MEDUMAT Standard^2

Ventilator

Instructions for Use for Devices from Software Version 4.1

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1 Introduction

1.1 Intended use

MEDUMAT Standard^2 is an automatic oxygen emergency ventilator with functions for the monitoring of respiratory values.

MEDUMAT Standard^2 is used in the treatment of infants, children and adults where spontaneous respiration has failed or is inadequate. The device can be used for invasive and non-invasive ventilation. In the case of volume-controlled ventilation, tidal volumes of 50 ml or more are possible. Smaller tidal volumes are also possible in the case of pressure-controlled ventilation.

Emergency applications:

- For resuscitation at the scene of an emergency
- For longer-term use in continuing emergency situations
- For the supportive induction of anesthesia (TIVA: total intravenous anesthesia)

Applications during transportation:

- In ground, sea and air emergency medical service
- Between hospital rooms and departments
- Between a hospital and other locations (secondary transport)

MEDUMAT Standard^2 is also suitable for gentle ventilation of anesthetized patients (TIVA: total intravenous anesthesia).

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1.2 Operator and user qualification

MEDUMAT Standard^2 must only be used by persons who possess a medical qualification and have received training in ventilation techniques.

As the operator or user, you must be fully familiar with the correct operation of this medical device. Observe the statutory requirements for operation and use (in Germany, particularly the German regulations governing owners/operators of medical devices (MPBetreibV)). General recommendation: You should seek instruction on the correct handling, use and operation of this medical device from a person authorized by WEINMANN Emergency.

1.3 Contraindications

Possible contraindications for ventilation include:

- High risk of a barotrauma
- Pneumothorax or pneumomediastinum

1.4 Side effects

Possible side effects of ventilation are:

- Atrophy of the respiratory muscles
- Drying out of the airways
- Gastrointestinal air insufflation in the case of mask ventilation

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2 Safety

2.1 Safety information

Read these instructions for use carefully. They form part of the devices described, and must be available at all times.

Use the device for the designated purpose only (see "1.1 Intended use", page 5).

For your own safety as well as that of your patients, and in accordance with the requirements of Directive 93/42/EEC, please observe the following safety instructions.

2.1.1 How to use the device

Warning

Risk of poisoning if the device is used in a toxic atmosphere!
If the device is used in a toxic atmosphere, it can suck in toxic gases from the ambient air. These toxic gases may reach the lungs of the patient and poison them.
⇒ Do not use the device in a toxic atmosphere.

Risk of infection if the device is used in a contaminated atmosphere!
If the device is used in a contaminated atmosphere, it may suck in contaminated or infected ambient air and harm the patient.
⇒ Only operate the device in a contaminated atmosphere with a hygiene filter.

Risk of injury if the device is used in a dusty atmosphere!
If the device is used in a dusty atmosphere, it can suck in dust and contaminants from the ambient air. Dust and contaminants may reach the lungs of the patient and harm them.
⇒ Only operate the device with a hygiene filter/device input filter.
⇒ Change the hygiene filter/device input filter following operation in a very dusty atmosphere.

Risk of explosion if the device is used in explosive atmospheres!
Flammable gases and anesthetics may cause spontaneous explosions and thereby bring about injury to the patient, user and bystanders.
⇒ Do not use the device in combination with flammable gases or anesthetic gases.

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Risk of injury due to device or component malfunction!
A damaged device or damaged components may result in injury to the patient, user or bystanders.
⇒ Only operate the device and components if they are externally undamaged.
⇒ Only operate the device and components if the function check has been successfully completed.
⇒ Only operate the device if the display is functional.
⇒ Keep an alternative ventilation unit at the ready.

Risk of injury if the pneumatic connections within the device are closed off or blocked!
When oxygen is supplied via a central gas supply system which has not been properly cleaned or is moist, the pneumatic connections within the device may become blocked by contaminants or particles or suck in moisture.
⇒ Only operate the device from central gas connections which are clean and dry.

Risk of injury in the event of device failure resulting from blocked suction inlets on the hygiene filter/device input filter!
Blocked suction inlets on the hygiene filter/device input filter may cause injury to the patient in the event of device failure as a result of excessively high pressures, and may prevent the patient from breathing on his/her own.
⇒ Always keep the suction inlets on the hygiene filter/device input filter clear.

Risk of injury due to sparks during defibrillation in the presence of oxygen and combustible materials!
In the event that a ventilator and defibrillator are used at the same time, defibrillation in an oxygen-enriched atmosphere and in the presence of combustible materials (e.g., textiles) combined with sparks generated by the defibrillation may cause explosions and fire, which may result in injury to the patient, user or bystanders.
⇒ During defibrillation, only use adhesive electrodes or ensure that the oxygen-air mixture coming from the exhalation valve flows away from the torso of the patient.

Risk of injury due to concealed alarm!
A concealed alarm light, loudspeaker and display will prevent the user from noticing any alarms and reacting to dangerous situations. This may result in injury to the patient.
⇒ Always keep the alarm (alarm light, loudspeaker and display) free.

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⇒ Do not operate the device in a closed bag.

Risk of injury if an incorrect volume is applied in hyperbaric environments!

Use of the device in hyperbaric environments (pressure chambers) leads to the application of incorrect volumes and may result in an injury to the patient.

⇒ Do not use the device in hyperbaric environments.

Risk of injury if the device is operated outside of the prescribed ambient conditions!

Use of the device outside of the prescribed ambient conditions may mean that tolerances are not adhered to and result in device failure and injury to the patient.

⇒ Only operate the device within the prescribed ambient conditions (see "14.1.1 Technical data on device", page 214).

Risk of injury due to reuse of disposable items!

Disposable items are intended for single use. Disposable items which are reused may be contaminated and/or impaired in their function and therefore cause injury to the patient.

⇒ Do not reuse disposable items.

Therapy prevented by increased oxygen consumption when using CCSV mode!

The increased ventilation rate in CCSV mode results in increased oxygen consumption during resuscitation (approx. 12-30 l/min) compared with IPPV ventilation.

⇒ Check the fill pressure in the oxygen cylinder regularly.

⇒ Keep reserve oxygen at the ready.

Risk of injury from deactivated alarm light, deactivated audio alarm output and darkened display in NVG mode!

The alarms are barely perceptible as a result of the deactivated alarm light, the deactivated audio alarm output and the darkened display in NVG mode. This can injure the patient.

⇒ Always monitor patients during ventilation.

⇒ Only use the NVG option in the military sector.

Caution **Risk of injury through electric shock if the device is touched!**

Accessories which are connected to the device may cause an electrical potential in the device. This may lead to an electric shock on contact with the device and result in injury to the user.

⇒ Only use accessories from WEINMANN Emergency.

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Risk of injury as a result of pressure variations during use in combination with devices from the WEINMANN Emergency MODUL range!

If the device is used together with devices from the WEINMANN Emergency MODUL range, the flow used by devices from the WEINMANN Emergency MODUL series may cause pressure variations in the device. This can injure the patient.

⇒ Only use the device and devices from the WEINMANN Emergency MODUL range in combinations approved by WEINMANN Emergency.

Delay in treatment due to interference caused by electric and magnetic fields!

Electric and magnetic fields may interfere with device functioning, and delay treatment.

⇒ Maintain separation distances between the device and mobile telephones, radio units and X-ray apparatus.

Notice **Damage to the device caused by ingress of liquids!**

The device is rated IP54 (splash-proof). This only applies when the battery is located in the battery compartment, the SD card compartment is closed, there is a filter in the filter compartment, and there is a patient hose system connected. Ingress of liquids may damage the device, components and accessories.

⇒ Do not immerse the device, components, or accessories in liquids.

⇒ Clean the battery compartment carefully so that no liquids enter the device.

2.1.2 Power supply

Warning **Risk of injury due to missing, flat, or defective battery!**

A missing, flat or defective battery prevents treatment.

⇒ Only operate the device with a charged battery.

⇒ Keep an alternative ventilation unit at the ready.

Treatment prevented by defective power cord or power supply!

A defective power cord or power supply prevents the battery in the device from charging and thus impairs the operational readiness of the device.

⇒ Inspect the power cord and power supply regularly.

⇒ Only operate the device with a charged battery.

⇒ Keep an alternative ventilation unit at the ready.

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Risk of injury due to electric shock when connecting an incorrect power supply to the line power!
The power supply contains a safety device to prevent electric shock. The use of a non-original power supply may result in injury to the user.
⇒ Only operate the device on line power using the power supply recommended by WEINMANN Emergency.

Caution **Risk of injury from touching the contacts in the battery compartment and the patient at the same time!**
The contacts in the battery compartment are live. Touching the contacts and the patient at the same time can injure the user or the patient.
⇒ Do not touch the contacts in the battery compartment and the patient at the same time.

Notice **Material damage due to prolonged storage of the battery without recharging!**
Storing the battery for a prolonged period of time without recharging can result in the rapid shutdown of and irreparable damage to the battery.
⇒ When the battery is stored in the device without a power connection: Charge battery every 3 months.
⇒ If the battery is not stored in the device: Charge battery every 5 months.

2.1.3 How to use the patient hose system

Warning **Risk of injury due to contaminated or infected patient hose system!**
A patient hose system which is contaminated or infected as a result of hygienic reprocessing not being performed or being performed incorrectly may transmit contamination or infections to the next patient and harm them.
⇒ Do not reprocess disposable hose systems.
⇒ Perform the hygienic reprocessing of reusable hose systems correctly (see "8.4 Hygienic reprocessing of the reusable hose system", page 168).

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Caution **Risk of injury from touching the contacts on the FlowCheck sensor connection line/FlowCheck sensor connection line with MEDUtrigger and the patient at the same time!**
The contacts on the FlowCheck sensor connection line/FlowCheck sensor connection line with MEDUtrigger are live. Touching the contacts and the patient at the same time can injure the user or the patient.
⇒ Do not touch the contacts on the FlowCheck sensor connection line/FlowCheck sensor connection line with MEDUtrigger and the patient at the same time.

2.1.4 Ventilation

Warning **Risk of injury due to lack of patient monitoring!**
If the patient is not supervised during ventilation, delayed responses of medical personnel to alarms and error messages may result in serious injuries to the patient.
⇒ Always monitor patients during ventilation.
⇒ Be sure to react immediately to alarms and error messages as well as a deterioration in the condition of the patient.

Risk of injury from condensate in the FlowCheck sensor and the patient valve at temperatures below 5°C!
With longer term ventilation of patients at temperatures below 5°C, the moisture from expiratory breath can condense in the FlowCheck sensor and patient valve. This may interfere with the functioning of the parts and injure the patient.
⇒ Quickly transfer the patient to a warmer location.
⇒ At temperatures below 5°C use a breathing system filter to extend the period of application.

Risk of poisoning due to an overly high concentration of oxygen during ventilation!
Highly concentrated oxygen can have a toxic effect on the patient if administered for too long and depending on the age of the patient.
⇒ Do not use highly concentrated oxygen on a patient for too long during ventilation.
⇒ Do not use the device for the ventilation of premature babies (born before the end of the 36th week of pregnancy).

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Risk of injury due to airway pressures which are excessively high or too low!

Airway pressures which are excessively high or too low may result in injury to the patient.

⇒ Check correct ventilation on the display.

⇒ Adjust the pressure limitation (pMax) to suit the connected patient.

Risk of injury due to alarm limits which are too high or too low!

Alarm limits which are either too high or too low can prevent the device from emitting an alarm, thereby putting the patient at risk.

⇒ Always set alarm limits which have been adapted to the patient.

Risk of injury from switching on a device with activated NVG mode during daylight or without a night vision device!

A device with activated NVG mode cannot be used straight away during daylight or without a night vision device. This can injure the patient.

⇒ Keep an alternative ventilation unit at the ready.

Risk of injury if CCSV mode is used on infants!

Use of the CCSV mode can result in increased intrathoracic pressures and thus injure infants' lungs.

⇒ Do not use CCSV mode on patients weighing less than 10 kg.

Risk of injury from use of pneumatic nebulizers during volume-controlled ventilation!

The use of pneumatic nebulizers increases the minute volume administered to the patient.

⇒ Do not use pneumatic nebulizers during volume-controlled ventilation.

Caution **Risk of injury due to operation of the device with compressed air!**

During operation with compressed air, the volume delivered by the device is excessively high and the oxygen concentration of the output is too low. This may lead to volutrauma and hypoxia in the patient.

⇒ Only operate the device with medical oxygen or concentrator oxygen.

Risk of injury due to drying out of the airways!

Prolonged ventilation using the device may dry out the airways of the patient and cause them an injury.

⇒ Do not use the device for long-term ventilation.

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Risk of injury due to unsuitable concentrator gas!
Unsuitable concentrator gas may distort treatment and result in injury to the patient.
⇒ Only use concentrator oxygen (90% to 96% oxygen) or medical oxygen.

Risk of injury if the patient valve is covered!
The patient valve may be covered due to the position of the patient and prevented from functioning properly.
⇒ Always keep the patient valve clear.

Risk of injury if dead space is not taken into consideration!
The patient hose systems for the device have different dead spaces. The use of additional accessories between the ventilation hose and patient (e.g.,humidifiers, nebulizers and goosenecks) increases the dead space. Failure to take dead space into consideration may lead to insufficient ventilation, especially in the ventilation of infants with very small tidal volumes.
⇒ Take dead space into consideration when choosing the ventilation parameters.
⇒ Do not use the device for the ventilation of premature babies (born before the end of the 36th week of pregnancy).

Risk of injury from autotriggering!
Automatic triggering of the inspiration trigger by artifacts (autotrigger) can result in hyperventilation of the patient.
⇒ Reduce the sensitivity of the inspiration trigger in case of autotriggers.

Risk of injury from incompatible hoses!
The use of too high ventilation pressures with incompatible hoses can result in insufflation of the stomach and cause injury to the patient.
⇒ Only use compatible hoses.

2.1.5 Safe handling of oxygen

Warning **Risk of fire if oxygen is used in combination with combustible substances!**
The combination of oxygen and combustible substances may lead to spontaneous explosions. Where ventilation is inadequate, oxygen may build up in the environment (e.g., clothing, hair, bed linen) and cause fires and thereby injuries to the patient, user and bystanders.

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⇒ Do not smoke.
⇒ Do not use open flames.
⇒ Ensure adequate ventilation.
⇒ Keep the device and screwed unions free from oil and grease.
⇒ Always close the SD card cover again following the insertion and removal of the SD card.

Risk of injury if oxygen escapes from damaged oxygen cylinders or pressure reducers!

Oxygen can escape unchecked from damaged oxygen cylinders or pressure reducers. This may lead to explosions and cause injury to the patient, user and bystanders.

⇒ Tighten all screwed unions on the oxygen cylinder and on the pressure reducer by hand only.
⇒ Secure the oxygen cylinder so that it cannot fall over.

Risk of fire due to inadequate ventilation in an oxygen-enriched environment!

Where ventilation is inadequate, oxygen may build up in the environment and cause fires. This may result in injury to the patient, user and bystanders.

⇒ Make provisions for adequate ventilation.

Risk of injury due to empty oxygen cylinder!

An empty oxygen cylinder prevents ventilation and may cause injury to the patient.

⇒ Keep a full oxygen cylinder at the ready.
⇒ Keep an alternative ventilation unit at the ready.

Notice **Damage to the device due to corrosion!**

Moist ambient air may enter oxygen cylinders which have been completely emptied and cause corrosion.

⇒ Do not empty oxygen cylinders completely.

Damage to the device due to pressure hammer on fittings!

Opening the valve on the oxygen cylinder too quickly may lead to pressure hammer on the fittings.

⇒ Always open the valve of the oxygen cylinder slowly.

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2.2 General instructions

- If third-party items are used, malfunctions may occur and fitness for use may be restricted. Biocompatibility requirements may also not be met. Please note that in such cases, any warranty claim and liability will be voided if neither the accessories recommended in the instructions for use nor genuine replacement parts are used. Third-party items may increase the radiation output or reduce the interference immunity.
- Repairs, servicing and maintenance should only be carried out by the manufacturer, WEINMANN Emergency, or by a technician expressly authorized by WEINMANN Emergency.
- Only have modifications to the device carried out by the manufacturer, WEINMANN Emergency, or by a technician expressly authorized by WEINMANN Emergency.
- Any constructive changes made to the device may put the patient and the user at risk and are not permitted.
- The device is protected against unauthorized access by means of a colored security seal on the rear of the housing. Please note that any damage to the security seal voids any warranty claims.
- Please observe the section on hygienic reprocessing in order to avoid infection or bacterial contamination (see "8 Hygienic reprocessing", page 164).
- Also observe the respective instructions for use for the device, the components and the accessories.
- Always carry out a function check before using the device (see "9 Function check", page 183).
- Risks due to software errors have been minimized by means of extensive qualification measures.
- This device's software contains code which is subject to the General Public License (GPL). You will receive the source code and the GPL upon request.

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- The software for the FlowCheck sensor connection line with MEDUtrigger/FlowCheck sensor connection line was created with FreeRTOS (www.freertos.org).

2.3 Warnings in this document

Warnings are used to flag up safety-relevant information.

You will find a warning preceding any action that entails a hazard for persons or equipment.

Warnings consist of

- the warning symbol (pictogram),
- a signal word designating the hazard level,
- information about the hazard and
- instructions for avoiding the hazard.

The warnings appear in three hazard levels depending on the degree of danger:

⚠ DANGER	**Danger!** Designates an extremely dangerous situation. Failure to observe this warning will lead to serious, irreversible injury or death.
⚠ WARNING	**Warning!** Designates an extremely dangerous situation. Failure to observe this warning may lead to serious, irreversible or fatal injury.
⚠ CAUTION	**Caution!** Designates a dangerous situation. Failure to observe this warning may lead to minor or moderately serious injury.
NOTICE	**Notice!** Indicates a hazardous situation. Failure to observe this warning may lead to damage to equipment.
i	Designates useful information relating to a particular action.

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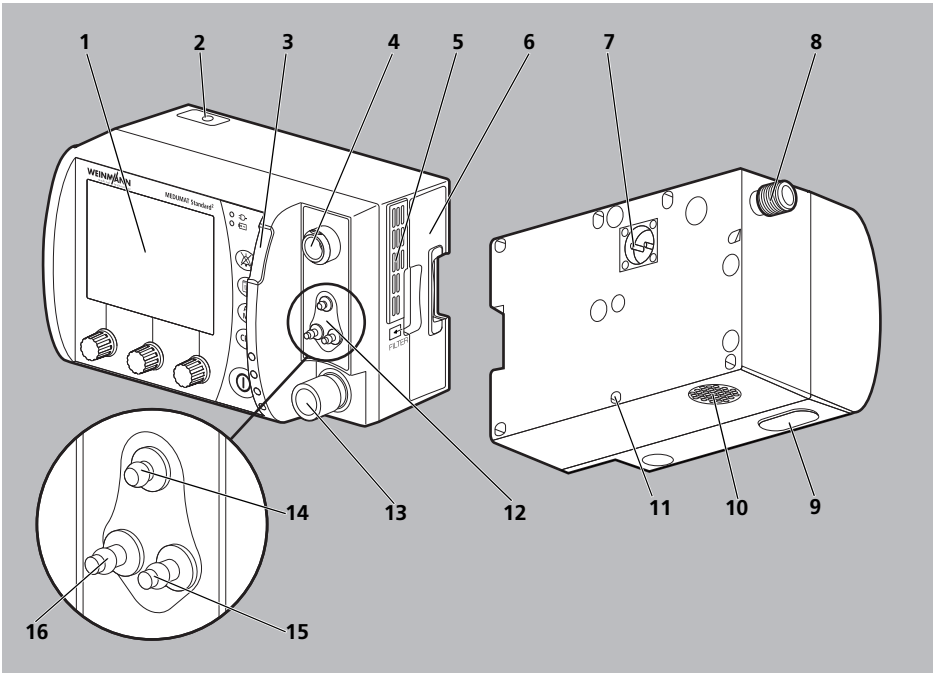
3 Description

3.1 Overview



3-1 Device

No.	Designation	Description
1	Display	Displays settings and current values (see "3.4 Symbols on the display", page 26).
2	Service cover	Used for servicing purposes. May only be opened by the manufacturer or persons authorized by the manufacturer.
3	Alarm light	Indicates high-priority alarms visually.
4	Accessory connection	• Connects the device to MEDUtrigger. • Connects the device to the FlowCheck sensor connection line. • Connects the device to the FlowCheck sensor connection line with MEDUtrigger.

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No.	Designation	Description
5	Filter compartment	Houses the hygiene filter/device input filter.
6	Battery compartment with battery	Houses the battery.
7	Power connection	Connects the device to the power supply.
8	Compressed gas connection	Used for connecting the oxygen supply (e.g., an oxygen cylinder).
9	SD card slot	For inserting an SD card.
10	Loudspeaker	Emits audible alarms and metronome sounds.
11	Security seal	Indicates whether the device has been opened without authorization.
12	Connection for measuring hose system	Connects the device to the measuring hose system of the patient hose system.
13	Connection for ventilation hose	Connects the device to the ventilation hose of the patient hose system.
14	Connection for CO_2 measuring hose	Connects the device to the CO_2 measuring hose (only with capnography option). This connection is included with devices without a capnography option, however it has no function.
15	Connection for pressure-measurement hose	Connects the device to the pressure-measurement hose.
16	Connection for PEEP control hose	Connects the device to the PEEP control hose.

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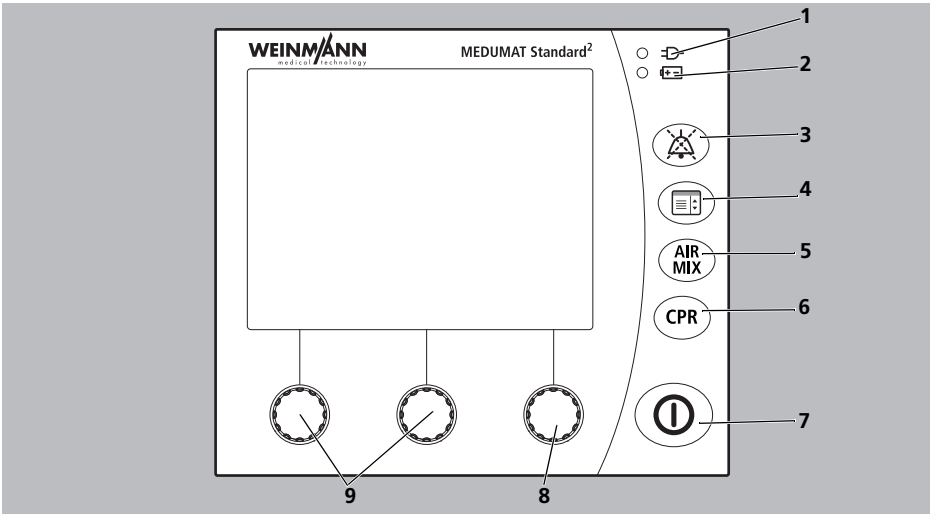
3.2 Control panel



3-2 Controls

No.	Designation	Description
1	Line power indicator	• Steady green light: Indicates that the device is connected to line power. • No light: The device is operating on battery power and not on line power. **or** The device is in NVG mode.
2	Battery status indicator	• Steady green light: The battery is full or is not being charged because it is outside the charging temperature range. • Flashing green light: The battery is being charged. • Steady red light: The battery is defective or not in the device. • No light: The device is operating on battery power and not on line power. **or** The device is in NVG mode.

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No.	Designation	Description
3	Alarm mute button	• Pressing the button briefly (< 1 s) mutes the alarm for 120 s. • Keeping the button depressed (≥ 1 s) opens the alarm limit menu.
4	Menu button	• In the start menu: Provides access to the operator menu. • With the ventilation mode set: Provides access to the user menu.
5	Air Mix button	Switches between Air Mix mode and non-Air Mix mode.
6	CPR button	Activates or deactivates the CPR mode.
7	On/Off button	Switches the device on or off.
8	Right-hand navigation knob	• Enables the selection of values for ventilation parameters. • Enables the selection and confirmation of other ventilation parameters.
9	Left/central navigation knob	• Enable the selection of values for ventilation parameters. • Enable confirmation of values selected for ventilation parameters.

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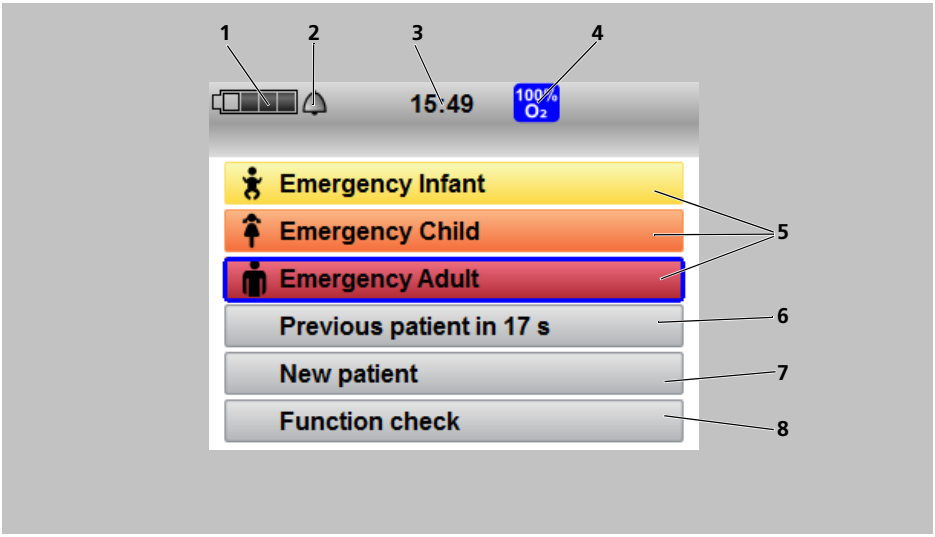
3.3 Display

3.3.1 Start menu



3-3 Start menu display

No.	Designation	Description
1	Battery status	Displays the charge level of the battery.
2	Alarm	Indicates whether the audio alarm output is active or has been muted.
3	Time	Displays the current time.
4	100% O_2 Air Mix	Indicates whether operation with 100% oxygen or Air Mix mode is activated.
5	Emergency modes	Provides access to the emergency modes.
6	Previous patient	Provides access to the emergency mode and the ventilation parameters set for the previous ventilated patient.
7	New patient	Provides access to the settings for a new patient.
8	Function check	Provides access to the function check.

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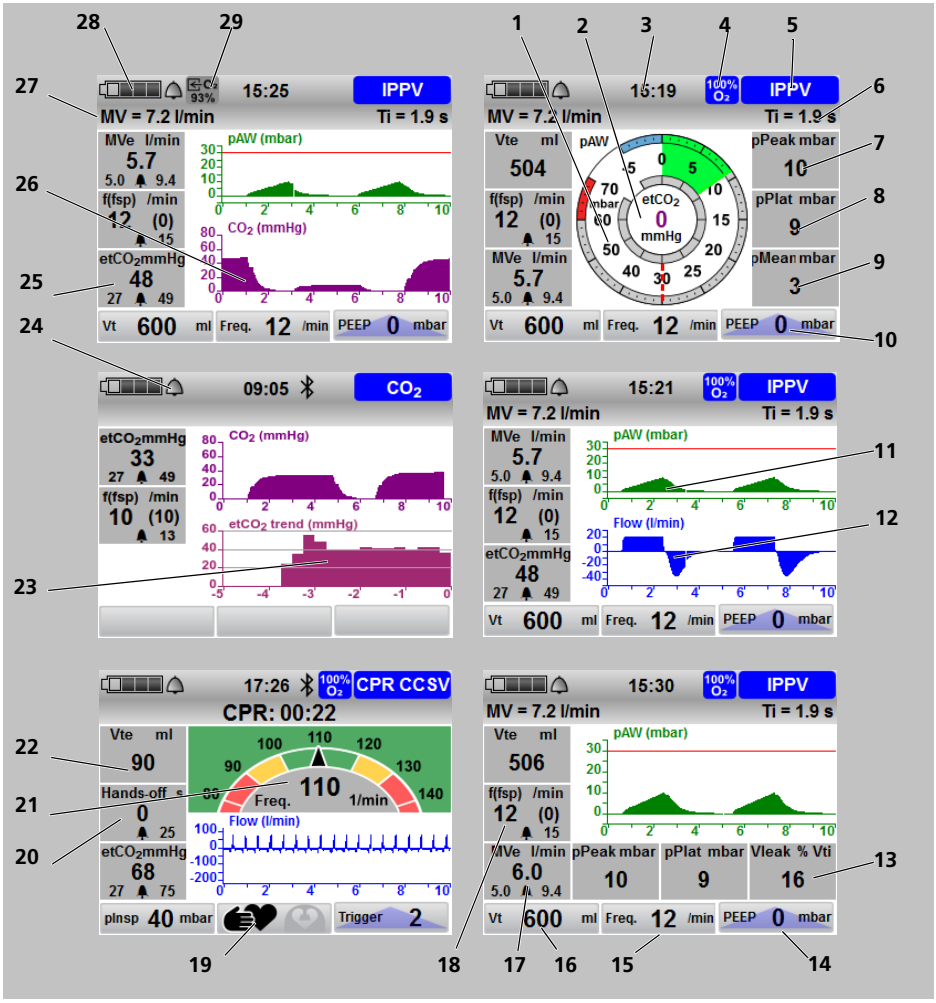
3.3.2 Ventilation mode (example)



3-4 Display in the views
1 (pressure, CO_2 curve) (top left), 2 (pressure gauge, measurements) (top right), 3 ($etCO_2$ trend) (center left), 4 (pressure, flow curve) (center right), 5 (CCSV mode) (bottom left), 6 (pressure curve, measurements) (bottom right)

No.	Designation	Description
1	Pressure gauge	• Indicates ventilation pressure progress. • Indicates pMax as a dotted line. • Indicates the currently attuning airway pressure as a green area. • Indicates the maximum airway pressure in the middle. • Indicates the end-tidal CO_2 concentration ($etCO_2$) in the middle (only with capnography option).
2	End-tidal CO_2 concentration ($etCO_2$) (only with capnography option)	Indicates the end-tidal CO_2 concentration. If the capnography option is deactivated, the peak pressure is shown here (pPeak).
3	Time	Displays the current time.
4	100% O_2 Air Mix	Indicates whether operation with 100% oxygen or Air Mix mode is activated.
5	Ventilation mode indicator	Indicates the currently selected ventilation mode.
6	Inspiration time (Ti)	Indicates the inspiration time. If an alarm is displayed, this information is omitted.
7	Peak pressure (pPeak)	Indicates the maximum pressure.
8	Plateau pressure (pPlat)	Indicates the pressure during the plateau time.
9	Mean pressure (pMean)	Indicates the mean pressure over all measurements.
10	Blue arrow	Provides access to the application menu (turn or press the right-hand navigation knob).
11	Pressure curve (only with flow measurement + ASB option and curve display option or capnography option)	Indicates the pressure progress.
12	Flow curve (only with flow measurement + ASB option)	Indicates the flow progress.
13	Leak (Vleak) (only with flow measurement + ASB option)	Indicates leaks.
14	Positive end-expiratory pressure (PEEP)	• Indicates the positive end-expiratory pressure. • Enables the positive end-expiratory pressure to be set.
15	Frequency (Freq.)	• Indicates the ventilation rate. • Enables the ventilation rate to be set.
16	Tidal volume (Vt)	• Indicates the tidal volume. • Enables the tidal volume to be set.
17	Expiratory minute volume (MV_e) (only with flow measurement + ASB option)	Indicates the expiratory minute volume and the associated alarm limits.

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No.	Designation	Description
18	Respiratory rate (f(fsp)) (only with flow measurement + ASB option)	• Indicates the total respiratory rate. • Indicates the number of spontaneous breaths per minute. • Indicates the associated upper alarm limit.
19	Manual/automatic chest compression	• Displays whether manual or automatic chest compression is set. • Allows optimized display for manual or automatic chest decompression in CCSV mode.
20	Hands-off time (only with CCSV option)	Displays the time since the last chest compression.
21	Frequency tachometer (only with CCSV option)	Displays the current chest compression frequency.
22	Expiratory tidal volume (Vte) (with flow measurement + ASB option only)	Indicates the expiratory tidal volume.
23	$etCO_2$ trend (only with capnography option)	Displays the $etCO_2$ trend as a curve (see 4.7.8, p. 77).
24	Alarm	Indicates whether the audio alarm output is active or has been muted.
25	End-tidal CO_2 concentration ($etCO_2$) (only with capnography option)	Indicates the end-tidal CO_2 concentration and the associated alarm limits.
26	CO_2 curve (only with capnography option)	Indicates the CO_2 progress.
27	Minute volume (MV)	Indicates the precalculated minute volume. If an alarm is displayed, this information is omitted.
28	Battery status	Displays the charge level of the battery.
29	93% O_2	Indicates whether the concentrator oxygen mode is activated.

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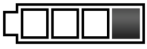
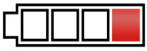
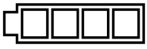
3.4 Symbols on the display

Symbol	Designation	Description
	Alarm symbol	Audio alarm output active
		Audio alarm output muted for 120 s (with the exception of an alarm at a supply pressure < 2.7 bar)
		Acoustic alarm output permanently muted (NVG mode only)
	Battery status symbol	Battery status > 90%
		Battery status approx. 60%-90%
		Battery status approx. 40%-60%
		Battery status approx. 10%-40%
		Battery status < 10% • The last remaining segment in the battery status symbol is red. • The message **Battery weak** appears in the display.
		Battery almost empty The message **Battery almost empty** appears in the display. The device can still be used for approx. 15 minutes. A timer in the alarm field counts down the time until the device switches off.
		• Battery is defective. **or** • No battery. **or** • Battery not at suitable temperature.
		Green arrow: Battery is charging.

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Symbol	Designation	Description
	Function check symbol	Device ready for use
		Device not ready for use
		Fault found during function check
		Observe the instructions for use
		Repair necessary
	Ventilation mode symbols	Metronome sound in CPR mode is switched on
		Metronome sound in CPR mode is switched off
CPR		Period during which the device is in the CPR mode
RSI		Period during which the device is in the RSI mode
		Time since last mechanical breath
		Setting for intubated patients (continuous chest compression)
	Emergency mode symbols	Emergency mode Infant (up to approx. 1 year)
		Emergency mode Child (approx. 1 year to 12 years)
		Emergency mode Adult (as of approx. 13 years)
	Supply gas symbol	Operation with concentrator oxygen
	Bluetooth® symbol	Bluetooth® connection: • When connection is activated, symbol is: Blue • When option is activated and no connection is active, symbol is: Black

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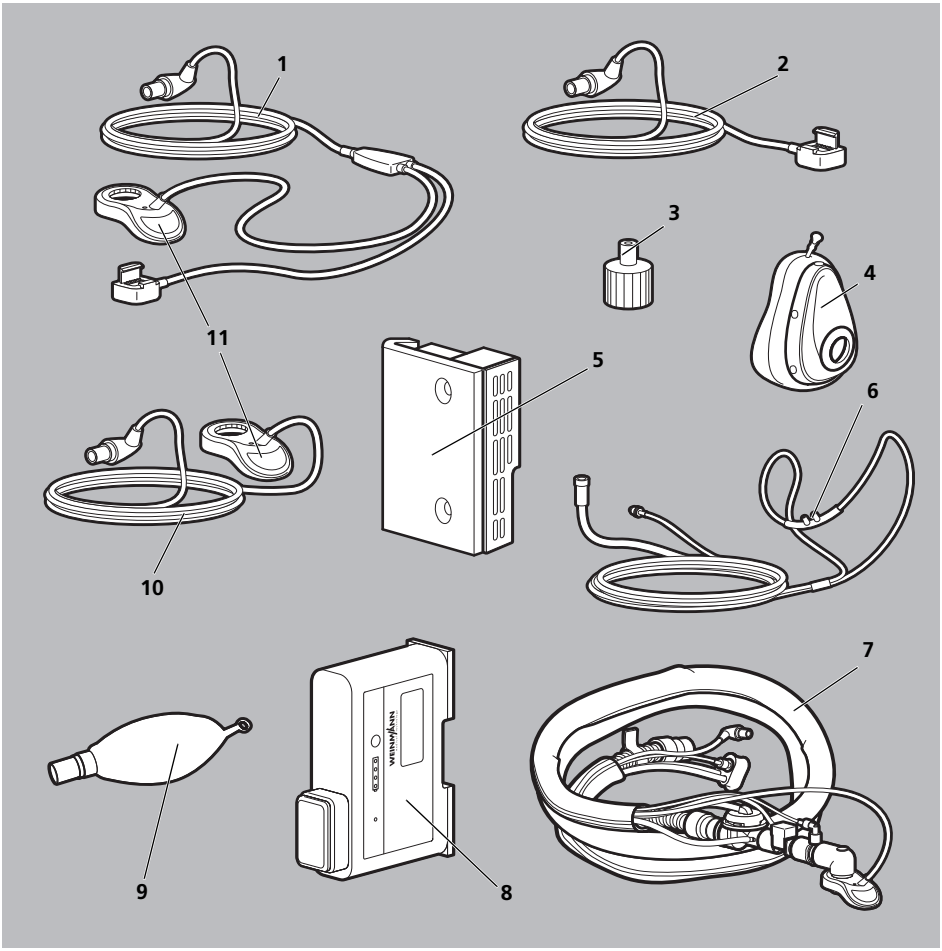
Symbol	Designation	Description
	Manual chest compression	Operation with manual chest compression
	Automatic chest compression	Operation with chest compression device

3.5 Components

3.5.1 Overview



3-5 Components

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No.	Designation	Description
1	FlowCheck sensor connection line with MEDUtrigger	Connects the MEDUtrigger and the FlowCheck sensor to the device.
2	FlowCheck sensor connection line	Connects the FlowCheck sensor to the device.
3	Inhalation adapter	Facilitates inhalation.
4	Ventilation mask	Connects the patient hose system to the patient.
5	Hygiene filter	Protects the device from viral and bacterial contamination.
6	etCO_2/O_2 nasal cannula	Allows oxygen inhalation via an external flow source with simultaneous CO_2 measurement via the device (see 4.4.8, p. 63)
7	Patient hose system	Administers the gas for inspiration to the patient via a mask or tube. There are three types of patient hose systems: • Reusable hose system (see 3.5.2, p. 30) • Disposable hose system (see 3.5.2, p. 30) • Disposable hose system with reduced dead space (see 3.5.4, p. 33)
8	Battery	Facilitates mobile power supply and can be replaced if necessary.
9	Testing bag	Simulates a ventilated patient during a function check.
10	Connection line of the MEDUtrigger	Connects the MEDUtrigger to the device.
11	MEDUtrigger	Is used to manually trigger mechanical breaths.

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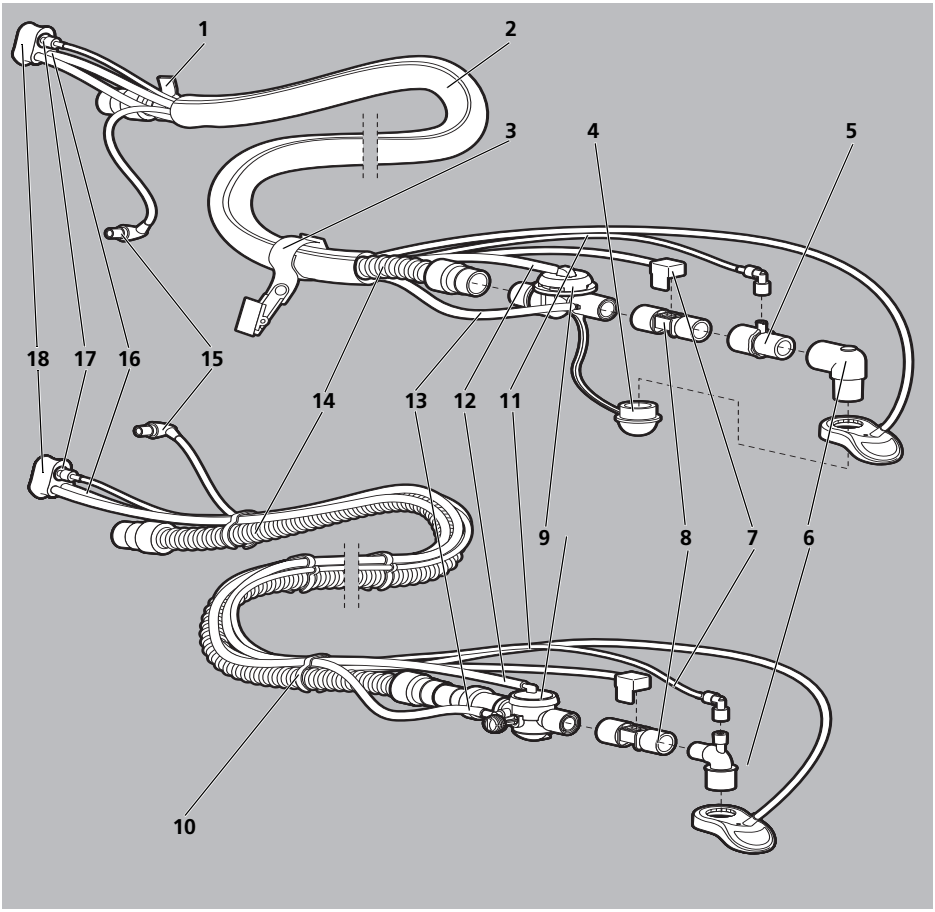
3.5.2 Reusable hose system and disposable hose system



3-6 Reusable hose system (top) and disposable hose system (bottom)

No.	Designation	Description
1	Service label (only with reusable hose system)	Indicates the date when the next maintenance is due.
2	Hose protection sleeve (only with reusable hose system)	Protects the ventilation hose against soiling and damage.

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No.	Designation	Description
3	Velcro strap with clip	• Fixes the patient hose system to the patient's clothing. • Fixes the MEDUtrigger to the patient hose system when not in use (e.g., during CPAP applications).
4	Protective cap (only with reusable hose system)	Protects the end of the patient hose system closest to the patient from damage.
5	Connector with Luer lock connector (only with reusable hose system, only with capnography option)	Enables connection of the CO_2 measuring hose to the patient hose system.
6	Elbow/ elbow with Luer lock connector (only with disposable hose system, only with capnography option)	• Connects the rest of the patient hose system to the mask or tube. • Enables connection of the CO_2 measuring hose (only with disposable hose system, only with capnography option).
7	FlowCheck sensor connector (only with flow measurement + ASB option)	Connects one of the following connection lines to the FlowCheck sensor: • FlowCheck sensor connection line • FlowCheck sensor connection line with MEDUtrigger
8	FlowCheck sensor (only with flow measurement + ASB option)	Measures the flow to the patient and to the device.
9	Patient valve	Switches between inspiration and expiration.
10	Hose clip (only with disposable hose system)	Keeps the hoses and the connection line together.
11	CO_2 measuring hose (only with capnography option)	Measures the CO_2 content in the respiratory gas of the patient.
12	PEEP control hose	The device controls the patient valve and the PEEP via the PEEP control hose.
13	Pressure-measurement hose	Measures the ventilation pressure at the patient.
14	Ventilation hose	The respiratory gas flows from the device to the patient valve through the ventilation hose.
15	FlowCheck sensor connection line with MEDUtrigger (only with flow measurement + ASB option)	Connects the MEDUtrigger and the FlowCheck sensor to the device. Alternatively, you can also connect the FlowCheck sensor connection line or the connection line of the MEDUtrigger here.

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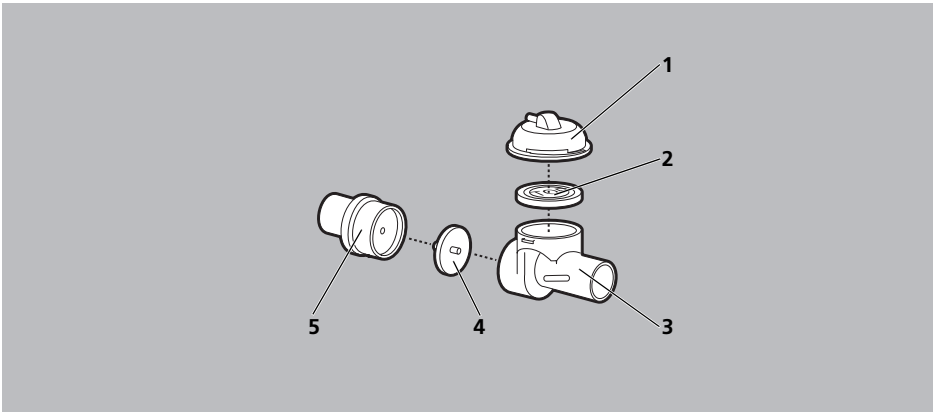
No.	Designation	Description
16	Measuring hose system	The device measures the patient's vital parameters via the measuring hose system. The measuring hose system comprises: • Measuring hose system connector • PEEP control hose • Pressure-measurement hose • CO_2 measuring hose (only with capnography option)
17	Water filter (only with capnography option)	The water filter protects the measuring chamber of the device against moisture and contamination from the patient's respiratory gas.
18	Measuring hose system connector	Connects the measuring hose system to the connection for the measuring hose system on the device.

3.5.3 Patient valve (reusable hose system)



3-7 Patient valve (reusable hose system)

No.	Designation	Description
1	Control cover	Together with the PEEP control diaphragm, this creates a pressure chamber for PEEP control.
2	PEEP control diaphragm	Together with the control cover, this creates a pressure chamber for PEEP control.
3	Main body	Provides a connection for a mask, tube or the elbow.

