Air Liquide HEALTHCARE | EO-150

EO-150 by EOVE

Clinician Pocket guide

EO Series Ventilators

INDICATIONS FOR USE

The EO-150 ventilator device provides continuous or intermittent ventilation support for pediatric and adult patients weighing at least 3.5 kg (8 lbs) who require mechanical ventilation. The EO device is intended to be used in home, institution and hospital, for both invasive and non-invasive ventilation.

⚠ General warnings and cautions

Clinicians must read and understand the entire manual before using the EO-150 ventilator

The EO-150 ventilator is a restricted medical device intended for use by qualified trained personnel, under the direction of a doctor.

Use the EO-150 ventilator only as directed by a doctor or healthcare provider.

Information in this guide does not supersede instructions given by the prescribing doctor.

Install and configure the EO-150 ventilator in accordance with the instructions given in the user's manual. Non-specialist operators or institutions encountering problems with set-up, operation or maintenance should immediately contact their EOVE representative.

An alternative mean of ventilation should always be available for ventilator-dependent patients. Failure to do this may result in patient injury or death.

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Quick **Start:**

In case of emergency, the ventilation module can be directly turned on simply by pressing the ⏻ button on the module keyboard.

1 Press ⏻ on the front panel keyboard to turn on the device. The home screen displays.

2 To start ventilation
Click on ❍ on the keyboard.

Functional **test**

In case of first use, it is recommended to perform a functional test:

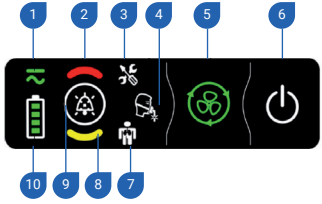
- Connect the device to the AC power source and turn it OFF.
- Turn ON the device (see page 6). The device should sound and the display screen should turn ON correctly.
- Disconnect the AC power source. The “AC power loss” alarm should trigger, and the medium priority alarm indicator and the alarm reset button should flash. Press the reset alarm button to stop the alarm.
- Connect the AC power source to the device. Two beeps should sound. Check that the power source indicator LED is ON on the ventilation module, and that “AC” is displayed on the patient interface.
- Perform a circuit calibration.

WARNING:

If any of these steps fails, do not use the EO 150 ventilator. Contact your healthcare provider or your Eove representative for a device checking.

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

1. Air inlet and filter
2. AC / DC Power connector
3. USB port
4. O_2 input
5. FiO_2 /SpO_2 connector
6. Remote Alarm connector



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

Turning ON the device

Ensure that the device has been charged prior to use or connect to AC power or DC connector inlet. If the Home Screen is turned off, press the STANDBY Button until it turns on before turning on the device.

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

Turning OFF the device using the keyboard

1. Press and hold until the ALARM key flashes.
2. Press to confirm.
3. The ventilator turns off.

Turning OFF the device using the Touch Screen

1. Press and hold until the circle becomes red.
2. Validate the ventilator's stop.
3. The ventilator turns off and the screen turns into deep sleep mode.

To start ventilation using the Touch Screen

1. Press on the touch screen
2. Ventilation starts

To start ventilation using the keyboard

1. Press on the keyboard
2. Ventilation starts

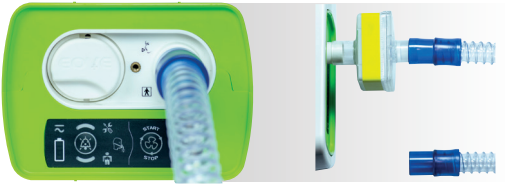
To stop ventilation using the Keyboard

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

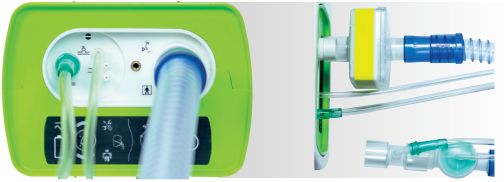
To stop ventilation using the Touch Screen

1. Press and hold until:
   - 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.
3. Ventilation stops.

Connect a patient circuit **without** flow sensor on the exhalation line



Single limb circuit with leak or mouth piece



Single limb circuit with expiratory valve (without proximal flow sensor)

Connect a patient circuit **with** flow sensor on the exhalation line

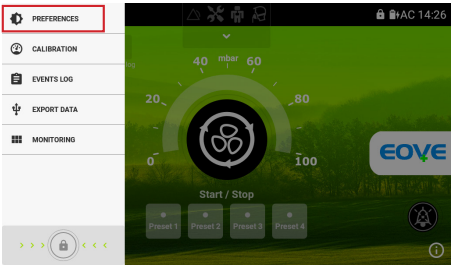
Single limb circuit with expiratoy valve (with proximal flow sensor)

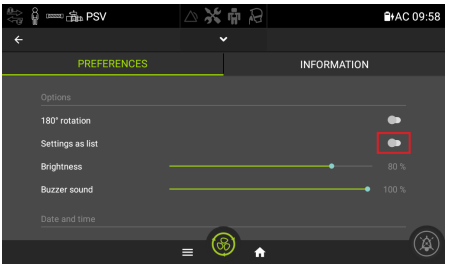
Double limb circuit (with adapter)

