EN

AC-150 Ventilator

User Guide (Patient)

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Introduction

The EOVE AC-150 ventilator provides mechanical ventilation for ventilator dependent and non-dependent patients.

Patient circuit for ventilator dependent patients:

- Double branch
- Single branch with proximal flow
- Leak ventilation circuit

Patient circuit for non ventilator dependent patients:

- Double branch
- Single branch
- Single branch with proximal flow
- Leak ventilation circuit

Applied parts are patient circuit components (not provided by EOVE).

AC-150 provides pressure and volume ventilation for adults and pediatric patients as prescribed by an attending doctor.

Indications for use

The AC-150 ventilator device provides continuous or intermittent ventilation support for pediatric and adult patients weighing at least 3.5kg (8lbs). These patients can be ventilator dependent and non-dependent patients and they can require invasive or non-invasive ventilation.

Environment of use

The AC-150 device is intended to be used in home, institution, hospital, portable and mobility environments(i.e. Train, Car, Airplane, Wheelchair).

AC-150 usage in a Helicopter is excluded.

Users

The operators of the AC-150 ventilator, as defined by the IEC60601-1are:

- The patient and/or the caregivers,
- The clinicians: doctor, nurse, physiotherapist

The service personnel of the AC-150 ventilator, as defined by the IEC60601-1, are :

- The installer (healthcare provider),
- The maintenance technician (healthcare provider)

Patient and or caregivers are intended to safely perform the following operations (with appropriate mandatory training from the homecare provider):

- Start and stop device
- Start and stop ventilation
- Inhibit alarm sound
- Switch presets
- Change preference settings
- Perform circuit replacement and circuit calibration

Patient and/or caregivers are not intended to:

- Change clinical settings
- Perform any maintenance operation

CAUTION	AC-150 ventilator is not intended for use as an emergency transport ventilator
⚠ **WARNING**	
● **Do not use AC-150 ventilator in an MRI equipment or in a barotherapy equipments.**	
● **A significant risk of reciprocal interference could be posed by proximity of specific investigation or treatment devices.**	
● **The AC-150 ventilator must not be serviced while in use on a patient.**	
● **The AC-150 ventilator is not intended for use in oxygen enriched environment.**	
● **The AC-150 ventilator is not intended for use with flammable anesthetics and neither for use in conjunction with flammable agents.**	

Contraindications

- Severe hypotension particularly with intravascular volume depletion
- Pneumothorax or pneumomediastinum
- After brain surgery or cranial trauma
- Cerebrospinal fluid leak
- Dehydration
- Bullous emphysema

Adverse effects

- Dry nose or mouth
- Eye irritation
- Bloating
- Gastric distension
- Skin wound
- Sinus discomfort
- Aerophagia
- Claustrophobia
- Dyspnea / excessive “deventilation dyspnea”
- Lung injury (including barotrauma, volotrauma)
- Increased secretion

Adverse effects specific to C-Flow mode

- Heat-related discomfort
- Thoraco-cervical discomfort

Clinical benefits

The direct benefit to the patient is provided by ventilation therapy, the AC-150 ventilator itself only has indirect benefit.

Definitions

⚠ **WARNING**	**Indicates a condition that may endanger the patient or the device operator**
CAUTION	Indicates a condition that may damage the device or equipment
NOTE	Advice that makes operation of the device more convenient or efficient

Ventilator dependent patient warnings

⚠ **WARNING**
● **To avoid patient death or serious injury, regularly monitor the patient and ventilator to determine the need to provide emergency ventilation in the event of an audible alarm or ventilator malfunction.**
● **An alternative means of ventilation should always be available for ventilator-dependent patients. Failure to do this may result in patient injury or death. The absence of an alternative means of ventilation such as a second ventilator of the same type or a self-inflating, manual resuscitator (as specified in ISO 10651-4) fitted with a mask may cause the death of the patient in the event of failure of the ventilator.**
● **Always provide an immediate access to an alternate mean of ventilation, which is ready to use, to avoid the death or a severe injury of the patient.**
● **For a maximum safety, an SPO2 monitor with a low SPO2 alarm activated is recommended for ventilator-dependent patients.**
● **A ventilator dependent patient should always be monitored by trained personnel.**
● **For ventilator dependent patients, in case of failure of the principal ventilator and using a stand-alone ventilation module (without docking station) as a backup device, the backup ventilation module must be used immediately by pressing on the module keypad buttons without inserting it in the docking station of the faulty ventilator. In any case of failure, contact your technical assistance immediately after ensuring the patient is safely ventilated with the backup device and wait for further instructions.**
● **Ensure that the home AC mains supply and connections are safe and comply with the applicable regulations. For ventilator dependent patients, consider using a back-up power system. For safe and adapted solutions, refer to Battery Pack (EO-BAT9) user manual and to the section "Connecting two power sources with Y cable" below.**
● **For ventilator dependent patients in mobility, we strongly recommend not to use internal battery as primary power source. It is mandatory to use an additional power source such as EOVE Battery Pack (EO-BAT9) when the patient is moving away from an external power source (AC or DC).**
● **If a "BAT. CHARGE FAIL" or a "BATTERY FAIL" alarm triggers, the ventilator internal battery needs to be changed. For ventilator dependent patients, contact your technical assistance immediately after ensuring the patient is safely ventilated with the backup device and wait for further instructions.**
● **As the battery ages, the available capacity decreases. When the remaining battery capacity is low, do not rely on the internal battery as the primary power supply and contact your service provider.**

•	**When using the AC-150 as a backup ventilator, check and charge the internal battery level regularly (recommended every month).**
•	**Some circuit and accessories configurations (mainly in leak pediatric configuration) with high resistive pressure in the circuit could lead to ineffective "Disconnection alarm". For ventilator dependent patient, "Disconnection alarm" must be tested after any calibration, setting changes or circuit configuration change. In case the disconnection alarm detection is not efficient, it is mandatory to set a VTI Min alarm (leak configurations) or a VTI Max alarm (valve configurations) as a backup for disconnection events covering.**
•	**As in CPAP and C-FLOW modes, in a S(T) mode with Rate OFF, the ventilator behaves like a purely spontaneous device (S mode). A patient must have a sufficient ability to breath spontaneously to use this mode. A ventilator-dependent patient cannot be ventilated under such ventilation modes.**

General warnings and cautions

⚠	**WARNING**
•	**Do not cover the ventilator or place it in a position that would alter its proper functioning. Example 1: Do not place near a curtain so as not to obstruct the circulation of cooling air and thus cause overheating of the ME EQUIPMENT. Example 2: Do not block the air inlet orifice, this could perturbate patient's ventilation.**
•	**Do not add intermediate pieces or accessories to the ventilator that are not listed in the operating instructions, otherwise the ventilator may not work properly.**
•	**In case of nebulization or humidification, it will be necessary to replace the breathing system filter more frequently to prevent increased resistance or clogging.**
•	**When the ventilator is running, use only the travel bag listed in the instructions for use (nomad or travel bag), to avoid any undesirable performance of the ventilator and consequently result in the death of the patient. Do not use the bag shipped with the device, it is not suitable for the use during the transport.**
•	**To reduce the likelihood of ventilator disconnection and avoid undesirable ventilator performance, use only accessories compatible with the ventilator.**
•	**Ventilator accuracy can be degraded by the gas added by the use of a pneumatic nebulizer.**
•	**The user and/or the patient must inform its service provider of any serious incident occurred with the device. This information must be notified to EOVE and to competent local authorities if necessary.**
•	**Read and understand the entire manual before using the AC-150 ventilator.**
•	**The AC-150 ventilator is a restricted medical device intended for use by qualified trained personnel, under the direction of a doctor.**
•	**Use the AC-150 ventilator only as directed by a doctor or healthcare provider.**
•	**Information in this manual does not supersede instructions given by the prescribing doctor.**
•	**Install and configure the AC-150 ventilator in accordance with the instructions given in this guide. Non-specialist operators or institutions encountering problems with set-up, operation or maintenance should immediately contact their EOVE representative.**
•	**Verify the effectiveness of ventilation and alarms before connecting a patient to the ventilator.**

● **Handle the AC-150 ventilator and AC power supply with care during and after use especially if ambient temperatures are high as some surfaces may become hot. Do not leave the AC-150 ventilator in direct contact with the patient for extended periods of time.**
● **The AC-150 should be kept out of reach of children and domestic animals to ensure their safety and the safety of the patient and to avoid damage to the ventilator and the accessories.**
● **The battery and all machine parts of the ventilator and accessories (including trolley) should be disposed of appropriately, following correct regulations for waste management in order to minimize the risk for the environment. They should not be disposed of in household waste.**
● **Ensure that the device and its power charger are placed in a way that allows an easy disconnection from the mains.**
● **Do not use the ventilator at altitude higher than 3000 m, or out of the temperature range 5°C-40°C. Using the ventilator out of these conditions can alter ventilation performance and consequently cause patient death.**
● **Do not supply the ventilator with a wheelchair battery unless this is mentioned in the wheelchair user's instructions or in the ventilator user's instructions, otherwise it could affect ventilator performance and result in patient death.**
● **Ventilator's accuracy can be degraded when using a nebulizer.**
● **Never touch the ventilator with an injured skin.**
CAUTION
The AC-150 ventilator is not intended for use as an emergency transport ventilator.
Do not expose the AC-150 ventilator to excessive force, do not shake or drop.
If the ventilator or its power supply are dropped or mishandled, immediately discontinue use and contact your EOVE representative.
Repairs and servicing should only be carried out by an authorized EOVE service representative or a qualified and certified service representative.
The airflow for breathing produced by the ventilator can be higher than the temperature of the room by up to 6°C. Exercise caution if the ambient air in the room exceeds 35ºC.

Chapter 1 – Description of the AC-150 ventilator

Front panel

1. Display screen	4. EO device housing unit
2. Ventilation module	5. Inspiratory / Circuit Port
3. Proximal pressure, valve, and proximal flow connectors	6. Menu bar / keyboard

Rear panel

1. Air inlet and hypoallergenic filter	5. USB-1 port (data retrieval)
2. DC Power connector	6. O_2 input
3. Docking station Power Button	7. FiO_2 / SpO_2 connector
4. USB-2 port (maintenance only)	8. Remote Alarm connector

Rear view of ventilator without housing

1. USB port (Do not use - limited to maintenance operations as described in the maintenance manual)	3. Connection to outer housing
2. DC Car charger connection	

References of the ventilation module, docking station and accessories included in the first shipment

AC-150 ventilator, ref **AC-150VNT** includes:

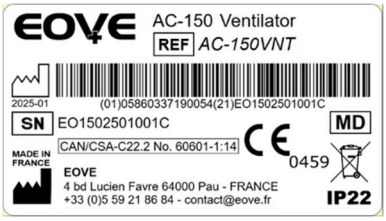
- A ventilation module: **AC-150 Ventilator module**, ref **AC-150VNT-VM**
- A docking station: **EO-1X0 Docking station**, ref **AC-150VNT-DCK**
- A power supply (AC/DC): **EO Charger module**, ref **EO-PWRCHRG**
- A double limb circuit adaptor: **AC-150 Double branch adaptor**, ref**EO-DB2-1P-KIT(EO-DB2-1P-INTERFACE+ EO-DB2-1P)**
- A leak circuit adaptor plug: **Leak and Mouthpiece adaptor**, ref **EO-LMP2**
- An oxygen connector:**O2 Low Flow Connector**, ref **EO-O2CON**
- A bag for transport: **Transport Bag,** ref**EO-CARBAG1X0**
- A user manual

Serial Number explanation

The serial number of AC-150 can be found on the label just after the SN symbol. It appears also after the application identifier (21) encoded in the barcode. The format is EO150YYMMiiiX. It includes the manufacturing date at the format YYMM.

The format was updated since serial number SNEO15021xxxxxx. Before that, the format was EO150MMYYiiiX.

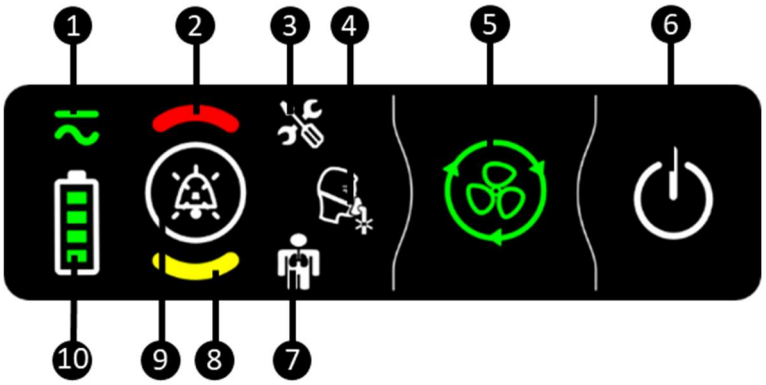
Example: The AC-150 ventilator below was built in April 2021.



Three different stickers can be found on EOVE devices and packaging:

- One sticker with a C extension after the Serial Number placed on the main ventilator box
- One sticker with a B extension at the end placed on the ventilation module
- One sticker with an S extension at the end placed on the docking station

Menu Bar / Keyboard



1. Power source indicator	6. ON / OFF switch
2. High priority alarm indicator	7. Physiological alarm indicator
3. Technical alarm indicator	8. Medium priority alarm indicator
4. Circuit alarm indicator	9. Alarm reset switch
5. Ventilation start / stop switch	10. Battery life indicator

Symbols table

The following symbols may appear either on your product or on its packaging.

Keypad indicators / buttons			
	Alarm priority indicators and mute Button		Patient Alarm indicator
	Technical Alarm indicator		Interface Alarm indicator
	Battery level indicator		AC/DC power indicator
	On/Off button		START/STOP ventilation button
Touch interface symbols			
	Ventilation start		Ventilation stopping
	Menu access button		Preference menu
	Return to Home Screen		Calibration screen access

	Alarm access button		Maintenance menu
	Data menu		Setting Mode locked
	Monitoring menu		Setting menu
	Battery charging		Battery power indicator
	Valve circuit		Leak circuit
	Mouthpiece configuration		Proximal free configuration
	Adult Patient		Pediatric Patient
	Waveform selection (pressure/Flow/volume)		Waveform selection (normal / loop)
	Waveform play		Waveform pause
	Single branch patient circuit		Single branch patient circuit with proximal flow
	Double branch patient circuit		Inspiration trigger (I) / Exhalation trigger (E) activation symbols
	Inhibition button (change of color according to the alarm priority)		Power off button
	Active settings information button		Help button
	Active alarm (change of color according to the alarm priority)		Connected to a remote monitoring platform
Device / packaging symbols			
	Exhalation Valve port		Proximal Pressure Port
	Inspiratory Port (to patient)		Do not obstruct
	Expiratory Flow port		Connection ports
	Oxygen inlet		Connection port
	USB connector		Warning
	Alarm repeater connection		Applied part BF type
	Consult operating instructions		Battery replacement warning: Only trained personnel can replace batteries
	DC power inlet	IP22	International Protection Marking, IEC standard 60529. Protection against ingress of water and foreign objects

	Date of manufacture		This side up
	Complies with European legal requirements		Manufacturer
	High and low temperature limitations for transport and storage	SN	Serial number
	Should not be disposed of in household waste	REF	Product reference number
	Keep dry		Recyclable
	Danger of fire if damaged	©	Copyright
	Fragile. Handle with care		Class II device
95 % 10	Humidity range for transport and storage		Docking station Power Button
: 20kg	Maximum weight for trolley (including ventilator and accessories)		Do not push (symbol for trolley accessory)
MD	Medical Device	1	Single patient, multiple use
6M	During storage, this device needs to be fully recharged at least every 6 months		Importer
https://eove.fr	Numerical manual available at https://eove.fr		Do not step (symbol for trolley accessory)
: 20kg	Maximum weight for trolley (including SM Device and accessories)		

AC power supply additional symbols

	Consult instruction for use	c US	UL certification for US and Canada
	For indoor use only	EAC	Complies with UEEA legal requirements

Chapter 2 – Operating instructions for the AC-150 ventilator

⚠	**WARNING**
●	**Blocking the air inlet could lead to patient injury.**
●	**Keep machines clear of blankets, soft toys, and dust. Keep out of direct sunlight.**
	CAUTION
	To prevent possible damage to the ventilator always place it on a flat, dry and stable surface. To protect the device during transportation, always ensure that the AC-150 ventilator is transported using the EOVE Transport bag, Nomad bag or Travel bag.
	Always protect the device from water if used outdoors.

Set Up test

Before using the AC-150 ventilator, perform the following Set Up test.

⚠	**WARNING**
●	**If alarms do not sound during the Set-Up test, do not use the ventilator.**
	CAUTION
	Contact your healthcare provider or EOVE for assistance if any of the checks in the set-up test fail.
	If the AC-150 has been returned after servicing, ensure it is clearly labelled as disinfected before starting the set-up test or installing.

To perform a Set Up test

During a first patient installation, it is recommended to check the correct operating status of the device:

1.	Connect the device to the AC power source and turn it off.
2.	Check the condition of the device and accessories, and the condition of the patient's circuit.
3.	Turn on the device (see next page). The device should sound, and the display screen should turn on correctly.
4.	Disconnect the AC power source. The "AC power loss" alarm should trigger, and the medium priority alarm indicator and the alarm reset button should flash. Press the reset alarm button to stop the alarm.
5.	Connect the AC power source to the device. Two beeps should sound. Check that the power source indicator LED is on the ventilation module, and that "AC" is displayed on the patient interface.
6.	Perform a circuit calibration (see calibration on chapter 3).
NOTE	Pressure and flow sensors are tested during circuit calibration.

⚠	**WARNING**
•	**If any of these steps fails, do not use the AC-150 ventilator. Contact your healthcare provider or your Eove representative for a device checking.**
•	**Some circuit and accessories configurations (mainly in leak pediatric configuration) with high resistive pressure in the circuit could lead to ineffective "Disconnection alarm". For ventilator dependent patient, "Disconnection alarm" must be tested after any calibration, setting changes or circuit configuration change. In case the disconnection alarm detection is not efficient, it is mandatory to set a VTI Min alarm (leak configurations) or a VTI Max alarm (valve configurations) as a backup for disconnection events covering.**

Additional tests for the supervising clinician

- Low volume (Low VTE) - All valve modes: set the low VTE alarm to a value higher than the monitored VTE for 3 consecutive breaths or 10 s.
- High volume (High VTE)- All valve modes: set the high VTE alarm to a value lower than the monitored VTE for 3 consecutive breaths or 10 s.
- Delivered volume (VOL OUT OF RANGE): No test possible without hardware modification in the device (fault condition).
- High pressure alarm- All modes except C-flow and CPAP: block the test lung during inspiration for three consecutive breaths.
- Hypoventilation (low-rate alarm)- modes PSV, PSV VT, ST, CPAP, VTS: set the low-rate alarm to a higher value than set rate and let the ventilator running for 6 consecutive breaths.
- Continuous positive pressure (PEEP alarm)- all modes: clamp the proximal pressure tubing in order to obtain a pressure higher than set PEEP + 10 cmH2O during 6 consecutive breaths or 17 s.

