HAMILTON-MR1

Quick Guide

HAMILTON MEDICAL

Intelligent Ventilation since 1983

This Quick Guide is intended as a useful reference for ventilation of **adult and pediatric** patients. It does *not* replace the clinical judgment of a physician nor the content of the ventilator *Operator's Manual*, which should always be available when using the ventilator.

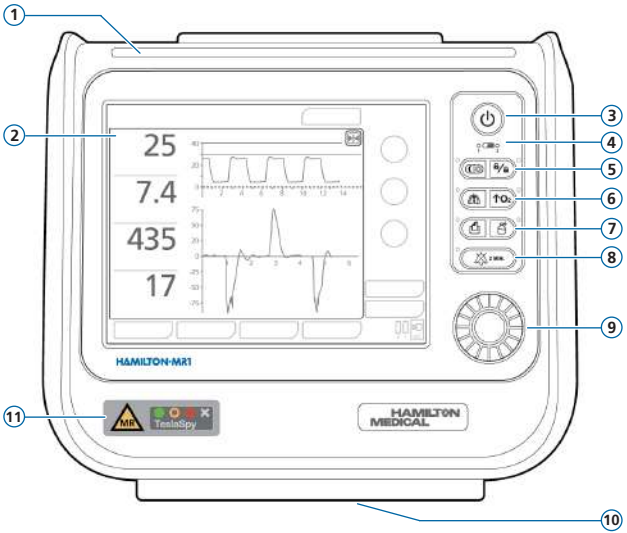
Some functions are optional and are *not* available in all markets.

The graphics shown in this guide may *not* exactly match what you see in your environment.

Table of contents

1. HAMILTON-MR1 basics

1.1 Ventilator, front view



1 **Alarm lamp.** Lit when an alarm is active.
Red = high priority. Yellow = medium or low priority.

2 **Touch screen display**

3 **Power/Standby key.** Turns the ventilator on/off; used to enter **Standby**.

4 **Battery charge indicator.** Lit = battery is fully charged. Flashing = battery is charging.

5 **Day/Night key.** Switches between **Day** and **Night** display brightness setting.

Screen lock/unlock key. Disables/enables the touch screen (for example, for cleaning).

6 **Manual breath key.** Delivers a mandatory breath or a prolonged inspiration.

O2 enrichment key. Delivers a maximum of 100% oxygen for a set time. Also used for suctioning.

7 **Print screen key.** Saves a screenshot of the current display to a USB storage device.

Nebulizer key. Activates the pneumatic nebulizer for 30 minutes. Press the key again to turn nebulization off.

8 **Audio pause key.** Pauses the audible alarm for 2 minutes. Press the key again to cancel the Audio pause.

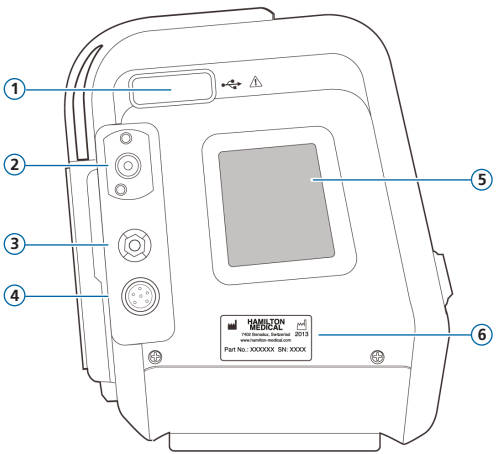
9 **Press-and-turn (P&T) knob.** Used to select and adjust settings.

10 **Expiratory valve bleed port.** *Do not obstruct.*

11 **TeslaSpy navigator.** The different lights indicate the strength of the magnetic field of the MRI scanner; used to position the ventilator.

1. HAMILTON-MR1 basics

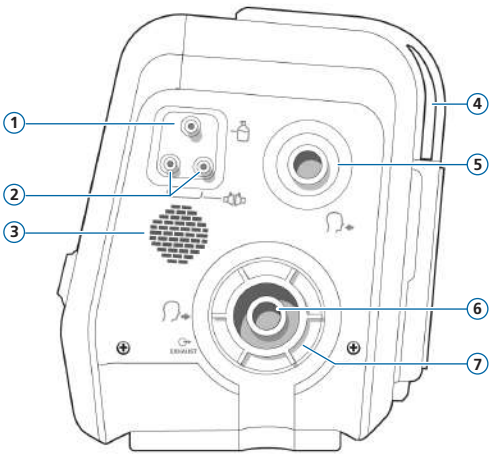
1.2 Ventilator, side view with gas connections



1. USB port
2. High-pressure oxygen DISS or NIST inlet fitting
3. Potential equalization conductor
4. Power socket
5. Cooling air intake and dust filter
6. Serial number label

1. HAMILTON-MR1 basics

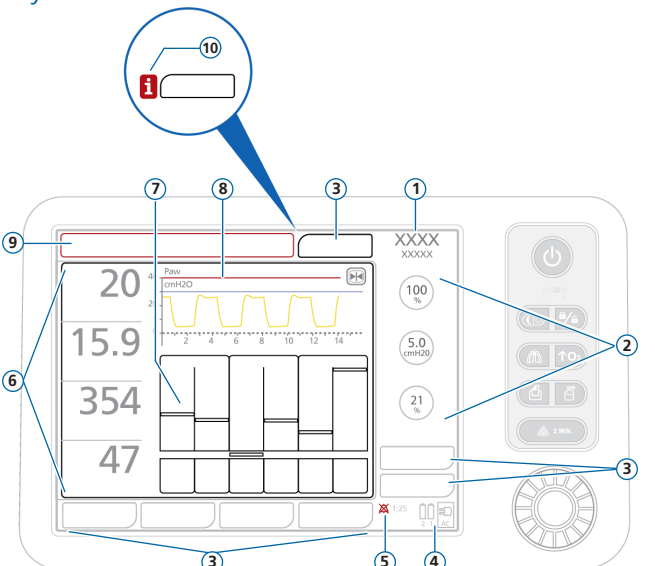
1.3 Ventilator, side view with breathing circuit connections



1. Pneumatic nebulizer port
2. Flow sensor connection ports
3. Loudspeaker
4. Cooling air outlet
5. *To patient* inspiratory port
6. *From patient* expiratory port
7. Expiratory valve set

1. HAMILTON-MR1 basics

1.4 Main display



1 **Active mode and patient group.** Shows the active mode and selected patient group.

