



Servo-air

Startup guide

This document is intended to provide information to an international audience outside of the US.



MAQUET



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Servo-air 4.0

This guide is intended for hospital personnel as start up training using the Servo-air® ventilator. It does not cover all aspects of the Servo-air ventilator. Please see the user's manual for more information.

Some modes and functions are options and might not be included.

1 System overview

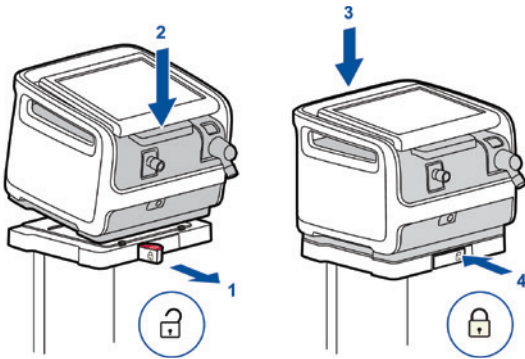


All wheels can be locked.



The user interface can be tilted back to flat and it can be drawn up to a 90 degree angle.

Ensure that the patient unit is firmly fixed to the mobile cart via the clamps and locking clamp.

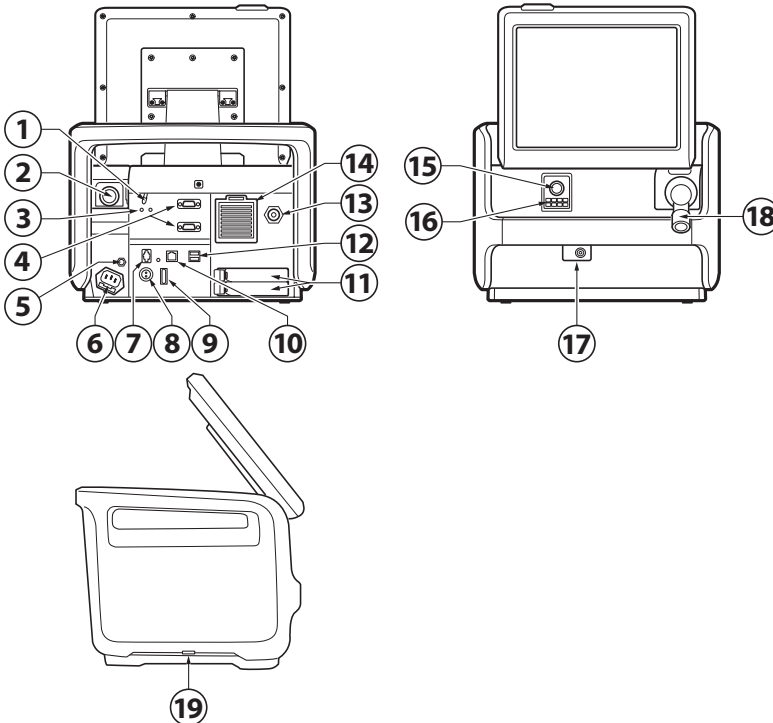


It is important that the expiratory cassette is properly attached (you will hear a 'click' sound when it locks into position).

The Servo-air can host two battery modules and one battery must be inserted at all times.