Additional tests for the non-professional user

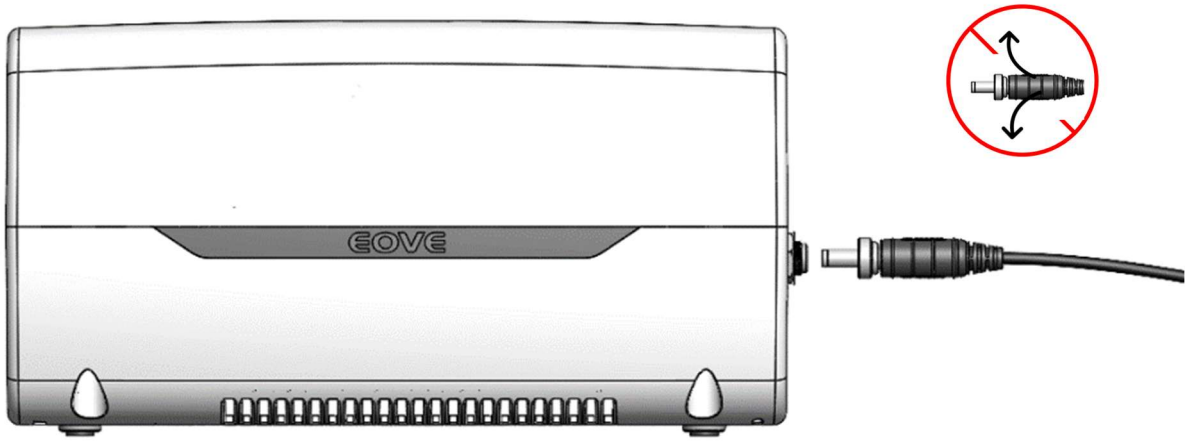
⚠	**WARNING**
•	**Do not perform these tests on a running ventilation with a patient connected to the ventilator. Use a test lung or a 4 to 5 mm leak to test a ventilator not connected to a patient.**

- High LEAK alarm -leak modes: set the leak alarm max threshold to a higher value than the monitored value for 6 consecutive breaths.
- Internal power source close to depletion: Unplug the ventilator for any external power source and let the internal battery discharge until “empty battery” alarm triggers. Plug back the mains power supply to stop the alarm and recharge completely the internal battery.
- Low pressure of the airways: unplug the patient circuit at ventilator side and wait for “disconnection” alarm to trigger. Plug back the patient circuit and check that the alarm disappears.
- Low inspiratory pressure: unplug the patient circuit at patient level and wait for the “disconnection” alarm to trigger. Plug back the patient circuit and check that the alarm disappears.
- Obstruction (occlusion alarm) - All modes except leak modes: block the inspiration outlet for two consecutive breaths or 5 s (longest of the two, 30 s maximum) after the faulty monitoring are obtained (VTI < 10 ml). Release the inspiration outlet and check if the alarm disappears.
- Failure of the external power supply network: unplug the device from the mains and check the triggering of the “AC power loss” alarm. Plug back the mains and check if the alarm disappears.

- Failure of the continuous external power source: after connecting the EO-BAT9 battery to the AC-150, unplug the EO-BAT9 and check the triggering of “DC power loss” alarm. Plug back the EO-BAT9 and check if the alarm disappears.
- Low exhaled volume alarm (double branch circuit) – all valve modes: With low exhaled volume activated, disconnect and plug the expiratory branch of the patient circuit during 3 consecutive breaths or 10 seconds. Check if the alarm triggers, then plug back the circuit and check if the alarm disappears.
- Level of O2: with FIO2 sensor installed and low FIO2 alarm set, shut the O2 source and check that “low FIO2” alarm triggers. Open the O2 source and check if the alarm disappears.
- Determination of internal battery running time: unplug the external power supply, wait for 1 minute, and check the displayed autonomy value in the up-right corner of the display.
- Distributed alarm system test: with an AC-150 connected to the alarm system, trigger an alarm on the ventilator (e.g., AC power loss) and check it is properly transmitted to the distributed alarm system. Cancel the alarm and check if the distributed alarm system stops transmitting the alarm. Unplug the remote alarm cable and check if the distributed alarm system is triggering an alarm.

External power connection

To connect properly the external power source, the male connector must be plugged in the axis of the device female connector. Then it can be screwed to ensure a reliable connection.



⚠	**WARNING**
●	Improper insertion of the male power plug may damage the device female connector. Contact your homecare provider if the power connection is not stable (intermittent alarms of power loss).
NOTE	The 2 pins at the center of the device female connector must be spread a little to keep a reliable connection with AC charger.

Turning on the device

Ensure the device has been charged prior to use or connect to AC power or DC connector inlet.

1. Insert AC connector into power inlet.
2. Turn the screw lock clockwise to secure.
Device will turn on automatically. If starting on battery, press on front panel keyboard to power on the ventilator.

Turning off the device

From the touch interface - Main proceedings

From the Home screen of the touch interface, press and hold until the circle becomes red.
1. A confirmation message is displayed. Validate.
2. The ventilator turns OFF and the touch interface turns to a deep-sleep mode.
WARNING
● **The AC-150 ventilator cannot be powered off during ventilation**

From the module - Secondary proceedings

Press and hold until the Alarm reset switch flashes.
Press Alarm reset switch to confirm.
1. The ventilator turns OFF.

Starting and stopping ventilation

Ventilation can be started and stopped either from the touch screen or from the keyboard. Various preset ventilation treatments may be stored on the device by your clinician to ensure the best therapy for you. Use these presets according to the instructions provided by the clinician.

To **START** ventilation using the menu bar:

1. Press on the Keyboard
2. Ventilation starts

To **START** ventilation using the Touch Screen:

1.	Press on the touch screen
2.	Ventilation starts

To **STOP** ventilation using the Keyboard:

1.	Press and hold until the alarm key flashes.
2.	Press to confirm.
3.	Ventilation stops

To **STOP** ventilation using the Touch Screen:

1.	Press and hold until flashes. The red line around the START/STOP key completes a full circle.
2.	The pop-up on the screen will ask you to validate your choice. Validate to confirm.
3.	Ventilation stops

CAUTION
The AC-150 ventilator cannot be powered off during ventilation
Unplugging from mains power does not power off the device. It will continue to run on the internal battery.
The device must be turned off manually before disconnecting from AC power for any extended period. Failure to do so may result in battery depletion and the alarms may be activated.

Using Stand-by mode

The use of the stand-by mode is recommended to save up the battery autonomy of the AC-150 ventilator, especially in mobile usage. Stand-by mode will reduce luminosity of the screen. That will preserve battery and keep system ready to wake up immediately when needed.

By default, the stand-by mode will occur automatically after 2 minutes of inactivity. This feature could be deactivated in the maintenance menu.

Touching the screen, powering on, or inserting the module in the station will wake up the interface as well. If an alarm triggers, it will wake up the interface immediately.

Turning on and off the docking station

If the module is inserted in the docking station, it will power up and power down automatically following the ventilation module status.

During a storage period or a long period of non-use, the docking station should be switched off.

To switch on and off the docking station and the touch screen, press the docking station power button for a few seconds.

CAUTION
With a ventilation module software version prior to C150000700, it is not possible to restart the device within the 10 s it was stopped, otherwise the screen may not restart properly (resulting in a black screen while the ventilation module is on). If that happens, pressing the docking station power button will restart the screen.

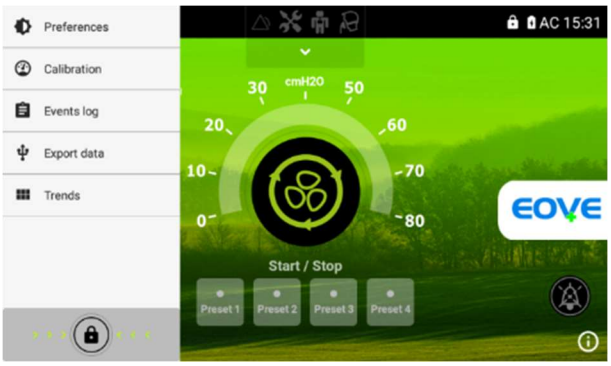
The Home screen

On the home screen, there are important information about the alarms, the pressure of ventilation, the presets modes set up by your clinician. It also provides menus for choosing your preferences and calibrating the ventilator. The Home Screen is accessible from all other screens by pressing.

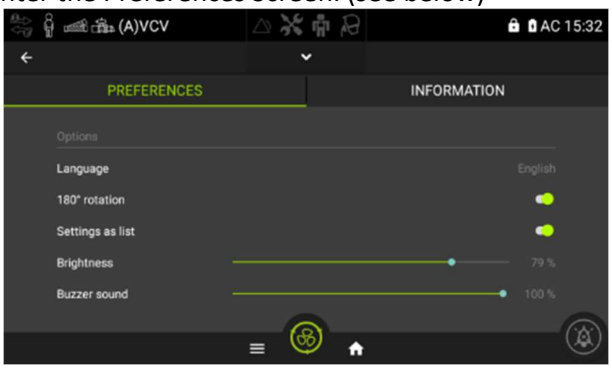
1. Patient triggered breath indicators (Inspiration / Expiration). 2. Patient mode indicator, indicates whether patient is adult or pediatric. The indicator flashes when the patient triggers a breath. 3. Circuit configuration: Single Limb + Valve, Single Limb with flow sensor + Valve, Double Limb + Valve, Single Limb + Leak, Leak + Proximal Free, Single Limb + Mouth Piece, Mouth Piece + Proximal Free. 4. Ventilation Mode, choose from (A)VCV, (A)PCV, PSV, MPV, MPP, PSV VT, V-SIMV, P-SIMV, CPAP, PAC, S(T), VTS, C-FLOW in the Setting Menu. 5. Alarm signal, lights up with the alarm color when there is an active alarm. 6. Alarm indicators, indicates the type of alarm (technical, interface or physiological). 7. Setting mode status, indicates whether the Setting menu is locked or unlocked. 8. Battery life indicator, indicates the level of charge left in the battery or whether the battery is charging. 9. Power source indicator, indicates whether the device is operating on mains power (AC) or DC power and battery life.	10. Time, indicates the time on 24hr clock. This can be set up and changed from the Preferences Menu. 11. Alarm tab, use to access the active alarms screen. 12. Alarm inhibition and pre-inhibition button, lights up with the alarm color when there is an active alarm. Stop the alarm sound or stop all the alarms sounds for the next two minutes. 13. Active settings information button, displays the active settings (including presets). 14. Preset selector, allow to switch from one preset to another 15. Start / Stop button, starts or stops ventilation. 16. Airway pressure indicator, indicates the pressure of the breath delivered. 17. Help button, displays the user manual. 18. Power Off button. 19. Time and date, can be set and changed from the Preferences Menu. 20. Event log direct access. 21. Setting menu direct access. 22. Menu button, allows access to patient screen and Setting menus.

Navigating the Patient screen and menu

From this screen, the patient can change preferences and calibrate the ventilator. Calibration should be performed at every circuit configuration change and is explained in Chapter 4 of this manual.
From the Home Screen, choose ☰ to access the Preferences, Calibration, Event Logs, Export data and Monitoring menus.



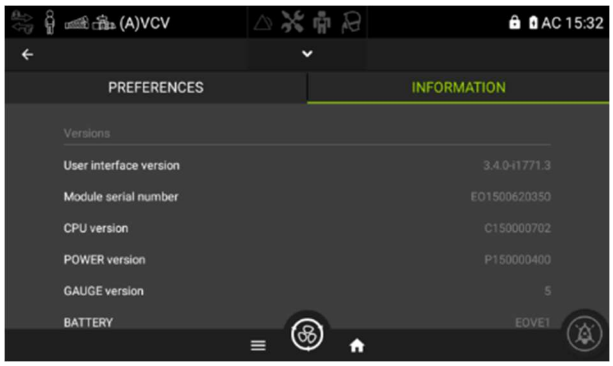
Presson Preferences to enter the Preferences Screen. (see below)



From this menu, the patient can adjust the following settings for the device.

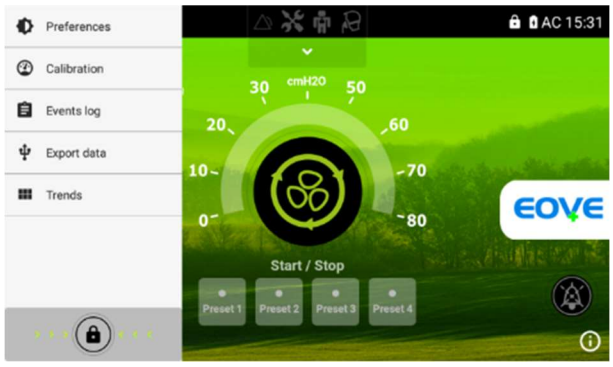
Language selection	Allows to change the interface language (available only if Setting menu is unlocked)
Rotation of the screen	Allows the screen to be rotated 180°. Press the toggle to rotate the screen.
Settings as list	Allows the display of settings and alarm settings as a list in the Setting menu.
Brightness/Contrast	Allows brightness levels from low to high. Simply swipe the blue circle from left to right to choose the preferred brightness.
Buzzer sound	Adjustable sound level for alarms. Simply swipe the blue circle from left to right to choose the preferred sound level.
⚠	**WARNING**
● **The sound level should be adjusted according to the criticality of the patient.**	
Current Date	Sets the current day, month and year. To set the date, click on the text and choose the date from the calendar. Press done when completed.
Current Time	Sets the current time on 24h clock. To set the time, choose the time from the dial and press done when completed.

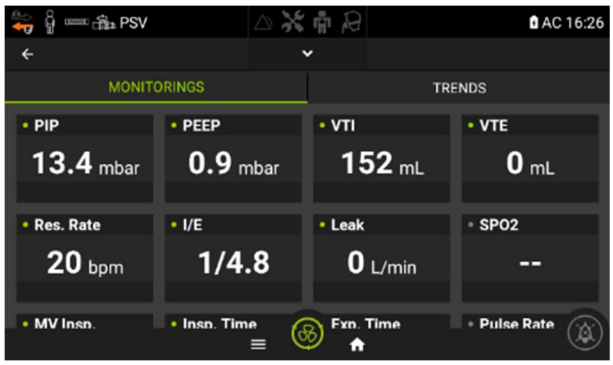
In the preference menu, the user can also access traceability and connection information.



Navigating the Trends/Monitoring menu

From this screen the patient or caregiver can access the monitoring menu.





This menu is the same as the monitoring menu that can be found in the Setting menu.

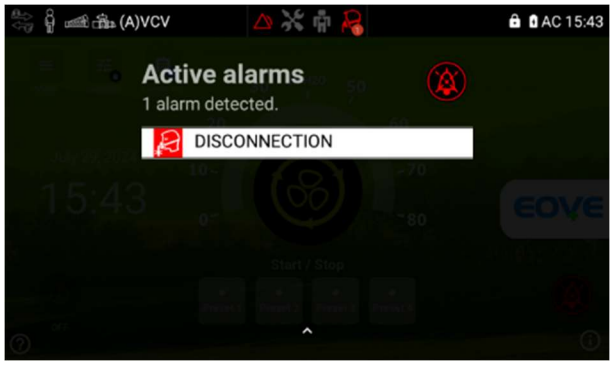
Navigating the Trends screens

From the trends tab, the patient or caregiver can access the median of last 24h, last week (average of medians) and last month (average of medians) monitored data.

Active alarm list

To access the list of active alarms for the ventilator, from the Home Screen, touch.

On the screen you will see the list of current active alarms.



See Chapter 4 for detailed information on alarms and how to respond to them.

Changing preset mode

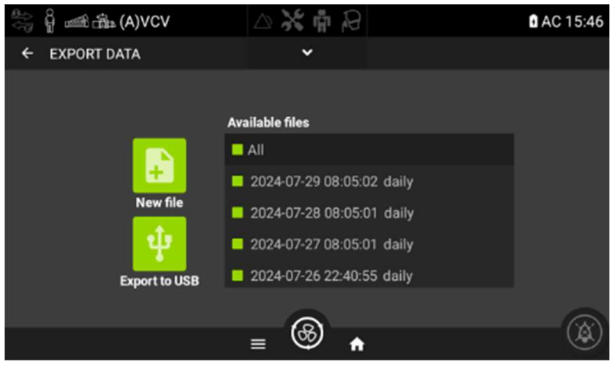
1. Current preset / Activated preset	2. Presets saved and not activated
3. Presets not saved	

To change the preset, click on the activable preset you want to switch on.

Click on the Information icon to display the current settings and the parameters of the activable preset.

Export Data screen

The data management screen will allow the user to export or generate ventilation data in the form of EOZ files.



One file is automatically generated every day at 08:05 (or at next device startup if not powered on at 08:05).

The last 30 ventilation files corresponding to the last 30 days of ventilation can be retrieved from this menu.

Each file contains 24 hours of ventilation waveforms at 80 ms sampling (40 ms with Newborn option activated), one month of monitoring at 1 minute sampling and several months of monitoring history based on daily average values.

Synchronisation screen

The synchronisation screen appears a few seconds at the interface startup. It can also be displayed briefly during usage without any impact on ventilation.

Chapter 3 - Patient circuit, power supplies and accessories configurations

⚠ **WARNING**
● **Use only CE marked circuit components compatibles for use with the AC-150.**
● **When using a non-invasive interface, the measurement of patient exhaled gas volume may be affected by leaks.**
● **To ensure correct functioning of the circuit, it is recommended that a calibration be performed at the installation of each new circuit.**
● **Install patient circuit tubing carefully, to avoid risk of strangulation or tripping.**
● **The responsible organization must guarantee compatibility of the ventilator with all accessories intended to be used for patient connection before usage.**
CAUTION
For pediatric patients, ensure that the breathing circuit type is suitable for use with a child. Pediatric patient circuits should be used when tidal volume is lower than 300 ml.

Patient circuit options

NOTE	The leak configuration is recommended for non-invasive ventilation; however, the AC-150 leak modes are compatible with invasive configurations if using intentional leakage such as whisper accessory.

The AC-150 ventilator can be used with five different circuits, as seen below. Breathing circuits may be 10, 15 or 22 mm in diameter.

See the following table to select suitable circuits and settings for different patient types.

30 ml to 300 ml	Paediatric	10 mm or 15 mm
> 300 ml	Adult	15 mm or 22 mm

The five types of circuits that can be used with the AC-150 ventilator are listed in the following table:

Single Limb with valve	Single limb circuit with expiratory valve (expiratory valve integrated into the circuit)
Single Limb with valve + proximal flow	Single limb circuit with expiratory valve and proximal flow sensor
Double Limb (with adapter)	Double limb circuit (expiratory valve integrated into the adapter)
Single limb with Leak	Single limb circuit with intentional leak using proximal free plug or proximal adaptor
Single limb with Mouthpiece	Single limb circuit with mouthpiece using proximal free plug or proximal adaptor

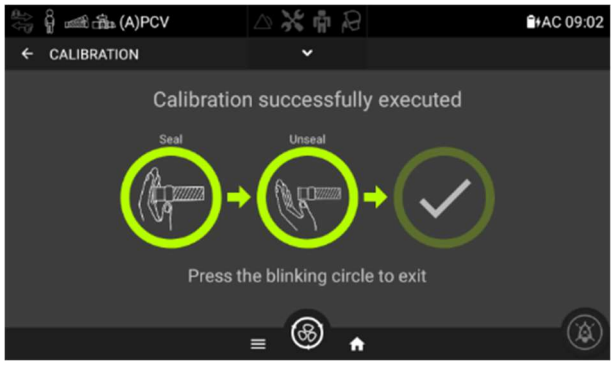
CAUTION
To ensure accurate performance, a circuit calibration is mandatory at every change of circuit configuration.
The blue proximal flow sensor tube must be connected at the side closest to the patient and according to the symbols on the ventilator ports. If connected in the wrong way, no VTE will be displayed.
Do not connect patient interfaces before starting the calibration. Patient interfaces include any components such as catheter mount, mask, tracheostomy tube or intentional calibrated leak. Patient interface can be added at the second step of calibration (open circuit) for improving disconnection alarm sensitivity.

Calibration

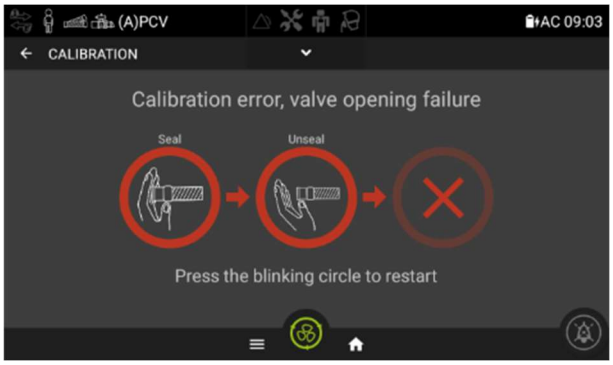
The EOVE ventilator can be calibrated to allow a wide range of circuit configurations and accessories. This calibration verifies the compliance characteristics of the circuit configuration chosen.

Starting calibration:

1. From either the General menu or CONFIG tab choose the Calibration sub-menu
2. Seal the circuit at the patient connection port, either manually or with a cap
3. Press "Seal"
4. Wait until the circle is completed
5. Unseal the patient circuit extremity and click the blinking circle
6. Wait until the circle is completed and follow eventual suggested verifications
7. Exit the calibration menu by clicking on "Validate"



8. If the calibration has failed or if clicking on "Abort" button, an error bar will appear with the reason of the failure.



NOTE	If a caution or warning appears on the touch screen after a calibration, ventilation can proceed if configuration matches with the symbols displayed. Contact your service provider to report the event.