Choice **of the settings/alarms view**

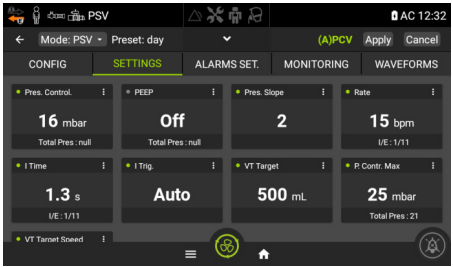
In the clinical menu, the ventilation and alarms settings can be displayed with boxes, or as a list associated to the patient's monitoring

To display settings as a list with monitoring, go into the menu tab, access the preference menu of device and activate "Settings as a list"

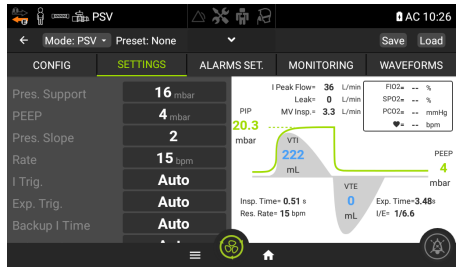




Choice **of the settings/alarms view**



Display with boxes



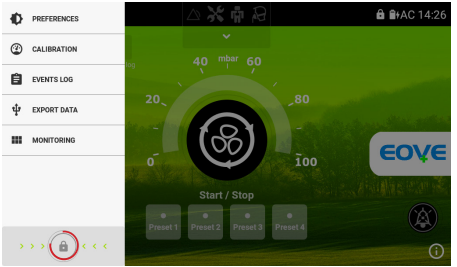
Display as a list with monitoring

⚠ Unlocking Padlock for Clinical Menu access

Navigating **the Clinical Menu**

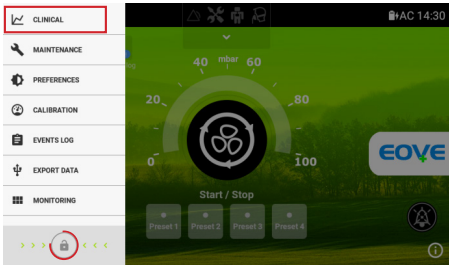
Note: Do not access clinical mode (unlocked mode) unless directed by a physician.

To access the Clinical Menu, you need first to unlock it. Open the menu by pressing (icon).



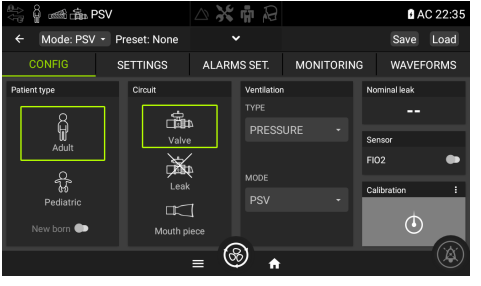
Hold down the lock button until the red circle completes. Confirm the following message and now the clinical screens are accessible.

Navigating **the Clinical Menu**



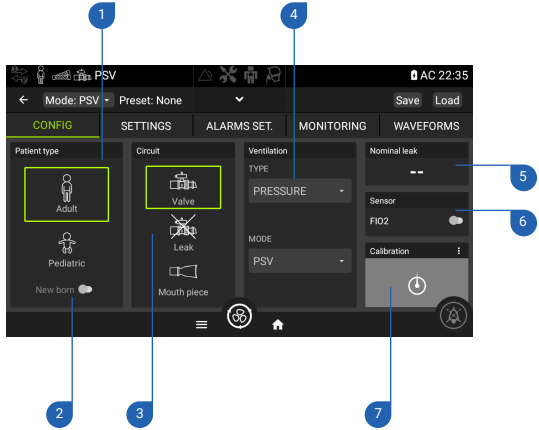
Accessing **Configuration Menu** to configure a New Patient

From this screen, you can select the configuration and perform a calibration. Simply press on the square of the setting you wish to change and it will be outlined in green.



Access the Patient **Configuration**

1. Patient type: adult or pediatric/child
2. New born configuration
3. Circuit type: valve, leak or mouth piece
4. Ventilation type: volume, pressure
5. **Set Intentional leak level Between 10 – 100 l/min @ 15 mbar AUTO = 40 l/min**
6. Activation of the FiO_2 sensor
7. Perform calibration



Intentional **leaks at 15 mbar:**

Full Face masks:

	Model	Leak (L/min)
Air Liquide Healthcare	Primo F	48
Air Liquide Healthcare	Soft Facial	48
Resmed	Quattro Air / Quattro / Quattro FX / Mirage	48
Fisher & Paykel	Simplus / Free Motion RT040	41
Weinmann/Löwenstein	Joyce Full Face	46
Philips-Respironics	Amara	32

Nasal Masks:

