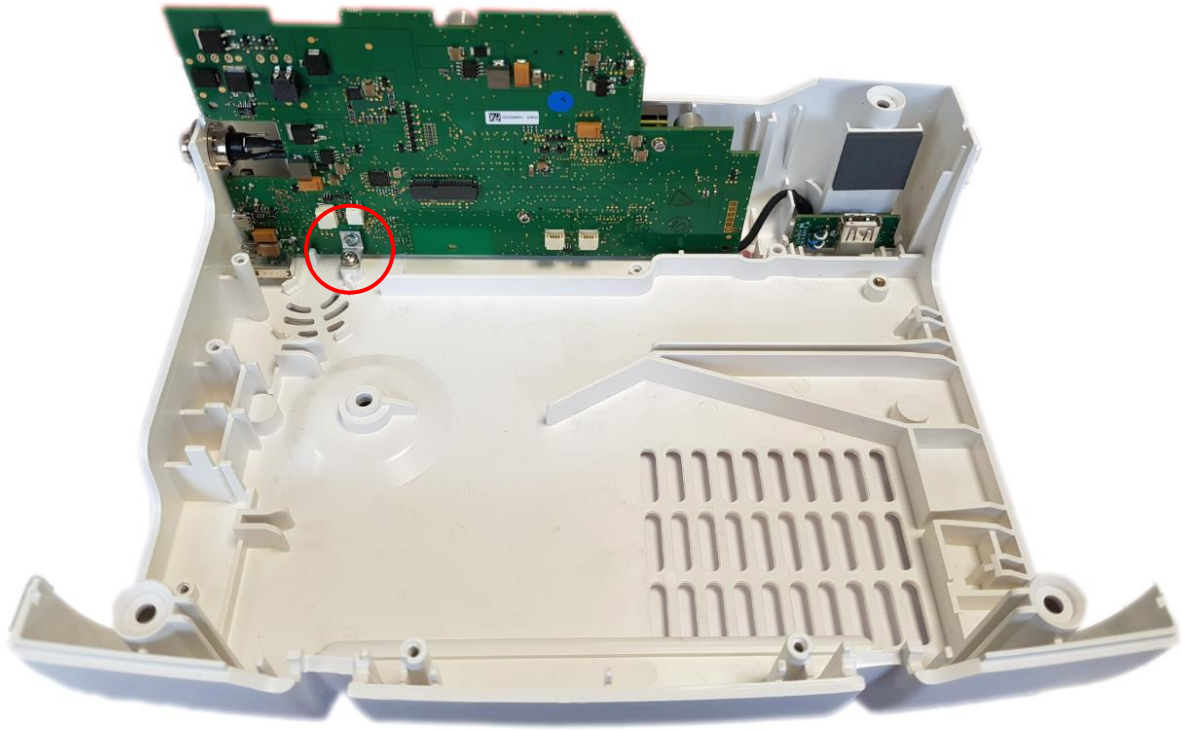
- Remove the three screws of the cover (4).
- Remove the four covers.



- Disconnect the 2 cables of the connection (pistons) board from the CPU board
- Disconnect the cable of the DC power plug from the CPU board

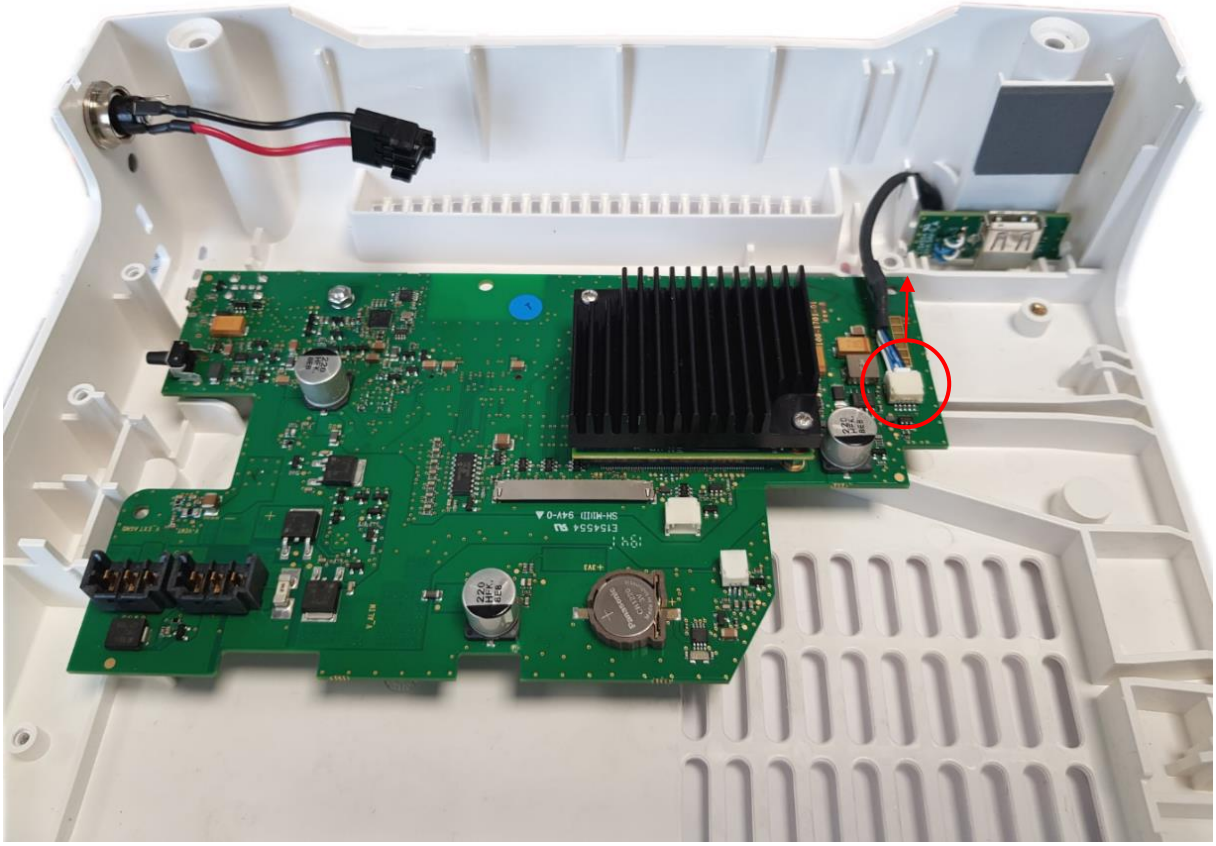


- Remove the connection (pistons) board
- Unscrew the CPU board then gently remove it from its slot



WARNING: Be careful, the USB board is still fitted in its slot and connected to the CPU board

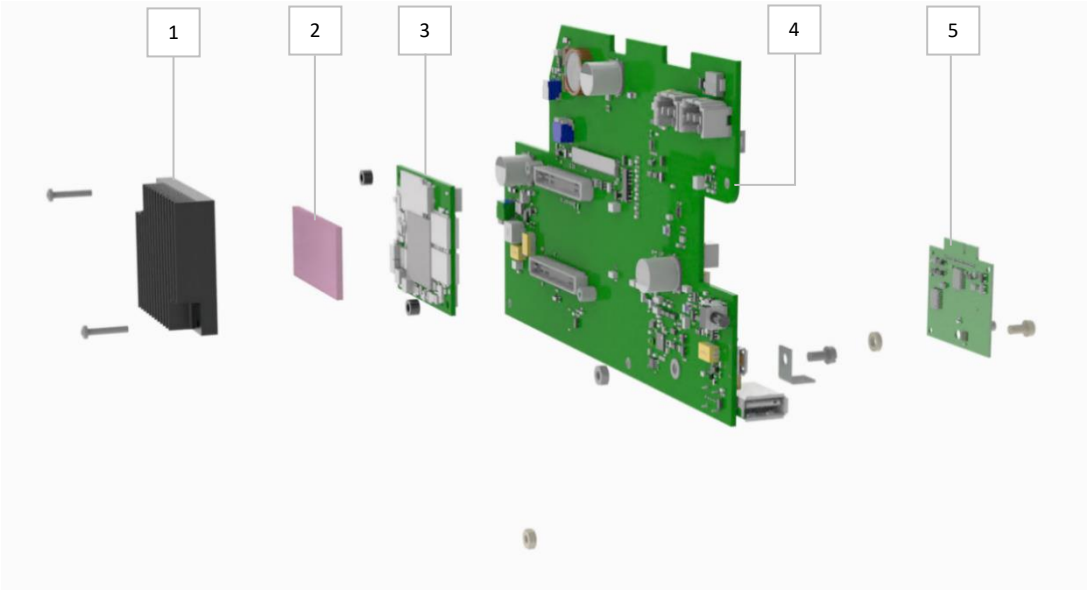
- Disconnect the USB board from the CPU board



- Remove the CPU board and the USB board

17.1.1 EO-Display CPU board assembly

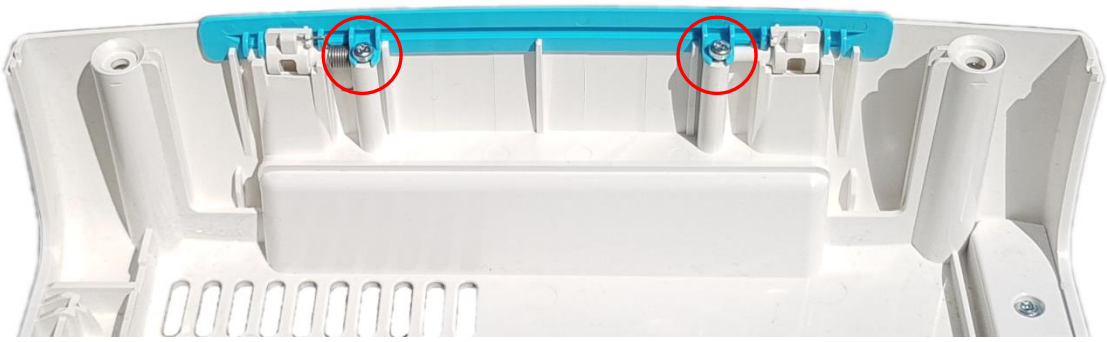
Composition of the EO-Display CPU board



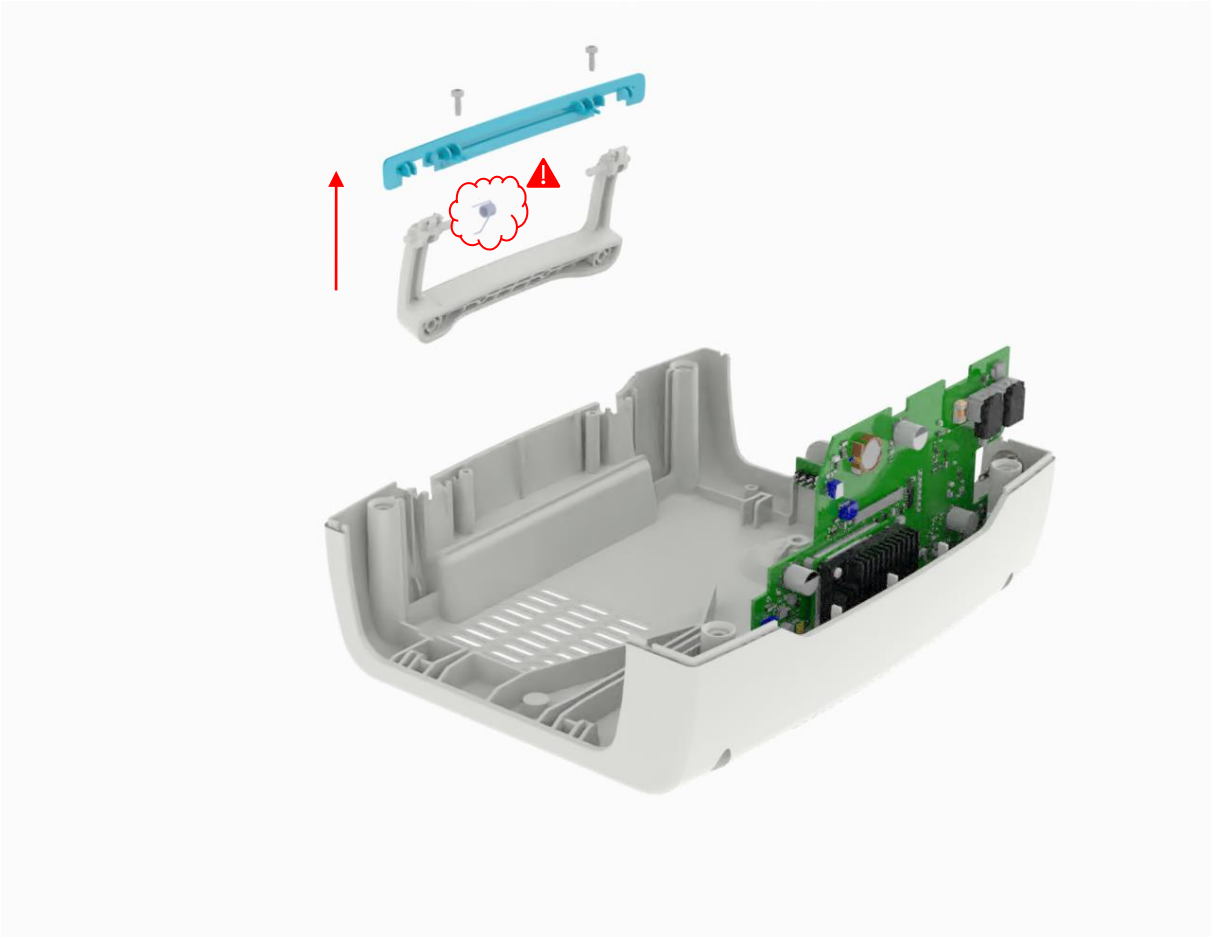
1. Heatspreader	1. CPU board
2. Thermal pad	2. Wi-Fi board (OPTIONNAL)
3. SOM (System On Module)	