⚠ WARNING
• **Mask with leak can be added at step 5 (open circuit) for more accurate pressure measurements and more efficient disconnection alarm. This should be considered in particular for new-born patients.**
• **Some circuit and accessories configurations (mainly in leak pediatric configuration) with high resistive pressure in the circuit could lead to ineffective "Disconnection alarm". For ventilator dependent patient, "Disconnection alarm" must be tested after any calibration, setting changes or circuit configuration change. In case the disconnection alarm detection is not efficient, it is mandatory to set a VTI Min alarm (leak configurations) or a VTI Max alarm (valve configurations) as a backup for disconnection events covering.**

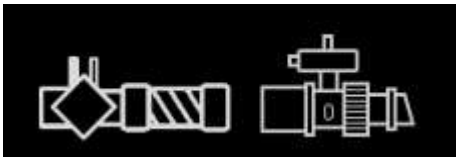
Connecting circuit configurations

Single limb circuit with valve:

1. Attach any accessories that may be required (eg. Humidifier or filter)
2. Connect the tubing to the inspiratory/circuit port on the front of the device (see image)
3. Attach the proximal pressure line and the valve to the proximal pressure and valve ports.(see image)
4. Select the circuit type and patient type (adult/pediatric) in the configuration menu and perform a calibration.
5. Attach the patient mask or other interface to the patient circuit.

Single limb circuit with proximal flow:

1. Follow steps 1-3 of the single limb with valve (see above)
2. Add the proximal flow sensor to the patient circuit end (blue tube on patient side)
3. Connect the proximal flow tubes to the proximal flow connectors (blue tube to upper connector)
4. Verify that the blue tube on the flow sensor is closest to the patient side.
5. Select the circuit and patient type and perform a calibration.



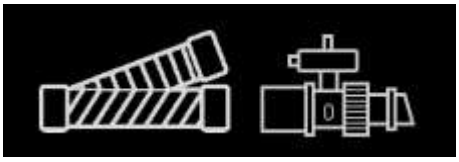
Double limb circuit with adapter EO-DB2-1P-KIT:

1. Screw the adapter receiver (see image below) into the front of the AC-150 ventilator. Screw tightly to ensure the connection.

2. Plug the adaptor. Make sure the two clips are engaged (bottom and upper).

3. Connect the inspiratory tubing to the inspiratory port and the exhalation tube to the exhalation port.

4. Select the circuit type (valve) in the configuration menu and perform a calibration.



	CAUTION
	The double limb circuit adaptor is single-patient-use and disposable. Only using an expiratory filter and observing its manufacturer recommendations can prevent from cross-contamination and allow its reuse.
⚠	**WARNING**
	This accessory is compatible with humidification systems. However, prolonged exposure to condensation can lead to misfunctioning of the VTE measurement. If that happens, removing and blowing the adaptor with air will solve the issue. It is recommended to regularly inspect the adaptor and adapt the humidification system or the humidification level if condensation is noted.

To remove the adaptor:
Press on the two clips at top and bottom (red arrows in the picture below), then pull it from the receiver at the same time (blue arrows in the picture below).

Single limb with intentional leak:

1. Attach any required accessories e.g. humidifier or filter.
2. Connect the inspiratory tubing to the inspiratory port on the front of the device.
3. According to the desired configuration, connect the proximal pressure line to the proximal pressure port or connect the proximal free plug as shown below.
4. Ensure the appropriate calibrated leak is integrated in the mask or added to the circuit.
5. Select the leak circuit type and patient type (adult/pediatric) in the menu and perform a calibration (without the leak).

With proximal pressure adapter

With proximal free plug EO-LMP2 (on EO-DB2-1P-KIT interface)

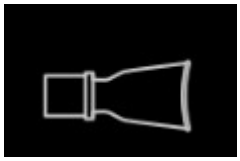
With proximal free plug EO-LMP2

⚠ **WARNING**
• **Rebreathing may occur when using a single limb circuit with intentional leak if the pressure is too low for a given leak diameter.**
• **Ensure the vent holes at the mask or constant leaks at the vented interface port are not obstructed.**
• **As far as possible, particularly in pediatric configuration, calibration must be performed with the maximum possible accessories (including mask if necessary) to optimize pressure measurements and disconnection alarm performance. Disconnection alarm must always be tested in the complete configuration after calibration. Low Vti alarm must be used in case of disconnection alarm not efficient.**

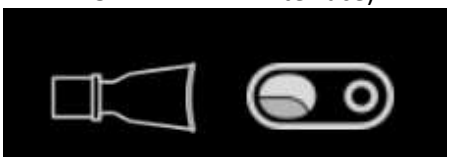
Mouthpiece with Single limb:

1. Attach any required accessories e.g. humidifier or filter.
2. Connect the inspiratory tubing to the inspiratory port on the front of the device.
3. According to the desired configuration, connect the proximal pressure line to the proximal pressure port or connect the proximal free plug as shown below.
4. Select the Mouth Piece circuit type and patient type (adult/pediatric) in the menu and perform a calibration.

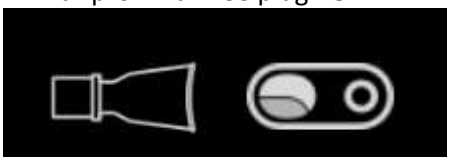
With proximal pressure adapter



With proximal free plug EO-LMP2 (on EO-DB2-1P-KIT interface)



With proximal free plug EO-LMP2



Accessories compatible with AC-150

The AC-150 ventilator is compatible with a range of accessories.

- FIO2 Cable (O2CELCBL)
- SPO2 Cable (EO-SPO2CBL)
- Nomad Bag (EO-NOMADBAG-EVO)
- Travel Bag (EO-TRVELBAG1X0)
- Remote Alarm Cable 2 m (EO-ALARMCBL)
- Remote Alarm Cable 4 m (EO-ALARMCBL4)
- Proximal Flow sensor (EO-PFLOWS)
- EO-BAT9 Battery Pack (EO-BATPCK) – See EO-BAT9 User manual
- Y cable (EO-EXTBATCBL) - See EO-BAT9 User manual
- Trolley (EO-TROLLEY and EO-TROARM)
- Upright Brackets (EO-UPRIGHT)

⚠ **WARNING**
● **Before using any accessory, always carefully read the accompanying Quick User Guide and User Manual.**
● **Before using EO-BAT9 Battery Pack (EO-BATPCK), read the accompanying EO-BAT9 User Manual.**
● **The AC-150 Ventilator should only be used with accessories recommended by EOVE. Connection of other accessories could result in patient injury or damage to the device.**

Attaching patient circuit accessories

⚠ **WARNING**
● **Adding or removing circuit components can adversely affect ventilation performance.**
● **A circuit calibration is recommended every time an accessory or component is added to or removed from the patient circuit.**
● **Do not use electrically conductive or anti-static air tubing.**

Attaching an antibacterial filter

⚠ **WARNING**
● **To prevent the risk of cross-contamination, an antibacterial filter is mandatory if the device is to be used on multiple patients.**
● **Regularly check the antibacterial filter and expiratory valve for signs of moisture or other contaminants, particularly during nebulization or humidification. Failure to do so could result in increased breathing system resistance and/or inaccuracies in expired gas measurement.**
● **Only use antibacterial filters that comply with the relevant safety standards, including ISO 23328-1 and ISO 23328-2.**
CAUTION
The antibacterial filter must be used and replaced according to the manufacturer's specifications.

To attach an antibacterial filter to the AC-150:

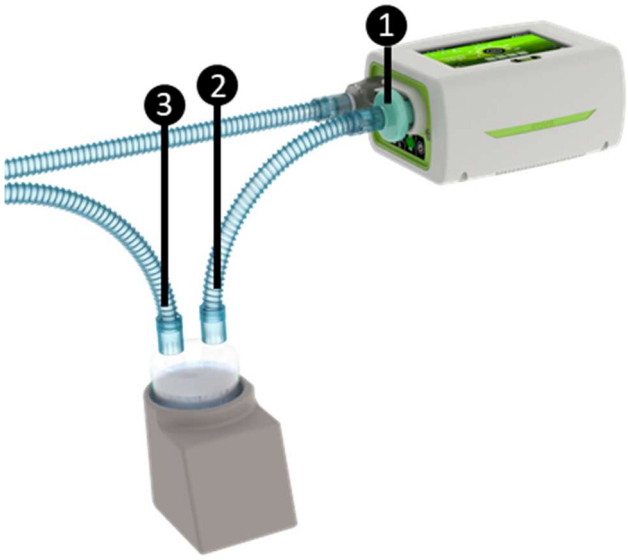
1. Attach the antibacterial filter to the inspiratory port of the device.
2. Connect the breathing tube to the other side of the filter.
3. Perform a calibration.
4. Connect the patient interface to the other end of the breathing tube.

Attaching a humidifier

⚠ **WARNING**
● **Humidification of the inspired gas is required for invasive ventilation in order to prevent any lung injury.**
● **Always place the humidifier on a level surface lower than level of the ventilator and the patient in order to prevent the mask and tubing filling with water.**
● **Ensure that the humidifier is set up according to the manufacturer's instructions.**
● **Use appropriate precautions to prevent water in the circuit transferring to the patient (e.g. a water trap).**
● **Always make sure the humidifier is placed properly after the ventilator and that there is no risk for the water to go inside the device.**
● **Only use HMEs that comply with the relevant safety standards, including ISO 9360-1 and ISO 9360-2.**
CAUTION
Make sure that the water tub is empty and thoroughly dried before transporting the humidifier.

To attach a humidifier to a circuit configuration:

1. Connect the air tubing to the inspiratory port (after the bacterial filter)on the device.
2. Connect the other end of the air tubing to the inlet port on the humidifier.
3. Connect the patient circuit to the outlet port on the humidifier.



Attaching oxygen

⚠ **WARNING**
● **Use only medical grade oxygen.**
● **Ensure that the device is ventilating before the oxygen supply is turned on.**
● **The oxygen flow must be turned off when the device is not ventilating so that oxygen does not accumulate within the device. The accumulation of oxygen presents a fire risk.**
● **Oxygen supports combustion. Only use oxygen in well-ventilated rooms. Using oxygen while smoking or in the presence of an open flame creates a fire hazard.**
● **Supplemental oxygen must be added into AC-150 ventilator's oxygen inlet at the rear of the device.**
● **Monitor supplemental oxygen using the optional FiO2 cell and relative alarms.**
● **O2 inlet is designed for functioning up to 50 kPa during ventilation, however oxygen sources up to 400 kPa can be used since a flow regulator limits flows below 20 l/min. If O2 pressure rises above 50 kPa when stopping ventilation, there is no risk for the ventilator, but the oxygen source tubing may disconnect from the oxygen adaptor. In this case, the oxygen supply must be cut off immediately.**
● **Connect to the ventilator inlet adaptor, always flexible tubing without additional fastening means. Never use a collar or anything to increase tubing resistance to pressure at ventilator inlet, this could result in damaging the ventilator.**
● **Always turn off the oxygen supply when ventilation is stopped for any reason.**
● **The AC-150 ventilator is not designed for use with anesthetic gases.**
● **Oxygen can be added up to a maximum flow of 20 l/min. Considering this limitation, it is not always possible to reach Fi02 concentrations above 50%. In C-Flow mode, O2 Flow can be increased up to 60 l/min to reach higher concentrations, however the O2 flow must stay below the set flow to avoid any risk.**
● **For a given O2 flow, O2 concentration may vary with many parameters such as volume, inspiratory time, rate, PEEP, leak, interface, patient circuit.**

To add supplemental oxygen:

1. Unlock the oxygen inlet at the rear of the device by pushing up on the locking clip.
2. Plug in the oxygen adaptor (supplied with the AC-150) to the oxygen inlet.
3. Attach the end of the oxygen supply tube (provided with the AC-150) to the oxygen adaptor.
4. Attach the other end of the oxygen supply tube to the oxygen source.
5. Start ventilation.
6. Turn on the oxygen and adjust for the prescribed flow rate or FiO2 level.

To remove supplemental oxygen:

1. Turn off the oxygen source.
2. Unlock the low flow oxygen inlet at the rear of the device by pushing up on the locking clip.
3. Remove the oxygen adaptor from the oxygen port.

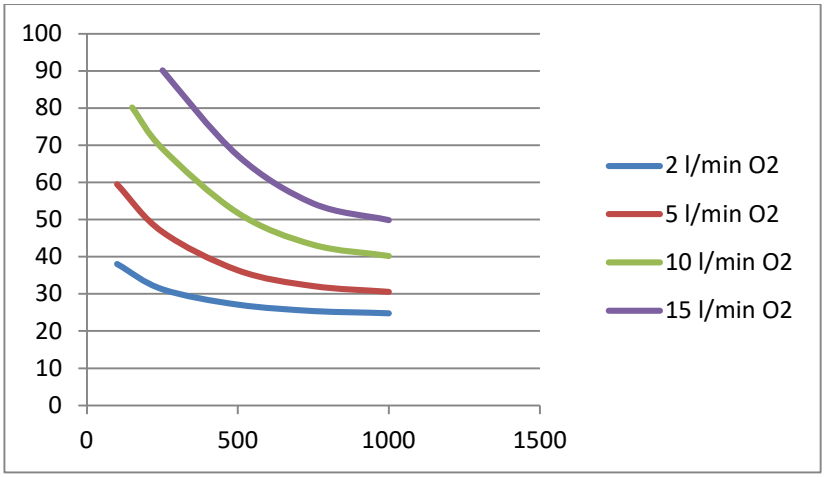


Image: Theoretical variation of the % FIO2 in function of tidal volume in ml

CAUTION
Ensure oxygen supply has been turned off before removing supplemental oxygen. Ventilator must be started and stopped after oxygen supply has been turned off. In rare cases (with devices manufactured before SN EO1500320510), if the oxygen is left opened while stopping and restarting the device, that could lead to a temporary blocking of the O2 safety valve. If that happens, device does not let the O2 in and tubing is self-disconnecting when opening the O2 source. In this case, stop the source, remove the oxygen tubing (letting the adaptor plugged) and restart the device to let the O2 valve opening properly.

Attaching a FiO_2 sensor

⚠ WARNING
• **The AC-150 ventilator can be used with an optional FiO2 sensor with minimum and maximum concentration alarms. This sensor should always be used to ensure that the prescribed oxygen concentration is delivered to the patient.**

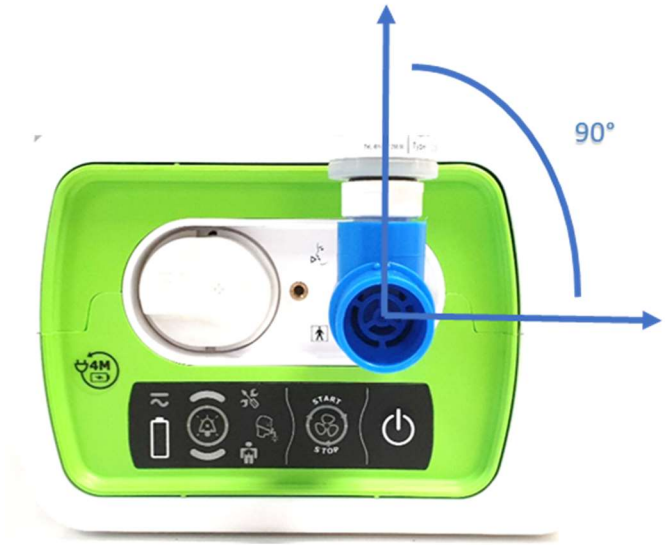
1. Plug the FiO2 cable into the FiO2 port**.**
2. Plug the FiO2 sensor into the other end of the FiO2 cable.
3. Attach the T-adaptor to the Inspiratory Patient Port
4. Plug the FiO2 sensor into the T-adaptor.

CAUTION
To display the FiO2 measurements and to set the alarms, activate FiO2 monitoring in the configuration menu. When activating the sensor, it will perform a calibration at ambient 21%. The sensor needs to be free from O2 for this calibration.

Material to be used:

- FiO2 cable: O2CELCBL
- FiO2 cell: ENVITEC OOM102-1 or equivalent
- Cell T piece adaptor: ENVITEC 46-006005 or equivalent

T piece and cell installation



⚠	**WARNING**
•	**Measurement is influenced by the O2 cell position.FIO2 cell must be placed vertically to have expected measurement performance.**

Attaching a pulse oximeter

⚠	**WARNING**
•	**Only use compatible NONIN finger pulse sensors**
	CAUTION
	Some factors may degrade the performance of the pulse oximeter or affect the accuracy of the readings (e.g. blood flow restrictors, arterial catheters, blood pressure cuffs, infusing lines, etc.), excessive ambient light, excessive motion, electromagnetic interference, moisture in the sensor, improperly applied sensor, incorrect sensor type, a sensor not at heart level, poor pulse quality, venous pulsations, anemia or low hemoglobin concentrations, cardiogreen or other intravascular dyes, carboxyhemoglobin, methemoglobin, dysfunctional hemoglobin, artificial nails or fingernail polish.

To connect the pulse oximeter:

1. Connect the plug of the pulse oximeter to the SpO2 (pulse oximeter) connector at the rear of the device.
2. Attach to patient.

	CAUTION
	To remove the cable, pull firmly on the locking ring. Do not twist.
NOTE	If used in conjunction with the Sentec monitor, the SPO2 and Heart rate signal will be taken from the NONIN sensor.

Attaching a remote alarm

A remote alarm can be connected to the AC-150 ventilator with the Remote Alarm Cable Accessory. This alarm alerts you to an event that requires immediate attention. An audible and visual alarm is triggered when an alarm is activated on the ventilator. For full instructions on using the Remote Alarm, see the Remote Alarm User Guide.

Attaching an external battery (EO-BAT9)

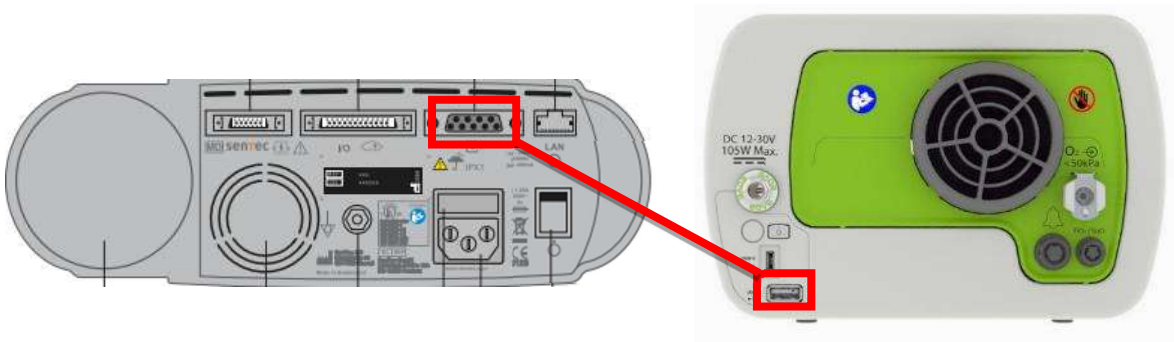
Please, refer to the EO-BAT9 user guide.

Attaching a Sentec PCO2/SPO2 monitor

To connect a Sentec PCO2 monitor, use an RS232 / USB converter to connect the RS232 outlet from the monitor to the USB-1 port inlet of the AC-150 after turning on both devices.

In the preference menu (information tab), check that the Sentec device status for connection is displayed as “connected”.

CAUTION
The Sentec monitor must be turned on before it is connected to the AC-150.
A low SPO2 alarm can be set for notification upon disconnection of the sensor.
The user of the Sentec monitor must be properly trained on its usage.
To compute the correction of PCO2 measurement, the calibration of Sentec TC Sensor must be done before and after the measurement with respect to the Sentec’s "calibration interval" settings.



Proceed to the calibration of the PCO2 sensor and place it on the patient according to Sentec instructions.

Measurements should start to be displayed and recorded in the AC-150 since they are displayed as valid data by the Sentec monitor.

After measurements are collected, the PCO2 sensor should be put back to calibration and the AC-150 will compute correction of the PCO2 measurement drift. The AC-150 must stay connected to the Sentec monitor until this operation is achieved.

It is highly recommended to create a new data file in EOZ form (see Export Data screen for details) immediately after the second PCO2 sensor calibration.

RS232/USB converter to be used: USB 2 full-speed cable to RS232 DB9 male based on FTDI type FT232R, FT2232 (UART mode) or FT232B able to support connexion speed from 4800 bauds to 460800 bauds.