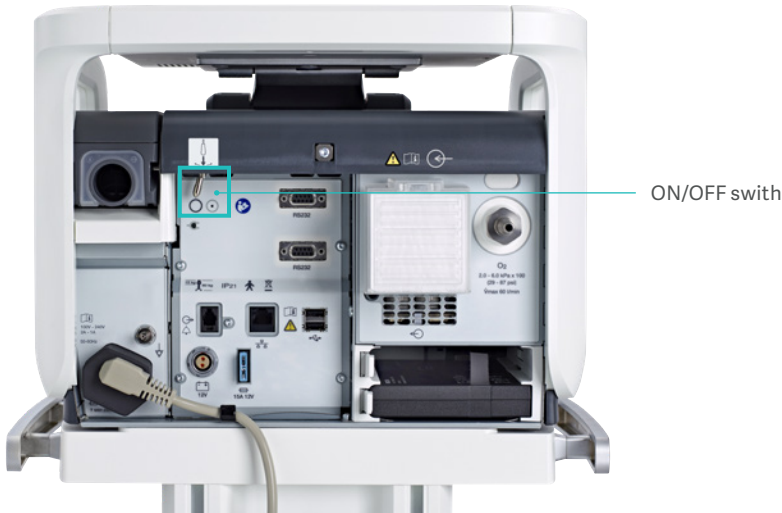


1. On/Off switch
The switch must be pulled downwards before it can be switched.
2. Expiratory outlet
3. Power indicators
4. RS-232 connectors
5. Equipotentiality terminal.
6. AC mains power source connector with fuse
7. Alarm output connection
8. External +12V DC inlet
9. Fuse for external DC power
10. Ethernet connection
11. Battery compartments
12. USB ports
13. Gas inlet for O₂
14. Gas inlet for air including air inlet filter
15. Inspiratory outlet
16. Emergency air intake
17. Nebulizer connector
18. Expiratory inlet
19. Cooling fan with filter (on both sides)



1.2 Workflow to start ventilation

1. Connect the ventilator to the mains power.
2. Connect pressurized O₂.
3. Connect the patient circuit and filter.
If active humidification add water to the water chamber.
4. Switch on power.
5. Perform a pre-use check.
6. Select patient category.
7. Select invasive or non-invasive ventilation.
8. Select ventilation mode and adjust settings.
9. Check and adjust alarm limits.
10. Start ventilation and connect ventilation system to patient.
11. Adjust alarm limits if necessary.



1.3 Pre-use check

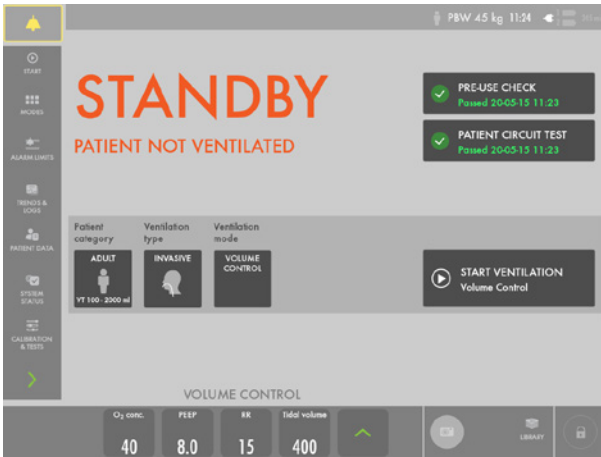
The pre-use check takes approximately five minutes, is started from Standby view and is semi-automatic.

The patient circuit test measures resistance and compliance in the patient circuit. If the patient circuit is changed and no new patient circuit test is performed, the ventilator will compensate incorrectly with the

previous patient circuit. If the correct circuit is not tested, the following risks may arise:

- In volume-based modes, the volume delivered to the patient will be incorrect.
- In pressure-based modes, the volume measured will be incorrect.

The patient circuit test is included in the pre-use check but can also be selected separately.



The symbol highlighted below indicates that the circuit compensation is on. If there has not been any circuit compensation there will not be any symbol present.

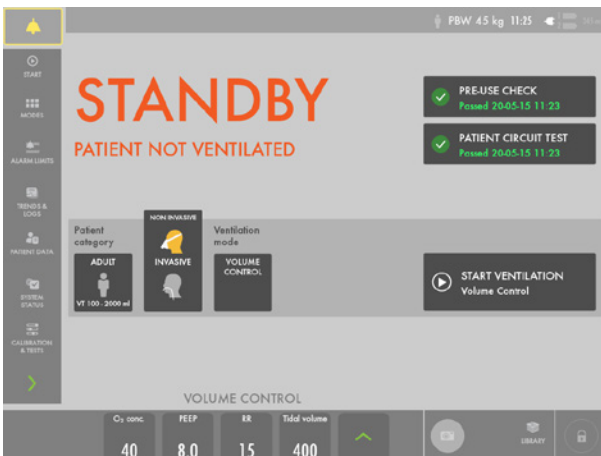



1.4 Modes and settings


There are two different patient categories, adult and pediatric.



