Instructions for use

Oxylog VE300

WARNING

To properly use this medical device, read and comply with these instructions for use.

Emergency and transport ventilator
Software 1.n

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Contents

1 Information regarding the instructions for use

1.1 Typographical conventions

Text	Texts printed in bold and italics indicate device labels and screen texts.
1.	Consecutive numbers indicate steps of action, with the numbering restarting with "1" for each new sequence of actions.
●	Bullet points indicate individual actions or different options for action.
–	Dashes indicate the listing of data, options, or objects.
(A)	Letters in parentheses refer to elements in the related illustration.
A	Letters in illustrations denote elements referred to in the text.
>	The "greater than" symbol indicates the navigation path in a dialog.
	This symbol indicates information which makes it easier to use the product.
►	This triangle is used in safety instructions and precautionary statements to indicate possible ways of avoiding the risk.

1.2 Use of terms

Dräger uses the term "accessory" not only for accessories in the sense of IEC 60601-1, but also for consumable parts, removable parts and attached parts.

1.3 Illustrations

Depending on the configuration, the products and screen content shown in this document may differ from the actual on-site products.

1.4 Trademarks

Trademarks owned by Dräger

The trademarks are registered in the following countries:

Trademark	Country
Oxylog®	Germany, EU, USA, Australia
DrägerService®	Germany, USA
MEDIBUS.X®	EU, USA
ClassicStar®	EU, USA
NovaStar®	EU, USA

Trademarks owned by third-party manufacturers

Trademark	Trademark owner
Dismozon®	BODE Chemie
Korsolex®	BODE Chemie
Neodisher®	Chemische Fabrik Dr. Weigert
Buraton®	Schülke & Mayr
Perform®	Schülke & Mayr
Mikrozid®	Schülke & Mayr
acryl-des®	Schülke & Mayr
Actichlor®	Ecolab
Sekusept®	Ecolab
Oxycide®	Ecolab USA
Dispatch®	Clorox
Descogen®	Antiseptica
Virkon®	DuPont
BruTab 6S®	Brulin
Klorsept®	Medentech

Trademark

Trademark
BIPAP[1)]

1) Licensed trademark

2 Safety-related information

2.1 Intended use

Oxylog VE300 is a time-cycled, volume-controlled and pressure-controlled emergency and transport ventilator for patients requiring mandatory or assisted ventilation with a tidal volume from 100 mL upward.

2.2 Indications

For patients with a tidal volume of 100 mL upward.

2.3 Contraindications

Patients with a tidal volume of 100 mL or less.

2.4 Environment of use

Intended environments of use:

– Mobile use for emergency patients, for outdoor and indoor environments
– During transport in ambulances, airplanes, helicopters, and on board ships
– In accident and emergency departments
– During intrahospital transport of ventilated patients

⚠ WARNING
Risk of patient injury
The device is not intended for long-term use.
► Do not use the device as an intensive care ventilator.

⚠ WARNING
Risk of patient injury and device malfunction
Do not use the device in hyperbaric chambers.
► This may result in danger to the patient and malfunctioning of the device.

⚠ WARNING
Risk of patient injury and device malfunction
Do not use the device in conjunction with magnetic resonance imaging (MRI).
► This may result in danger to the patient and malfunctioning of the device.

⚠ WARNING
Risk of explosion and fire
The device is not approved for use in areas where oxygen concentrations greater than 25 Vol% and combustible or explosive gas mixtures are likely to occur.
► This may result in risk of explosion and fire.

2.5 Essential performance characteristics

Provided that the essential performance characteristics are functioning correctly, the product can be used for its intended purpose. The product has the following essential performance characteristics:

Provision of controlled and monitored patient ventilation with user-defined pressure limitation for airway pressure or the triggering of a corresponding alarm.

If CO_2 measurement (option) is active, the product has the following additional essential performance characteristics:

– Adherence to the specified CO_2 measurement accuracy
– Triggering of an alarm if the alarm limit set by the user is exceeded
– Triggering of an alarm if the specified CO_2 measurement accuracy cannot be maintained

In the event of an external power supply failure, the device automatically switches to the internal battery.