Power connections

⚠ WARNING
● **Beware of electrocution. Do not immerse the device, power supply or power cord in water.**
● **Make sure the power cord and plug are not damaged and the equipment is in good condition.**
● **Keep the power cord and device away from hot surfaces.**
● **Explosion hazard—do not use in the vicinity of flammable anesthetics.**
● **Ensure that the device and its power charger are placed in a way that allows an easy disconnection from the mains.**

The AC-150 ventilator can be used with three different power sources:

- Mains power.
- Internal battery.
- External DC power supply (e.g., car 12V power outlet).

For information on power supplies and sources see the Technical Specifications.

Connecting to mains power

⚠ WARNING
● **Ensure that the power cord does not pose a tripping or choking hazard.**
● **Ensure that the home AC mains supply and connections are safe and comply with the applicable regulations. For ventilator dependent patients, consider using a back-up power system. For safe and adapted solutions, refer to Battery Pack (EOBAT9) user manual and to the section "Connecting two power sources with Y cable" below.**

To connect to mains power:

1. Connect the DC plug of the supplied external power supply unit to the rear of the AC-150 module or docking station. Ensure the connection is correctly aligned. Secure the connection by screwing the connector firmly in place.
2. Plug the other end of the power cord into the power outlet.

NOTE	Do not twist or tug the power cord or the outer housing of the connector.

Running the ventilator on internal battery

⚠ WARNING
● **When using the AC-150 as a backup ventilator, check and charge the internal battery level regularly (recommended every month).**
● **As the battery ages, the available capacity decreases. When the remaining battery capacity is low, do not rely on the internal battery as the primary power supply and contact your service provider.**
● **For ventilator dependent patients in mobility, we strongly recommend not to use internal battery as primary power source. It is mandatory to use an additional power source such as EOVE Battery Pack (EO-BAT9) when the patient is moving away from an external power source (AC or DC).**
● **The internal battery should be replaced every two years, or when a service notification is displayed.**

●	**Replacement of lithium batteries or fuel cells by anyone other than trained personnel will result in dangerous risk (e.g., excessive temperatures, fire or explosion)**
●	**The internal battery and any other device component should be disposed of following appropriate waste management regulations.**
	CAUTION
	Plug device into AC mains power when the remaining capacity of the battery is low.
	The internal battery may stop charging when ambient temperatures of 35°C or more are reached.
	If AC power is lost, the battery is guaranteed to continue to provide ventilation for a limited duration. Find an alternate supply or alternative means of ventilation e.g. back-up ventilator or manual ventilation means.
	If the EOVE device is left in storage for an extended period of time the internal battery will become depleted. If storing your device, recharge the internal battery once every six months. Never store a device with an empty battery.
	Storing the ventilator at temperatures higher than 50°C for extended periods will accelerate battery ageing. This will not affect the safety of the battery or the device.

The internal battery of the EOVE ventilator allows your ventilator to operate even when mains power is disrupted or when the device is not connected to the mains. When the EOVE ventilator is operating on internal battery power, you are notified of the level of charge of the battery by the battery power source indicators both on the keyboard and touch screen.

NOTE	The internal battery continues to charge when the device is connected to mains power, even when it is operating or on standby.
	The internal battery takes **6 hours** to fully charge from empty without ventilation and **6 hours** when ventilating.
	To preserve the internal battery from too repetitive charges occurring, the internal battery may not charge if battery level is higher than 95%. To obtain a 100% charge it could be necessary to discharge the battery below 95% before plugging back the AC power.

Battery run time

When the internal battery is being used to power the device, the amount of charge remaining in the battery is displayed as shown in the following table.

Touch Screen	Keyboard	Display Description
		When the internal battery is in use, the battery charge level is displayed by percentage on the touch screen and by 4 LEDs on the keyboard.
		When the internal battery is charging, the charge battery symbol is displayed on the touch screen and by scrolling LEDs on the keyboard.
		When the internal battery is charging but may be not enough charged to supply the device, the yellow charge battery symbol is displayed on the touch screen and by scrolling LEDs on the keyboard (also displayed in case of some battery failure alarm).
		When the internal battery power is low, the charge battery symbol is displayed with an exclamation mark on the touch screen and the LED's on the keyboard are red.

Alarms will alert the user when the battery power is getting low.

Internal battery run time is determined by:

- Environmental conditions (operating conditions See Technical Specifications).
- The condition and age of the battery.
- The device settings.
- The current circuit in place and unintentional leak.

The ventilation module internal battery will operate for approximately 5 hours (+/-10%) when the device is used according to the following configuration for an adult patient (Resistance: 20 cmH2O/l/s, Compliance: 25 ml/cmH2O): Inspiratory pressure: 20 cmH2O, Ventilation Rate: 15 bpm, I/E ratio: 1/2, PEEP: OFF.

The ventilation module internal battery will operate for approximately 4,5 hours (+/-10%) when the device is used according to the following configuration for an adult patient (Resistance: 5 cmH2O/l/s, Compliance: 50 ml/cmH2O): Inspiratory volume: 800 ml, Ventilation Rate: 20 bpm, I/E ratio: 1/2.

The ventilation module internal battery will operate for approximately 3,5 hours when the device is used according to the following configuration for an adult patient (Resistance: 20 cmH2O/l/s, Compliance: 25 ml/cmH2O): Inspiratory pressure: 30 cmH2O, Ventilation Rate: 15 bpm, I/E ratio: 1/2, PEEP: 10 cmH2O.

⚠ **WARNING**
● **Those reference internal battery run time are given for a ventilation module without docking station. When used with docking station, the resulting operation time will depend on luminosity setting and stand-by mode option and can be reduced by 20% to 30%. Always look at the device indication to know the real conditions expected autonomy.**

Storing and recharging

If the device is being stored, its internal battery must be recharged every six months during the storage period.

Prepare the battery for long-term storage

1. The battery charge level should be 100%.
2. Turn off the device.
3. Remove the power cord from the device.

Connecting to an external DC power source

⚠ **WARNING**
● **When using a car auxiliary adapter, start the car before plugging in the DC Adapter of the device and unplug the ventilator before stopping the car. The car start/stop functionality must be deactivated.**
● **If the external DC power source drops to below 12V, the AC-150 ventilator will switch to internal battery.**

To connect to DC power:

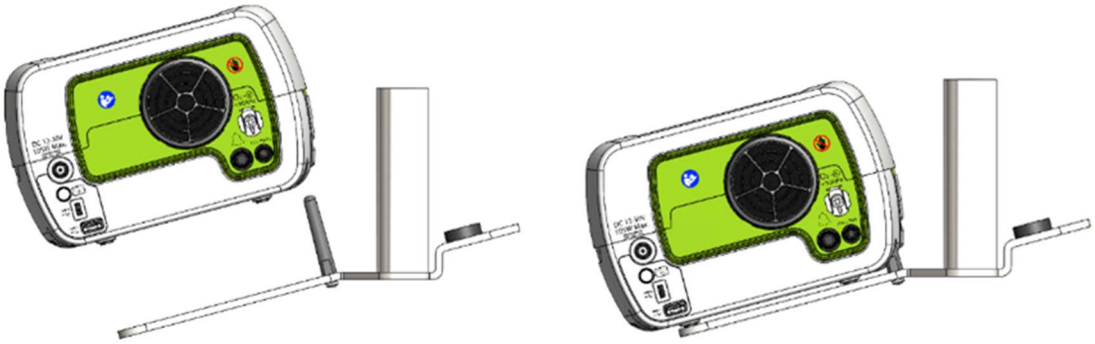
1. Connect the DC power cord into the rear of the device.
2. Plug the other end of the power cord into the power outlet.

Mounting AC-150 on trolley (EO-TROLLEY)

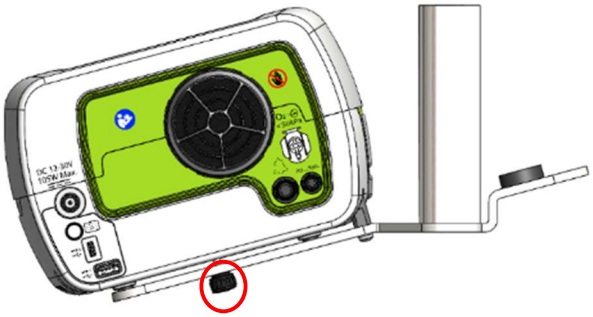
⚠ **WARNING**
• **When using the trolley in combination with AC-150 and other accessories, always verify a maximum weight of 20 kg is not exceeded. Always use the handle to move the trolley (always pull, do not push). Not respecting this could result in damaging the ventilator or causing patient injury.**

The AC-150 ventilator must be mounted on the trolley according to the following instructions:

1. Insert the device on the trolley columns.



2. Fix the device on the trolley with bottom screw.



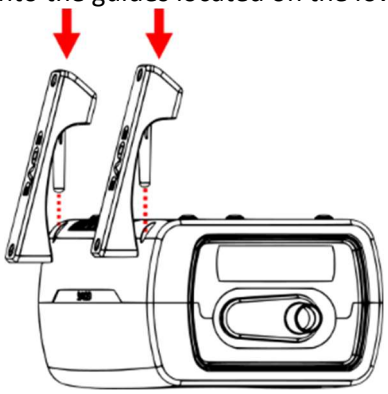
3. Insertion of the arm. Insert the arm inside the dedicated trolley port and secure with screw.

4. Insertion of humidifier. Insert the humidifier inside the dedicated trolley port.

⚠ **WARNING**
• **Use only screws delivered by Eove. Otherwise, there is a risk to damage the ventilator or its accessories.**

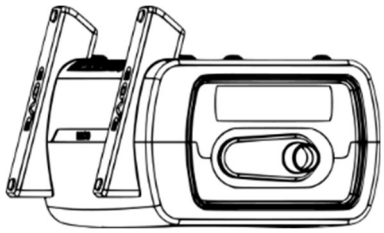
Upright Bracket installation for a vertical position of the device

1. Insert the upright brackets into the guides located on the lower housing of the device.

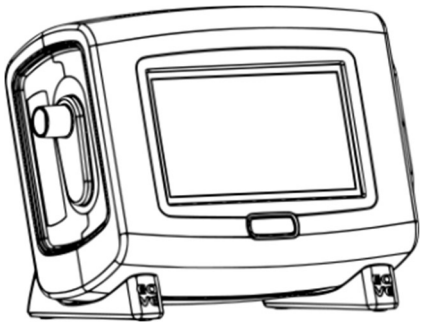


NOTE:	**Upright brackets are fully reversible and can be used on the right or left guide with the same feature**

2. Push the upright brackets until full contact with the lower housing.



3. Place the device on its upright brackets to use it in vertical position.



CAUTION
Make sure to push the upright brackets until the contact with the lower housing to ensure good support for the device
Be sure to check the positioning of the upright brackets after moving the device

Travelling with AC-150 ventilator, the Click-and-Go system

Several solutions are available which allow freedom and mobility with the AC-150 ventilator, whether for a short time or for travelling longer distances. See the table below for the recommended use of each EOVE Bag.

⚠ **WARNING**
• **When the ventilator is functioning, use only transport bags recommended in these instructions (nomad or travel bags) to avoid any undesirable ventilation performance that**

	could lead to patient death. Do not use the bag shipped with the device, which is not adapted for the use during transport.
●	**For ventilator dependent patients in mobility, we recommend the usage of an additional power source such as Battery Pack (EO-BAT9).**
	CAUTION
	Do not place any heavy or bulky objects in the zippered pocket on the inside front of the bag. This could result in damage to the touch screen.

Type of Bag	Recommended Use
Transport	Use for storing the EOVE device with its docking station. Use whenever the device is not in use to prevent damage. Use to store cables and patient circuits.
Travel	Use for travelling and using the device while it is in its docking station. Use to store cables and patient circuits.
Nomad	Use for travelling and using the device without its docking station.

Using the Nomad bag (no docking station)

The Nomad Bag

1. Remove the safety screw at the bottom of docking station (if in place).
2. Remove the ventilator from the docking station by pressing at the back of the module.

3. Place the device in the bag with the front face of the ventilator to the top opening of the bag. Carefully close the zipper. You can now attach the circuit accessories and use the bag while moving around.

Using the Transport bag

Before placing the EOVE device in the bag:

1. Remove the power cord from the rear of the device.
2. Remove all patient circuit components.
3. Remove all accessories.
4. Place the device carefully into the bag, ensuring that the touch screen is facing upwards.
5. Ensure all zippers are completely closed and the device is secure before lifting the bag.

Using the Travel bag

1. Place the device in the bag with the front face of the ventilator to the top opening of the bag.
2. Carefully close the zipper.
3. You can now attach the circuit accessories and use the bag while moving around and use the touch screen.

Chapter 4 - Alarms

WARNING
• **Test the effectiveness of the alarm after any changes to the circuit, ventilation settings or co-therapy. Alarm settings are sensitive to these changes.**
• **Alarms may deactivate if the alarms are set to extreme values. This could put the patient at risk.**

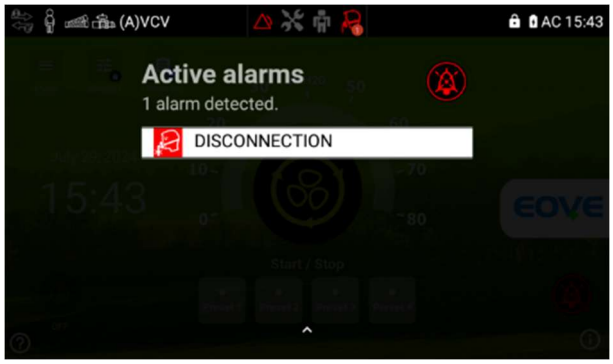
The AC-150 is equipped with alarms to ensure the safety of the patient and to alert the user of certain conditions that require a response. When an alarm is activated, it is both audible and visible.

When an alarm is activated

1. A series of beeps will sound.
2. A message will appear on the touch screen showing the priority of the alarm and giving the reason for the alarm.
3. A pop-up on the Home Screen will show the nature and priority of the alarm and the red arrow on the touch screen will flash until it is selected.
4. The alarm button on the top panel of the machine will also flash and the icons will indicate the nature of the alarm.

Viewing active alarms

1. Press to access the active alarm list from the Home Screen.



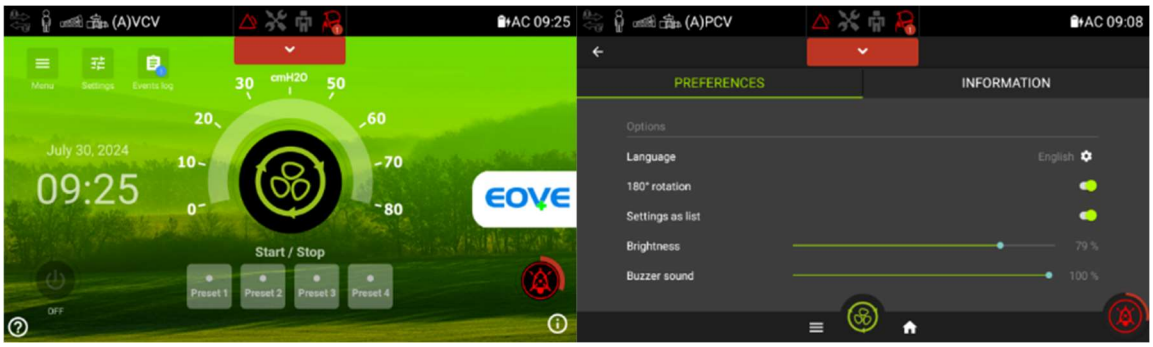
2. Hold to temporarily mute the alarm. The alarm sound will be temporarily muted for two minutes. If after two minutes the conditions of the alarm are still present, the alarm sound will be set off again.

3. Touch the screen or swipe upwards to get back to the Home Screen.

NOTE	The red arrow in the touch screen display is visible from all screens and indicates that there are one or more active alarms not already consulted in the alarm menu.

Alarms inhibition and pre-inhibition

Alarms can be inhibited from all the different menus of the interface with this button



The button takes the color of the active alarm (red or yellow). Click on the button to inhibit the active alarm for two minutes. In this state, any new alarm will make the alarm sound to come back.

If the inhibition button is maintained pushed for a few seconds and the confirmation message is validated, the device goes in pre-inhibition. For the next two minutes, no alarm will sound. The button stays lighted in red or yellow if alarm in progress or white if no alarm in progress. In this state, even a new alarm will not make the alarm to sound until the end of the two minutes.

Pre-inhibition can also be activated directly on the module keypad by maintaining inhibition button pressed for 3 seconds. A single press on the alarm button during the pre-inhibition cancels its activation.

Alarm priority

Alarms are classified into relative priority (High and Medium) according to the severity and urgency of the alarm condition. The alarm will appear on both the keyboard and the touch screen. See details below in the table.

Alarm priority	Keyboard	Touch Screen	Audible alert
High	Red flashing light	Red Alarm Type symbol	10 beeps every 6 seconds
Medium	Yellow flashing light	Yellow Alarm Type symbol	3 beeps every 15 seconds
NOTE	All alarms should be responded to, but an immediate response is required for high priority alarms.		

Troubleshooting alarms

NOTE	Check the patient's status before responding to an alarm. Switch to back-up ventilator if necessary.
	If extreme alarm settings are set, alarms may not trigger.

Alarm	Cause/Ventilator response	Action needed	Type of Alarm
Total Power Loss	Continuous sound: Alarm activates immediately.	Check power connections. If the power loss alarm continues, contact your service provider and use a backup ventilator.	No Display
Disconnection High Priority	A tube or accessory has become disconnected. Alarm activates after 1 cycle or set disconnection time (the longest of the two).	Check all tube and accessory connections.	
Prox. Fail High Priority	Proximal sensor fails. Alarm activates after 1 second.	Contact your service provider.	
Valve Disconnected High Priority	Valve disconnected. Alarm activates after 1 cycle.	Reconnect valve.	
Occlusion High Priority	Patient circuit is blocked. Alarm activates after 5 seconds or 2 cycles after faulty monitored value is obtained (maximum 30 seconds).	Check that the patient mask or tubing are not obstructed.	
Valve Leak High Priority	There is a leak in the double circuit configuration. Alarm activates after 6 cycles.	Inspect the circuit, expiratory valve, and proximal lines for leak. Check for leaks around the mask if one is being used.	
Ventilation stop High Priority	Ventilation stopped voluntarily by clinician or patient. Alarm activates after 1 second.	Confirm that the ventilation stop is appropriate or necessary.	
Close O2 Source High Priority	O2 source is still opened, and ventilation is OFF. Alarm activates after 20 seconds.	Close O2 source.	
Rebreathing High Priority	Not enough leak in LEAK mode or valve not correctly functioning in VALVE mode. Alarm activates after 10 cycles (except in CPAP mode) or 10 to 40 s (in CPAP mode).	Check calibrated leak is present and is the right size or if expiratory pressure is high enough. (LEAK mode) Check valve function. (VALVE mode)	
High Pres High Priority	Inspiratory pressure is too high. Alarm activates after 3 cycles.	Inspect the circuit or patient for occlusion.	
PEEP out of range (continuous pressure alarm) High Priority	PEEP not correctly regulated (above 10 cmH2O from the setting). Alarm activates after 6 cycles or 17 seconds.	Check the circuit and expiratory valve for occlusion. Check for occlusion in proximal lines, if in use.	
Abs. Pres. Fail High Priority	Alarm activates after 1 second.	Contact your service provider.	
Expi. Flow Fail High Priority	Alarm activates after 1 second.	Contact your service provider.	
Battery Empty High Priority	The battery is depleted. Alarm activates after 1 second. Guaranteed ventilation time after alarm is triggered: 10 min. This alarm can be triggered in combination with “Battery Fail” alarm.	Reconnect to mains power Or Refer to “Battery Fail” alarm if both alarms are displayed.	
Speed Fault High Priority	Turbine speed too low and temperature too high. Alarm activates after 10 seconds.	Contact your service provider	
Check Settings High Priority	Settings are not within limits or settings reset to default due to new Software upload. Alarm activates after 1 second.	Check the settings are within the parameters. Call your service provider.	
Memory Fail High Priority	Failure to save parameters set. Alarm activates after 1 second.	Contact your service provider.	
Vol. out of range High Priority	Maximum volume reached. Alarm activates after 6 cycles.	Contact your service provider.	
Blower Fail High Priority	The turbine is not functioning properly. Alarm activates after 1 cycle.	Contact your service provider.	
Blower overheat High Priority	Alarm activates after 1 cycle	Contact your service provider.	
INSP Flow Fail High Priority	Inspiratory flow sensor fails. Alarm activates after 1 cycle.	Contact your service provider.	
Sec. Pres. Fail High Priority	Security pressure sensor fail. Alarm activates after 1 second.	Contact your service provider.	
Gauge com fail	Battery Gauge not functional. Alarm activates after 1 minute.	Contact your service provider.	
Valve Fail High priority	Exhalation control valve failure. Alarm activates after 1 cycle.	Contact your service provider.	