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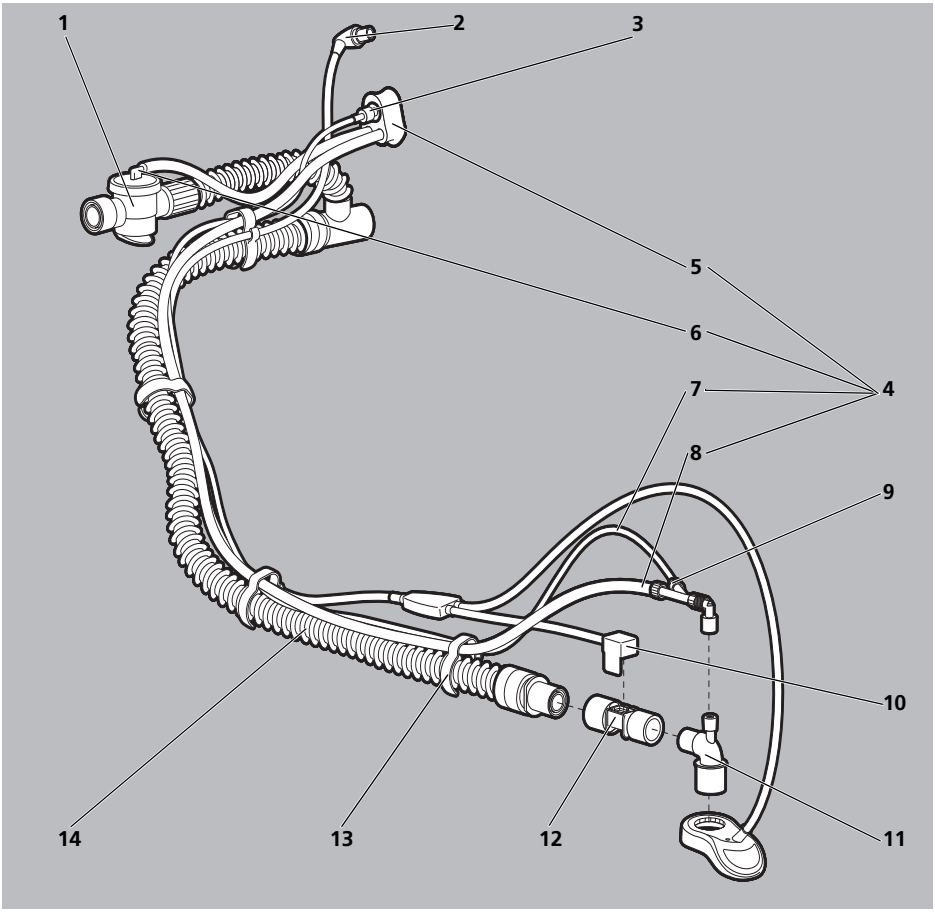
No.	Designation	Description
4	Check valve diaphragm	Due to the check valve diaphragm, the respiratory gas only flows towards the patient. No rebreathing takes place.
5	Holder for check valve diaphragm	Connects the patient valve to the ventilation hose and contains the check valve diaphragm.

3.5.4 Disposable hose system with reduced dead space



3-8 Disposable hose system with reduced dead space

No.	Designation	Description
1	Patient valve	Switches between inspiration and expiration.
2	FlowCheck sensor connection line with MEDUtrigger (only with flow measurement + ASB option)	Connects the MEDUtrigger and the FlowCheck sensor to the device. Alternatively, you can also connect the FlowCheck sensor connection line or the connection line of the MEDUtrigger here.
3	Water filter (only with capnography option)	The water filter protects the measuring chamber of the device against moisture and contamination from the patient's respiratory gas.
4	Measuring hose system	The device measures the patient's vital parameters via the measuring hose system. The measuring hose system comprises: • Measuring hose system connector • PEEP control hose • Pressure-measurement hose • CO_2 measuring hose (only with capnography option)
5	Measuring hose system connector	Connects the measuring hose system to the connection for the measuring hose system on the device.
6	PEEP control hose	The device controls the patient valve and the PEEP via the PEEP control hose.
7	CO_2 measuring hose (only with capnography option)	Measures the CO_2 content in the respiratory gas of the patient.
8	Pressure-measurement hose	Measures the ventilation pressure at the patient.
9	Y-piece (only with capnography option)	Connects the pressure-measurement hose and the CO_2 measuring hose with the elbow of the patient hose system.
10	FlowCheck sensor connector (only with flow measurement + ASB option)	Connects one of the following connection lines to the FlowCheck sensor: • FlowCheck sensor connection line • FlowCheck sensor connection line with MEDUtrigger
11	Elbow with Luer lock connector (only with capnography option)/elbow	• Connects the rest of the patient hose system to the mask or tube. • Enables the connection of the pressure-measurement hose and the CO_2 measuring hose (only with capnography option).
12	FlowCheck sensor (only with flow measurement + ASB option)	Measures the flow to the patient and to the device.
13	Hose clip	Keeps the hoses and the connection line together.

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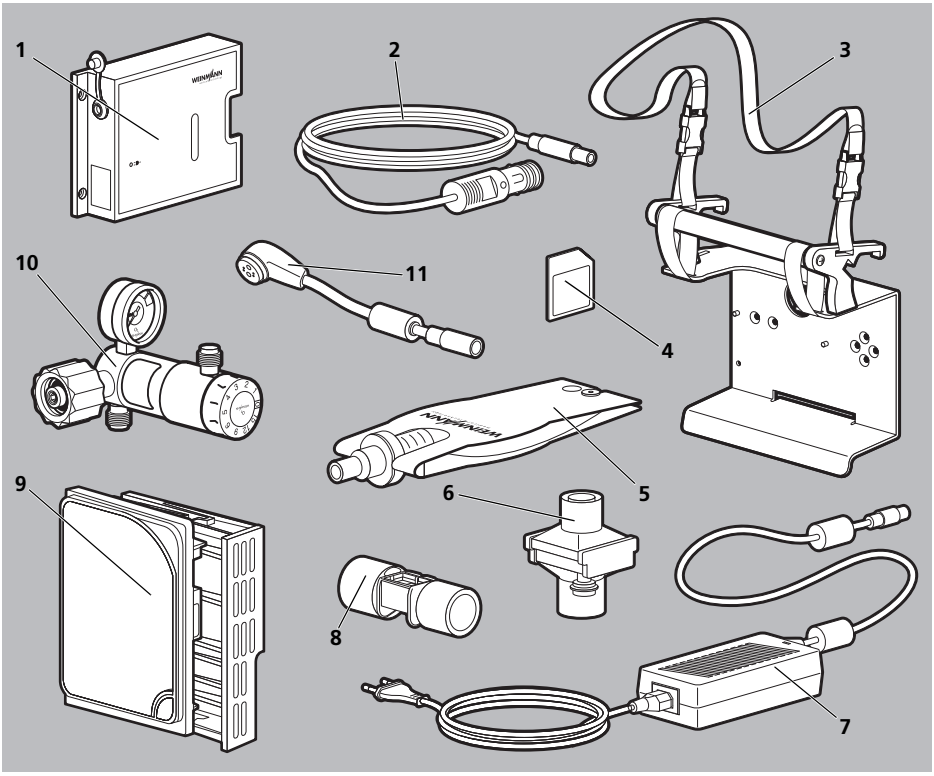
No.	Designation	Description
14	Ventilation hose	The respiratory gas flows from the device to the patient valve through the ventilation hose.

3.6 Accessories



3-9 Accessories

No.	Designation	Description
1	Charging station	Facilitates external battery charging.
2	12 V cable	Supplies power to the device from the vehicle's electrical system.
3	Portable system (example)	Serves to transport the device (see "4.10 Transporting the device", page 90).

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No.	Designation	Description
4	SD card	Used for reading session data and log files and updating the device software.
5	EasyLung for WEINMANN Emergency	Simulates a ventilated patient for presentation purposes and during a function check.
6	Breathing system filter	Serves to ensure that the respiratory air is filtered and conditioned.
7	Power supply	Supplies power to the device.
8	FlowCheck sensor	Measures the flow to the patient and to the device.
9	Device input filter	Filters the ambient air which has been sucked in.
10	Pressure reducer	Reduces the pressure of the oxygen from the oxygen cylinder to the operating pressure of the device.
11	Charging adapter	Connects the power supply or the 12 V cable to the device.

3.7 Options

You can tailor the range of functions on the device to your needs with the options (see "6.3.9 Options", page 134). Almost all the options require an access code. This can be used to enable the option (see "4.14 Enabling options", page 97).

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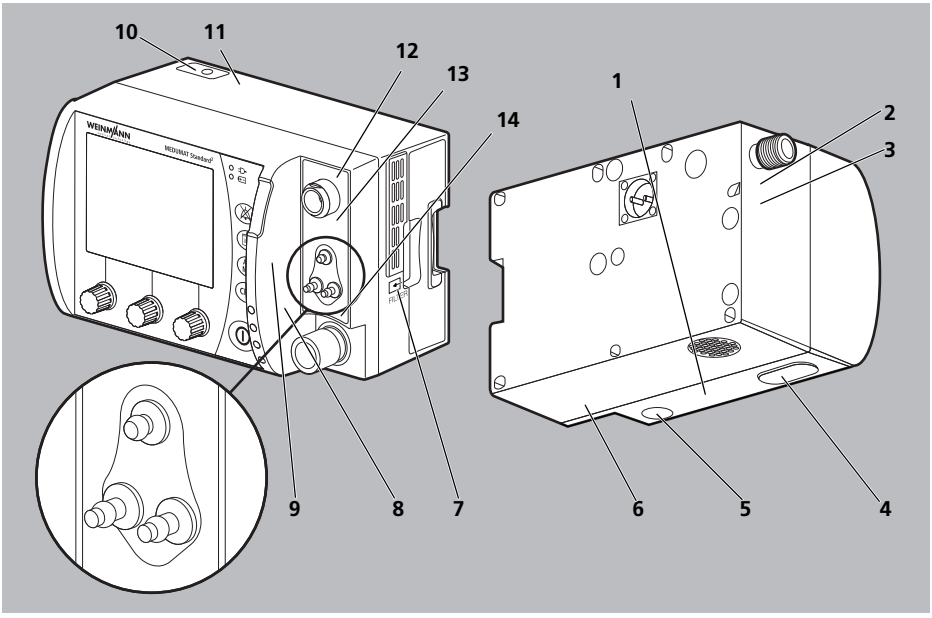
3.8 Labels and symbols

3.8.1 Labels on the product



3-10 Labels on the product

No.	Symbol	Description
Device information label		
1	SN	Serial number
		Type BF applied part
		Input (12 V to 15 V)
		DC voltage

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No.	Symbol	Description
Device information label (continued)		
1		Type of protection against electric shock: Protection class II device
		Do not dispose of device in household waste
		Manufacturer
	IP54	Degree of protection against: • Ingress of solid objects • Ingress of dust • Ingress of water with harmful effect
		Observe the instructions for use.
	CE 0197	CE mark (confirms that the product complies with the applicable European directives)
Other labels and symbols		
2		Input 2.7 bar-6 bar O_2
3		Volume flow rate
4 /10		Observe the instructions for use.
5		Follow the instructions for use.
6		Maximum pressure ≤ 100 mbar
7		Input (opening for fresh gas and emergency air)
8		STK sticker (only in the Federal Republic of Germany): Indicates when the next safety check in accordance with §11 of the MPBetreibV (German regulations governing owners/operators of medical devices) is required.
9		Service label: Indicates when the next maintenance is required.

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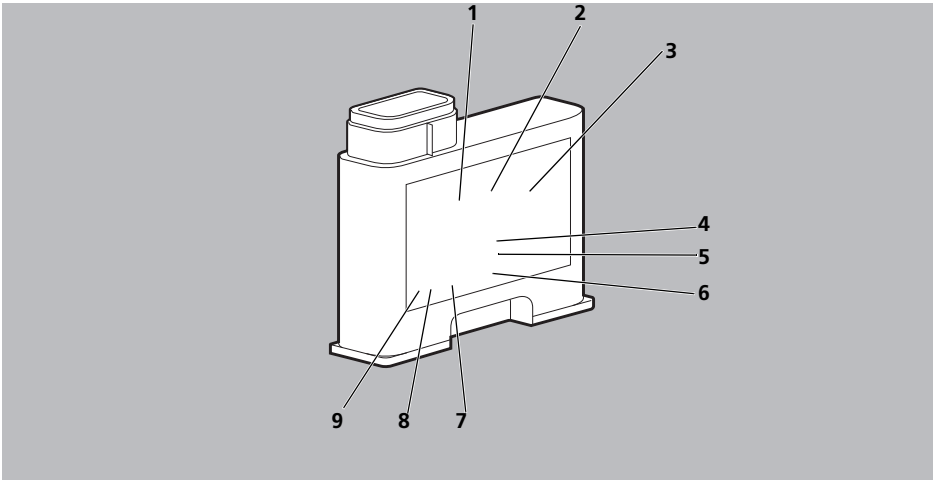
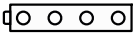
No.	Symbol	Description
11		Input voltage (12 V-15 V)
12		Input
13 / 14		Type BF applied part

3.8.2 Symbols on the battery



3-11 Symbols on the battery

No.	Symbol	Description
1		Battery fault, if fault indicator light is red
2		Battery status
3 / 9		Observe the instructions for use.
4		Date of manufacture
5	**SN**	Serial number

No.	Symbol	Description
6		Manufacturer
7		Do not dispose of battery in household waste.
8		China RoHS label (confirms that the product does not emit toxic substances for the number of years indicated)

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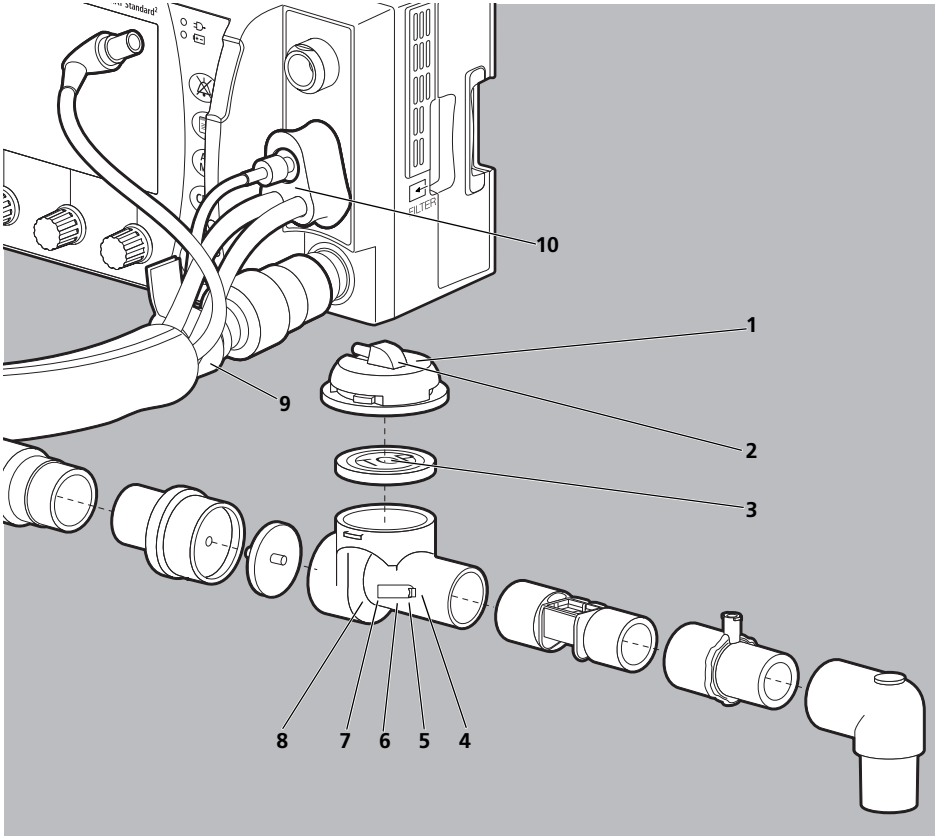
3.8.3 Symbols on the patient hose system



3-12 Symbols on the patient hose system

No.	Symbol	Description
Reusable hose system and disposable hose system		
1	INSP	Indicates the correct flow direction during inspiration.
3	TOP	Indicates the correct installation direction of the PEEP control diaphragm.
4	CE 0197	CE mark (confirms that the product complies with the applicable European directives)

No.	Symbol	Description
5		Calendar clock for year and month
6		Observe the instructions for use.
7	**>PC<**	Material designation: Polycarbonate
8	**134°C**	Steam sterilization at 134°C
Additional symbols, for reusable hose system only		
9		Indicates the date when the next maintenance is due (position: on the service label).
Additional symbols, for disposable hose system only		
2		Disposable item, do not reuse
Additional symbols, for disposable hose system with reduced dead space only		
10		Disposable item, do not reuse

3.8.4 Symbols on the device information label of MEDUtrigger

Symbol	Description
Device information label	
	Degree of protection against electric shock: Type BF device
	Do not dispose of device in household waste
CE 0197	CE mark (confirms that the product complies with the applicable European directives)
IP54	Degree of protection against: • Ingress of solid objects • Ingress of dust • Ingress of water with harmful effect
	Type of protection against electric shock: Protection class II device
	Date of manufacture

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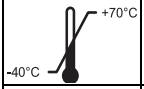
3.8.5 Symbols on the hygiene filter/device input filter

Symbol	Description
	Disposable item, do not reuse
Additionally hygiene filter only	
	Manufacturer

3.8.6 Labels on the packaging

Symbol	Description
Device	
	Protect the device against moisture.
	Permissible storage temperature: -40°C to +70°C
	Permissible humidity for storage: max. 95% relative humidity
	Fragile
SN	Serial number
CE 0197	CE mark (confirms that the product complies with the applicable European directives)
Battery	
	Article number
	Permissible storage temperature: -30°C to +70°C
	Keep dry

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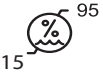
Symbol	Description
	Permissible humidity for storage: Max. 95% relative humidity
	Serial number
	Manufacturer

Patient hose system (reusable hose system and disposable hose system)	
	Latex-free
	Permissible storage temperature: -30°C to +70°C
	Permissible humidity for storage: 15% to 95% relative humidity
	CE mark (confirms that the product complies with the applicable European directives)
	Manufacturer
Additional symbols, for disposable hose system only	
	Disposable item, do not reuse
	Expiration date
Hygiene filter/device input filter	
	Article number
	Observe the instructions for use
	Permissible humidity for storage: max. 95% relative humidity

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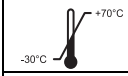
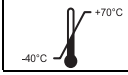
	Disposable item, do not reuse
	Manufacturer
Additionally hygiene filter only	
	Permissible storage temperature: -30°C to +70°C
	Expiration date

Additional symbols, for device input filter only	
	Permissible storage temperature: -40°C to +70°C

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4 Preparation and operation

4.1 Mounting the device

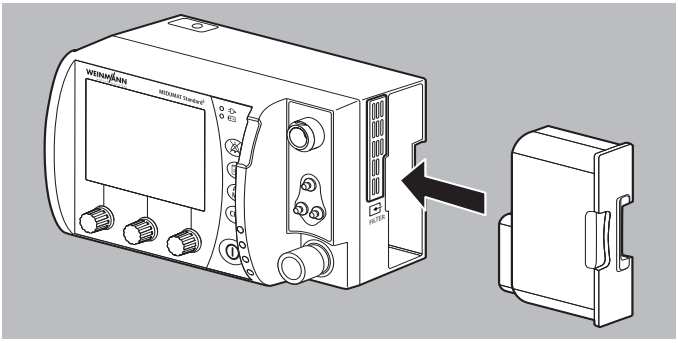
The device is mounted on a portable system as standard and is ready for use. Observe the instructions for use of the portable systems.

4.2 Connecting to a power supply

NOTICE

Loss of power due to combination of the device with an incorrect power supply!
If you use a portable system which combines the MEDUMAT Standard^2 and MEDUCORE Standard devices, a loss of power may occur in the devices in the event that these are used with a 50 W power supply.
⇒ Use only the more powerful 100 W power supply when combining the devices MEDUMAT Standard^2 and MEDUCORE Standard.

1. Check battery status (see "4.3 Using the rechargeable battery", page 47).
2. If necessary: Charge battery (see "4.3.2 Charging the battery in the device", page 47).



3. Slide full battery into the battery compartment until it clicks into place.

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4. If necessary:
   If operating on the portable system, mount the portable system on a wall mounting with charging interface.

   or

   Connect the device up to the line power with the charging adapter (WM 28979) and the 50 W or 100 W power supply

   or

   Connect the device up to the vehicle's electrical system with the charging adapter (WM 28979) and 12 V cable.

Result The device is ready for use.

4.3 Using the rechargeable battery

4.3.1 General instructions

- Always operate the device with the rechargeable battery WM 45045.
- Note the methods of storing the battery and the charging intervals for prolonged storage (see "12.3 Storing the battery", page 212).
- The expected life of the battery is 2 years. Recommendation: Replace the battery after 2 years. If battery life has substantially dropped before then, replace the battery earlier.
- If you receive a replacement battery, you need to fully charge it before the first use.

4.3.2 Charging the battery in the device

Requirement

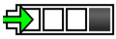
- The portable system is mounted on a wall mounting with charging interface.

  or

- The device is connected to the line power via the power supply.

1. Insert battery into the battery compartment.
   Charging starts automatically if the following conditions are met:

- external supply of at least 10 V is connected
- battery is not yet fully charged (< 95% charge level)
- battery temperature between 0°C and 45°C

If the device is switched on, the green arrow appears in the battery status symbol on the display (example: ) and the battery status indicator on the device flashes green.
If the device is switched off, only the battery status indicator flashes green.

If the battery is deeply discharged and you charge it in the device, the alarm light will light up red for a short period of time. It goes out again when the battery status progresses.

If the battery temperature is not within the designated charging temperature range (see "14.1.2 Technical data for battery", page 218), the green arrow on the battery status symbol disappears and the charging process is interrupted. The charging procedure is continued once the battery temperature is within the designated charging temperature range again.

When the battery status indicator lights up green and/or the symbol  appears on the display:
The device can be disconnected from the charging interface or from the power supply.

Result The battery is fully charged.

4.3.3 Charging the battery with the charging station

You can also charge the battery with the charging station WM 45190. Observe the instructions for use of the charging station.

4.3.4 Battery status indicator

Battery

You can see the battery status on the battery itself.
The battery status is indicated by 4 green status LEDs. Simply press the status button on the battery.

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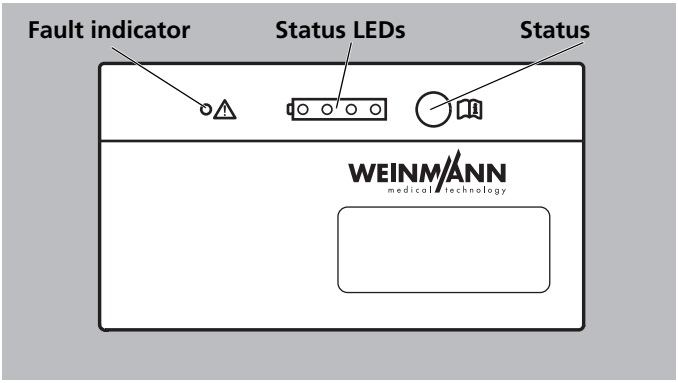
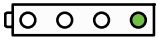
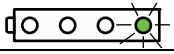
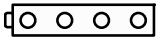
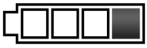
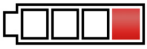
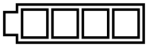


4-1 Status indicator on the battery

Status indicator	Explanation	Meaning
	4 LEDs are lit	Battery status > 90%
	3 LEDs are lit	Battery status approx. 60%-90%
	2 LEDs are lit	Battery status approx. 40%-60%
	1 LED is lit	Battery status approx. 10%-40%
	1 LED is flashing	Battery status < 10%
	No LEDs are lit	Battery is deeply discharged. Charge battery in the device for 24 hours. After 24 hours: • Green LED is lit: Battery fully charged and ready for use. • Red LED or no LED is lit: Battery defective. Replace battery.
	Red fault indicator is lit	Battery defective. Replace battery.

Device

If the device is switched on, you can see the battery status on the display:

Status indicator	Meaning
	Battery status > 90%
	Battery status approx. 60%-90%
	Battery status approx. 40%-60%
	Battery status approx. 10%-40%
	Battery status < 10% • The last remaining segment in the battery status symbol is red. • The message **Battery weak** appears in the display.
	Battery almost empty The message **Battery almost empty** appears in the display. The device can still be used for approx. 15 minutes. A timer in the alarm field counts down the time until the device switches off.
	• Battery is defective. **or** • No battery. **or** • Battery not at suitable temperature.
	Green arrow: Battery is charging.

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4.3.5 Changing the battery

Requirement The replacement battery is fully charged.

1. Switch off the device (see "4.6 Switching the device off", page 66).

   or

   Connect the device to the line power.

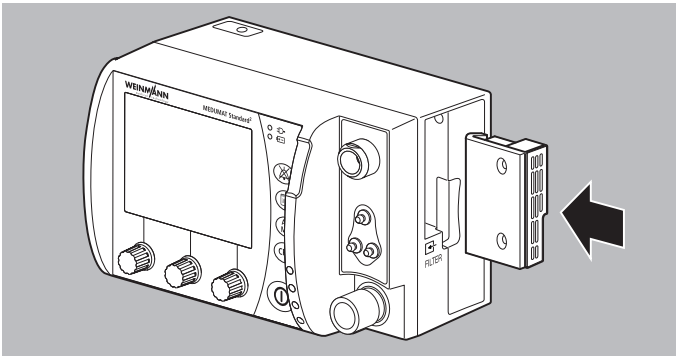
2. Take battery out of the battery compartment.
3. Slide the replacement battery into the battery compartment until it audibly clicks into place.
4. Switch on the device (see "4.5 Switching the device on", page 65). The symbol appears on the display.

Result The device is operated with a fully charged battery.

4.4 Connecting components

4.4.1 Inserting the hygiene filter

1. Check the hygiene filter for external damage. If necessary: Replace the hygiene filter.



2. With the filter side facing forwards, slide the hygiene filter into the device's filter compartment until the hygiene filter is flush with the device.

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3. Perform a function check (see "9.3 Performing a function check", page 184).

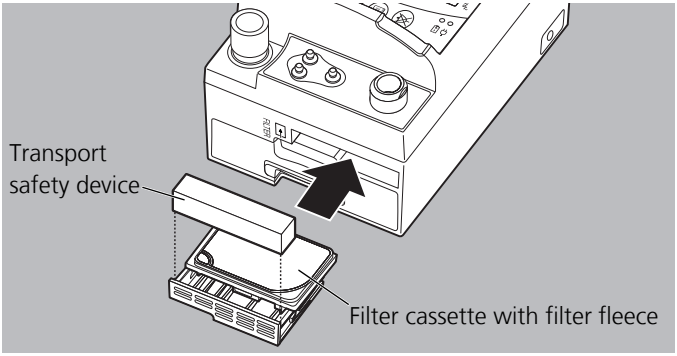
Result The hygiene filter has been inserted.

4.4.2 Inserting the device input filter

1. Check the device input filter for external damage.
   If necessary: Replace the device input filter.

NOTICE

Device may be damaged if a device input filter which has already been pushed together is inserted in the filter compartment!
On delivery, the filter cassette is inserted halfway into the device input filter and is fixed in its position by a transport safety device. If the filter cassette is pushed all the way into the device input filter before insertion into the filter compartment of the device, the function of the device input filter can no longer be guaranteed.
⇒ Do not alter the state of device input filters on delivery.
⇒ Do not push the filter cassette into the device input filter completely by hand.



2. Remove the transport safety device from the device input filter.
3. Push the device input filter with the half-inserted filter cassette into the filter compartment of the device.
   In the process, the filter cassette is pushed all the way into the device input filter.
4. Press the device input filter into the filter compartment until the device input filter audibly clicks into place and sits flush with the device.

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5. Perform a function check (see "9.3 Performing a function check", page 184).

Result The device input filter has been inserted.

4.4.3 Connecting the patient hose system

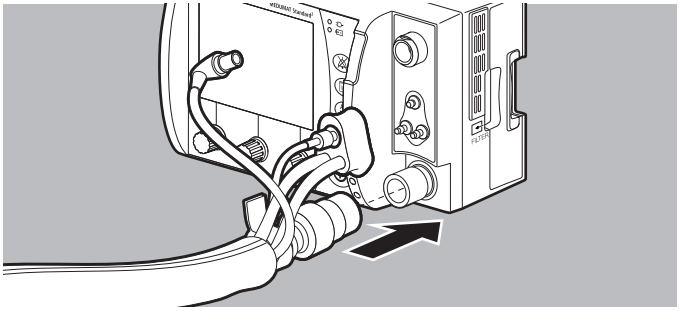
⚠ CAUTION

Risk of injury posed by ventilation with inhalation mask, tube, or nasal cannula!

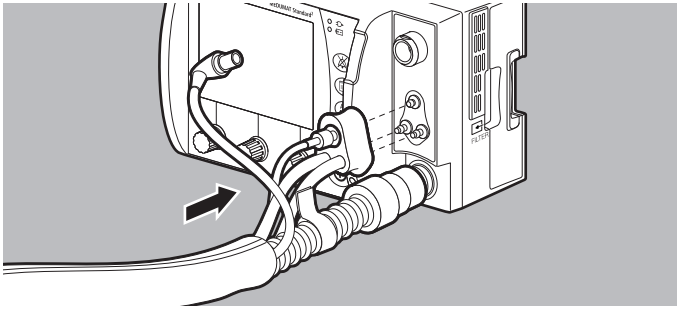
Ventilation with an inhalation mask, tube, or nasal cannula connected may cause an injury to the patient.

⇒ Do not use an inhalation mask, tube, or nasal cannula for ventilation.

Recommendation: Always use a breathing system filter for ventilation.

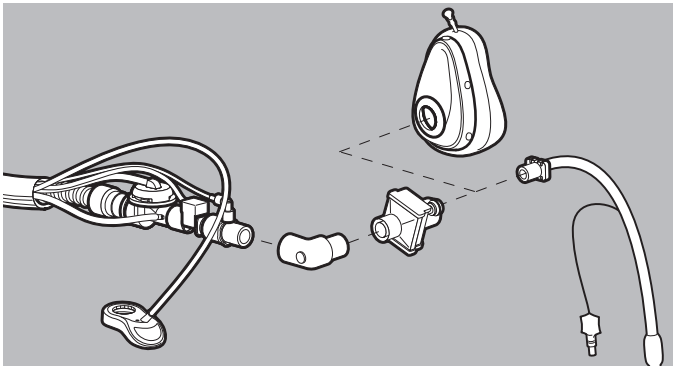


1. Connect the ventilation hose to the ventilation hose connection.



2. Connect the measuring hose system connector to the connection for the measuring hose system.

3. If necessary: Connect the FlowCheck sensor (see "4.4.4 Connecting the FlowCheck sensor", page 55).
4. If necessary: Connect MEDUtrigger (see "4.4.6 Connecting MEDUtrigger", page 59).
5. If necessary: Connect the CO_2 measuring hose (see "4.4.5 Connecting the CO_2 measuring hose", page 57).



6. In the case of tube ventilation: Following intubation, attach the patient valve of the patient hose system to the tube:
   - with/without elbow
   - with/without breathing system filter

   or

   In the case of mask ventilation: Attach the ventilation mask to the patient valve of the patient hose system:
   - with/without elbow
   - with/without breathing system filter

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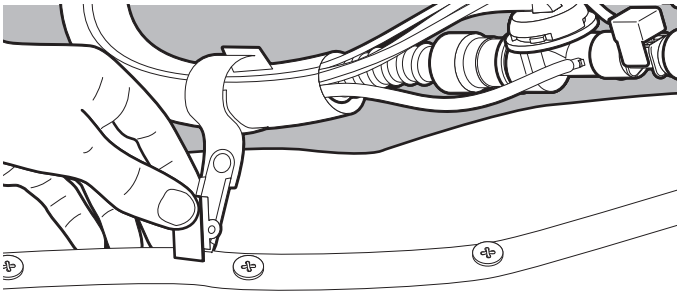
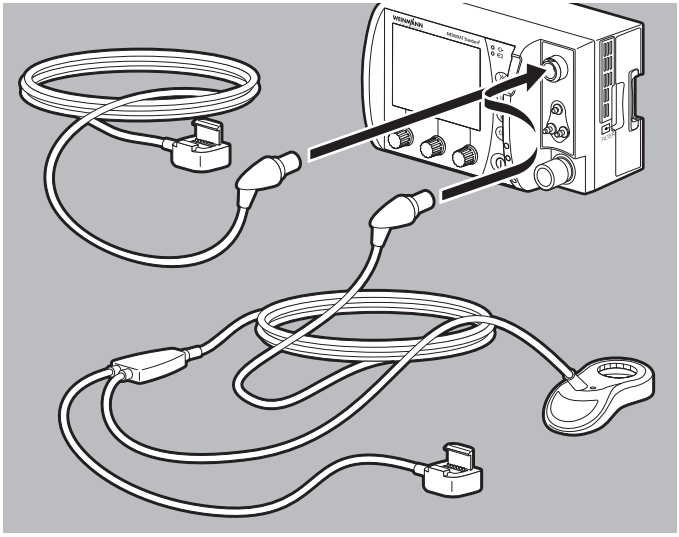


7. If necessary: Attach the patient hose system with Velcro strap with clip to the patient's clothing.

Result The patient hose system is connected and ready for use.

4.4.4 Connecting the FlowCheck sensor

The FlowCheck sensor enables flow measurement (only with flow measurement + ASB option).



1. Connect the connector of one of the following connection lines to the accessory connection on the device:
   - FlowCheck sensor connection line
   - FlowCheck sensor connection line with MEDUtrigger

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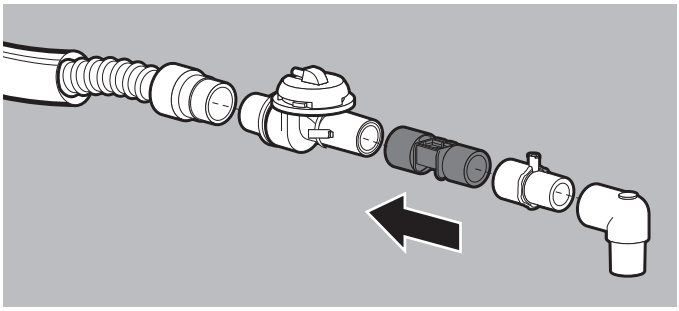


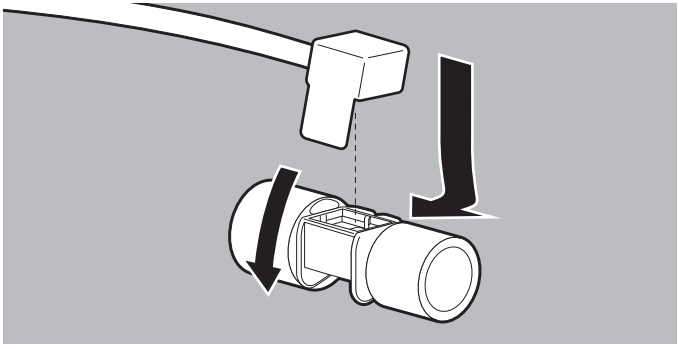
2. Connect the FlowCheck sensor to the patient valve.

⚠ CAUTION

Risk of injury from touching the contacts on the FlowCheck sensor connection line/FlowCheck sensor connection line with MEDUtrigger and the patient at the same time!

The contacts on the FlowCheck sensor connection line/FlowCheck sensor connection line with MEDUtrigger are live. Touching the contacts and the patient at the same time can injure the user or the patient.

⇒ Do not touch the contacts on the FlowCheck sensor connection line/FlowCheck sensor connection line with MEDUtrigger and the patient at the same time.



3. Hook the FlowCheck sensor connector onto the FlowCheck sensor and push down until it audibly clicks into place.

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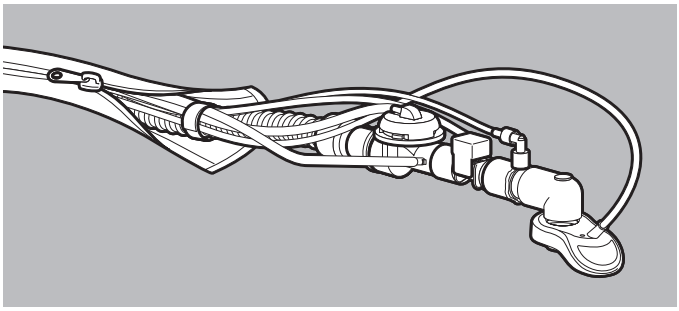

4. With the reusable hose system: Guide the connection line with measuring hose system and ventilation hose into the hose protection sleeve of the patient hose system.
5. If necessary: Activate flow measurement + ASB option (see "6.3.9 Options", page 134).
6. If necessary: On connecting one of the two connection lines to the device, perform a function check (see "9.3 Performing a function check", page 184) to update the connection line software.

Result The FlowCheck sensor is connected to the device and is ready for use.

4.4.5 Connecting the CO_2 measuring hose

NOTICE

Material damage due to lack of a water filter!
If CO_2 is measured without a water filter, the device can suck in dirt and become damaged.
⇒ Always use a water filter for CO_2 measurement.

Requirement
- The ventilation hose is connected to the device.
- The measuring hose system connector is connected to the device.

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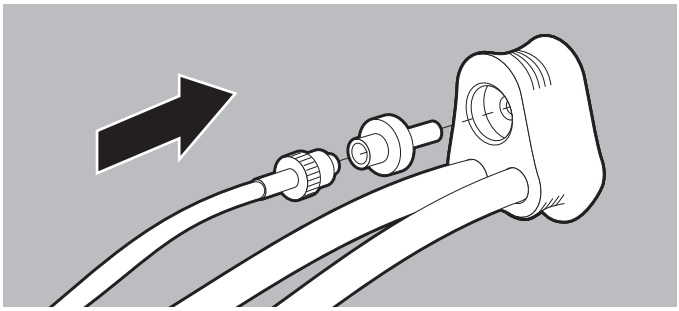
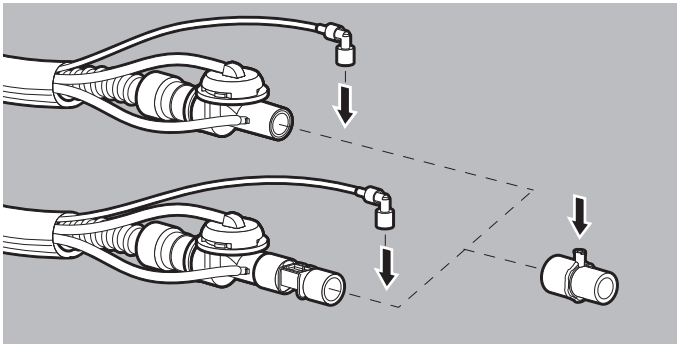


1. Connect the water filter to the CO_2 measuring hose.
2. Connect the CO_2 measuring hose with water filter to the measuring hose system connector.



3. With the reusable hose system: Connect the connector with Luer lock connector:
   - to the patient valve

   or

   - to the FlowCheck sensor
4. With the reusable hose system: Connect the CO_2 measuring hose to the connector with Luer lock connector.

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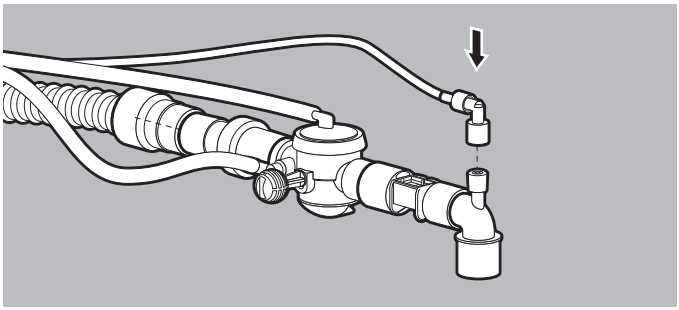


5. With disposable hose systems: Connect the CO_2 measuring hose to the elbow with Luer lock connector.

To minimize the dead space, you can also connect the CO_2 measuring hose to a breathing system filter with Luer lock connector (e.g., WM 22162).

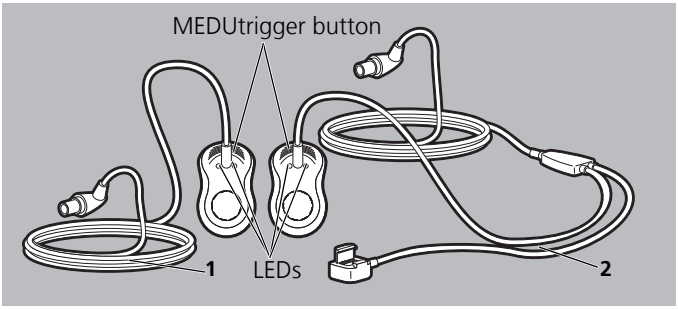
6. With the reusable hose system: Guide the CO_2 measuring hose with the rest of the measuring hose system and ventilation hose into the hose protection sleeve of the patient hose system.

7. If necessary: Activate the capnography option (see "6.3.9 Options", page 134).

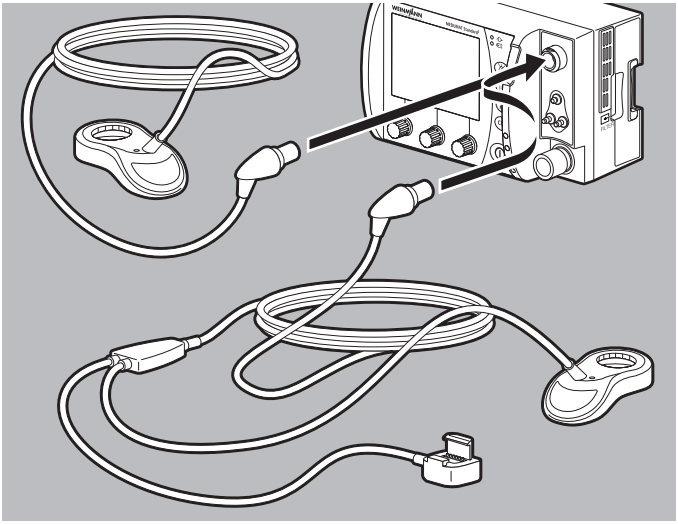
Result The CO_2 measuring hose is connected to the patient hose system.

4.4.6 Connecting MEDUtrigger

The operational readiness of MEDUtrigger is indicated by 2 green LEDs on MEDUtrigger. If MEDUtrigger is connected to the device and the green LEDs on MEDUtrigger are lit, you can trigger mechanical breaths manually by pressing the MEDUtrigger button.



*4-2 Connection line of MEDUtrigger (**1**) and FlowCheck sensor connection line with MEDUtrigger (**2**)*



1. Connect the connector of one of the following connection lines to the accessory connection on the device:
   - Connection line of MEDUtrigger
   - FlowCheck sensor connection line with MEDUtrigger
2. If necessary: Connect the FlowCheck sensor connector of the FlowCheck sensor connection line with MEDUtrigger to the FlowCheck sensor (see "4.4.4 Connecting the FlowCheck sensor", page 55).

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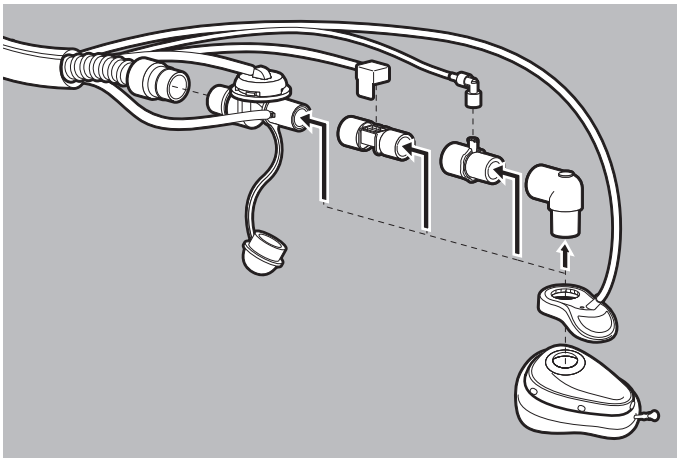


3. Place MEDUtrigger between the mask and the following end of the patient hose system closest to the patient:

   - Patient valve

   or

   - FlowCheck sensor

   or

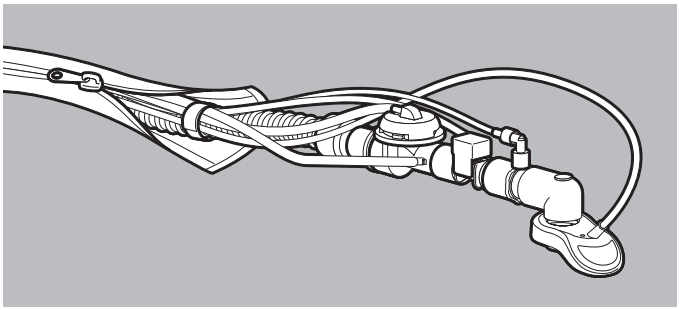
   - Connector with Luer lock connector

   or

   - Elbow

If you use a breathing system filter, always place MEDUtrigger between the mask and the breathing system filter.

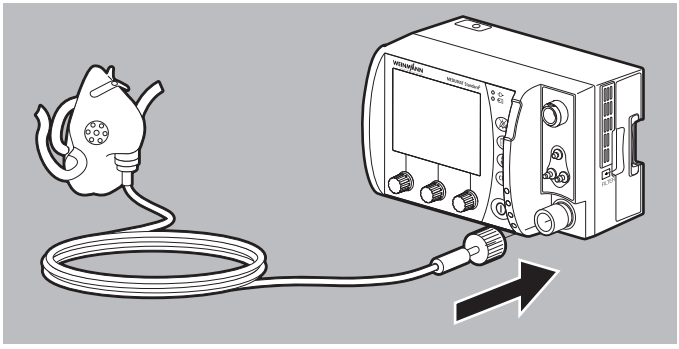
If you are not using MEDUtrigger (e.g., with CPAP applications), release it from the patient hose system and fix to the patient hose system with the Velcro strap with clip.



4. With the reusable hose system: Guide the connection line with measuring hose system and ventilation hose into the hose protection sleeve of the patient hose system.
5. If necessary: Activate MEDUtrigger option (see "6.3.9 Options", page 134).