2 **Controls.** Controls for the active mode.

3 **Window buttons.** Open the Modes, Monitoring, Tools, Events, System, Alarms, Controls windows. The Controls window provides access to patient, SpeakValve, and Apnea settings.

4 **Power source.** Shows the active and available power sources.

5 **Audio pause indicator.** Shows that Audio pause is enabled and how much time remains before the audible alarm sounds.

6 **Main monitoring parameters (MMPs).** Configurable monitoring data.

7 **Graphic panel.** Real-time waveforms, loops, trends, Intelligent panels.

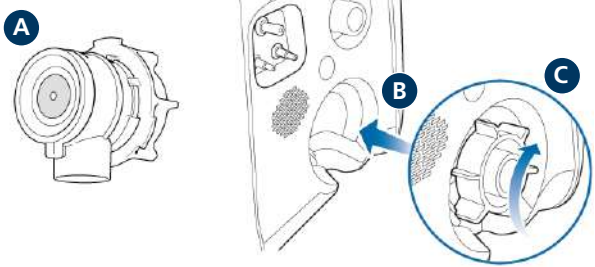
8 **Paw waveform.** The pressure/time (Paw) waveform is always displayed.

9 **Message bar.** Displays alarms and other messages.

10 **i-icon.** Displayed when there are unreviewed alarms.

2. Setting up the ventilator

2.1 Installing the expiratory valve set

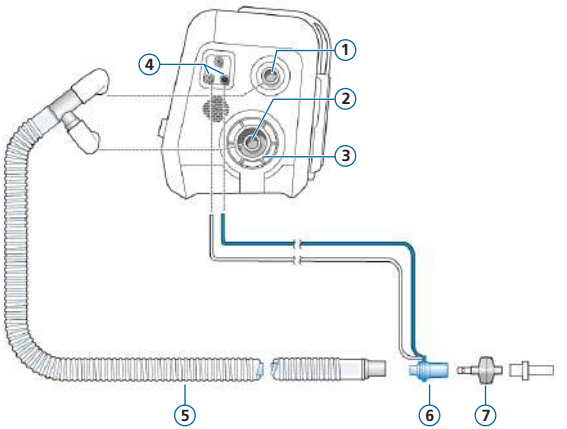


To install the expiratory valve set

1. Remove the safety cover.
2. Ensure the membrane is properly aligned with the expiratory valve housing, and the metal plate faces up (**A**).
3. Position the expiratory valve set in the expiratory port (**B**) and twist the locking ring clockwise until it locks into place (**C**).

2. Setting up the ventilator

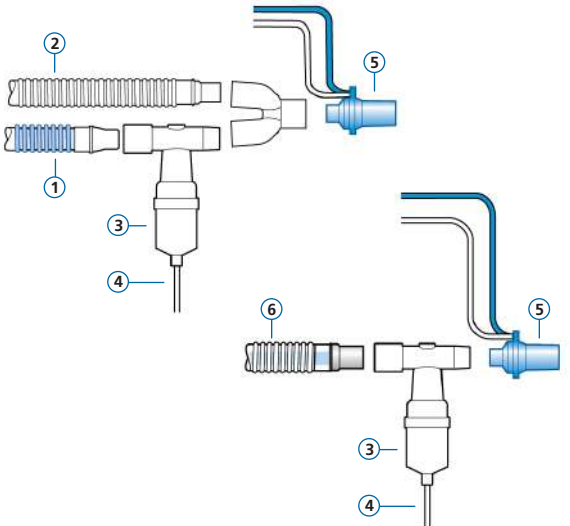
2.2 Connecting a breathing circuit (MR-Safe, coaxial with HMEF)



1. *To patient* inspiratory port
2. *From patient* expiratory port
3. Expiratory valve set
4. Flow sensor connection ports
5. Coaxial inspiratory/expiratory limb
6. Flow sensor
7. HMEF

2. Setting up the ventilator

2.3 Connecting a pneumatic nebulizer (optional)



1. Inspiratory limb
2. Expiratory limb
3. Nebulizer (example)*
4. Nebulizer tubing to ventilator
5. Flow sensor
6. Coaxial breathing circuit

Inspiratory bacteria filter not shown.

* Place the nebulizer according to your institution's protocol.

2. Setting up the ventilator

2.4 Turning on the ventilator

To turn on the ventilator

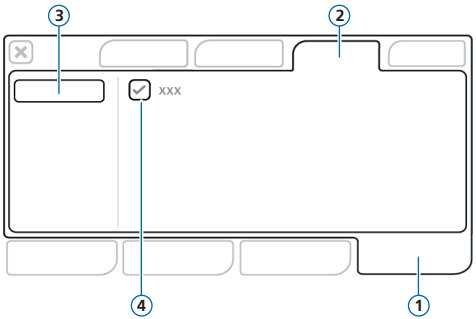
1. Connect the cable from the power transformer to the ventilator.
2. Connect the transformer to an appropriate AC power supply
3. Connect the oxygen supply.
4. Assemble and connect the patient breathing circuit.
5. Press ⏻ (Power/Standby) (**A**).