2.6 Target groups

2.6.1 Intended users

The device is intended for use by and under the supervision of trained healthcare professionals, e.g., doctors, nurses, emergency medical technicians, respiratory therapists, and paramedics.

2.6.2 Definition of target groups

The target groups may only carry out the following activities if they meet the necessary requirements.

2.6.2.1 Users

Task	Requirement
Use of the product in accordance with the intended use	Specialist medical knowledge in respiratory care and the use of the medical device

2.6.2.2 Reprocessing personnel

Task	Requirement
Reprocessing	Specialist knowledge in the reprocessing of medical devices

2.6.2.3 Service personnel

Task	Requirement
Installation	Specialist knowledge in electrical engineering and mechanics Experience in the servicing of medical devices
Basic service work (inspection, maintenance according to the "Service" chapter)	

2.6.2.4 Specialized service personnel

Task	Requirement
Installation	Specialist knowledge in electrical engineering and mechanics Experience in the servicing of medical devices Experience in complex service work on this product
Basic and complex service work (inspection, maintenance, repair)	

Dräger recommends arranging a service contract with DrägerService.

2.7 Information on safety instructions and precautionary statements

Safety instructions and precautionary statements warn of risks and give instructions for the safe use of the product. Failure to observe them may lead to personal injury or property damage.

2.7.1 Safety instructions

This document contains sections with safety instructions which warn of risks. The type of risk and the consequences of non-compliance are described in each safety instruction.

2.7.2 Precautionary statements

Precautionary statements relate to action steps and warn of risks that may arise when executing the action steps. Precautionary statements precede the action steps.

The following warning signs and signal words indicate precautionary statements and differentiate the possible consequences of non-compliance.

Warning sign	Signal word	Consequences of non-compliance
	WARNING	May result in death or serious injury.
	CAUTION	May result in moderate or minor injury.
	NOTICE	May result in property damage.

2.8 Basic safety instructions

2.8.1 Instructions for use

Failure to use the product in accordance with the information contained in these instructions for use may result in personal injury and property damage.

- ► Follow these instructions for use and those for any products used in conjunction with this product.
- ► Only use this product for the purpose specified in "Intended use".
- ► Keep these instructions for use close to hand.

The instructions for use do not contain any information on the following points:
– Risks that are obvious to users
– Consequences of obvious improper use of the product
– Potentially negative effects on patients with different underlying diseases

2.8.2 Symbols and product labels

Failure to observe symbols and product labels may result in personal injury and property damage.

► Observe the symbols and product labels.

2.8.3 Monitoring the patient's condition

Monitoring of a patient's condition can range from direct observation to electronic monitoring by means of medical devices. The patient may be put at risk if his or her condition is not adequately monitored.

► Monitor the patient's condition by suitable means and at appropriate intervals.

2.8.4 Duties of the operating organization

The tasks described in this document specify the requirements which have to be met by each respective target group. If the respective target group is not appropriately qualified, personal injury and property damage may result.

The operating organization of this product must ensure the following:

► The target group has the required qualifications (e.g., has undergone specialist training or acquired specialist knowledge through experience).

► The target group has been trained to perform the task.

► The target group has read the sections of these instructions for use relating to the activity concerned and noted the safety instructions and precautionary statements they contain.

2.8.5 Operation of the device by persons outside the defined target groups

The device is not intended for use by non-specialists (persons not defined as target group). Responsibility for use of the device that is inconsistent with its intended use, particularly by non-specialists, lies with the operating organization. If the operating organization nevertheless allows non-specialists to interact with the device, appropriate instruction and supervision must be provided.

If non-specialists (e.g., visitors) are given access to the device, the following precautions must be taken:

► Non-specialists must be informed that unauthorized interactions may lead to injury.

2.8.6 Modifications to the product

Modifications to the product may lead to malfunctions and unforeseen risks. This may result in injury to the patient or the user or in property damage.

► Do not modify this product.

2.8.7 Alarms

Failure to notice alarm signals may put the patient at risk.