	Model	Leak (L/min)
Air Liquide Healthcare	Soft Nasal	48
	Soft Nasal Silent	48
Resmed	Mirage FX / Micro / Activa LT	40
	Ultra Mirage II	45
	Air Fit N10 / P10	43
Fisher & Paykel	Eson	40
Weinmann / Löwenstein	Joyce One	32

Nasal Pillows Masks:

	Model	Leak (L/min)
Air Liquide Healthcare	Primo P	38
Resmed	Swift 2 / Swift FX	43
Fisher & Paykel	PILAIRO	38

Paediatric Masks:

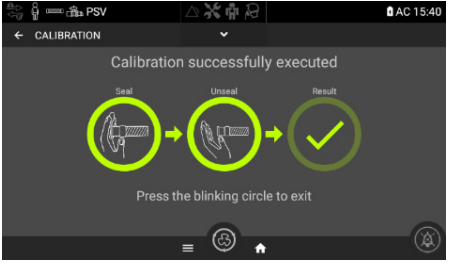
	Model	Leak (L/min)
Air Liquide Healthcare	Soft Baby / Soft Child	28

NOTE:

See the leaks values in the manufacturer's user manual for the masks which don't figure in this guide.

Circuit **Calibration:**

Follow the 2 steps calibration processes when prompted and push on “Result” to go back to the home page

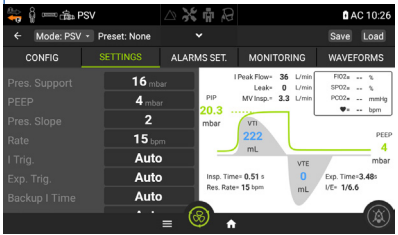


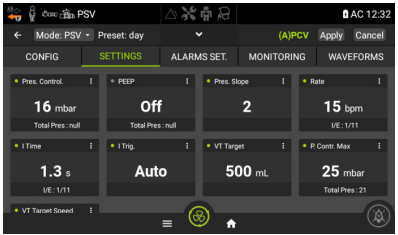
NOTE:

- **A calibration have to be done for each new circuit configuration**
- **Make the calibration with all circuit components (circuits, filters, humidificator), but without the patient interface.**

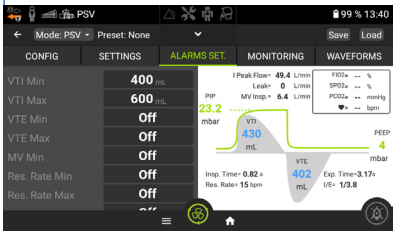
Navigate in the clinical menu **Settings and alarms**

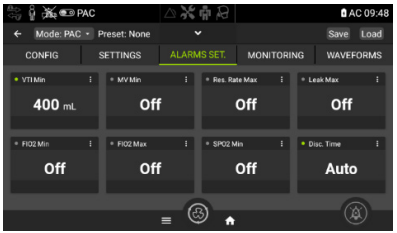
1 Settings





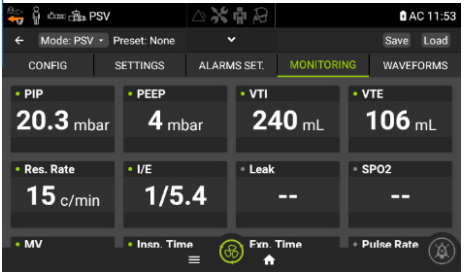
2 Alarms



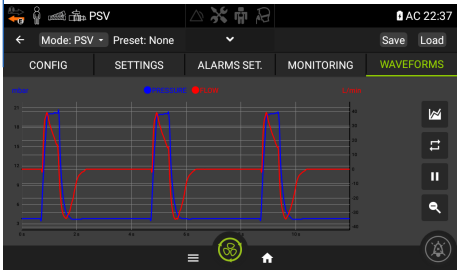


Navigate in the clinical menu
Monitoring and waveforms

3 Monitoring

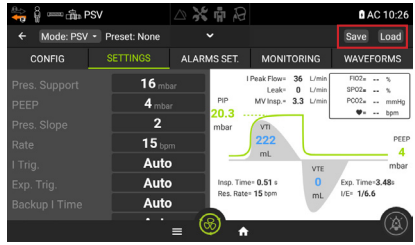


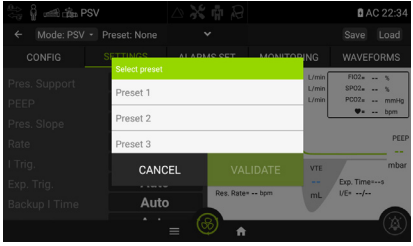
4 Waveforms

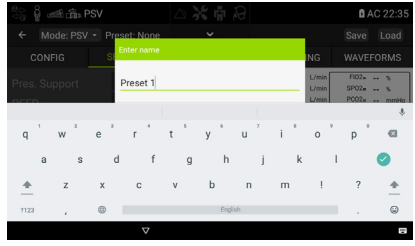


Select **Save** to create a new preset and rename it Select **Load** to display an existing preset

Save a preset to apply the ventilation and alarm parameters and rename the preset.
Push on “ok” to confirm the name of the preset and validate to apply changes.