Reversed I/E set High Priority	Reversed I/E setting. Activates when the Rate and I-Time settings are leading to a reversed I/E ratio.	Adjust Lower Rate or a lower I-Time. Cancel the alarm if the setting is intentional.	
High VTI High Priority	Inspired tidal volume is too high. Alarm activates after 3 cycles or 10 seconds.	Inspect the circuit and expiratory module for leaks.	
Low VTI High Priority	Inspired tidal volume is too low. Alarm activates after 3 cycles or 10 seconds.	Inspect the circuit and expiratory module and check the pressure settings.	
Low SPO2 High Priority	The Pulse Oximeter is recording low SPO2 levels. Alarm activates after 6 cycles or 20 seconds.	Check the patient and check that the pulse oximeter is correctly attached.	
Remote Fail Medium Priority	Remote Alarm control fail. Alarm activates after 1 cycle.	Contact your service provider.	
Low FiO2 High priority	The level of oxygen delivered by the ventilator is below the Min FIO2 level set. Alarm activates after 6 cycles or 20 seconds.	Check for leak. Check and adjust the oxygen supply settings and the connections.	
High FIO2 Medium Priority	The level of oxygen delivered by the ventilator exceeds the Max FIO2 level set. Alarm activates after 6 cycles or 20 seconds.	Check and adjust the oxygen supply and settings.	
High Leak Medium Priority	The leak estimated by the ventilator exceeds the maximum Leak threshold. Alarm activates after 6 cycles.	Inspect the circuit, expiratory valve and proximal lines for leak. Check for leaks around the mask, if in use.	
Expi Flow Disconnection Medium Priority	Expi flow sensor disconnected. Alarm activates immediately.	Reconnect Expi flow sensor	
Low VTE Medium Priority	Expired tidal volume is too low. Alarm activates after 3 cycles or 10 seconds.	Inspect the expiratory valve and check the settings.	
High VTE Medium Priority	Expired tidal volume is too high. Alarm activates after 3 cycles or 10 seconds.	Inspect the expiratory valve and replace, if necessary.	
Max Pres Medium Priority	In C-Flow mode, inspiratory pressure is reaching the set limit. The set flow may not be reached consequently. Alarm activates after 10 seconds.	Inspect the circuit for occlusion.	
Low MV Medium Priority	Low tidal volume. Alarm activates after 6 cycles.	Check for leaks or loose connections.	
Apnea / Low Rate Medium Priority	Patient respiratory rate is too low. Alarm activates after 6 cycles.	Check the patient and the ventilator settings.	
High Res. Rate Medium Priority	Patient respiratory rate is too high. Alarm activates after 6 cycles.	Check the patient and the ventilator settings.	
AC Power Loss Medium Priority	Connection to AC power has been lost. Alarm activates after 1 second.	Check the power cord is correctly plugged in to mains power and to the ventilator.	
DC Power Loss Medium Priority	Connection to DC power has been lost. Alarm activates after 2 seconds.	Check the power cord is correctly plugged into the DC source and into the ventilator.	
Battery < 2h Medium Priority	Battery life is < 2 hours. For ventilator dependent patients, if battery life is < 2h, don't use battery as principal power source anymore. Alarm activates after 1 second.	Plug the ventilator in to either AC or DC power source. (for ventilator dependent patients)	
Battery Low Medium Priority	Battery power is low. Alarm activates after 1 second. Guaranteed ventilation time left: 15 mins.	Plug the ventilator in to either AC or DC power source.	
Bat. Charge Pause (T°>) Medium Priority	Temperature is too high to charge the battery. Charge will automatically restart after temperature has decreased. Alarm activates after 45 min.	Check the level of the battery charge.	
Batt. Temp. High Medium Priority	Battery has high internal temperature while powering the ventilator. Alarm activates after 1 second in battery discharging mode or 30 mins in battery charging mode.	Check the level of the battery charge.	
Supply Fail Medium Priority	Power supply not detected. Alarm activates after 1 second.	Contact your service provider.	
Battery Fail Medium Priority	The ventilator cannot be used on internal battery. Alarm activates after 3 seconds. **Warning: If a "BAT. CHARGE FAIL" or a "BATTERY FAIL" alarm triggers, the ventilator internal battery needs to be changed. For ventilator dependent patient, contact your technical assistance immediately after ensuring the patient is safely ventilated with the backup device and wait for further instructions.**	Switch to backup ventilator (for ventilator dependent patient). Contact your service provider.	
Buzzer Fail Medium Priority	One of the buzzers is not functioning properly. Backup buzzer activated. Alarm activates after 10 buzzer cycles.	Contact your service provider.	
Buzzer Batt. Low Or	The buzzer battery is too low to sound the SUPPLY FAIL alarm. Alarm activates after 2 seconds.	Contact your service provider.	

Buzzer Batt. Fail Medium Priority			
CPU Fail Medium Priority	Internal failure. Alarm activates after 1 second.	Contact your service provider.	
Keyboard Fail Medium Priority	Keyboard stopped working. Alarm activates after 20 seconds.	Contact your service provider.	
Batt. Charge Fail Medium Priority	Internal battery cannot be charged. Alarm activates after 2 seconds. **Warning: If a "BAT. CHARGE FAIL" or a "BATTERY FAIL" alarm triggers, the ventilator internal battery needs to be changed. For ventilator dependent patient, contact your technical assistance immediately after ensuring the patient is safely ventilated with the backup device and wait for further instructions.** NOTE: This alarm is merged into "BATTERY FAIL ALARM" for CPU software versions from C150000417.	Switch to backup ventilator (for ventilator dependent patient). Contact your service provider.	
Saved Device Data Lost Medium Priority	Maintenance Serial information or counter lost. Alarm activates after 1 second.	Contact your service provider.	
Turbine Maintenance Medium Priority	Turbine must be preventively changed. Alarm activates immediately.	Contact your service provider.	
Exh. Valve Maintenance Medium Priority	Exhalation control valve must be preventively changed. Alarm activates immediately.	Contact your service provider.	
Battery Maintenance Medium Priority	Internal battery must be preventively changed. Alarm activates after 1 minute.	Contact your service provider.	
Interface system messages	If the screen is displaying one of the following messages: "Com.eove150 keeps stopping" Or "Com.eove150 isn't responding" Or "Unfortunately, system UI has stopped" It means the interface software needs to reboot. Clicking on "OK" or "Close App" will reboot the interface software without any impact on ventilation if running.	Follow pop-up instructions.	-

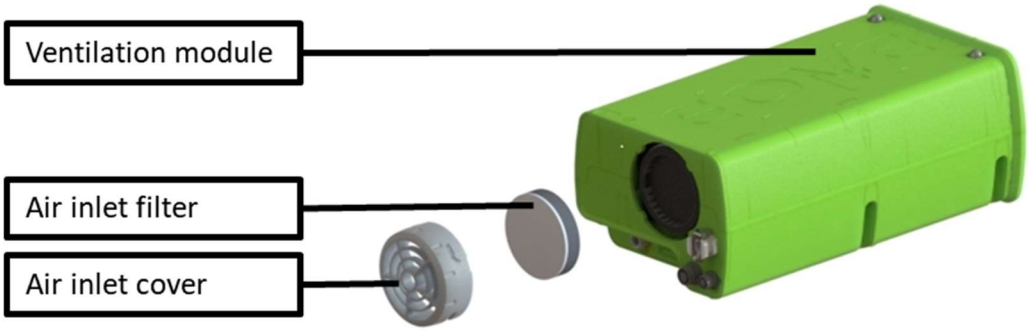
Chapter 5 - Routine cleaning, disinfection, and maintenance

⚠ **WARNING**
● **The AC-150 ventilator must not be serviced while in use on a patient**
● **Ventilation dependent patients are potentially vulnerable to infections. If necessary, all equipment should be regularly cleaned and disinfected. For the AC-150 ventilator, a procedure of cleaning and disinfection is described below.**
● **Keep the device, and accessories away from water. Always turn off and unplug the device before cleaning and verify that it is dry before plugging it back in.**
CAUTION
Clean only exterior surfaces of the AC-150 Ventilator device.
If necessary, wipe the exterior of the device with the procedure of cleaning and disinfection described below.
For all circuit components and hoses, follow the manufacturer's recommendations for cleaning and maintenance.

Proper cleaning and maintenance of your EOVE device is essential. Cleaning and disinfection described in this section should be carried out regularly.

Refer to the user guides of any accessories in use for detailed instructions specific to those devices.

Maintenance	Method	Frequency
Inspect the condition of the connections and circuit adapters for any moisture or contaminants	Replace and clean as necessary using appropriate cleaning solutions	Weekly
Test the alarm sounds	See Set Up Test, Chapter 1	Weekly
Check the condition of the air filter	Check for dirt or dust particles	Monthly
Check the charge level of the internal battery	1. Unplug the device from external power and operate the device on internal battery for a minimum of 10 minutes 2. Reviewing the remaining battery capacity 3. Restoring external power once the test is complete	Monthly
Replace the air filter (See image below)	1. Unlock the air filter cover at the rear of the ventilation module by turning in an anti-clockwise direction 2. Pull the air filter cover from the device 3. Remove the air filter from the cover and discard 4. Insert a new filter into the cover 5. Insert the air filter and cover back into the device using the four tabs 6. Turn in a clockwise direction to secure in place	Every six months (with normal daily use) Change more frequently in a dusty environment
CAUTION		
The air filter cannot be washed or reused.		



Instructions for product cleaning and disinfection at patient change

The following process must be followed before change of patient:

- Disconnection of the device from the power supply.
- Separation the module and the station.
- Cleaning the exterior of the module and station with a damp cloth and mild detergent, then wipe dry.
- Verification of the cleaning completeness (no dust, no fingerprints, no stain or residue of food, human, animal, or domestic product origin).
- Surface disinfection of module and station exterior shells with a wipe or a soft, lint-free cloth using one of the recommended disinfectant solutions, with emphasis on the areas near the patient output, the fresh air inlet, the keyboard, and the station handle. Follow the product manufacturer recommendation. Let dry the product completely before next use.

Area to be covered by the cleaning and disinfection

- Replacement of Bacterial filter or HME filter
- Replacement of patient circuit or sterilization of reusable circuit system
- Replacement of the double limb circuit adaptor, if used.
- Insert the module in the station.

- Function Check, as per set up test described in chapter 2.

Follow this procedure also for devices which have previously been used by patients in whom MRSA infection, for example, has been verified.

CAUTION	Follow the use precautions of the disinfectant (Protective glass, gloves and / or mask as indicated on the product)
	Do not apply the liquid cleaning solution directly on the device
	Be careful to not wet the electrical connection
	When using a liquid solution on a wipe, the wipe should be saturated but not dripping
	Do not clean the inside of the station so that no damage is done on the station fan and the electrical connector with the module

For AC-150 disinfection, we recommend usage of the following products:
- Mikrozid® sensitive liquid from Schülke
- Mikrozid® sensitive wipes from Schülke
- Mikrozid® AF liquid from Schülke
- WILAsil® from WILAmed.

For trolley and its accessories disinfection, EOVE recommends Anioxy spray WS, Anios Surfa'safe premium, Aniosyme X3, Wip'Anios Excel and Mikrozid Lingettes AF.

List of parts potentially contaminated by exhaled gas

- Double branch adaptor (if not protected by a bacterial filter)
- Patient circuit

Servicing

⚠ **WARNING**	
● **Maintenance of the ventilator should be carried out by a trained technician. Attempting to repair the machine yourself could result in patient injury or damage to the machine.**	
● **It is forbidden to modify the AC-150 without manufacturer authorization.**	
NOTE	Retain the original packaging to use when shipping to/from service agent.

Maintenance timetable

The AC-150 should be regularly serviced by an authorized EOVE technician according to the following schedule. The ventilator will provide safe and reliable ventilation 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 AC-150 device, you should exercise caution and have it inspected by an authorized EOVE technician.

Servicing schedule from the date of first use:

Recommended Service	Conducted by	Instructions
Every 6 months	Person trained in the use of AC-150	Check the air filter and replace if necessary (replace earlier if dirty or dusty). Check double limb circuit adapter membrane, if used. Replace if necessary.
Every 2 years	Qualified EOVE technician	Replace internal battery or if service notification is displayed.
Every 25,000 hours of use	Qualified EOVE technician	Replace turbine or if service notification is displayed.

Chapter 6 - Device information

Technical specifications

⚠ **WARNING**
● **Due to their resistance to flow, accessories such as filters, water traps and humidifiers many decrease patient pressure during inspiration and increase patient pressure during exhalation.**

Physical specifications

Docking Specifications	Weight: 1.5 kg± 5%	Size: 25x21x13 cm
Ventilation Module Specifications	Weight: 1.8 kg± 5%	Size: 24.5x14x10 cm

Ventilation Sound level weighted A (tested according to ISO80601-2-72)	Sound Power <45 dB ± 10% Sound Pressure < 30 dB

Ventilation specifications

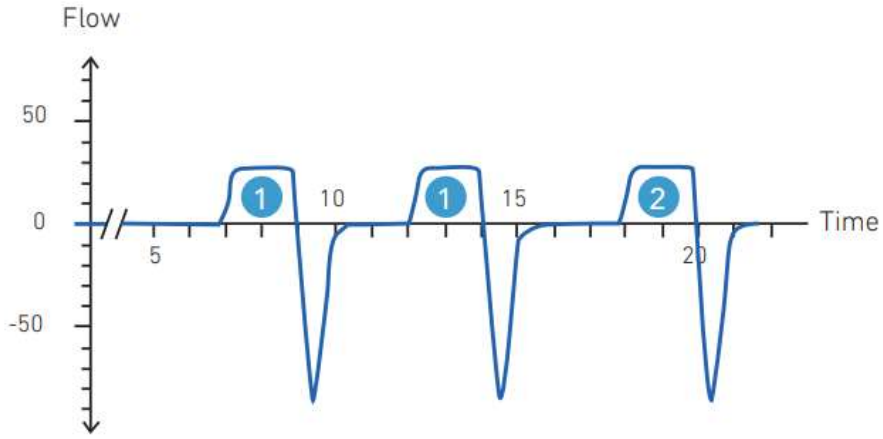
The AC-150 can be used in the following ventilation modes:

- (A)VCV: Volume Assisted Controlled Ventilation (with expiration valve)
- (A)PCV: Pressure Assisted/Controlled Ventilation (with expiration valve)
- PSV: Pressure Support Ventilation (with expiration valve)
- MPV: Mouthpiece Volume Ventilation
- MPP: Mouthpiece Pressure Ventilation
- PSV VT: Pressure Support Ventilation Volume regulated (with expiratory valve)
- V-SIMV: Volume Synchronized Intermittent Mandatory Ventilation (with expiratory Valve)
- P-SIMV: Pressure Synchronized Intermittent Mandatory Ventilation (with expiratory valve)
- CPAP: Continuous Positive Airway Pressure (with leak)
- S(T): Spontaneous Timed (with leak)
- PAC: Pressure Assisted/Controlled (with leak)
- VTS: Volume Target Spontaneous (with leak)
- C-FLOW: Continuous Flow

(A)VCV: Volume Assisted Controlled Ventilation (Valve)

This mode delivers breaths according to the set volume (**VT**), based on a flow control (Rectangle or Decelerated **Flow Slope**). Inspiration lasts a set constant time (**I Time**). Exhalation controls the set exhalation pressure (**PEEP**). Breaths are guaranteed at a set minimum rate (**Rate**). Patient can increase rate by inspiration triggering (**I Trig**.). If a **Sigh** is set, a deeper breath with **I Time** and exhalation time multiplied by the **Sigh VT Coef.** will be delivered every number of breaths corresponding to the set **Sigh Interval.**

Example of waveforms:



1 =Assisted breath triggered by the patient and cycled by the ventilator

2=Mandatory breath based on respiratory rate

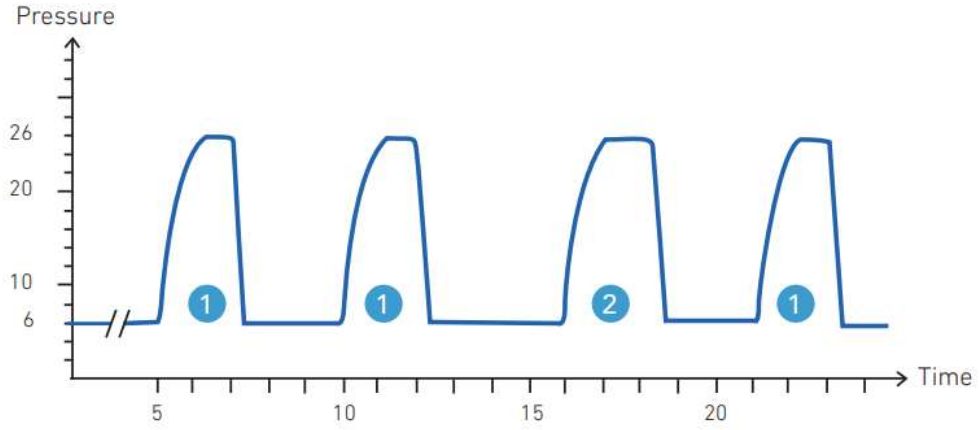
Setting	Adult	Pediatric	Limitations
VT (ml)	300-2500	30-600	None
PEEP (cmH2O)	OFF / 1-25	OFF / 1-20	None
Flow Slope	1 (Rectangle), 2 (Decelerating)		None
Rate (c/min)	5-60	5-80	**Rate** ≤ 45 / **I Time** (I/E ≤ 3/1) *
I Time (s)	0.3-2.5	0.3-2.5	**Rate** ≤ 45 / **I Time** (I/E ≤ 3/1) *
I Trig.	OFF / AUTO / 1-5	OFF / AUTO / 1-5	None
Sigh	ON / OFF	ON / OFF	None
Sigh VT Coef.	1.5 - 2.5	1.5 - 2.5	None
Sigh Interval (breaths)	50 - 250	50 - 250	None

*A cancellable alarm “Reversed I/E” will trigger when the set I/E ratio exceeds 1/1

(A)PCV: Pressure Assisted Controlled Ventilation (Valve)

This mode delivers breaths according to the set total pressure, **Pres. Control.** added to the set exhalation pressure (**PEEP**). Inspiration lasts a set constant time (**I Time**). Breaths are guaranteed at a set minimum rate (**Rate**). Patient can increase rate by inspiration triggering (**I Trig.**).An optional **VT Target** can be activated.