Select non invasive ventilation or invasive ventilation.




Slide the bar to the right or left to increase or decrease the settings. Confirm the setting by tapping .

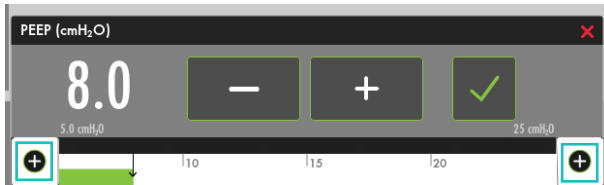
Exit settings without changing by tapping the .



The bar displays the safety scale, which is the range that represents normal use.

To access the full settings range tap the .

To only show the range that represents normal use again tap the .

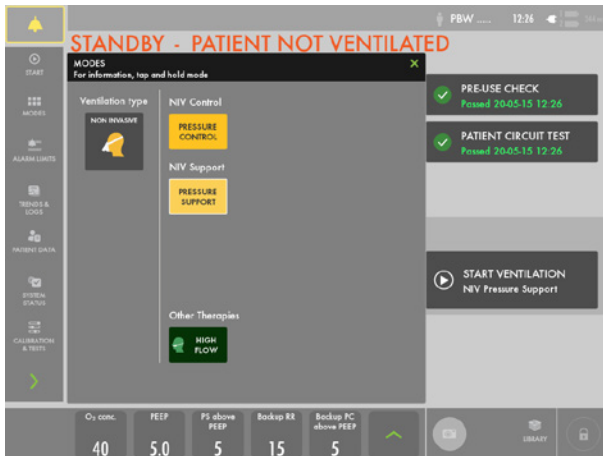


1.5 Modes

Tap to select mode. The current mode tile is always highlighted and the previous mode tile is marked PREVIOUS, together with the date and time it was last used.



Non invasive modes: All non invasive modes are optional and may therefore may not be available.



The mode settings are divided into supported and controlled settings.

The screenshot shows the PRVC mode settings screen. A red box highlights the 'PS/CPAP' section, which includes settings for O₂ conc. (40), PEEP (8.0), PS above PEEP (20), and End inspiration (30). A blue box highlights the 'PC' section, which includes settings for Backup RR (15), Backup PC above PEEP (15), and Backup I_E (0.90). A green box highlights the 'Apnea time' setting (20). A yellow box highlights the 'Backup I:E' setting (1:3.4). Callouts on the right side of the screen point to these settings with the following labels: 'Supported mode setting' (pointing to the PS/CPAP section), 'Apnea Time' (pointing to the Apnea time setting), 'Controlled mode setting' (pointing to the Backup RR, Backup PC, and Backup I_E settings), and 'Help information' (pointing to the Backup I:E setting).

1.6 Context based guidance

Tap and hold on the mode tile to see more information.

The screenshot shows the PRVC mode settings screen with a help dialog box open. The dialog box is titled 'MODES' and contains the following text: 'for information, tap and hold mode', 'PRESSURE REGULATED VOLUME CONTROL (PRVC)', 'combines the advantages of Volume Control and Pressure Control by delivering a preset tidal volume with a decelerating inspiratory flow at a preset respiratory rate.', 'maintains the lowest possible constant pressure throughout inspiration.', 'the inspiratory pressure of a breath will never exceed 5 cmH₂O below the upper pressure limit.', and 'Typical pressure (yellow) and flow (green) waveforms in PRVC.' Below the text is a graph showing typical pressure and flow waveforms. A 'Set mode' button is at the bottom of the dialog box. The background shows the PRVC mode settings screen with various parameters and waveforms.