17.1.2 EO-Display handle removal

- Unscrew the green insert from the lower shell

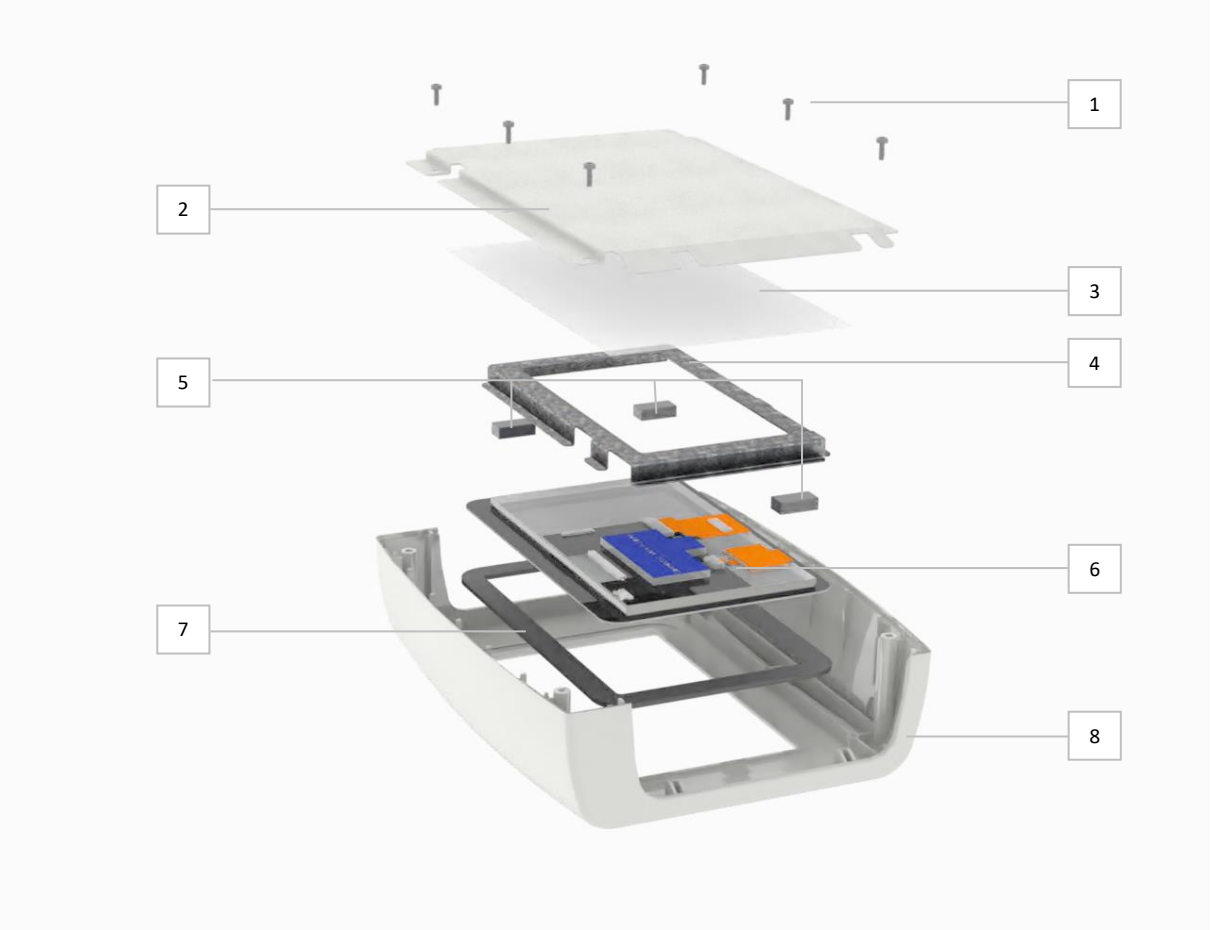


- Lift the insert then the handle



WARNING: Pay attention to not lose the spring when you remove the handle

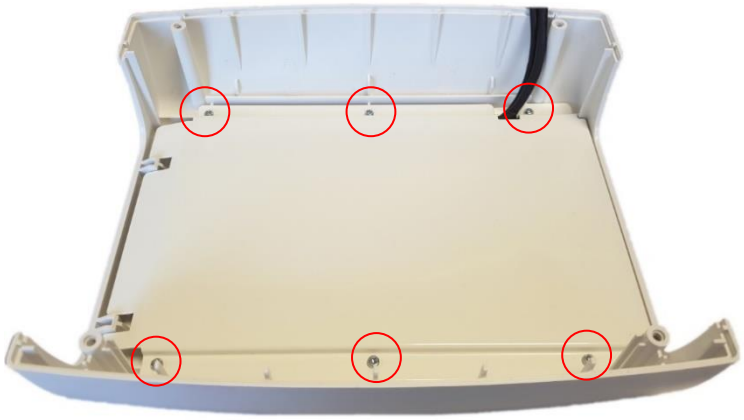
17.1.3 EO-Display screen connections



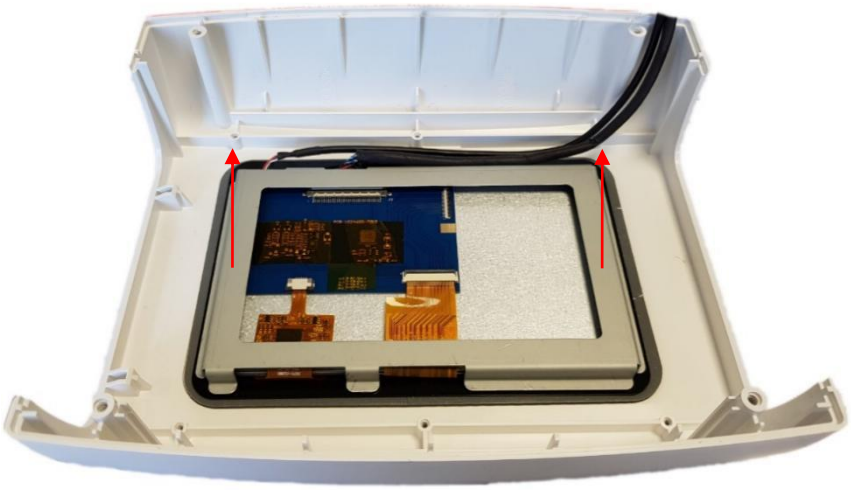
EO-Display upper shell architecture

1. M3x8 screws	2. Screen metal protection
3. ESD sheet protection	4. Frame
5. Frame foams	6. Display screen
7. Screen foam	8. Upper shell

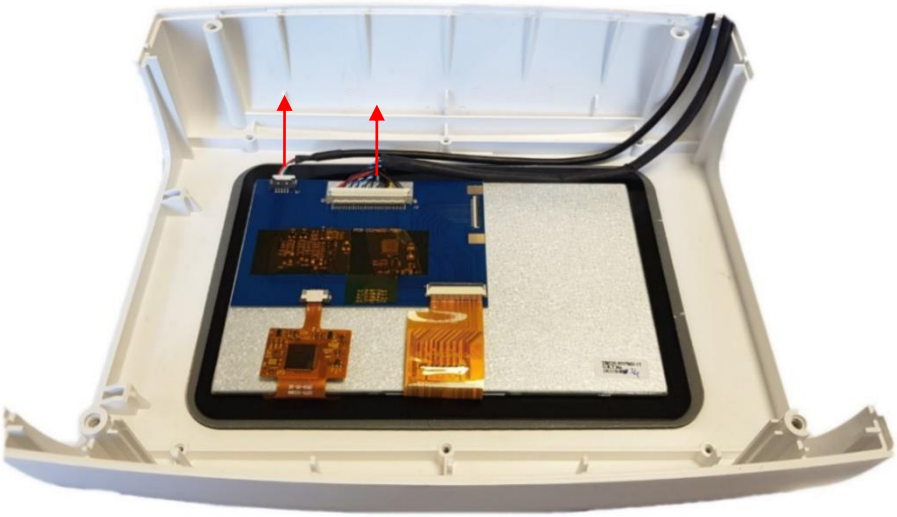
- Remove the 6 screws from the screen metal protection



- Remove the screen frame

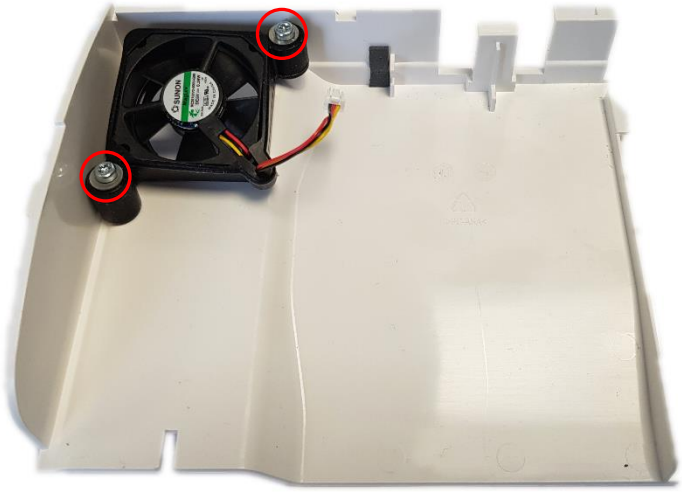


- Disconnect the touch screen cable and the LVDS cable



17.1.4 Cooling fan removal

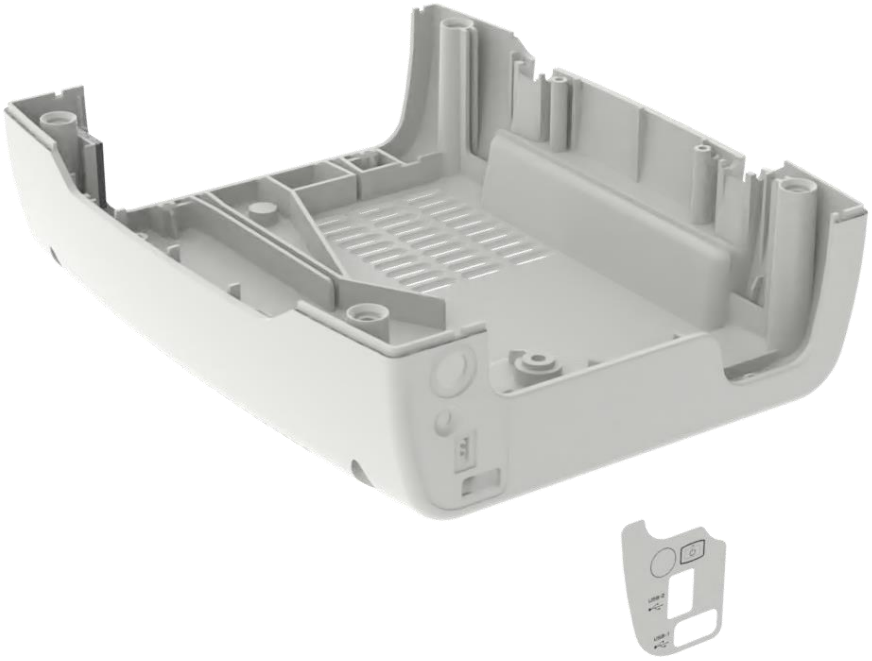
- Remove the 2 screws with their washer



- Remove the cooling fan suspension

17.1.5 EO-Display keyboard replacement

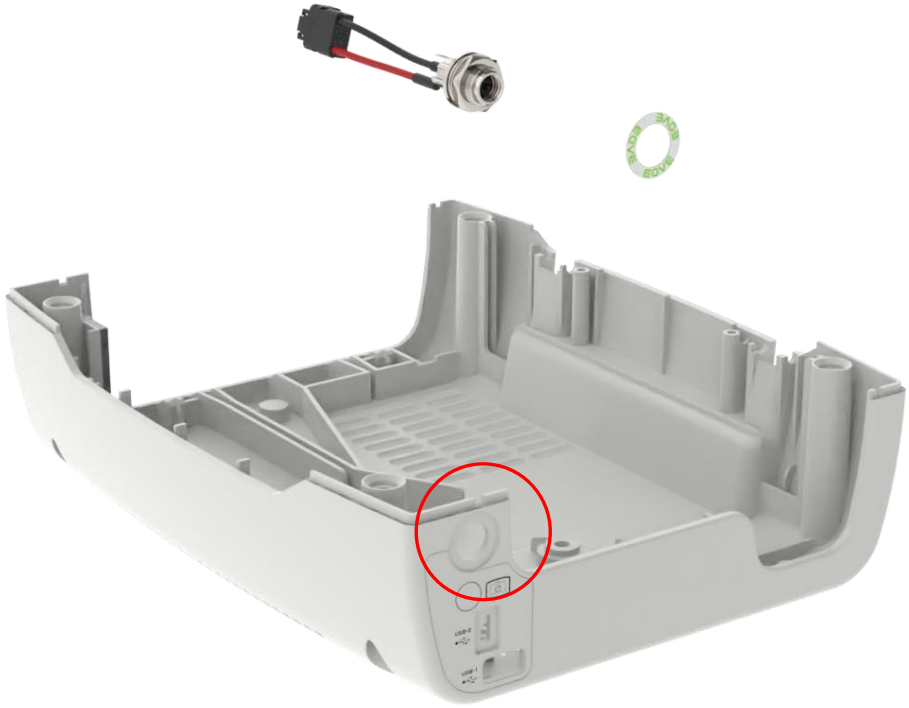
- Unstick the keyboard from the lower shell
- Clean the keyboard slot with an appropriate surface cleaning solution
- Stick the new keyboard on the dedicated slot



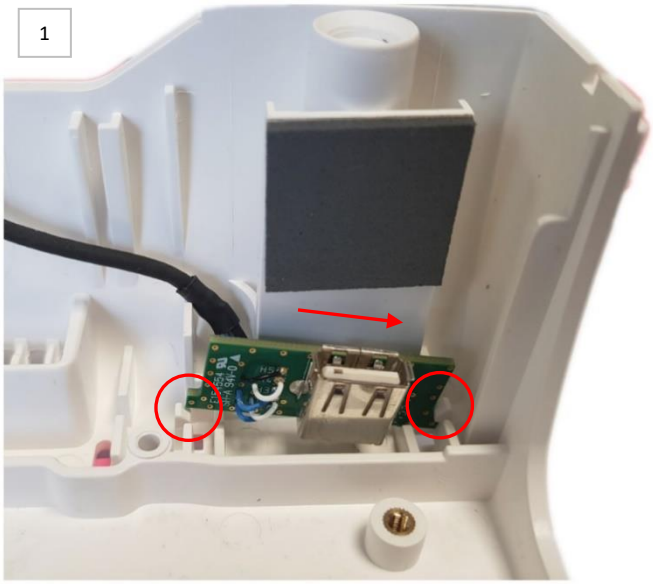
17.2 EO-Display assembly

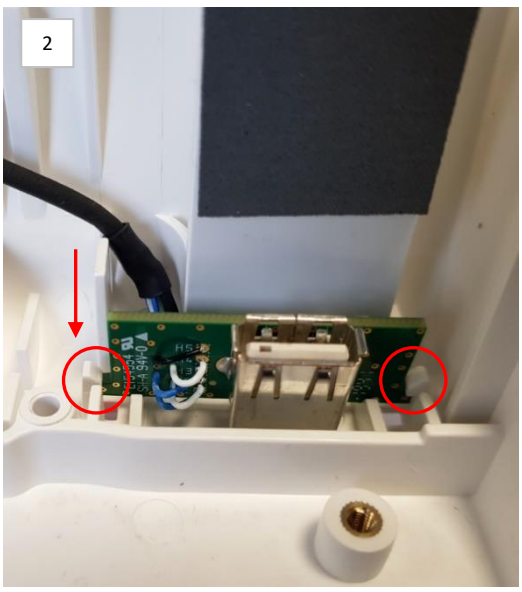
17.2.1 EO-Display peripheral connections

- Screw the DC power plug on the dedicated slot of the lower shell and respect a tightening torque of 1N.m



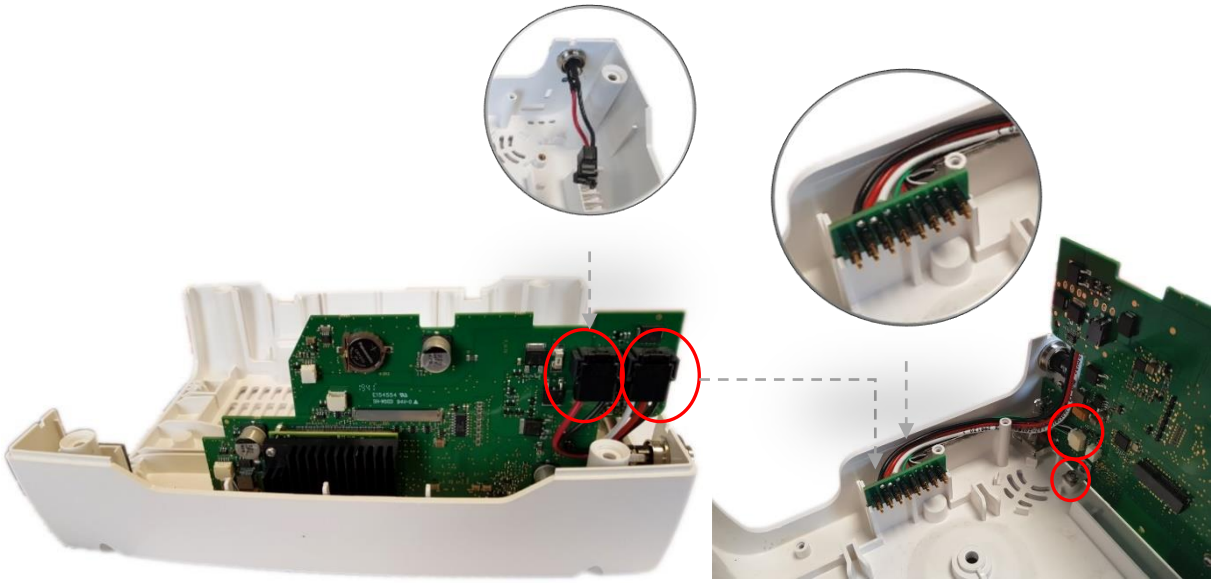
- Put the USB board in place, in two steps