The ventilator runs a self-test and, when complete, displays the Standby window.

Use the ventilator only if it passes all tests.

2. Setting up the ventilator

2.5 Enabling O2 monitoring



1 System
2 Sensors
3 On/Off
4 O2 sensor

To enable O2 monitoring

1 Touch **System** > **Sensors** > **On/Off**.
2 Select the **O2 sensor*** checkbox if required, and close the window.

* By default, the O2 sensor is enabled.

3. Working in the MR environment

3.1 Before entering the MR environment

If using a HAMILTON-MR1 trolley, the ventilator and its components **must be** configured and positioned as follows during transport within the hospital:

- The ventilator must be securely mounted on the trolley.
- The O2 cylinder must be securely attached to the trolley.
- During transport, only the following components may be connected:
  - Breathing circuit
  - Flow sensor (or pressure line)
  - O2 cylinder

Note that humidifiers are *not* MR compatible.

Do *not* use humidifiers in the MR environment; you must use an HMEF instead.

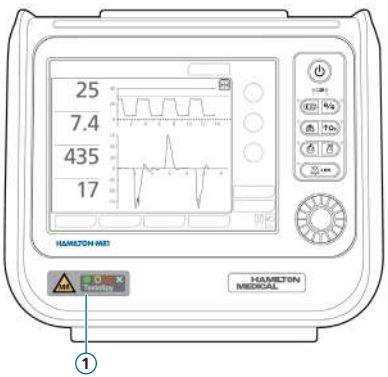
Mount the expiratory valve set outside of the MR environment only!

Otherwise, the MRI scanner and the valve membrane may be severly damaged.

3. Working in the MR environment

3.2 About TeslaSpy

The TeslaSpy magnetic field navigator (**1**) continuously monitors the background magnetic field to ensure the ventilator is kept in a safe operating enivornment.



When the green indicator is lit, TeslaSpy samples the magnetic field once every 2 seconds.

When using TeslaSpy to position the ventilator in the MR environment, move the ventilator *slowly* toward the scanner and observe the TeslaSpy indicator lights. The table to the right describes what the lights mean.

If you move the ventilator toward the MRI scanner too quickly, you may cause damage to the ventilator.

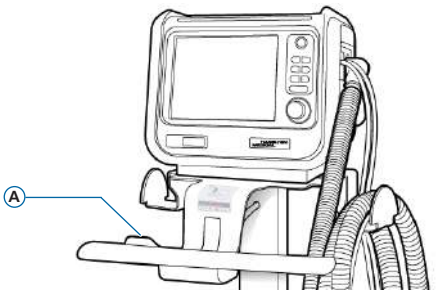
Do *not* move the ventilator faster than 10 cm (3 in) per second.

For positioning details, see page 20.

TeslaSpy indicator light	Description	Action needed
	**Green indicator** Magnetic field is within acceptable limits.	None, device is in a safe position.
	**Orange indicator** Magnetic field is too high.	Move device away from the scanner until the green indicator is lit.
	**Red indicator** Magnetic field is unacceptably high.	• Provide alternative ventilation. • Remove the ventilator from use. • Have the ventilator serviced.
	**Red X indicator** TeslaSpy is not responding properly. Ventilation continues but device must be serviced.	• Provide alternative ventilation. • Remove the ventilator from use. • Have the ventilator serviced.

3. Working in the MR environment

3.3 Moving and parking the trolley

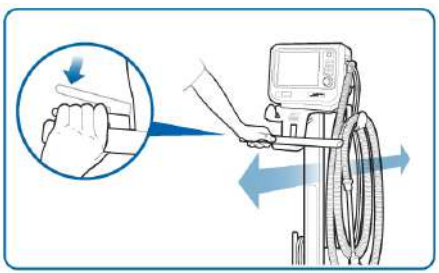


The HAMILTON-MR1 ventilator trolley is equipped with an auto-lock brake (**A**).

The brake automatically locks the trolley in position when you release the brake lever.

To move the trolley a short distance

1 Squeeze the brake lever while moving the trolley.

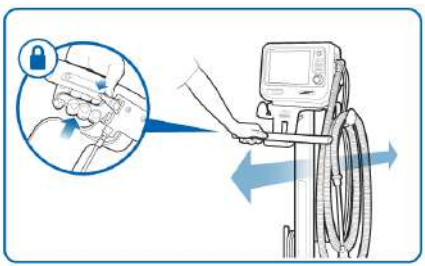


2 Release the lever to lock the brake and park the trolley.

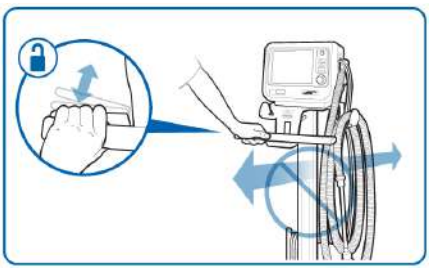
To move the trolley across longer distances

When moving the trolley a longer distance, you can disengage the auto-lock brake.