- ► Before operation, check that the visual and acoustic alarm signals are working correctly. To do so, generate any alarm, e.g. ***O2 supply pressure low***.
- ► Set the alarm volume so that alarm signals can be heard.
- ► The user must stay within hearing range of the acoustic alarm signal.
- ► Pay additional attention in environments where the surrounding noise interferes with hearing the maximum alarm volume of the device (e.g., in a helicopter).
- ► Make sure that the alarm system has not been rendered useless by setting the alarm limits to extreme values.
- ► Check the display regularly for optical alarm signals when the acoustic alarm signals are silenced.

2.8.8 Accessories

The use of incompatible accessories may adversely affect the functional integrity of the product. Personal injury and property damage may result.

- ► Use only compatible accessories. The accessories that are compatible with this product are listed in the list of accessories supplied with the product.
- ► Do not use any antistatic or electrically conductive breathing circuits.

2.8.9 Connected devices

Any connected devices or device combinations not complying with the requirements mentioned in these instructions for use may compromise the correct functioning of the medical device and lead to an electric shock.

- ► Before operating the medical device, strictly comply with the instructions for use of all connected devices or device combinations.
- ► Electrical connections to equipment not listed in these instructions for use or these assembly instructions must only be made when approved by each respective manufacturer.

2.8.10 Service

If service is not performed regularly, malfunctions may occur, which can result in personal injury and property damage.

- ► Perform service work as described in "Service".

2.8.11 Electromagnetic compatibility (EMC)

Medical electrical equipment is subject to special precautionary measures concerning electromagnetic compatibility. During installation and before initial operation, follow the information in section: "EMC Declaration" (page 121).

This device can be affected by other electrical devices.

Electromagnetic interferences

Wireless communication devices (e.g., cellular phones) and medical electrical equipment (e.g., defibrillators, electrosurgical devices) emit electromagnetic radiation. When such devices are operated too close to this device or its cables, the functional integrity of this device may be compromised by electromagnetic interferences. As a result, the patient could be put at risk.

- ► Maintain a distance of at least 0.3 m (1.0 ft) between this device and wireless communication devices, to ensure that the essential performance characteristics of this device are fulfilled.
- ► Maintain an adequate distance between this device and other medical electrical equipment.

2.8.12 Use of oxygen

Oxygen enhances combustion of other substances and can intensify fires.

- ► No smoking or open flames.
- ► Protect the oxygen cylinder from tipping over, and do not expose it to excessive heat.
- ► Always provide adequate ventilation in the area where the ventilator is being operated, in order to maintain ambient oxygen concentration below 25 Vol%, to prevent risk of fire.
- ► Do not use any combustible gases or anesthetic gases with the ventilator.
- ► Do not use any flammable drugs with the ventilator.

Special care must be taken when using oxygen fittings.

- ► Do not grease or lubricate cylinder valves and pressure reducers or device ports, and do not handle with greasy hands.
- ► Operate cylinder valves by hand and rotate slowly to prevent the risk of fire or explosion.
- ► Do not use tools.
- ► Do not use a control valve or flowmeter in the gas supply line.
- ► Only use medical oxygen or 93 % oxygen.

Special care must be taken when providing gas supply from an oxygen cylinder.

- ► Always use gas cylinders and pressure reducers that comply with all applicable regulations and have a pressure gauge.
- ► Always use full oxygen cylinders.
- ► To protect the patient from hypothermia, do not use oxygen cylinders that are too cold.
- ► Only use O_2 inhalation in conjunction with a pressure reducer for patients with sufficient spontaneous breathing.
- ► Only use a pressure reducer with a blow-off valve at the outlet to limit the outlet pressure to a maximum of 1000 kPa in the event of a malfunction.

2.8.13 Use of the rechargeable battery

Observe the following instructions when using the rechargeable battery:

- ► Remove the battery if the device is not going to be used for an extended period of time.
- ► In the absence of the rechargeable battery, the integrated clock is powered by a button cell. In the event of permanent storage without the rechargeable battery, replace the button cell after 2 years.
- ► Fully charge the battery if the device has not been used for an extended period of time.
- ► Always fit the battery correctly in the device, applying only a small amount of force to do so.
- ► Before each use, make sure that the battery is sufficiently charged.
- ► Always keep a fully-charged battery in reserve.
- ► Do not throw the battery into a fire or try to open by force.