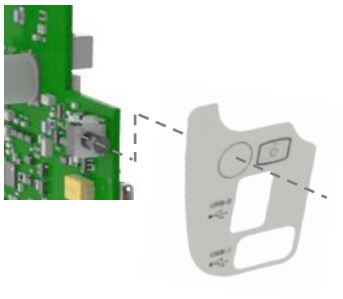


- Connect the USB board to the CPU board

- Position the CPU board an connect the pistons board and the DC plug cable on it
- Check that the CPU board is properly on position and screw it into the lower shell

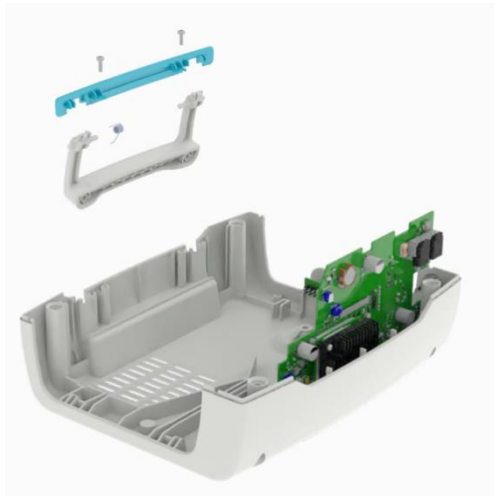


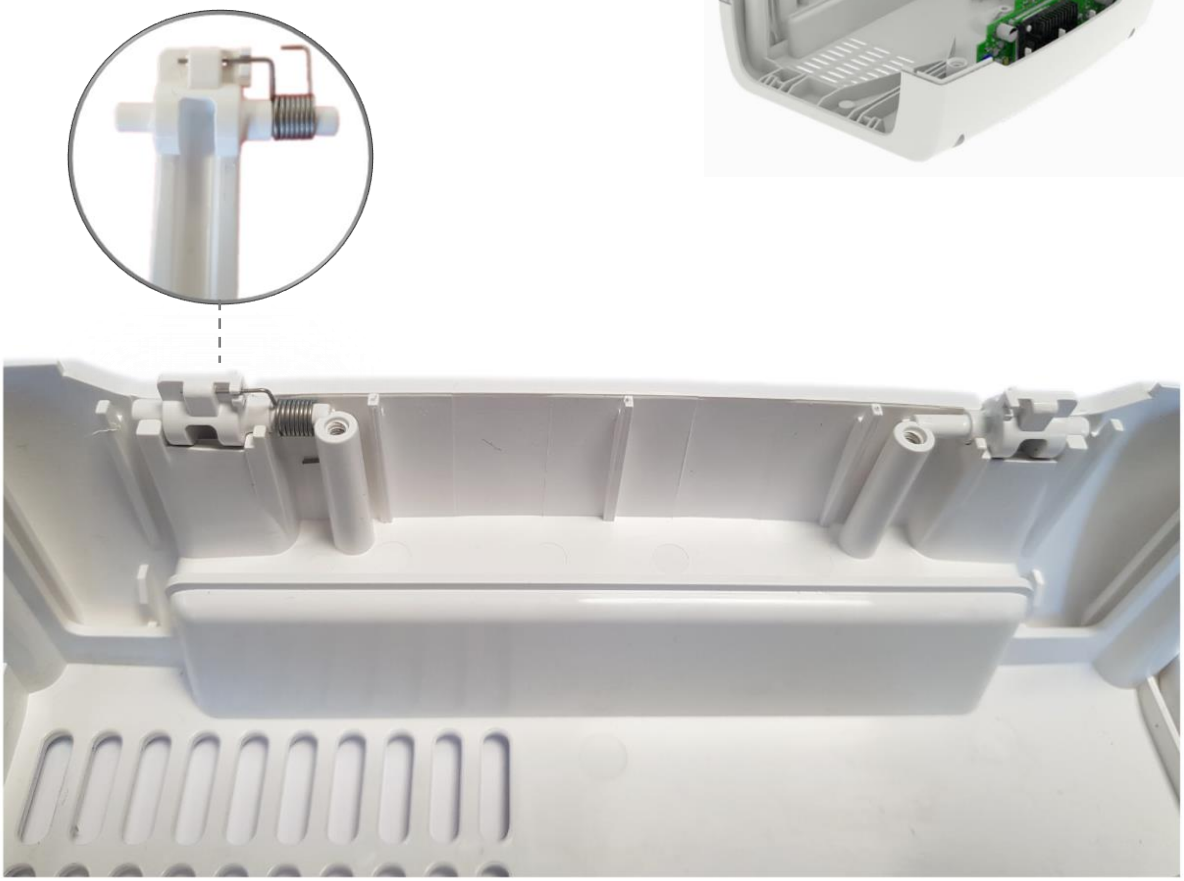
WARNING: You must hold the CPU board when you screw it to keep a good contact between the On/Off button and the Keyboard.



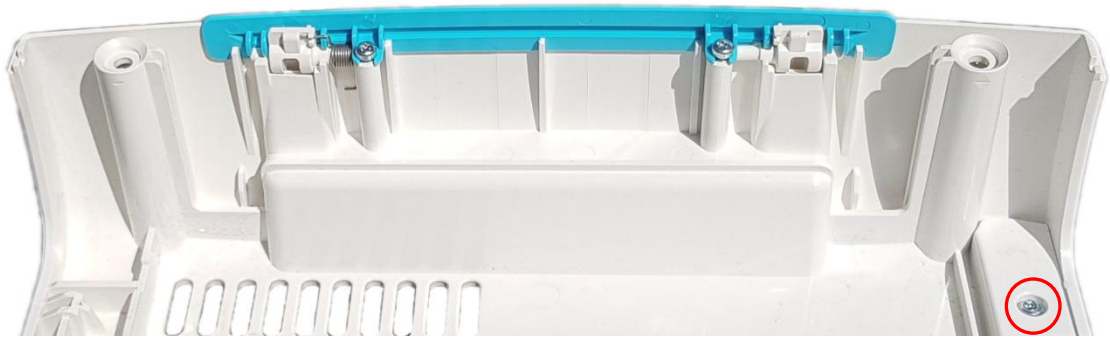
17.2.2 EO-Display handle assembly

- Position the spring on the handle and position it onto the lower shell
- Screw the insert and verify the handle move properly



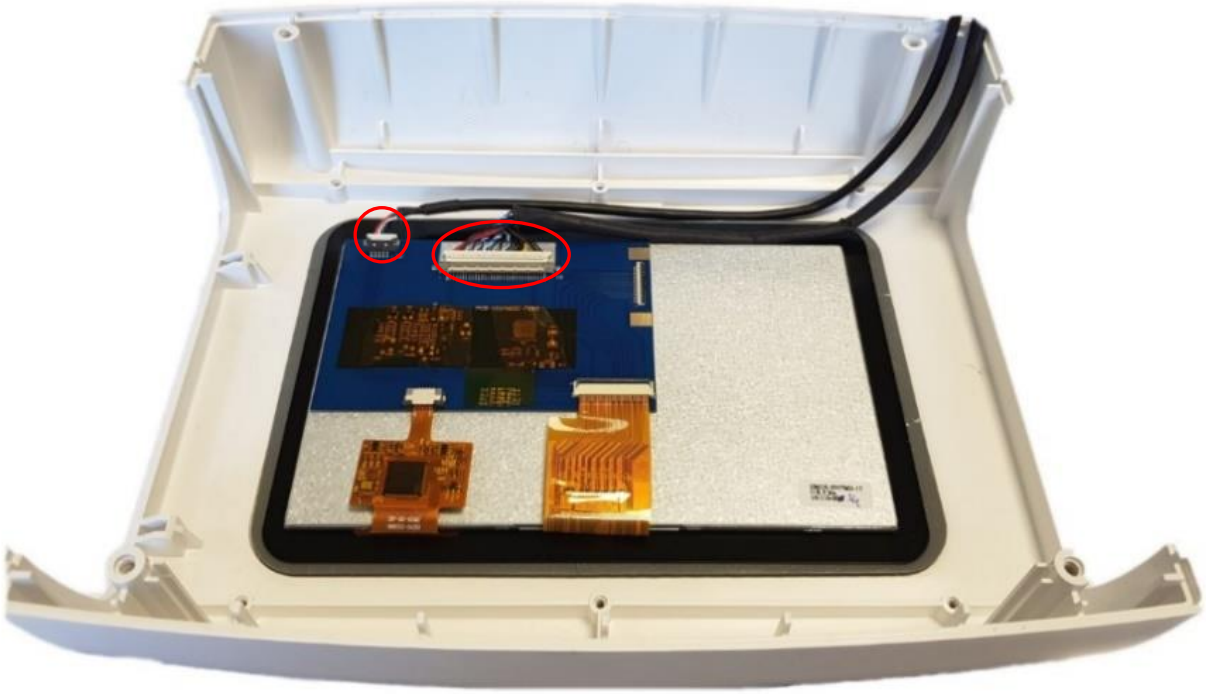


- Position the pistons board cover and screw it (x3)

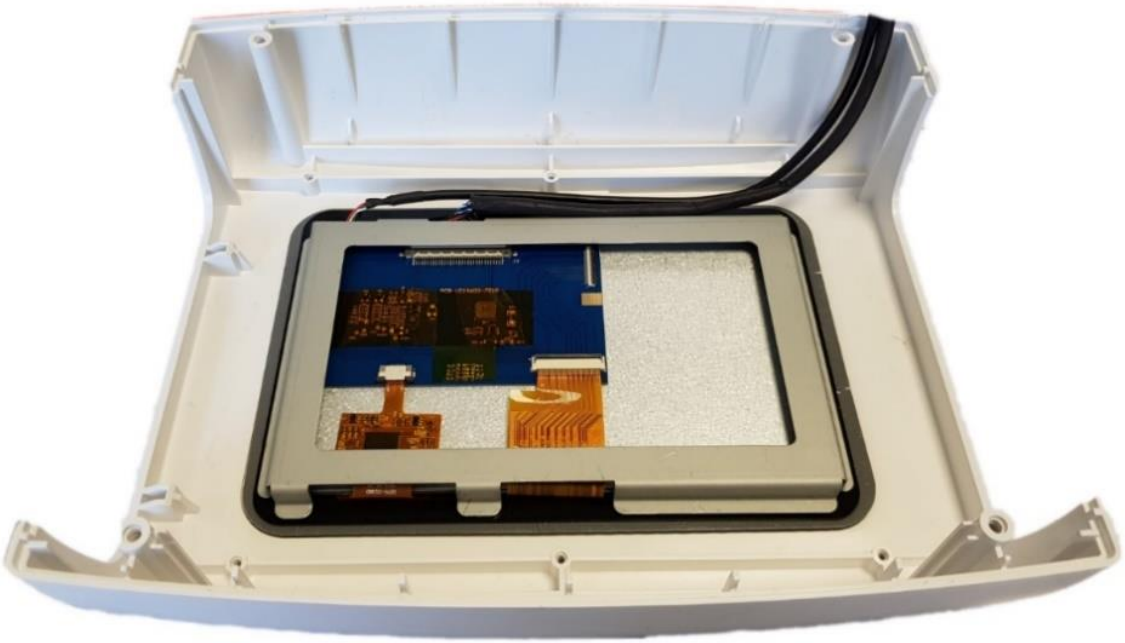


17.2.3 EO-Display screen assembly

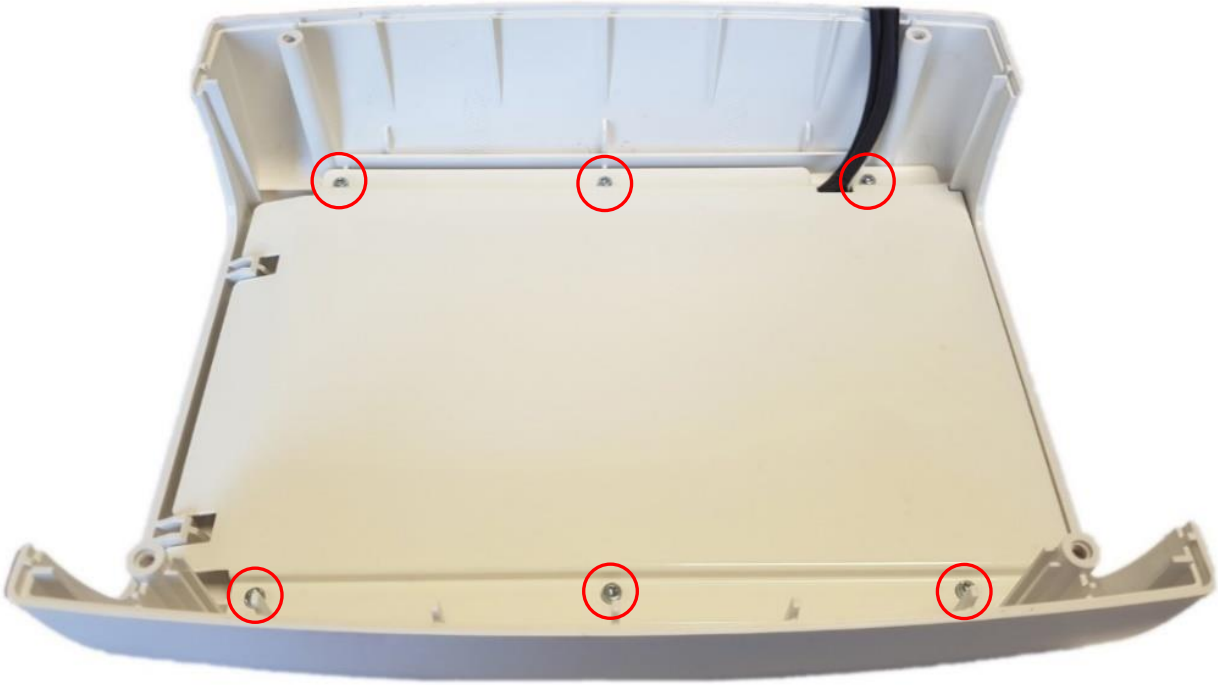
- Connect the touch screen cable and LVDS cable to the display screen



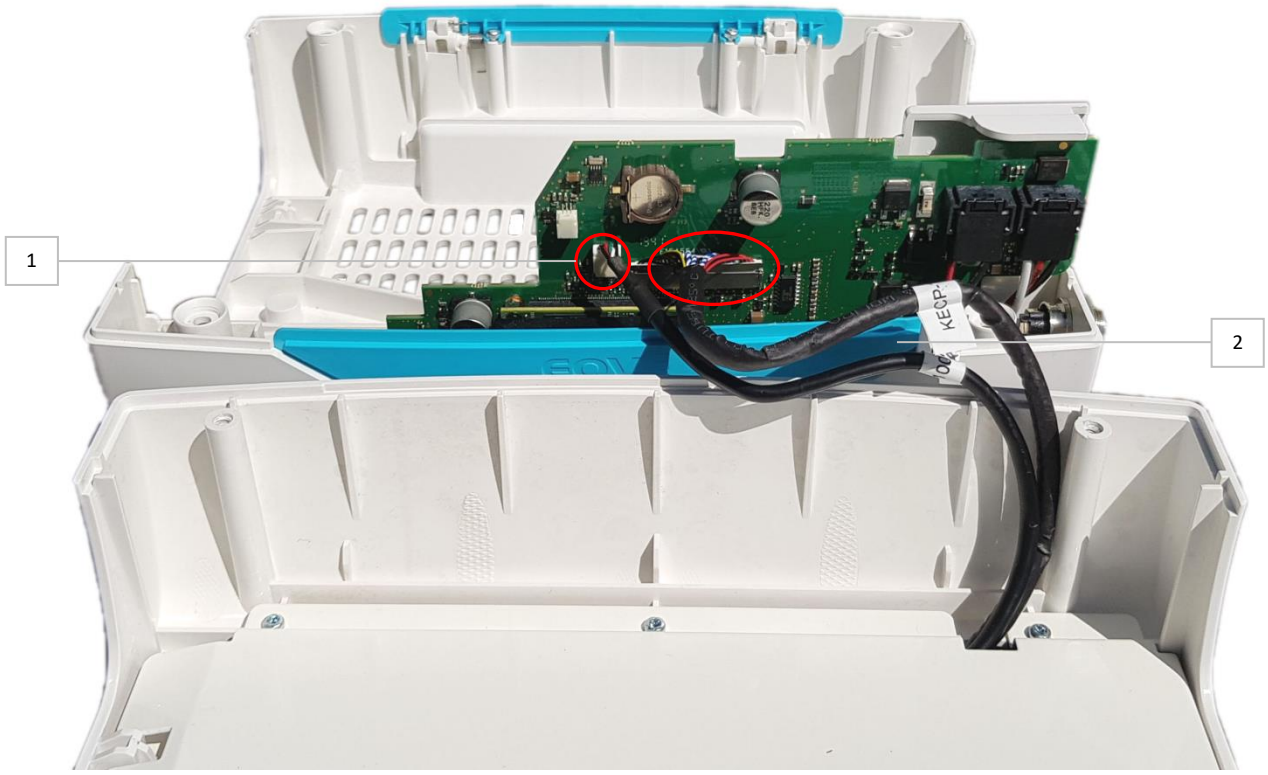
- Position the screen frame



- Screw the screen metal protection (x6)