Result The MEDUtrigger is connected to the device and is ready for use.

4.4.7 Connecting the inhalation adapter



1. Connect the inhalation adapter to the connection for the ventilation hose on the device.
2. Connect the inhalation mask to the inhalation adapter

   or

   Connect the tube to the inhalation adapter

   or

   Connect the nasal cannula to the inhalation adapter.

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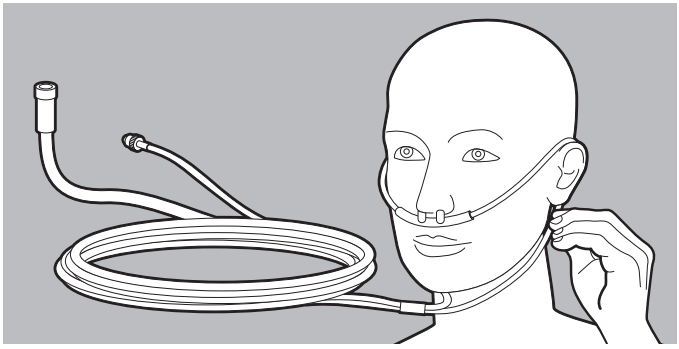
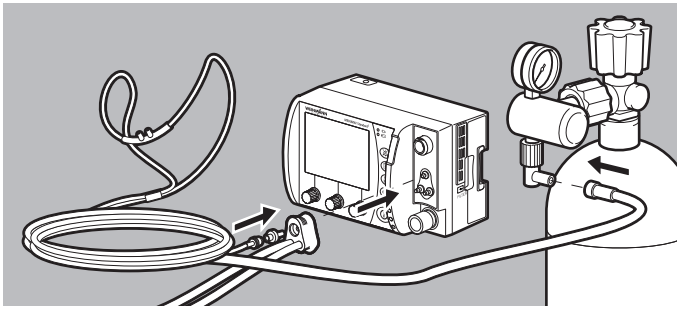
3. Perform inhalation (see "4.7.7 Performing inhalation (only with Inhalation option)", page 76).

Result Inhalation via the inhalation adapter is prepared.

4.4.8 Connecting the $etCO_2/O_2$ nasal cannula



1. Position the $etCO_2/O_2$ nasal cannula.
2. If necessary: Fix the tubes of the $etCO_2/O_2$ nasal cannula to the face using adhesive plasters.



3. Connect the inhalation inlet of the $etCO_2/O_2$ nasal cannula to the inhalation outlet of the pressure reducer.
4. Connect the CO_2 inlet of the $etCO_2/O_2$ nasal cannula with water filter to the measuring hose system connector.

As an alternative to the $etCO_2/O_2$ nasal cannula, you can also connect the CO_2 measuring hose to the measuring hose system connector and couple with the Luer lock connector of a breathing system filter or a resuscitator.

Result CO_2 monitoring is prepared via an external interface.

4.4.9 Connect up the nebulizer

Only use the device in combination with the following nebulizer:

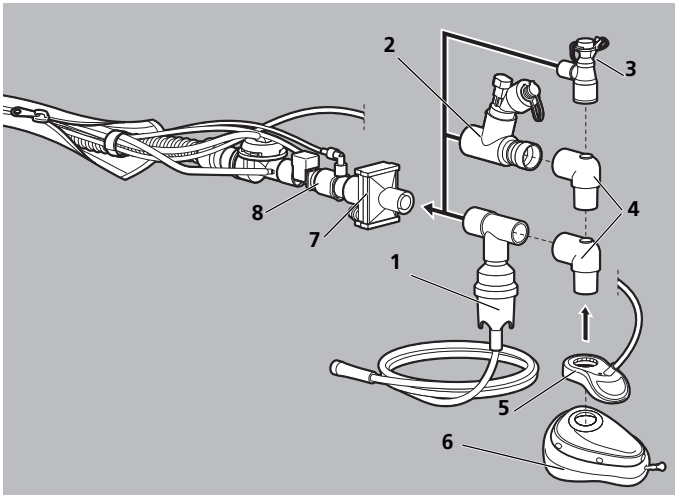
- Pneumatic drug nebulizer WM 15827 **1**
- Aerogen(R) Solo (Inspiration Medical GmbH) **2**
- Tube Inhaler (VBM Medizintechnik GmbH) **3**

⚠ CAUTION

Risk of injury due to erroneous readings!
If the filter is installed incorrectly or no filter is used, the membrane may stick in the patient valve or the FlowCheck sensor could return erroneous readings, which can cause injury to the patient.
⇒ Observe the correct order of the individual components.
⇒ Install the filter (breathing system filter, bacteria filter, or a combined breathing system/bacteria filter) between the FlowCheck sensor and nebulizer.

⚠ CAUTION

Risk of injury from use of pneumatic nebulizers during volume-controlled ventilation!
The use of pneumatic nebulizers increases the minute volume administered to the patient. This can injure the patient.
⇒ Do not use pneumatic nebulizers during volume-controlled ventilation.



1. Place the mask/tube **6** (optionally with elbow **4** and/or MEDUtrigger **5**) on the nebulizer **1**, **2**, or **3**.

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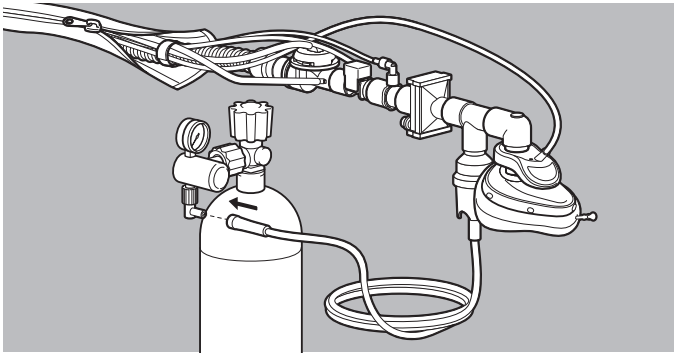
2. Connect the open end of the nebulizer **1**, **2**, or **3** with the filter **7** (breathing system filter, bacteria filter, or a combined breathing system/bacteria filter).
3. Place the filter **7** (breathing system filter, bacteria filter, or a combined breathing system/bacteria filter) on the patient hose system's FlowCheck sensor **8**.



4. When using the pneumatic drug nebulizer WM 15827: Connect the oxygen hose to the inhalation outlet on the pressure reducer.
   When doing so, note: The nebulizer must be in a horizontal position for sufficient nebulization to occur.

Result A nebulizer is connected.

4.5 Switching the device on

Requirement
- The device is disconnected from the patient.
- A fully charged battery is inserted in the device.
- The device is connected to the oxygen supply.

1. Briefly press the On/Off button ⏻.

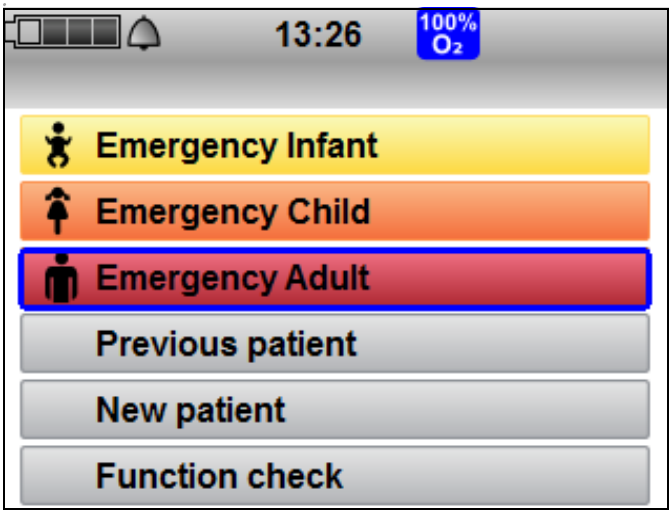
   An automatic self-test starts, which runs through the following sequence:
   - The alarm light flashes twice and two short test tones are emitted
   - The start screen appears

If you switch the device on in NVG mode, the following displays are deactivated:

- Alarm light
- Line power indicator
- Battery status indicator
- Audio alarm output

The start screen with the selected NVG brightness appears (see "6.3.7 Device configuration", page 125).

The self-test is successful when all of the steps have been completed. After the self-test, the device displays the start menu:



2. If one or more steps were not completed: Do not operate the device.
3. Perform a function check (see "9.3 Performing a function check", page 184).

Result The device is ready for use.

4.6 Switching the device off

1. Press and hold the On/Off button ⏻ for at least 2 seconds.
2. Shut off the oxygen supply.

Result The device is completely switched off.

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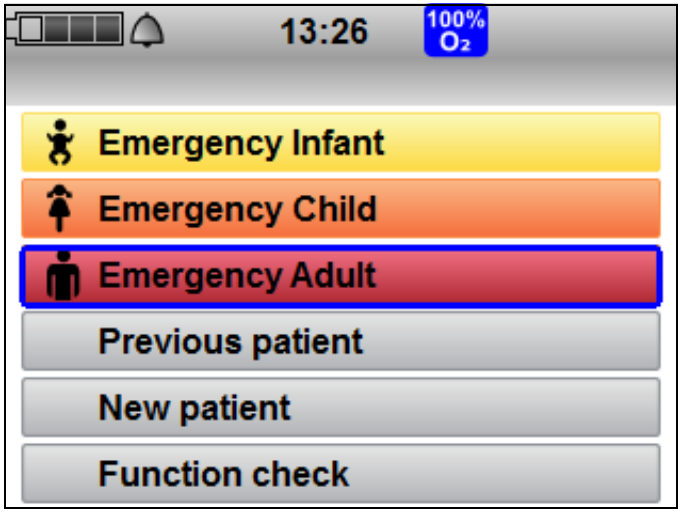
4.7 Ventilating the patient

4.7.1 Selecting the emergency mode from the start menu

Requirement The device is switched off.

1. Switch on the device.
   After the self-test, the device displays the start menu:



   If the device was switched off for < 30 seconds (e.g., for a battery change), a countdown in the **Previous patient** field counts down 20 seconds.

   If the device was switched off for > 30 seconds, the countdown for the last patient is deactivated.

2. Select emergency mode:
   - Emergency Infant
   - Emergency Child
   - Emergency Adult

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Depending on the preset in the operator menu, the device switches to one of the following modes with the ventilation parameters preset for the patient group (see "14.1.9 Factory settings for emergency modes and ventilation modes", page 234) and shows a pressure gauge view:

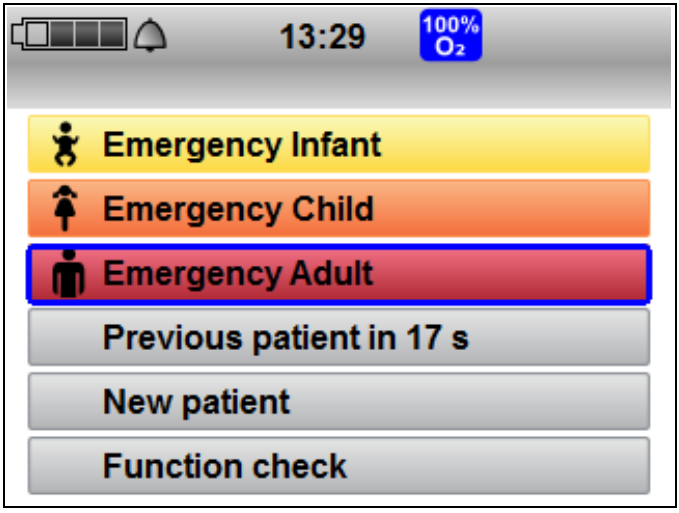
- IPPV
- BiLevel + ASB (only if the BiLevel + ASB option is activated)

Result An emergency mode for a particular patient group is activated.

4.7.2 Calling up the parameters of the patient last ventilated

Requirement The device is switched off.

1. Switch on the device.
   After the self-test, the device displays the start menu:



If the device was switched off for < 30 seconds (e.g., for a battery change), a countdown in the **Previous patient** field counts down 20 seconds.

If the device was switched off for > 30 seconds, the countdown for the last patient is deactivated.

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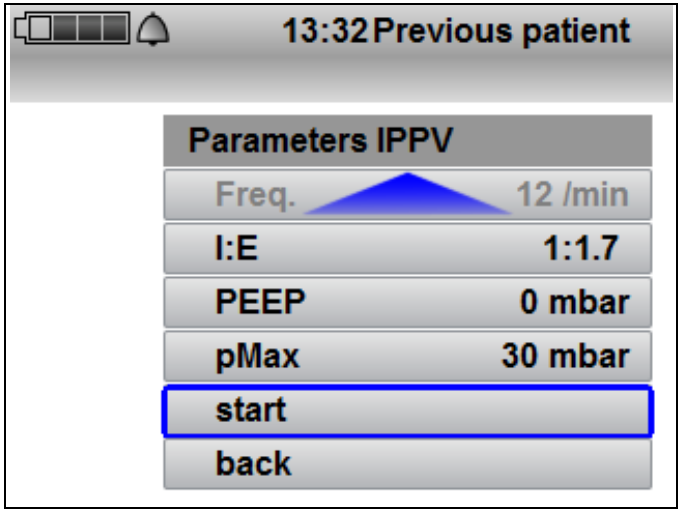
2. Select **Previous patient** field.

   or

   Allow the countdown to run.



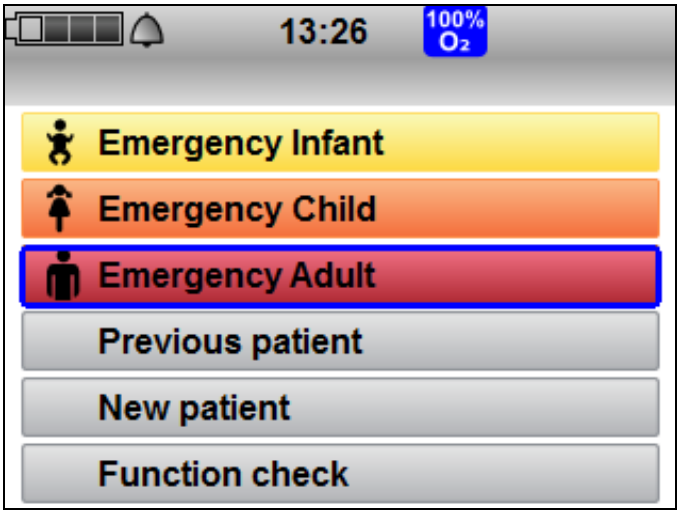
3. If necessary: Adjust the settings of the last patient and confirm.

Result The ventilation mode, ventilation parameters and the view of the last ventilated patient are loaded.

4.7.3 Selecting a ventilation mode for a new patient

Requirement The device is switched off.

1. Switch on the device.
   After the self-test, the device displays the start menu:



   If the device was switched off for < 30 seconds (e.g., for a battery change), a countdown in the **Previous patient** field counts down 20 seconds.

   If the device was switched off for > 30 seconds, the countdown for the last patient is deactivated.

2. Select the field **New patient**.

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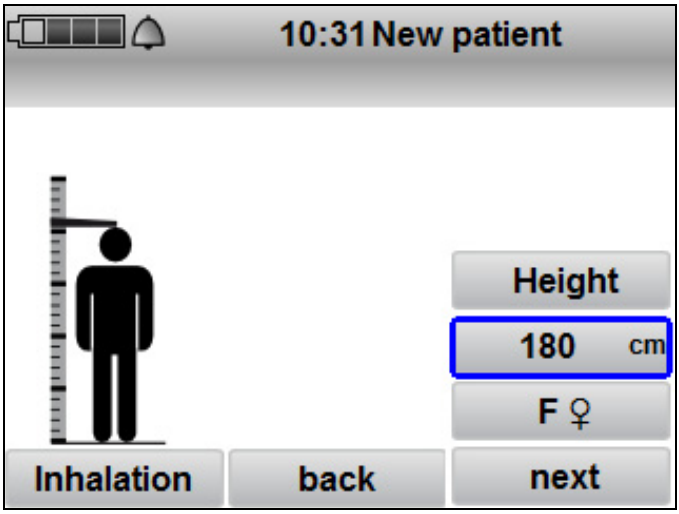
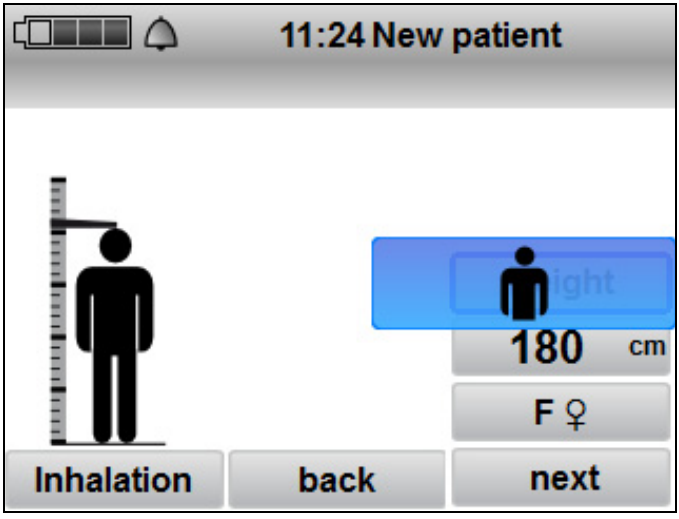


3. Select the height and gender: The height is given in 5 cm increments between 50 cm and 250 cm. (see "14.2 Calculation of body weight on the basis of body height", page 234).

or



Navigate to the field **Height** and turn the navigation knob further to select the desired patient group:

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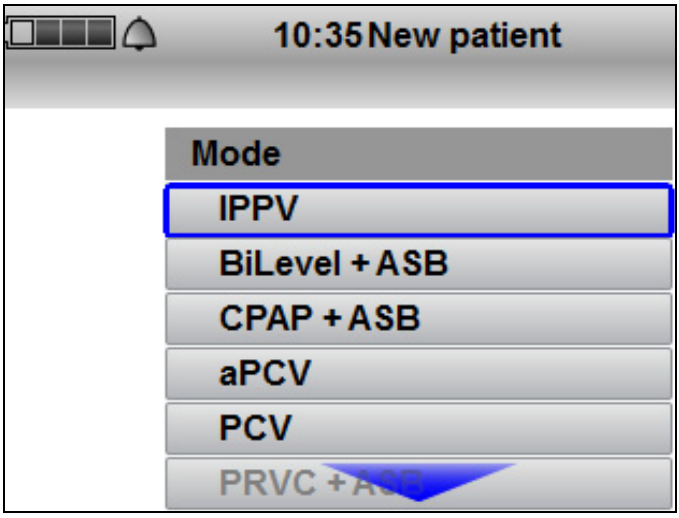
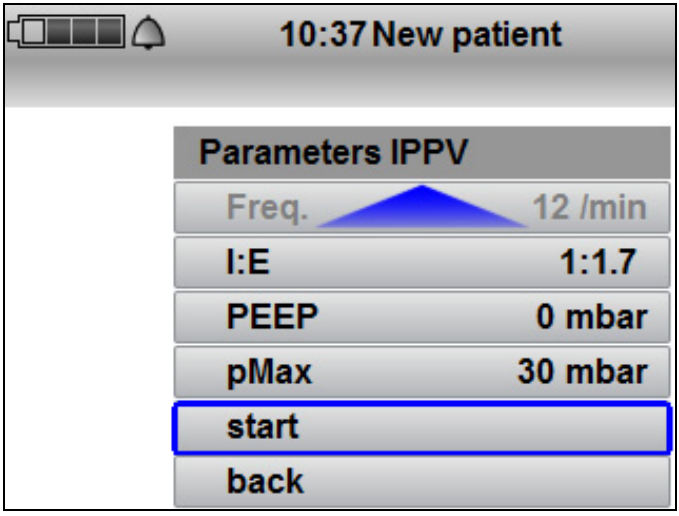
- Adult
- Child
- Infant

4. Press the navigation knob **next**.



5. Select a ventilation mode.



6. If necessary: Set the parameters of the ventilation mode.

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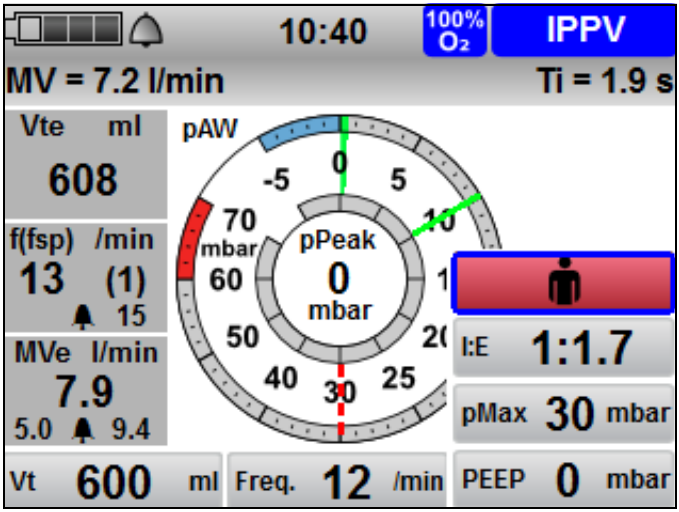
7. Select the **start** field.

Result A ventilation mode for a new patient has been set. If the curve display option is activated, the device shows a curve view.

4.7.4 Selecting an emergency mode from a ventilation mode

Requirement

- The device is switched on.
- A ventilation mode is set (exception: CPR, Inhalation, CO_2 monitoring)



1. Select the field for the emergency mode using the right-hand navigation knob.
2. Select emergency mode:
   - Emergency Infant
   - Emergency Child
   - Emergency Adult

   Depending on the preset in the operator menu, the device switches to one of the following modes with the ventilation parameters preset for the patient group (see "14.1.9 Factory settings for emergency modes and ventilation modes", page 234) and shows a pressure gauge view:

- IPPV
- BiLevel + ASB (only if the BiLevel + ASB option is activated)

You can adjust the preset ventilation parameters for the emergency modes in the operator menu: Operator menu | Presets patient.

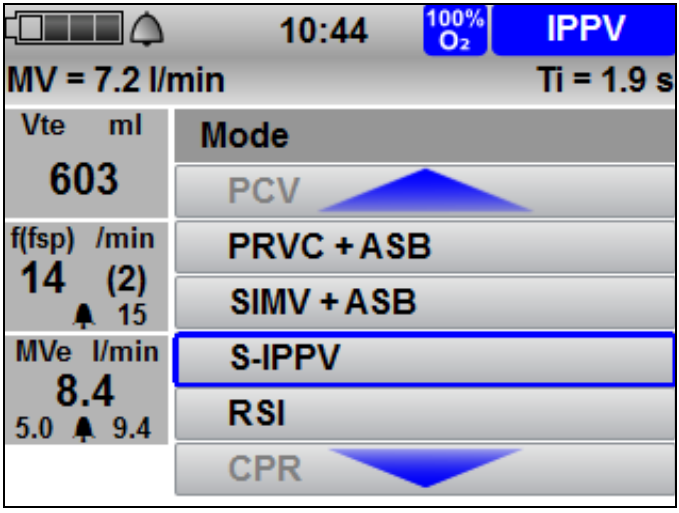
Result An emergency mode for a particular patient group is activated.

4.7.5 Changing the ventilation mode

Requirement

- The device is switched on.
- A ventilation mode is set.

1. Briefly press the menu button .
   The user menu opens.
2. Select the **Mode** field using the right-hand navigation knob.



3. Select a ventilation mode.

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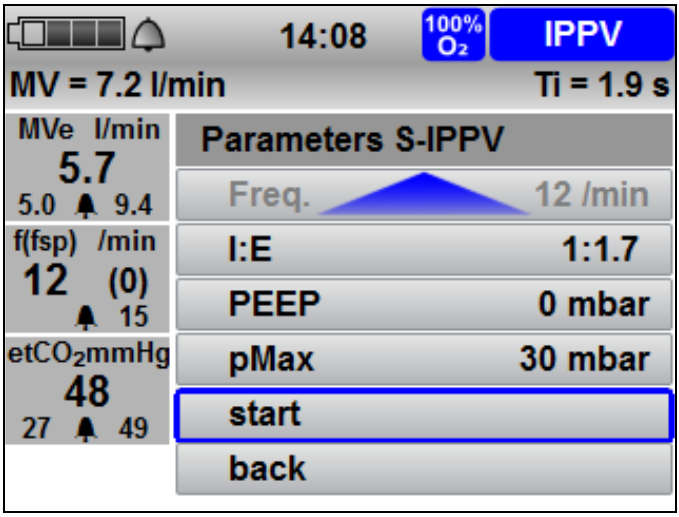

4. If necessary: Set the parameters of the ventilation mode.
5. Select the **start** field.

Result The ventilation mode is changed.

4.7.6 Operating the device in oxygen or Air Mix mode

Requirement

- The device is switched on.
- A ventilation mode is set.

1. Briefly press the Air Mix button (AIR MIX).
   Air Mix appears in the status line and the device is operated in Air Mix mode.
2. Briefly press the Air Mix button (AIR MIX).
   - If **100% O_2** is set as the supply gas (see "6.3.7 Device configuration", page 125): **100% O_2** appears in the status line and the device is operated with 100% oxygen.

   or

   - If **93% O_2** is set as the supply gas (see "6.3.7 Device configuration", page 125): O2 93% appears in the status line and the device is operated with concentrator oxygen.

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Oxygen mode is activated as standard for all emergency modes.

Result The device is operated in oxygen or Air Mix mode.

4.7.7 Performing inhalation (only with Inhalation option)

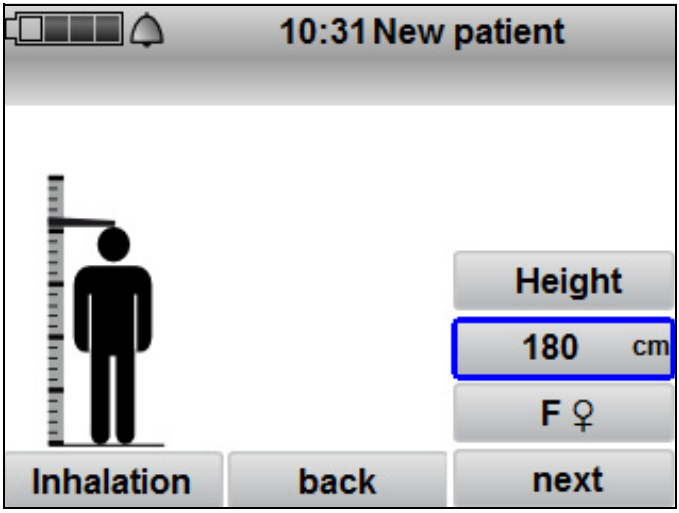
NOTICE

Using a nebulizer prevents treatment in Inhalation mode!
The device is not suitable for nebulizers in inhalation mode. The device does not create sufficient pressure for this function.
⇒ Do not use nebulizers in inhalation mode with this device.

Requirement

- The patient is not connected via a tube.
- An inhalation adapter is connected (see "4.4.7 Connecting the inhalation adapter", page 62).
- The device is switched on.
- The start menu is on the display.

1. Select **New patient** field.
2. Select the height and gender (see "14.2 Calculation of body weight on the basis of body height", page 234).



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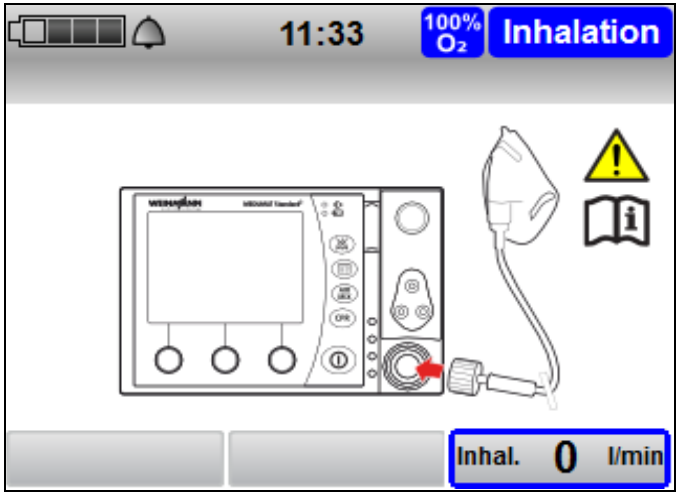
3. Select the field **Inhalation** using the left-hand navigation knob.
   The device switches to Inhalation mode.



4. Select flow for inhalation using the right-hand navigation knob.

Result The inhalation is performed.

4.7.8 Performing CO_2 monitoring (only with capnography option)

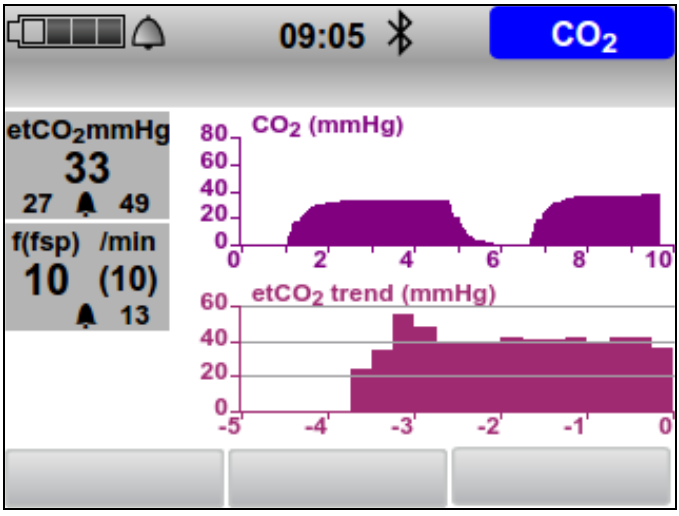
Requirement

- The device is switched on.
- **CO_2 monitoring** was set as the ventilation mode for a new patient (see "4.7.3 Selecting a ventilation mode for a new patient", page 70).
- An $etCO_2/O_2$ nasal cannula is connected (see "4.4.8 Connecting the $etCO_2/O_2$ nasal cannula", page 63)

  or

- The CO_2 measuring hose is connected to an external interface (e.g., resuscitator with breathing system filter).

When using an $etCO_2/O_2$ nasal cannula, the CO_2 measurement may be distorted by the intake of additional air. Only the CO_2 trend can be assessed.



1. Assess CO_2 measurements diagnostically.

Result The CO_2 measurements and the respiratory rate of the patient are monitored.

4.7.9 Performing ventilation in CPR Manual mode

In CPR Manual mode, you determine the respiratory rate administered yourself. Using MEDUtrigger, you manually trigger individual mechanical breaths with the set tidal volume.

⚠ CAUTION

Delay in treatment due to simultaneous metronome outputs from the ventilator and the defibrillator!
If the ventilator is used together with a defibrillator (MEDUCORE Standard) which can also emit a metronome sound, the simultaneous metronome outputs from the defibrillator and the ventilator may confuse the user and cause delays in treatment.
⇒ Where the ventilator and defibrillator are used at the same time, switch off the metronome sound of MEDUMAT Standard[2].
⇒ Do not perform resuscitation without a metronome.

Requirement

- The device is switched on.
- MEDUtrigger is connected to the device.
- MEDUtrigger is activated in the operator menu (Operator menu | Options | MEDUtrigger).

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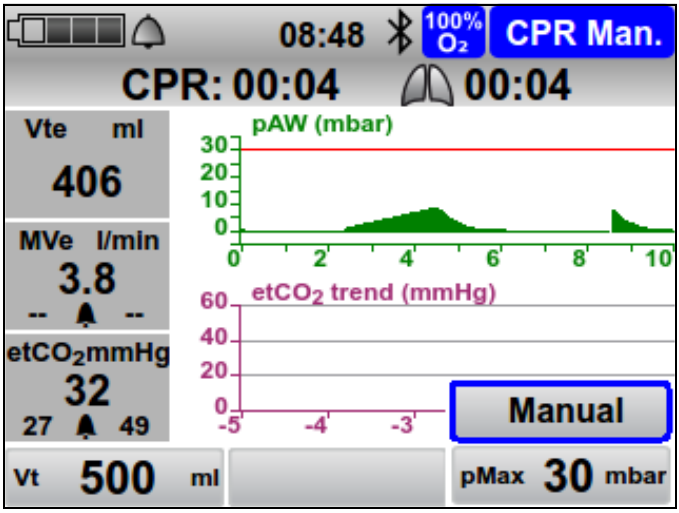
- **Manual** was set in the operator menu (Operator menu | Presets patient | CPR mode | Start mode).

1. Briefly press the CPR button (CPR).
   The device switches to the mode **CPR Man.** The green LEDs on the MEDUtrigger light up.
   If you have activated the metronome, the metronome emits signals at a rate of 30:2 (Patient group adult) or 15:2 (Patient group infant and child).



2. If necessary: Change the rhythm using the right-hand navigation knob:
   - Manual
   - Continuous (see "4.7.10 Performing ventilation in CPR IPPV mode", page 80)
3. Press and hold the MEDUtrigger button during the ventilation interval until two mechanical breaths are performed.

   or

   If the green LEDs on the MEDUtrigger are lit, briefly press the MEDUtrigger button twice and trigger the mechanical breaths manually.
4. If necessary: Cancel CPR Manual mode using the CPR button (CPR).

The device always switches to IPPV mode upon exiting CPR mode.

Result Ventilation is performed in CPR Manual mode.

4.7.10 Performing ventilation in CPR IPPV mode

⚠ CAUTION

Delay in treatment due to simultaneous metronome outputs from the ventilator and the defibrillator!
If the ventilator is used together with a defibrillator (MEDUCORE Standard) which can also emit a metronome sound, the simultaneous metronome outputs from the defibrillator and the ventilator may confuse the user and cause delays in treatment.
⇒ Where the ventilator and defibrillator are used at the same time, switch off the metronome sound of MEDUMAT Standard^2.
⇒ Do not perform resuscitation without a metronome.

Requirement
- The device is switched on.
- CCSV option is deactivated.

1. Briefly press the CPR button (CPR).
   Depending on the preset in the operator menu, the device switches to **CPR IPPV** mode or **CPR Manual** mode (Operator menu | Presets patient | CPR mode | Start mode).
2. If  is already set in the operator menu: Continue ventilation in CPR IPPV mode

   or

   If **Manual** is already set in the operator menu: Switch to  using the right-hand navigation knob.
3. If the patient experiences spontaneous circulation again: Cancel **CPR IPPV** mode using the CPR button (CPR).

The device always switches to IPPV mode upon exiting CPR mode.

Result Ventilation is performed in CPR IPPV mode.

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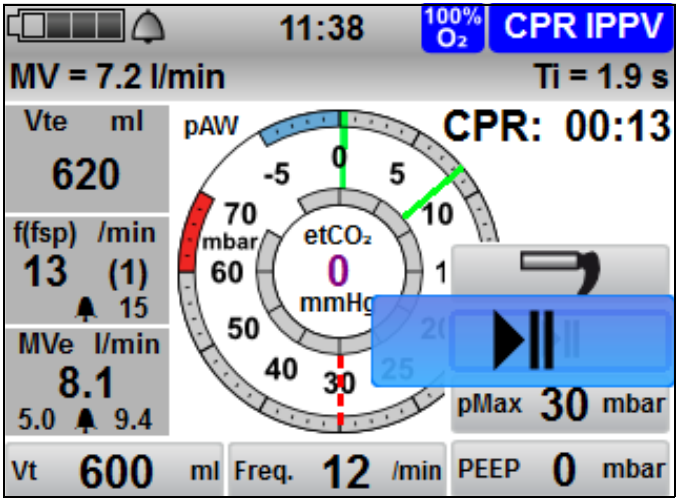
Pausing ventilation in CPR IPPV mode

During the analysis of the defibrillator, you can pause ventilation in order to avoid artifacts in the analysis.

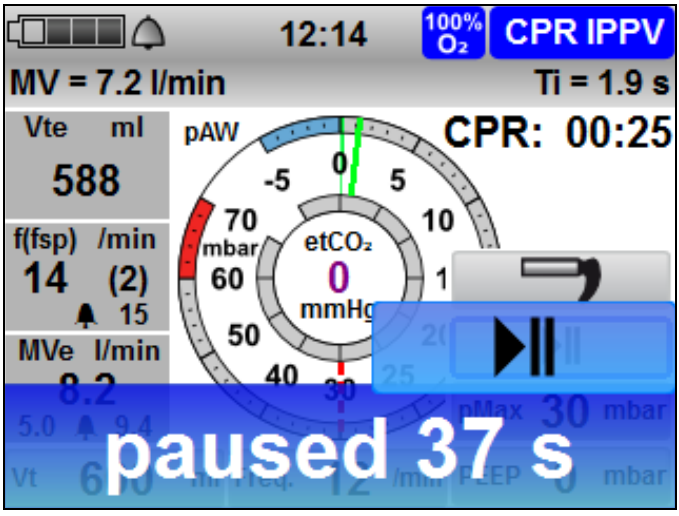
Requirement

- The device is switched on.
- The CPR mode is set.
- Continuous ventilation is activated (**CPR IPPV**).

1. Turn or press the right-hand navigation knob.



2. Select the ⏯ field.
   The ventilation is paused for the interval time set in the operator menu (max. 60 seconds). A countdown indicates the remaining time.



3. To start continuous ventilation again: Press the ⏯ field twice.

Result Ventilation pauses.
When the countdown reaches zero, ventilation automatically restarts.

4.7.11 Performing ventilation in CPR CCSV mode

⚠ WARNING

Delay in treatment due to simultaneous metronome outputs from the ventilator and the defibrillator!
If the ventilator is used together with a defibrillator, which can also emit a metronome sound, the simultaneous metronome outputs from both devices may confuse the user and cause delays in treatment.
⇒ Where the ventilator and defibrillator are used at the same time, switch off the metronome sound of MEDUMAT Standard^2.
⇒ Do not perform resuscitation without a metronome.

⚠ WARNING

Treatment delays due to triggered alarms for spontaneously breathing patients which do not apply in the this application scenario!
In CPR CCSV mode, triggered $etCO_2$ alarms can confuse the user and result in delays in treatment.
⇒ Switch off $etCO_2$ alarms for CPR CCSV mode in the operator menu.

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Requirement
- The device is switched on.
- The CCSV option is activated.

1. Briefly press the CPR button (CPR).
   Depending on the preset in the operator menu, the device switches to **CPR CCSV** mode or **CPR Manual** mode (Operator menu | Presets patient | CPR mode | Start mode).
2. If  is already set in the operator menu: Continue ventilation via chest compressions in **CPR CCSV** mode:

   or

   If **Manual** is already set in the operator menu: Switch to  using the right-hand navigation knob.
3. If the patient experiences spontaneous circulation again: Stop chest compressions.

   or

   Cancel **CPR CCSV** mode with the CPR button (CPR).

Result Ventilation is performed in **CPR CCSV** mode.

Interrupting ventilation in CPR CCSV mode

During the analysis of the defibrillator, you can pause ventilation in order to avoid ventilation artifacts in the analysis.

Requirement
- The device is switched on
- The CPR CCSV mode is set.

1. Stop chest compressions.

Result The ventilation is paused for as long as the chest compressions are continued (up to the set back-up ventilation time at most).

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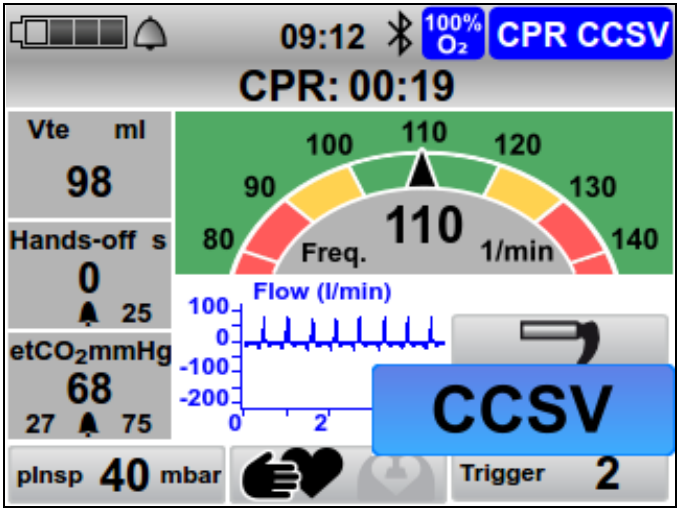
4.7.12 Replacing CPR mode

Requirement

- The device is switched on.
- The CCSV option is activated.
- The CPR mode is set.
- Continuous ventilation is activated.

1. To change the mode, switch between the **CCSV** and **IPPV** fields using the right navigation knob.



Result The ventilation mode in CPR mode has been changed.

4.7.13 Performing ventilation in RSI mode

Requirement

- The device is switched on.
- The MEDUtrigger is connected to the device.
- **RSI** was set as the ventilation mode for a new patient (see "4.7.3 Selecting a ventilation mode for a new patient", page 70). The Demand function is automatically activated.

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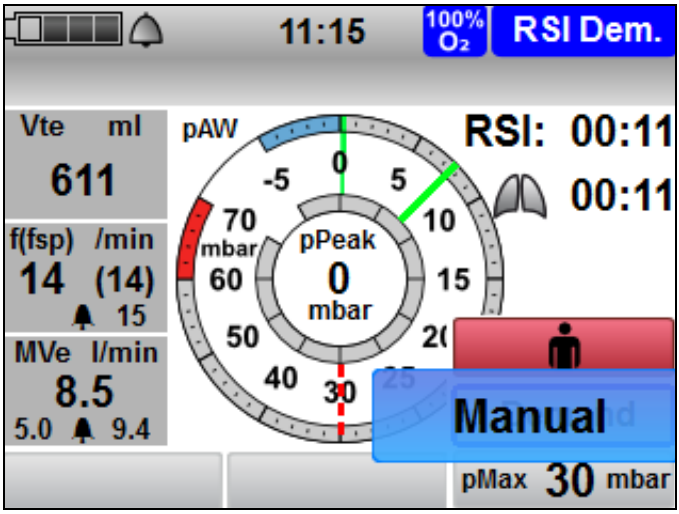
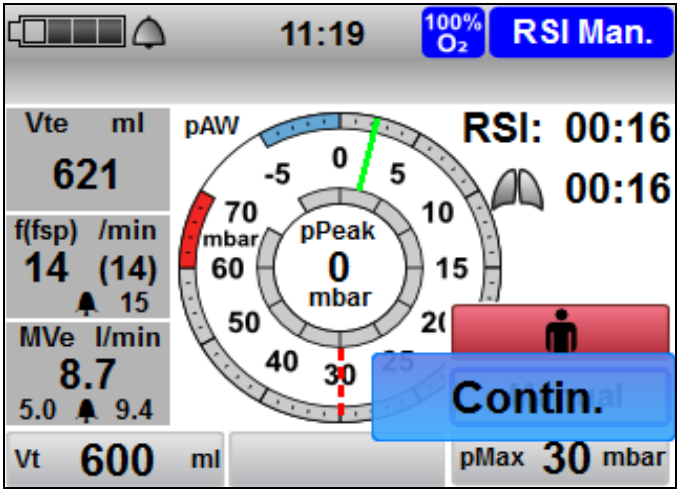


1. For the function **Manual**, navigate to the field **Demand** and select the field **Manual**.

To enable the selection of the **Manual** function, a MEDUtrigger must be connected and activated in the operator menu. Otherwise, this function will not be displayed.



2. To perform continuous ventilation following successful airway management, select the **Contin.** field.
   Depending on the preset in the operator menu, the device switches to one of the following modes with the ventilation parameters preset for the patient group (see "14.1.9 Factory settings for emergency modes and ventilation modes", page 234):

   - IPPV
   - BiLevel + ASB (only if the BiLevel + ASB option is activated)

   If the capnography option is activated, the device shows a pressure gauge view or a curve view depending on the preset in the operator menu (see "6.3.8 Presets patient", page 128).

Result Ventilation is performed in RSI mode.

4.7.14 Using the simulation mode

The device features a simulation mode with which settings can be simulated.

⚠ WARNING

Risk of injury from confusing simulation mode with the device's normal mode!
The simulation mode is distinguished only by the words **Simulation Mode!** on the display and can therefore be confused with the device's normal mode. This can put the patient at risk.
⇒ Do not use the simulation mode when the device is in use.
⇒ Always switch off and restart the device after using the simulation mode.

Requirement The device is switched off.

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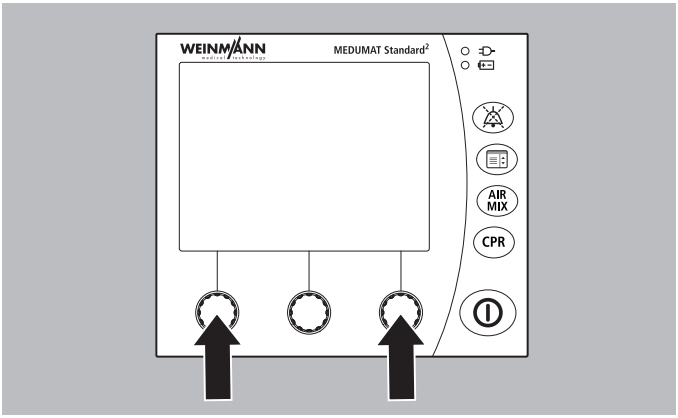

1. Switch on the device and during start-up press the right-hand and left-hand navigation knobs at the same time.
   The device switches to simulation mode. The words **Simulation Mode!** flash in the display.

2. Simulate settings.
3. To end the simulation mode: Switch the device off and restart.

Result Simulation mode is used.

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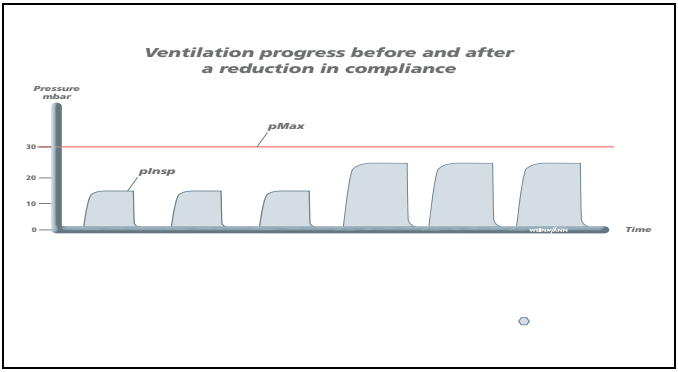
4.8 Monitoring the patient

During ventilation, you must monitor the patient continuously. You can see the ventilation progress on the gauge, on the ventilation curves and on the measurements shown on the display of the device (see "3.3.2 Ventilation mode (example)", page 23).