Example of waveforms:



1 =Assisted breath triggered by the patient and cycled by the ventilator
2=Mandatory breath triggered by respiratory rate

Setting	Adult	Pediatric	Limitations
Pres. Control. (cmH2O)	5-48	5-48	**Pres. Control.** + **PEEP** ≤ 49 cmH2O **Pres. Control.** <**P. Contr. Max**
PEEP (cmH2O)	OFF / 1-25	OFF / 1-20	**Pres. Control.** + **PEEP** ≤ 49 cmH2O **P. Contr. Max** + **PEEP** ≤ 50 cmH2O
Pres. Slope	1-5 (100-500ms)	1-5 (50-250ms)	None
Rate (c/min)	5-60	5-80	**Rate** ≤ 45 / **I Time** (I/E ≤ 3/1) *
I Time (s)	0.3-2.5	0.3-2.5	**Rate** ≤ 45 / **I Time** (I/E ≤ 3/1) *
I Trig.	OFF / AUTO / 1-5	OFF / AUTO / 1-5	None
Vt Target (ml)	OFF / 300-2500	OFF / 30-600	None
P. Contr. Max (cmH2O)	10-49	10-49	Inactive when **Vt Target** is OFF **P. Contr. Max** + **PEEP** ≤ 50 cmH2O **Pres. Control.** <**P. Contr. Max**
VT Target Speed	1-3	1-3	Inactive when **Vt Target** is OFF

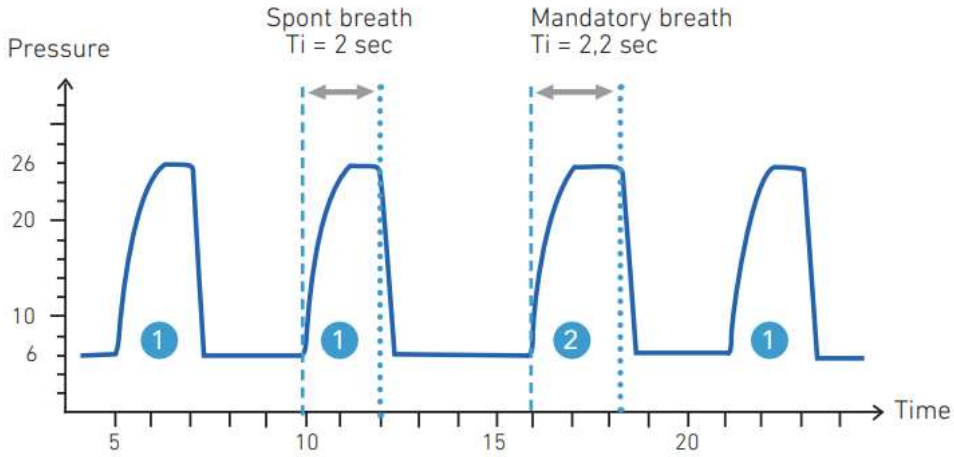
*A cancellable alarm “Reversed I/E” will trigger when the set I/E ratio exceeds 1/1

PSV: Pressure Support Ventilation (Valve)

This mode delivers breaths according to the set total pressure, (**Pres. Sup.**) added to the set exhalation pressure (**PEEP**). Inspiration time is variable adapting to patient flow (**E Trig.**). Breaths are guaranteed at a set minimum rate (**Rate**). Patient can increase rate by inspiration triggering (**I Trig.**).

During backup breaths, the set **Backup I Time** defines the inspiration time. If set to AUTO, **Exp. Trig.** still applies to backup breaths. **Exp. Trig**. is allowed between **I Time Min** and **I Time Max**. **I Time Max** has priority on **I Time Min** in case the AUTO conditions are conflicting.

Example of waveforms:



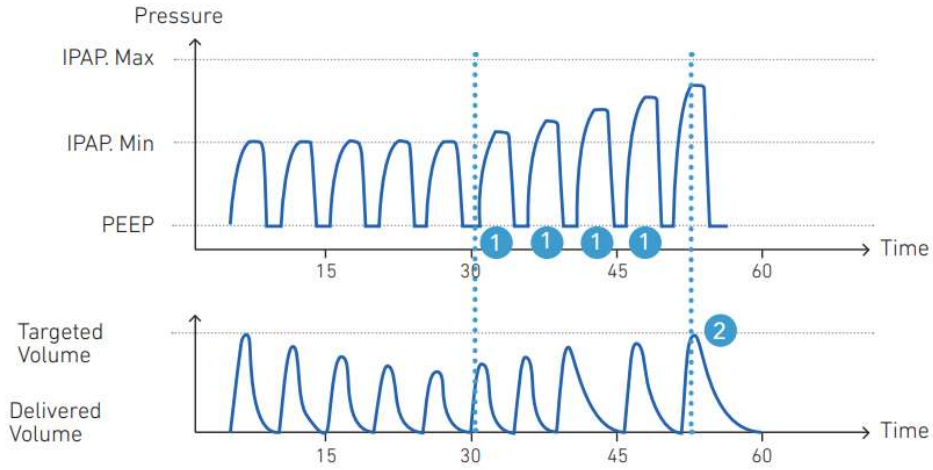
1 =Assisted breath triggered by the patient and cycled by the ventilator
2=Mandatory breath triggered by respiratory rate

Setting	Adult	Pediatric	Limitations
Pres. Support (cmH2O)	5-49	5-49	**Pres. Support** + **PEEP**≤ 50 cmH2O
PEEP (cmH2O)	OFF / 1-25	OFF / 1-20	**Pres. Support** + **PEEP**≤ 50 cmH2O
Pres. Slope	1-5(100ms-500ms)	1-5 (50-250ms)	None
Rate (c/min)	5-60	5-80	**Rate** ≤ 30 / **I Time Min** (I/E ≤ 1/1) **Rate** ≤ 30 / **Backup I Time** (I/E ≤ 1/1)
I Trig.	AUTO / 1-5	AUTO / 1-5	None
Exp. Trig. (%)	AUTO / 10-90	AUTO / 10-90	None
Backup I Time (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**Rate** ≤ 30 / **Backup I Time (**I/E ≤ 1/1)
I Time Min (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**Rate** ≤ 30 / **I Time Min** (I/E ≤ 1/1) **I Time Min** ≤ **I Time Max** **I Time Min** AUTO = **Press Slope** + 100 ms
I Time Max (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**I Time Min** ≤ **I Time Max** **I Time Max** AUTO = 30 / **Rate**

PSV VT: Pressure Support Ventilation with VT Target (Valve)

This mode delivers breaths according to the set target volume (**VT**), based on pressure control adapting breath by breath, between the set total pressure limits (**Pres Sup Min and P Sup Max**) added to the set exhalation pressure (**PEEP**). **VTTarget Speed** adapts the maximum pressure increments between two breaths. Inspiration time is variable according to patient flow (**E Trig**). Breaths are guaranteed at a set minimum rate (**Rate**). Patient can increase rate by inspiration triggering (**I Trig**.). During backup breaths, the set **Backup I Time** defines the inspiration time. If set to AUTO, **E trig.** still applies to backup breaths. **E Trig.** is allowed between **I Time Min** and **I Time Max**. **I Time Max** has priority on **I Time Min** in case the AUTO conditions are conflicting.

Example of waveforms:



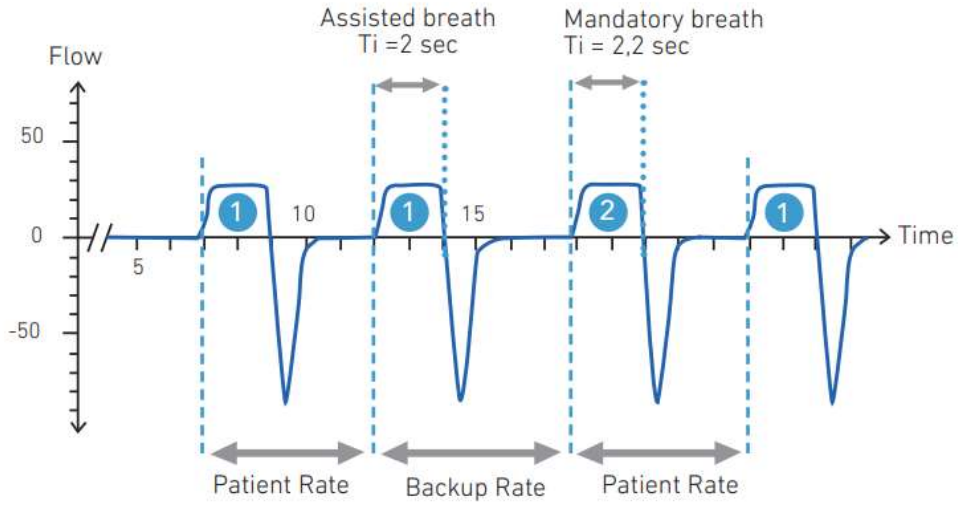
1 =Pressure increment breath by breath
2=Targeted volume reached

Setting	Adult	Pediatric	Limitations
Vol. Target (ml)	300-2500	30-600	None
Pres Sup Min (cmH2O)	5-48	5-48	**Pres Sup Min** < **Pres Sup Max**
Pres Sup Max (cmH2O)	10-49	10-49	**Pres Sup Min** < **Pres Sup Max** **Pres Sup Max** + **PEEP** ≤ 50 cmH2O
PEEP (cmH2O)	OFF / 1-25	OFF / 1-20	**Pres Sup Max** + **PEEP** ≤ 50 cmH2O
Pres. Slope	1-5 (100-500ms)	1-5 (50-250ms)	None
Rate (c/min)	5-60	5-80	**Rate** ≤ 30 / **I Time Min** (I/E ≤ 1/1) **Rate** ≤ 30 / **Backup I Time** (I/E ≤ 1/1)
I Trig.	AUTO / 1-5	AUTO / 1-5	None
E Trig. (%)	AUTO / 10-90	AUTO / 10-90	None
VT Target Speed	1-3	1-3	None
Backup I Time (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**Rate** ≤ 30 / **Backup I Time** (I/E ≤ 1/1)
I Time Min (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**Rate** ≤ 30 / **I Time Min** (I/E ≤ 1/1) **I Time Min** ≤ **I Time Max** **I Time Min** AUTO = **Press Slope** + 100 ms
I Time Max (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**I Time Min** ≤ **I Time Max** **I Time Max** AUTO = 30 / **Rate**

V-SIMV: Volume Synchronized Intermittent Ventilation (Valve)

This mode delivers mandatory breaths according to the set volume (**VT**), at set minimum rate (**Rate**) and a set constant inspiration time (**I Time**). Patient can trigger additional spontaneous breaths (**ITrig**.) according to the set total pressure (**Pres. Support**) added to the set exhalation pressure (**PEEP**) with a variable inspiration time adapting to patient flow (**E Trig**). During spontaneous breaths, **E Trig**. is allowed between **I Time Min** and **I Time Max**. **I Time Max** has priority on **I Time Min** in case the AUTO conditions are conflicting.

Example of waveforms:



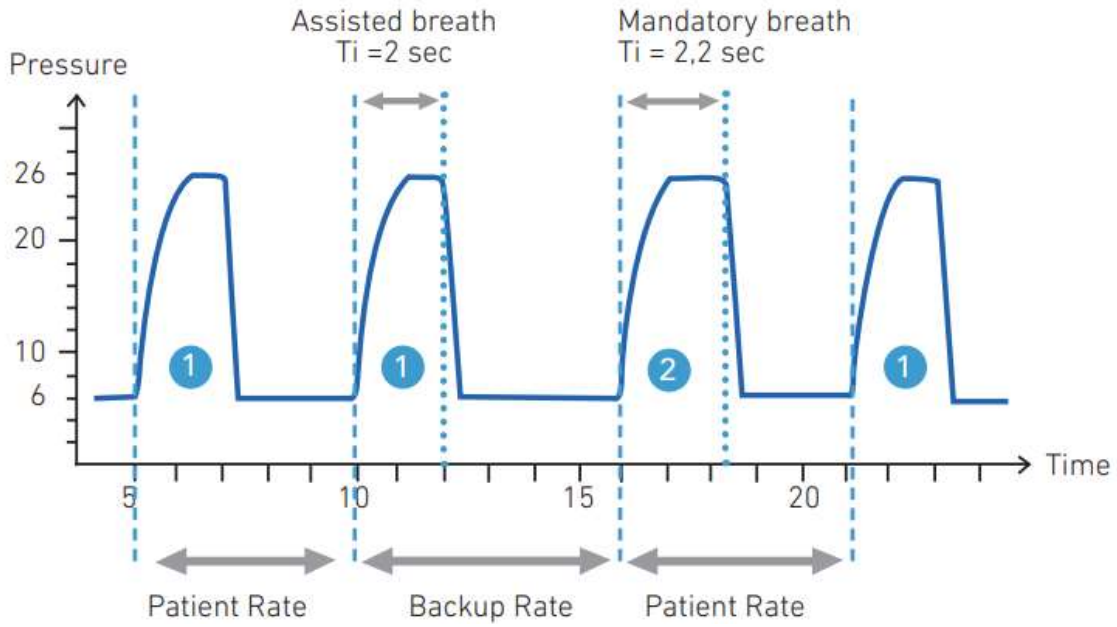
1 =Assisted breath triggered by the patient
2=Mandatory breath based on respiratory rate but synchronized with patient

Setting	Adult	Pediatric	Limitations
VT (ml)	300-2500	30-600	None
Pres. Support (cmH2O)	5-49	5-49	**Pres. Support** + **PEEP** ≤ 50 cmH2O
PEEP (cmH2O)	OFF / 1-25	OFF / 1-20	**Pres. Support** + **PEEP** ≤ 50 cmH2O
Pres. Slope	1-5 (100-500ms)	1-5 (50-250ms)	None
Rate (c/min)	5-40	5-60	**Rate** ≤ 30 / **I Time** (I/E ≤ 1/1) **Rate** ≤ 30 / **I Time Min** (I/E ≤ 1/1)
I Time (s)	0.3-2.5	0.3-2.5	**Rate** ≤ 30 / **I Time** (I/E ≤ 1/1)
I Trig.	AUTO / 1-5	AUTO / 1-5	None
E Trig. (%)	AUTO / 10-90	AUTO / 10-90	None
I Time Min (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**I Time Min** ≤ **I Time Max** **Rate** ≤ 30 / **I Time Min** (I/E ≤ 1/1) **I Time Min** AUTO = **Press Slope** + 100 ms
I Time Max (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**I Time Min** ≤ **I Time Max** **I Time Max** AUTO = 30 / **Rate**

P-SIMV: Pressure Synchronized Intermittent Ventilation (Valve)

This mode delivers mandatory breaths according to the set total pressure (**Pres. Control.**) added to the set exhalation pressure (**PEEP**) at set minimum rate (**Rate**) at a set constant inspiration time (**I Time**). Patient can trigger additional spontaneous breaths (**I Trig**.) according to the set total pressure (**Pres. Support**) added to the set exhalation pressure **(PEEP**) with a variable inspiration time adapting to patient flow (**E Trig**). During spontaneous breaths, **E Trig**. is allowed between **I Time Min** and **I Time Max**. **I Time Max** has priority on **I Time Min** in case the AUTO conditions are conflicting.

Example of waveforms:



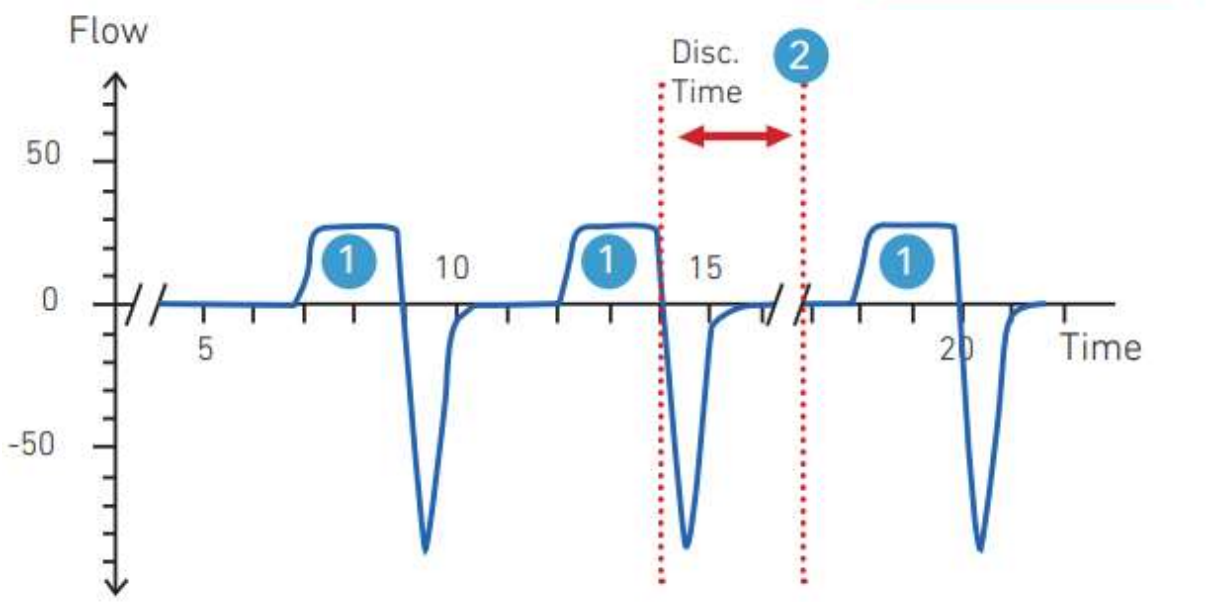
1 =Assisted breath triggered by the patient
2=Mandatory breath based on respiratory rate but synchronized with patient

Setting	Adult	Pediatric	Limitations
Pres. Control. (cmH2O)	5-49	5-49	**Press. Control.** + **PEEP** ≤ 50 cmH2O
Pres. Support (cmH2O)	5-49	5-49	**Pres. Support** + **PEEP** ≤ 50 cmH2O
PEEP (cmH2O)	OFF / 1-25	OFF / 1-20	**Press. Control.** + **PEEP** ≤ 50 cmH2O **Press. Support** + **PEEP** ≤ 50 cmH2O
Pres. Slope	1-5 (100-500ms)	1-5 (50-250ms)	None
Rate (c/min)	5-40	5-60	**Rate** ≤ 30 / **I Time** (I/E ≤ 1/1) **Rate** ≤ 30 / **I Time Min** (I/E ≤ 1/1)
I Time (s)	0.3-2.5	0.3-2.5	**Rate** ≤ 30 / **I Time** (I/E ≤ 1/1)
I Trig.	AUTO / 1-5	AUTO / 1-5	None
E Trig. (%)	AUTO / 10-90	AUTO / 10-90	None
I Time Min (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**Rate** ≤ 30 / **I Time Min** (I/E ≤ 1/1) **I Time Min** ≤ **I Time Max** **I Time Min** AUTO = **Press Slope** + 100 ms
I Time Max (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**I Time Min** ≤ **I Time Max** **I Time Max** AUTO = 30 / **Rate**

MPV: Mouthpiece Volume Ventilation (Valve or no valve)

This mode delivers breaths according to the set volume (**VT**), based on a flow control (**Rectangle or Decelerated Flow Ramp**). Inspiration lasts a set constant time (**I Time**). The minimum rate (**Rate**) is an optional setting. Exhalation control is delivering the set flow (**Bias Flow**), based on a flow control. Patient triggering (**I. Trig**.) and alarms are specific to the mouthpiece configuration needs.

Example of waveforms:



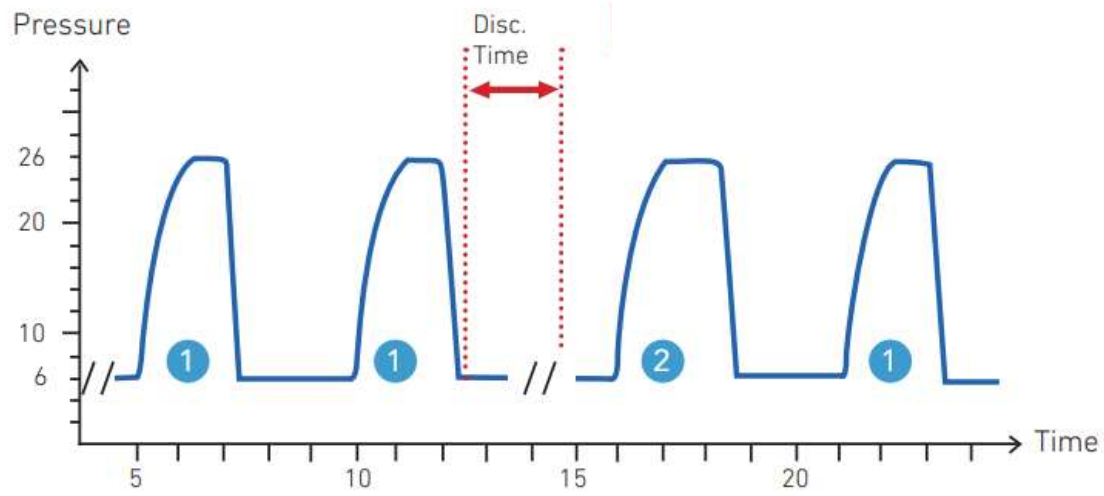
1 =Breath triggered by the patient
2=Disconnection alarm

Setting	Adult	Pediatric	Limitations
VT (ml)	100-2500	100-600	None
Bias Flow (l/min)	OFF / 1-20 l/min	OFF / 1-20 l/min	None
Flow Slope	1 (Rectangle), 2 (Decelerating)		None
Rate (c/min)	OFF / 5-60	OFF / 5-80	**Rate** ≤ 30 / **I Time** (I/E ≤ 1/1)
I Time (s)	0.3-2.5	0.3-2.5	**Rate** ≤ 30 / **I Time** (I/E ≤ 1/1)
I Trig.	AUTO / 1-5	AUTO / 1-5	None

MPP: Mouthpiece Pressure Ventilation (Valve or no valve)

This mode delivers breaths according to the set pressure (**Pres. Control.**), based on a pressure control. Inspiration lasts a set constant time (**I Time**). The minimum rate (**Rate**) is an optional setting. Exhalation control is delivering the set flow (**Bias Flow**), based on a flow control. Patient triggering (**I Trig**.) and alarms are specific to the mouthpiece configuration needs.