2.8.14 Cleaning and service

Disinfectants and cleaning agents

Residues of disinfectants or cleaning agents left in the device after reprocessing may put the patient at risk due to irritation to the skin or mucous membranes.

- ► Observe the instructions relating to disinfectants and cleaning agents.
- ► Make sure that the device is adequately ventilated after reprocessing.

Risk of infection

The device must be reprocessed, otherwise there is an increased risk of infection and the function of the device may be impaired.

- ► Observe the hygiene regulations at the operating location (e.g., hospital or ambulance station), including the reprocessing intervals and reprocessing procedures.
- ► Have reprocessing personnel perform reprocessing with validated procedures.
- ► Reprocess reusable products before their first use and after each use.
- ► Follow the manufacturer's instructions in respect of cleaning agents and disinfectants.
- ► Reprocess the product before performing service activities or returning it for repair. For further information, see the following chapter: "Reprocessing", page 98.

Service

This product must be maintained at regular intervals and in the appropriate manner. Failure to perform service activities correctly may result in personal injury and property damage.

- ► Perform service activities. For further information, see the following chapter: "Service", page 106.
- ► Service must be performed by those target groups that are assigned to the particular measure.
- ► Only carry out service activities when there is no patient connected to the device.

Checks prior to use of the device

Reprocessing, wear and tear, and improper storage may damage parts of the device such that they no longer function correctly. This puts the patient at risk. Make sure that the following preconditions are met before operating the device:

- ► There are no cracks or sharp edges on the device.
- ► All hoses are undamaged and correctly connected.
- ► The touchscreen and the rotary knob are working correctly.
- ► The visual and acoustic alarm signals are working correctly.

Undetected damage to the device

Reprocessing, wear and tear, and improper storage may damage the device such that it no longer functions correctly. The patient is put at risk.

- ► If a device is behaving suspiciously or is clearly malfunctioning, replace it with a device in proper working order.

2.9 Product-specific safety information

Patient monitoring

Ventilation monitoring is mandatory at all times. Whenever a patient is connected to the ventilator, constant attention by qualified medical staff is required in order to provide immediate corrective action in the event of a malfunction.

- ► The user must not rely solely on the built-in ventilation monitoring.
- ► The user bears full responsibility for proper ventilation, and for the patient's safety, in all situations.
- ► Do not make therapeutic decisions based solely on individual measured values and monitoring parameters.
- ► An etCO_2 value is insufficient as a basis for medical decisions. Always consider multiple values as part of the decision-making process.

Settings on the device

To ensure proper ventilation, the total dead space of the breathing circuit must be considered when setting the ventilation parameters. This applies particularly when using low tidal volumes.

- ► Observe for signs of CO_2 rebreathing.
- ► The factory presettings of the device must be compared with standard procedures and the valid guidelines, e.g., of the American Heart Association or the European Resuscitation Council.
- ► The device settings must be checked for each patient and adjusted to the patient’s condition as necessary.

Device malfunction

If a malfunction is detected in the ventilator, and its life-preserving function can no longer be ensured (e.g., in the event of a power failure or an interruption of the gas supply), ventilation with an independent ventilation device (breathing bag) must be started immediately.

- ► Keep a manual resuscitator at the ready.
- ► Ventilate with PEEP and/or increased inspiratory O_2 concentration if necessary.

Transporting the device

If the device is operated during transport, there is a risk of selecting undesired settings or the device falling down.

► Transport the device safely and in a stable manner.

► Place the device on a flat and stable surface for operation.