All the measurements shown for flow, tidal volume and minute volume relate to standard body temperature and ambient pressure (BTPS (Body Temperature and Pressure, saturated): Volume at current ambient pressure and 37°C, with 100% saturated gas).

High airway resistances, e.g., due to obstructions of the airways or during external chest compression, may change the respiratory minute volume, depending on the ventilation mode.

In the event that the compliance of the lungs is reduced, during volume-controlled ventilation the device reacts by increasing the ventilation pressure to the set pressure limit whilst the ventilation volume remains constant. Then the applied volume drops.



4-3 Ventilation progress before and after a reduction in compliance (during volume-controlled ventilation)

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4.9 Audio alarm output

4.9.1 Muting the audio alarm output

Requirement An alarm is active and is audible.

1. Briefly (< 1 s) press the alarm mute button  .

The acoustic alarm output is permanently muted in NVG mode.

Result The audio alarm output is muted for 120 s. The symbol  appears on the display.

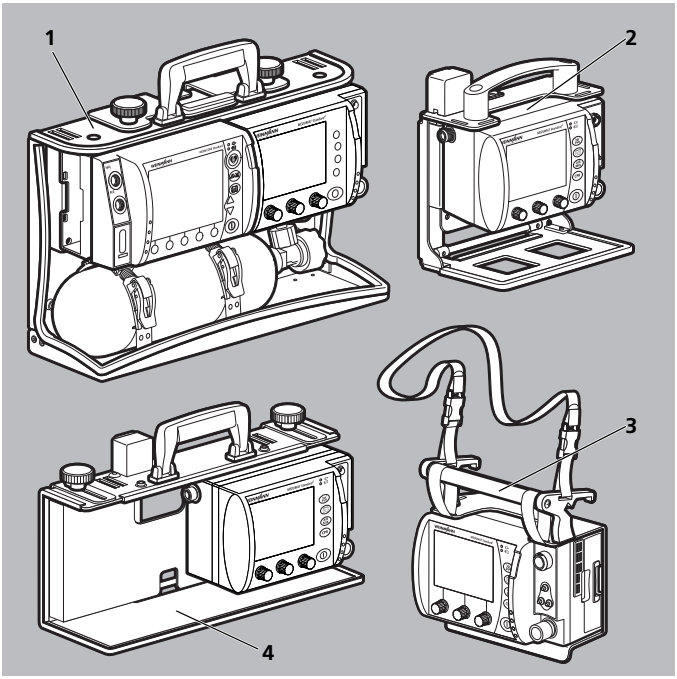
4.9.2 Canceling the muting of the audio alarm output

Requirement An alarm is active and is muted.

1. Briefly (< 1 s) press the alarm mute button  .

Result The muting of the audio alarm output is canceled. The symbol  appears on the display.

4.10 Transporting the device



4-4 Transport on a portable system

You can transport the device in the following ways:

- On the portable system LIFE-BASE 3 NG (**1**)
- On the portable system LIFE-BASE 1 NG XS (**2**)
- On the portable system LIFE-BASE *light* XS (**3**)
- On the portable system LIFE-BASE 1 NG XL (**4**)

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4.11 Feeding in oxygen

4.11.1 Connecting an oxygen supply

⚠ WARNING

Risk of injury posed by the combination of highly compressed oxygen and hydrocarbon compounds!

When combined with highly compressed oxygen, hydrocarbon compounds (e.g., oil, grease, cleaning alcohols, hand cream or adhesive plasters) can cause explosions and injuries to the patient, user and bystanders.

⇒ Wash hands thoroughly and remove adhesive plasters before using highly compressed oxygen.

⚠ WARNING

Risk of injury if oxygen escapes from damaged oxygen cylinders or pressure reducers!

Oxygen can escape unchecked from damaged oxygen cylinders or pressure reducers. This may lead to explosions and cause injury to the patient, user and bystanders.

⇒ Tighten all screwed unions on the oxygen cylinder and on the pressure reducer by hand only.

⇒ Secure the oxygen cylinder so that it cannot fall over.

⚠ CAUTION

Risk of injury due to particles of dust which have been blown away!

When you open the oxygen cylinder, particles of dust which are blown away by the high pressure may injure the user or bystanders.

⇒ Hold the valve opening so that it points away from the body.

⇒ Hold the valve opening so that no bystanders can be affected.

NOTICE

Connecting several devices to the same oxygen supply may result in loss of performance!

If you connect several devices to the same oxygen supply, the performance of the device and of the individual components may be reduced.

⇒ Do not operate the device simultaneously with other components sharing the same oxygen supply.

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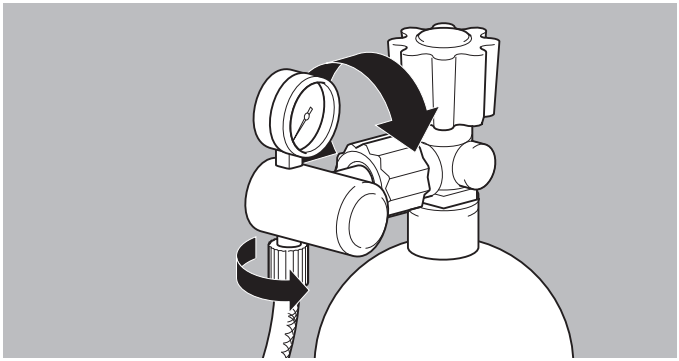
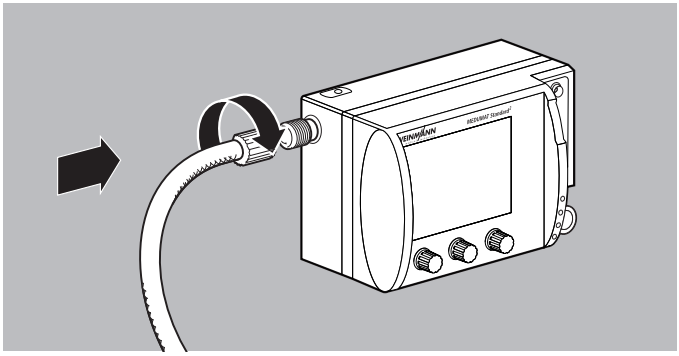
Requirement

- The patient is not connected to the device.
- The oxygen cylinder is full.

1. Briefly open and then close the valve of the oxygen cylinder in order to blow away any particles of dust.



2. Connect a pressure reducer to the valve of the oxygen cylinder with a knurled union nut and tighten it by hand.
3. If necessary: Connect a pressure hose to the outlet of the pressure reducer using the union nut.



4. If necessary: Connect a pressure hose to the compressed gas connection of the device.

Result The device is connected to the oxygen supply.

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4.11.2 Removing the oxygen supply

1. Close the valve on the oxygen cylinder.
2. Briefly press the On/Off button ⏻ and operate the device without an oxygen supply.
   The remaining oxygen is flushed out of the device.
3. Press and hold the On/Off button ⏻ for at least 2 seconds to switch off the device.
4. Disconnect the pressure hose from the compressed gas connection of the device.
5. If necessary: Replace the empty oxygen cylinder.

Result The device is disconnected from the oxygen supply.

4.11.3 Calculating the operating time

1. Calculating the oxygen level in the cylinder (oxygen supply):

Oxygen supply = Volume of the oxygen cylinder x Pressure in the oxygen cylinder		
Example		
Volume of the oxygen cylinder	10 l	2 l
Pressure in the oxygen cylinder	200 bar	200 bar
Oxygen level in the cylinder (oxygen supply)	**2000 l**	**400 l**

2. Calculating the operating time:

   100% oxygen mode:

$$\text{Time(min)} = \frac{\text{Oxygen supply(l)}}{\text{Vt(l)} \times \text{f(min}^{-1}\text{)} + 0.31}$$

Example	
Oxygen supply	2000 l
Vt	500 ml
f	12 min^{-1}
Time	**317 min = 5 h 17 min**

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Air Mix mode:

$\text{Time(min)} = \frac{\text{Oxygen supply(l)} \times 2}{\text{Vt(l)} \times \text{f(min}^{-1}\text{)} + 0.3\text{l}}$	
Example	
Oxygen supply	2000 l
Vt	500 ml
f	12 min^{-1}
Time	**634 min = 10 h 34 min**

Result The operating time has been calculated.

4.12 After use

1. Detach the patient hose system from the ventilation mask or tube.
2. If necessary: Dispose of the ventilation mask or tube.
3. If necessary: Disconnect the patient hose system from the device.
4. If necessary: Dispose of the disposable hose system.
5. If necessary: Take a new disposable hose system.
6. If necessary: Replace hygiene filter/device input filter.
7. Hygienically reprocess the device, components and accessories (see "8 Hygienic reprocessing", page 164).
8. If necessary: Take a new ventilation mask or new tube.
9. If necessary: Stow the components and accessories away on the portable system.
10. If necessary: Store the device, components and accessories (see "12 Storage", page 211).

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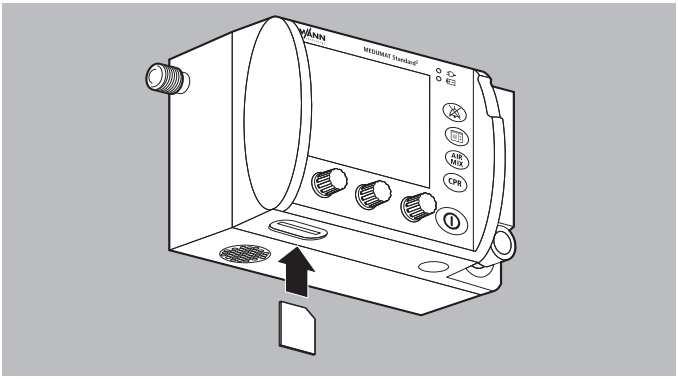
4.13 Using the SD card

4.13.1 Inserting an SD card

NOTICE

Loss of data due to incorrect SD card!
SD cards not purchased from WEINMANN Emergency may have reduced functionality or result in the loss of data.
⇒ Only use SD cards from WEINMANN Emergency.
⇒ Do not use the SD card for third-party files.

1. Open the splash guard of the SD card slot.



2. Slide the SD card into the SD card slot until it audibly clicks into place.
   When doing so, note: The beveled corner of the SD card must be at the front on the right during insertion.
3. Close the splash guard.

Result The SD card is inserted in the device and ready for use.

4.13.2 Removing the SD card

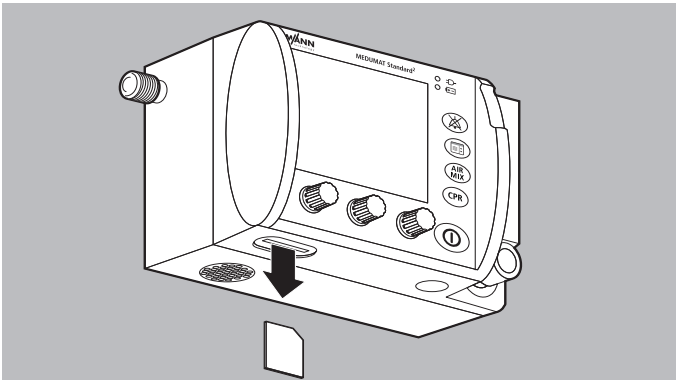
Requirement An SD card is in the SD card slot.

1. Open the splash guard of the SD card slot.

NOTICE

Incorrect use may result in loss of data or damage to the device!
If you remove the SD card whilst exporting log files or updating the software of the device, data may be lost or the device may be damaged.
⇒ Only remove the SD card after ensuring that no log file exports or updates to the device software are in progress.

2. Briefly press in the SD card.
   The SD card is ejected slightly.



3. Remove the SD card.
4. Close the splash guard to protect the device from the ingress of moisture.

Result The SD card is removed.

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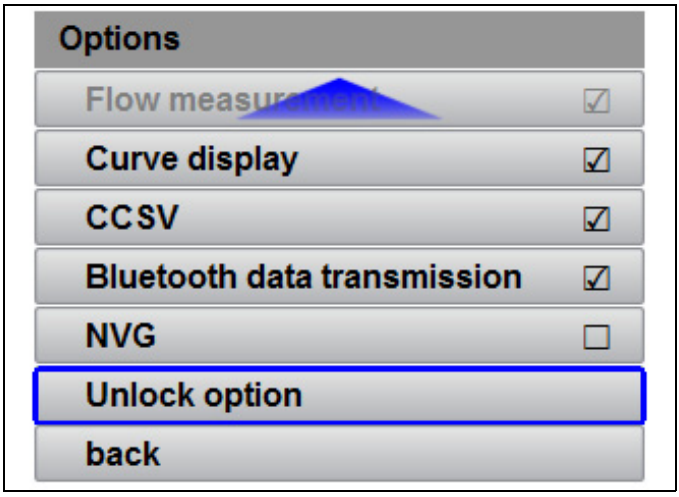
4.14 Enabling options

Requirement

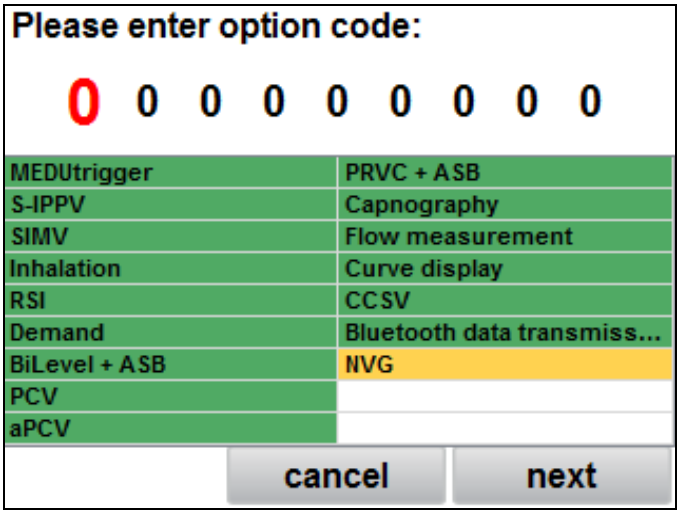
- The operator menu has been called up (see "6.1 Navigating the operator menu", page 116).
- The latest software version is installed on the device (see "4.15 Updating the software", page 100).

1. Select the menu item **Options**.



2. Select the menu item **Unlock option**.
   The device shows which options have already been unlocked using the following color scale:

Color scale	Description
Gray	Option is not unlocked.
Yellow	Option is unlocked, but not activated.
Red	Option is unlocked, but cannot be activated (because, for example, another required option has not yet been unlocked).
Green	Option is unlocked and activated.



3. Turn the right-hand navigation knob to enter the first digit of the option code.
4. Press the navigation knob **next** to confirm the first digit of the option code.
5. Enter the other digits of the option code in the same way.
6. Press the navigation knob **ok** to confirm the option code.

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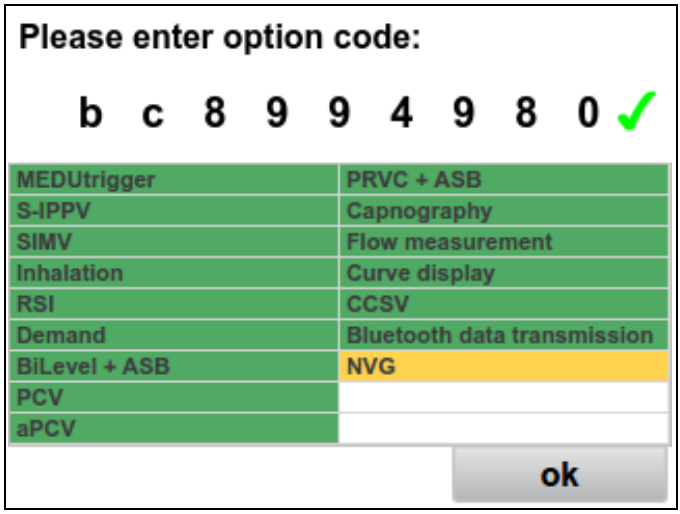


The device uses a green checkmark to display whether the input option code is correct and changes the color of the option as per the color scale above.

When doing so, note:

Prerequisite for the unlocking of the curve display option: Flow measurement + ASB option is enabled.

Prerequisite for the unlocking of the pressure-controlled ventilation modes option: Flow measurement + ASB option and curve display option are enabled.

7. Press the navigation knob **ok** to leave the code input menu.
8. Activate or deactivate the option using the right-hand navigation knob.
9. To leave the operator menu, press the navigation knob **back**.

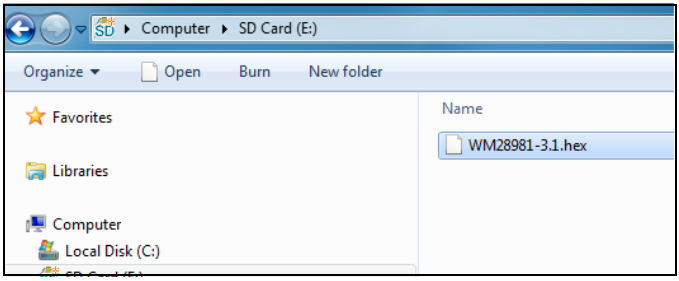
Result An option is unlocked for use and activated.

4.15 Updating the software

Requirement

- The device is connected to the line power.
- A fully charged battery is inserted in the device.
- The operator menu has been called up (see "6.1 Navigating the operator menu", page 116).

1. If necessary: Download the software from the Login area of the WEINMANN Emergency website to the SD card.
2. If the software is available as a ZIP file: Unzip the software. The software is available in the folder as a file named **WM28981-x.x.hex**.



3. Place the file in the SD card's root directory.
   When doing so, note: The file for the software update must not be in a sub-folder.
4. Select the menu item **Software update**.

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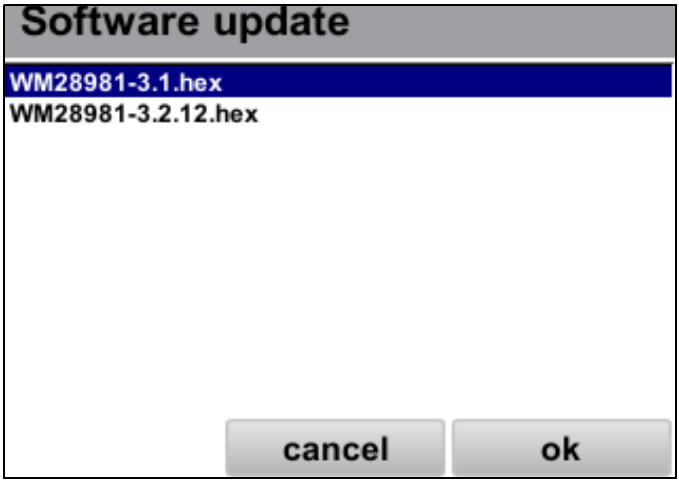

5. Select Software update.

NOTICE

Damage to the device caused by moving the device and/or pressing buttons during the update!
Moving the device and/or pressing buttons during the update may cancel the update and damage the device.
⇒ Do not move the device.
⇒ Do not press any buttons on the device.

6. Press the navigation knob **ok** to update the software.
   The device updates the software.
7. After the end of the update: Press the navigation knob **reboot** to restart the device.
   The device restarts and the start menu appears on the display.
8. Perform a function check (see "9.3 Performing a function check", page 184).
9. Press and hold the On/Off button ⏻ for at least 2 seconds to switch off the device and save the settings.

Result The software has been updated.

The **update.txt** file is saved to the SD card in the device as soon as the software update is complete. The file contains information on the software update just performed. This helps you with documentation within the scope of your quality management process. You can open the file with a text editing program, print it and sign it. The following information can be found in the file:

```
Softwareupdate durchgeführt / software update performed:
Datum / date: 2013-07-10 18:20:10
Seriennummer / serial number: 109
Updatedatei / update file: xxxxx.hex


Unterschrift / signature:
```

4.16 Pairing an external data documentation system with MEDUMAT Standard^2 for the first time (via Bluetooth®)

4.16.1 Pairing in the operator menu

Requirement

- The external data documentation system supports the device's communication protocol.
- The **Bluetooth data transmission** option is unlocked and activated in the device's operator menu (see "4.14 Enabling options", page 97).
- The operator menu has been opened.

1. Select the **Device information** field.
   The device's Bluetooth® name is displayed.
2. Search for the device's Bluetooth® name via the external data documentation system.
3. Send a pairing request to the device via the external data documentation system.

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4. If necessary: Enter the device's Bluetooth PIN in the external data documentation system.

Result The device is paired with the external data documentation system via Bluetooth®.

4.16.2 Pairing during ventilation

Requirement

- The external data documentation system supports the device's communication protocol.
- The **Bluetooth data transmission** option is unlocked and activated in the device's operator menu (see "4.14 Enabling options", page 97).
- The **Allow bluetooth pairing** under **Device settings** in the operator menu is activated.

1. Start ventilation (see "4.7 Ventilating the patient", page 67).
2. Activate **Bluetooth** in the user menu (see "5.3.7 Bluetooth® (only with Bluetooth data transmission option)", page 113).
3. Enter the device's MAC address in the external data documentation system.
4. Send a pairing request to the device via the external data documentation system.
5. If necessary: Enter the device's Bluetooth® PIN in the external data documentation system.

Result The device is paired with the external data documentation system via Bluetooth®.

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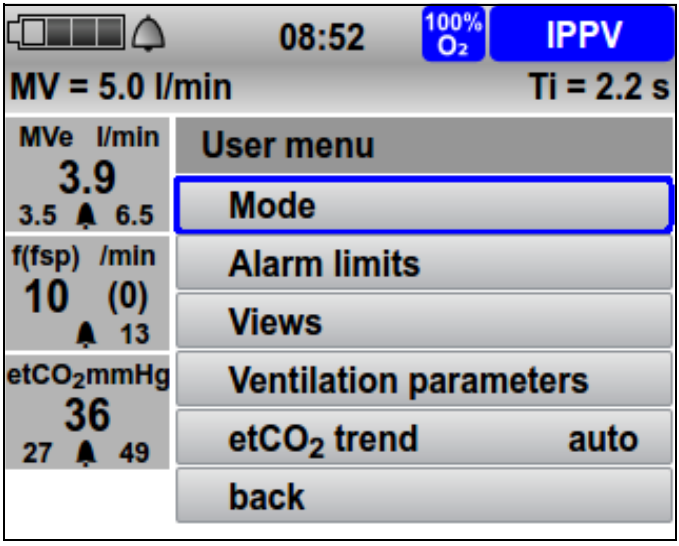
5 User menu

5.1 Navigating the user menu

Requirement A ventilation mode is set.

1. Briefly press the menu button (⊟).



2. To select a submenu, turn one of the three navigation knobs.
3. To confirm the settings, press one of the three navigation knobs.

Result You know how to navigate the user menu.

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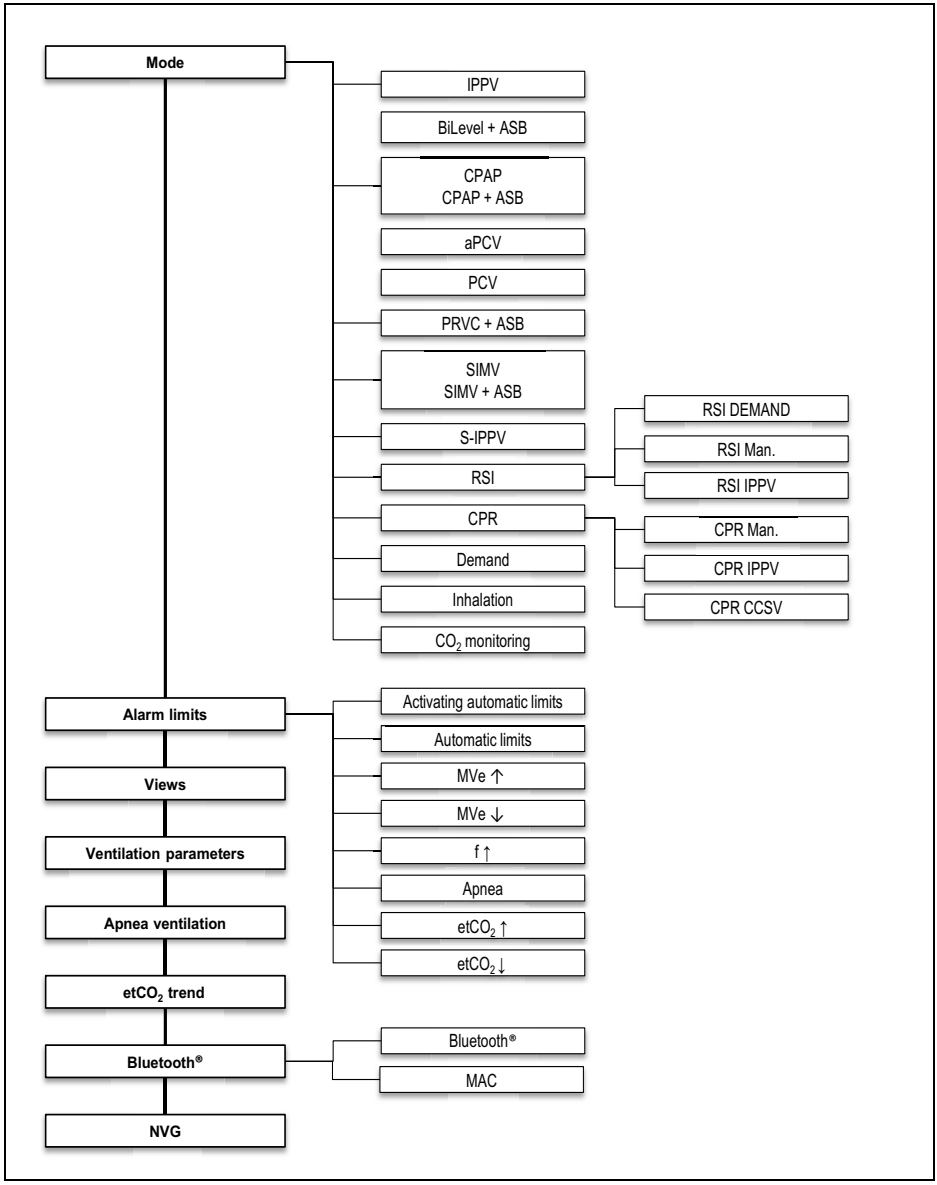
5.2 Structure of the user menu



5-1 User menu structure

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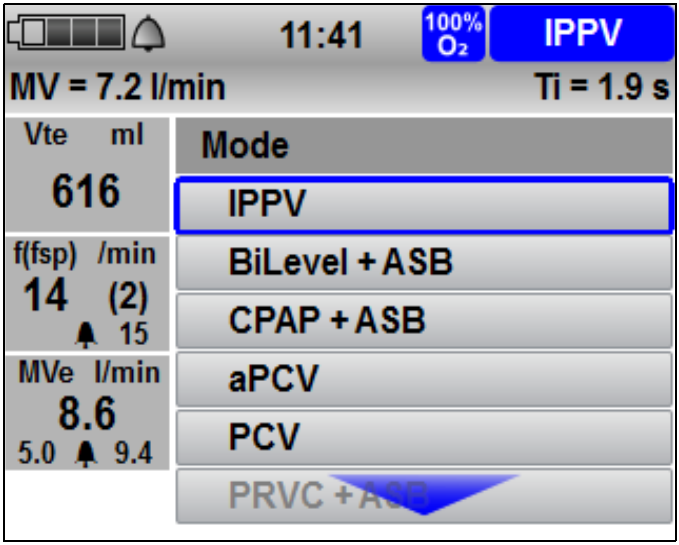
5.3 Settings in the user menu

5.3.1 Mode



5-2 Mode submenu

You can select the following ventilation modes and additional functions here (see "7 Description of the modes", page 136):

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Mode submenu	
Ventilation modes	IPPV
	BiLevel + ASB (only if the pressure-controlled ventilation modes option is activated)
	CPAP
	CPAP + ASB (only with flow measurement + ASB option)
	aPCV (only if the pressure-controlled ventilation modes option is activated)
	PCV (only if the pressure-controlled ventilation modes option is activated)
	PRCV + ASB (only if the pressure-controlled ventilation modes option is activated)
	SIMV (only with SIMV option)
	SIMV + ASB (only if the SIMV and flow measurement + ASB options are activated)
	S-IPPV (only with S-IPPV option)
Additional functions	RSI
	CPR
	Demand
	Inhalation
	CO_2 monitoring (only with capnography option)

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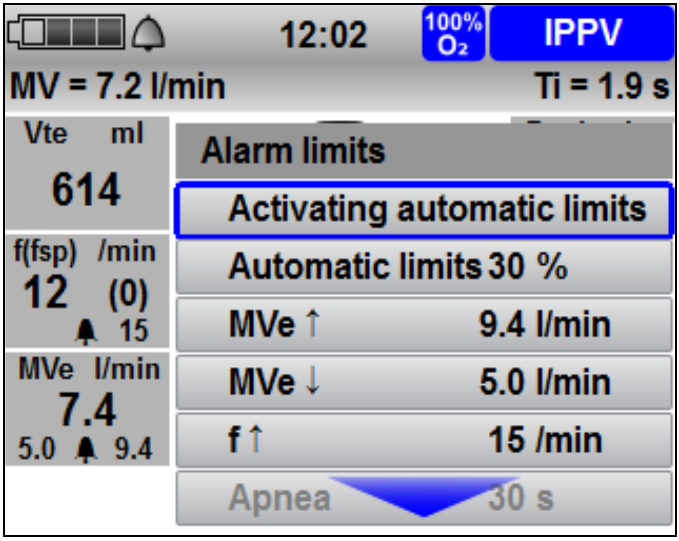
5.3.2 Alarm limits



5-3 Alarm limits submenu

Here you can set the alarm limits.

You can also open the alarm limit menu by keeping the alarm mute button depressed.

⚠ WARNING

Risk of injury due to alarm limits which are too high or too low!

Alarm limits which are either too high or too low can prevent the device from emitting an alarm, thereby putting the patient at risk.

⇒ Always set alarm limits which have been adapted to the patient.

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Alarm	Setting range
Activating automatic limits	The device sets the alarm limits for the alarms relating to respiratory physiology automatically. The deviation is 10%, 20% or 30% from the ventilation values at the time of activation. The automatic alarm limits are set to ± 30% on delivery.
Automatic limits	
MVe ↑ (only with flow measurement + ASB option)	1 l to 160 l
MVe ↓ (only with flow measurement + ASB option)	0.1 l to 110 l
f ↑ (only with flow measurement + ASB option)	1/min to 150/min
Apnea (only in CPAP, CPAP + ASB and Demand modes)	4 s to 60 s When the time elapses, the device automatically switches to an apnea ventilation mode.
$etCO_2$ ↑ (only with capnography option)	20 mmHG to 75 mmHG 2.6 vol% to 9.9 vol% 2.6 kPa to 10 kPa
$etCO_2$ ↓ (only with capnography option)	0 mmHG to 40 mmHG 0 vol% to 5.3 vol% 0 kPa to 5.4 kPa

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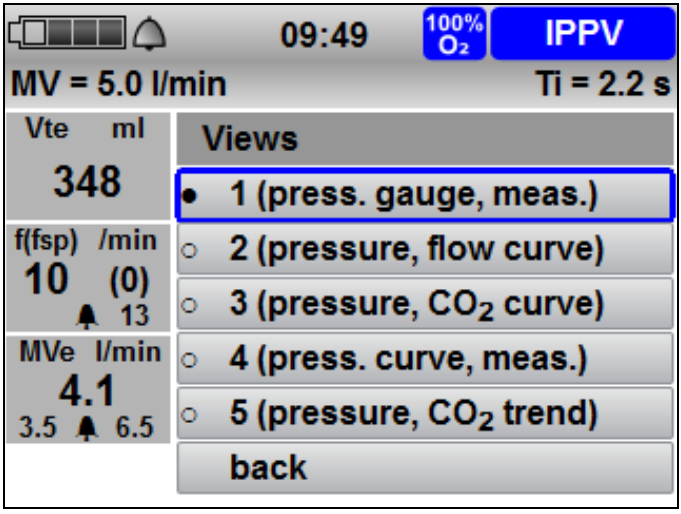
5.3.3 Views



5-4 Views submenu (example)

You can select preconfigured views of measurements here. The views depend on the activated options and the ventilation mode selected.

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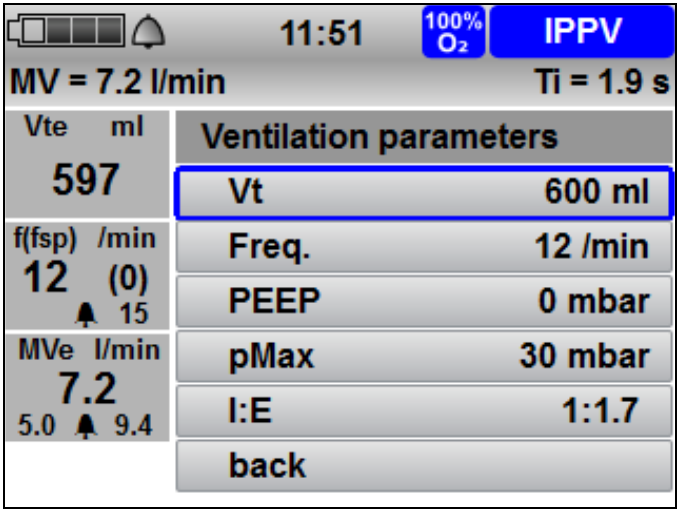
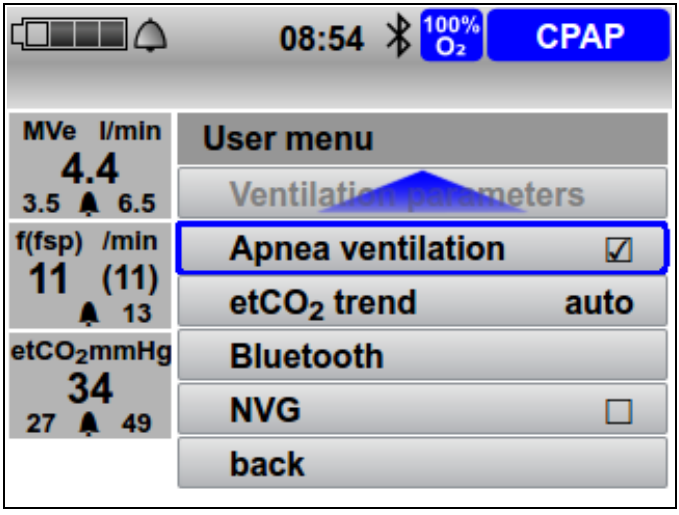
5.3.4 Ventilation parameters



5-5 Ventilation parameters submenu (example)

You can change the ventilation parameters of the selected ventilation mode here.

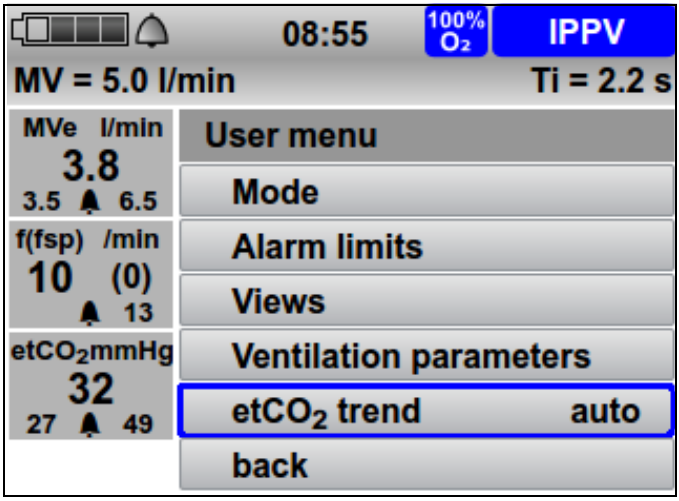
5.3.5 Apnea ventilation



5-6 Apnea ventilation submenu

In this menu you can activate or deactivate apnea ventilation in the CPAP, CPAP + ASB and Demand ventilation modes.
When apnea ventilation is activated, the device automatically switches to IPPV mode once the set apnea time has elapsed.
If the BiLevel + ASB mode is unlocked in the operator menu and activated, you can choose between the IPPV mode and the BiLevel + ASB mode as the apnea ventilation mode in the operator menu.

5.3.6 $etCO_2$ trend (only with capnography option)



5-7 $etCO_2$ *trend submenu*

If the capnography option is activated, the device offers the possibility of a visualization of the $etCO_2$ value. The trend curve can be selected via the Views item in the user menu and shown on the device's display.
The trend curve shows the patient's ventilation as a graphic. The last value recorded appears on the far right of the trend curve.

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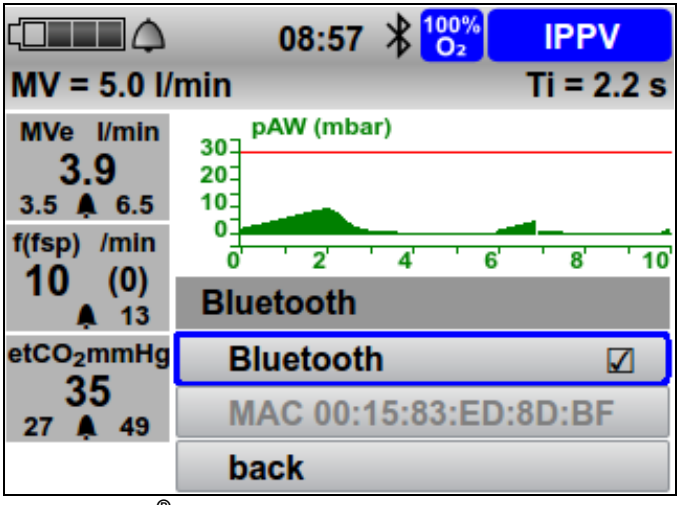
In this menu you can set the scale for the time axis of the $etCO_2$ trend. The following settings are possible: auto, 5 min., 10 min., 30 min., 60 min.,120 min. At a time setting of 5 minutes or 10 minutes, the device records the determined value every 15 seconds. At a setting of 30, 60, or 120 minutes, an average value is recorded every 30 seconds.
In the "auto" setting, the x axis is scaled automatically depending on the duration of the application.

5.3.7 Bluetooth® (only with Bluetooth data transmission option)



5-8 Bluetooth® submenu

If the **Bluetooth data transmission** option is unlocked and activated in the operator menu (see "4.14 Enabling options", page 97), you can activate and deactivate the Bluetooth® connection here. If the Bluetooth® connection is activated, an operation documentation system can connect to the device to retrieve operating data.

If you have unlocked the **Allow bluetooth pairing** function in the operator menu (see "6.3.7 Device configuration", page 125), the MAC address of the device will also be displayed in this menu. You can then pair MEDUMAT Standard^2 with an external data documentation system during the application.

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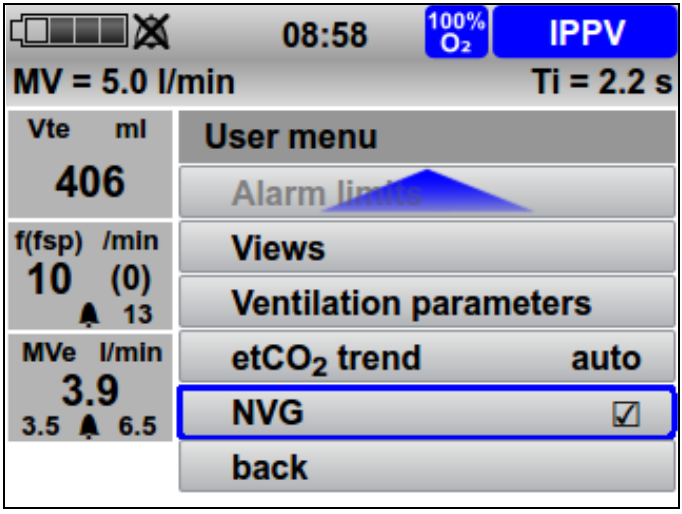
5.3.8 NVG (Night Vision Goggles)



5-9 NVG submenu

⚠ WARNING

Risk of injury from deactivated alarm light, deactivated audio alarm output and darkened display in NVG mode!
The alarms are barely perceptible as a result of the deactivated alarm light, the deactivated audio alarm output and the darkened display in NVG mode. This can injure the patient.
⇒ Always monitor patients during ventilation.
⇒ Only use the NVG option in the military sector.

You can activate the NVG mode here. When the NVG mode is activated, the device behaves as follows:

- Alarm light deactivated
- Acoustic alarm output for all alarms permanently deactivated
- Line power and battery status indicators deactivated
- Coloring of the display optimized for night vision devices
- Display brightness reduced as per preset (see "6.3.7 Device configuration", page 125)

This submenu only appears if you activate the NVG option in the operator menu (see "6.3.9 Options", page 134). This option is only permitted for use in the military sector.

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A device in NVG mode does not comply with the following standards with respect to alarm output:

- EN 60601-1-8
- EN 794-3/EN 10651-3.

The operator assumes the resulting risk for operation.

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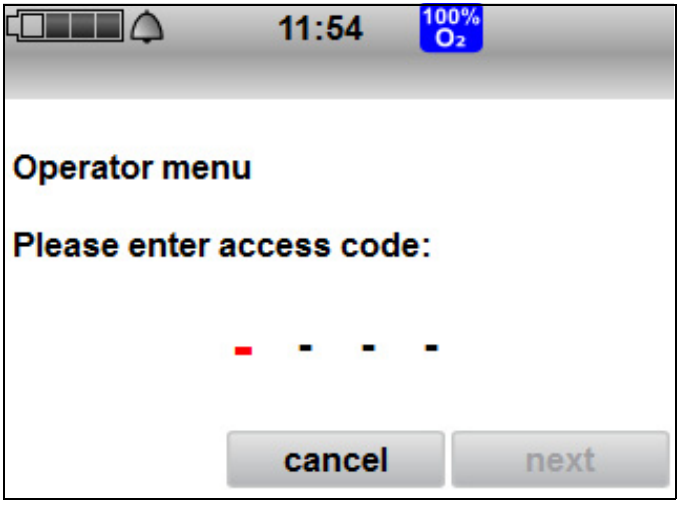
6 Operator menu

6.1 Navigating the operator menu

1. Switch on the device.
   The start menu appears.
2. Briefly press the menu button (☰).



3. Turn the right-hand navigation knob to enter the first digit of the access code.
4. Press the navigation knob **next** to confirm the first digit of the access code.
5. Enter the other digits of the access code in the same way.

On delivery, the access code for the operator menu is 0000. We recommend changing the access code so as to protect the device from undesired modification. Operator menu | Change access code.

6. Press the navigation knob **ok** to confirm the access code.
   The operator menu appears on the display.

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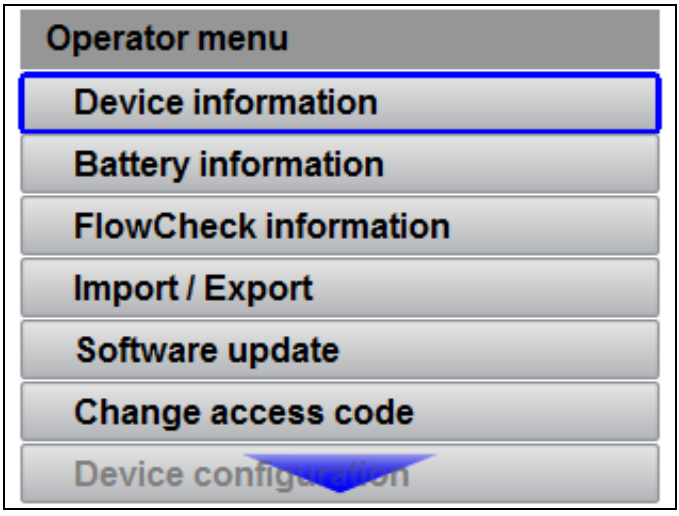
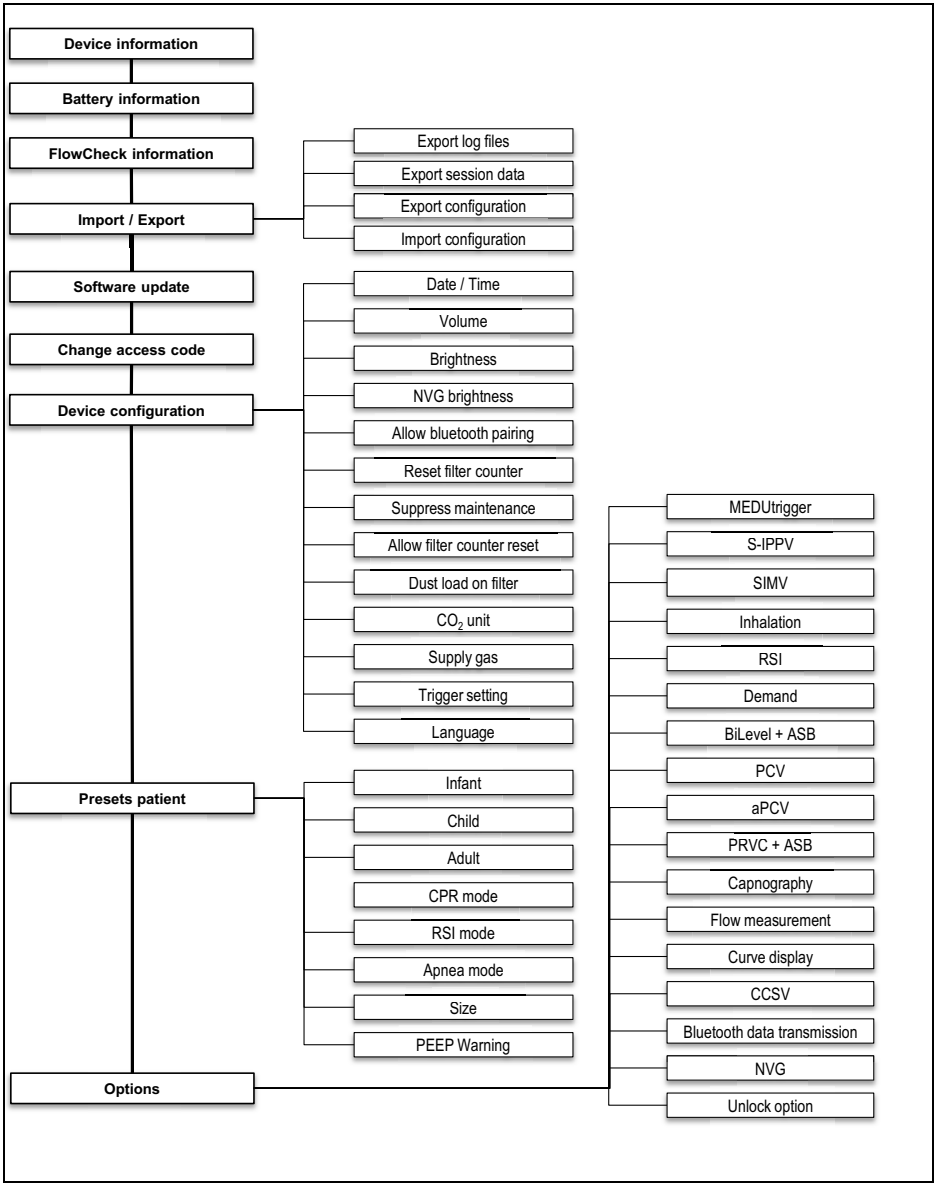


7. To select a submenu, turn one of the three navigation knobs.
8. To call up a submenu, press one of the three navigation knobs.
9. To select a desired value, turn one of the three navigation knobs.
10. To confirm a value, press one of the three navigation knobs.
11. To reset values to their original state, press the menu item **Reset**.
12. To leave the menu, press the menu item **back** until the menu closes.