Dynamic images are presented for some of the settings. A dynamic image illustrates the effects of changes made.



Press the (i) symbol and additional information will be presented.



1.7 Trigger settings

When triggering is based on flow, to the left on the scale, the ventilator system senses deviations in the bias flow delivered during expiration. The further to the left on the scale, the less effort the patient has to make. At the far left of the scale, there is a risk of auto-triggering, and the scale and value are therefore marked in red.

When triggering is based on pressure, to the right on the scale, the ventilator system senses deviations in the pressure below PEEP created by the patient. The pressure below PEEP required to initiate a breath is displayed when the setting is made. The further to the right on the scale, the greater the patient effort required to trigger.



1.8 VT&PBW

In adult patient category enter patient gender and height and in pediatric categories enter weight. It is important that

patient circuit compensation is on to receive accurate VT/PBW.

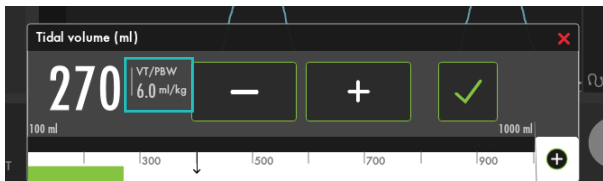


The ventilator monitors the ratio of tidal volume to predicted body weight (VT/PBW).

In volume controlled modes the VT/PBW (ml/kg) is calculated and presented to the

right of the volume. VT/PBW (ml/kg) is continuously trended and measured.

For pediatric patient category body weight (BW) is used.



1.9 User interface



By pressing **>** additional settings and more values become available.



1.10 Active/inactive modes and settings

The grey text and settings indicate an inactive mode and settings. If a mode is changed then the other mode becomes white.




2 Alarms

Light frame for 360° visibility. Alarm indication is shown in two ways; blinking value (measured or calculated) and alarm message in the alarm message area.

- High priority
- Medium priority
- Low priority



With some alarms the audio can be turned off by tapping . Audio off is displayed in the corresponding parameter in the numerical values area and a message is displayed in the status bar.





Two alarms active

Alarm management checklist

Settings for alarm limits include upper and lower limits settings and the current measured value.

Autoset alarm limits are available in controlled modes.



Upper alarm limit

Current measured value
Lower alarm limit

Alarm sound level setting

2.1 Batteries

If the ventilator system is running on battery power, the battery symbol turns yellow and the mains power symbol disappears. The estimated remaining battery time in minutes is always displayed, regardless of the power supply in use.

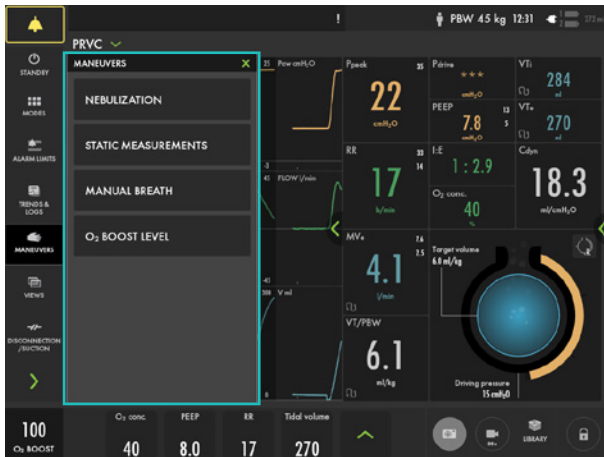
Make sure that the battery in slot two is in place as a backup at all times during ventilation.



Battery time remaining

2.2 Maneuvers

When the MANUAL BREATH is tapped, the ventilator system will initiate a new breath cycle according to the current ventilator settings.