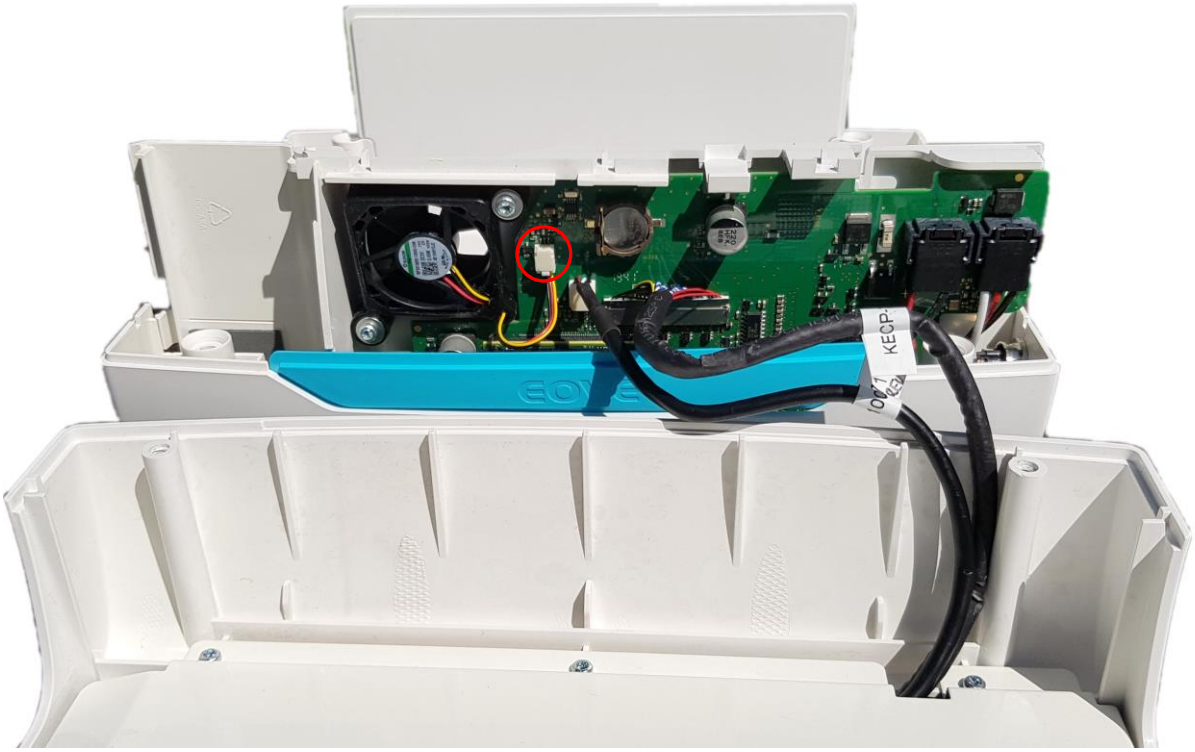
- Connect the touch screen cable and the LVDS cable (1) to the CPU board
- Position the insert (2) and the handle cover on the lower shell



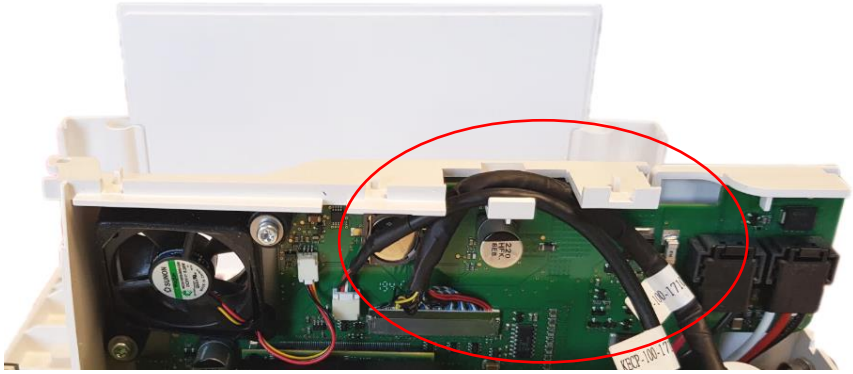
17.2.4 EO-Display fan assembly

- Put the cooling fan and its suspension in place

- Position the fan cover and connect the cooling fan to the CPU board

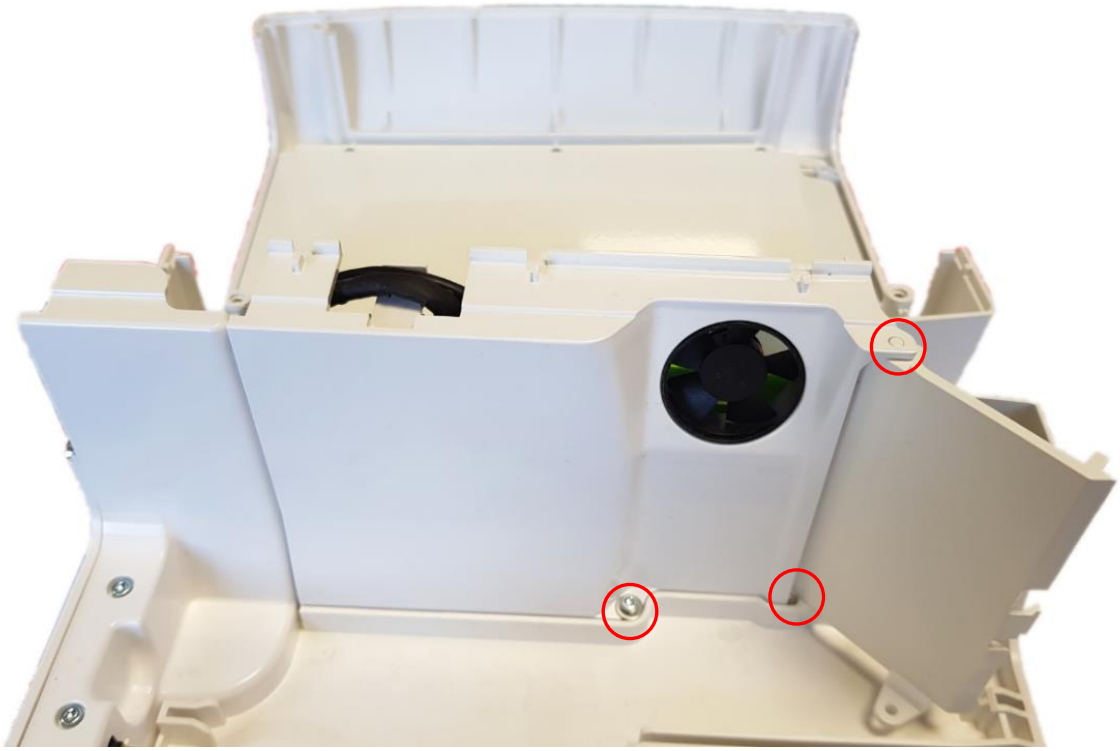


NOTE: the touch screen cable and the LVDS cable must be held by the fan cover as done on the picture below.



17.2.5 EO-Display closing

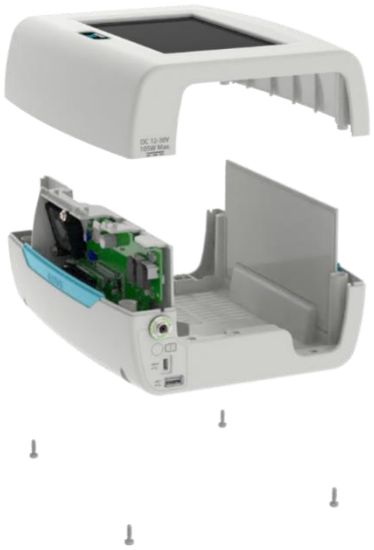
- Position the USB board flap then screw the fan cover



NOTE: We advise keeping the USB board flap opened and close it only when the EO-Display is completely assembled.

- Spin the upper sheel and lift it above the lower shell

WARNING: Be careful to not catch cables between the two shells when you close the EO-Display.



- Flip the EO-Display and screw the lower shell to the upper shell

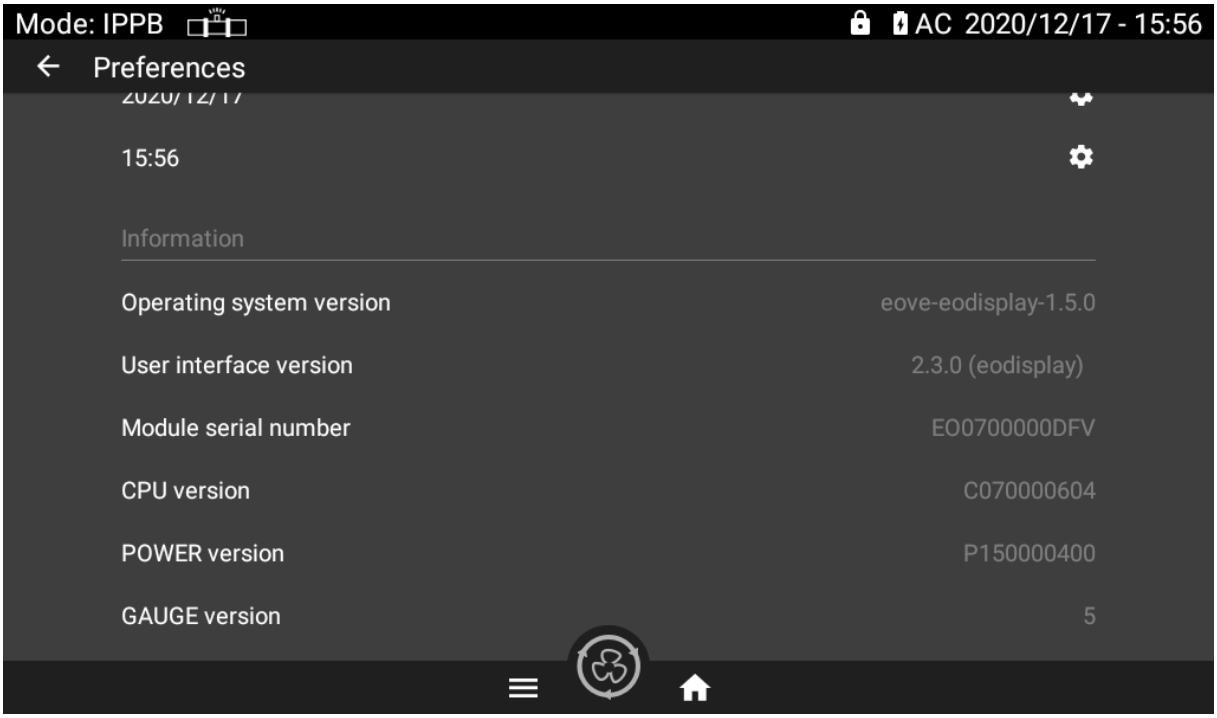
18 EO-Display housing unit: Performance controls

18.1 OP6-1: Operation on power source and charge control

- Turn off the EO-Display housing unit
- Connect the housing unit to the AC power source
- Start the housing unit by pressing the On/Off button at the rear
- Check that the EO-Display boots properly

18.2 OP6-2: Software versions

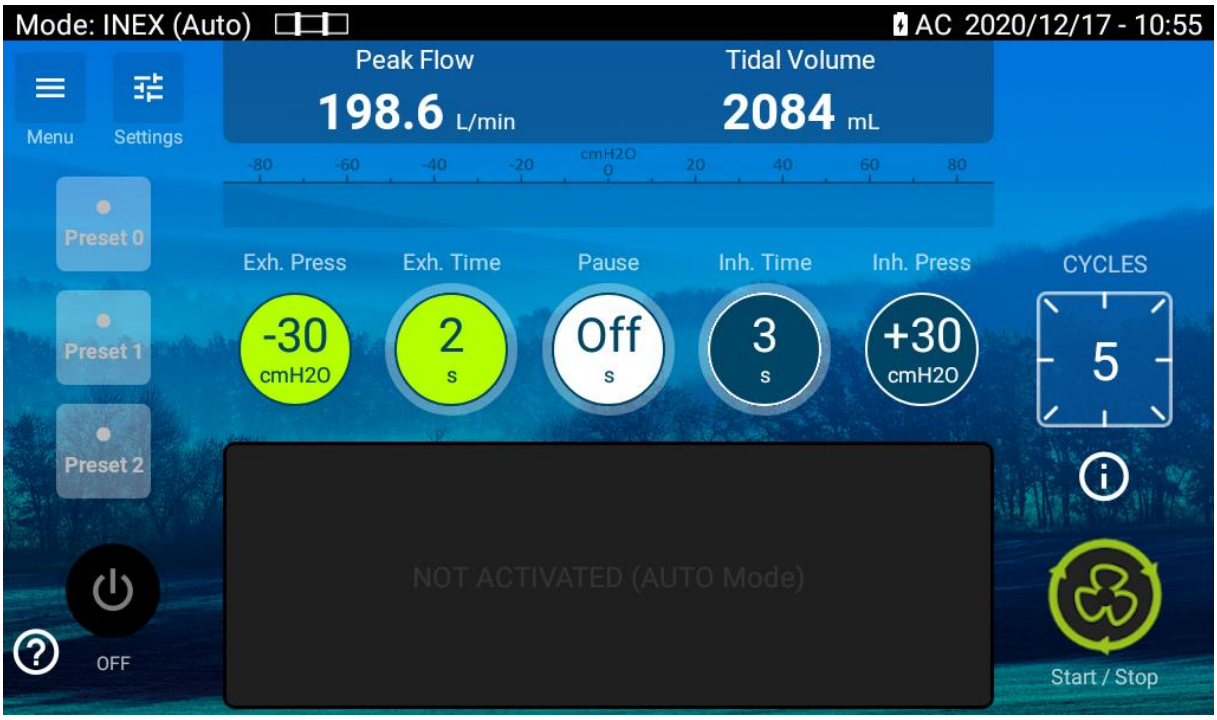
- Go in Preferences menu and check OS and Interface versions
- Update them if necessary