Using **Supplemental Oxygen inlet**

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.**

- Plug in the oxygen adaptor (supplied with the EO 150) to the oxygen inlet 4.
- Attach the end of the oxygen supply tube to the oxygen adaptor.
- Attach the other end of the oxygen supply tube to the oxygen source.
- Start ventilation.
- Turn on the oxygen and adjust for the prescribed flow rate or FiO_2 level.
- Make sure that the oxygen source has been switched off before turning off the ventilation.

1. Air inlet and pollen filter
2. AC / DC Power connector
3. STANDBY Button
4. O_2 input
5. FiO_2 /SpO_2 connector
6. Remote Alarm connector

Adding FiO_2/SpO_2 sensors
Attaching a pulse oximeter

WARNING

Only use compatible NONIN finger pulse sensors

To connect the pulse oximeter:

1. Connect the plug of the pulse oximeter to the SpO_2 (pulse oximeter) connector at the rear of the device.
2. Attach to patient.

NOTE:

- In order to display the FiO_2 measurements and to set the alarms, activate FiO_2 monitoring in the Patient/Circuit configuration menu. *(See. page 14)*
- A 5 minutes delay after the beginning of ventilation is recommended to ensure that FiO_2/SpO_2 recording is correct.

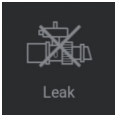
Attaching a FiO_2 sensor

WARNING

The EO-150 Ventilator can be used with an optional FiO_2 sensor with minimum and maximum concentration alarms. This sensor should always be used in order to ensure that the prescribed oxygen concentration is delivered to the patient.

To connect the FiO_2 sensor:

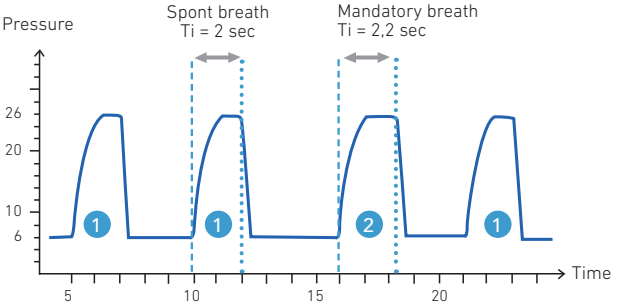
1. Plug the FiO_2 cable into the FiO_2 port.
2. Plug the FiO_2 sensor into the other end of the FiO_2 cable.
3. Attach the T-adaptor to the Inspiratory Patient Port.
4. Plug the FiO_2 sensor into the T-adaptor.



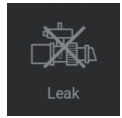
ST Mode: **Spontaneous Timed**

EPAP = 6 mbar
IPAP = 25 mbar
RR = 10 bpm

1 = Assisted Breath triggered by the Patient
2 = Mandatory Breath triggered by Backup Respiratory Rate

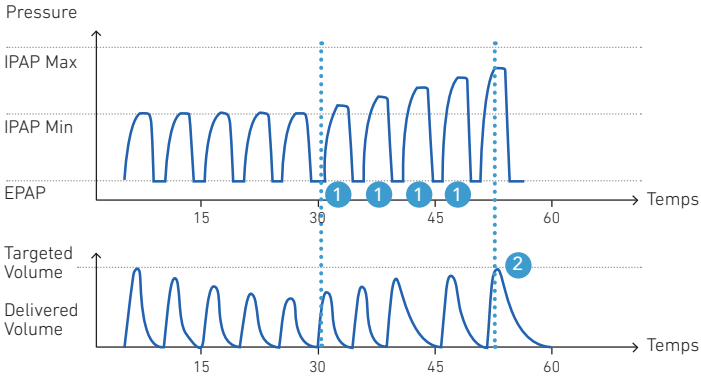


VTS Mode: **Volume Target Synchronised**

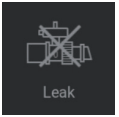


1 = Pressure increment breath by breath
2 = Targeted volume reached

EPAP = 6 mbar
IPAP = 25 mbar
RR = 10 bpm



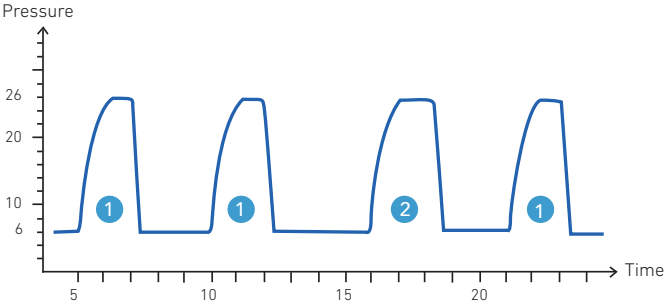
For further information, see page 42



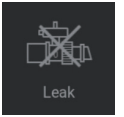
PAC Mode: **Pressure Assisted/Controlled**