2.10 Additional information

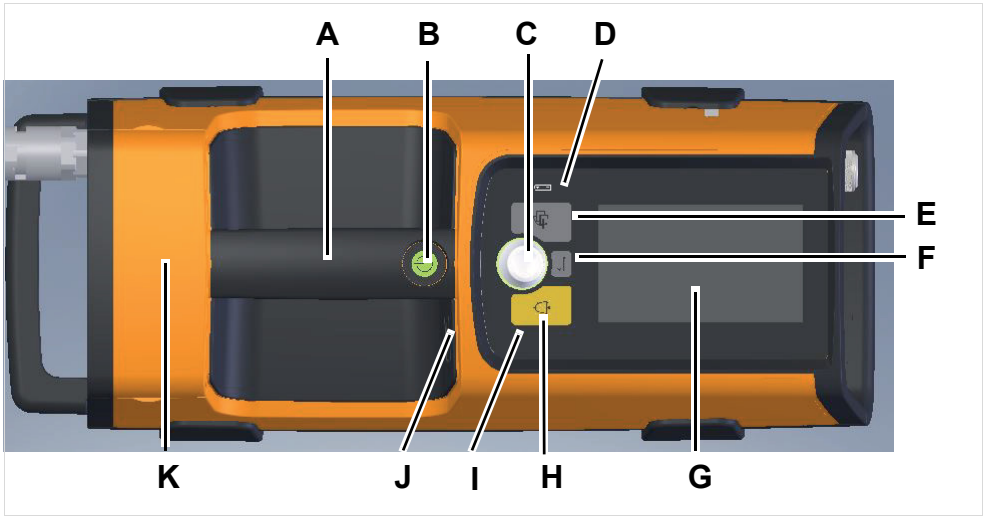
2.10.1 Training

User training is offered by the responsible Dräger organization, see www.draeger.com.

3 Overview

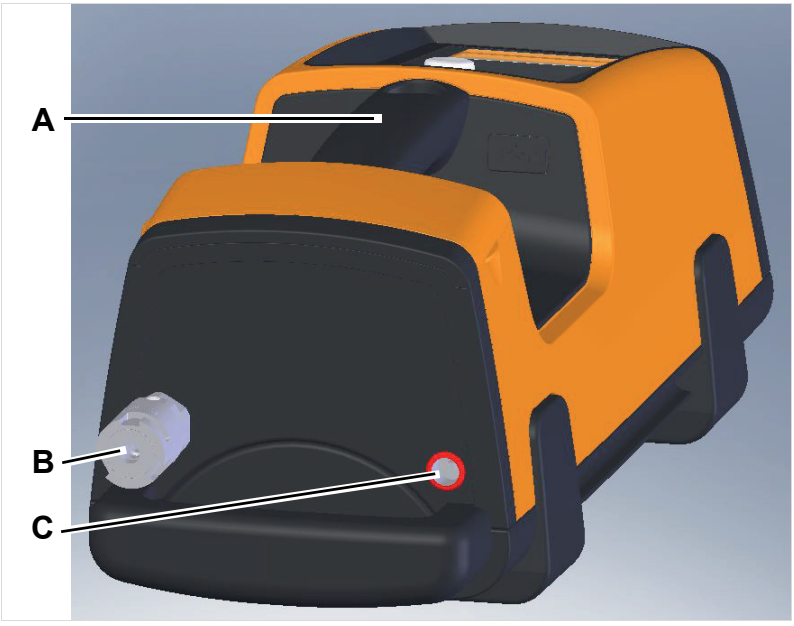
3.1 Main device

Upper side



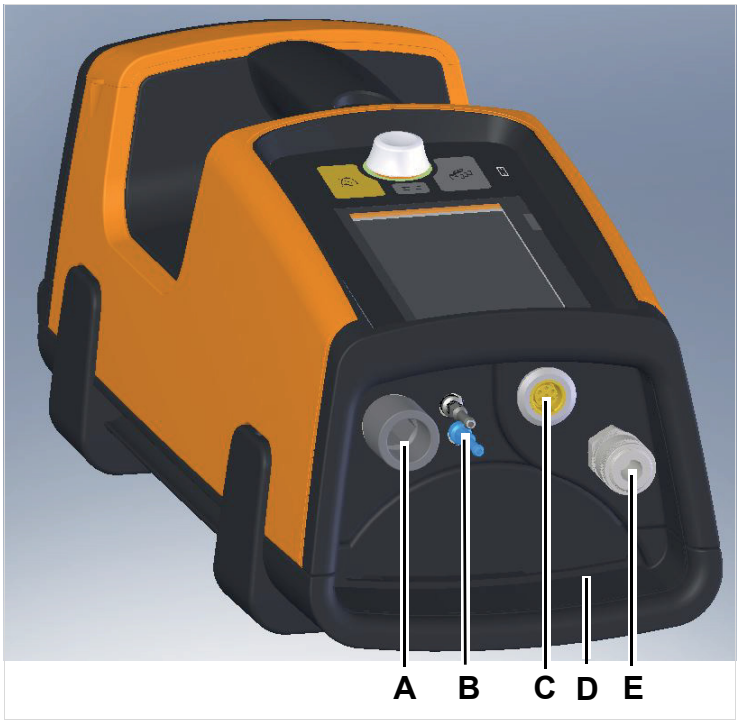
No.	Designation	Description
A	Carrying handle	To transport the device
B	Start/standby key	To switch the device on and off and to switch to standby mode
C	Rotary knob	To select, change and confirm settings
D	LED	To display the state of charge of the battery and the power supply
E	Start dialog key	To return from any dialog to the start dialog
F	Screen rotation key	To rotate the screen orientation by 180°
G	Screen	To display and operate the application-specific dialog pages
H	Alarm silence key	To suppress the acoustic alarm signal for 2 minutes
I	Color LEDs	To visually indicate alarms
J	USB port	To export data. Compatible with USB 2.0
K	Battery compartment cover	