- Switch off the EO-Display housing unit

18.3 OP6-3: Test of the communication with the module

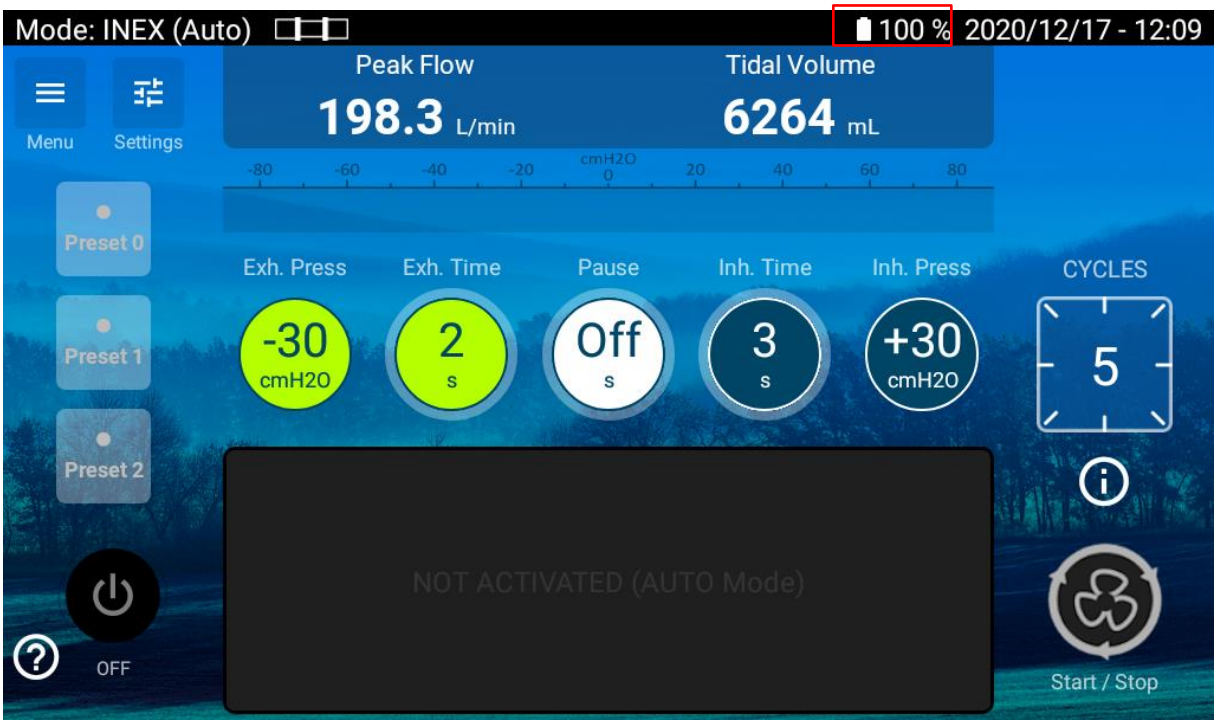
- Start a charged module and place it in the housing unit
- Once the display screen boot complete, verify that the communication with the EO-70 SMD module is established and information are displayed



18.4 OP6-4: Operation on internal battery of EO-70 SMD module

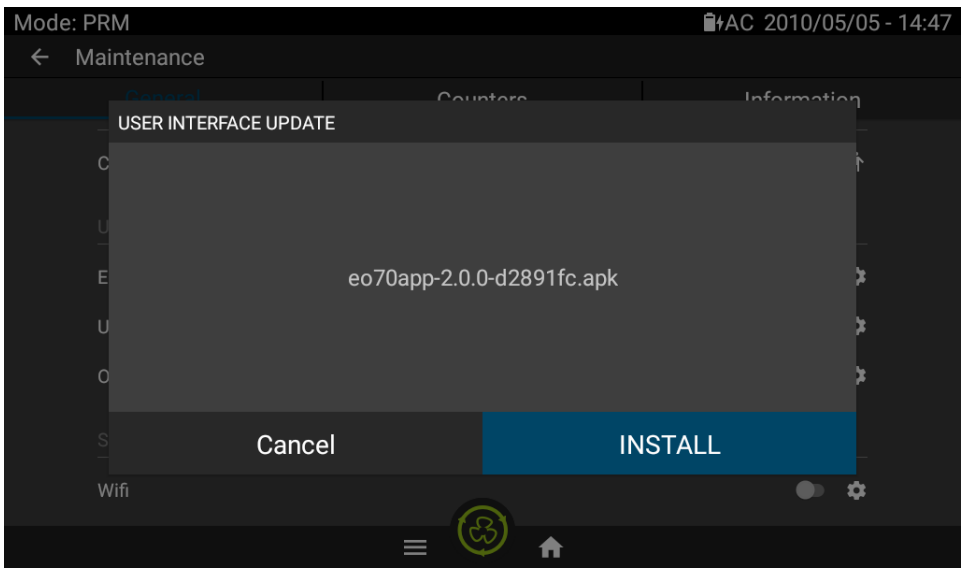
- Disconnect AC power source
- AC power indicator must disappear 

in the top right corner of the screen and it must display the remaining charge of the EO-70 SMD module



18.5 OP6-5: Check USB ports

- Connect a USB stick embedded with the interface software version, onto the dedicated port of the EO-Display keyboard
- Go to the maintenance menu / General tab and select EO70 user interface to check that the USB stick is properly detected

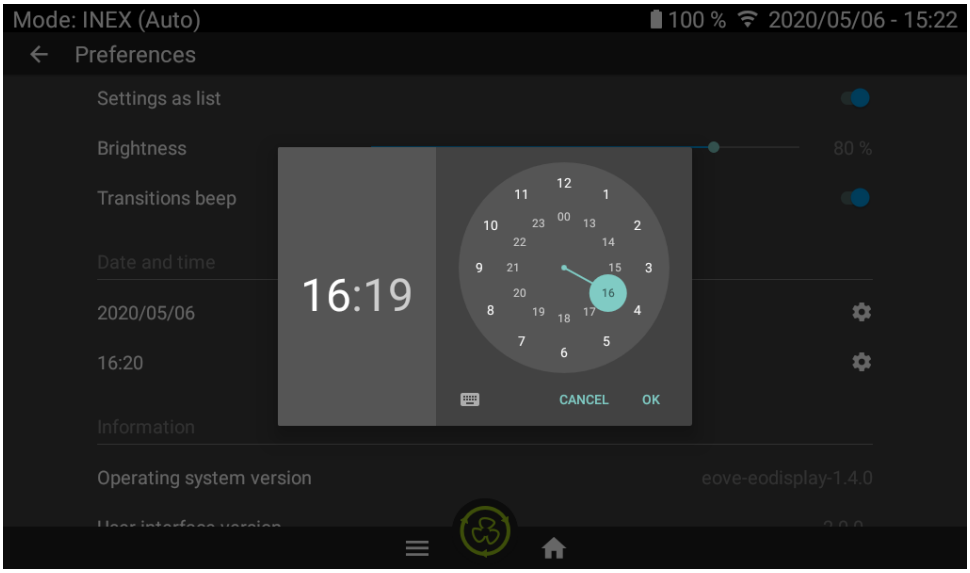


18.6 OP6-6: Wi-Fi feature test (optional)

- If the Wi-Fi option is activated on the EO-Display, go to the Maintenance menu and verify that the local Wi-Fi signal is detected

18.7 OP6-7: Interface setting

Check date, time and language



18.8 OP6-8: EO-Display switch off from EO-70 SMD module

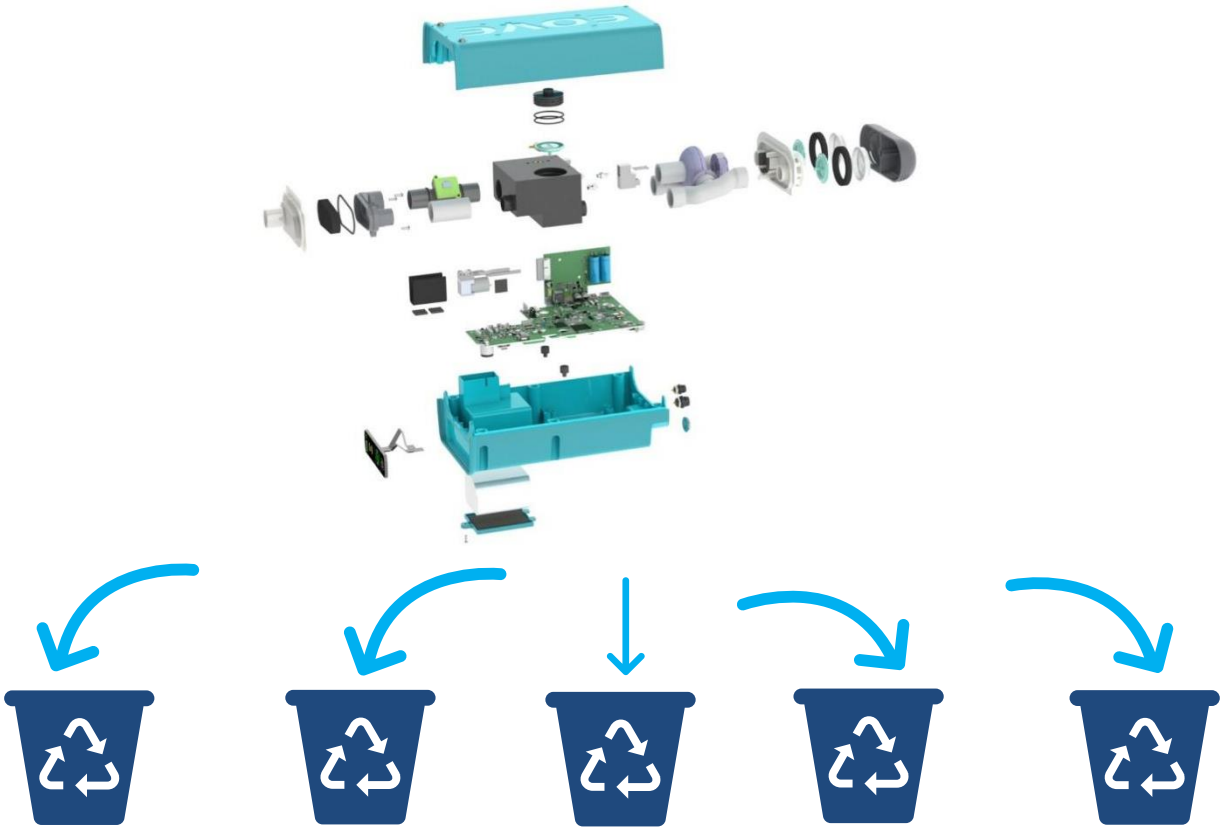
- Press around 10s the On/Off button at the rear of the EO-Display housing unit
- Verify that the EO-Display turns off

18.9 OP6-9: Visual inspection

Proceed to a visual inspection of the shells, covers, labels

19 EO-70SMD disposal

The disposal of the EO-70SMD must be done by dismantling the device according to EOVE procedure (refer to $11 EO-70 SMD module: Replacement procedures & $14 Housing unit: replacement procedures) in order to split the parts and send them toward the appropriate recycling channel.



Lithium Ion Batteries	Electronic boards	Electronic waste	Plastic / shells	Foams/tubes/sealing rings
				
				
				
				

19.1 Use of dangerous substance

Lithium Ion battery is considered as dangerous good. Manufacturing, transport, storage and disposal of Lithium Ion batteries are strictly followed by safety process.

The disposal of defective batteries should be done in compliance with the laws in effect in your country. Collection toward a recycling center, must be done by accredited channels able to provide certificate and traceability.

Lithium Ion technology of the internal battery requires a secure design. That is why, only batteries developed under EOVE control and provided by EOVE are suitable and allowed for EO-70SMD operation.

EOVE is not responsible for the proper recycling of your EO-70SMD park. To put the EO-70SMD ventilator out of service and reduce the use of dangerous substances, recycling procedures must be strictly followed in compliance with laws in effect in the distributed country.

19.2 Emissions in the air

EOVE is not responsible for the proper recycling of your EO-70SMD park. To put the EO-70SMD out of service and reduce the emissions in the air, recycling procedures must be strictly followed in compliance with laws in effect in the distributed country. Collection toward a recycling center, must be done by accredited channels able to provide certificate and traceability.

Device must be dismantled and battery, turbine & motor, solenoid valves, electronic parts, display screen and other plastic parts must follow appropriate collection and recycling process in compliance with country regulations.

19.3 Rejects in surface water and groundwater table

EOVE is not responsible for the proper recycling of your EO-70SMD park. To put the EO-70SMD out of service and reduce the rejects in surface water and groundwater table, recycling procedures must be strictly followed in compliance with laws in effect in the distributed country. Collection toward a recycling center, must be done by accredited channels able to provide certificate and traceability.

Device must be dismantled and battery, turbine & motor, solenoid valves, electronic parts, display screen and other plastic parts must follow appropriate collection and recycling process in compliance with country regulations.

19.4 Waste, especially dangerous substance

Waste of the EO-70SMD which contain dangerous substance only concern the internal battery and the tablet battery (Lithium Ion technology) with a periodical replacement every 2 years.

The disposal of defective batteries should be done in compliance with the laws in effect in your country. Lithium Ion Battery, when defective, might present explosion or combustion risks. Used

batteries must be stored in closed ratified boxes with appropriate protection (like vermiculite) against impacts and overheating propagation.

Collection toward a recycling center, must be done by accredited channels able to provide certificate and traceability.

EOVE is not responsible for the proper recycling of your EO-70SMD park. To put the EO-70SMD out of service and reduce the final wastes of dangerous substances (after incineration for exemple), recycling procedures must be strictly followed in compliance with laws in effect in the distributed country.

19.5 Use of raw material, energy

EOVE is not responsible for the proper recycling of your EO-70SMD ventilators park. To put the EO-70SMD out of service and reduce the use of raw material, energy (during incineration, transformation), recycling procedures must be strictly followed in compliance with laws in effect in the distributed country.

19.6 Noise, vibrations, smell, dust, electromagnetic field

EOVE is not responsible for the proper recycling of your EO-70SMD park. To put the EO-70SMD out of service and reduce the noise, vibrations, smell, dust, electromagnetic field (during incineration, transformation), recycling procedures must be strictly followed in compliance with laws in effect in the distributed country.

19.7 Transportation

EOVE is not responsible for the proper recycling of your EO-70SMD park. To put the EO-70SMD out of service and reduce the transportation of wastes, recycling procedures must be strictly followed in compliance with laws in effect in the distributed country.

Collection toward a recycling center, must be done by accredited channels able to provide certificate and traceability.

19.8 Risks caused by environmental accidents

Environmental accidents such as earthquakes, floods, hurricanes, tsunamis, and safety risks they can cause onto the wastes and treatment center of the wastes (incineration, transformation), can have huge environmental impact.

EOVE is not responsible for the proper recycling of your EO-70SMD park. To put the EO-70SMD out of service and reduce the risks caused by environmental accidents, recycling procedures of wastes must be strictly followed in compliance with laws in effect in the distributed country.

19.9 Biosphere contamination

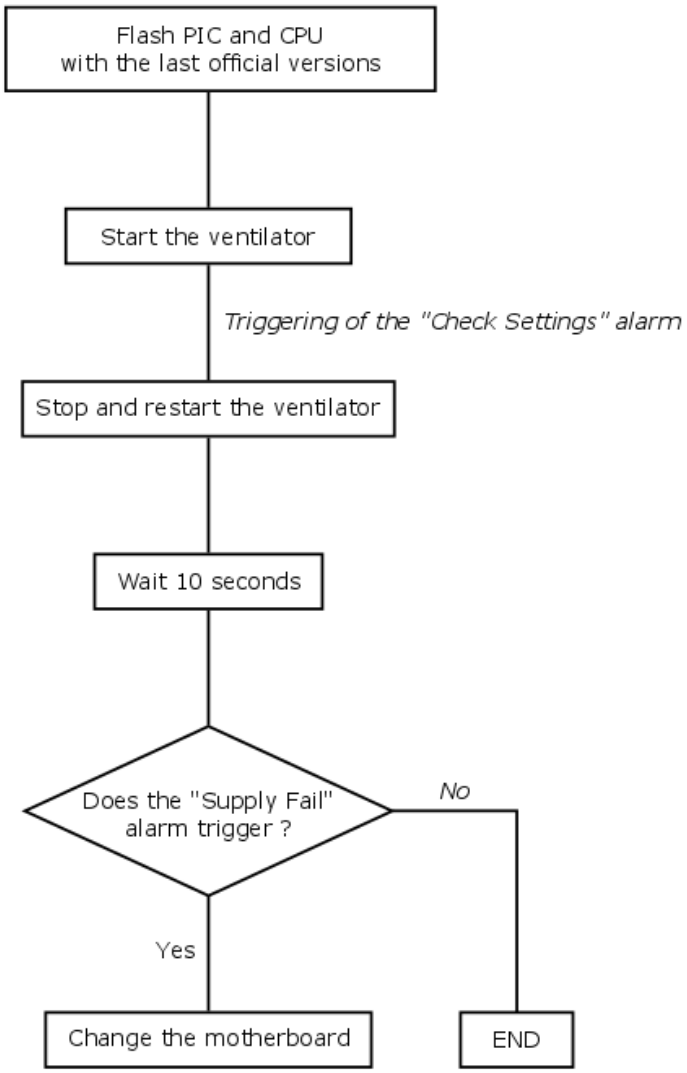
EOVE is not responsible for the proper recycling of your EO-70SMD park. To put the EO-70SMD out of service, and reduce the biosphere contamination, recycling procedures must be strictly followed in compliance with laws in effect in the distributed country. Collection toward a recycling center, must be done by accredited channels able to provide certificate and traceability.