Example of waveforms:



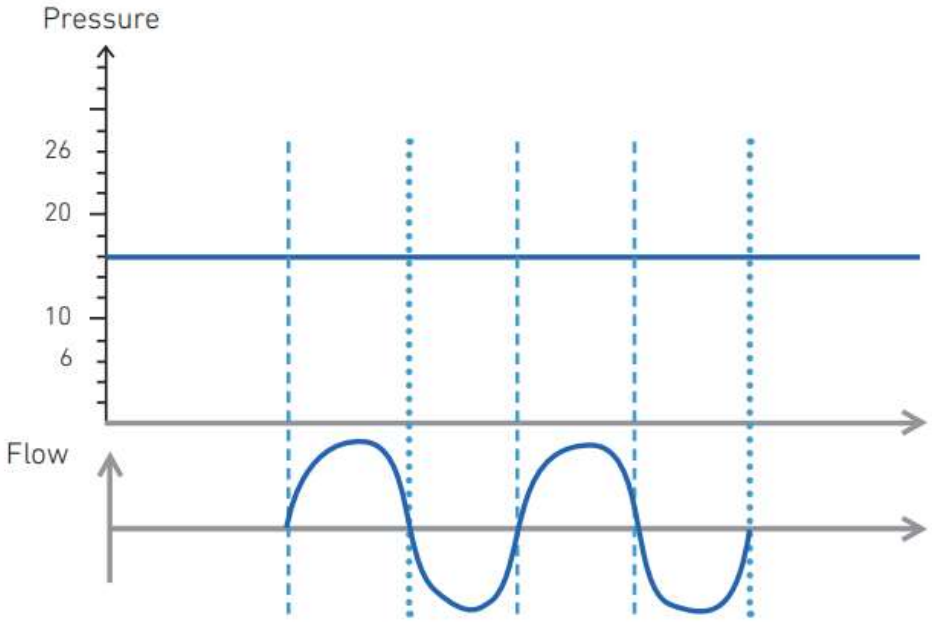
1 =Breath triggered by the patient
2=Disconnection alarm

Setting	Adult	Pediatric	Limitations
Pres. Control. (cmH2O)	5-49	5-49	None
Bias Flow (l/min)	OFF / 1-20 l/min	OFF / 1-20 l/min	None
Pres. Slope	1-5 (100-500ms)	1-5 (50-250ms)	None
Rate (c/min)	OFF / 5-60	OFF / 5-80	**Rate** ≤ 30 / **I Time** (I/E ≤ 1/1)
I Time (s)	0.3-2.5	0.3-2.5	**Rate** ≤ 30 / **I Time** (I/E ≤ 1/1)
I Trig.	AUTO / 1-5	AUTO / 1-5	None

CPAP: Continuous Positive Airway Pressure (Leak)

This mode delivers continuous pressure to the patient. All breaths in this mode are spontaneous breaths.

Example of waveforms:



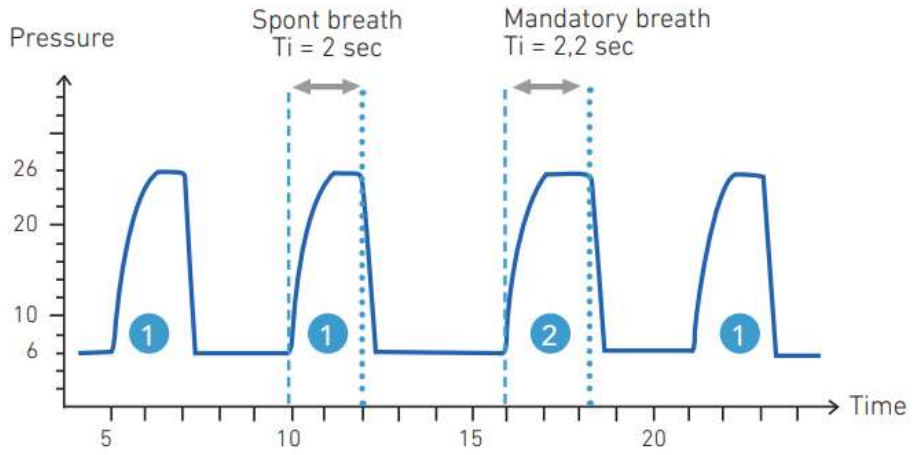
Setting	Adult	Pediatric	Limitations
CPAP Pressure (cmH2O)	4-20	4-20	None

NOTE	The CPAP mode is usually associated with a single branch circuit. It can also be performed with a double branch configuration, but it will always require a leak mask or an additional leak accessory at patient side. In this case the exhalation valve will stay closed. If no leak is detected by the device, a rebreathing alarm will be triggered.

S(T): Spontaneous Timed(Leak)

This mode delivers breaths according to the set inspiration pressure (**IPAP**) and set exhalation pressure (**EPAP**). Inspiration time is variable adapting to patient flow (**E. Trig.**). Breaths are guaranteed at a set minimum rate (**Rate**), unless **Rate** is turned OFF. Patient can increase rate by inspiration triggering (**I. Trig.**).On backup breaths, the set **Backup I Time** defines the inspiration time. If set to AUTO, **E trig.** still applies to backup breaths. **E Trig**. is allowed between **I Time Min** and **I Time Max**. **I Time Max** has priority on **I Time Min** in case the AUTO conditions are conflicting.

Example of waveforms:



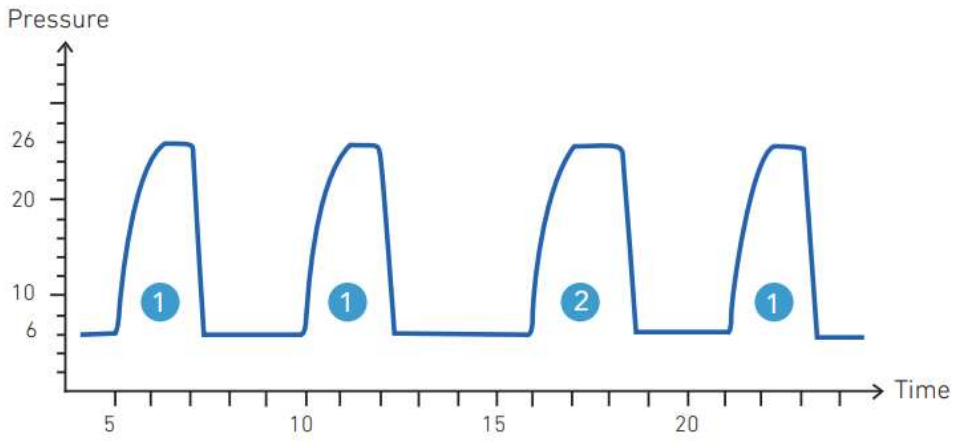
1 =Assisted breath triggered and cycled by the patient
2=Mandatory breath triggered by backup respiratory rate

Setting	Adult	Pediatric	Limitations
IPAP (cmH2O)	6-50	6-50	**IPAP** ≥ **EPAP** + 2
EPAP (cmH2O)	4-25	4-20	**IPAP** ≥ **EPAP** + 2
Pres. Slope	1-5 (100-500ms)	1-5 (50-250ms)	None
Rate (c/min)	OFF / 5-60	OFF / 5-80	**Rate** ≤ 30 / **I Time Min** (I/E ≤ 1/1) **Rate** ≤ 30 / **Backup I Time** (I/E ≤ 1/1)
I Trig.	AUTO / 1-5	AUTO / 1-5	None
E Trig. (%)	AUTO / 10-90	AUTO / 10-90	None
Backup I Time (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**Rate** ≤ 30 / **Backup I Time** (I/E ≤ 1/1) Inactive if **Rate** is OFF
I Time Min (s)	AUTO / 0.3-2.5	AUTO / 0.2-2.5	**Rate** ≤ 30 / **I Time Min** (I/E ≤ 1/1) **I Time Min** ≤ **I Time Max** **I Time Min** AUTO = **Press Slope** + 100 ms
I Time Max (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**I Time Min** ≤ **I Time Max** **I Time Max** AUTO = 30 / **Rate** If **Rate** is OFF, **I Time Max** AUTO corresponds to 2.5 s in Adult, 1.5 s in Pediatric, and 1 s in Newborn

PAC: Pressure Assisted Controlled (Leak)

This mode delivers breaths according to the set inspiration pressure (**IPAP**) and set exhalation pressure (**EPAP**). Inspiration lasts a set constant time (**I Time**). Breaths are guaranteed at a set minimum rate (**Rate**). Patient can increase rate by inspiration triggering (**I Trig**.). An optional **VT Target** can be activated.

Example of waveforms:



1 =Assisted breath triggered by patient and cycled by ventilator
2=Mandatory Breath triggered by respiratory rate

Setting	Adult	Pediatric	Limitations
IPAP (cmH2O)	6-49	6-49	**IPAP** ≥ **EPAP** + 2
EPAP(cmH2O)	4-25	4-20	**IPAP** ≥ **EPAP** + 2
Pres. Slope	1-5 (100-500ms)	1-5(50-250ms)	None
Rate (c/min)	5-60	5-80	**Rate** ≤ 45 / **I Time** (I/E ≤ 3/1)*
I Time (s)	0.3-2.5	0.2-2.5	**Rate** ≤ 45 / **I Time** (I/E ≤ 3/1)*
I Trig.	OFF / AUTO / 1-5	OFF / AUTO / 1-5	None
Vt Target (ml)	OFF / 300-2500	OFF / 30-600	None
IPAP Max(cmH2O)	7-50	7-50	Inactive when **VT Target** is OFF
VT Target Speed	1-3	1-3	Inactive when **VT Target** is OFF

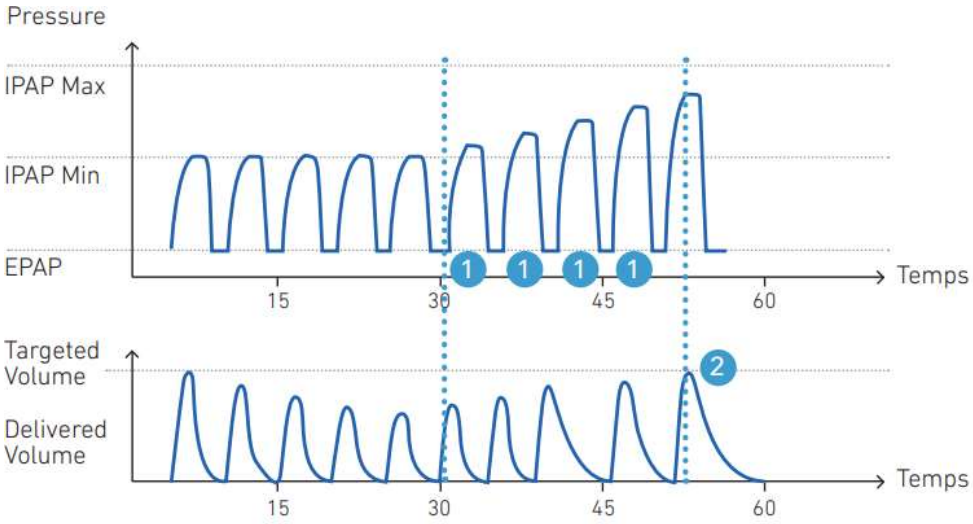
*A cancellable alarm "Reversed I/E" will trigger when the set I/E ratio exceeds 1/1

VTS: Volume Target Spontaneous mode (Leak)

This mode delivers breaths according to the set volume (**Vol. Target**) based on pressure control adapting breath by breath, between the set pressure limits (**IPAP Min** and **IPAP Max**). **VT Target Speed** adapts the maximum pressure increments between two breaths. Inspiration time is variable adapting to patient flow (**Exp. Trig.**). Breaths are guaranteed at a set minimum rate (**Rate**). Patient can increase rate by inspiration triggering (**I Trig.**). On backup breaths, the set Backup I Time defines the inspiration time. If set to AUTO, exhalation trigerring (**Exp. Trig.**) still applies to backup breaths. **Exp. Trig**. is

allowed between **I Time Min** and **I Time Max**. **I Time Max** has priority on **I Time Min** in case the AUTO conditions are conflicting.

Example of waveforms:



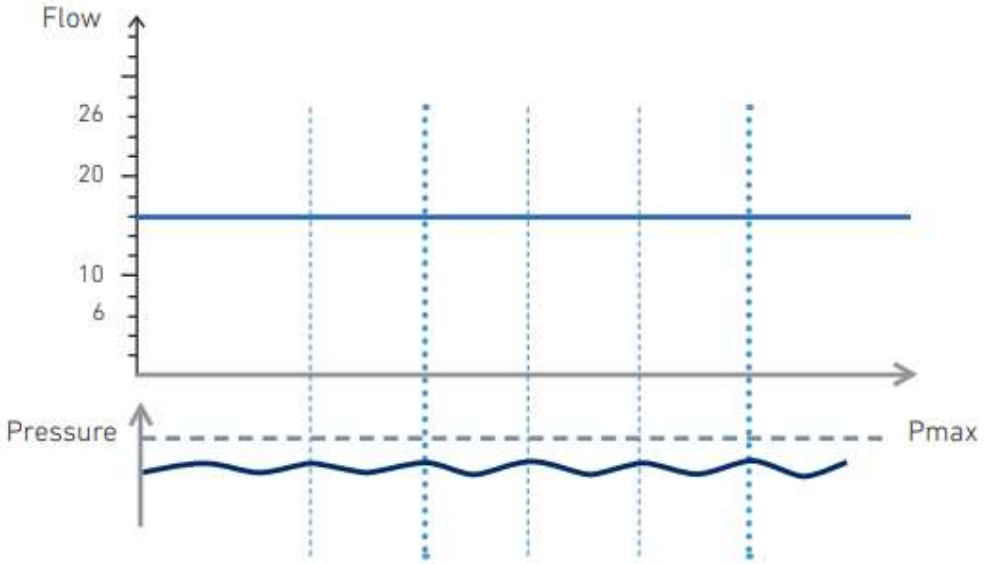
1 =Pressure increment breath by breath
2 =Targeted volume reached

Setting	Adult	Pediatric	Limitations
Vol. Target (ml)	300-2500	30-600	None
IPAP Min(cmH2O)	6-49	6-49	**IPAP Max** ≥ **IPAP Min** + 5 **IPAP Min** ≥ **EPAP** + 2
IPAP Max(cmH2O)	7-50	7-50	**IPAP Max** ≥ **IPAP Min**
EPAP(cmH2O)	4-25	4-20	**IPAP Min** ≥ **EPAP** + 2
Pres. Slope	1-5 (100-500ms)	1 -5(50-250ms)	None
Rate (c/min)	5-60	5-80	**Rate** ≤ 30 / **I Time Min** (I/E ≤ 1/1) **I Time Min** ≤ **I Time Max**
I Trig.	AUTO / 1-5	AUTO / 1-5	None
Exp Trig. (%)	AUTO / 10-90	AUTO / 10-90	None
Backup I Time (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**Rate** ≤ 30 / **Backup I Time** (I/E ≤ 1/1)
VT Target Speed	1-3	1-3	None
I Time Min (s)	AUTO / 0.3-2.5	AUTO / 0.2-2.5	**Rate** ≤ 30 / **I Time Min** (I/E ≤ 1/1) **I Time Min** ≤ **I Time Max** **I Time Min** AUTO = **Press Slope** + 100 ms
I Time Max (s)	AUTO / 0.3-2.5	AUTO / 0.3-2.5	**I Time Min** ≤ **I Time Max** **I Time Max** AUTO = 30 / **Rate**

C-FLOW: Continuous Flow (Leak)

This mode delivers continuous flow to the patient. The set flow (**Flow**) is delivered continuously through the humidifier and nasal cannula. If the maximum pressure (**Pres. Max**) is reached, the device will still deliver flow but within the limit of this pressure.

Example of waveforms:



Settings	Adult	Pediatric	Limitations
Flow (l/min)	10-60	2-25	None

⚠ **WARNING**
● **The C-Flow mode cannot be considered as a ventilation mode since it is not providing pressure and flow directly to the patient.**
● **As in CPAP and CFLOW modes, in a S(T) mode with Rate OFF, the ventilator behaves like a purely spontaneous device (S mode). A patient must have a sufficient ability to breath spontaneously to use this mode. A ventilator-dependent patient cannot be ventilated under such ventilation modes.**
CAUTION
In Spontaneous mode (S(T) mode with Rate deactivated), the disconnection alarm will trigger if an apnea is longer than the Disconnection alarm timer is set. To avoid annoying alarms, the disconnection timer needs to be set at a higher value than the maximum expected apnea times.

Accuracy of ventilation settings

- Valve volumes: ± (5 ml + 10%) under BTPS conditions
- MPV volumes: ± (10 ml + 15%) under BTPS conditions
- Leak volumes: ± (10 ml + 10%) under BTPS conditions
- Sigh Volumes: +/- (10 ml + 20%) under BTPS conditions
- Pressure: ± (1 cmH2O + 10%)
- Time: ± 0.1 s
- Rate: ± 1 breath/min
- Flow: ± (0.5 l/min + 10%)

Measurement uncertainties (measurement control device)

- Pressure: ± 0.75% or ± 0.1 cmH2O*
- Flow: ± 1.9% or ± 0.1 l/min*
- Volumes: ± 2% or ± 0.2 ml*
- Time: ± 0.02 s

*Whichever is greater

According to ISO 80601-2-72 standard, all volume, flow, leak specifications should be expressed in STPD conditions apart from VBS (Ventilator Breathing System) characteristics expressed in BTPS at the absolute pressure of the VBS.

The ventilator is maintaining the settings accuracy under the conditions described in the "environmental specifications" chapter, and with the compatible accessories used in their normal conditions (correct humidifier level, no non-intentional leakages).

Monitored parameter specifications

(Rounded values for readings)

Parameter	Range	Display method / Filtering
Peak Inspiratory Pressure (PIP)	0 to 99 cmH2O	Computed for each inspiration
Positive End Expiratory Pressure (PEEP)	0 to 60 cmH2O	Computed for each exhalation
Inspiratory Tidal Volume (VTI)	0 to 4000 ml	Computed for each inspiration
Exhalation Tidal Volume (VTE)	0 to 4000 ml	Computed for each exhalation
Total Breath Rate (Res. Rate)	1 to 99.9 bpm	Computed for each 4 breaths
I/E Ratio (I/E)	33.3:1 to 1:99.9	Computed for each breath
Inspiratory Time (Insp. Time)	0.1 to 9.9 s	Computed for each inspiration
Exhalation Time (Exp. Time)	0.3 to 59.9 s	Computed for each exhalation
I Peak Flow	0 to 100 l/min	Computed for each inspiration
E Peak Flow	0 to 100 l/min	Computed for each exhalation
Inspiratory Minute Volume (MV)	0 to 99.9l	Computed for each breath
Leak: Leak modes Valve modes*	 0 to 200 l/min 0 to 100 l/min	Computed for each breath *Set to 0 if Disconnection alarm is ON
FiO2	21% to 100%	Computed for each breath
SpO2	80% to 100%	According to NONIN or Sentec
Pulse Rate	30-250 (Sentec) 18-300 (NONIN)	According to NONIN or Sentec
PCO2	0-200	According to Sentec

A monitored value displayed as "--" means that the measurement is not available or invalid.