Rear



No.	Designation	Description
A	Carrying handle	To transport the device
B	Compressed gas port with standard connector	To connect an O_2 compressed gas hose
C	Connector for the DC power supply	To connect to an external power supply

Front



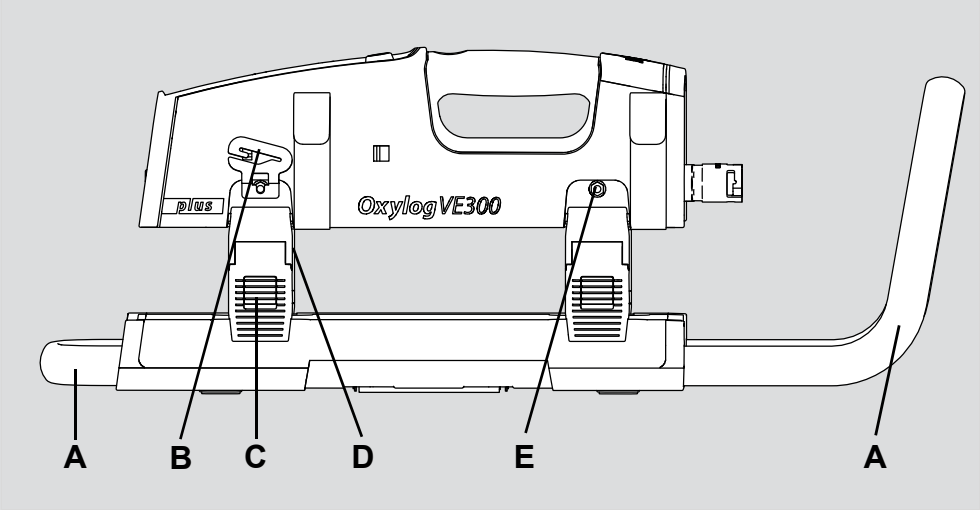
No.	Designation	Description
A	Breathing circuit port	To connect a disposable or reusable breathing circuit
B	Measuring line ports	To connect the measuring lines of the breathing circuit
C	CO_2 sensor port	To connect the CO_2 sensor cable
D	Emergency air and ambient air inlet	To suction ambient air
E	Additional quick-coupling port	For additional gas supply from the wall terminal unit, to swap the gas supply without interrupting ventilation.

⚠ CAUTION
Ventilator malfunction
Do not block the emergency air inlet.
► A blocked emergency air inlet may result in ventilator malfunction.

ℹ Devices with the Plus option are indicated by labels on the sides of the device.