1 Squeeze the brake handle to release the auto-lock brake, and press the locking lever forward with your thumb.



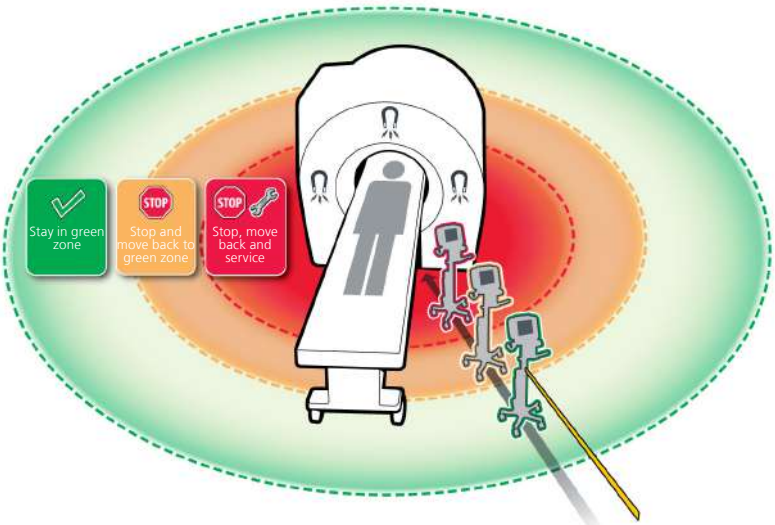
2 Before entering the MR environment, **re-engage the auto-lock brake** by squeezing and releasing the brake lever.



When the ventilator is *not* in use and is stored outside of the MR environment, disengage the auto-lock brake. Leaving the auto-lock brake engaged for long periods of time may place undue stress on the brake cable.

3. Working in the MR environment

3.4 Positioning the ventilator using the TeslaSpy navigator

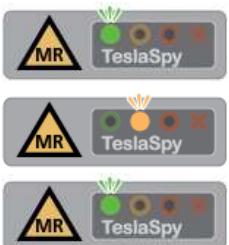


Carefully monitor the TeslaSpy indicator lights and alarms when working with the HAMILTON-MR1 in the MR environment.

To safely position the HAMILTON-MR1 in the MR environment

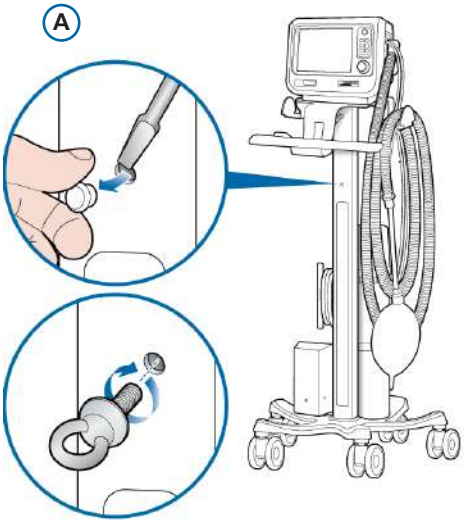
1. Slowly move the ventilator toward the scanner.

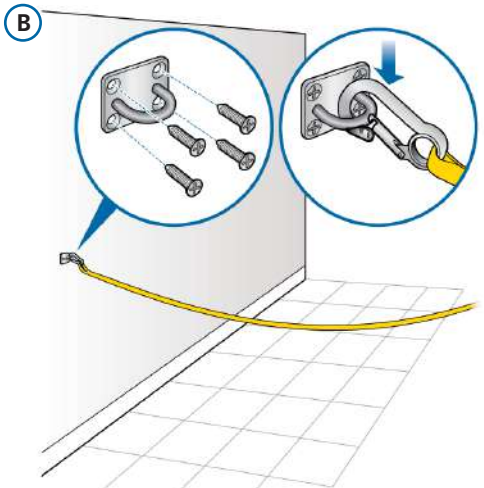
   Do *not* move the ventilator more than 10 cm (3 in) per second.
2. When the orange indicator on the TeslaSpy is lit, *stop*.
3. Slowly move the ventilator away from the scanner until the green indicator is lit.
4. Secure the trolley using the tether in the MR room. See page 22.

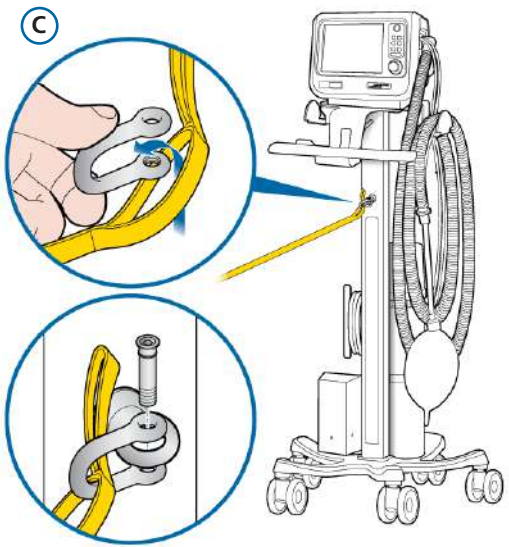


3. Working in the MR environment

3.5 Using the HAMILTON-MR1 tether







To secure the HAMILTON-MR1 trolley using the tether

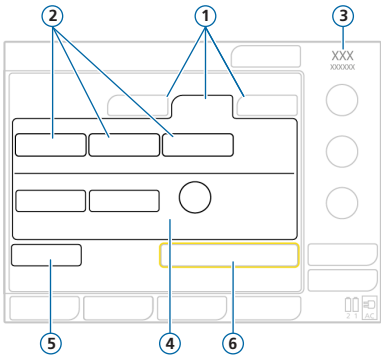
1. Attach the safety ring to the trolley (**A**).
2. Install the safety anchor in the MRI room (**B**).
3. Position the ventilator using TeslaSpy (see page 20).
4. Assemble the HAMILTON-MR1 tether by attaching the carabiner to the wall mount (**B**), and the screw-pin shackle to the safety ring (**C**) on the trolley.