EPAP = 6 mbar
IPAP = 25 mbar
RR = 10 bpm

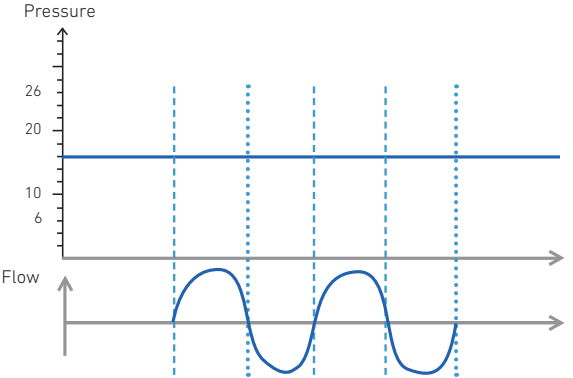
1 = Assisted Breath triggered by Patient and cycled by ventilator
2 = Mandatory Breath triggered by Respiratory Rate

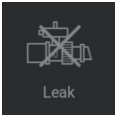


CPAP Mode: **Continuous Positive Airway Pressure**



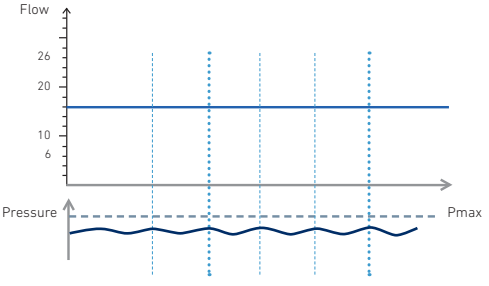
In the Continuous Positive Airway Pressure (CPAP) mode, the device delivers a continuous pressure to the patient at all times. All breaths in this mode are Spontaneous breaths.





Mode C-Flow: **Continuous flow**

In the Continuous flow (C-flow) mode, the device delivers a continuous flow to the patient at all times. All breaths in this mode are Spontaneous breaths.



C-Flow mode must not be used without humidifier

Gas mixure concentration

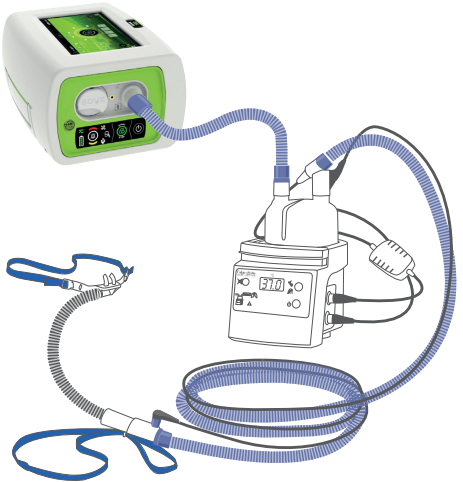
(in % of FiO_2)

FiO_2 %	C-Flow setting (L/min)						
		15	20	30	40	50	60
O_2 Flow (L/min)	4	42	37	32	29	27	26
	8	63	53	42	37	34	32
	12	84	68	53	45	40	37
	16	-	84	63	53	46	42
	20	-	-	75	61	53	47
	25	-	-	88	63	55	54
	30	-	-	97	65	59	57
	40	-	-	-	96	-	-
	50	-	-	-	-	93	-
	60	-	-	-	-	-	94

O_2 concentration is given by :

$$\%\ O_2 = \frac{O_2 \text{Flow} \times 100 + (\text{Flow setting} - O_2 \text{Flow}) \times 21}{\text{Flow setting}}$$

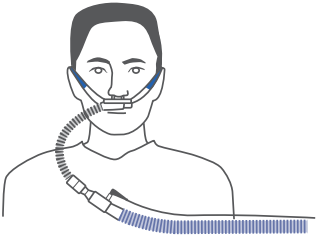
⚠ C-Flow mode needs to be used with an humidifier



Connections : from the active humidifier

- Connect the patient circuit
- Connect the temperature probes and the electric adapter of the heated circuit
- Place the nasal cannula
- Use the leak adapter (cap) included into the starter kit **(EO-LMPADAPT)**

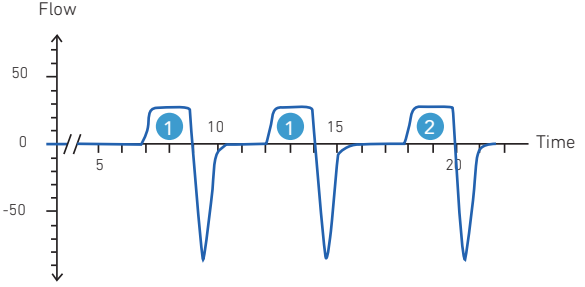
Select **“invasive mode”** or **“Free”** on the humidifier (according to the models)



(A)VCV Mode: **Volume Assisted/Controlled Ventilation**

VT = 600 ml
PEEP= OFF
RR. = 12 bpm
Ti = 2 sec
Flow Ramp = 1 Square

1 = Assisted Breath triggered by the Patient
2 = Mandatory Breath based on Respiratory Rate