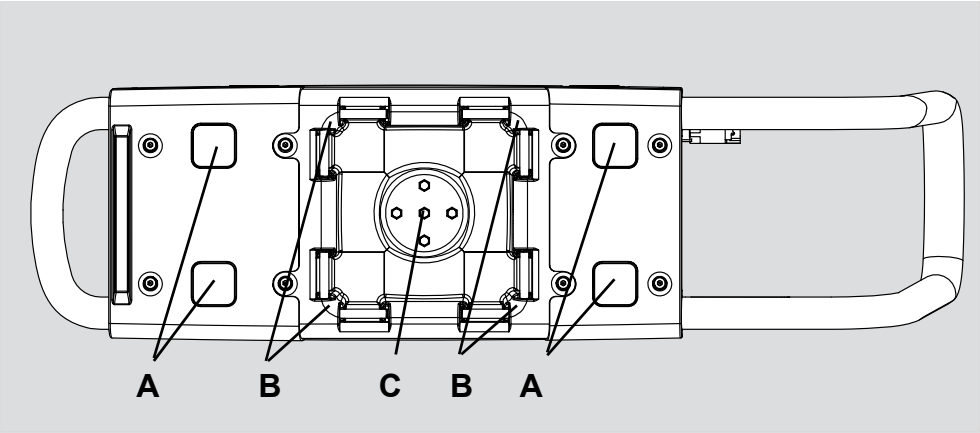
3.2 Main device with carrying system

Side view, right



No.	Designation	Description
A	Protection bar	To protect the compressed gas cylinder and the pressure reducer.
B	Strap brackets (on front and rear)	For diagonal fixing of the carrying strap (option).
C	Closure	To open the carrying system. Height-adjustable. For further information, see the following chapter: "Assembling the main device with carrying system (option)", page 33.
D	Hinge (when the closure is raised)	To open the carrying system. Height-adjustable. For further information, see the following chapter: "Assembling the main device with carrying system (option)", page 33.
E	Pins	To attach the accessories bag (option)

Bottom view

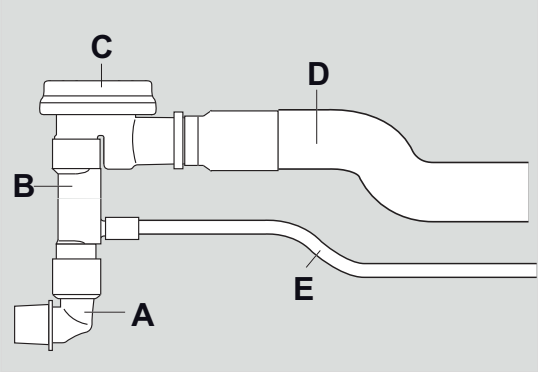


33374

No.	Designation	Description
A	Rubberized feet	To ensure reliable device stability.
B	Connecting area for the carrying system holder	To use the device with the carrying system holder.
C	Charging pins	To use the device with the carrying system holder.

3.3 Breathing circuits

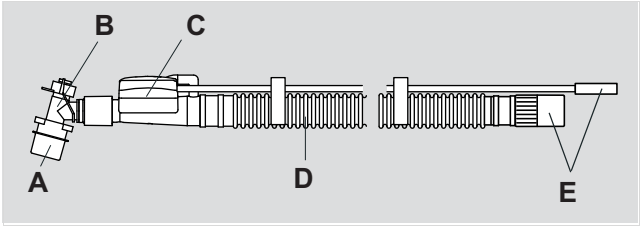
Reusable breathing circuit for adults



30060

No.	Designation
A	Elbow
B	Pressure sensor
C	Breathing valve
D	Breathing hose
E	Pressure measuring line

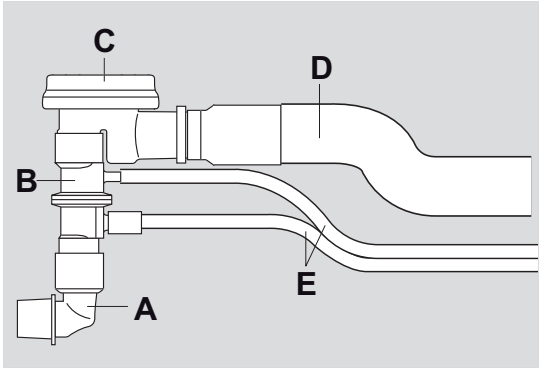
Disposable breathing circuit for adults



33256

No.	Designation
A	Red protection cap
B	Elbow
C	Breathing valve
D	Breathing hose
E	Device-side connectors

Reusable breathing circuit for adults (with Plus option)