   When the trolley is attached, the tether must be taut.
5. Cut off any excess tether.

   Leave at least 3 cm of excess tether.

For details, see the *HAMILTON-MR1 Tether User Guide*, available on MyHamilton.

4. Configuring patient settings



1. Patient group: **Neonatal**, **Adult/Ped**, **Last patient**
2. Quick setups
3. Selected mode and patient group
4. Sex, Patient height, calculated IBW
5. Preop check
6. Start ventilation

To select the patient group and specify patient data

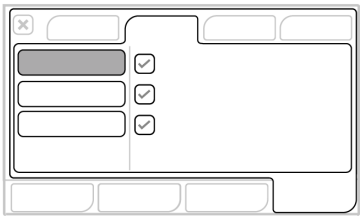
1. Touch **Adult/Ped**, **Neonatal**, or **Last patient** (uses the last-specified settings).
2. If **Adult/Ped** is selected, set the patient height. The device calculates the ideal body weight (IBW).
3. Touch **Preop check** to perform the preoperational check.

5. Performing the preoperational check

5.1 Tightness test

Perform these steps disconnected from the patient.

Prompts are provided in the System > Tests & Calib window.



Step one

1. Do either of the following:
   - Touch **System** > **Tests & Calib**.
   - In the Standby window, touch **Preop check**.
2. Touch **Tightness** to perform the tightness test.
3. When prompted, block the patient end of the breathing circuit.
4. Hold until instructed to stop on the display.

Pass ✔ or fail ✘ and date/time of the completed test are displayed.

5. Performing the preoperational check

5.2 Calibrating the flow sensor

Step two

1. Touch **Flow sensor** to calibrate the flow sensor.

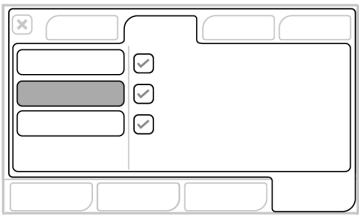
   Calibration starts automatically.

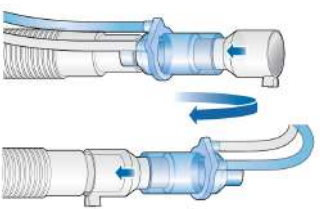
2. When prompted, attach the calibration adapter to the flow sensor and flip them both 180° so the adapter is directly connected to the limb (as shown below to the right).

   Calibration starts automatically.

3. When prompted, flip the flow sensor/adapter 180° again, so the flow sensor is directly connected to the limb, and remove the calibration adapter.

Pass ✔ or fail ✘ and date/time of the completed test are displayed.





5. Performing the preoperational check

5.3 O2 sensor calibration, alarm tests

Step three

1. If an ✖ is displayed next to O2 sensor, touch **O2 sensor** to calibrate the sensor.
2. If the **O2 sensor calibration needed** alarm is generated, repeat the calibration.

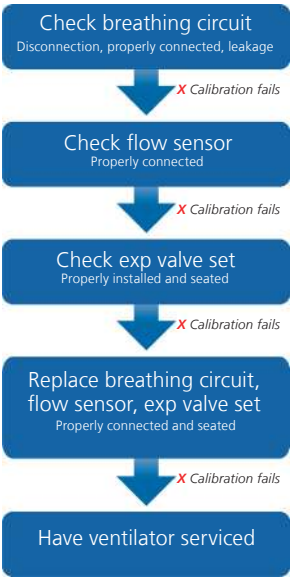
Step four

- ▶ Test the alarms to ensure proper operation as described in your ventilator *Operator's Manual*.

When calibration and tests are complete, the ventilator is ready for use.

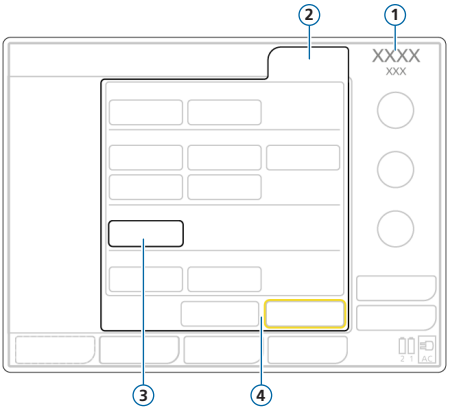
5. Performing the preoperational check

5.4 If the preoperational check fails



6. Configuring ventilation settings

6.1 Selecting a mode



1. Active mode and patient group
2. Modes button
3. New mode
4. Confirm/Cancel buttons

To change the mode

1. Touch **Modes**.

   The **Modes** window opens.
2. Touch the desired ventilation mode.
3. Touch **Confirm**.

   The **Controls** window opens.
4. Review and adjust settings in the **Basic** and **More** windows.
5. Touch **Confirm**.

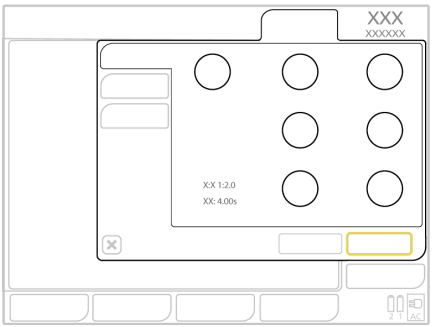
The mode and settings become active.

*The **Confirm/Cancel** buttons are only displayed when selecting a new mode.*

6. Configuring ventilation settings

6.2 Reviewing and adjusting mode controls

Controls window



Adjust controls at any time during ventilation.

For details about control settings, see your ventilator *Operator's Manual*.