Accuracy of monitoring data

- Inspired volume in valve modes: ± (5 ml + 10%)
- Expired volume in valve modes: ± (5 ml + 20%)
- Leak volume: ± (10 ml + 10%)
- Pressure: ± (2 cmH2O + 4%)
- Time: ± 0.1 s
- I/E: Calculation based on Inspiratory Time and Exhalation Time
- Rate: ± 1 breath/min
- Leak: ± (2 l/min + 15%)
- Peak flow: +/- (2l/min + 20%)
- Minute volume: +/- (0,2L + 10%)
- FIO2 : ± (2,5% + 2,5% O2) / Response Time 90% : < 25 s **
- SPO2: According to NONIN or Sentec specifications
- Pulse Rate: According to NONIN or Sentec specifications
- PCO2: According to Sentec specifications

Alarm parameter specifications

Alarm sound level: 55 - 75 dB ± 10%

The ventilator has the following alarm settings in specific ventilation modes:

Settings	Adult	Pediatric	Modes
Pres. Min (cmH2O)*	2-55 1-45	5-55 1-45	(A)VCV, MPV, VSIMV C-FLOW
Pres. Max (cmH2O)*	10-80 7-50	10-80 7-50	(A)VCV, MPV, VSIMV C-FLOW
VTI Min (ml)	OFF / 50-2490	OFF / 20-590	All except (A)VCV, MPV, MPP, C-FLOW
VTI Max (ml)	OFF / 310-3000	OFF / 40-800	(A)PCV, PSV, PSV VT, VSIMV, PSIMV
VTE Min (ml)	OFF / 50-2490	OFF / 20-590	All valve modes
VTE Max (ml)	OFF / 310-3000	OFF / 40-800	All valve modes
MV Min	OFF / 1-25	OFF / 0.5-6	All except (A)VCV, C-FLOW
Res. Rate Min	OFF / 6-65	OFF / 6-85	PSV, PSV VT, ST, VTS, CPAP
Res. Rate Max	OFF / 10-70	OFF / 20-90	All except MPV, MPP, CPAP, C-FLOW
FIO2 Min	OFF / 18-80	OFF / 18-80	All
FIO2 Max	OFF / 30-100	OFF / 30-100	All
SPO2 Min	OFF / 80-95	OFF / 80-95	All
Leak Max	OFF / 10-100	OFF / 10-100	All Leak modes except C-FLOW
Disc. Time	AUTO / 5-120	AUTO / 5-60	All except MPV, MPP, C-FLOW, CPAP
Disc. Time	OFF / 5-120	OFF / 5-60	C-FLOW
Disc. Time	5-120	5-60	CPAP
Disc. Time	OFF / 5-900	OFF / 5-900	MPV, MPP
*PWmax and PWmin according to ISO 10651-2 / ISO 80601-2-72 ** FIO2 measurement is sensitive to atmospheric pressure variation.			

⚠ **WARNING**
Delaying or deactivating the disconnection alarm through the disconnection timer must be done only with patients that have the corresponding capacity of breathing spontaneously. Failure to apply this recommendation can lead to a life-threatening risk for the patient.

Power specifications

⚠ **WARNING**
● **This device is intended to function with external power supply 2440 from Mascot, never use any other power supply unless recommended by Eove.**
● **To disconnect the device from the mains, unplug power supply.**

AC Inlet Voltage	100-240V
AC Inlet Power	1.6 A max
AC Inlet Frequency	50-60 Hz
DC inlet voltage Max current	12 to 30 V 2.5 to 5.8 A
Power	105 W maximum (peaks) 70 W nominal
Module Embedded battery life	5 hrs
Internal battery (not replaceable by user): capacity voltage discharge current	Lithium-ion 2.8 / 2.95 Ah 21,6 V nominal 7 A max
Interface/touchscreen start up time	<60 s
Ventilator unit start up time	5 seconds

Environmental specifications

Storage and transport conditions:

Ambient temperature	From -20°C à +60°C.
Relative humidity	From 10% à 95%, (non-condensing)

Operating conditions:

Ambient temperature	From +5°C to +40°C (after conditioning at 23° for 20 minutes)
Relative humidity	From 10% à 95%, (non-condensing)
Atmospheric pressure	From 660 hPa to 1100 hPa. (by default, AC-150 compensates for atmospheric pressure variations related to altitude up to 3000 m)
O2 pressure source	O2 pressure source: up to 50 Kpa with flow up to 20 l/min and flexible tubing used.

	(from hospital O2 network, always use a flow or pressure limiter)

Breathing system specifications

Inspiratory resistance at 60 l/min Ventilation stopped / Failure	<3 cmH2O
Expiratory resistance at 60 l/min Ventilation stopped / Failure	<3 cmH2O
Breathing system Compliance	<5 ml/cmH2O
Anti-bacterian Filter caracteristics	Resistance <2 cmH2O @ 60 l/min Dead space < 120 ml

Software versions

Main: C150 0007XX	Power: P150 0004XX	Interface: 3.X.X

Guidance and manufacturer's declaration electromagnetic emissions & immunity

⚠ **WARNING**
● **The ventilator should not be used in close proximity to other equipment or stacked on top of other devices. If this kind of use is unavoidable, the ventilator should be checked carefully and observed to ensure correct functioning of the device.**
● **Only accessories recommended for the AC-150 should be used. Using any other accessories could result in risk to the device or the patient.**
● **Any additional equipment connected to medical electrical devices must comply with the respective IEC or ISO standards (e.g., IEC 60950 for data processing equipment).** ● **Furthermore, all configurations shall comply with the requirements for medical electrical systems (see IEC 60601-1-1 or clause 16 of the 3Ed. of IEC 60601-1, respectively). Adding additional equipment configures a medical system and this system must comply with the requirements for medical electrical systems. Any person undertaking this kind of addition shall be responsible to ensure that all requirements are complied with. It is important to note that local laws take priority over the above-mentioned requirements. If in doubt, consult an EOVE representative or the technical service department.**
● **Interference may occur in the vicinity of equipment marked with the following symbol:**
● **AC-150 is designed for use in the electromagnetic environment described below. Those using the device should ensure that the AC-150 is used in such an environment.**

Electromagnetic emissions

Emissions test	Level of compliance	Guidance for EM environment
RF emissions CISPR 11	Class B	AC-150 is suitable for home health care environment and a professional health care establishment
Harmonic Emissions IEC 61000-3-2	Complying	
Voltage Fluctuations/Flicker Emissions IEC 61000-3-3	Complying	

Electromagnetic immunity

Immunity Test	IEC 60601 level	Level of compliance	Guidance for EM environment
Electrostatic discharge (ESD) IEC 61000-4-2	8 kV contact 15 kV air	8 kV contact 15 kV air	for home health care environment and a professional health care establishment
Electrical fast transient/burst IEC 61000-4-4	2 kV for power supply lines 1 kV for input/output lines	2 kV for power supply lines 1 kV for input/output lines	for home health care environment and a professional health care establishment

Immunity Test	IEC 60601 level	Level of compliance	Guidance for EM environment
Surge IEC 61000-4-5	1 kV differential mode 2 kV common mode	1 kV differential mode 2 kV common mode	for home health care environment and a professional health care establishment
Voltage dips, short interruptions, and voltage variations on power supply input lines IEC 61000-4-11	0% Ut for 0.5 cycle With 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0% Ut for 1 cycles 70% Ut for 25 cycles at 50 Hz For 30 cycles at 60 Hz Monophased at 0°	0% Ut for 0.5 cycle With 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0% Ut for 1 cycles 70% Ut for 25 cycles at 50 Hz For 30 cycles at 60 Hz Monophased at 0°	Mains power quality should be as home health care environment and a professional health care establishment. If operating during power cuts, it is recommended to use other power sources.
Voltage Interruption IEC 61000-4-11	0 % UT for 250 cycles at 50 Hz for 300 cycles at 60 Hz	0 % UT for 250 cycles at 50 Hz for 300 cycles at 60 Hz	
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	30 A/m	30 A/m	for home health care environment and a professional health care establishment
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz 6 V in ISM band and from 0.15 MHZ to 80 MHZ, amateur radio band included 80% MA at 1 KHz	3 Vrms 150 kHz to 80 MHz 6 V in ISM band and from 0.15 MHZ to 80 MHZ, amateur radio band included 80% MA at 1 KHz	for home health care environment and a professional health care establishment
Electromagnetic fields Radiated RF* IEC 61000-4-3	10 V/m 80 MHz to 2.5 GHz	10 V/m 80 MHz to 2.5 GHz	for home health care environment and a professional health care establishment
Proximity fields emitted by RF wireless communication devices IEC 61000-4-3 (provisional method)	9 V/m: 710 MHz, 745 MHz, 780 MHZ, 5240 MHz, 5550 MHz, 5785 MHz 27 V/m: 385 MHz 28 V/m: 450 MHz, 810 MHz, 870 MHz, 930 MHz, 1720 MHz, 1845 MHz, 1970 MHz, 2450 MHz	9 V/m: 710 MHz, 745 MHz, 780 MHZ, 5240 MHz, 5550 MHz, 5785 MHz 27 V/m: 385 MHz 28 V/m: 450 MHz, 810 MHz, 870 MHz, 930 MHz, 1720 MHz, 1845 MHz, 1970 MHz, 2450 MHz	for home health care environment and a professional health care establishment

Recommended separation distance

AC-150 device must be used in an electromagnetic environment in which the perturbations due to RF are controlled.

The user or installer of the device can help to prevent any electromagnetic interference by maintaining a minimum distance depending on RF emitter maximum power. Portable RF devices (included cables and antennas) must not be used closer than 30 cm (12 inches) from any part of the AC-150, including specified cables. Not respecting this recommendation could lead to performance alteration.

NOTE	Additional technical description (pneumatic description, theory of operation, measurement uncertainty, functional tests) can be found in the technical manual

Standards compliance

The AC-150 meets the following standards:

EN ISO 14971: Medical Device Risk Management.

IEC 60601-1Ed3(&CSA22.2): Medical Electrical Equipment –Part 1: General Requirements for Safety 1: Collateral Standard: Safety Requirements for Medical Electrical Systems.

The ventilator is classified according to Chapter 5 of the norm CEI 60601-1, as follows:

Class II Equipment

Internally Powered Equipment

Type BF Applied Parts

IP22 with respect to access to hazardous parts and ingress of moisture

Not suitable for use in the presence of flammable anaesthetic mixtures

Not suitable for sterilisation

Suitable for continuous operation

Detachable power supply cable

IEC 60601-1-2: Medical electrical equipment – Part 1-2: General requirements for basic safety and essential performance – Collateral Standard: Electromagnetic disturbances – Requirements and tests.

IEC 60601-1-6: Medical Electrical Equipment – Part 1-6: General requirements for basic safety and essential performance – Collateral Standard – Usability.

IEC 60601-1-8: Medical Electrical Equipment -Part 1-8: General requirements for basic safety and essential performance: Tests and guidance for alarm systems in medical electrical equipment and medical electrical systems.

CEI 60601-1-11: General requirements for basic safety and essential performance -- Collateral standard: Requirements for medical electrical equipment and medical electrical systems used in the home healthcare environment.

ISO 80601-2-72: Medical electrical equipment -- Part 2-72: Particular requirements for basic safety and essential performance of home healthcare environment ventilators for ventilator-dependent patients.

Cybersecurity contact

If you believe you have discovered a vulnerability or have a security incident to report, please contact us at **security@eove.fr**.

Use this email for all information security incidents to ensure they are correctly captured and handled in a timely manner. If you have discovered a security concern, we will work with you to make sure that we understand the scope of the issue and that we address the exposure.

Training and support

Training and support are available on the EOVE website, www.eove.fr or by calling our helpline at +33 05 59 21 86 84.

Limited warranty

The seller guarantees that the Product delivered complies with the use for which it is intended and guarantees the Purchaser in this respect from defects in materials and workmanship.

Subject to the extended warranty that the Seller may offer to the Purchaser, depending on the Product, the Seller offers to the Purchaser a TWELVE (12) month warranty period, covering the costs of defective parts. Such warranty shall be effective from the expiration of a FIFTEEN (15) day period following the invoice date.

This warranty is only applicable when Products are installed and operated in accordance with factory recommendations and user manual instructions. This warranty specifically excludes damage or wear to Products caused by misuse, abrasion, corrosion, negligence, accidents, faulty installation or by using material incompatible with the Product. Also, this warranty does not cover associated consumables or disposables relative to the use of the Product.

Whatever the claim on the quality of the Product made by the Purchaser, the latter remains liable for paying the corresponding amounts, on their due date.

The condition of the supplied Products must be verified by the Purchaser upon receipt. As such, any claim from the Purchaser based on the quality of the Product must be made by written notice within THREE (3) days from the discovery of the relevant defect. The Purchaser shall be responsible for providing all necessary proofs showing evidence of defects or non-conformity.

Once defects or non-conformity are duly recorded by the Seller, the Purchaser may return the relevant Product if the Seller believes that it can be repaired in whole or in part. Otherwise, the Seller shall substitute the non-repairable dysfunctional equipment with equivalent new equipment.

In any case, any return of Products requested by the Purchaser must be agreed in writing by the Seller. In particular, no returns will be accepted if:

- Products have not been installed and operated in accordance with factory recommendations and user manual instructions;
- Products are no longer in their original packaging;
- Products are not accompanied by their instruction manuals and accessories;
- Products have been repaired by a non-Seller-accredited provider.

Appendix A: Definitions

Ventilation parameter definitions

Ventilation Setting	Definitions
(A)PCV	Pressure Assisted Controlled (with expiration valve).
(A)VCV	Volume Assisted Controlled (with expiration valve).
Backup I Time	Sets the Inspiratory Time (in sec) during the backup rate ventilation.
C-FLOW	Continuous Flow.
Circuit Type	Sets the type of circuit configuration and interface in use with Valve (Non-Vented) or No Valve (Vented).
CPAP (cmH2O)	Continuous Positive Airway Pressure maintained during a spontaneous breath cycle (with leak).
c/min	Count per minute.
E Trig (%)	The threshold mechanism to switch from inspiration to exhalation.
EPAP (Expiratory Positive Airway Pressure - cmH2O)	Sets the positive airway pressure delivered to the patient during expiration.
Flow Ramp	Sets the shape of inspiratory flow delivered during mandatory controlled volume breaths: Square or Decelerating.
IPAP (Inspiratory Positive Airway Pressure - cmH2O)	Sets the positive airway pressure delivered to the patient during inspiration.
Breath (Manual Breath)	Triggers a manual breath according to the current ventilation mode in use.
MPV	Mouthpiece Volume Ventilation.
MPP	Mouthpiece Pressure Ventilation.
PAC	Pressure Assisted/ Controlled (with leak).
Patient type	Sets either Adult or Paediatric patient. This configures the default values and ranges available for ventilation settings and determines circuit resistance acceptance criteria applied to the Calibration.
Leak (l/min)	The average unintentional leak monitoring above the set intentional Leak Level. It is reported as a flow for single limb circuits with intentional leak. The measured Leak is displayed as a monitored parameter during ventilation.
PEEP (Positive End Expiratory Pressure - cmH2O)	Sets the positive airway pressure delivered to the patient during expiration.
Pressure Ramp (ms)	Sets the time needed to reach inspiratory pressure during pressure breaths.

Pres. Support (cmH2O)	Sets the inspiratory pressure support above PEEP delivered during Pressure Support Ventilation mode (spontaneous breaths).
Pres. Sup. Max (cmH2O)	Sets the maximum pressure support above PEEP allowed to achieve safe tidal volume in PSV VT mode.
Pres. Control. (Pressure Controlled - cmH2O)	Sets the pressure control above PEEP delivered during inspiration for pressure-controlled breaths (with constant I Time).
P. Contr. Max (Pressure Controlled max - cmH2O)	Sets the maximum pressure control above PEEP delivered during inspiration for pressure-controlled breaths (with constant I Time).
PSV	Pressure support Ventilation (with expiration valve).
PSV VT	Pressure support ventilation Volume regulated (with expiratory valve).
P-SIMV	Pressure Synchronized Intermittent Mandatory Ventilation (with expiratory valve).
Rate (C/min)	Sets the breaths per minute (bpm) to be delivered by the ventilator to the patient. The measured respiratory rate may be greater due to manual breaths.
S(T)	Spontaneous Timed (with leak).
I Time (s)	Sets the duration of the inspiratory phase of a breath.
I Time Max (Maximum inspiratory time - s)	Sets the maximum duration of the inspiratory phase of a breath. AUTO / 0.3-2.5.
I Time Min (Minimum Inspiratory Time - s)	Sets the minimum duration of the inspiratory phase of a breath.
Inspiration Trigger (I Trigger)	Sets the trigger threshold to be detected to deliver a new breath. The trigger is blocked for the first 300 ms (Pediatric) or 500 ms (Adult) following the beginning of expiration phase.
V-SIMV	Volume Synchronized Intermittent Mandatory Ventilation (with expiratory Valve)
VT (Tidal Volume - ml)	Sets the volume of gas, to be delivered to the patient in during the inspiratory phase of controlled volume breath in (A)VCV, MPV, PSV VT or VTS modes.
VTS	Volume Target Synchronised (with leak).

Measured and calculated parameter definitions

These measured and calculated parameters are displayed during configuration or during ventilation. Each ventilation mode sets out the parameters displayed.

Monitored data	Definitions
FiO2 %	Fraction of inspired Oxygen delivered to patient circuit.

I/E	The time ratio of the inspiratory period to the expiratory period. The measured I/E ratio is displayed as a monitored parameter during ventilation. Relative I/E ratio value is calculated and displayed during settings of time variables like respiratory rate or Ti.
Leak Level (l/min)	Level of intentional leak set in the patient configuration menu. Leak monitoring displays leak above this set level.
MV (Delivered Minute Volume)	The measured volume averaged over the last breath. The measured MV is displayed as a monitored parameter during ventilation.
Pressure	The measured airway pressure at the patient inlet port. The measured Pressure is displayed in the monitoring menu during ventilation.
PEEP (Positive End Expiratory pressure - cmH2O)	The airway pressure measured 100 ms at the end of the last expiration. The measured PEEP is displayed in the monitoring menu during ventilation.
Pmean	Mean airway pressure in the Patient circuit computed over the last breath.
PIP (Peak Inspiratory Pressure -cmH2O)	The maximum airway pressure reached over the last inspiration. The measured PIP is displayed in the monitoring menu during ventilation.
Heart rate	When a pulse oximeter is connected on the ventilator Pulse rate is displayed in the monitoring menu during ventilation.
Total Breath Rate (RR) (Res. Rate - c/min)	Breath rate is computed over the last breath according to (60/inspiratory time + expiratory time). The measured Rtot is displayed in the monitoring menu during ventilation.
SpO2 (**Measured Oxygen Saturation %**)	When a pulse oximeter is connected on the ventilator, SpO2 is displayed in the monitoring menu during ventilation.
Te (Expiratory time -s)	The duration in seconds of the last expiratory phase. The measured Te is displayed in the monitoring menu during ventilation.
Ti (Inspiratory time -s)	The duration in seconds of the last inspiratory phase. The measured Ti is displayed in the monitoring menu during ventilation.
Exhalation Tidal Volume (VTE -ml)	The expired volume measured over the last breath. Vte is displayed in the monitoring menu during ventilation.
Inspiratory Tidal Volume (VTI- ml)	The inspired volume measured over the last breath. Vti is displayed in the monitoring menu during ventilation.

Other definitions

IP22	Ingress protection level
IP2X	Protects against the ingress of solid objects with >12.5 mm diameter. (e.g. fingers)
IPX2	Protects against the ingress of water droplets (at 15° angle tilt)

Revision history

Date	Revision	Change details from previous version
July 2022	**DE** Documentary update, no effective change on the product.	● Introduction: intended use clarifications, update of adverse effects, clinical benefit addition, warning updates and additional warnings. ● Chapter 1: additional details to setup test. ● Chapter 3: additional warning, additional references to EO-BAT9 manual. ● Chapter 4: minor corrections and additional details about alarms. ● Chapter 6: additional Waveforms to illustrate ventilation modes description, removal of ISO10651-2 reference (obsolete).
December 2022	**DF**	● Chapter 4: alarm Low FIO2 -> High Priority
June 2023	**DG**	● Introduction: Add new warnings and correct other warnings for better matching with ISO80601-2-72 ● Chapter 2: Add new tests for non-professional users (as required by ISO80601-2-72) an add recommendations for power connector insertion. ● Chapter 3: Add new recommendations for Sentec monitor usage. ● Chapter 5: Add basic disinfection products. ● Chapter 6: Add new precision on monitoring and settings accuracy validity.
June 2024	**DI**	● Introduction: Exclusion of helicopter use from the environment of use ● Chapter 1: Update of the symbol table ● Chapter 2: Monitoring / Trends menu update ● Chapter 3: Accessory list update ● Chapter 5: Cleaning/disinfection instructions update ● Chapter 6: New note on CPAP mode in double branch configuration

CE 0459

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