2.3 Static measurements



2.4 Inspiratory hold

This function is activated by pressing INSPIRATORY HOLD. This function can provide an exact measurement of the end inspiratory lung pressure. It can be used to

pause ventilation during X-ray or to determine the plateau pressure (P_{plat}), or, together with the expiratory hold, to calculate static compliance.

2.5 Expiratory hold

Expiratory and inspiratory valves are closed after the expiration phase is completed for as long as EXPIRATORY HOLD is pressed. Expiratory hold provides an exact measurement of the end expiratory pause pressure.

It can be used to determine total PEEP and, together with inspiratory hold, static compliance (C_{static}). The dynamic pressure is displayed on the PEEP numerical value.

2.6 Nebulization

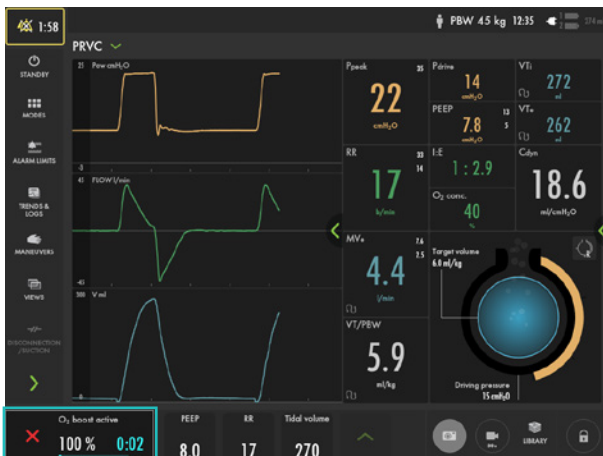
Nebulization can be either activated for a certain period of time (5–30 minutes) or continuous (only use Aerogen Solo).



Aerogen nebulizer connector

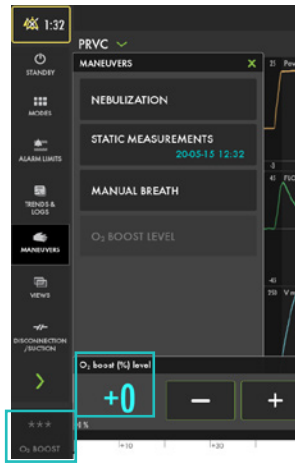
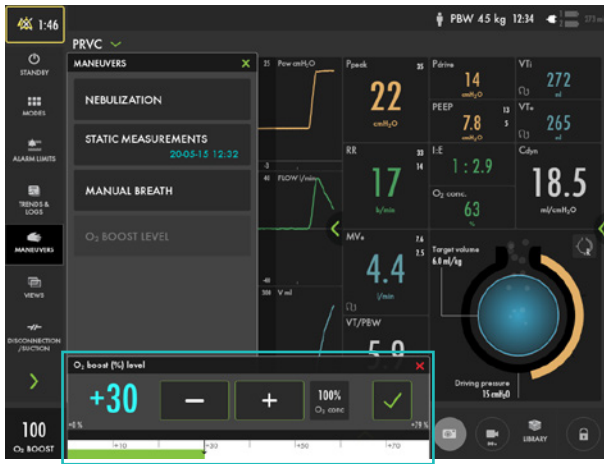
2.7 O₂ boost

When tapped, O₂ boost delivers the oxygen setting displayed here for a period of 1 minute. The O₂ boost function can be interrupted by tapping the red cancel symbol in the O₂ boost timer window anytime during the 1 minute interval.



By tapping O₂ BOOST LEVEL, it is possible to change the desired level for the O₂ boost function. It is possible to lock the O₂ boost level to 100 %.

It is also possible to set it to 0 %, in which case the O₂ boost function will no longer be active and will be replaced by three asterisks.