Device must be dismantled and battery, turbine & motor, solenoid valves, electronic parts, display screen and other plastic parts must follow appropriate collection and recycling process in compliance with country regulations.

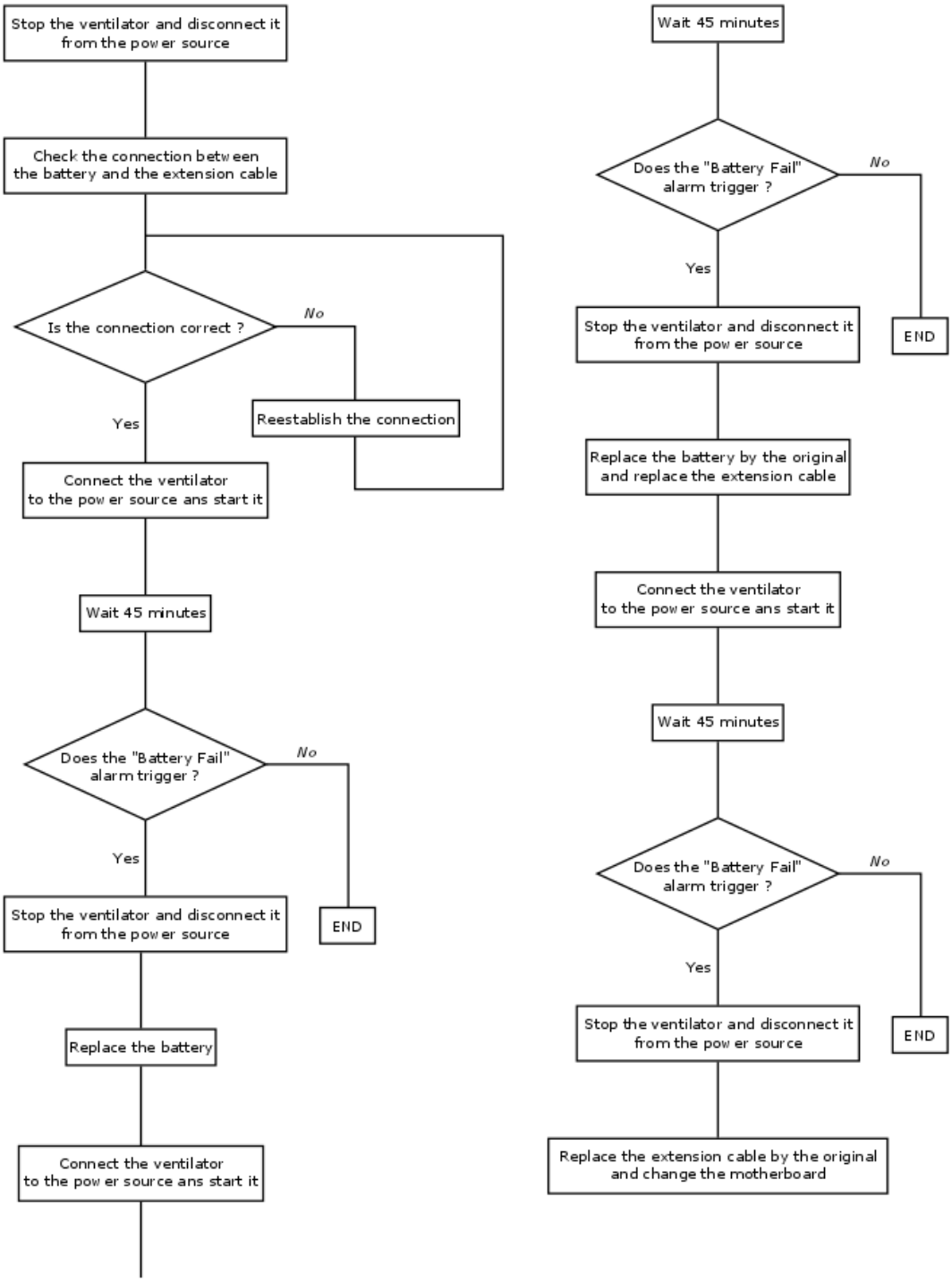
APPENDIX

20 APPENDIX 1: Troubleshooting trees

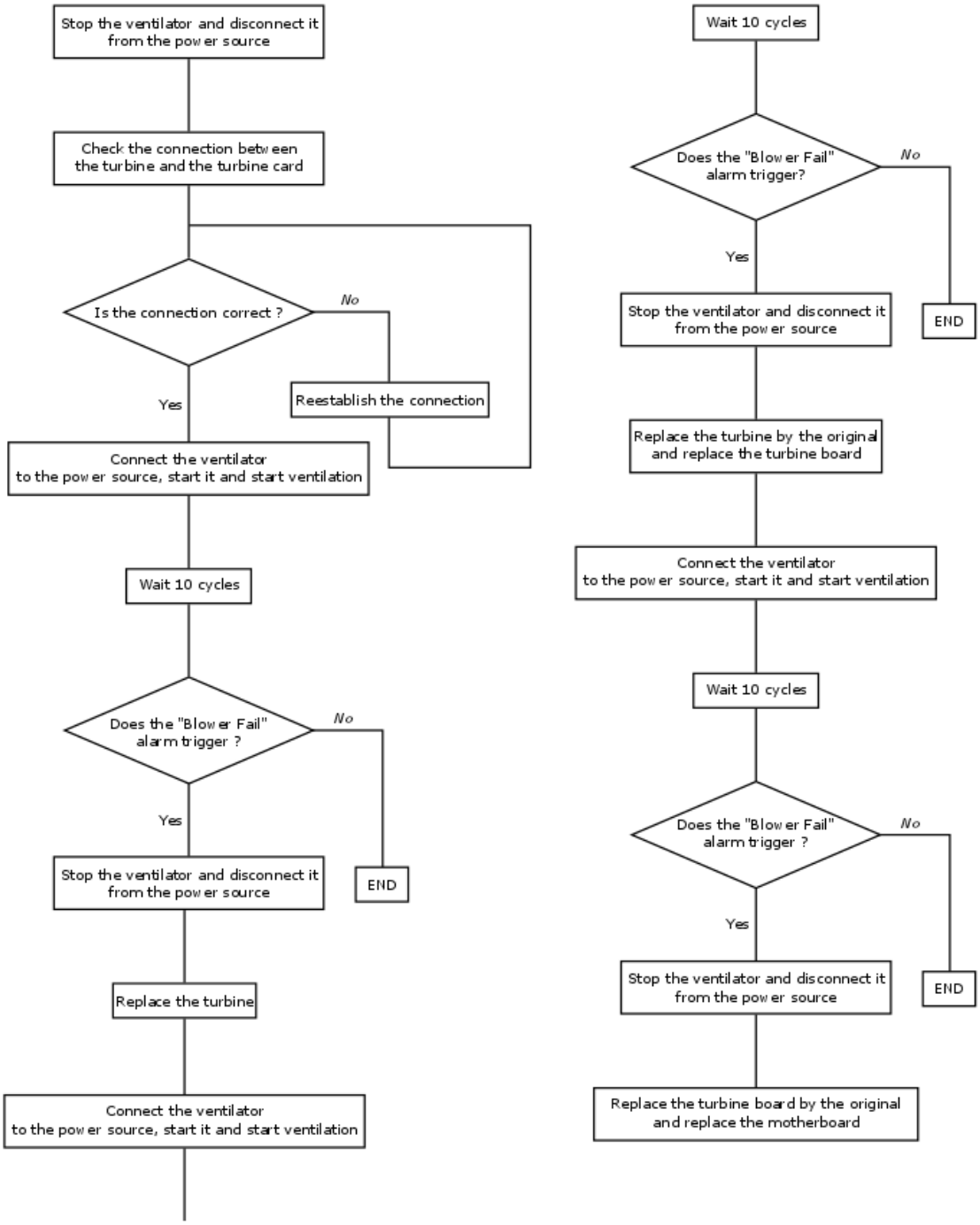
20.1 Supply Fail



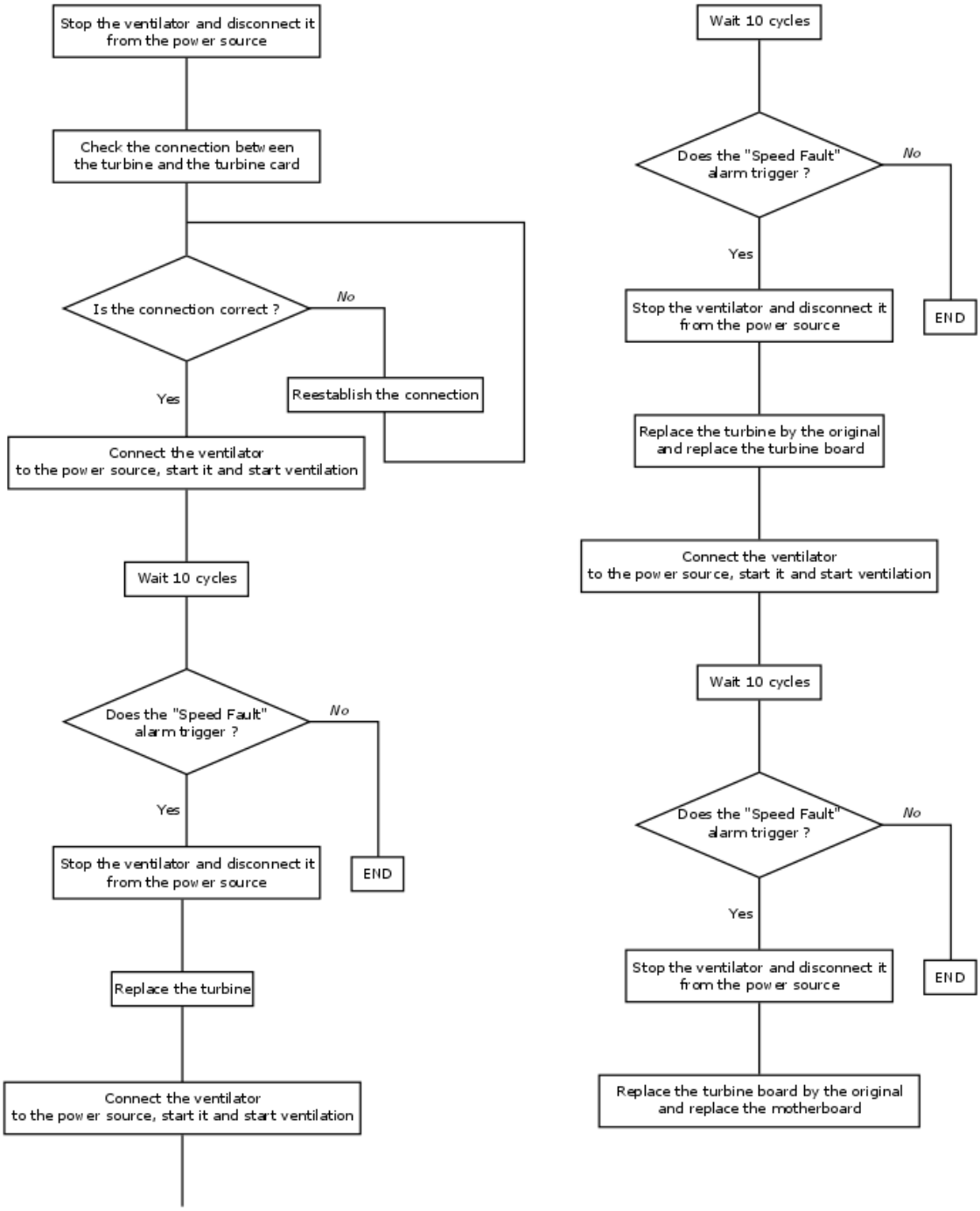
20.2 Battery Fail



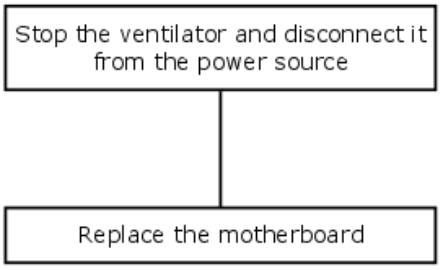
20.3 Turbine Fail



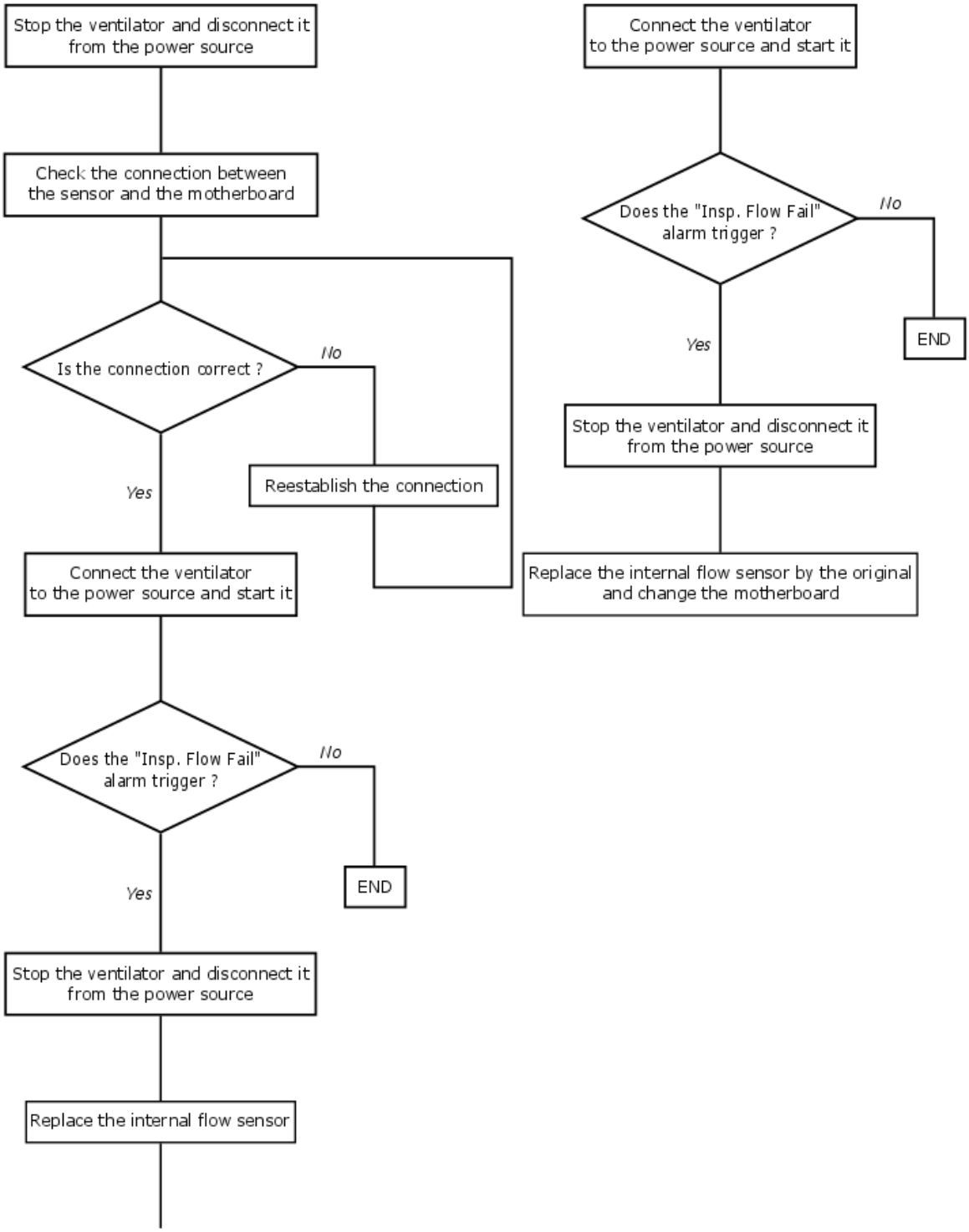
20.4 Speed Fault



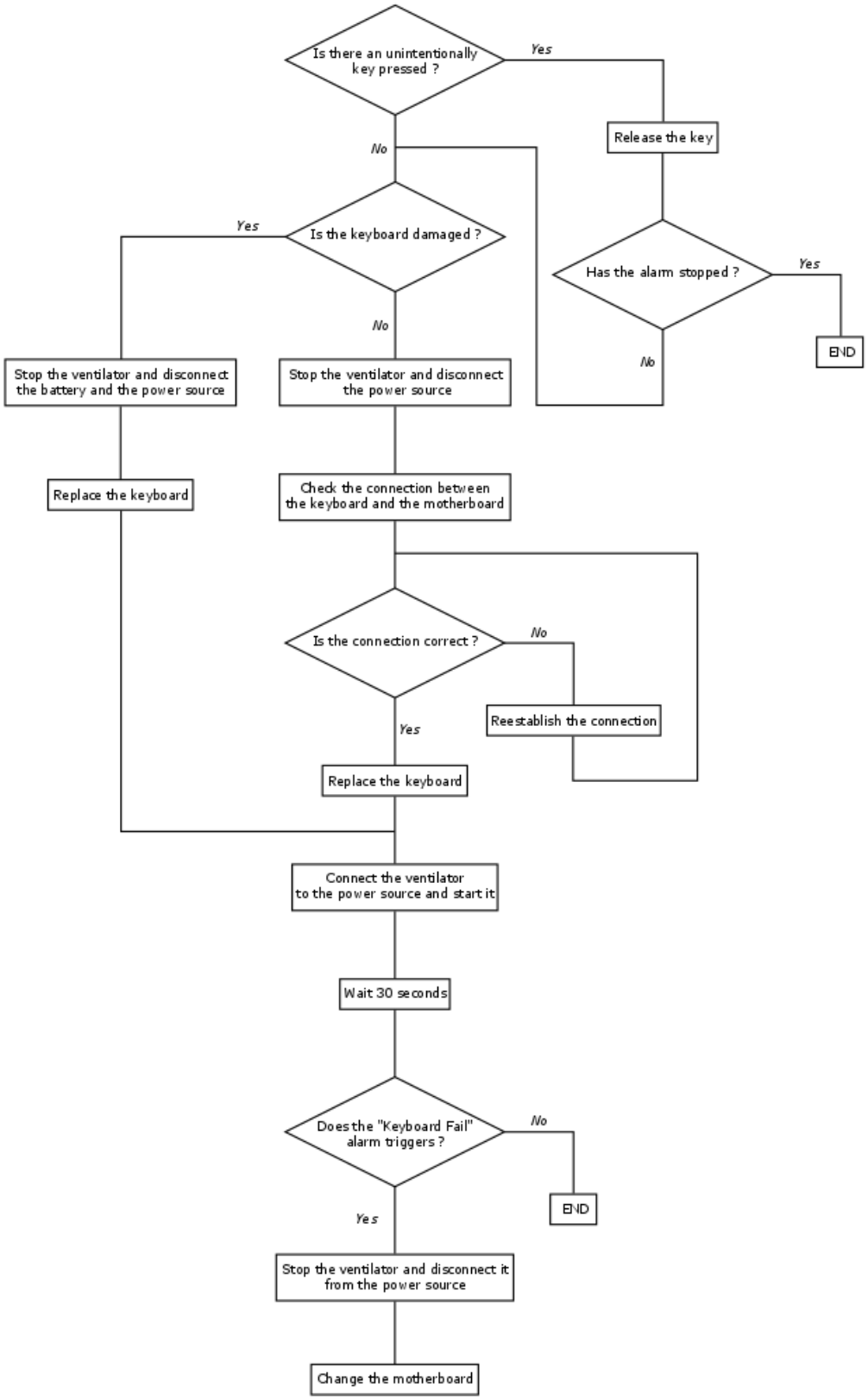
20.5 Sensors failure / CPU Fail / Memory Fail / Device information lost



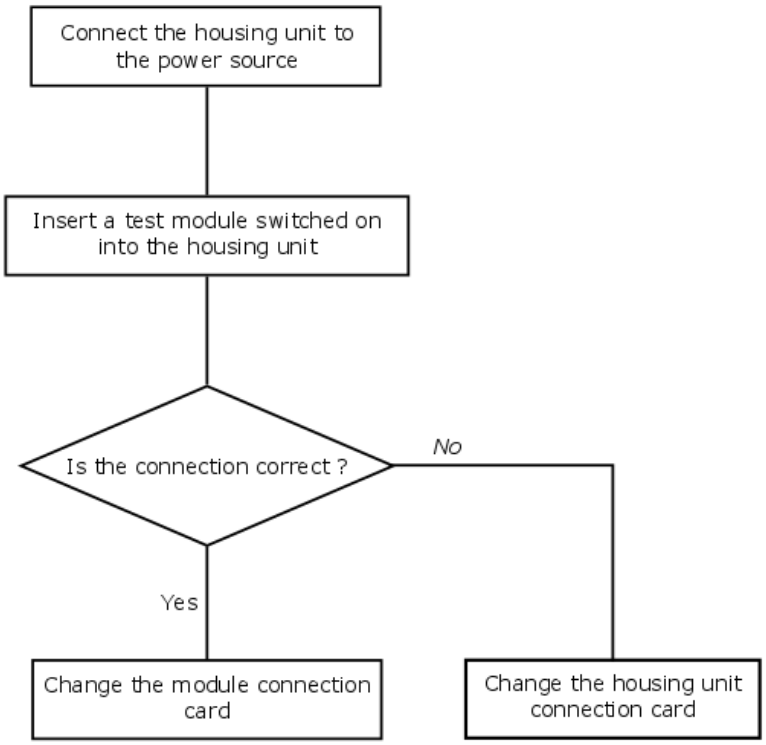
20.6 Insp. Flow Fail



20.7 Keyboard Fail



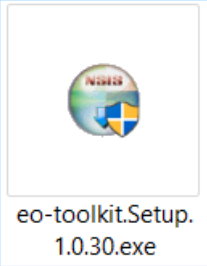
20.8 No communication between the unit and the ventilator



21 APPENDIX 2: Software installation

21.1 EO TOOLKIT