To adjust settings

1. Touch **Controls**.

   The Controls > Basic window opens.
2. Adjust control settings as needed.
3. Touch **More** to access additional controls and make changes as needed.

To start ventilating the patient

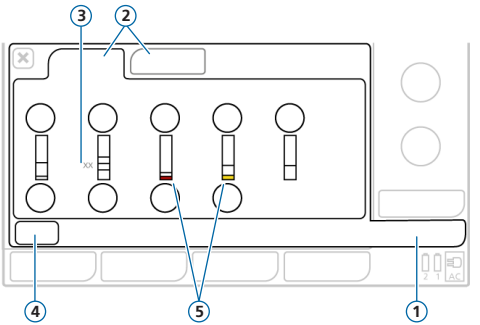
▶ Touch **Start ventilation** or press (Power/Standby) to start ventilating the patient.

To stop ventilation and enter Standby

1. Press (Power/Standby).
2. In the confirmation window, touch **Activate standby**.

6. Configuring ventilation settings

6.3 Reviewing and adjusting alarm limits



1. Alarms
2. Limits 1, 2
3. Current monitored value
4. **Auto** button
5. Red or yellow bar (depending on alarm priority) indicates monitored value is out of range

To review adjustable alarm limits

1. Touch **Alarms**.

   The Alarms > Limits 1 window opens.
2. Set alarm limits as appropriate.

Changing the high Pressure and high Vt alarm limits may affect ventilation. See next page.

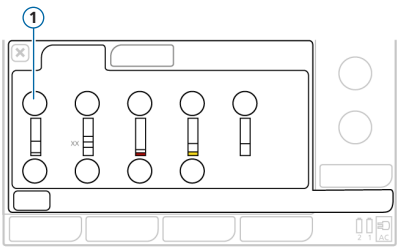
6. Configuring ventilation settings

6.3 Reviewing and adjusting alarm limits

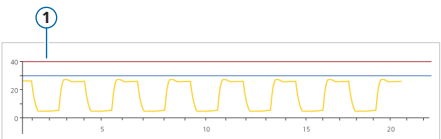
High pressure alarm limit

The ventilator uses the high **Pressure** alarm limit minus 10 cmH2O as a safety boundary for its inspiratory pressure adjustment, and does not exceed this value. An exception is **Sigh** breaths, when the ventilator may apply inspiratory pressures 3 cmH2O below the high **Pressure** alarm limit.

High Pressure alarm limit (**1**)



High Pressure alarm limit (**1**)

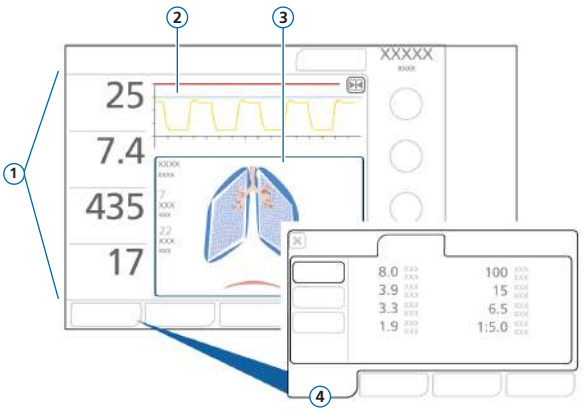


High Vt alarm limit

Inspiratory volume is limited to 150% of the set high **Vt** alarm limit. Changing the high **Vt** alarm limit may limit the inspiratory volume. Volume limitation is disabled in noninvasive modes.

7. Monitoring the patient

7.1 Reviewing patient data

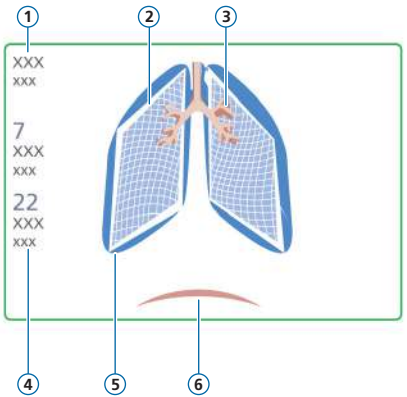


1. Main monitoring parameters (MMP), configurable
2. Pressure/time (**Paw**) waveform, nonconfigurable
3. Graphic display showing **Dynamic Lung**, configurable
4. Monitoring window, shows all available monitoring data

The main display provides an overview of the patient's data.

7. Monitoring the patient

7.2 The Dynamic Lung



1. Sex, height
2. Real-time representation of lung compliance
3. Real-time representation of airway resistance
4. Parameter values
5. Real-time representation of breaths and tidal volume
6. Patient trigger (diaphragm)

Visualizes in real-time:

- Tidal volume
- Lung compliance
- Resistance
- Patient triggering

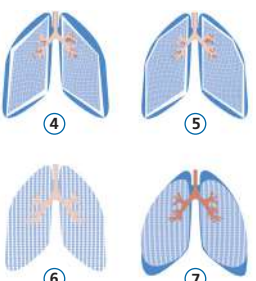
The lungs expand and contract in synchrony with patient breaths.

When all values are within the specified ranges, the panel is framed in green.