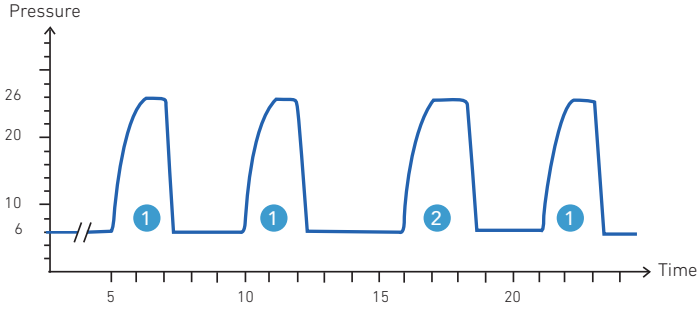


(A)PCV Mode: **Pressure Assisted/Controlled Ventilation**

1 = Assisted Breath triggered by Patient and cycled by ventilator

2 = Mandatory Breath triggered by Respiratory Rate

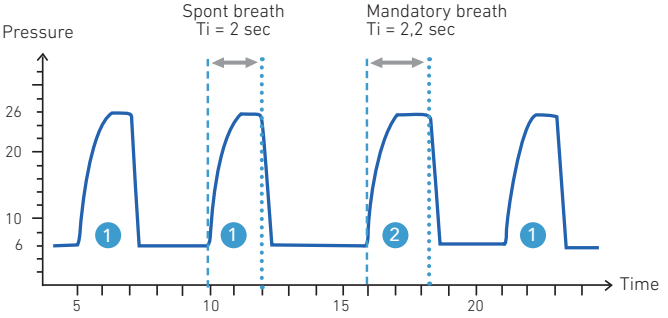
pres. Control. = 20 mbar
PEEP = 6 mbar
PRES Ramp = 2
RR = 10 bpm



PSV Mode: **Pressure Support Ventilation**

Pres. Support = 20mbar
PEEP = 6mbar
RR = 10 bpm

1 = Assisted Breath triggered and cycled by the Patient
2 = Mandatory Breath triggered by Back up Respiratory Rate

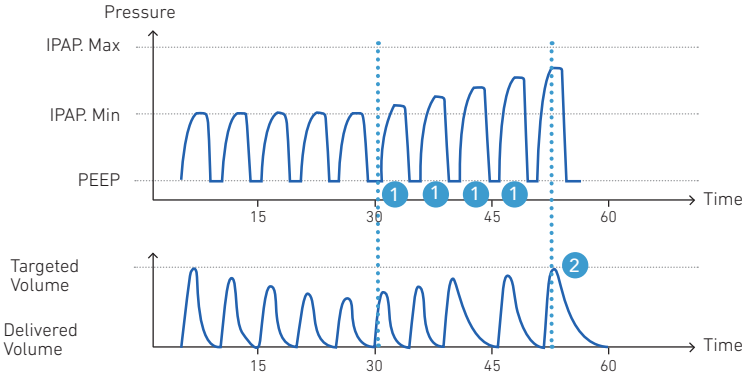


PSV VT Mode: **Pressure Support Ventilation Volume Regulated**

1 = Pressure increment breath by breath

2 = Targeted volume reached

VT = 600 ml
Pres. Sup min = 20 mbar
Pres. Sup max = 35 mbar
RR = 10 bpm
PEEP= 6 mbar



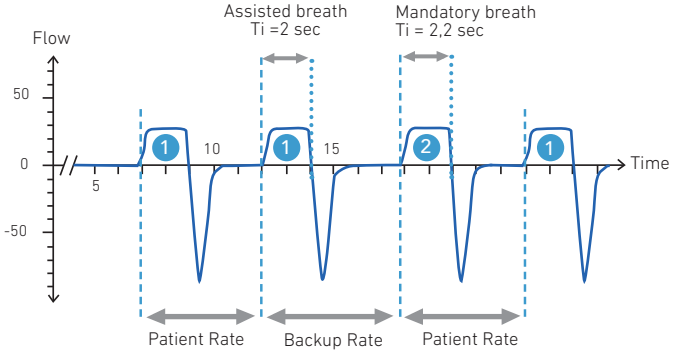
For further information, see page 42

V-SIMV Mode:
Volume Synchronized Intermittent Mandatory Ventilation

VT = 600 ml
PEEP = 6 mbar
RR = 10 bpm

1 = Assisted Breath triggered by the Patient, Time = Ti

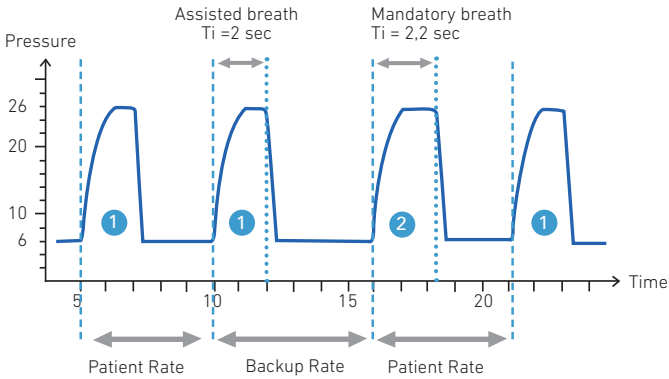
2 = Mandatory Breath based on Backup Rate but Synchronized with Patient