Result You know how to navigate the operator menu.

6.2 Structure of the operator menu



6-1 Structure of the operator menu

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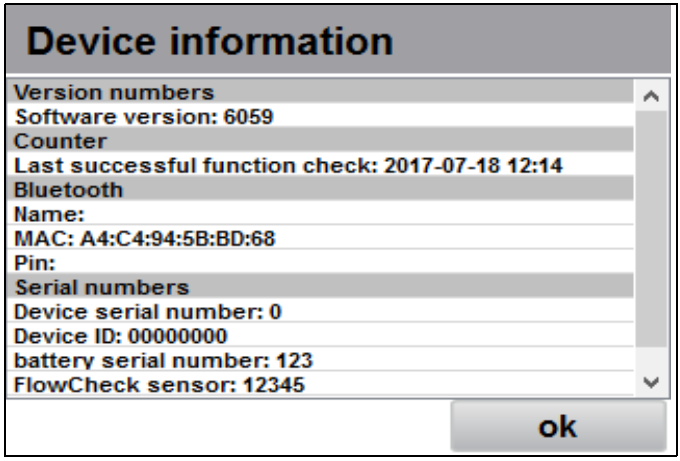
6.3 Settings in the operator menu

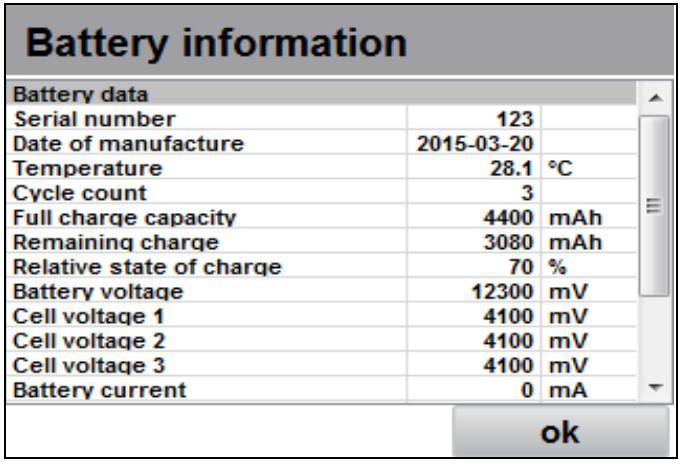
6.3.1 Device information



6-2 Device information submenu

You will find all the information on the device in this submenu.

6.3.2 Battery information



6-3 Battery information submenu

You will find all the information on the battery in this submenu.

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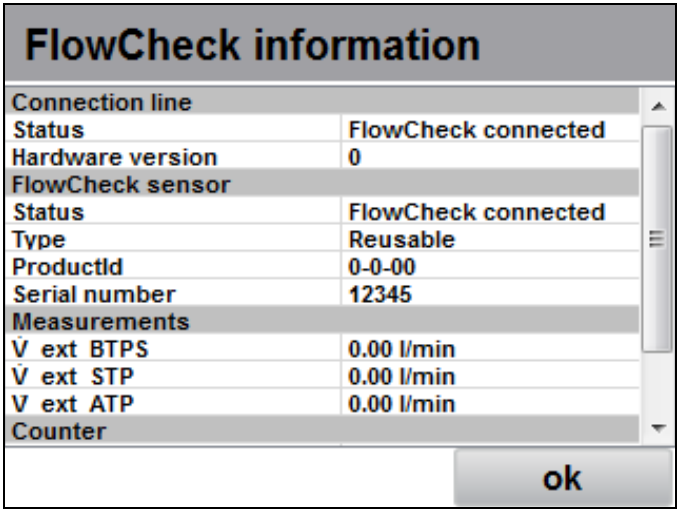
6.3.3 FlowCheck information (only with flow measurement + ASB option)



6-4 FlowCheck information submenu

You will find all the information on the FlowCheck sensor and the following connection lines in this submenu:

- FlowCheck sensor connection line
- FlowCheck sensor connection line with MEDUtrigger

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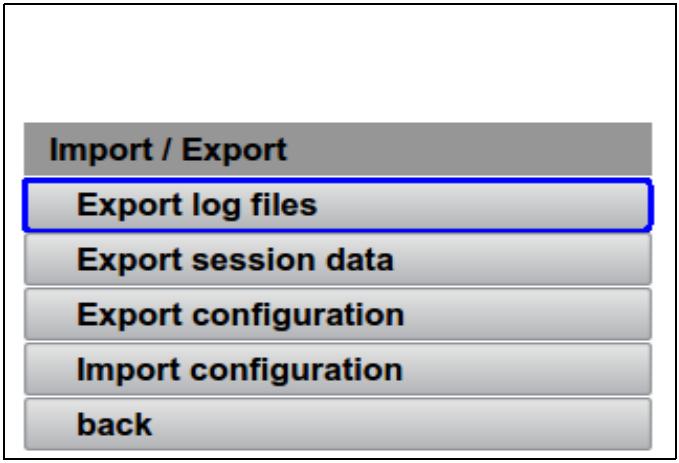
6.3.4 Import / Export



6-5 Import / Export submenu

Export log files

The device always saves the log files in its internal memory. You can export data to an SD card in order to analyze it.

Detailed information on exported log files can be found in the appendix (see "14.3 Exported log files", page 235).

Export session data

The session data logs contain detailed session data from up to 100 applications. The number of saved applications may vary depending on the session duration.
The device stores the session data in its internal memory. You can export them to an SD card to analyze the data.

Detailed information on exported log files can be found in the appendix (see "14.3 Exported log files", page 235).

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Export configuration

The **Export configuration** function allows you to export all the configuration settings made on the device to an SD card.

When exporting, all the configuration settings (including the options) are transferred with the exception of the following configuration settings:

- Date and time
- Serial number
- Device runtime
- Filter runtime
- Date of last function check
- Date of last maintenance
- Number of start-ups

Import configuration

The **Import configuration** function allows you to import the configuration settings exported to an SD card from one device onto a second device.

Following the import, the second device is configured in exactly the same way as the original device. The access code for the operator menu is also adopted.

If you do not wish to adopt the customer-specific password for the operator menu, you have two options:

- Before the export: Reset the password to **0000** and export the configuration.
- Prior to import: Set the password to **0000** before exiting the operator menu.

Configuration imports are saved in the log files. Configurations can only be transferred between devices with the same software version. Options subject to a charge are only imported if these options are already activated.

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Exporting data to an SD card

Requirement

- An SD card is in the SD card slot.
- The operator menu has been called up (see "6.1 Navigating the operator menu", page 116).

1. Select the menu item **Import / Export**.
2. Select the submenu item **Export log files**.

   or

   Select the submenu item **Export configuration**.

   The device automatically begins to export the desired data to the SD card.
3. Once the export has concluded: Press the navigation knob **ok** to confirm that all of the data has been correctly exported.
4. To leave the operator menu, press the navigation knob **back**.
5. Remove the SD card (see "4.13.2 Removing the SD card", page 96).

Result The desired data are on the SD card.

Importing a configuration onto a device

Requirement

- There must be an SD card with the desired configuration in the SD card slot.
- The operator menu has been called up (see "6.1 Navigating the operator menu", page 116).

1. Select the menu item **Import / Export**.
2. Select the submenu item **Import configuration**.
   The device automatically begins to import the configuration from the SD card.
3. Once the import has concluded: Press the navigation knob **ok** to confirm that the configuration has been correctly imported.
4. To leave the operator menu, press the navigation knob **back**.
5. Remove the SD card (see "4.13.2 Removing the SD card", page 96).

Result The desired configuration is now on the device.

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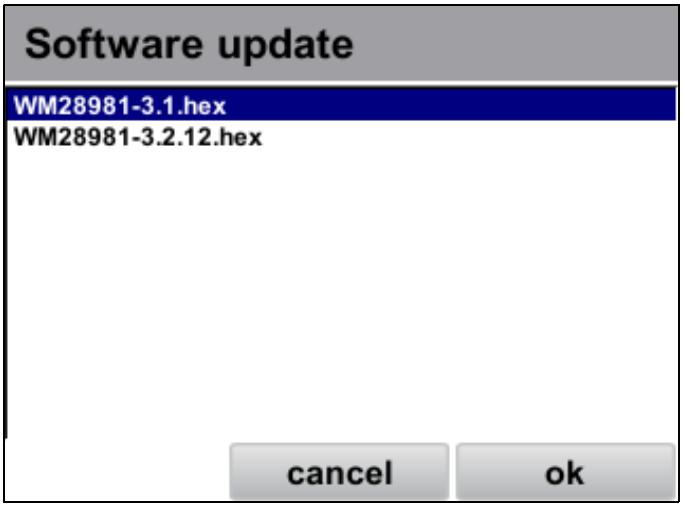
6.3.5 Software update



6-6 Software update submenu

You can update your software here (see "4.15 Updating the software", page 100).

6.3.6 Change access code

6-7 Submenu for changing the access code

Here you can change the access code for the operator menu. On delivery, the access code for the operator menu is 0000.

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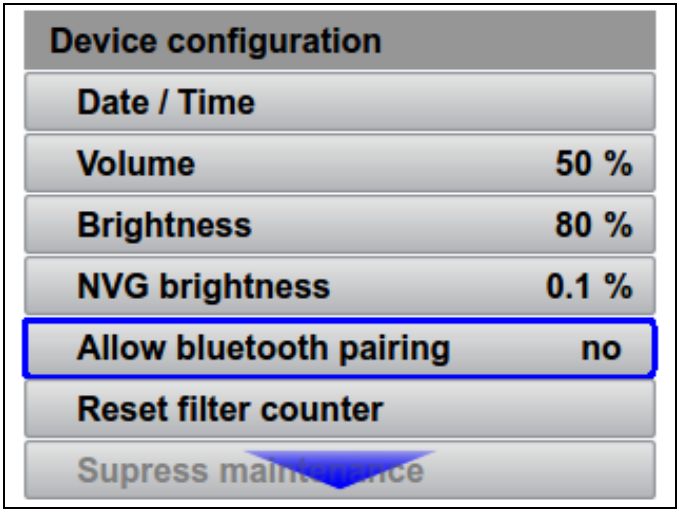
6.3.7 Device configuration



6-8 Device configuration submenu

In the submenu **Device configuration**, you can set the following parameters for the device:

Parameter	Possible values	Description
Date / Time	Year Month Day Hour Minute	Here you can set the current date and time.
Volume	50% 100%	Here you can set the volume of the acoustic signals and voice prompts.
Brightness	10% 20% 30% 40% 50% 60% 70% 80% 90% 100%	Here you can set the brightness of the display.

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Parameter	Possible values	Description
NVG brightness (only with NVG option)	0.1% to 3% in 0.1% increments 3% to 5% in 0.5% increments 5% to 10% in 1% increments 10% to 100% in 10% increments	You can set the brightness here to which the device switches when the NVG mode is activated.
Allow bluetooth pairing	Yes No	Here you can set whether the device can be paired with an external data communication system during ventilation. If this is not allowed, the device can only be paired in the operator menu.
Reset filter counter	-	Here you can reset the counter for the hygiene filter/device input filter.
Suppress maintenance	Activated Deactivated	When maintenance becomes due, you can suppress the maintenance notice within a maintenance cycle one time for a maximum of 180 days from the date maintenance is due. The device then behaves as if the maintenance were not due in terms of the reminders. It is not possible to reverse the suppression of the maintenance notice within a maintenance cycle. After the 180 days have elapsed, the maintenance notice becomes active again until the next service is performed and cannot be deactivated again. Even when the reminder has been suppressed, maintenance is still required (see "11.2 Intervals", page 205).
Allow filter counter reset	Yes No	Here you can determine whether the user is allowed to reset the hygiene filter/device input filter at any time during the function check.
Dust load on filter	100% 150% 200%	Here you can set the load caused by environmental factors (e.g., dust) for the device input filter. With an average load (**100%**), the device input filter is able to function for approx. 24 hours of ventilation in Air Mix mode, or for 6 months.

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Parameter	Possible values	Description
CO_2 unit (only with capnography option)	vol% kPa mmHG	Here you can select which unit of measurement the CO_2values should be displayed in.
Supply gas	93% O_2 100% O_2	Here you can set the type of supply gas.
Trigger setting	3 levels Units	Here you can set the inspiration and expiration trigger: • Simple three-level setting • Normal multi-level setting (in units)
Language	German (de DE) English (en US) French (fr FR) Dutch (nl NL) Spanish (es ES) Brazilian Portuguese (pt BR) Polish (pl PL) Russian (ru RU) Czech (cs CZ) Portuguese (pt PT) Korean (ko KR) Italian (it IT) Thai (th TH) Farsi (fa IR) Chinese (zh CN) Danish (da DK) Romanian (ro RO) Slovak (sk SK) Croatian (hr HR) Turkish (tr TR)	Here you can set the language of the display texts. Depending on the status of the device software, additional languages may be available. The device shows the languages in your respective language.

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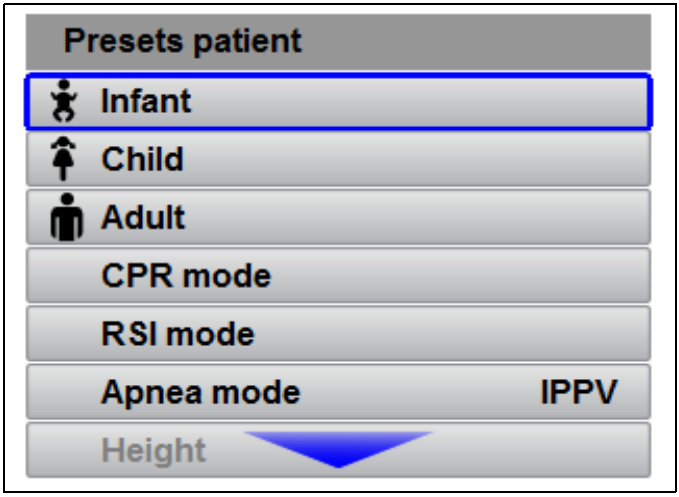
6.3.8 Presets patient



6-9 Presets patient submenu

In the **Presets patient** submenu, you can determine which presets are assigned to the ventilation parameters of the different patient groups:

⚠ WARNING

Risk of injury from different alarm presets in the same or similar devices!
Different alarm presets in the same or similar devices in different application areas can confuse the user and result in injury to the patient.
⇒ Select the same alarm presets in the same or similar devices.

⚠ WARNING

Risk of injury from deactivated alarms in the additional functions CPR and RSI!
Through deactivation in the operator menu, no alarms for flow and CO_2 monitoring are output in the additional functions CPR and RSI. This can injure the patient.
⇒ Notify the user if the alarms in the additional functions CPR and RSI have been deactivated.
⇒ Observe the alarm limits during ventilation in the additional functions CPR and RSI.

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Parameter	Possible values	Description
Infant/Child/Adult		
Emergency mode (only if the pressure-controlled ventilation modes option is activated)	IPPV BiLevel + ASB	Here you can choose between IPPV mode or BiLevel + ASB as the emergency ventilation mode per patient group.
Vt	50 ml - 2000 ml, in 50 ml increments	Here you can set the tidal volume.
pInsp (only if the pressure-controlled ventilation modes option is activated)	3 mbar - 60 mbar	Here you can set the ventilation pressure.
Freq.	5/min - 50/min	Here you can set the frequency.
I:E	1:4 to 4:1	You can specify the inspiration to expiration ratio here.
PEEP	0 mbar - 30 mbar	Here you can set the positive end-expiratory pressure.
Δ pASB (only if the Flow measurement + ASB option is activated)	0 mbar - 30 mbar	Here you can set the pressure support.
pMax	10 mbar - 65 mbar	Here you can set the maximum inspiratory pressure.
pMax CPR	10 mbar - 65 mbar	Here you can set the maximum inspiratory pressure in CPR mode.
CPR mode		
Start mode	Manual 	Here you can set with which submenu the CPR mode should be started.
Metronome		Here you can activate or deactivate the audio output of the metronome.
Metronome freq.	100/min - 120/min	Here you can set the frequency of the metronome tone.
$etCO_2$ ↑ / ↓ (only with capnography option)	☑ ☐	Here you can determine whether an alarm should be output in the event of rising or dropping end-expiratory CO_2.

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Parameter	Possible values		Description
CPR Manual/IPPV	View (only with activated capnography option)	Pressure gauge Pressure/CO_2 curve Pressure/etCO_2 trend	Here you can choose between a pressure gauge view and a curve view for the CPR mode.
	Airway pressure ↑	☑ ☐	Here you can determine whether or not an alarm should be emitted when airway pressure increases.
	CPR Manual		
	Ventilation pause	2 s - 6 s	Here you can set the time interval for ventilation between the chest compressions.
	CPR IPPV		
	MVe ↑ / ↓ / (only with flow measurement + ASB option)	☑ ☐	Here you can determine whether an alarm should be output in CPR IPPV mode in the event of rising or falling expiratory minute volume. In the CPR 30:2 and CPR 15:2 modes this alarm is deactivated as a rule.
	f ↑ / (only with flow measurement + ASB option)	☑ ☐	Here you can determine whether an alarm should be output in CPR IPPV mode in the event of a rising respiratory rate. In the CPR 30:2 and CPR 15:2 modes this alarm is deactivated as a rule.
	Interval cont.	20 s - 60 s	Here you can set the maximum duration of the ventilation interval for the analysis phase of the defibrillator during the continuous ventilation.

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Parameter	Possible values		Description
CPR CCSV	pInsp	40 mbar - 60 mbar	Here you can set the ventilation pressure.
	Trigger	1 - 3	Here you can set the trigger for the CCSV mode.
	Hands-off time ↑	10 s - 55 s	Here you can set when the hands-off time alarm ↑ should appear.
	Time to back-up ventilation	30 s - 60 s	Here you can set when the back-up ventilation should be initiated. The hands-off time is always less than the time to back-up ventilation.
	f CCSV ↑ / ↓	80/140 90/130 100/120	You can set the alarm limit for the chest compression rate here.
	f CCSV ↑ / ↓ alarm	☑ ☐	Here you can determine whether or not an alarm should be emitted if the compression rate is too slow or too fast.
	Airway pressure ↓	☑ ☐	Here you can determine whether or not an alarm should be emitted when airway pressure decreases.
RSI mode (only with flow measurement + ASB option or capnography option)			
View (only if the capnography option is activated)	Pressure gauge Pressure/CO_2 curve		Here you can choose between a pressure gauge view and a curve view for the RSI mode.
Contin. mode (only if the pressure-controlled ventilation modes option is activated)	IPPV BiLevel + ASB		Here you can determine whether the device switches to IPPV mode or BiLevel + ASB mode after RSI Manual.
MVe ↑ / ↓ (only with flow measurement + ASB option)	☑ ☐		Here you can determine whether an alarm should be output in RSI Demand mode in the event of rising or falling expiratory minute volume. In the RSI Manual mode this alarm is deactivated as a rule.
f ↑ (only with flow measurement + ASB option)	☑ ☐		Here you can determine whether an alarm should be output in RSI Demand mode in the event of a rising respiratory rate. In the RSI Manual mode this alarm is deactivated as a rule.

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Parameter	Possible values	Description
$etCO_2$ ↑ / ↓ (only with capnography option)	☑ ☐	Here you can determine whether an alarm should be output in the event of rising or dropping end-expiratory CO_2.
Apnea mode (only if the uncontrolled ventilation modes option is activated)		
	IPPV BiLevel + ASB	Here you can set the apnea ventilation mode for the CPAP and CPAP + ASB modes.
Size		
Vt per kg bodyweight	4 ml/kg - 10 ml/kg	Here you can set the tidal volume in milliliters per kilogram body weight. In the process, a variable is used to convert the height to a tidal volume (see "14.2 Calculation of body weight on the basis of body height", page 234).
PEEP Warning		
	1 mbar - 21 mbar	Here you can set a limit value for the positive end-expiratory pressure. A warning is then given on the display if this value is reached or exceeded. In this case, the **PEEP** field in the bottom right of the display turns red.

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Setting height*

Depending on the height selected (tidal volume Vt in ml per kg bodyweight) the height which can be set is restricted to the following minimum values:

Tidal volume Vt in ml per kg bodyweight	Minimum height which can be set in cm
4	90
5	80
6	70
7	65
8	60
9	55
10	50

For the smallest height which can be set, the tidal volume is always at least 50 ml.

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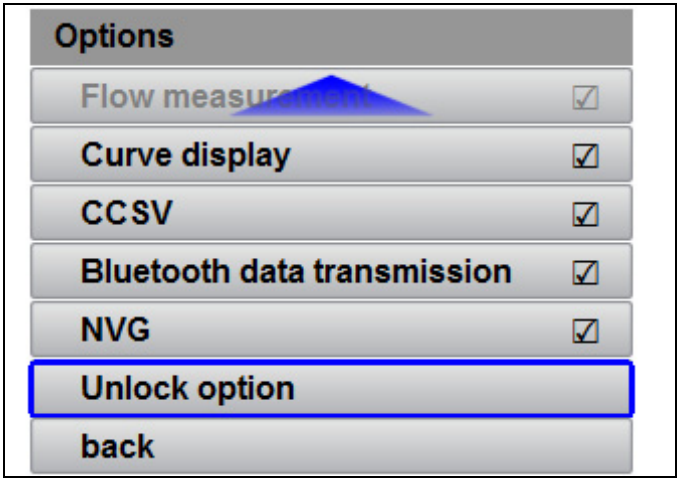
6.3.9 Options



6-10 Options submenu

As the operator, you can unlock new options for the user in the menu item **Unlock option** (see "4.14 Enabling options", page 97) and activate or deactivate the unlocked options.

Options	Description
MEDUtrigger	Enables connection of the MEDUtrigger to the device and use of the MEDUtrigger in CPR mode.
S-IPPV	Enables the S-IPPV ventilation mode.
SIMV	Enables the SIMV ventilation mode.
Inhalation	Enables the additional function Inhalation.
RSI	Enables the additional function RSI.
Demand	Enables the additional function Demand.
BiLevel + ASB	Enables the BiLevel + ASB pressure-controlled ventilation mode.
PCV	Enables the PCV pressure-controlled ventilation mode.
aPCV	Enables the aPCV pressure-controlled ventilation mode.

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Options	Description
PRVC + ASB	Enables the PRVC + ASB pressure-controlled ventilation mode.
Capnography	Enables CO_2 measurement and display of the CO_2 curve. For CO_2 measurement you require a device with CO_2 measuring.
Flow measurement	Enables flow measurement with the FlowCheck sensor and the following ventilation modes: • CPAP + ASB • SIMV + ASB
Curve display (only with simultaneously activated flow measurement + ASB option)	Enables display of the following curves: • Pressure • Flow
CCSV	Enables the CCSV pressure-controlled ventilation mode.
Bluetooth® data communication	Allows communication of ventilation data to an external documentation system via Bluetooth®.
NVG	Enables use of the device with night vision devices. This option is only permitted for use in the military sector (see "5.3.8 NVG (Night Vision Goggles)", page 114).
Unlock option	You can unlock the software options here using an option code (see "4.14 Enabling options", page 97).

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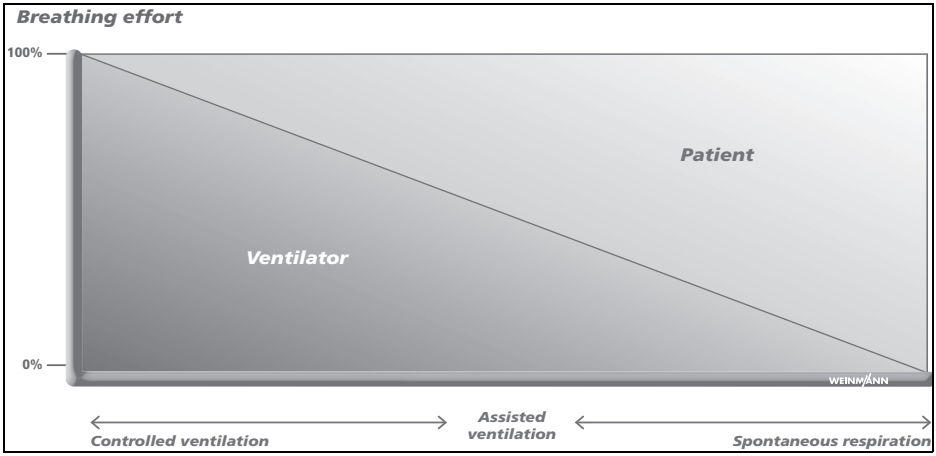
7 Description of the modes

7.1 Classification of the ventilation modes



The following ventilation modes are possible with this device:

Control parameter	Controlled ventilation	Assisted ventilation	Spontaneous respiration
Pressure	CCSV PCV	aPCV BiLevel + ASB PRVC + ASB	CPAP CPAP + ASB RSI Demand Demand
Volume	IPPV CPR RSI Manual	S-IPPV SIMV SIMV + ASB	

Depending on the options activated in the operator menu, there are different ventilation modes available in the device.

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There are the following trigger options in the individual ventilation modes:

Ventilation mode	Inspiration trigger	Expiration trigger	Trigger time slot for mandatory breaths	ASB breath
IPPV	No	No	No	No
BiLevel + ASB	Yes	Yes	20% of Te	Yes
CPAP	No	No	No	No
CPAP + ASB	Yes	Yes	No	Yes
aPCV	Yes	No	Can be set from 0% - 100% of Te	No
PCV	No	No	No	No
PRVC + ASB	Yes	Yes	20% of Te	Yes
SIMV	Yes, permanently set	No	20% of Te	No
SIMV + ASB	Yes	Yes	20% of Te	Yes
S-IPPV	Yes (can be set with flow measurement + ASB option)	No	100% of Te	No
RSI Demand	Yes, permanently set	Yes, permanently set	No	No
RSI Manual	No	No	No	No
CPR	No	No	No	No
Demand	Yes, permanently set	Yes, permanently set	No	No
CCSV	Yes, can be set from level 1 to 3	No	No	No

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7.2 Ventilation parameters

Ventilation parameters	Unit	Description
Vt	ml	Tidal volume (breath volume)
Freq.	1/min	Ventilation rate
pMax	mbar	Maximum inspiratory pressure
PEEP	mbar	Positive end-expiratory pressure (CPAP)
Air Mix	-	Ventilation through the addition of ambient air
93% oxygen	-	Ventilation with concentrator oxygen
100% oxygen	-	Ventilation with 100% oxygen
Δ pASB (only with flow measurement + ASB option)	mbar	Pressure support (relative to the set PEEP)
InTr level (only if the flow measurement + ASB option is activated)	-	Inspiratory trigger (three-level setting)
ExTr level (only if the flow measurement + ASB option is activated)	-	Expiratory trigger (three-level setting)
InTr (only if the flow measurement + ASB option is activated)	l/min	Inspiratory trigger (setting with units)
ExTr (only if the flow measurement + ASB option is activated)	% Flow max	Expiratory trigger (setting with units)
I:E	-	Inspiration to expiration ratio
(only if the flow measurement + ASB option is activated)	-	Pressure increase time
Trigger time slot (only in aPCV mode if the pressure-controlled ventilation modes option is activated)	% Te	Trigger time slot

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- If the flow measurement + ASB option is not activated: With a set PEEP value > 0 mbar, the patient must create an underpressure of at least -1.3 mbar below the set PEEP value through his/her spontaneous respiratory effort in order to initiate an inspiratory trigger in the device.
- If the flow measurement + ASB option is not activated: If no PEEP value has been set (PEEP value = 0), the patient must create an underpressure of at least -0.8 mbar in order to initiate an inspiratory trigger. When using assisted ventilation modes, ensure that the patient shows sufficient respiratory effort. If this is not the case, the trigger sensitivity can be increased by setting a PEEP value > 2 mbar. If the patient is still not able to initiate a trigger, the mandatory rate must be set accordingly high to ensure adequate ventilation of the patient.
- If the flow measurement + ASB option is activated, you can set the inspiratory trigger independently of the PEEP.
- When the device switches to CPR mode, the PEEP value is automatically set to 0 mbar.
- When the device switches from CPR mode to another ventilation mode, it automatically changes from the preset pMax value for CPR to the preset pMax value for all other ventilation modes (see "6.3.8 Presets patient", page 128).
- The ventilation parameters are interdependent. Example: pMax is always larger than the PEEP value.

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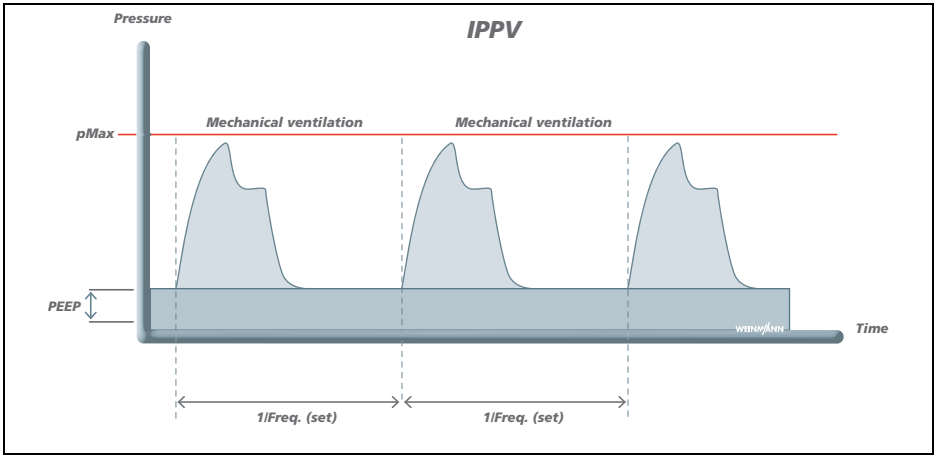
7.3 Ventilation modes

7.3.1 IPPV mode

Description	
Abbreviation	IPPV
Long form	Intermittent Positive Pressure Ventilation
Type	Volume-controlled
Requirement	None
Ventilation parameters	
Left-hand navigation knob	Vt
Central navigation knob	Freq.
Right-hand navigation knob	• PEEP • pMax • I:E • Emergency mode



The IPPV mode is used for mandatory volume-controlled ventilation with a fixed tidal volume. This mode is used on patients who have no spontaneous respiration. However, a spontaneously breathing patient can breathe deeply and freely during expiration. The set maximum pressure limitation (pMax) ensures the safety of the patient.

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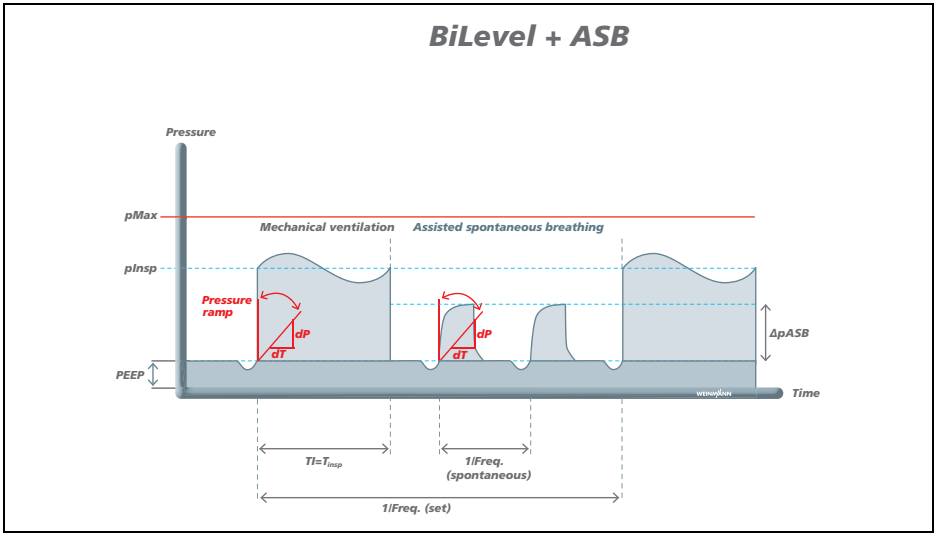
7.3.2 BiLevel + ASB mode

Description	
Abbreviation	BiLevel + ASB
Long form	Ventilation at two pressure levels + Assisted Spontaneous Breathing
Type	Pressure-controlled
Requirement	• Flow measurement + ASB option is activated • Pressure-controlled ventilation modes option is activated • Curve display option is activated
Ventilation parameters	
Left-hand navigation knob	pInsp
Central navigation knob	Freq.
Right-hand navigation knob	PEEP pMax Δ pASB InTr I:E Emergency mode



The BiLevel + ASB mode is used for pressure-controlled ventilation combined with free spontaneous respiration at pressure levels pInsp and PEEP during the entire breathing cycle and for adjustable pressure support at PEEP level. This mode is used on patients who have no spontaneous respiration or on spontaneously breathing patients. The patient can trigger a mandatory, pressure-controlled mechanical breath during a predetermined trigger time slot. The trigger time slot is 20% of the expiration time Te before the anticipated mandatory mechanical breath. For the rest of the time, the patient can breathe spontaneously or with the aid of pressure support. Tidal volume and minute volume are determined by the set pInsp, lung compliance and the set inspiration time T_i.

7.3.3 CPAP mode

Description	
Abbreviation	CPAP
Long form	Continuous Positive Airway Pressure
Type	Pressure-controlled
Requirement	None
Ventilation parameters	
Left-hand navigation knob	-
Central navigation knob	-
Right-hand navigation knob	• PEEP • pMax • Emergency mode

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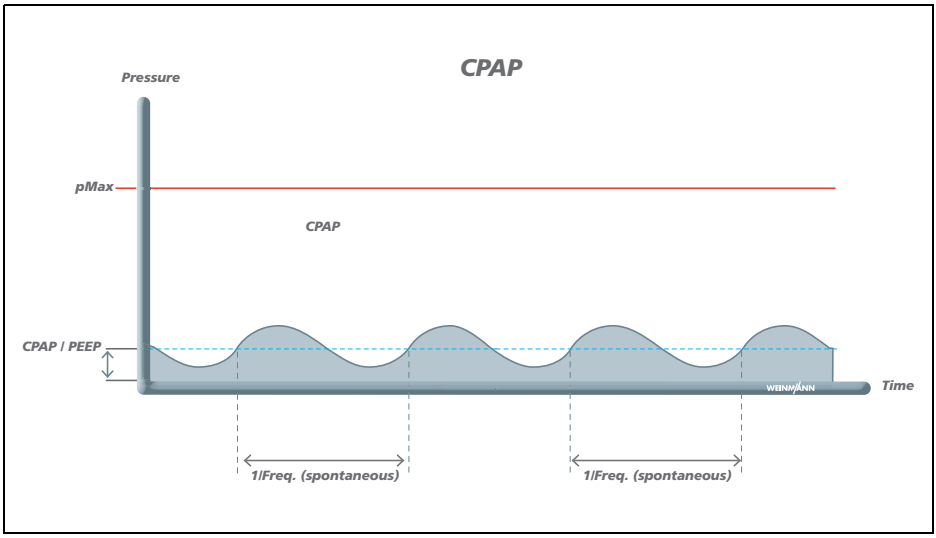


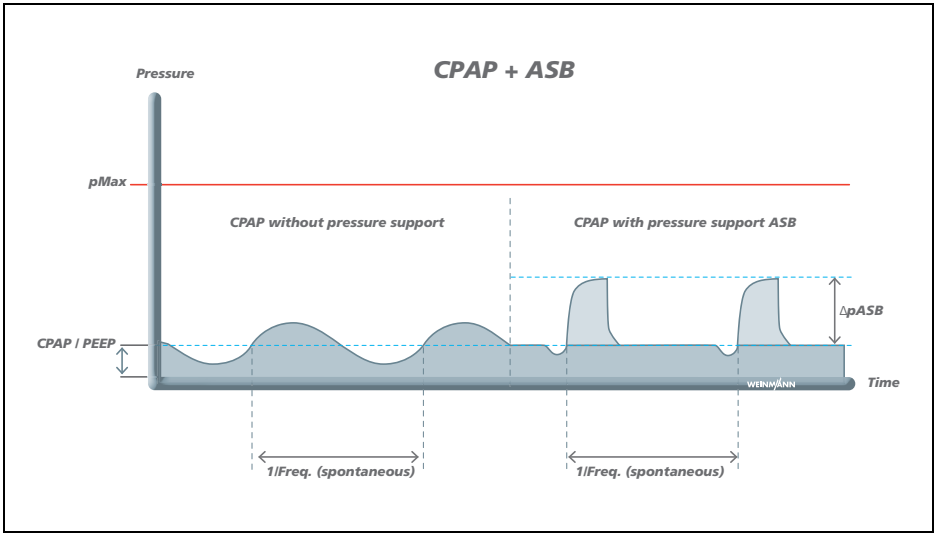
The set value CPAP/PEEP is used to increase the pressure level of respiration in order to raise the functional residual capacity (FRC) of a spontaneously breathing patient. The patient is able to breathe spontaneously without any restriction at the set pressure level. The CPAP mode is used exclusively on patients with adequate spontaneous respiration.

In principle, the pressure is set at the end of expiration (PEEP). The set maximum pressure limitation (pMax) ensures the safety of the patient.

7.3.4 CPAP + ASB mode

Description	
Abbreviation	CPAP + ASB
Long form	Continuous Positive Airway Pressure + Assisted Spontaneous Breathing
Type	Pressure-controlled
Requirement	Flow measurement + ASB option is activated

Ventilation parameters	
Left-hand navigation knob	InTr
Central navigation knob	Δ pASB
Right-hand navigation knob	• PEEP • pMax • ExTr • Emergency mode



The CPAP + ASB mode can be separated into its individual elements:

- The set value CPAP/PEEP is used to increase the pressure level of respiration in order to raise the functional residual capacity (FRC) of a spontaneously breathing patient.
- The ASB function is used for pressure support of insufficient or exhausted spontaneous respiration. The patient is able to breathe spontaneously without any restriction, but is supported in his breathing effort by the device.

The CPAP + ASB mode is used exclusively on patients with adequate spontaneous respiration.

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In principle, the pressure is set at the end of expiration (PEEP). If necessary, the pressure support (Δ pASB) can be switched on. Ventilation can be individually adjusted to suit the patient with the aid of the inspiratory and expiratory triggers. The inspiratory trigger indicates a sensitivity for triggering pressure support. The expiratory trigger determines when the device interrupts pressure support. This allows the administered volume and the inspiration time to be set indirectly.

The set maximum pressure limitation (pMax) ensures the safety of the patient.

7.3.5 aPCV mode

⚠ WARNING

Risk of hyperventilation!
When using the aPCV mode, the CO_2 concentration in the patient's blood can drop and injure the patient.
⇒ Monitor the patient continuously.

⚠ WARNING

Risk of air trapping!
When using the aPCV mode, air can become trapped in the patient's lung. This results in a reduced gas exchange and can injure the patient.
⇒ Monitor the airway pressure continuously.

⚠ WARNING

Risk of intrinsic PEEP!
An expiration that is too short can cause the pressure to increase slowly at the end of the expiration and injure the patient.
⇒ Set the pressure limitation correctly.
⇒ Monitor the patient continuously.

Description	
Abbreviation	aPCV
Long form	Assisted Pressure Controlled Ventilation
Type	Pressure-controlled
Requirement	• Flow measurement + ASB option is activated • Pressure-controlled ventilation modes option is activated • Curve display option is activated

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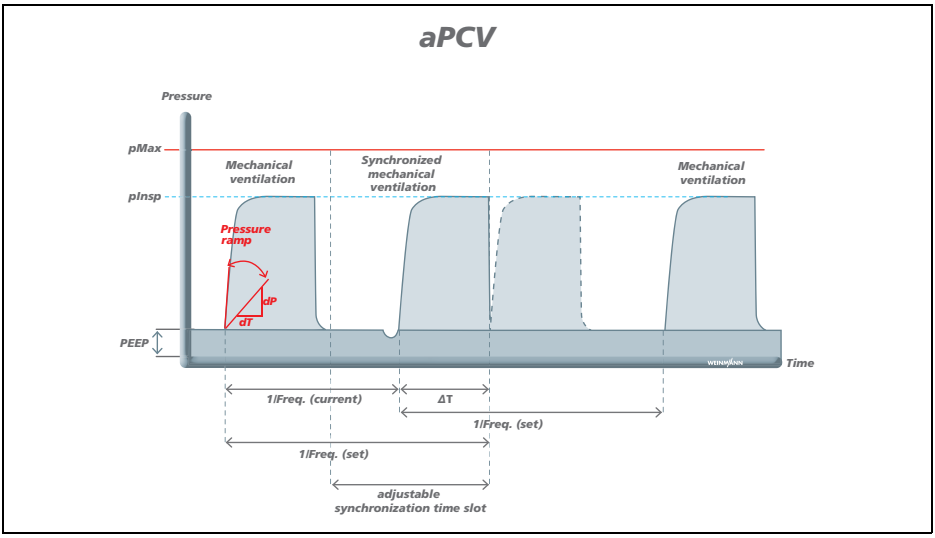
Ventilation parameters	
Left-hand navigation knob	pInsp
Central navigation knob	Freq.
Right-hand navigation knob	PEEP pMax InTr I:E Emergency mode



The aPCV mode is used for pressure-controlled, assisted ventilation at a fixed mandatory ventilation rate. In case of spontaneous respiration, the patient has the possibility of increasing the rate and consequently the minute volume. If the patient displays a spontaneous respiratory effort within a specified time slot of the expiration, the mandatory mechanical breath is synchronized with the patient's respiration. The time slot or trigger time slot can be set in % of T_e before the next expected mandatory mechanical breath. If the patient displays a spontaneous respiratory effort outside of the set trigger time slot, no mandatory mechanical breath is triggered.

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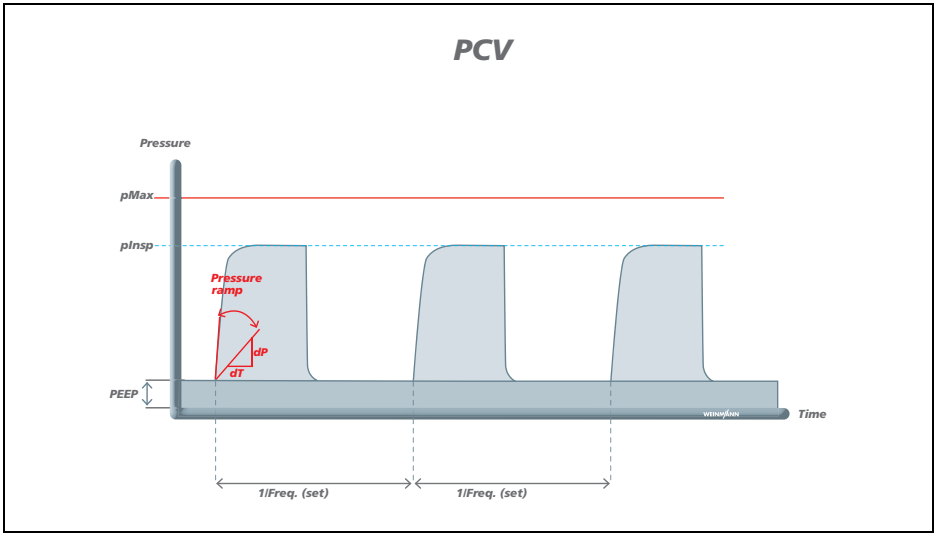
7.3.6 PCV mode

Description	
Abbreviation	PCV
Long form	Pressure Controlled Ventilation
Type	Pressure-controlled
Requirement	• Flow measurement + ASB option is activated • Pressure-controlled ventilation modes option is activated • Curve display option is activated
Ventilation parameters	
Left-hand navigation knob	pInsp
Central navigation knob	Freq.
Right-hand navigation knob	PEEP pMax I:E Emergency mode



The PCV mode is used for mandatory pressure-controlled ventilation with fixed pressure levels. This mode is used on patients who have no spontaneous respiration. However, a spontaneously breathing patient can breathe deeply and freely during expiration. The set maximum pressure limitation (pMax) ensures the safety of the patient.