2.8 Disconnect/suction support

DISCONNECTION/SUCTION enables automatic inhibition of the ventilator system during a tracheal suction procedure or when briefly pausing ventilation in invasive modes. The ventilator system is prevented from cycling without activating alarms.

When using a closed-suction system, DISCONNECTION/SUCTION should not be used. The O₂ boost function should be used instead for oxygenation purposes. Consider pre-silencing the alarms before suctioning.



3 Trends

Trend values are stored every 60 seconds and retained for a maximum of 72 hours. Stored events and system changes are also displayed here.

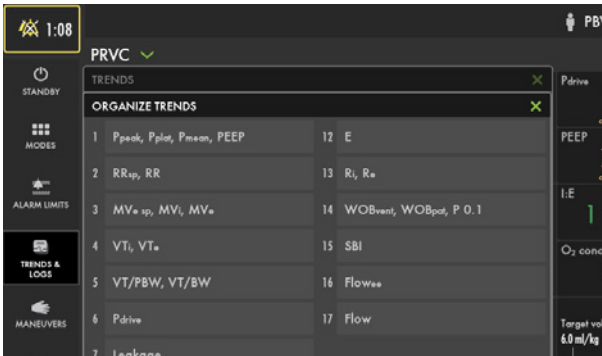
The time valid for the cursor position is displayed. If events have been stored, their number is displayed in the ring shown in the

figure and an explanation appears to the left of this ring.

If a recording is saved at a time corresponding to the cursor position, a recorder is displayed. To view the recording, tap this recorder.

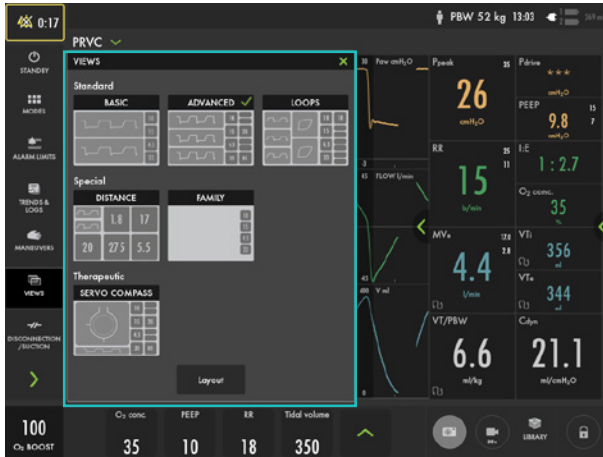


Tap Organize in the TRENDS window to place the trends in the desired order by dragging and dropping the different trended values presented.



5 Views

The ventilator system offers different views to suit different needs. They are accessed via the quick menu during ventilation.



5.1 Basic view

The view consists of two or three waveforms – pressure and flow waveforms are always present, together with the volume waveform if desired.

All non invasive ventilation modes start in the BASIC view.



5.2 Advanced view

The view consists of two to three waveforms and two columns of numerical values.



5.3 Loop view

The view consists of:

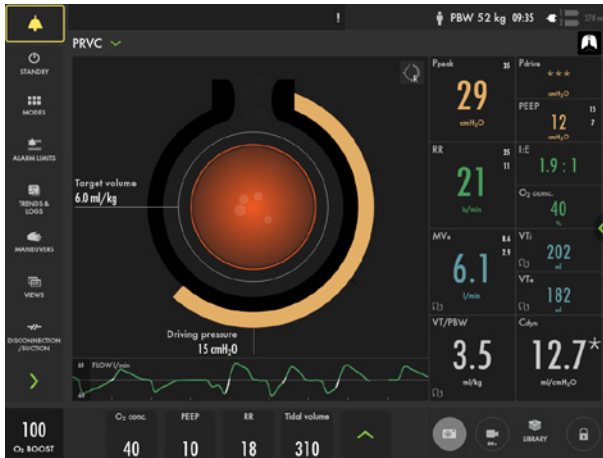
- up to two loops
- pressure-volume and volume-flow.