7. Monitoring the patient

7.3 Dynamic Lung: Display of resistance and compliance

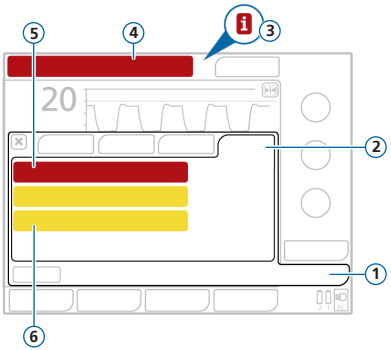
1. Normal resistance
2. Moderate resistance
3. High resistance



4. Very low compliance
5. Low compliance
6. Normal compliance
7. High compliance

7. Monitoring the patient

7.4 Reviewing alarms



1. Alarms
2. Buffer
3. i-icon (not displayed with active alarms)
4. Message bar with alarm
5. High-priority alarm (red)
6. Medium- or low-priority alarm (yellow)

The *alarm buffer* displays *active* alarms. Active alarm messages also alternate in the **message** bar.

To review active alarms

Do either of the following:

- Touch the **message** bar.
- Touch **Alarms** > **Buffer**.

The **Alarms** > **Buffer** window displays all previous (now inactive) alarms.

To review previous (inactive) alarms

Do either of the following:

- Touch the **i-icon**.
- Touch **Alarms** > **Buffer**.

8. Ventilation modes

Mode	Description
APVcmv/ (S)CMV+	*Adaptive pressure ventilation with controlled mandatory ventilation.* Breaths are mandatory, volume targeted, pressure regulated, variable flow, and time cycled.
APVsimv/ SIMV+	*Adaptive pressure ventilation with synchronized intermittent mandatory ventilation.* Volume-targeted mandatory breaths can be alternated with pressure-supported spontaneous breaths.
PCV+	*Pressure-controlled ventilation.* Breaths are pressure controlled and mandatory.
PSIMV+	*Pressure-controlled synchronized intermittent mandatory ventilation.* Mandatory breaths are pressure controlled. Mandatory breaths can be alternated with pressure-supported spontaneous breaths.
DuoPAP	*Duo positive airway pressure.* Mandatory breaths are pressure controlled. Spontaneous breaths can be triggered at both pressure levels. **Rate** and inspiratory time are set.
APRV	*Airway pressure release ventilation.* Spontaneous breaths can be continuously triggered. The pressure release between the levels contributes to ventilation. **T high** and **T low** settings determine the **Rate**.
SPONT	*Spontaneous mode.* Every breath is spontaneous, with or without pressure-supported spontaneous breaths.
ASV	*Adaptive support ventilation.* Operator sets **%MinVol**, **PEEP**, and **Oxygen**. Frequency, tidal volume, pressure, and **I:E** ratio are based on physiological input from the patient.
NIV	*Noninvasive ventilation.* Every breath is spontaneous.
NIV-ST	*Spontaneous/timed noninvasive ventilation.* Every breath is spontaneous as long as the patient is breathing above the set **Rate**. A backup **Rate** can be set for mandatory breaths.

8. Ventilation modes

Mode	Description
nCPAP	*Neonatal only mode.* Demand flow Nasal Continuous Positive Airway Pressure.
nCPAP-PC	*Neonatal only mode.* Breaths are pressure controlled and mandatory.

Additional information is available in your ventilator *Operator's Manual*.

9. Monitoring parameters (ventilator)

Parameter	Description
AutoPEEP	The difference between the set **PEEP** and the calculated total **PEEP** within the lungs. **AutoPEEP** is the abnormal pressure generated by air "trapped" in the alveoli due to inadequate lung emptying. Ideally, it should be zero. **AutoPEEP** is calculated using the LSF method applied to the entire breath.
Control Flow	The set **flow** of gas to the patient when using **HiFlowO2**.
Cstat	Static compliance of the respiratory system, including lung and chest wall compliances, calculated using the LSF method. **Cstat** can help diagnose changes in elastic characteristics of the patient's lungs.
Exp Flow	Peak expiratory flow.
ExpMinVol/ MinVol NIV	Expiratory minute volume. The moving average of the monitored expiratory volume per minute over the last 8 breaths. **ExpMinVol** changes to **MinVol NIV** in noninvasive modes. **MinVol NIV** is an adjusted parameter taking leakage into account.
fControl	Mandatory breath frequency.
Flow	In **nCPAP** mode, this value is the average flow, updated every second. In **nCPAP-PC** mode, this value is the average flow during expiration, updated every breath.
fSpont	Spontaneous breath frequency.
fTotal	Total breathing frequency.
IBW	Ideal body weight. A calculated value using height and sex, for adult and pediatric patients.
I:E	Inspiratory:expiratory ratio. Ratio of the patient's inspiratory time to expiratory time for every breath cycle. This includes both mandatory and spontaneous breaths. **I:E** may differ from the set **I:E** ratio if the patient breathes spontaneously.
Insp Flow	Peak inspiratory flow, spontaneous or mandatory. Measured every breath.

9. Monitoring parameters (ventilator)

Parameter	Description
MVSpont/ MVSpont NIV	Spontaneous expiratory minute volume. The moving average of the monitored expiratory volume per minute for spontaneous breaths, over the last 8 mandatory and spontaneous breaths. In noninvasive ventilation modes, **MVSpont** is replaced by **MVSpont NIV**. **MVSpont NIV** is an adjusted parameter taking leakage into account.
Oxygen	Oxygen concentration of the delivered gas.
P0.1	Airway occlusion pressure. The pressure drop during the first 100 ms when a breath is triggered. **P0.1** indicates the patient's respiratory drive and patient inspiration effort. Applies to patient-triggered breaths.
PEEP/CPAP	Monitored **PEEP/CPAP**. The airway pressure at the end of exhalation. Measured **PEEP/CPAP** may differ slightly from the set value, especially in spontaneously breathing patients.
Pinsp	Inspiratory pressure, the automatically calculated target pressure (additional to **PEEP**) applied during the inspiratory phase.
Pmean	Mean airway pressure. The absolute pressure, averaged over the breath cycle.
Ppeak	Peak airway pressure. The highest pressure during the previous breath cycle. It is influenced by airway resistance and compliance. **Ppeak** may differ noticeably from alveolar pressure if airway resistance is high. This value is always displayed.
Pplateau	Plateau or end-inspiratory pressure. The pressure measured at the end of inspiration when flow is at or close to zero. Used as a rough representation of alveolar pressure. **Pplateau** is displayed for mandatory and time-cycled breaths.
PTP	Inspiratory pressure time product. **PTP** is valid for patient-initiated breaths only, and indicates work by the patient to trigger the breath.
RCexp	Expiratory time constant. The rate at which the lungs empty.
Rinsp	Resistance to inspiratory flow caused by the endotracheal tube and the patient's airway during inspiration.