- Download EO-Toolkit .exe file from the maintenance portal of EOVE website (http://eove.fr/cms/en/produits-et-support/maintenance/eo-70-cough-assist)
- Install EO-Toolkit



NOTE: FTDI drivers must be updated/installed from Windows Update or the following links:

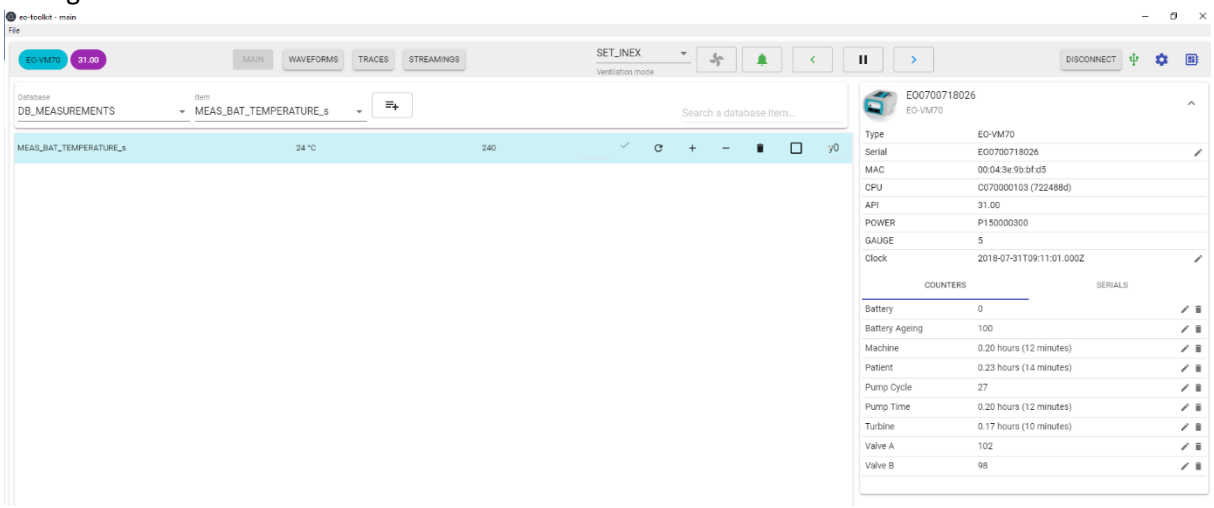
Windows 32 bits

https://www.ftdichip.com/Drivers/CDM/CDM%20v2.12.28%20WHQL%20Certified.zip

Windows 64 bits

https://www.ftdichip.com/Drivers/CDM/CDM%20v2.12.28%20WHQL%20Certified.zip

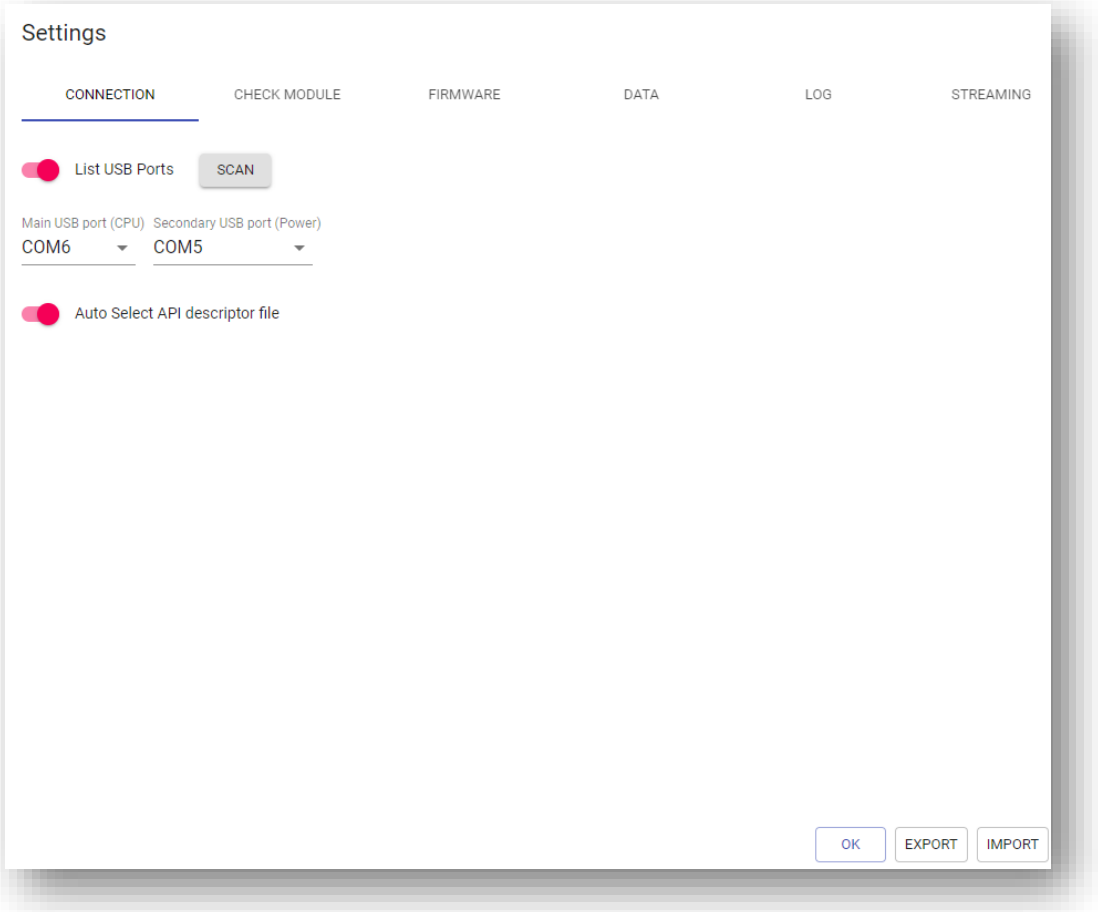
- Configurate EO-TOOLKIT



- Launch the software
- Click on Settings

- Connect an EOVE-70 module by usb to the computer
- Choose two consecutive usb ports lower than 10

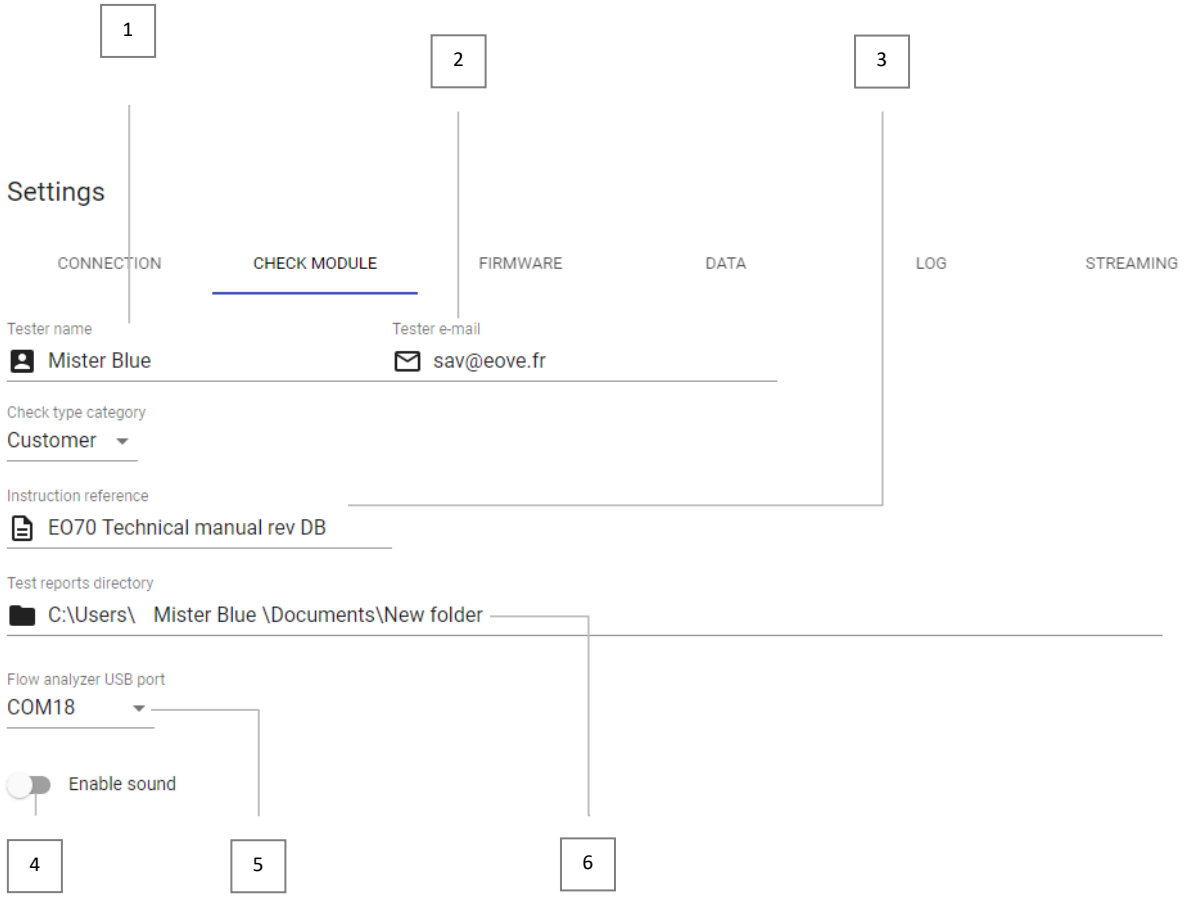
- Select the API file required. It must be accordance with software version which might be updated. By default, enable Auto Select API descriptor



- Click on OK

WARNING: Make sure to use two consecutive usb ports lower than 10.