P-SIMV Mode: **Pressure Synchronized Intermittent Mandatory Ventilation**

1 = Assisted Breath triggered by the Patient, Time = Ti
2 = Mandatory Breath based on Backup Rate but Synchronized

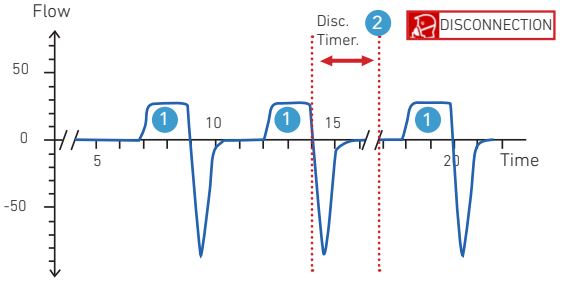
EPAP = 6 mbar
IPAP = 25 mbar
RR = 10 bpm



MPV Mode: **Mouth Piece Volume Ventilation**

Tidal Volume = 600 ml
RR = OFF
Pmin = 5 mbar

1 = Breath triggered by the Patient
2 = Disconnection alarm



Disconnection alarm (adjustable to OFF) is triggered if Pmin is not reached during Disconnection time.

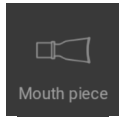
Setting	Positive Trigger	Négative Trigger
Auto	+0,2 mb	-0,2 mb
1	+0,1 mb	-0,1 mb
2	+0,2 mb	-0,2 mb
3	+0,3 mb	-0,3 mb
4	+0,4 mb	-0,4 mb
5	+0,5 mb	-0,5 mb

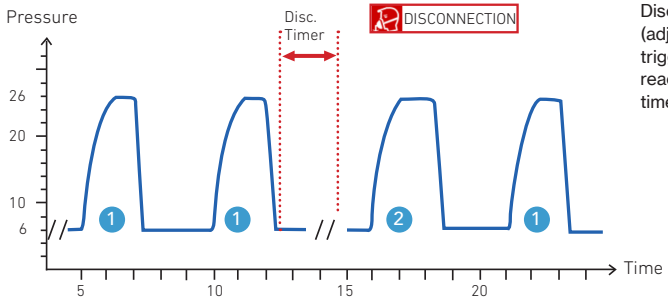
In MPV and MPP modes, triggers in pressure can be negative or positive, the increase of the bias flow will promote the positive trigger. The bias flow “OFF” setting only promotes the negative trigger.

MPP Mode: **Mouth Piece Pressure ventilation**

1 = Triggered cycle
2 = Disconnection alarm

RR = OFF
Pmin = 5 mbar
Pres. Control = 25 mbar





Disconnection alarm (adjustable to OFF) is triggered if Pmin is not reached during Disconnection time

Inspiratory Trigger: **Manual setting adjustment**

The sensitivity levels can be adjusted from 1 to 5 (1 = Most sensitive – 5 = Less sensitive)
These levels correspond to differences in flow compared to the bias flow, in l/min.

Trigger sensitivity is adapting to the exhalation patient's flow curve for more comfort:

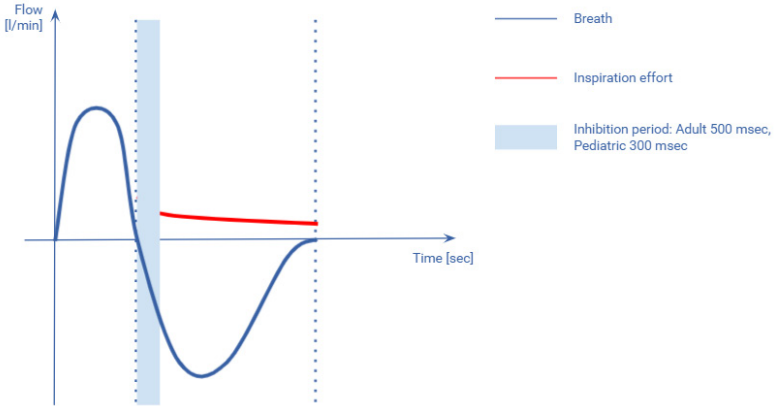
1. Beginning of the exhalation: Inhibition time based on previous inspiration characteristics trigger to safely detect early triggering.

2. Optimal trigger: Dynamic sensitivity optimization adapting to the patient's waveform to allow breath triggering in optimal conditions.

Trigger setting	1	2	AUTO	3	4	5
Flow difference (± 0,2 l/min)	1,5	1,7	2	2	2,3	2,7

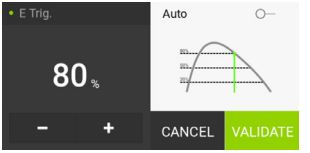
Adult minimum inhibition time = 500 ms
Pediatric minimum inhibition time = 300 ms

Inspiratory Trigger: **Manual setting adjustment**



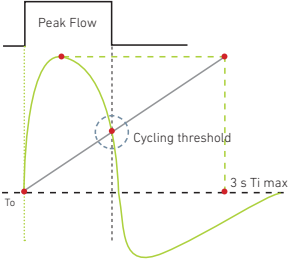
Expiratory Trigger: **Manual setting adjustement**

Cycling threshold to expiration is based on % of peak flow. When the inspiratory flow decreases and reaches a percentage of the peak flow (green line), expiration phase is activated.