7.3.7 PRVC + ASB mode

Description	
Abbreviation	PRVC + ASB
Long form	Pressure Regulated Volume Controlled Ventilation + Assisted Spontaneous Breathing
Type	Pressure-controlled
Requirement	• Flow measurement + ASB option is activated • Pressure-controlled ventilation modes option is activated • Curve display option is activated
Ventilation parameters	
Left-hand navigation knob	Vt
Central navigation knob	Freq.
Right-hand navigation knob	PEEP pMax Δ pASB InTr I:E Emergency mode

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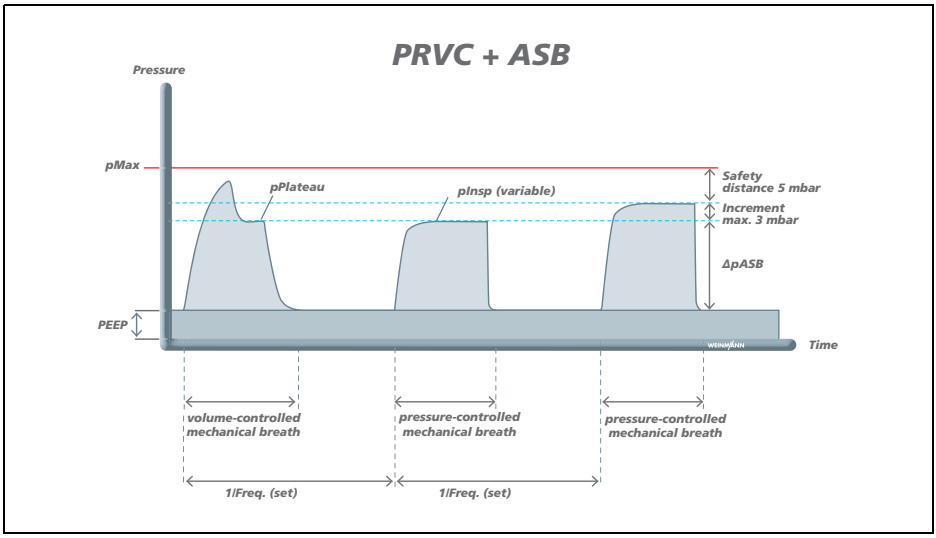

The controlled PRVC + ASB mode combines the advantages of both pressure-controlled ventilation and volume-controlled ventilation. The set tidal volume is applied with the minimum ventilation pressure possible. Ventilation begins with three volume-controlled breaths with the set tidal volume and decreasing flow. The volume-controlled breaths have a plateau time of 50% of the configured inspiration time T_i. The device selects the measured plateau pressure as the starting value for the inspiratory pressure pInsp of the following pressure-controlled ventilation. It measures the administered volumes and adjusts the ventilation pressure accordingly. If the lung parameters change during ventilation, the device alters the inspiratory pressure pInsp in increments of a maximum of 3 mbar in order to achieve the set tidal volume again and thereby automatically compensate for changes in the patient. Measuring the applied volume is improved by compensating hose compliance. This enables precise control of the required tidal volume, in particular of small tidal volumes under high airway pressures. The set maximum pressure limitation (pMax) ensures the safety of the patient. For safety reasons, the inspiratory pressure pInsp is 5 mbar below the set maximum pressure limitation (pMax).

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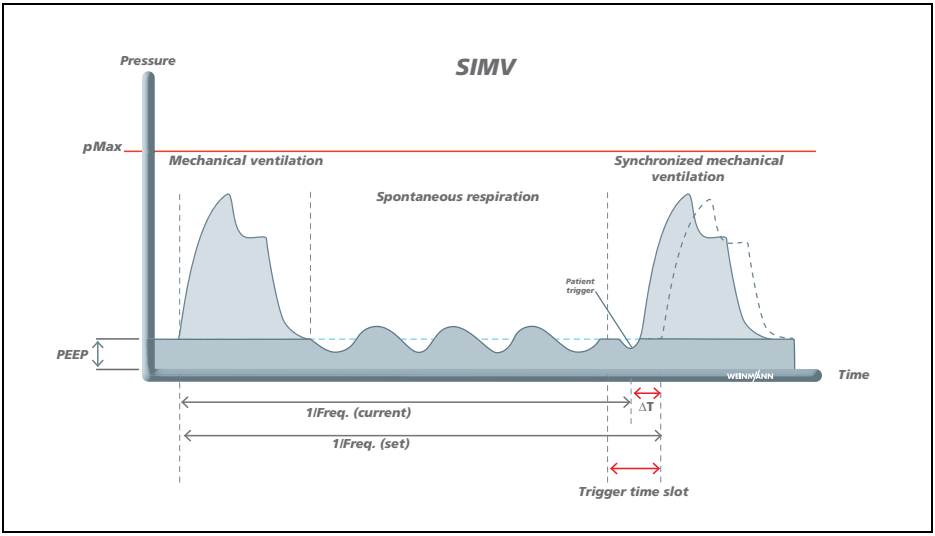
Once the maximum ventilation pressure (pMax-5 mbar) is achieved, the device administers as much volume as possible. If this volume deviates from the set tidal volume, the device triggers the medium-priority alarm "Vt not achievable".

7.3.8 SIMV mode

Description	
Abbreviation	SIMV
Long form	Synchronized Intermittent Mandatory Ventilation
Type	Volume-controlled
Requirement	SIMV option is activated
Ventilation parameters	
Left-hand navigation knob	Vt
Central navigation knob	Freq.
Right-hand navigation knob	• PEEP • pMax • I:E • Emergency mode



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The SIMV mode is used for volume-controlled ventilation with a fixed mandatory minute volume. The patient can breathe spontaneously between the mandatory mechanical breaths and thereby increase the minute volume. During spontaneous respiration, the mandatory mechanical breath is synchronized with the patient's breathing. The mandatory minute volume and the mandatory respiration rate remain unchanged. The set maximum pressure limitation (pMax) ensures the safety of the patient.

7.3.9 SIMV + ASB mode

Description	
Abbreviation	SIMV + ASB
Long form	Synchronized Intermittent Mandatory Ventilation + Assisted Spontaneous Breathing
Type	Volume-controlled
Requirement	• SIMV option is activated • Flow measurement + ASB option is activated
Ventilation parameters	
Left-hand navigation knob	Vt
Central navigation knob	Freq.
Right-hand navigation knob	• PEEP • pMax • Δ pASB • InTr • ExTr (does not appear if at least one pressure-controlled ventilation mode is activated) • I:E • Emergency mode

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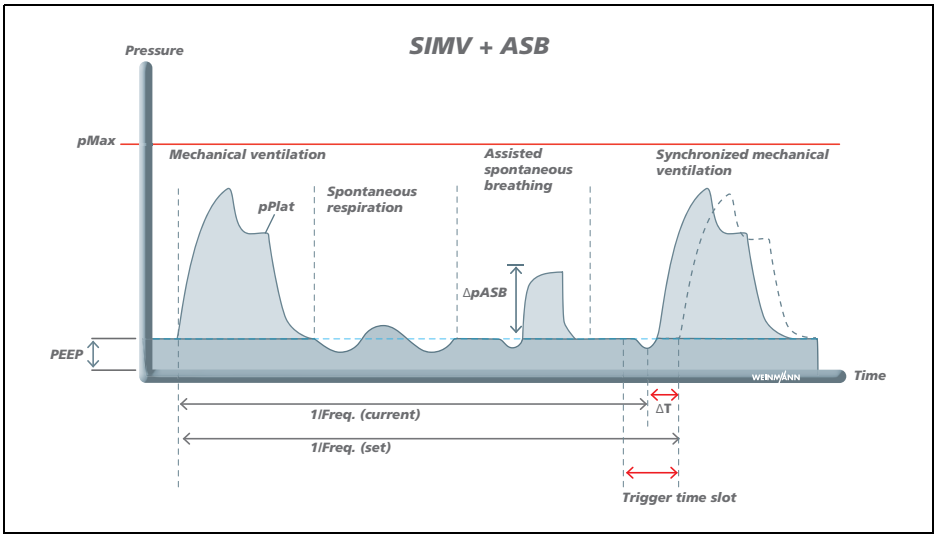

The SIMV + ASB mode is used for volume-controlled ventilation with a fixed mandatory minute volume. The patient can breathe spontaneously between the mandatory mechanical breaths and thereby increase the minute volume. During spontaneous respiration, the mandatory mechanical breath is synchronized with the patient's breathing. The mandatory minute volume and the mandatory respiration rate remain unchanged. The set maximum pressure limitation (pMax) ensures the safety of the patient. The patient can trigger a mandatory, pressure-controlled mechanical breath during a predetermined trigger time slot. The trigger time slot is available in the final 20% of expiration time Te. For the rest of the time, the patient can breathe spontaneously or with the aid of pressure support (see "7.3.4 CPAP + ASB mode", page 143).

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7.3.10 S-IPPV mode

⚠ WARNING

Risk of hyperventilation!
When using the S-IPPV mode, the CO_2 concentration in the patient's blood can drop and injure the patient.
⇒ Monitor the patient continuously.

⚠ WARNING

Risk of air trapping!
When using the S-IPPV mode, air can become trapped in the patient's lung. This results in a reduced gas exchange and can injure the patient.
⇒ Monitor the airway pressure continuously.

⚠ WARNING

Risk of intrinsic PEEP!
An expiration that is too short can cause the pressure to increase slowly at the end of the expiration and injure the patient.
⇒ Set the pressure limitation correctly.
⇒ Monitor the patient continuously.

Description	
Abbreviation	S-IPPV
Long form	Synchronized Intermittent Positive Pressure Ventilation
Type	Volume-controlled
Requirement	S-IPPV option is activated
Ventilation parameters	
Left-hand navigation knob	Vt
Central navigation knob	Freq.
Right-hand navigation knob	• PEEP • pMax • InTr (only if the flow measurement + ASB option is activated) • I:E • Emergency mode

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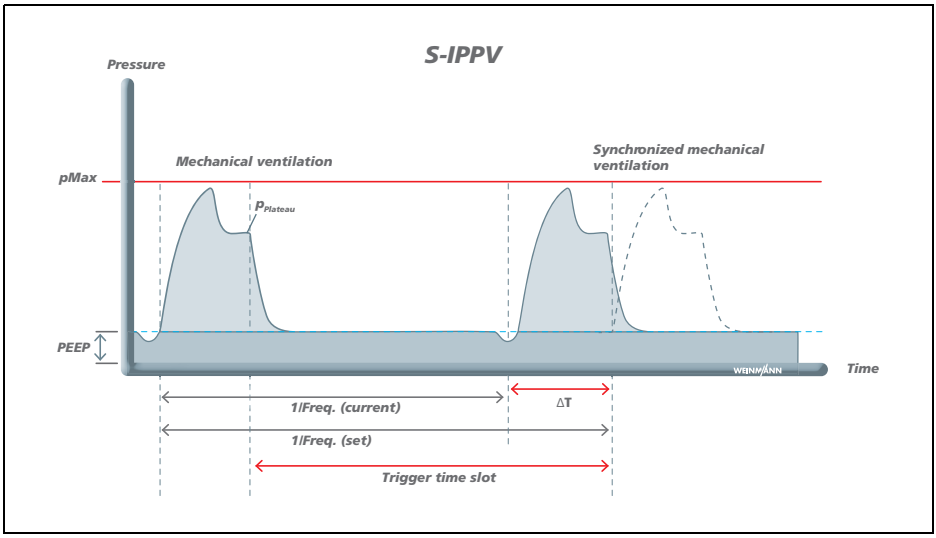

The S-IPPV mode is used for volume-controlled ventilation with a variable mandatory minute volume. Throughout the entire expiration phase, a trigger is active which enables the patient to trigger a new breath. This means the patient has the option of increasing the respiratory rate and therefore the minute volume, and adapting these to his/her needs. As a rule this mode is used on patients who have inadequate spontaneous respiration.

Ventilation in the S-IPPV mode corresponds to ventilation in the IPPV mode with the difference that it is possible to synchronize ventilation with the patient's efforts to inhale. Since the setting for the respiratory rate is lower, the patient can trigger mandatory mechanical breaths spontaneously. A trigger time slot extending throughout the expiration time is available for this synchronization.

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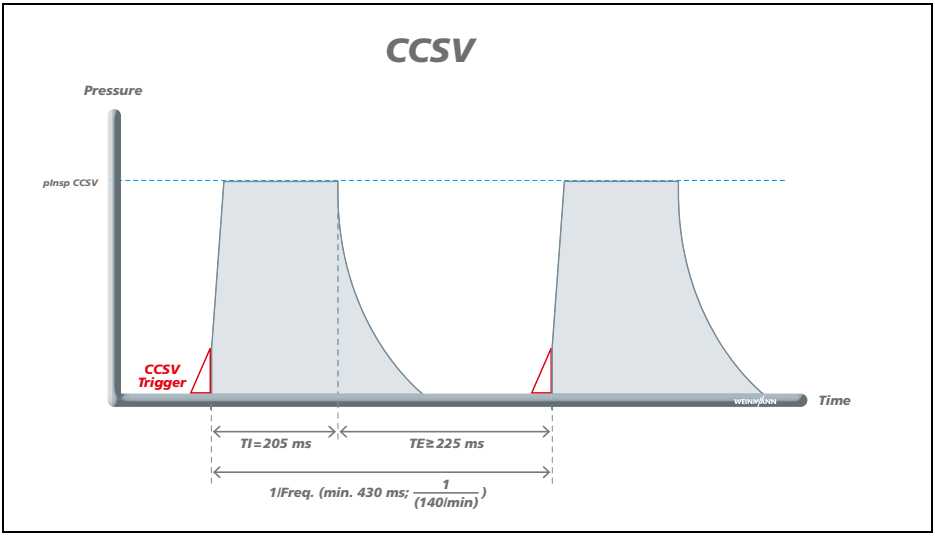
7.3.11 CCSV mode

⚠ WARNING

Risk of injury due to unsecured airway!
If the CCSV mode is used, an unsecured airway can result in insufflation of the stomach and cause injury to the patient.
⇒ Secure the airway.

Description	
Abbreviation	CCSV
Long form	Chest Compression Synchronized Ventilation
Type	Pressure-controlled
Requirement	• Flow measurement + ASB option is activated. • CCSV option is activated
Ventilation parameters	
Left-hand navigation knob	pInsp
Central navigation knob	•  • 
Right-hand navigation knob	• Manual/  • CCSV/IPPV • Trigger



The CCSV mode is a pressure-controlled ventilation mode employed specially and exclusively for resuscitation ventilation during continuing chest compression. The ventilation mode offers you support during cardiopulmonary resuscitation (in accordance with the resuscitation guidelines) by applying a defined pressure into the lungs in time with every chest compression and switches to expiration during the chest decompression phase.
The set inspiratory pressure corresponds to the maximum pressure limit at the same time.

7.4 Additional functions

7.4.1 CPR mode

⚠ WARNING

Risk of injury from deactivated alarms in the additional functions CPR and RSI!
Through deactivation in the operator menu, no alarms for flow and CO_2 monitoring are output in the additional functions CPR and RSI. This can injure the patient.
⇒ Notify the user if the alarms in the additional functions CPR and RSI have been deactivated.
⇒ Observe the alarm limits during ventilation in the additional functions CPR and RSI.

Description			
Abbreviation	CPR Manual	CPR IPPV	CPR CCSV
Long form	Cardiopulmonary Resuscitation		
Type	Volume-controlled		Pressure-controlled
Requirement	None	None	• Flow measurement + ASB option is activated • CCSV option is activated

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Ventilation parameters			
Left-hand navigation knob	Vt	Vt	pInsp
Central navigation knob	-	Freq.	•  • 
Right-hand navigation knob	• Manual/ • pMax	• Manual/ • CCSV/ IPPV • Interval • pMax • PEEP	• Manual/ • CCSV/IPPV • Trigger

The CPR mode supports you during cardiopulmonary resuscitation (according to the Resuscitation Guidelines). MEDUMAT Standard^2 emits a metronome sound which dictates the frequency of the chest compressions according to the algorithm 15:2 or 30:2 or continuously (in the case of intubated patients).
When the Infant or Child patient group is selected, the metronome automatically emits the tone in the rate 15:2 in CPR Manual mode. When the Adult patient group is selected, a rate of 30:2 is emitted in CPR Manual mode.
The metronome can be deactivated in the operator menu.

During the analysis of the defibrillator, you can pause continuous ventilation in order to avoid artifacts in the analysis of the defibrillator.

The MEDUtrigger supplied supports the algorithms 15:2 and 30:2. With these algorithms, 15 or 30 metronome beats are emitted in each case, of which the last five sounds have a rising tone frequency and thus announce the imminent ventilation phase. In the ventilation phase, you administer the mechanical breaths manually via MEDUtrigger. The I:E ratio is always 1:1. The set maximum pressure limitation (pMax) ensures the safety of the patient.

Air Mix switches off automatically when CPR mode is started. You cannot activate Air Mix in the CPR Manual and CPR CCSV modes. You can activate Air Mix in CPR IPPV mode. The Air Mix setting is retained upon exiting CPR mode.

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If you do not perform chest compressions for an extended period of time in CPR CCSV mode, the device returns to IPPV back-up ventilation after the time preset in the operator menu. As soon as you recommence chest compressions, the device automatically returns to CSSV ventilation.

The device always switches to IPPV mode upon exiting CPR mode.

If the capnography option is activated, you can set a pressure gauge view or curve view in CPR mode (see "6.3.8 Presets patient", page 128).

7.4.2 RSI mode

⚠ WARNING

Risk of injury from deactivated alarms in the additional functions CPR and RSI!

Through deactivation in the operator menu, no alarms for flow and CO_2 monitoring are output in the additional functions CPR and RSI. This can injure the patient.

⇒ Notify the user if the alarms in the additional functions CPR and RSI have been deactivated.

⇒ Observe the alarm limits during ventilation in the additional functions CPR and RSI.

Description	
Abbreviation	RSI
Long form	Rapid Sequence Induction
Type	Volume-controlled
Requirement	None
Ventilation parameters	
Left-hand navigation knob	Vt (only with RSI Manual)
Central navigation knob	-
Right-hand navigation knob	• pMax • Demand, manual, contin. • Emergency mode

The RSI mode supports you in the induction of anesthesia (TIVA). It is used on all patients with an increased risk of a pulmonary aspiration.

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Following the selection of the RSI mode, the device launches the oxygen demand function immediately for the preoxygenation of a spontaneously breathing patient.

For intubation, switch to the **Manual** function. The I:E ratio is always 1:1. With the MEDUtrigger supplied, this function now enables manual ventilation with a defined volume and a defined pressure limitation. The **Manual** function can be used for checking the position of the tube or as a fallback option should it prove difficult to secure the airway.

Air Mix cannot be activated in the Demand and Manual functions.

Following successful airway management, switch to continuous ventilation mode with the **Contin.** function. The device automatically switches to one of the following modes with the ventilation parameters preset for the patient group (see "14.1.9 Factory settings for emergency modes and ventilation modes", page 234):

- IPPV
- BiLevel + ASB (only if the BiLevel + ASB option is activated).

If the capnography option is activated, you can set a pressure gauge view or curve view in CPR mode (see "6.3.8 Presets patient", page 128)

7.4.3 Demand mode

Description	
Abbreviation	-
Long form	Demand
Type	Pressure-controlled
Requirement	Demand option is activated
Ventilation parameters	
Left-hand navigation knob	-
Central navigation knob	-
Right-hand navigation knob	• pMax • Emergency mode

The Demand mode serves to (pre)oxygenate spontaneously breathing patients via a ventilation mask. The patient must trigger inspiration himself in Demand mode. If there is a FlowCheck sensor this recognizes the respiratory effort, otherwise the underpressure created is used. You can select the following operation in Demand mode:

- Concentrator oxygen mode
- 100% oxygen mode

Air Mix cannot be activated in Demand mode.

7.4.4 Apnea ventilation

Description	
Abbreviation	• IPPV **or** • BiLevel + ASB (if pressure-controlled ventilation option is activated)
Long form	• Intermittent Positive Pressure Ventilation **or** • BiLevel ventilation at two pressure levels
Type	• Volume-controlled **or** • Pressure-controlled
Requirement	• Apnea ventilation is activated in the user menu

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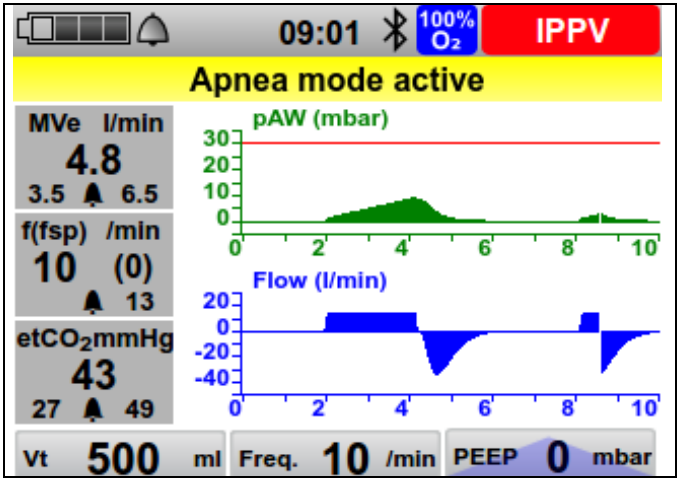
Ventilation parameters	
Left-hand navigation knob	• Vt • pInsp
Central navigation knob	Freq
Right-hand navigation knob	• PEEP • pMax • Δ pASB (in BiLevel + ASB mode only) • InTr (in BiLevel + ASB mode only) • I:E • Emergency mode

Apnea ventilation is a safety function which causes the device to take over and continue ventilation in the CPAP, CPAP + ASB and Demand modes if the patient stops breathing (apnea). If the patient is no longer breathing spontaneously and the set Apnea time in the "Alarm Limits" menu has elapsed, the device will automatically change to mandatory IPPV ventilation. If the BiLevel + ASB ventilation mode is activated, you can choose between IPPV and BiLevel + ASB as the apnea ventilation mode in the operator menu. The device uses the settings preconfigured in the operator menu for the Infant, Child and Adult patient groups or the settings defined via the height for the ventilation parameters in the respective apnea ventilation mode.



7-1 Apnea mode active

During apnea ventilation, the device emits a medium-priority alarm and the ventilation mode display turns red.

The apnea ventilation mode can only be exited if the ventilation mode is changed actively.

7.4.5 Inhalation mode

Description	
Abbreviation	-
Long form	Inhalation
Type	-
Requirement	Inhalation option is activated
Ventilation parameters	
Left-hand navigation knob	-
Central navigation knob	-
Right-hand navigation knob	Inhalation flow

The Inhalation mode is used for the application of a defined oxygen flow of 1-10 l/min via a corresponding interface. To connect the interface, an inhalation adapter is required, which is attached to the connection for the ventilation hose on the device. On delivery, the inhalation adapter is secured to the connection for the ventilation hose by a retaining band.

7.4.6 CO_2 monitoring mode

Description	
Abbreviation	-
Long form	CO_2 monitoring
Type	-
Requirement	Capnography option is activated
Ventilation parameters	
Left-hand navigation knob	-
Central navigation knob	-
Right-hand navigation knob	-

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CO_2 monitoring is used for the sidestream CO_2 measurement during oxygen inhalation or bag-valve-mask ventilation (see "4.7.8 Performing CO_2 monitoring (only with capnography option)", page 77). To use the CO_2 measurement during oxygen inhalation, you require an interface with a male Luer lock connector for CO_2 measurement (see "4.4.8 Connecting the $etCO_2/O_2$ nasal cannula", page 63). To use the CO_2 measurement during bag-valve-mask ventilation, connect the device's CO_2 measuring hose to, for example, a breathing system filter or a resuscitator.

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8 Hygienic reprocessing

8.1 General instructions

- **This product may contain disposable items. Disposable items are intended to be used only once.** So use these items only once and do **not** reprocess them. Reprocessing disposable items may impair the functionality and safety of the product and lead to unforeseeable reactions as a result of ageing, embrittlement, wear, thermal load, the effects of chemical processes, etc.
- Wear suitable protective equipment for hygienic reprocessing work.
- Please refer to the instructions for use supplied with the disinfectant used.
- Also observe the respective instructions for use for the components and the accessories.
- Always carry out a function check after the hygienic reprocessing (see "9.3 Performing a function check", page 184).
- You can find further information about hygienic reprocessing and a list of all the suitable cleaning agents and disinfectants in a brochure on the Internet at www.weinmann-emergency.com.
- The service life of the components of the reusable hose system is at least 30 reprocessing cycles (exception FlowCheck sensor: typically 50 reprocessing cycles).
- You can steam sterilize the measuring hose system of the reusable hose system. However, steam sterilization does not remove all bacteria. To guarantee bacteria reduction, disinfect the measuring hose system (see "8.7 Disinfecting the reusable measuring hose system", page 181).
- The components and accessories are not sterile on delivery.

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8.2 Intervals

Clean the device, components and accessories after every use (but at least once a week).

8.3 Hygienic reprocessing of the device

⚠ WARNING

Risk of injury due to reuse of disposable items!
Disposable items are intended for single use. Disposable items which are reused may be contaminated and/or impaired in their function and therefore cause injury to the patient.
⇒ Do not reuse disposable items.

NOTICE

Damage to the device caused by ingress of liquids!
The device is rated IP54 (splash-proof). This only takes effect when the battery is located in the battery compartment. Ingress of liquids may damage the device, components and accessories.
⇒ Do not immerse the device, components or accessories in liquids.
⇒ Clean the battery compartment carefully so that no liquids enter the device.

1. Disconnect the device from the patient.
2. Switch off the device (see "4.6 Switching the device off", page 66).
3. If necessary: Disconnect the device from the line power.
4. Remove the battery.
5. Wipe-disinfect the outside of the device.
6. Remove the device input filter.
7. Disconnect the patient hose system from the device.

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8. Carry out hygienic reprocessing of the device, components and accessories as specified in the following table:

Part	Cleaning	Disinfection	Thermal disinfection	Sterilization
Device	Wipe down with a dry or moist cloth: Using water or mild soap.	Wipe disinfection (Recommendation: terralin® protect)	Not permitted	Not permitted
Battery				
Power supply				
Testing bag				Steam sterilize at 134°C (for a minimum of 5 mins and maximum of 18 mins with devices which comply with EN 285)
Oxygen fittings	Wipe down with a dry or moist cloth: Use clean water.	Not permitted	Not permitted	Not permitted
Reusable hose system	(see "8.4 Hygienic reprocessing of the reusable hose system", page 168)			
Disposable hose system	(see "8.5 Hygienic reprocessing of the disposable hose system", page 170)			
Velcro strap with clip	• Rinse with water and mild soap • Wash at 30°C in the washing machine (without spinning)	Use the immersion disinfection method(2) (Recommendation: gigasept® FF (new))	Rinse at up to 30°C with the addition of a suitable disinfectant	Not permitted
Hygiene filter	Disposable item, do not reuse			
Device input filter	Disposable item, do not reuse			
Inhalation adapter	Disposable item, do not reuse			
Ventilation masks	Clean in warm water with a mild cleaning agent(1).	Use the immersion disinfection method(2) (Recommendation: gigasept® FF (new))	Rinse at up to 95°C (Recommendation: thermosept® alkaclean forte and thermosept® NKZ)	Steam sterilize at 134°C (for a minimum of 5 mins and maximum of 18 mins with devices which comply with EN 285)

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(1) Brush the parts thoroughly inside and outside using a normal laboratory soft bottle brush.

(2) Wet all surfaces, free of bubbles, inside and outside. Allow the full exposure time to elapse. Following disinfection, rinse the parts off and out thoroughly with distilled water and allow them to dry.

The applicable instructions are those in the instructions for use from the manufacturers of the individual components or accessories. Observe these instructions for use.

9. Connect the patient hose system up to the device.
10. Insert battery.
11. If necessary: Reconnect to line power.
12. Perform a function check (see "9.3 Performing a function check", page 184).

Result The device, components and accessories have been hygienically reprocessed.

8.4 Hygienic reprocessing of the reusable hose system

Requirement The reusable hose system has been disassembled (see "8.6.1 Disassembly of the reusable hose system", page 172).

1. Carry out hygienic reprocessing of the reusable hose system as specified in the following table:

Part	Cleaning	Disinfection	Thermal disinfection	Sterilization
Ventilation hose	Clean in warm water with a mild cleaning agent(1)	Use the immersion disinfection method(2) (Recommendation: gigasept® FF (new))	Rinse at up to 95°C (Recommendation: thermosept® alkaclean forte and thermosept® NKZ)	Steam sterilize at 134°C (for a minimum of 5 mins and maximum of 18 mins with devices which comply with EN 285)
Patient valve				
Diaphragms				
Elbow				
Reusable measuring hose system (without CO_2 measuring hose) • PEEP control hose • Pressure-measurement hose • Measuring hose system connector		Use the immersion disinfection method(2) (Recommendation: gigasept® FF (new)) (see "8.7 Disinfecting the reusable measuring hose system", page 181)		
FlowCheck sensor (reusable)	Clean in warm water with a mild cleaning agent(3)	Use the immersion disinfection method(2) (Recommendation: gigasept® FF (new))	Rinse at up to 95°C (Recommendation: thermosept® alkaclean forte and thermosept® NKZ)	Steam sterilize at 134°C (for a minimum of 5 mins and maximum of 18 mins with devices which comply with EN 285)
CO_2 measuring hose (only with capnography option)	Disposable item, do not reuse			
Water filter (only with capnography option)				

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Part	Cleaning	Disinfection	Thermal disinfection	Sterilization
Connector with Luer lock connector	Clean in warm water with a mild cleaning agent(1)	Use the immersion disinfection method(2) (Recommendation: gigasept® FF (new))	Rinse at up to 95°C (Recommendation: thermosept® alkaclean forte and thermosept® NKZ)	Steam sterilize at 134°C (for a minimum of 5 mins and maximum of 18 mins with devices which comply with EN 285)
MEDUtrigger (with connection line)	Wipe down with a dry or moist cloth: Using water or mild soap.	Wipe disinfection (Recommendation: terralin® protect)	Not permitted	Not permitted
FlowCheck sensor connection line				
FlowCheck sensor connection line with MEDUtrigger				
Hose protection sleeve	• Wipe with a damp cloth: Use water and an alkaline cleaning agent • Wash at up to 70°C in the washing machine (without spinning); industrial washing also possible	• Use the immersion disinfection method (Recommendation: gigasept® FF (new)) • Wash at up to 70°C (recommendation: Derval SOLO (RKI) with Ottalin PERACET)(4)	Not permitted	Not permitted

(1) Brush the parts thoroughly inside and outside using a normal laboratory soft bottle brush.

(2) Wet all surfaces, free of bubbles, inside and outside. Allow the full exposure time to elapse. Following disinfection, rinse the parts off and out thoroughly with distilled water and allow them to dry.

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(3) Only brush the outside of the part thoroughly using a normal laboratory soft bottle brush. Do **not use** a bottle brush on the inside in order to prevent damaging the sieves. Rinse thoroughly with distilled water after cleaning.

(4) Washing method according to the Robert Koch Institute (RKI) and the Association for Applied Hygiene (VAH) at 70°C with Derval SOLO (RKI) and with Ottalin PERACET)

2. Assemble reusable hose system (see "8.6.2 Assemble reusable hose system", page 177).

Result The reusable hose system has been hygienically reprocessed.

8.5 Hygienic reprocessing of the disposable hose system

1. If necessary: Release one of the following connection lines from the hose clips:
   - Connection line of the MEDUtrigger
   - FlowCheck sensor connection line
   - FlowCheck sensor connection line with MEDUtrigger
2. Carry out hygienic reprocessing of the disposable hose system as specified in the following table:

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Part	Cleaning	Disinfection	Thermal disinfection	Sterilization
Disposable hose system: • Ventilation hose • Patient valve • Elbow	Disposable item, do not reuse			
Disposable measuring hose system: • Measuring hose system connector • PEEP control hose • Pressure-measurement hose • CO_2 measuring hose (only with capnography option) • Water filter (only with capnography option)				
Hose clips				
FlowCheck sensor (disposable)				
MEDUtrigger (with connection line)	(see "8.4 Hygienic reprocessing of the reusable hose system", page 168)			
FlowCheck sensor connection line				
FlowCheck sensor connection line with MEDUtrigger				

3. Take a new disposable hose system with disposable measuring hose system.
4. If necessary: Attach one of the following connection lines to the hose clips:
   - Connection line of the MEDUtrigger
   - FlowCheck sensor connection line
   - FlowCheck sensor connection line with MEDUtrigger

Result The disposable hose system has been hygienically reprocessed.

8.6 Disassembly/assembly of the reusable hose system

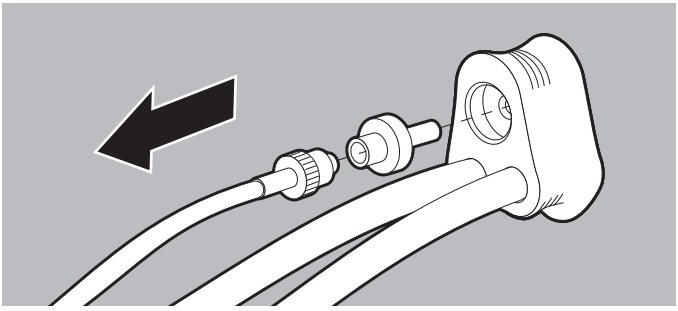
The images in this subchapter show all the possible components of the reusable hose system. Depending on the system type, your reusable hose system may not include certain components (see "3.5.2 Reusable hose system and disposable hose system", page 30).

8.6.1 Disassembly of the reusable hose system

Requirement

- The device is disconnected from the patient hose system.
- The patient is disconnected from the patient hose system.

1. Open the hose protection sleeve.
2. Open the Velcro fasteners in the hose protection sleeve.



3. If available: Detach the water filter from the measuring hose system connector.
4. If available: Detach the water filter from the CO_2 measuring hose.

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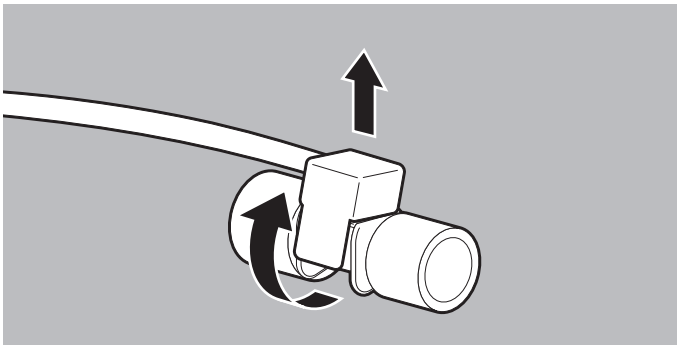
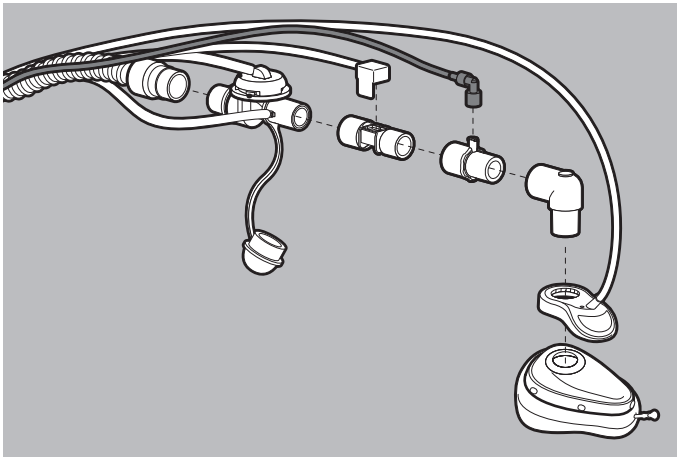
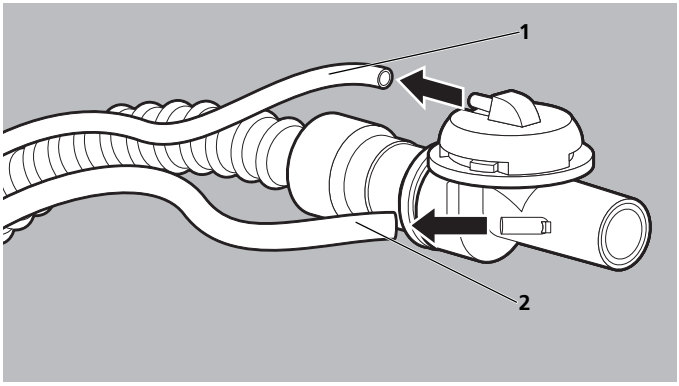


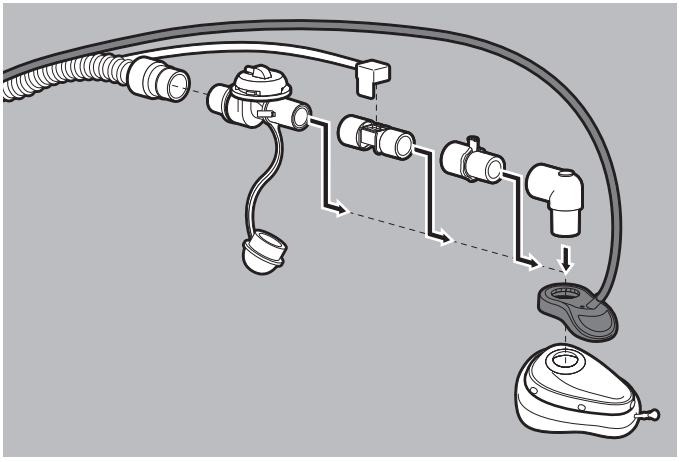
5. If available: Detach one of the following connection lines from the FlowCheck sensor:
   - FlowCheck sensor connection line
   - FlowCheck sensor connection line with MEDUtrigger



6. If available: Detach the CO_2 measuring hose from the connector with Luer lock connector.



7. Detach the pressure-measurement hose (**2**) and PEEP control hose (**1**) from the patient valve.
8. If available: Remove the protective cap from the end of the reusable hose system closest to the patient.



9. If available: Detach MEDUtrigger.

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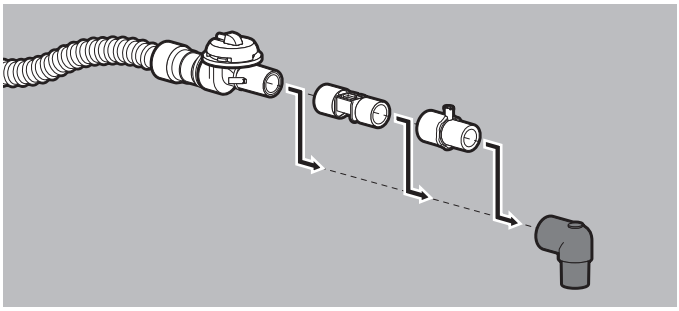
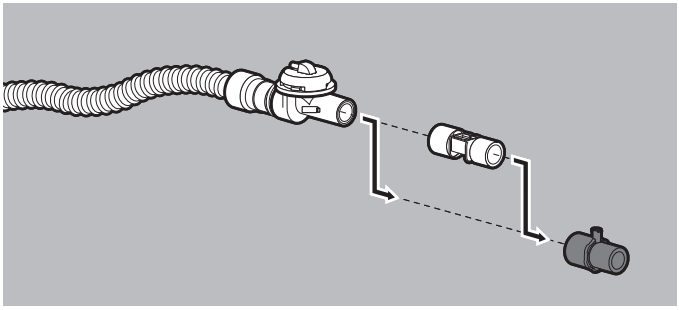
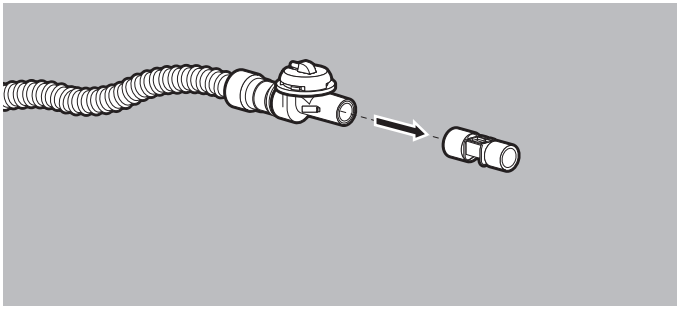


10. If available: Detach the elbow.



11. If available: Detach the connector with Luer lock connector.



12. If available: Detach the FlowCheck sensor from the patient valve.

13. Disconnect the patient valve from the ventilation hose.

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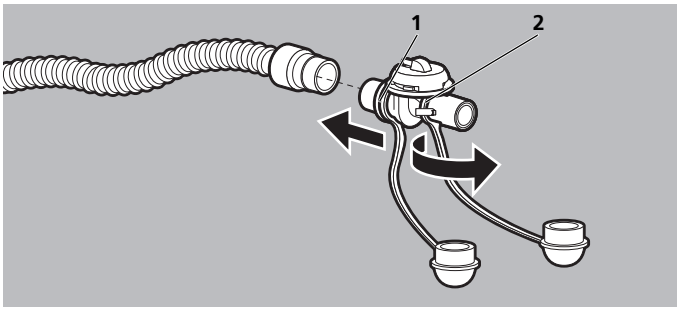
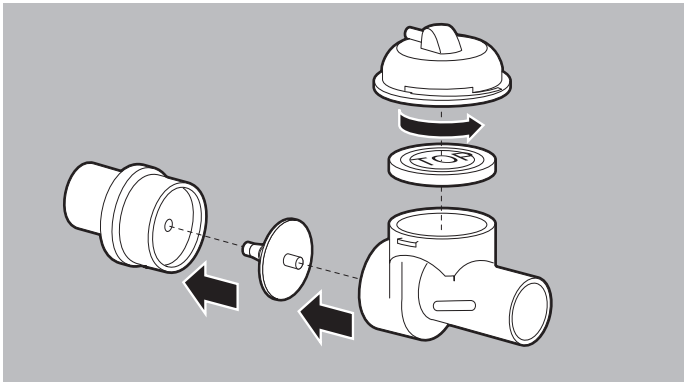


14. If available: Remove the protective cap strap from the patient valve:

    - Position **1**

    or

    - Position **2** (only with reusable hose systems with flow measurement **and** CO_2 measurement)



15. Disassemble the patient valve.

Result The reusable hose system is disassembled.

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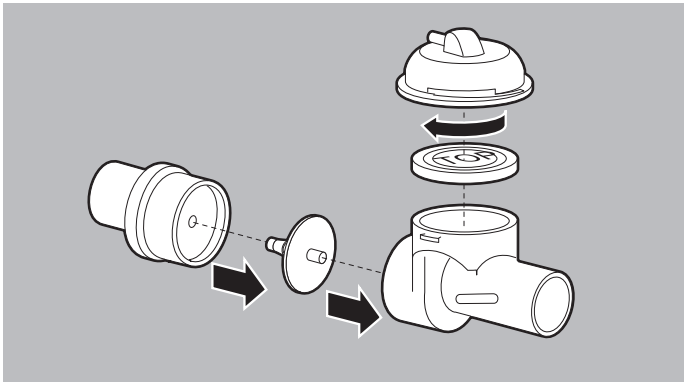
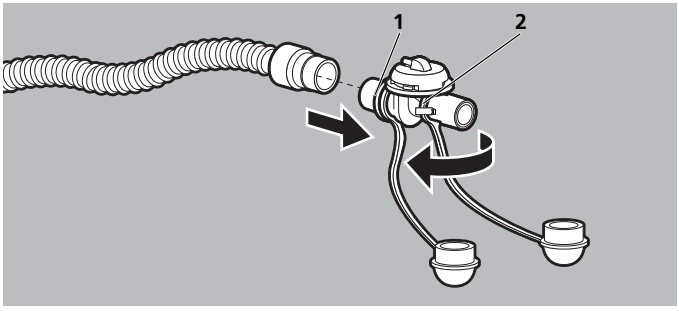
8.6.2 Assemble reusable hose system

Requirement The reusable hose system is disassembled.



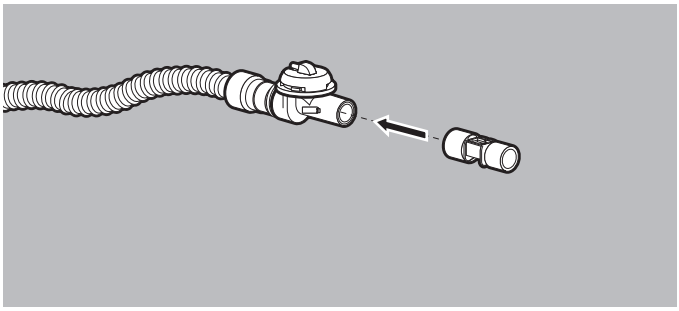
1. Assemble the patient valve.
   When doing so, note:
   - the side of the PEEP control diaphragm labeled "TOP" must face upward toward the control cover.
   - the arrow on the control cover must point toward the patient.



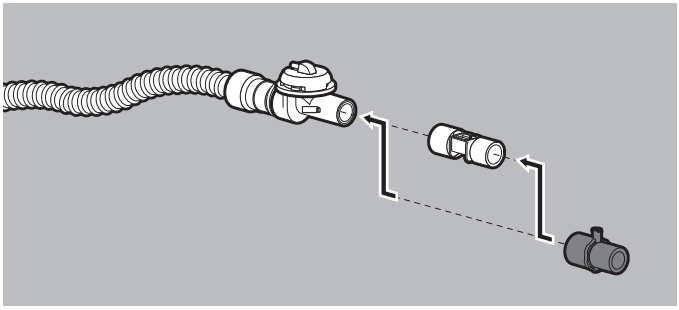
2. If available: Secure the protective cap strap on the patient valve:
   - Position **1**

   or

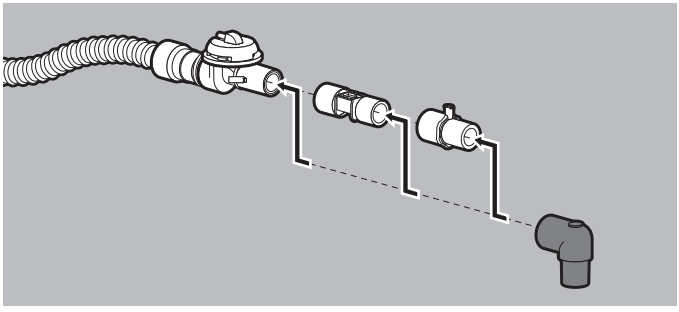
   - Position **2** (only with reusable hose systems with flow measurement **and** CO_2 measurement)
3. Connect the patient valve to the ventilation hose.