- If you run the automatic performance controls via EO-Toolkit, complete the check module settings as bellow



1- Technician

2- User e-mail address

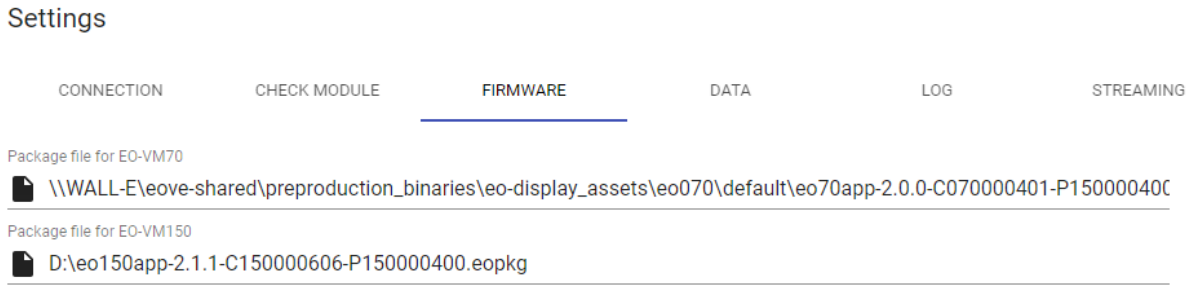
3- Documentation associated

4- On/Off test sound

5- Choice of Flow Analyzer USB port (must be connected first)

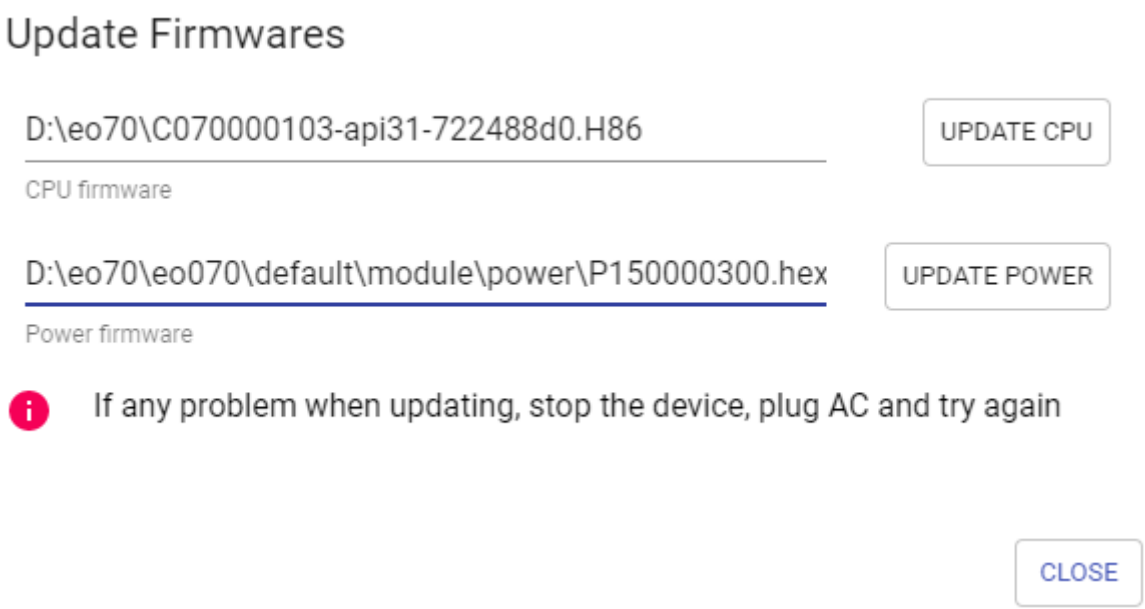
6- Destination folder to save Process Value tests

- Click on update firmwares



Or,

- Select path file to executable PIC and CPU software



22 APPENDIX 3: Inspection sheet

EOVE New Medical Inspiration	INSPECTION SHEET EOVE-070	SAV100-12 REV D 06/05/20

OP6: EO-DISPLAY TEST	**Result**	**Comments**
OP6-1: Operation & charging with external power source		
OP6-2: Software versions		
OP6-3: Communication with module		
OP6-4: Operation on internal battery of ventilation module		
OP6-5: USB ports verification		
OP6-6: Wi-Fi feature (Optionnal)		
OP6-7: Setting of clock / date / language		
OP6-8: Switch off from ventilation module		
OP6-9: Labels: power source, serial number		

EQUIPMENTS	Charger module S/N: External battery EO-BAT9 S/N:		
COMMENTS			
	DATE	PLACE	SIGNATURE

23 APPENDIX 4: Spare parts list

EOVE
New Medical Inspiration

Spare Parts List EO-70SMD

Note: To order a spare to EOVE, select the appropriate reference in EOVE P/N column. To order directly to Air Liquide Medical System, select the reference in ALMS P/N column

Rev V
10/9/2021

PRODUCT DESCRIPTION	EOVE P/N	ALMS P/N	EOVE PRICE	PHOTO	LIST OF COMPONENTS	COMMENTS	PRODUCT	AVAILABILITY
Tablet Battery Kit EO1X0-03	SP-TABBAT-003	KY732636	153.00 €		Z380M Tablet battery + support	From manufactured device S/N > EO1X00218011S		✓
Docking Lower Shell EO1X0	SP-DOCKLOSHEL-001	KY732645	**51.00 €**		DCK Lower Shell + 4 DCK Feet + SN Label	Provide S/N to edit the label		✓
Insulating Washer	SP-INWASH-001	KY732628	24.48 €	 x20	20 pieces			✓
DCK Power Connector Spinning Prevention	SP-SPINPREV-001	In progress	48.96 €	x8	8 pieces			✓
Inspiratory Flow Sensor	SP-INSFLOWSENS-001	KY732637	183.60 €					✓
Internal Battery Pack Li-Ion	SP-INTBATT-002	KY732930	255.00 €					✓
Display data cable EO1X0	SP-DISPDATACBL-002	KY732623	30.60 €			From manufactured device S/N > EO1X00117051S		✓
FiO2/SpO2 Cable + Connector	SP-FIO2SPO2CBL-002	KY732626	40.80 €			From manufactured device S/N > EO15005180228		✓
Remote Alarm Cable + Connector	SP-REMALCBL-002	KY732647	51.00 €			From manufactured device S/N > EO15005180228		✓
Turbine EO-70	SP-TURB70-001	KY732673	459.00 €					✓
Solenoid valve Clippard EO70	SP-SOLVALVE-002	KY732676	76.50 €					✓
Solenoid valve Camozzi EO70	SP-SOLVALVE-003	KY732675	86.70 €					✓
Pneumatic Block EO70	SP-PNEUBLOCK-002	KY732657	387.60 €					✓
Valve Support EO70	SP-VALSUP-001	KY732672	61.20 €	  x2				✓
Pneumatic Block Cover EO70	SP-PNEUCOV-001	KY732658	20.40 €					✓
Exhalation/Inhalation valve EO70	SP-EXHVALVE-002	KY732674	30.60 €	 x20		Do not use ref SP-EXHVALVE-001 for EO70 purpose		✓
Blower Control PCB EO70	SP-BLOWRPCB-002	KY732664	183.60 €					✓

CPU Board EO70	SP-CPU70-001	KY732661	1,173.00 €								✓
Module Keyboard EO70	SP-MODULKEYBD-002	KY732663	91.80 €								✓
Pump EO70	SP-PUMP-001	KY732669	122.40 €								✓
Patient Circuit Port EO70	SP-CIRPORT-001	KY732670	20.40 €								✓
EO70 PM KIT	SP-PMKIT-001	KY732668	40.80 €	 x2	 x4						✓
EO70 Air Filter	SP-AIRFILT-001	In progress	51.00 €	 x10							✓
Lower Shell EO70	SP-LOSHEL-002	KY732665	249.90 €						Lower Shell + Remote Alarm & SpO2 Connectors + Foams + 2 Spring Buttons + Keyboard + Battery Flap + SN Label		✓
Upper Shell EO70	SP-UPSHEL-002	KY732667	76.50 €						Upper Shell + Foams + 2 Spring Buttons		✓
Valve Cover EO70	SP-VALCOV-001	KY732660	15.30 €								✓
Docking Station Power PCB EO70-01	SP-DOCKPWR-004	KY732662	153.00 €								✓
Docking Display ASSY EO70	SP-DOCKDISPL-002	KY732671	464.10 €								✓
Docking Covers EO70	SP-DOCKCOV-002	KY732659	20.40 €						3 DCK Covers + 2 DCK Inserts		✓
Docking Upper Shell EO70	SP-DOCKUPSHEL-002	KY732666	**45.90 €**						DCK Upper Shell + EO70 Label + Adhesive to past the tablet		✓
EO-Display LVDS cable	SP-LVDSCBL-001	In progress	20.40 €								✓
EO-Display Touch Screen Cable	SP-TOUCHCBL-001	In progress	15.30 €								✓
EO-Display Connection Board	SP-PISTBOARD-001	In progress	122.40 €								✓
EO-Display DC Plug	SP-DCPLUG-001	In progress	40.80 €								✓
EO-Display Screen EO70	SP-UPDISPLAY-002	In progress	234.60 €						Display screen + Upper shell		✓
EO-Display timer battery	SP-TIMBAT-001	In progress	20.40 €								✓
EO-Display CPU board	SP-CPUDISP-001	In progress	510.00 €						CPU + SOM + HEATSPREADER		✓

EO-Display SOM	SP-DISPSOM-001	In progress	306.00 €								✓
EO-Display Fan Suspension	SP-FANSUSP-001	In progress	10.20 €								✓
EO-Display Cooling Fan	SP-COOLFAN-001	In progress	30.60 €								✓
EO-Display Assembled Cooling Fan	SP-ASSFAN-001	In progress	40.80 €					Fan suspension + Colling Fan			✓
EO-Display USB board	SP-USBRD-001	In progress	66.30 €								✓
EO-Display inserts EO70	SP-DISPINSRT-002	In progress	5.10 €								✓
EO-Display Covers	SP-DISPCOVRS-001	In progress	25.50 €								✓
EO-Display Handle	SP-DISPHANDL-001	In progress	10.20 €								✓
EO-Display Screws Kit	SP-SCREWSKIT-001	In progress	10.20 €					Screws + Washers			✓
EO-Display Keyboard	SP-DISPKEYBRD-001	In progress	20.40 €								✓

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Maintenance tools list EOVE

Note: To order a spare to EOVE, select the appropriate reference in EOVE P/N column. To order directly to Air Liquide Medical System, select the reference in ALMS P/N column

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10/9/2021

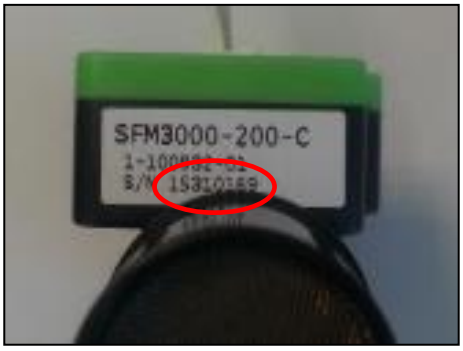
PRODUCT DESCRIPTION	EOVE P/N	ALMS P/N	EOVE PRICE	PHOTO	LIST OF COMPONENTS	COMMENTS
EO1X0-VNT Testing cable PF300	SP-TESTCBL-001	In progress	102.00 €		Cable RS232/microUSB for final control - PF300/ventilation module	
EO1X0-VNT Testing cable CITREX H4	SP-TESTCBL-002	In progress	153.00 €		Cable RS232/microUSB for final control - Citrex H4/ventilation module	
FiO2 testing connector	SP-TESTFIO2-001	In progress	36.72 €			
Reconditioning Tool for device AC Plug	SP-PLUGTOOL-001	In progress	91.80 €			
Remote alarm test cable	SP-REMCBL-001	In progress	81.60 €			
Battery life test circuit	SP-BATESTCIR-001	In progress	20.40 €			
Tablet pattern EO1X0-001	SP-TABPAT-001	In progress	204.00 €		For tablet model ME176	Until Docking station S/N < EO1X001170515
Tablet pattern EO1X0-002	SP-TABPAT-002	In progress	204.00 €		For tablet model Z370C	Docking station manufactured between EO1X001170515 < S/N < EO1X002180115
Tablet pattern EO1X0-003	SP-TABPAT-003	In progress	204.00 €		For tablet model Z380M	From docking station S/N > EO1X002180115
Tablet repair tool EO1X0	SP-TABTOOL-001	In progress	30.60 €			Tool to open the tablet
EO70 Pneumatic bloc Tool	SP-PNEUTOOL-001	In progress	153.00 €			
EO70 Sealing test plugs	SP-SEALPLUG-001	In progress	357.00 €	x3		
Double limb circuit 22mm	SP-DBLCIRCT22-001	In progress	20.00 €			
Double limb circuit 15mm	SP-DBLCIRCT15-001	In progress	25.00 €			

EO70 short single limb circuit 22mm	SP-SGLCIRCT22-001	In progress	15.00 €			
OM70 Tool	SP-OM70-001	In progress	102.00 €			

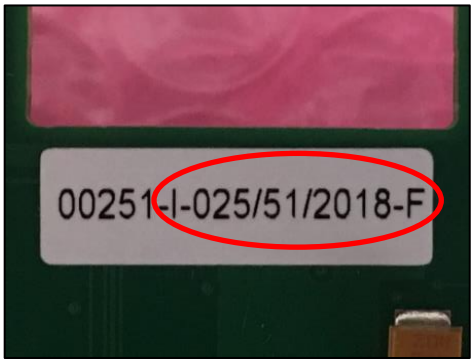
24 Appendix 5: Components serial numbers

Pneumatic block

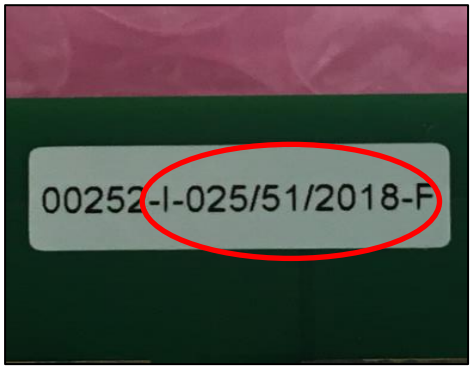
Solenoid valve



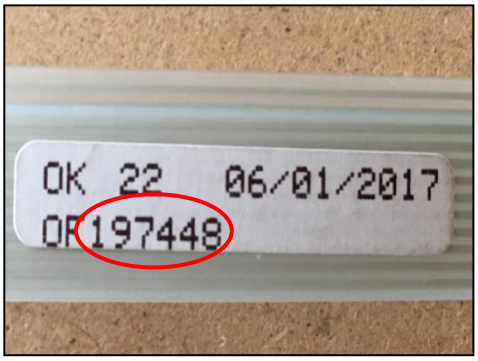
Inspiratory flow sensor



CPU board



Turbine board



Keyboard

EOVE1 Battery S/N (ex: 17-351501)

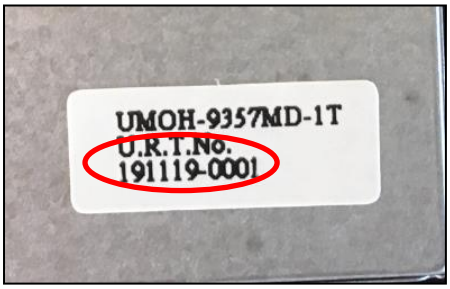
EOVE3 Battery S/N (ex : VCA2027182)

Turbine

CPU board **EO-Display**

Wifi board **EO-Display**

USB board **EO-Display**



Screen S/N **EO-Display**