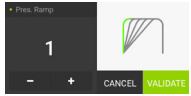
Expiratory Trigger: **Auto setting**

In Auto mode the cycling threshold is computed according to 2 parameters: Peak Flow and given Ti max. When flow decreases and cross the line between T0 and Ti max, expiration phase is activated.

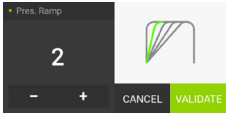


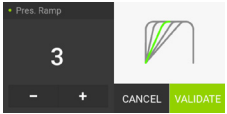
Rise time: **Manual setting adjustment**

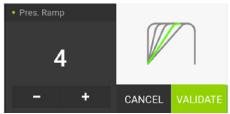
Pressurisation Ramp levels can be adjusted from 1 to 5
(1 = Fastest– 5 = Slowest)

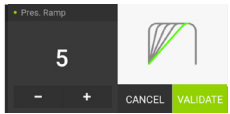


	Setting	1	2	3	4	5
Adult	**Duration (ms)**	100	200	300	400	500
Pediatric	**Duration (ms)**	50	100	150	200	250





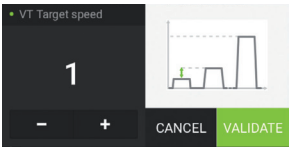


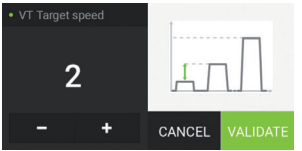


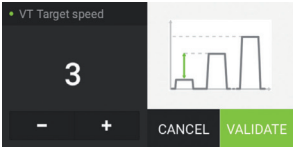
Volume Target Speed: **Manual setting adjustment**

This parameter sets the pressure increment to reach the Target Volume.
The sensitivity levels can be adjusted from 1 to 3 (1 = Slowest – 3 = Fastest)
Two increments are implemented from each setting:

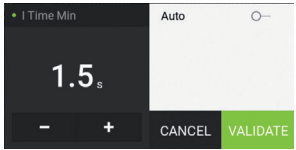
Setting	Volume > 80 % of Target Volume	Volume < 80 % of Target Volume
1	0.5 mbar	0.5 mbar
2	0.5 mbar	1 mbar
3	0.5 mbar	2 mbar







Inspiratory Time:
Manual and AUTO setting adjustment



The inspiratory time can be adjusted from 0.3 to 2.5 seconds.

In AUTO mode, minimum inspiratory time is set at:

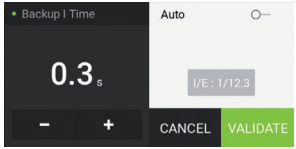
I. Time Min = Pressure ramp time +100 ms

Maximum inspiratory time is set at:

$$\text{I. Time Max} = \frac{30}{\text{Given respiratory rate}}$$

in order to avoid Inspiration/Expiration reversed settings

Backup Inspiratory Time:
Manual and AUTO setting adjustment

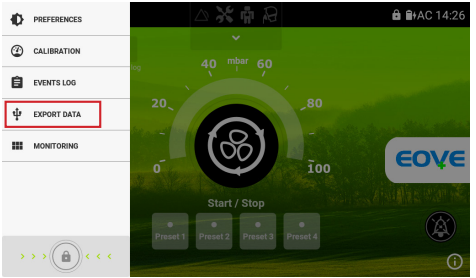


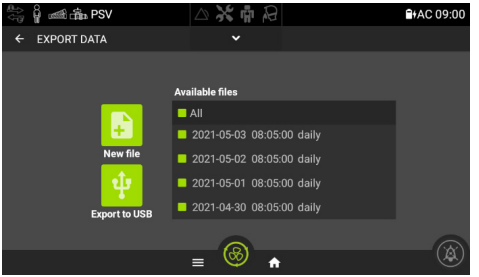
The backup inspiratory time can be adjusted from 0.3 to 2.5 seconds.

In AUTO mode, auto Expiratory Trigger is applied.

Export **ventilation datas** with an USK key

1. Insert a USB key in the USB port at the rear of the device
2. In the menu tab, select “export data”
3. Select “export on USB key” to copy files on the USB key





Export **ventilation datas** with an USK key

NOTE:

The device save a data file each day. It's possible to manually save a new file by pushing on the "new file" button. Each files contains the last 24 hours of detailed waveforms data and up to one year of trends. The device memory is able to store up to 31 files.

NOTE

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Air Liquide Healthcare is a world leader in medical gases, home healthcare, hygiene products and healthcare specialty ingredients. It aims to provide customers in the continuum of care from hospital to home with medical products, specialty ingredients and services that contribute to protecting vulnerable lives.

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