4. If available: Connect the FlowCheck sensor.



5. If available: Connect the connector with Luer lock connector.



6. If available: Connect the elbow.

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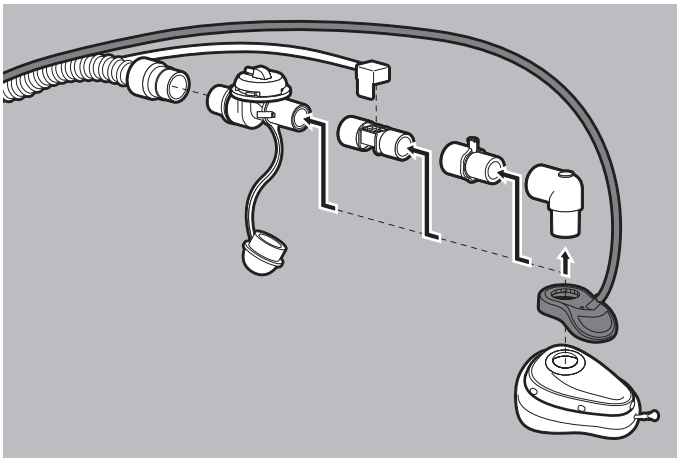
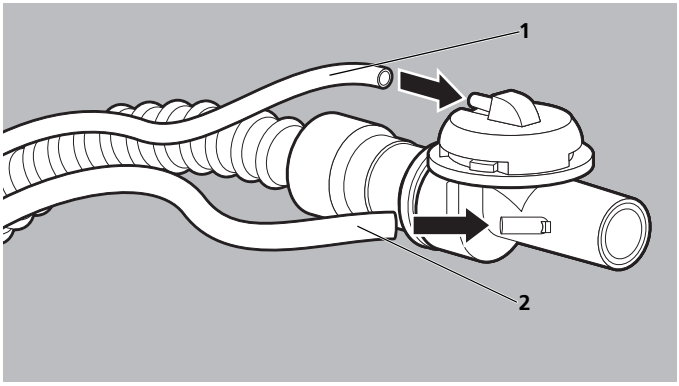


7. If available: Connect MEDUtrigger



8. Connect the pressure-measurement hose (**2**) and PEEP control hose (**1**) to the patient valve.
   When doing so, note: The hoses must be firmly attached to the patient valve.

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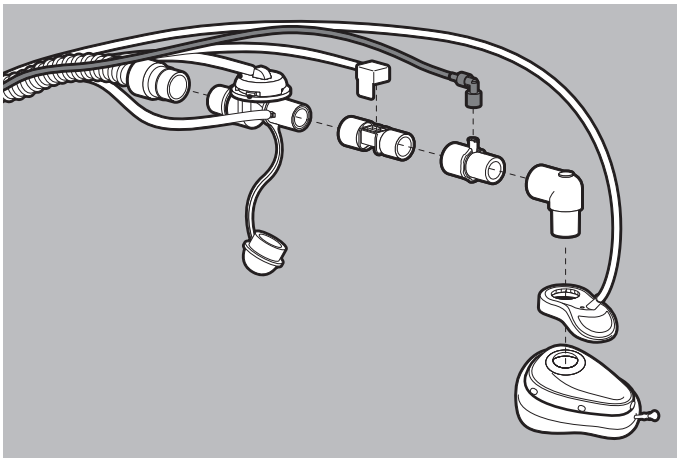
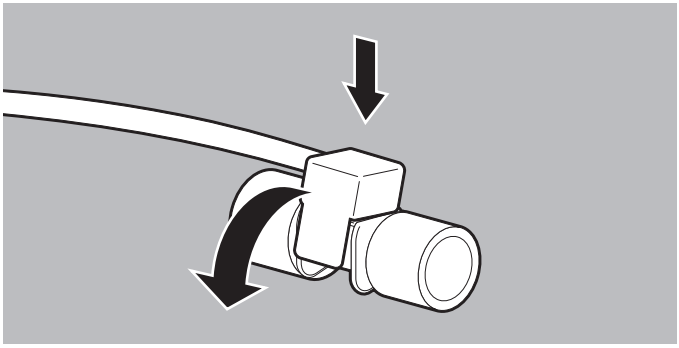


9. If available: Connect the CO_2 measuring hose to the connector with Luer lock connector.



10. If available: Connect one of the following connection lines to the FlowCheck sensor:
    - FlowCheck sensor connection line
    - FlowCheck sensor connection line with MEDUtrigger

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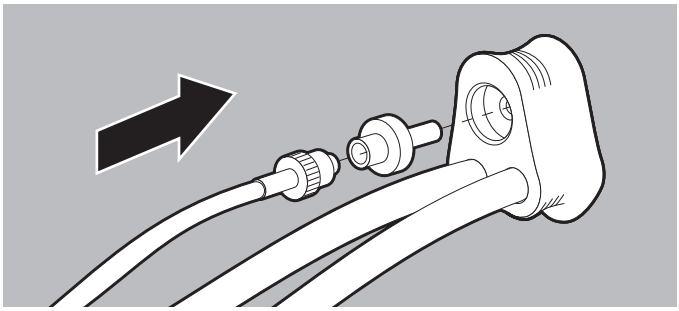

11. If available: Connect the CO_2 measuring hose with water filter to the measuring hose system connector.
12. If available: Seal the end of the reusable hose system closest to the patient with a protective cap.
13. Place all the hoses and one of the connection lines in the hose protection sleeve.
14. Close the Velcro fasteners in the hose protection sleeve around the hoses and connection line.
15. Close the hose protection sleeve zipper.

Result The reusable hose system is assembled.

8.7 Disinfecting the reusable measuring hose system

The principle only applies to the following parts of the reusable measuring hose system:

- Pressure-measurement hose
- PEEP control hose

⚠ WARNING

Risk of injury due to incorrect disinfection of the measuring hose system!
Rinsing the measuring hose system in the opposite direction to that specified does not guarantee any bacteria reduction and may injure the patient.
⇒ Only rinse the pressure-measurement hose in the specified direction.

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Requirement The reusable measuring hose system is disconnected from the reusable hose system.

1. Connect a sterile disposable syringe (20 ml) to the free end of the pressure-measurement hose.
2. Immerse the connector of the measuring hose system in diluted disinfection solution.
3. Draw the disinfection solution up through the pressure-measurement hose into the disposable syringe by means of suction until the syringe is completely full (Hold time: 15 min).
4. Disconnect the disposable syringe from the pressure-measurement hose.
5. Empty the disposable syringe completely.
6. Carry out the process 6 times according to this principle.
7. Rinse the pressure-measurement hose and PEEP control hose 8 times with distilled water, according to this principle.

⚠ CAUTION

Risk of injury due to false readings!
Fluid in the measuring hose system may produce false readings and cause injury to the patient.
⇒ Allow the measuring hose system to dry out completely.

8. Allow the reusable measuring hose system to dry out completely.
   If necessary: Use sterile compressed air or medical oxygen for drying.

Result The reusable measuring hose system has been disinfected.

i After disinfection and drying, the hose system can be sterilized.

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9 Function check

9.1 Intervals

Carry out a function check at regular intervals:

Part concerned	Interval
Device	• Before each use • After each hygienic reprocessing • After each repair
Patient hose system (reusable hose system)	• Before each use • After each hygienic reprocessing • After each disassembly • At least every 6 months

9.2 Preparing for the function check

1. Check battery status: The battery must be fully charged.
   If necessary: Charge or replace the battery.
2. Check the following parts for external damage:
   - Device
   - Plug and cable
   - Patient hose system
   - Accessories

   If necessary: Replace parts.
3. Check the patient valve of the patient hose system (see "9.5 Testing the reusable hose system", page 191).
   If necessary: Replace the patient hose system.
4. Check the oxygen level in the oxygen cylinder.
   If necessary: Change the oxygen cylinder.

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5. Check the system for leaks (see "9.6 Checking the system for leaks", page 192).
   If necessary: Rectify any leaks in the system (see "9.7 Rectifying leaks in the system", page 192).

Result The function check is ready.

9.3 Performing a function check

You can perform the function check with the following test lungs:

- Testing bag WM 1453
- Testing bag WM 1454
- EasyLung for WEINMANN Emergency WM 28625

⚠ WARNING

Risk of injury from incorrect test lungs!
Test lungs other than those named here may not reliably detect errors and thus distort the result of a function check. This can injure the patient.
⇒ Only use the test lungs named here.

⚠ WARNING

Risk of injury due to a connection between the device and the patient during the function check!
A connection between the device and the patient during the function check can result in barotrauma and injury to the patient.
⇒ Always disconnect any connection between the device and the patient for the function check.

Requirement

- The device is disconnected from the patient.
- A fully charged battery is inserted in the device.
- The device input filter is inserted in the device.
- The protective cap has been removed from the end of the patient hose system.
- The function check is ready (see "9.2 Preparing for the function check", page 183).

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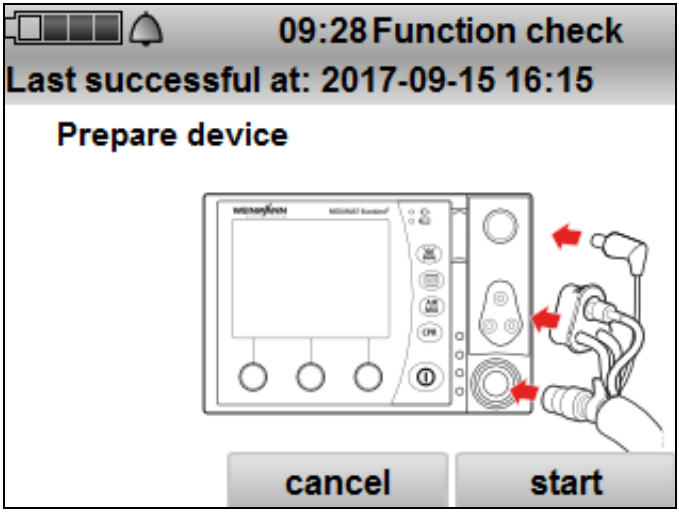
1. Switch on the device (see "4.5 Switching the device on", page 65).
2. Select the menu item **Function check**.

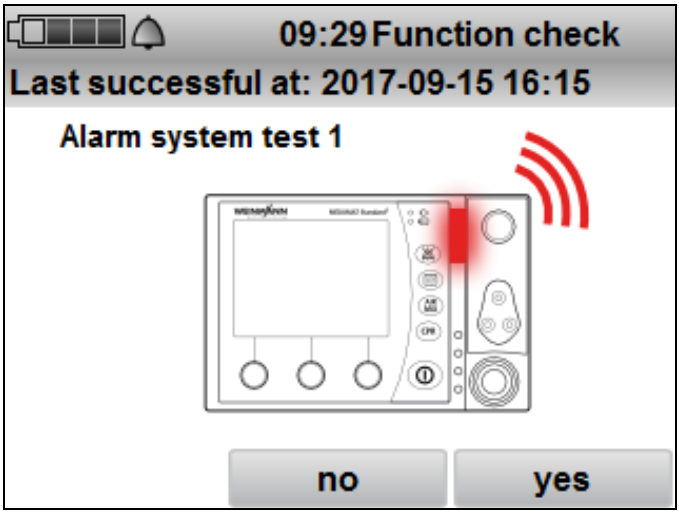


3. Prepare the device:
   - Connect and open the oxygen cylinder.
   - Connect the patient hose system up to the device.
   - Connect the test lung up to the patient hose system.

Do not touch the patient hose system and the test lung during the function check. Touching could distort the results of the function check.

4. Press the navigation knob **start**.

The alarm system test is not necessary if the NVG option is activated (see "6.3.9 Options", page 134).



5. Check the alarm system:
   - The alarm light must flash red.
   - The device must emit at least one audible alarm in alarm system test 1 and alarm system test 2.
6. If the alarm system is functioning: Press the navigation knob **yes** each time.
7. If the alarm system is not functioning: Press the navigation knob **no**.

If the software of the FlowCheck sensor connection line/ FlowCheck sensor connection line with MEDUtrigger is not up-to-date, the device updates the software before the key function check starts.

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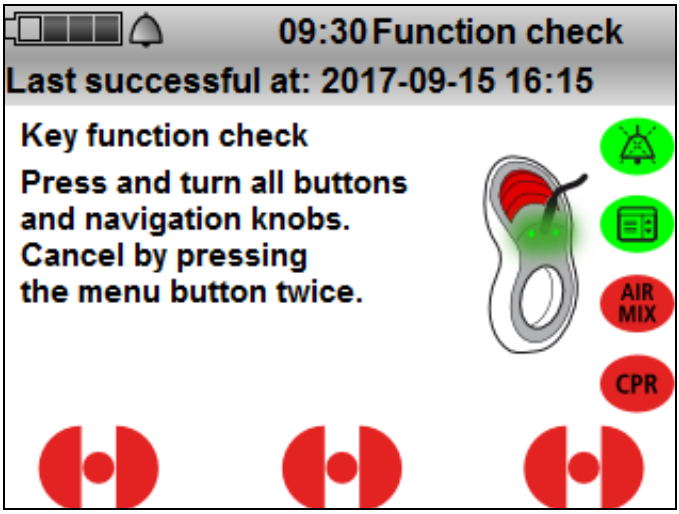

8. In the key function check, press all of the controls one after the other except for the On/Off button (⏻).

If the MEDUtrigger is not displayed in the function check, activate it in the operator menu and repeat the function check.

9. If necessary: Press the menu button (▤) twice to cancel the key function check.

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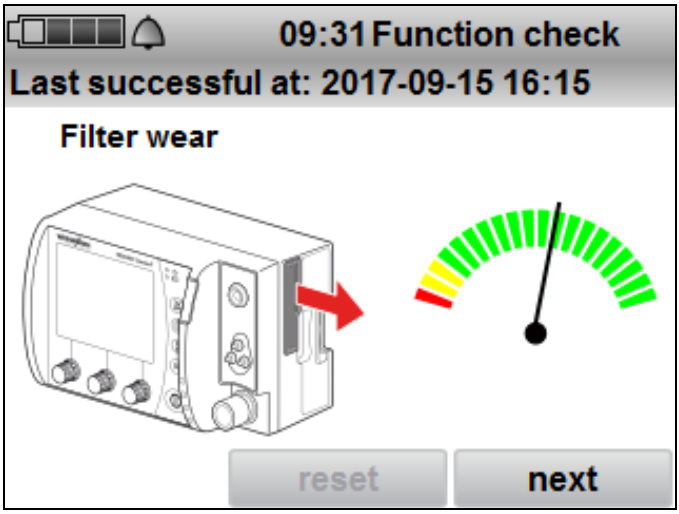

10. Proceed with the hygiene filter/device input filter according to the following table:

Color	Action
Green	Continue to use the hygiene filter/ device input filter.
Yellow	• Keep hygiene filter/device input filter at the ready. **or** • Order hygiene filter/device input filter.
Red	Replace hygiene filter/device input filter.

11. When the hygiene filter/device input filter has been replaced: Reset the filter change indicator using the **reset** navigation knob.

Depending on the preset in the operator menu, you can reset the hygiene filter/device input filter at any time or never during the function check.

12. Press the navigation knob **next**.
    The status report appears.

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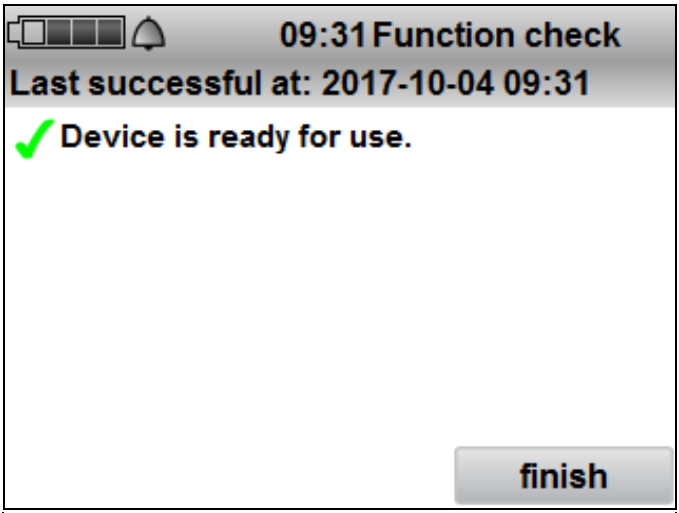

⚠ WARNING

Device malfunction or device failure if maintenance is either not performed or not performed in good time!
Wearing parts which are either not replaced or not replaced in good time as part of maintenance can result in device malfunction or device failure and injury to the patient.
⇒ Always observe the maintenance intervals.

13. Proceed with the device according to the following table:

Display		Meaning	Action
✓	Device ready for use	Function check passed.	Use device without restriction.
✓	• Device ready for use • Maintenance required in xx days.	• Function check passed • ≤ 60 days until expiry of the maintenance interval	• Device can be used without restrictions until expiry of the maintenance interval. • To continue using the device without restrictions: Contact WEINMANN Emergency or a technician authorized by WEINMANN Emergency in good time for maintenance.

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Display		Meaning	Action
	• Device ready for use • Maintenance required • Maintenance symbol is flashing in the display (only in the start menu)	• Function check passed • Maintenance interval expired	To continue using the device without restrictions: Contact WEINMANN Emergency or a technician authorized by WEINMANN Emergency for maintenance.
	• Device ready for use • Check or replace the FlowCheck sensor • Maintenance symbol is flashing in the display (only in the start menu)	• Function check passed • Total useful life of the FlowCheck sensor has been exceeded	To continue using the device without restrictions: Check or replace the FlowCheck sensor.
	Device not ready for use	Function check failed.	Take action (see "9.4 Failed function check", page 191).

The message **Check or replace the FlowCheck sensor** can also appear with a reminder that maintenance is required.

14. Press the navigation knob **finish**.
15. Switch off the device.
16. Close the oxygen cylinder.

⚠ WARNING

Risk of injury from improperly removed testing bag!
If the testing bag is removed improperly, the connector of the testing bag may remain on the patient hose system. The resulting increase in inspiratory airway resistance can injure the patient.
⇒ When disassembling always pull the testing bag off at the connector.

17. Pull the test lung from the patient hose system.

Result The function check is complete.

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9.4 Failed function check

⚠ CAUTION

Risk of injury due to inoperational device!
Operation of the device after a failed function check may result in injury to the patient.
⇒ Only operate the device after it passes the function check.

Requirement The function check ended with **Device is not ready for use**.

Precise information on the individual tests in the function check can be found in the file **fcheck** (see "14.3.1 Recorded function checks", page 235).

1. Check the components named in the instructions on the display and replace if necessary.
2. Repeat the function check.
3. If the function check ends with **Device is not ready for use** again: Contact your authorized dealer or WEINMANN Emergency.

9.5 Testing the reusable hose system

Requirement The patient valve of the reusable hose system is dismounted (see "8.6.1 Disassembly of the reusable hose system", page 172).

1. Check all parts of the patient valve for external damage.
   If necessary: Replace damaged parts.
2. Check the PEEP control diaphragm and inspect the check valve diaphragm:
   If the diaphragm is torn, wavy, distorted, or sticky: Replace the diaphragm.
3. Assemble reusable hose system (see "8.6.2 Assemble reusable hose system", page 177).

Result The patient valve of the reusable hose system has been checked and is ready for use.

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9.6 Checking the system for leaks

Requirement The device is connected to the oxygen supply.

1. Open the valve of the oxygen cylinder slowly.
   The contents gauge on the pressure reducer indicates the pressure in the oxygen cylinder.
2. Close the valve on the oxygen cylinder.
3. Observe the contents gauge on the pressure reducer for approx. 1 min:
   - If the position of the needle remains constant, the system is free from leaks
   - If the needle falls, there is a leak in the system
4. If necessary: Rectify the leak (see "9.7 Rectifying leaks in the system", page 192).

Result The system has been checked for leaks.

9.7 Rectifying leaks in the system

Requirement
- All screw connections are tightened.
- All hoses are securely connected.
- There is a leak in the system.

1. Prepare a soapy solution using unperfumed soap.

NOTICE

Damage to the device caused by ingress of liquids!
Ingress of liquids may damage the device, components and accessories.
⇒ Do not immerse the device, components, or accessories in liquids.

2. Wet all screw connections and hoses with the soapy solution. Bubbles will form if a leak is present.
3. In the event of a leakage: Close the valve on the oxygen cylinder.

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4. Briefly press the On/Off button ⏻ and operate the device without an oxygen supply.
   The remaining oxygen is flushed out of the device.
5. Press and hold the On/Off button ⏻ for at least 2 seconds to switch off the device.
6. Replace leaky components.
7. Check the system for leaks once more (see "9.6 Checking the system for leaks", page 192).
8. If necessary: Look for other leaks and replace leaky components.
9. If the leak cannot be rectified, Have the device repaired.

Result The leak in the system has been rectified.

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10 Alarms and error messages

10.1 General instructions

The device's alarm system is based on the concept of self-preserving alarms. The device emits an alarm for as long as the cause continues to exist. Once the cause of the alarm no longer exists, the device no longer emits the alarm.

The device emits physiological and technical alarms. Every alarm has a certain priority.

Priority	Color in the alarm line	Meaning
High priority	Red	High-priority alarms warn of imminent fatal or irreversible patient injuries or of device faults.
Medium priority	Yellow	Medium-priority alarms warn of immediate reversible patient injuries or of minor device faults.
Low priority	Turquoise	Low-priority alarms warn of delayed minor injuries or inconvenience to the patient or minor restrictions on the device.

If more than one alarm is active, the device handles this as follows:

- Multiple alarms of different priorities: The device displays the alarm with the highest priority. Alarms with a lower priority do not appear until the higher-priority alarm is no longer active.
- Multiple alarms of identical priorities: The device displays the alarms alternately.
- Technical alarms dominate and cannot be muted. Technical alarms occur if ventilation is not possible with the device (e.g., in the event of a device fault, a supply pressure < 2.7 bar).

The device displays alarms as follows:

- As text in the alarm line on the display.

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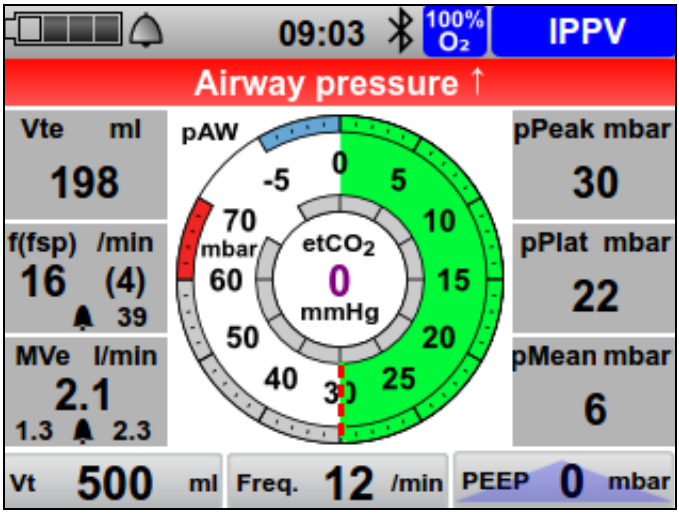
- Acoustically as an audible alarm (via the loudspeaker on the underside of the device)
- With the alarm light (in the top right-hand corner on the front of the device)



10-1 Alarm line with airway pressure alarm

The device additionally displays physiological alarms through the flashing of the respective parameter field.

10.2 Alarm messages

10.2.1 High-priority alarm (red)

Alarm	Cause	Remedy
Airway pressure ↑	Obstruction of the patient's airways	Free the patient's airways of obstructions.
	Tube wrongly positioned	Position tube correctly.
	pMax set too low	Adjust pMax.
	Hoses kinked or pinched	Route hoses so that they are not kinked or pinched.
Airway pressure ↓	Patient hose system leaking	Replace the patient hose system.
	Patient hose system not connected correctly	Connect patient hose system correctly.
	Tube wrongly positioned	Position tube correctly.
	Hoses kinked or pinched	Route hoses so that they are not kinked or pinched.
	Ventilation settings incorrectly set	Adjust ventilation settings.
	Mask is not sitting correctly or is leaking	Place the mask on tightly or replace it.
Apnea	No inspiration since the set apnea alarm time, exception: in Manual CPR mode (no inspiration in the last 59 s)	Check the condition of the patient. Select mandatory ventilation. In CPR CCSV mode: Restart chest compression.
Battery almost empty	Very low battery status	Replace battery (see 4.3.5, p. 51).
		Connect device to the line power (see 4.2, p. 46) and charge battery (see 4.3.2, p. 47).
Battery temperature critical	Battery temperature > 80°C	Operate battery within the permitted temperature range (see 14.1.2, p. 218).
Device fault	Temporary device malfunction	• Switch device off (see 4.6, p. 66) and back on again (see 4.5, p. 65). • Perform a function check.
	Device defective	Have the device repaired.
Device temperature ↓	Device temperature < -20°C	Operate device within permitted temperature range (see 14.1.1, p. 214).

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Alarm	Cause	Remedy
Device temperature critical	Device temperature > 75°C	Operate device within permitted temperature range (see 14.1.1, p. 214).
MVe ↑ (only with flow measurement + ASB option)	Upper limit value exceeded	• Check the condition of the patient. • Check the set limit values for plausibility.
MVe ↓ (only with flow measurement + ASB option)	Lower limit value not reached	
PEEP ↑	Obstruction of the patient's airways	Free the patient's airways of obstructions.
	Tube wrongly positioned	Position tube correctly.
	Hoses kinked or pinched	Route hoses so that they are not kinked or pinched.
	Patient valve defective	Replace patient valve.
	Ventilation settings incorrectly set	Adjust ventilation settings.
Supply pressure < 2.7 bar	Oxygen cylinder not opened	Open oxygen cylinder.
	Oxygen cylinder almost empty	Replace oxygen cylinder.
	Compressed gas source not connected correctly	Connect compressed gas source correctly.
	Compressed gas source defective	Replace compressed gas source.
	Compressed gas hose kinked or pinched	Route compressed gas hose so that it is not kinked or pinched.
	Pressure reducer defective	Replace pressure reducer.
Supply pressure > 6 bar	Pressure of compressed gas too high	Use compressed gas source < 6 bar.
		Switch off the device (see 4.6, p. 66) and disconnect it from compressed gas source.

The following alarms are only emitted once the respective condition is satisfied in two consequent breathing cycles.

- Airway pressure ↑ /Airway pressure ↓
- PEEP ↑
- MVe ↑ /MVe ↓ (only with flow measurement + ASB option)
- f ↑ (only with flow measurement + ASB option)

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10.2.2 Medium-priority alarm (yellow)

Alarm	Cause	Remedy
Apnea mode active	No inspiration since the set apnea alarm time	• Check the condition of the patient. • Select mandatory ventilation mode.
Battery defective	Battery defective	Let the device run on battery power without line power until it switches off. Fully recharge battery (see 4.3.2, p. 47). If the device continues to display the alarm: Replace battery (see 4.3.5, p. 51).
Battery weak	Low battery status	Replace battery (see 4.3.5, p. 51). Connect device to the line power (see 4.2, p. 46) and charge the battery (see 4.3.5, p. 51).
Check the FlowCheck connection line (only with flow measurement + ASB option)	FlowCheck sensor connection line/ FlowCheck sensor connection line with MEDUtrigger not connected correctly	Connect the FlowCheck sensor connection line/FlowCheck sensor connection line with MEDUtrigger correctly.
	FlowCheck sensor connection line/ FlowCheck sensor connection line with MEDUtrigger defective	Replace the FlowCheck sensor connection line/FlowCheck sensor connection line with MEDUtrigger
	Software version of the FlowCheck sensor connection line/FlowCheck sensor connection line with MEDUtrigger not compatible with device	Perform a function check. The device updates the software version during the function check.
Check the FlowCheck sensor (only with flow measurement + ASB option)	FlowCheck sensor not connected correctly	Connect the FlowCheck sensor correctly.
	FlowCheck sensor defective	Replace the FlowCheck sensor.
CO_2 occlusion (only with capnography option)	Water filter blocked	Replace water filter.
	CO_2 measuring hose blocked	Replace CO_2 measuring hose.
Compression rate ↑ (only with CCSV option)	Chest compression too fast	Perform chest compression slower.
Compression rate ↓ (only with CCSV option)	Chest compression too slow	Perform chest compression faster.
Disconnection MEDUtrigger	MEDUtrigger removed from the device during manual ventilation	Reconnect MEDUtrigger to the device.

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Alarm	Cause	Remedy
$etCO_2$ ↑ (only with capnography option)	Upper limit value exceeded	• Check the condition of the patient. • Check the set limit values for plausibility.
$etCO_2$ ↓ (only with capnography option)	Lower limit value not reached	
f ↑ (only with flow measurement + ASB option)	Upper limit value exceeded	• Check the condition of the patient. • Check the set limit values for plausibility.
Hands-off time ↑ (only with CCSV option)	Hands-off time too high	Continue chest compression.
Insert battery	Battery not inserted or incorrectly inserted	Insert battery correctly (see 4.2, p. 46).
Vt not achievable	Implausible ventilation parameters	Adjust ventilation parameters.
	Compressed gas supply inadequate	Adjust compressed gas supply.
	Sintered filter blocked	Have the device repaired.

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10.2.3 Low-priority alarm (turquoise)

Alarm	Cause	Remedy
Battery operation	Line power too weak or power failure	The alarm appears: • If you remove the portable system from the wall mounting. • If you operate the device using the power supply and a power failure occurs. In both cases, the alarm stops after 10 s.
CO_2 module defective (only with capnography option)	No communication with the CO_2 module or error message from the CO_2 module	Continue ventilation without CO_2 measurement. Have the device repaired.
	CO_2 module defective	
CO_2 temperature ↓ (only with capnography option)	Temperature in the device below 0°C	• If necessary: Continue ventilation without CO_2 measurement. • Move device to a warmer environment.
Device temperature ↑	Device temperature > 65°C	Operate device within permitted temperature range (see 14.1.1, p. 214).

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10.3 Faults

If you are not able to clear an error message with the aid of the table, you should contact the manufacturer WEINMANN Emergency or your authorized dealer to have the device repaired. To avoid serious damage, do not continue using the device.

10.3.1 Device

Fault	Cause	Remedy
Alarm output too quiet	Volume set to 50%	Set the volume to 100% in the operator menu (see 6.3.7, p. 125).
No acoustic alarm output	NVG mode activated	Deactivate NVG (see 5.3.8, p. 114).
Alarm light does not light up		
Display too dark	Brightness of the display set too low	Increase brightness of the display in the operator menu (see 6.3.7, p. 125).
	NVG mode activated	Adjust NVG brightness (see 6.3.7, p. 125).
		Deactivate NVG (see 5.3.8, p. 114).
Device cannot be switched on	Battery not correctly inserted in device, or battery empty	Check battery.
	Battery empty and device not connected to the line power	Check power supply.
	Device defective	Have the device repaired.
Device cannot be switched off	Operating error	Press and hold the On/Off button ⏻ for at least 2 seconds.
Red cross in function check status report	Non-functioning component	See "9.4 Failed function check", page 191.
Software update is not functioning	Update file or SD card defective	Perform software update with another SD card. If the update still cannot be performed successfully, have the device repaired.
Battery status indicator flickers between red and green	Battery deeply discharged	Charge battery in the device for 24 hours (see 4.3.2, p. 47).
Battery status indicator and the line power indicator are not lit up	NVG mode activated	Deactivate NVG (see 5.3.8, p. 114).

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Fault	Cause	Remedy
The functionality of an option is not available	Option is deactivated in the operator menu	Activate the option in the operator menu (see 6.3.9, p. 134).
	Option is not enabled in the operator menu	Enable the option in the operator menu with the option code (see 4.14, p. 97).
Power failure/device failure: • Black screen • Alarm LED flashes • Audio alarm output	Battery empty and device not connected to the line power	Check power supply.
	Device defective	Switch off the device and have it repaired.
The device switches off in NVG mode	Battery empty and device not connected to the line power	Check power supply.
	Device defective	Switch off the device and have it repaired.
Not possible to establish Bluetooth® connection during ventilation	Bluetooth® deactivated in user menu	Activate Bluetooth® in user menu (see "5.3.7 Bluetooth® (only with Bluetooth data transmission option)", page 113).
	Distance between two devices too far	Reduce distance and move any objects which might interfere.
	Bluetooth® module of device or external data communication device is defective	Repair Bluetooth® module of device or external data communication device.
	Devices are not paired	Pair devices in user or operator menu (see "6.3.7 Device configuration", page 125).

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10.3.2 Battery

Fault	Cause	Remedy
Red fault indicator lights up when status button on battery is pressed or red battery status indicator on device lights up	Battery defective	Replace battery.
	Battery temperature outside the permitted range (> 70°C)	Use battery within permitted temperature range (see 14.1.2, p. 218).
Battery does not respond when status button is pressed	Battery has run down completely and has shut down to prevent deep discharge.	Charge battery in the device for 24 hours (see 4.3.2, p. 47). After 24 hours: • Green LED is lit: Battery fully charged and ready for use. • Red LED or no LED is lit: Battery defective. Replace battery.
Device runtime with battery operation too short	Battery has reached end of its service life.	Replace battery.
Battery not charging although it is not full	Battery temperature < 0°C or > 45°C	Charge battery within permitted temperature range (see 14.1.2, p. 218).
	Battery defective	Replace battery.

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10.3.3 Ventilation

Fault	Cause	Remedy
Unusually high oxygen consumption	Leak in oxygen feed line	Locate and rectify leak (see 9.7, p. 192).
	Patient valve does not close completely	Check the hose system (PEEP control hose and patient valve).
	Leakage during mask ventilation	Place mask as tightly as possible on the patient.
MEDUtrigger is not functioning	MEDUtrigger option is deactivated in the operator menu	Activate the MEDUtrigger option in the operator menu (see 6.3.9, p. 134).
	MEDUtrigger/MEDUtrigger connection line/FlowCheck sensor connection line with MEDUtrigger defective	Replace MEDUtrigger.
Flow measurement is not functioning	Flow measurement + ASB option deactivated in the operator menu	Activate flow measurement + ASB in the operator menu (see 6.3.9, p. 134).
	FlowCheck sensor connection line/ FlowCheck sensor connection line with MEDUtrigger defective	Replace the FlowCheck sensor connection line/FlowCheck sensor connection line with MEDUtrigger.
CO_2 measurement is not functioning	Capnography option is deactivated in the operator menu	Activate the MEDUtrigger option in the operator menu (see 6.3.9, p. 134).
	Esophagus intubation	Check correct intubation.
	CO_2 measuring hose not connected correctly	Check CO_2 measuring hose.
	Ongoing occlusion	Eliminate the occlusion.
No ventilation in CCSV	• Tube not sufficiently blocked • Esophagus intubation • Chest compression is not being performed	• Check cuff pressure. • Check correct intubation. • Restart chest compression.

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11 Maintenance

11.1 General instructions

Maintenance, safety checks, inspections and repairs must only be carried out by the manufacturer or a technician specifically authorized by the manufacturer.

11.2 Intervals

Part concerned	Interval	Maintenance by
Device	Maintenance and safety check every 2 years	Manufacturer or a technician specifically authorized by the manufacturer
Battery	Maintenance-free When stored in the device: Charge every 3 months. When not stored in the device: Charge every 5 months. Recommendation: Replace battery after 2 years.	
Disposable hose system	Maintenance-free	
Reusable hose system	Maintenance every 2 years	User/operator (see "11.4 Maintaining the reusable hose system", page 207)
FlowCheck sensor	Following a prompt during the function check Recommendation: Replace FlowCheck sensor after 2 years.	User/operator
Device input filter	Following a prompt during the function check (every 6 months or after 24 ventilation hours in Air Mix mode)	User/operator (see "11.6 Replacing the device input filter", page 209)
Hygiene filter	Following a prompt during the function check (every 6 months or after 24 ventilation hours in Air Mix mode) **or** after each transportation of an infected and ventilated patient	User/operator (see "11.5 Replacing the hygiene filter", page 208)

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Part concerned	Interval	Maintenance by
Accessories (e.g., charging station)	There are individual intervals for the different accessories. Please refer to the instructions for use supplied with the accessories.	

11.3 Sending in device

⚠ WARNING

Risk of infection due to contaminated parts during maintenance work!
The device, components and accessories may be contaminated, and infect the technicians with bacteria or viruses.
⇒ Clean and disinfect the device, components and accessories.
⇒ Do not send in parts which are potentially contaminated.

1. Remove components and accessories.
2. Clean and disinfect the device, components and accessories (see "8.3 Hygienic reprocessing of the device", page 165).
3. Send in the device and, if necessary, components and accessories to WEINMANN Emergency or a technician specifically authorized by WEINMANN Emergency.

If you send in parts which are visibly contaminated, they will be disposed of by WEINMANN Emergency or a technician specifically authorized by WEINMANN Emergency at your expense.

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11.4 Maintaining the reusable hose system

Requirement The reusable hose system has been disassembled (see "8.6.1 Disassembly of the reusable hose system", page 172).

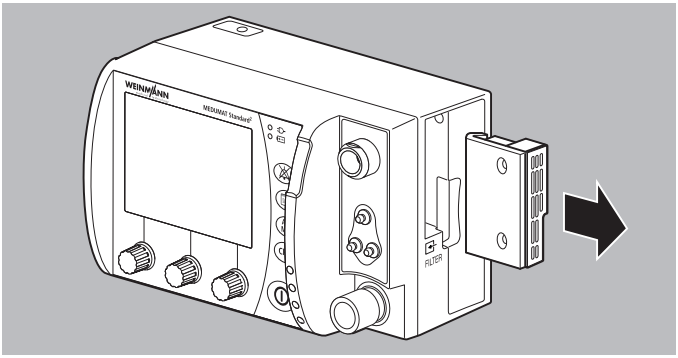
1. Check all parts of the reusable hose system for external damage and complete labeling.
   If necessary: Replace damaged or incorrectly labeled parts.
2. Replace the PEEP control diaphragm and check valve diaphragm (maintenance set WM 15779).
3. Assemble reusable hose system (see "8.6.2 Assemble reusable hose system", page 177).
4. Punch out the date at which the next maintenance is due on the service label (maintenance set WM 15779).
5. Attach the service label to the end of the ventilation hose which is closest to the device.
6. Perform a function check (see "9.3 Performing a function check", page 184).

Result The reusable hose system has been maintained and is ready for use.

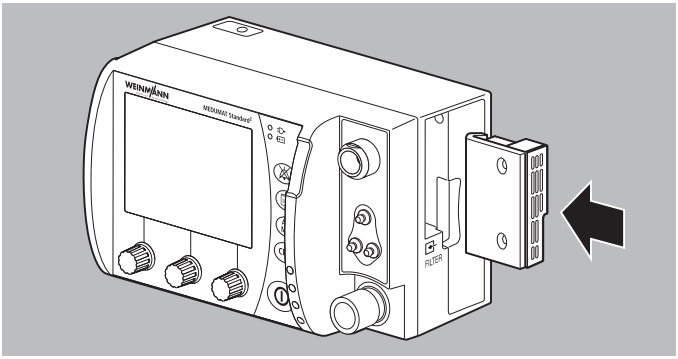
11.5 Replacing the hygiene filter

Requirement The device is switched off.

1. Wipe-disinfect the outside of the hygiene filter and the device.



2. Pull the hygiene filter out of the filter compartment of the device.
3. Dispose of the hygiene filter along with the filter cassette (see "13.4 Hygiene filter/device input filter", page 213).



4. With the filter side facing forwards, slide the hygiene filter into the device's filter compartment until the hygiene filter is flush with the device.
5. Perform a function check (see "9.3 Performing a function check", page 184).

Result The hygiene filter has been replaced.

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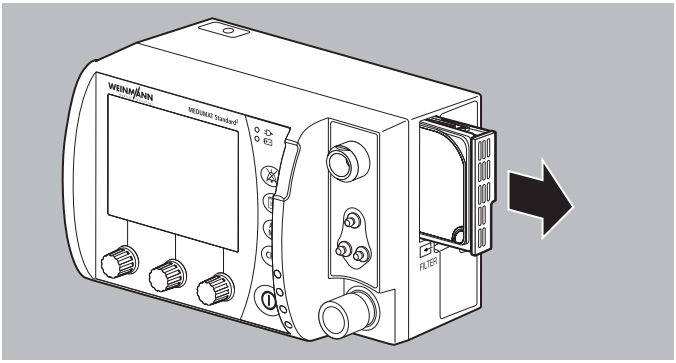
11.6 Replacing the device input filter

Requirement The device is switched off.



1. Pull the device input filter out of the filter compartment of the device.
2. Dispose of the device input filter along with the filter cassette (see "13.4 Hygiene filter/device input filter", page 213).

NOTICE

Device may be damaged if a device input filter which has already been pushed together is inserted in the filter compartment!

On delivery, the filter cassette is inserted halfway into the device input filter and is fixed in its position by a transport safety device. If the filter cassette is pushed all the way into the device input filter before insertion into the filter compartment of the device, the function of the device input filter can no longer be guaranteed.

⇒ Do not alter the state of device input filters on delivery.

⇒ Do not push the filter cassette into the device input filter completely by hand.

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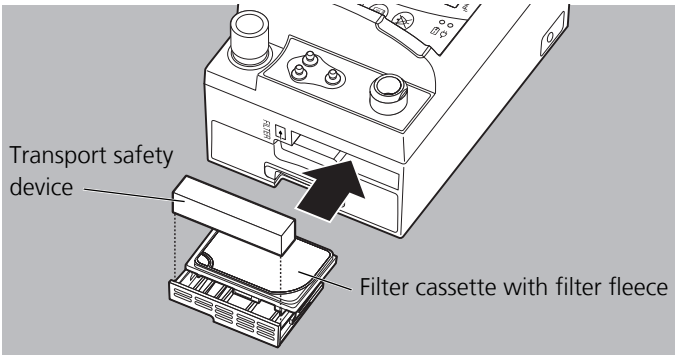

3. Remove the transport safety device from the device input filter.
4. Push the device input filter with the half-inserted filter cassette into the filter compartment of the device.
   In the process, the filter cassette is pushed all the way into the device input filter.
5. Press the device input filter into the filter compartment until the device input filter audibly clicks into place and sits flush with the device.
6. Perform a function check (see "9.3 Performing a function check", page 184).

Result The device input filter has been replaced.

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12 Storage

12.1 General instructions

- Store the device under the prescribed ambient conditions (see "14.1.1 Technical data on device", page 214).
- Following storage in extreme ambient conditions (outside of the ambient operating conditions, (see "14.1.1 Technical data on device", page 214)):
  Store the device at room temperature for at least 12 hours before putting it into operation once more.

12.2 Storing the device

1. Switch off the device (see "4.6 Switching the device off", page 66).
2. If necessary: Disconnect the device from the line power.
3. Remove the battery.
4. Clean and disinfect the device (see "8.3 Hygienic reprocessing of the device", page 165).
5. Store the device in a dry place.

Result The device is stored in a dry place.

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12.3 Storing the battery

Requirement

- The device and the battery have been cleaned and disinfected (see "8.3 Hygienic reprocessing of the device", page 165).
- The battery is fully charged.
- If available: The replacement battery is fully charged.

1. Insert the battery in the battery compartment and store the device in a dry place.

   or

   Store the battery in a dry place outside of the device.

NOTICE

Material damage due to prolonged storage of the battery without recharging!
Storing the battery for a prolonged period of time without recharging can result in the rapid shutdown of and irreparable damage to the battery.
⇒ When the battery is stored in the device without a power connection: Charge battery every 3 months.
⇒ If the battery is not stored in the device: Charge battery every 5 months.

2. Charge battery at regular intervals:

Type of storage	Charging interval
In device without power connection	Every 3 months
Not in device	Every 5 months

Result The battery is stored in a dry place and is ready for use.

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13 Disposal

13.1 Electronic waste

Do not dispose of the product in the household waste. Consult an authorized, certified electronic waste recycling company for proper disposal. You can find out their address from your environmental officer or from your local council.
The device packaging (cardboard box and inserts) can be disposed of as waste paper.

The following products are categorized as electronic waste:

- Device
- Power supply
- MEDUtrigger
- FlowCheck sensor
- Connection lines

13.2 Battery

Do not dispose of used batteries in the household waste. Contact WEINMANN Emergency or a public waste disposal authority.

13.3 Patient hose system

After use, dispose of the patient hose system in the correct manner for plastics.

13.4 Hygiene filter/device input filter

Dispose of the hygiene filter/device input filter correctly.