5.4 Compass view

Servo Compass visualizes volume and pressure in relation to set targets in invasive modes.

The Servo Compass view consists of:
– two columns of numerical values.



The Servo Compass can be included in Advanced, Loops and Distance views. The set tidal volume target is compared with the measured tidal volume. If the deviation is $\pm 20\%$ or more, the volume animation changes color from blue to orange to indicate that ventilation is suboptimal and adjustments should be considered.

The aim is for the pressure to remain below the set target value. The target may be set as:
– total pressure i.e. measured end-inspiratory pressure
– driving pressure i.e. measured end-inspiratory pressure minus positive end-expiratory pressure (PEEP)



5.5 Distance view

There are six large tiles displaying:

- Five enlarged numerical values
- The pressure and flow waveforms.



5.6 Family view

Displayed information is minimized to:

- One column of numerical values.
- Alarms and messages in the status bar.
- The direct access settings bar.

– A dynamic representation (moving bubbles) shows that ventilation is in progress.

To exit the family view you can tap anywhere on the screen.



5.7 Screen layout

The ventilator system can display a minimum of two waveforms and a maximum of three, depending on the view selected.

It is possible to adjust the layout by tapping and holding a waveform.



Choose filled or non-filled waveforms



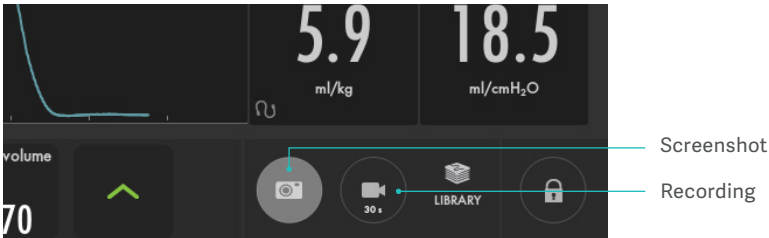
Filled waveforms

5.8 Panellock

Possible to lock the screen for example for cleaning. Tap and hold to unlock.



6 Media



6.1 Recording

Recording highlighted to left and screenshot to right.

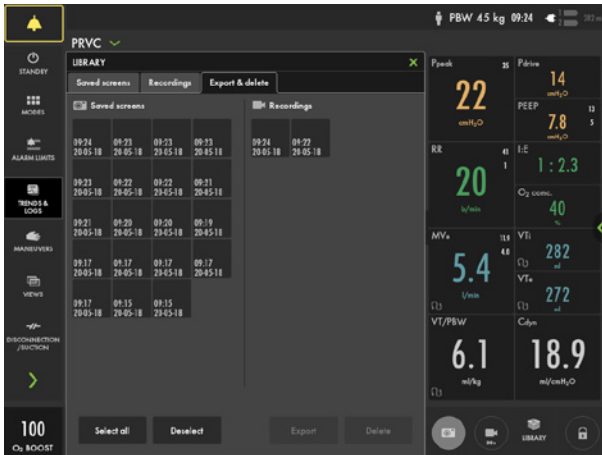
A 30 second long recording will be made starting 15 seconds before, and lasting until 15 seconds after the time the recording was initiated.

The recording will be stamped with the date and time that it was initiated and will be saved under the Recordings tab in the Media library. Forty recordings can be saved on the Servo-air.

6.2 Screenshots

The screenshot will be stamped with the date and time it was taken and saved under the Saved screens tab in the MEDIA window. Forty screenshots can be saved.

All screenshots and recordings can be transferred to a USB memory stick. The USB port is located at the back of the patient unit.



6.3 Non-invasiv

The screen layout is changed in non invasive modes and the leakage compensation is always active in non invasive modes. Leakage is measured and presented in percent.



6.4 High Flow therapy

High Flow therapy can be selected in both invasive and non-invasive ventilation as well as in Standby. Possibility to switch directly from invasive ventilation.





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