Parameter	Description
RSB	Rapid shallow breathing index. The total breathing frequency (fTotal) divided by the exhaled tidal volume (VTE).
TE	Expiratory time. In mandatory breaths, TE is measured from the start of exhalation until the set time has elapsed for the switch to inspiration. In spontaneous breaths, TE is measured from the start of exhalation, as dictated by the ETS setting, until the patient triggers the next inspiration. TE may differ from the set expiratory time if the patient breathes spontaneously.
TI	Inspiratory time. In mandatory breaths, TI is measured from the start of breath delivery until the set time has elapsed for the switch to exhalation. In spontaneous breaths, TI is measured from the patient trigger until the flow falls to the ETS setting for the switch to exhalation. TI may differ from the set inspiratory time if the patient breathes spontaneously.
VLeak/ MVLeak	Due to the leakage at the patient interface, displayed exhaled volumes in the noninvasive modes can be substantially smaller than the delivered volumes. The flow sensor measures the delivered volume and the exhaled tidal volume; the ventilator displays the difference as VLeak in %, and as MVLeak in l/min, averaged over the last 8 breaths.
Vt/IBW	Tidal volume is calculated according to ideal body weight (IBW) for adult/pediatric patients and according to the actual body weight for neonatal patients.
VTE/ VTE NIV	Expiratory tidal volume, the volume exhaled by the patient. If there is a gas leak on the patient side, the displayed VTE may be less than the tidal volume the patient actually receives.
VTESpont	Spontaneous expiratory tidal volume, the volume exhaled by the patient. Only displayed for spontaneous breaths.
VTI	Inspiratory tidal volume, the volume delivered to the patient, determined from the flow sensor measurement.

Additiional information about monitoring parameters is available in your ventilator *Operator's Manual*.

10. Control parameters

Parameter	Description
%MinVol	Percentage of minute volume to be delivered in **ASV** mode. The ventilator uses the **%MinVol**, **Pat. height**, and **Sex** settings to calculate the target minute ventilation.
Apnea Backup	A function that provides ventilation after the adjustable apnea time passes without breath attempts.
ETS	Expiratory trigger sensitivity. The percentage of peak inspiratory flow at which the ventilator cycles from inspiration to exhalation.
Flow	In **HiFlowO2**, **Flow** is the continuous and constant flow of medical gas to the patient in liters per minute.
Flow trigger	The patient's inspiratory flow that triggers the ventilator to deliver a breath.
I:E	Ratio of inspiratory time to expiratory time as determined by the control settings. Applies to mandatory breaths, when the device is configured in this way.
Oxygen	Oxygen concentration to be delivered.
Pasvlimit	The maximum pressure to apply in **ASV** mode. Changing **Pasvlimit** or the high **Pressure** alarm setting automatically changes the other. The upper **Pressure** alarm limit is always 10 cmH2O greater than **Pasvlimit**.
Pat. height	Patient height. Used in calculation of the ideal body weight (**IBW**), which is used in calculations for **ASV** and startup settings for adult and pediatric patients.
Pinsp	Pressure (additional to **PEEP/CPAP**) to apply during the inspiratory phase in **PSIMV+Psync**, and **NIV-ST** modes.
Pcontrol	Pressure (additional to **PEEP/CPAP**) to apply during the inspiratory phase in **PCV+** and **PSIMV+** modes.
PEEP/CPAP	Positive end expiratory pressure.
P high	The high pressure setting in **APRV** and **DuoPAP** modes. Absolute pressure, including **PEEP**.

Parameter	Description
P low	The low pressure setting in **APRV**.
P-ramp	Pressure ramp. Time required for inspiratory pressure to rise to the set (target) pressure.
Psupport	Pressure support for spontaneous breaths in **SPONT**, **NIV**, **APVsimv**, **PSIMV+**, and **DuoPAP** modes.
Rate	Respiratory frequency or number of breaths per minute.
Sigh	Breaths delivered at a regular interval (every 50 breaths) at a pressure up to 10 cmH2O higher than non-**Sigh** breaths, as allowed by the upper **Pressure** alarm setting.
T high	Length of time at the higher pressure level, **P high**, in **DuoPAP** and **APRV** modes.
TI	Inspiratory time, the time to deliver the required gas for inspiration at the **Pcontrol** setting. Used with **Rate** to set the breath cycle time. Applies in **PCV+**, **APVcmv**, **APVsimv**, **PSIMV+**, and **NIV-ST** modes.
TI max	Maximum inspiratory time for flow-cycled (pressure support) breaths in **NIV**, **NIV-ST**, and **SPONT** in neonatal modes.
T low	Length of time at the lower pressure level, **P low**, in **APRV** mode.
Vt	Tidal volume delivered during inspiration in **APVcmv** and **APVsimv** modes.
Weight	Actual body weight. Used only with neonates.

Additional information about control parameters is available in your ventilator *Operator's Manual*.

Notes

Notes

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