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14 Appendix

14.1 Technical data

14.1.1 Technical data on device

Specification	Device
Product class according to Directive 93/42/EEC	IIb
Dimensions (W x H x D)	206 mm x 137 mm x 130 mm
Weight: Without battery With battery	 Approx. 2 kg Approx. 2.5 kg
Weight with capnography option: Without battery With battery	 Approx. 2.15 kg Approx. 2.65 kg
Operation: Temperature range Humidity Air pressure Height above sea level	 -18°C to +50°C 0% RH to 95% RH without condensation 540 hPa to 1100 hPa -500 m to 5000 m
Storage (device)/transport: Temperature range Humidity Air pressure Height above sea level	 -40°C to +70°C 0% RH to 95% RH without condensation 540 hPa to 1100 hPa -500 m to 5000 m
Temperature range of CO_2 measurement (only with capnography option)	0°C to 50°C
Electrical connection (rated voltage)	12 V to 15.1 V
Max. power consumption	30 W
Current consumption	0.1 to 3 A
Input voltage (external power supply)	100 V-240 V~/50 Hz-60 Hz
Operating time with battery Without options With flow measurement + ASB option With capnography option With flow measurement + ASB option and capnography option	 10 h 8 h 6 h 5 h

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Specification	Device
Vehicle electrical system operation: Rated voltage Max. internal resistance of vehicle electrical system	 12 V 500 mΩ
Operating mode	Continuous operation
Classification acc. to EN 60601-1: • Type of protection against electric shock • Degree of protection against electric shock	 Protection class II BF-type protection
Degree of protection against: • Ingress of solid objects • Ingress of dust • Ingress of water with harmful effect	 IP54 (housing category II)
Electromagnetic compatibility (EMC) as per EN 60601-1-2: Radio interference suppression Radio interference immunity	Test parameters and limit values can be requested from the manufacturer (WEINMANN Emergency Medical Technology GmbH + Co. KG, Frohbösestraße 12, 22525 Hamburg, GERMANY) if required. EN 55011 EN 61000-4 (parts 2 to 6, 8 and 11) RTCA DO 160 G
Radio waves (only with Bluetooth data transmission option)	Frequency range: 2.4 Ghz to 2.483 Ghz Signal power: Max. 12 dBm
Display	5" TFT color display Resolution: 320 pixels x 240 pixels
Alarm volume	60 dBA to 88 dBA
Standards used	EN 60601-1 EN 1789 EN 794-3 ISO 10651-3 RTCA DO-160 G MIL-STD 810 G EN ISO 80601-2-55 (only with capnography option)
Volume-controlled ventilation modes	IPPV, CPR, RSI Optional: SIMV (only with SIMV option), SIMV + ASB (only with SIMV option and flow measurement + ASB option), S-IPPV (only with S-IPPV option)

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Specification	Device
Pressure-controlled ventilation modes	CPAP, Demand Optional: CPAP + ASB (only with flow measurement + ASB option) PCV (only with pressure-controlled ventilation modes option) aPCV (only with pressure-controlled ventilation modes option) BiLevel + ASB (only with pressure-controlled ventilation modes option) PRVC + ASB (only with pressure-controlled ventilation modes option) CCSV (only with CCSV option)
Inhalation flow (only with inhalation option)(1)	0 l/min to 10 l/min, in increments of 1 l/min
Monitoring	Pressure gauge: Airway pressure Frequency tachometer (only with CCSV option) Curves: • Airway pressure (only with flow measurement + ASB option and curve display option or capnography option) • Flow (only with flow measurement + ASB option and curve display option) • CO_2 (only with capnography option) • $etCO_2$ trend (only with capnography option)
Monitoring parameters	pPeak, pPlat, pMean Vte, MVe, f, fsp, Vleak (only with flow measurement + ASB option) $etCO_2$ (only with capnography option)
Operating gas	Medical oxygen (100% oxygen) **or** Concentrator oxygen (90% to 96% oxygen)
Operating pressure range	2.7 bar to 6 bar
Recommended gas supply	4.5 bar (static) 2.7 bar at 80 l/min
Maximum outlet flow	80 l/min with an input pressure of 4.5 bar in Air Mix and non-Air Mix mode
Mechanical pressure relief/emergency air valve	Pressure limitation to a maximum of 100 mbar
I:E	1:1 in CPR 30:2, 15:2 and RSI Manual 1:4 to 4:1
Ventilation rate	5 min^{-1} to 50 min^{-1} (±1 min^{-1})
Inspiration time	0.2 s to 9.6 s
Tidal volume(1)	50 ml to 2000 ml (±40 ml or ±20%)

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Specification	Device
Respiratory minute volume(1)	At least 0.25 l Max. 20 l
Pressure limitation (pMax)	10 mbar to 65 mbar (±3 mbar or ±15%)
PEEP	0 mbar to 30 mbar (±3 mbar or ±15%)
Pressure support Δ pASB (only with flow measurement + ASB option)	0 mbar to 30 mbar (±3 mbar or ±15%) above PEEP
Pressure ramp (only with flow measurement + ASB option)	Steep Averaging Flat
Trigger (permanently set)(1)	Inspiratory trigger: -1.3 mbar at PEEP > 0 -0.8 mbar at PEEP = 0 Expiratory trigger: 30% of the maximal flow Triggering via internal sensors
Trigger can be set (only with flow measurement + ASB option)(1)	Triggering via FlowCheck sensor Inspiratory trigger (three levels): • Level 1: Sensitive, corresponds to approx. 3 l/min • Level 2: Medium sensitivity, corresponds to approx. 6 l/min • Level 3: Insensitive, corresponds to approx. 10 l/min Expiratory trigger (three levels): • Level 1: Long ASB breath, corresponds to approx. 10% of the inspiratory maximum flow • Level 2: Medium ASB breath, corresponds to approx. 35% of the inspiratory maximum flow • Level 3: Short ASB breath, corresponds to approx. 70% of the inspiratory maximum flow Inspiratory trigger (units): 1 l/min to 15 l/min Expiratory trigger (units) 5% flow max. to 80% flow max.
Trigger time slot for mandatory breaths	20% of Te (SIMV, SIMV + ASB, BiLevel + ASB and PRVC + ASB) 0% to 100% of Te (S-IPPV)
Trigger time slot for ASB breaths	0% to 100% Te
aPCV trigger time slot (only with pressure-controlled ventilation modes option)	0% to 100% Te (adjustable)
Volume monitoring(1)	Measurement range: 40 ml to 8000 ml Tolerance: ± 15%

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Specification	Device
CO_2 measurement (only with capnography option)	Sidestream method Pressure-compensated Removal rate: 80 ml/min Measurement range: 0 vol% to 10 vol%/0 mmHG to 76 mmHG/ 0 kPa to 10.1 kPa Tolerance: ± 0.43 vol% + 8% of the CO_2 concentration Maximum drift of measuring accuracy: < 0.4 vol% in 6 h Start-up time of the CO_2 module: 10 s T_{90}-T_{10} < 150 ms
Oxygen concentration: • Air Mix mode • Non-Air Mix mode	See "14.1.7 Oxygen concentration in Air Mix mode", page 228. 100% oxygen Concentrator oxygen (90% to 96% oxygen)
Pressurized gas thread	External thread G 3/8
Connection for ventilation hose	WEINMANN Emergency-specific
Patient valve connections	WEINMANN Emergency-specific
Service life of the device input filter	24 h in Air Mix mode or 6 months
Service life of hygiene filter	24 h in Air Mix mode or 6 months
Efficiency of hygiene filter	> 99%

(1) BTPS (Body Temperature and Pressure, saturated): Volume at current ambient pressure and 37°C, with 100% saturated gas

CE 0197 Subject to alterations in design.

14.1.2 Technical data for battery

Specification	Battery
Type	Li-ion
Dimensions (W x H x D)	97 mm x 127 mm x 33 mm
Weight	450 g
Rated capacity	4.2 Ah (≥ 46.4 Wh)
Rated voltage	10.8 V
Charging time (0% to 95%)	3.5 h
Charging temperature	0°C to +45°C
Temperature range for operation	-20°C to +50°C

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Specification	Battery
Transport/Storage: Temperature range Humidity	 -40°C to +70°C (max. one week at more than +60°C) 0% RH to 95% RH without condensation
Service life	At least 300 charging cycles*
Charging intervals	When stored in the device without a power connection: Every 3 months When not stored in the device: Every 5 months

* One charging cycle corresponds to one instance of the battery being charged by 100%, regardless of the current battery status. Example: If you charge the battery to 100% from a status of 50% twice, the device counts this as one charging cycle.

14.1.3 Technical data for power supply

Specification	Power supply
Power supply operation 50 W (WM 28305): Temperature range Humidity Air pressure Height above sea level	 -18°C to +50°C 0% RH to 95% RH without condensation 540 hPa to 1100 hPa -500 m to 5000 m
Power supply operation 100 W (WM 28937): Temperature range Humidity Air pressure Height above sea level	 0°C to +40°C 5% RH to 95% RH without condensation 700 hPa to 1100 hPa -500 m to 3000 m
Input voltage (external power supply)	100 V-240 V~/50 Hz-60 Hz
Rated voltage output	15 V
Disconnection from line power	Pulling out the power plug disconnects the device from line power on all poles.

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14.1.4 Technical data for patient hose system

Specification	Patient hose system Length 2 m	Patient hose system Length 3 m
Operation: • Temperature range • Relative humidity	 -20°C to +50°C 15% to 95%	
Storage: • Temperature range • Relative humidity	 -30°C to +70°C Maximum of 95%	
Patient valve: Patient connection for mask/ endotracheal tube	15 mm internal taper 22 mm external taper EN ISO 5356-1	
Patient valve: Expiration opening	Non-connectable expiration opening	
Compliance: • Reusable hose system • Disposable hose system • Disposable hose system with reduced dead space	 0.79 ml/hPa (ml/cmH_2O) 0.90 ml/hPa (ml/cmH_2O) 0.43 ml/hPa (ml/cmH_2O)	 1.11 ml/hPa (ml/cmH_2O) 1.26 ml/hPa (ml/cmH_2O) -
Internal volume of the complete respiratory system: • Reusable hose system • Disposable hose system • Disposable hose system with reduced dead space	 Approx. 573 ml Approx. 573 ml Approx. 800 ml	 Approx. 857 ml Approx. 857 ml -
Internal volume of the complete respiratory system with FlowCheck sensor and CO_2 measurement: • Reusable hose system • Disposable hose system • Disposable hose system with reduced dead space	 Approx. 600 ml Approx. 573 ml Approx. 820 ml	 Approx. 880 ml Approx. 880 ml -
Materials used	PC, silicone, TPE, PA, polyolefin, PP, TPR, PE, PU, polyisoprene	

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Dead space in the patient hose systems (2 m and 3 m)		
	Without elbow	**With elbow**
Reusable patient valve	Approx. 16 ml	Approx. 28 ml
Disposable patient valve	Approx. 12 ml	Approx. 21 ml
Disposable patient valve with reduced dead space	Approx. 5 ml	Approx. 14 ml
Reusable patient valve with FlowCheck sensor	Approx. 21 ml	Approx. 33 ml
Disposable patient valve with FlowCheck sensor	Approx. 17 ml	Approx. 26 ml
Disposable patient valve with reduced dead space with FlowCheck sensor	Approx. 12 ml	Approx. 21 ml
Reusable patient valve with CO_2 connection	Approx. 27 ml	Approx. 39 ml
Disposable patient valve with CO_2 connection	-	Approx. 19 ml
Disposable patient valve with reduced dead space with CO_2 connection	-	Approx. 14 ml
Reusable patient valve with FlowCheck sensor and CO_2 connection	Approx. 34 ml	Approx. 46 ml
Disposable patient valve with FlowCheck sensor and CO_2 connection	-	Approx. 26 ml
Disposable patient valve with reduced dead space with FlowCheck sensor and CO_2 connection	-	Approx. 21 ml

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⚠ CAUTION

Risk of injury from use of other accessories!
Other accessories can increase the pressure drop and injure the patient.
⇒ When using other accessories, observe the requirements from ISO 10651-3 as regards the maximum pressure drop.

Pressure drop [hPa] over the inspiratory and expiratory flow path at different flow rates [l/min] as per EN 794-3 (in combination with MEDUMAT Standard², measuring point 1: Patient connection opening)

Patient hose systems (2 m) without FlowCheck sensor and without CO_2 measurement

	Flow [l/min]	Patient hose system (reusable), 2 m WM 28860		Patient hose system (disposable), 2 m WM 28865		Patient hose system (disposable), 2 m, with reduced dead space WM 28867
		With elbow	Without elbow	With elbow	Without elbow	With elbow
Spontaneous respiration in event of power failure, inspiratory (STP)(1)	2.5	0.35	0.26	0.23	0.10	0.13
	15	1.35	1.08	1.15	0.50	1.18
	30	2.82	2.72	2.93	1.30	3.27
Spontaneous respiration in event of power failure, expiratory (BTPS)(2)	2.5	0.62	0.66	1.17	0.60	0.75
	15	1.52	1.53	1.99	1.00	1.82
	30	2.05	2.00	2.60	1.20	3.26
Normal operation, inspiratory (STP)(1)	5	0.00	0.00	0.10	0.00	0.00
	30	0.13	0.00	0.26	0.10	0.12
	60	0.34	0.14	0.93	0.20	0.27
Normal operation, expiratory (BTPS)(2)	5	0.85	0.92	1.41	0.70	0.96
	30	2.01	2.01	2.58	1.20	3.24
	60	2.80	2.59	3.67	1.70	7.28

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Pressure drop [hPa] over the inspiratory and expiratory flow path at different flow rates [l/min] as per EN 794-3 (in combination with MEDUMAT Standard^2, measuring point 1: Patient connection opening)						
Patient hose systems (2 m) with FlowCheck sensor and with CO_2 measurement						
	Flow [l/min]	**Patient hose system (reusable), 2 m WM 29190**		**Patient hose system (disposable), 2 m WM 29192**		**Patient hose system (disposable), 2 m, with reduced dead space WM 29199**
		With elbow	**Without elbow**	**With elbow**	**Without elbow**	**With elbow**
Spontaneous respiration in event of power failure, inspiratory (STP)(1)	2.5	1.25	1.03	1.34	-	0.94
	15	2.45	2.64	2.20	-	1.82
	30	3.77	3.39	3.43	-	3.02
Spontaneous respiration in event of power failure, expiratory (BTPS)(2)	2.5	0.43	0.41	1.16	-	1.40
	15	1.68	1.66	2.00	-	6.68
	30	2.68	2.56	2.90	-	4.39
Normal operation, inspiratory (STP)(1)	5	0.18	0.18	0.03	-	0.05
	30	1.11	1.05	0.96	-	1.69
	60	2.83	2.55	2.76	-	5.68
Normal operation, expiratory (BTPS)(2)	5	0.94	1.01	1.38	-	1.65
	30	2.79	2.85	2.94	-	4.32
	60	4.53	4.09	5.14	-	9.40

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Pressure drop [hPa] over the inspiratory and expiratory flow path at different flow rates [l/min] as per EN 794-3 (in combination with MEDUMAT Standard^2, measuring point 1: Patient connection opening)					
Patient hose systems (3 m) without FlowCheck sensor and without CO_2 measurement					
	Flow [l/min]	**Patient hose system (reusable), 3 m WM 28861**		**Patient hose system (disposable), 3 m WM 28866**	
		With elbow	**Without elbow**	**With elbow**	**Without elbow**
Spontaneous respiration in event of power failure, inspiratory (STP)(1)	2.5	0.35	0.32	0.26	0.27
	15	1.25	1.19	1.23	1.18
	30	2.75	2.68	2.96	2.81
Spontaneous respiration in event of power failure, expiratory (BTPS)(2)	2.5	0.54	0.83	1.30	1.15
	15	1.29	1.35	2.03	1.85
	30	1.75	1.75	2.63	2.38
Normal operation, inspiratory (STP)(1)	5	0.00	0.00	0.00	0.00
	30	0.15	0.12	0.18	0.10
	60	0.40	0.15	0.76	0.21
Normal operation, expiratory (BTPS)(2)	5	0.80	1.05	1.50	1.33
	30	1.75	1.72	2.60	2.36
	60	2.39	2.29	3.86	3.27

Pressure drop [hPa] over the inspiratory and expiratory flow path at different flow rates [l/min] as per EN 794-3 (in combination with MEDUMAT Standard^2, measuring point 1: Patient connection opening)					
Patient hose systems (3 m) with FlowCheck sensor and with CO_2 measurement					
	Flow [l/min]	**Patient hose system (reusable), 3 m WM 29191**		**Patient hose system (disposable), 3 m WM 29193**	
		With elbow	**Without elbow**	**With elbow**	**Without elbow**
Spontaneous respiration in event of power failure, inspiratory (STP)(1)	2.5	1.65	1.46	1.06	-
	15	3.21	3.01	1.97	-
	30	4.08	3.81	3.23	-

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Pressure drop [hPa] over the inspiratory and expiratory flow path at different flow rates [l/min] as per EN 794-3 (in combination with MEDUMAT Standard^2, measuring point 1: Patient connection opening)					
Patient hose systems (3 m) with FlowCheck sensor and with CO_2 measurement					
	Flow [l/min]	**Patient hose system (reusable), 3 m WM 29191**		**Patient hose system (disposable), 3 m WM 29193**	
		With elbow	**Without elbow**	**With elbow**	**Without elbow**
Spontaneous respiration in event of power failure, expiratory (BTPS)(2)	2.5	0.52	0.43	1.05	-
	15	2.02	1.95	1.93	-
	30	2.93	2.82	2.83	-
Normal operation, inspiratory (STP)(1)	5	0.58	0.57	0.02	-
	30	1.37	1.34	1.13	-
	60	2.97	2.86	3.40	-
Normal operation, expiratory (BTPS)(2)	5	1.44	1.02	1.24	-
	30	3.00	2.83	2.83	-
	60	4.68	4.39	5.02	-

(1) STP (Standard Temperature and Pressure): Volume at 21°C and 1013 hPa

(2) BTPS (Body Temperature and Pressure, saturated): Volume at current ambient pressure and 37°C, with 100% saturated gas

Attainable tidal volume with counterpressure				
Counterpressure (mbar)	**Deviation of tidal volume (ml)**			
	Patient hose system 2 m		**Patient hose system 3 m**	
	Reusable	**Disposable**	**Reusable**	**Disposable**
0	0	0	0	0
5	-3.95	-4.5	-5.55	-6.3
15	-11.85	-13.5	-16.65	-18.9
30	-23.7	-27	-33.3	-37.8
60	-47.4	-54	-66.6	-75.6

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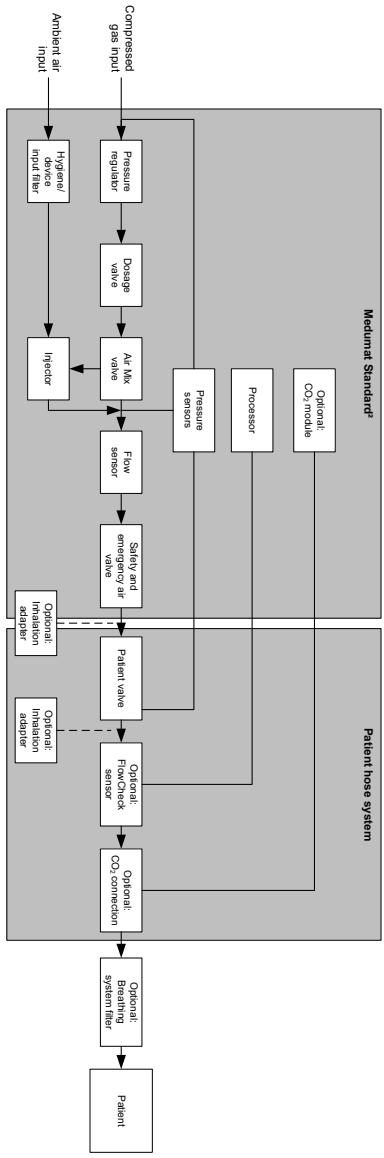
14.1.5 Block diagram



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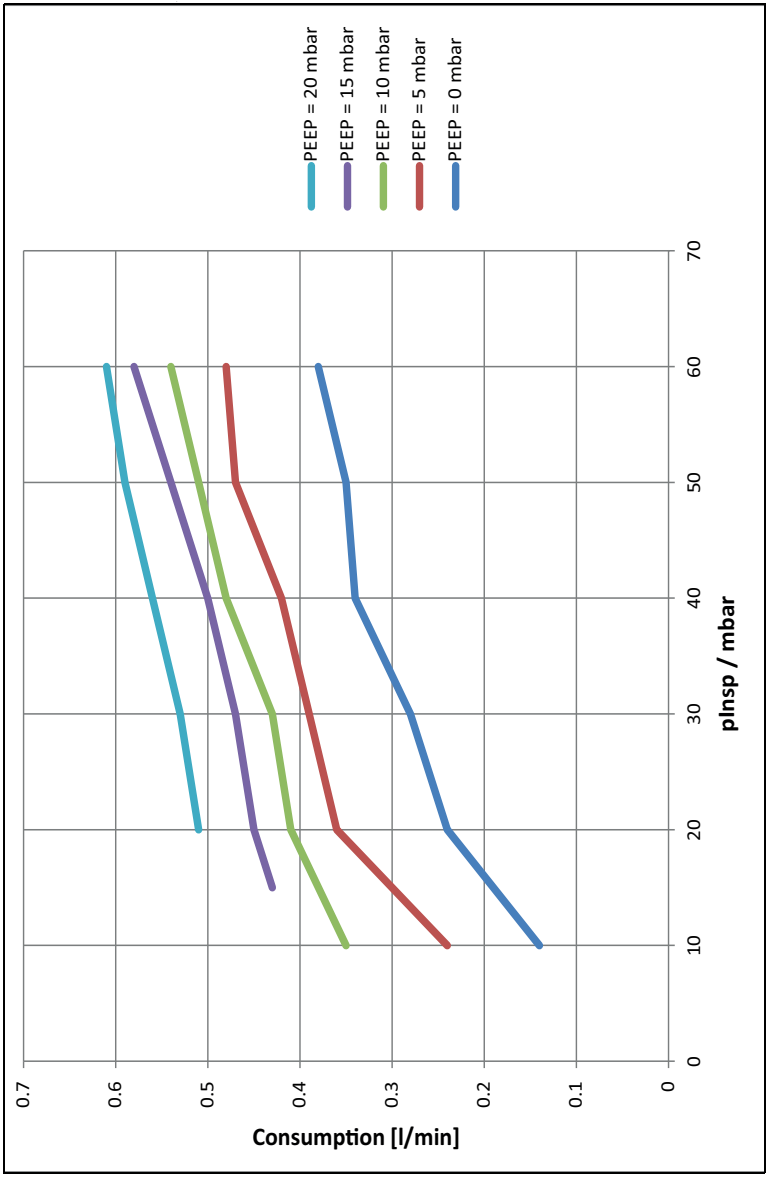
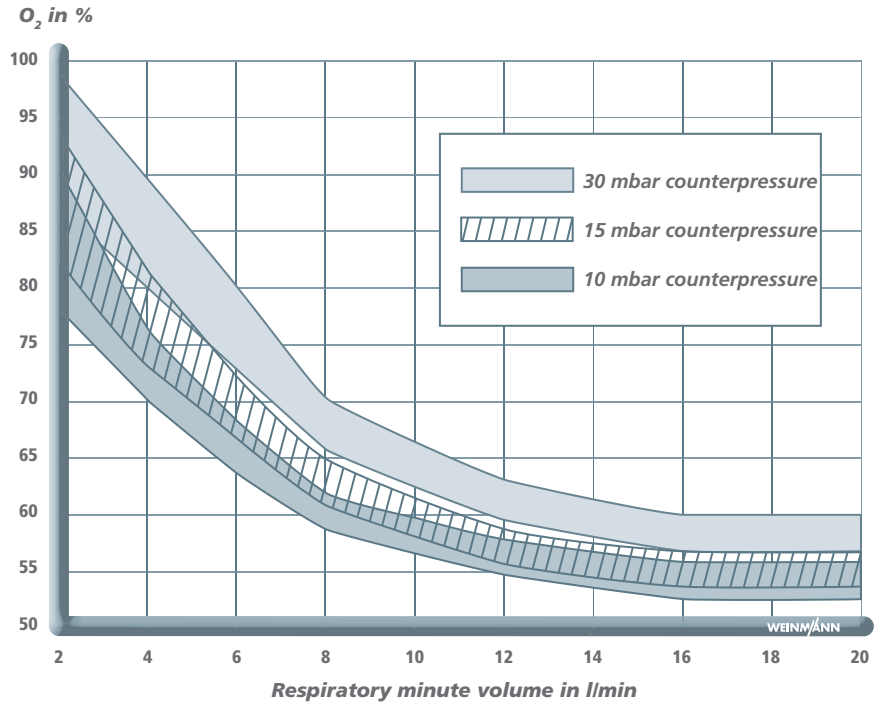
14.1.6 O_2 consumption of the device



14.1.7 Oxygen concentration in Air Mix mode

The following diagram shows the oxygen concentration for Air Mix mode at different counterpressures and respiratory minute volumes. The oxygen concentration is also reduced accordingly in Air Mix mode when concentrator oxygen is used.



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14.1.8 Technical data on electromagnetic compatibility (EMC)

Medical electrical equipment is subject to special precautions in relation to electromagnetic compatibility (EMC). It must be installed and put into operation in accordance with the EMC information contained in the accompanying documentation.

Guidelines and manufacturer's declaration – electromagnetic interference		
MEDUMAT Standard^2 is intended for operation in an electromagnetic environment as specified below. The customer or the user of the MEDUMAT Standard^2 device must ensure that it is truly operated in such an environment.		
Interference measurements	**Compliance**	**Electromagnetic environment – guidelines**
RF emissions in acc. with CISPR 11	Group 1	MEDUMAT Standard^2 only uses RF energy for its internal functions. As such, its RF emissions are very low and it is unlikely that they will interfere with neighboring electronic devices.
RF emissions in acc. with CISPR 11	Class B	MEDUMAT Standard^2 is suitable for use in all premises including private residences and other such facilities connected directly to the public power grid which also supplies residential buildings.
Emissions of harmonics in acc. with IEC 61000-3-2	Class A	
Emissions of voltage fluctuations/flickers in acc. with IEC 61000-3-3	Complies	

Guidelines and manufacturer's declaration – electromagnetic immunity			
MEDUMAT Standard^2 is intended for operation in the electromagnetic environment specified below. The customer or the user of the MEDUMAT Standard^2 device must ensure that it is also used in such an environment.			
Immunity tests	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment – guidelines**
Electrostatic discharge (ESD) in acc. with IEC 61000-4-2	± 6 kV contact discharge ± 8 kV air discharge	± 8 kV contact discharge ± 15 kV air discharge	Floors should be made of wood or concrete, or covered with ceramic tiles. If the floor is covered with a synthetic material, the relative humidity must be at least 30%.
Bursts in acc. with IEC 61000-4-4	± 2 kV for mains power lines ± 1 kV for input and output lines	± 2 kV for mains power lines ± 1 kV for input and output lines	The quality of the supply voltage should correspond to that of a typical business or hospital environment.

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Guidelines and manufacturer's declaration – electromagnetic immunity			
MEDUMAT Standard^2 is intended for operation in the electromagnetic environment specified below. The customer or the user of the MEDUMAT Standard^2 device must ensure that it is also used in such an environment.			
Immunity tests	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment – guidelines**
Surges in acc. with IEC 61000-4-5	± 1 kV voltage Phase-to-phase ± 2 kV voltage Phase-to-earth	± 1 kV voltage Phase-to-phase ± 2 kV voltage Phase-to-earth	The quality of the supply voltage should correspond to that of a typical business or hospital environment.
Voltage dips, short-term power failures and fluctuations in the supply voltage in acc. with IEC 61000-4-11	< 5% U_T (> 95% dip in U_T) for 0.5 cycles 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (> 95% dip in U_T) for 5 s	< 5% U_T (> 95% dip in U_T) for 0.5 cycles 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (> 95% dip in U_T) for 5 s	The quality of the supply voltage should correspond to that of a typical business or hospital environment. If the user of the MEDUMAT Standard^2 device demands continuing function even if the power supply is interrupted, we recommend running MEDUMAT Standard^2 with a fully charged battery.
Magnetic field at supply frequency (50/60 Hz) in acc. with IEC 61000-4-8	3 A/m	3 A/m	Magnetic fields at the mains frequency should correspond to the typical values encountered in business and hospital environments.
Note: U_T is the AC voltage in the mains prior to application of the test level.			

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Guidelines and manufacturer's declaration – electromagnetic immunity			
MEDUMAT Standard[2] is intended for operation in the electromagnetic environment specified below. The customer or the user of the MEDUMAT Standard[2] device must ensure that it is also used in such an environment.			
Immunity tests	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment – guidelines**
Conducted RF bursts in acc. with IEC 61000-4-6	3 $V_{effective\ value}$ 150 kHz to 80 MHz Outside of the ISM bands[a]	3 V	Portable and mobile wireless devices should not be used at closer distances to the MEDUMAT Standard[2] device, including its cables, than the recommended separation distance calculated in accordance with the corresponding equation for the frequency of the transmitter. **Recommended separation distance:** $d = 1,2\sqrt{P}$
	10 $V_{effective\ value}$ 150 kHz to 80 MHz Outside of the ISM bands[a]	10 V	$d = 1,2\sqrt{P}$
Emitted RF bursts in acc. with IEC 61000-4-3	10 V/m 80 MHz to 2.5 GHz	30 V/m	$d = 0,4\sqrt{P}$ for 80 MHz to 800 MHz $d = 0,8\sqrt{P}$ for 800 MHz to 2.5 GHz where P is the maximum rated output power of the transmitter in watts (W) as per the manufacturer of the transmitter's specifications and d is the recommended separation distance in meters (m).[b] The field strength of fixed RF transmitters, as determined by an electromagnetic site survey[c], should be lower than the compliance level in each frequency range.[d] Interference is possible in the vicinity of devices furnished with the following pictogram. 

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Note 1: The higher frequency range applies at 80 MHz and 800 MHz.
Note 2: These guidelines may not be applicable in all cases. The size of electromagnetic fields depends on the extent to which they are absorbed and reflected by buildings, objects and persons.

[a]The ISM frequency bands (for industrial, scientific and medical applications) between 150 kHZ and 80 Mhz are: 6.765 MHz to 6.795 MHz; 13.553 MHz to 13.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40.70 MHz.

[b]The compliance levels in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range from 80 MHz to 2.5 GHz are intended to reduce the likelihood of portable/mobile communication systems causing interference if brought into the PATIENT area unintentionally. For this reason, the additional factor of 10/3 is applied when calculating the recommended separation distances in these frequency ranges.

[c]Field strengths of fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio channels and TV broadcasters cannot be predicted accurately in theory. A survey of the site should be performed to determine the electromagnetic environment with regard to the fixed transmitters. If the field strength measured at the site where MEDUMAT Standard^2 is used exceeds the upper compliance level, MEDUMAT Standard^2 should be monitored to ensure it is functioning as intended. If unusual performance characteristics are noted, additional measures may prove necessary such as changing the orientation or moving MEDUMAT Standard^2 to another site.

[d]The field strength should be lower than 3 V/m for the frequency range from 150 kHz to 80 MHz.

Recommended separation distances between portable and mobile RF telecommunication devices and MEDUMAT Standard^2

MEDUMAT Standard^2 is intended for use in an electromagnetic environment in which the RF interference is controlled. The customer or user of the MEDUMAT Standard^2 device can help to avoid electromagnetic interference by observing the minimum distance between portable and mobile RF telecommunication devices (transmitters) and MEDUMAT Standard^2, as recommended below, according to the communication device's power output.

Rated maximum output power of the transmitter in W	**Separation distance, depending on transmission frequency in m**			
	150 kHz to 80 MHz outside of the ISM bands $d = 1,2\sqrt{P}$	**150 kHz to 80 MHz within the ISM bands** $d = 1,2\sqrt{P}$	**80 MHz to 800 MHz** $d = 0,4\sqrt{P}$	**800 MHz to 2.5 GHz** $d = 0,8\sqrt{P}$
0.01	0.12	0.12	0.04	0.08
0.1	0.38	0.38	0.13	0.25
1	1.2	1.2	0.4	0.8
10	3.8	3.8	1.3	2.5

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Recommended separation distances between portable and mobile RF telecommunication devices and MEDUMAT Standard²

MEDUMAT Standard² is intended for use in an electromagnetic environment in which the RF interference is controlled. The customer or user of the MEDUMAT Standard² device can help to avoid electromagnetic interference by observing the minimum distance between portable and mobile RF telecommunication devices (transmitters) and MEDUMAT Standard², as recommended below, according to the communication device's power output.

100	12	12	4	8

For transmitters with a maximum rated power output not listed in the table above, the distance can be calculated using the equation corresponding to the respective column, where P is the maximum rated power output of the transmitter in watts (W) in accordance with the manufacturer of the transmitter's specifications.

Note 1: The higher frequency range applies at 80 MHz and 800 MHz.

Note 2: The ISM frequency bands (for industrial, scientific and medical applications) between 150 kHZ and 80 Mhz are: 6.765 MHz to 6.795 MHz; 13.553 MHz to 13.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40.70 MHz.

Note 3: The compliance levels in the ISM bands between 150 kHz and 80 MHz and in the frequency range from 80 MHz to 2.5 GHz are intended to reduce the likelihood of portable/mobile communication systems causing interference if brought into the PATIENT area unintentionally. For this reason, the additional factor of 10/3 is integrated into the formula and applied when calculating the recommended separation distances in these frequency ranges.

Note 4: These guidelines may not be applicable in all cases. The size of electromagnetic fields depends on the extent to which they are absorbed and reflected by buildings, objects and persons.

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14.1.9 Factory settings for emergency modes and ventilation modes

Ventilation parameters	Adult	Child	Infant
Emergency mode	IPPV	IPPV	IPPV
Vt	500 ml	200 ml	60 ml
pInsp	20	15	15
Frequency	10/min	20/min	30/min
PEEP	0 mbar	0 mbar	0 mbar
Δ pASB	0	0	0
pMax	30 mbar	25 mbar	20 mbar
pMax CPR	30 mbar	25 mbar	20 mbar

14.2 Calculation of body weight on the basis of body height

In the start menu, you can set the height of the patient under the menu item **New patient** (see "4.7.3 Selecting a ventilation mode for a new patient", page 70). The device calculates the matching ventilation parameters based on the set height and the corresponding ideal body weight (IBW).

The IBW value is calculated as follows:

- Child(1) (height ≤ 154 cm):

⇒ IBW = 2.05 x $e^{0.02 \text{ x height}}$

- Adult(2) (height > 154 cm):

⇒ IBW, male = 50 + 2.3 x [height/2.54 - 60]
⇒ IBW, female = 45 + 2.3 x [height/2.54 - 60]

With the aid of the IBW, the tidal volume can be calculated as follows:

$$\text{IBW} \times \frac{\text{Vt}}{\text{kgKG}}$$

(KG = body weight)

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Example

- Patient, male, height 185 cm
- Setting for Vt/kg KG = 6 ml/kg

⇒ IBW = 50 + 2.3 x [185 cm/2.54 - 60] = 79.51 kg ≈ 80 kg

⇒ Vt = 80 kg x 6 ml/kg = 450 ml

(1) Source: TRAUB, S.L.; JOHNSON, C.E.: Comparison of methods of estimating creatinine clearance in children. In: American journal of hospital pharmacy 37, 1980, No.2, pp. 195–201.
(2) Source: DEVINE, Ben J. Gentamicin therapy. The Annals of Pharmacotherapy, 1974, Vol. 8, No. 11, pp. 650-655

14.3 Exported log files

If you have exported log files to an SD card (see "6.3.4 Import / Export", page 121), you will find the following files on the SD card:

File name	Description
debug	Supports communication in the event of servicing.
status	Supports communication in the event of servicing.
fcheck	Record of the function checks which have been performed (see 14.3.1, p. 235).
mission logs	Detailed recording of session data

14.3.1 Recorded function checks

In the file **fcheck**, the function checks which have been performed are saved along with the date, time and their results. This information helps you with documentation within the scope of your quality management system. You can open the file **fcheck** with a spreadsheet program (e.g., Microsoft® Excel®).

In the column **result**, you will find the overall result of a function check (**ok** = passed, **failed** = not passed). A function check is failed if a test is not passed.

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The following results are possible for the individual tests:

Result	Description
ok	Test passed
failed	Test not passed
not tested	Test not performed
n/a	Test not necessary with this device
-	Requested information has not been read out

The following tests are performed as part of the function check and listed in the file **fcheck**:

Column name	Description
#date	Date of the function check
time	Time of the function check
sequence	Consecutive application number
uid	For service purposes only
fcheck	For service purposes only
result	Result of the function check
alarmsystem	Test of the visual and audible alarms
buttontest	Test of the buttons and navigation knobs
temperature sensor	Test of the internal temperature of the device
airway / mixing chamber pressure sensors	Test of the internal pressure sensors
int./ext. flow sensor	Test of the internal flow sensor
pressure drop	Test of the pneumatic bleed time
leak tightness	Test of the tightness of the device including the patient hose system
input pressure sensor	Test of the input pressure sensor
airmix valve	Test of the Air Mix mode
flowcheck sensor	Test of the FlowCheck sensor
flowcheck cable	Test of the FlowCheck sensor connection line/FlowCheck sensor connection line with MEDUtrigger
flowcheck offset	Test of the offset of the FlowCheck sensor
flowcheck sensor sn	Documentation of the serial number of the FlowCheck sensor which was connected during the function check
co2system	Test of the CO_2 module

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14.3.2 Recorded mission logs

Mission logs contain detailed session data from up to 100 applications. The number of saved applications may vary depending on the session duration.

Depending on the frequency of the applications, the time required to export the data may vary.

The following data are saved in the mission logs:

- Measurements: Depending on the setting in the (see "6.3 Settings in the operator menu", page 119) operator menu, the device records average minute values from the measurements as trend data or all measurements as real-time data.
- Ventilation settings and their changes: All triggered alarms and settings changes are saved immediately.
- Triggered alarms

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14.4 Scope of supply

14.4.1 Standard product

MEDUMAT Standard^2 with capnography option **WM 29500**

Part	Article number
MEDUMAT Standard^2 basic device with CO_2 measurement	WM 28710-02
Reusable patient hose system for MEDUMAT Standard^2 without flow measurement and with CO_2 measurement, 2 m	WM 28905
MEDUtrigger for 2 m patient hose system for manual triggering of breath	WM 28992
Inhalation adapter	WM 28263
Battery	WM 45045
Testing bag	WM 1453
Set of CPAP/NIV disposable masks with air cushion	WM 15807
Ventilation mask with self-inflating silicone cushion for adults, size 5	WM 5074
$etCO_2/O_2$ nasal cannula	WM 1928
Hygiene filter	WM 28740
Velcro strap with clip	WM 28964
Medical device logbook	WM 16430
Delivery record	WM 16318
MEDUMAT Standard^2 Instructions for Use	WM 68011

MEDUMAT Standard^2 with capnography option, with compressed gas connection on rear **WM 29550**

Part	Article number
MEDUMAT Standard^2 basic device with CO_2 measurement	WM 28710-04
Reusable patient hose system for MEDUMAT Standard^2 without flow measurement and with CO_2 measurement, 2 m	WM 28905

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Part	Article number
MEDUtrigger for 2 m patient hose system for manual triggering of breath	WM 28992
Inhalation adapter	WM 28263
Battery	WM 45045
Testing bag	WM 1453
Set of CPAP/NIV disposable masks with air cushion	WM 15807
Ventilation mask with self-inflating silicone cushion for adults, size 5	WM 5074
$etCO_2/O_2$ nasal cannula	WM 1928
Hygiene filter	WM 28740
Velcro strap with clip	WM 28964
Medical device logbook	WM 16430
Delivery record	WM 16318
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MEDUMAT Standard^2 without capnography option **WM 29300**

Part	Article number
MEDUMAT Standard^2 basic device without CO_2 measurement	WM 28710-01
Reusable patient hose system for MEDUMAT Standard^2 without flow measurement and without CO_2 measurement, 2 m	WM 28860
MEDUtrigger for 2 m patient hose system for manual triggering of breath	WM 28992
Inhalation adapter	WM 28263
Battery	WM 45045
Testing bag	WM 1453
Set of CPAP/NIV disposable masks with air cushion	WM 15807
Ventilation mask with self-inflating silicone cushion for adults, size 5	WM 5074
Hygiene filter	WM 28740
Velcro strap with clip	WM 28964
Medical device logbook	WM 16430
Delivery record	WM 16318
MEDUMAT Standard^2 Instructions for Use	WM 68011

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MEDUMAT Standard^2 without capnography option, with compressed gas connection on rear **WM 29350**

Part	Article number
MEDUMAT Standard^2 basic device without CO_2 measurement	WM 28710-03
Reusable patient hose system for MEDUMAT Standard^2 without flow measurement and without CO_2 measurement, 2 m	WM 28860
MEDUtrigger for 2 m patient hose system for manual triggering of breath	WM 28992
Inhalation adapter	WM 28263
Battery	WM 45045
Testing bag	WM 1453
Set of CPAP/NIV disposable masks with air cushion	WM 15807
Ventilation mask with self-inflating silicone cushion for adults, size 5	WM 5074
Hygiene filter	WM 28740
Velcro strap with clip	WM 28964
Medical device logbook	WM 16430
Delivery record	WM 16318
MEDUMAT Standard^2 Instructions for Use	WM 68011

14.4.2 Options

Part	Article number
S-IPPV option	WM 28915
SIMV option	WM 28916
Inhalation option	WM 28920
Flow measurement + ASB option	WM 28959
Curve display option	WM 28963
NVG option	WM 28954
Pressure-controlled ventilation modes option	WM 28970
CCSV option	WM 28940
Bluetooth data transmission option	WM 28945

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14.4.3 Patient hose systems

Reusable hose system

With flow measurement	With CO_2 measurement	Number	Article number	
			2 m	3 m
-	-	1	WM 28860	WM 28861
x	-	1	WM 29197	WM 29198
-	x	1	WM 28905	WM 28906
x	x	1	WM 29190	WM 29191

Disposable hose system

With flow measurement	With CO_2 measurement	Number	Article number	
			2 m	3 m
-	-	1	WM 28865	WM 28866
-	-	10	WM 15910	WM 15916
-	-	25	WM 15911	-
-	-	50	WM 15912	-
x	-	1	WM 29195	WM 29196
x	-	10	WM 17851	WM 17852
x	-	25	WM 17853	-
x	-	50	WM 17854	-
-	x	1	WM 28907	WM 28908
-	x	10	WM 17855	WM 17856
-	x	25	WM 17857	-
-	x	50	WM 17858	-
x	x	1	WM 29192	WM 29193
x	x	10	WM 17859	WM 17860
x	x	25	WM 17861	-
x	x	50	WM 17862	-

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Disposable hose system with reduced dead space

With flow measurement	With CO_2 measurement	Number	Article number	
			2 m	3 m
-	-	1	WM 28867	-
-	-	10	WM 15913	
x	-	1	WM 29194	
x	-	10	WM 17863	
-	x	1	WM 28904	
-	x	10	WM 17866	
x	x	1	WM 29199	
x	x	10	WM 17869	

14.4.4 Accessories

Accessories can be ordered separately, if required.

Part	Article number
MEDUtrigger for patient hose system, 2 m	WM 28992
MEDUtrigger for patient hose system, 3 m	WM 28993
FlowCheck sensor connection line, 2 m	WM 32506
FlowCheck sensor connection line, 3 m	WM 32507
FlowCheck sensor connection line with MEDUtrigger, 2 m	WM 32508
FlowCheck sensor connection line with MEDUtrigger, 3 m	WM 32509
FlowCheck sensor, reusable	WM 32501
Set, FlowCheck sensor, reusable (5 x WM 32501)	WM 17850
Testing bag with triggering	WM 1454
Charging adapter	WM 28979
50 W power supply	WM 28305
100 W power supply	WM 28937
12 V cable	WM 28356
Charging station	WM 45190
EasyLung for WEINMANN Emergency	WM 28625
SD card	WM 29791
T-distributor with self-sealing coupling	WM 22395
Set, holding plate for equipment rail	WM 15845
Set, wall mounting for power supply unit/charger	WM 15846
Set, wall mounting for rechargeable battery pack	WM 15847

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Part	Article number
Hospital standard rail attachment set	WM 15795
Rail bracket attachment set	WM 15806
Breathing system filter for MEDUMAT ventilators	WM 22162
AD22 protective cap	WM 28942
2 l oxygen cylinder, full, G 3/4", max. filling pressure 200 bar	WM 1822
2 l lightweight oxygen cylinder, full, G 3/4", max. filling pressure 200 bar	WM 1814
$etCO_2/O_2$ split nasal cannula for $etCO_2$ measurement and oxygen supply, for adults, 2.1 m connection hose	WM 1928
Nasal cannula for adults, double lumen, with ear clips and 1.5 m connection hose	WM 1929
Pressure reducer OXYWAY Fix III, G 3/4"	WM 30301
Pressure reducer OXYWAY Fast II High Flow, G 3/4"	WM 31891
Pressure hose, 10 bar, with connection nozzle G 3/8", at the other end, the option of a union nut G 3/8" or oxygen supply connector	Article number on request
Hygiene filter set	WM 17865
Device input filter	WM 28745
MEDUMAT Standard^2 brief operating instructions EN	WM 68051
Pneumatic drug nebulizer set	WM 15827

14.4.5 Replacement parts

Replacement parts can be ordered separately, if required. A current list of replacement parts is available on the Internet at www.weinmann-emergency.com or from your authorized dealer.

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14.5 Warranty

Starting from the date of purchase, WEINMANN Emergency offers the customer a limited manufacturer's warranty on a new original WEINMANN Emergency product or replacement parts installed by WEINMANN Emergency in accordance with applicable warranty terms and conditions for the particular product and the warranty periods listed below. The warranty terms and conditions are available on the Internet at www.weinmann-emergency.com. On request, we will send you the warranty terms and conditions by mail.
If you wish to make a warranty claim, consult your authorized dealer.

Product	Warranty periods
WEINMANN Emergency devices including accessories (for exceptions see below) for oxygen therapy and emergency medicine	2 years
MEDUtrigger connection line/FlowCheck sensor connection line/FlowCheck sensor connection line with MEDUtrigger	1 year
Masks, incl. accessories, batteries (unless otherwise stated in the technical documentation), sensors, hose systems, FlowCheck sensor	6 months
Disposable products	None

14.6 Declaration of Conformity

WEINMANN Emergency Medical Technology GmbH + Co. KG declares herewith that the product complies fully with the respective regulations of the Medical Device Directive 93/42/EEC. The unabridged text of the Declaration of Conformity can be found on our website at www.weinmann-emergency.com.

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