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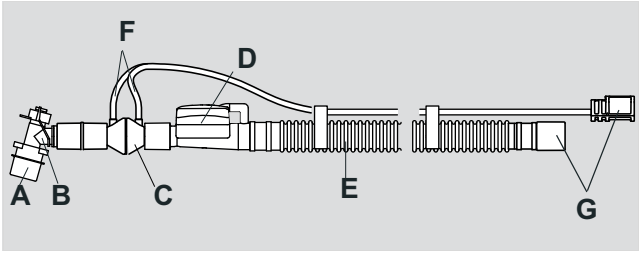
No.	Designation
A	Elbow
B	Flow sensor
C	Breathing valve
D	Breathing hose
E	Flow and pressure measuring lines

Disposable breathing circuit for adults (with Plus option)



No.	Designation
A	Red protection cap
B	Elbow
C	Flow sensor
D	Breathing valve
E	Breathing hose
F	Flow and pressure measuring lines
G	Device-side connectors

3.4 Range of functions

Ventilation functions

Ventilation modes:

- Volume-controlled ventilation:
  - ***VC-CMV*** / ***VC-AC***
  - ***VC-SIMV*** (Plus option)
- Pressure-controlled ventilation:
  - ***PC-BIPAP*** (option, prerequisite: Plus option is enabled)
- Support of spontaneous breathing:
  - ***SPN-CPAP***

Additional settings for ventilation:

- Pressure support (option, prerequisite: Plus option is enabled): in the ventilation modes ***SPN-CPAP***, ***VC-SIMV***, ***PC-BIPAP***
- Non-invasive ventilation: in the ventilation modes ***SPN-CPAP/PS*** and ***PC-BIPAP/PS***

For a detailed description of the ventilation modes and the additional settings, see page 56. For information on abbreviations, see page 24.

ℹ In these instructions for use the unit of measurement for airway pressure is expressed in [***mbar***].

3.5 Abbreviations

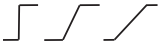
Abbreviation	Explanation
BF	Body floating
BTPS	Body Temperature and Pressure, Saturated Corresponds to conditions of patient's lungs: 37 °C (98.6 °F), ambient pressure, 100 % relative humidity
cmH_2O	Centimeters of water
CO_2	Carbon dioxide
CPR	Cardiopulmonary resuscitation
dB(A)	Sound pressure level, A-weighted
ΔPsupp	Pressure support above PEEP
EMC	Electromagnetic compatibility
ESD	Electrostatic Discharge, electrostatic discharge
$etCO_2$	End-tidal CO_2 concentration
HME	Heat and moisture exchanger
hPa	Hectopascal
I:E	Ratio of inspiratory time to expiratory time
IPX4	Degree of protection against ingressing liquids, level 4
kPa	Kilopascal
L/min	Liter per minute
LED	Light-emitting diode
mbar	Millibar
MEDIBUS.X	Communication protocol for medical devices with uniform data definition for all devices
min	Minute
mmHg	Millimeter of mercury
MRI	Magnetic resonance imaging
MVe	Expiratory minute volume
MVi	Inspiratory minute volume
NIV	Non-invasive ventilation (mask ventilation)
O_2	Oxygen
Paw	Airway pressure
PC-BIPAP	Pressure-controlled - spontaneous breathing with continuous positive airway pressure with 2 different pressure levels
PEEP	Positive end-expiratory pressure
PGM	Patient gas measurement
Pinsp	Inspiratory pressure
PIP	Peak inspiratory pressure
Pmax	Pressure limitation
PS	Pressure support

Abbreviation	Explanation
QR code	Quick Response Code
RR	Respiratory rate
SPN-CPAP	Spontaneous continuous positive airway pressure
Ti	Inspiratory time
UMDNS	Universal Medical Device Nomenclature System, nomenclature for medical devices
USB	Universal Serial Bus, computer interface
VC-AC	Volume-controlled - assisted-controlled ventilation
VC-CMV	Volume-controlled - controlled mandatory ventilation
VC-SIMV	Volume-controlled - synchronized intermittent mandatory ventilation
VDC	Volt direct current
Vol.%	Percentage gas ratio, related to total volume
VT	Tidal volume
VTe	Expiratory tidal volume
VTi	Inspiratory tidal volume

3.6 Symbols

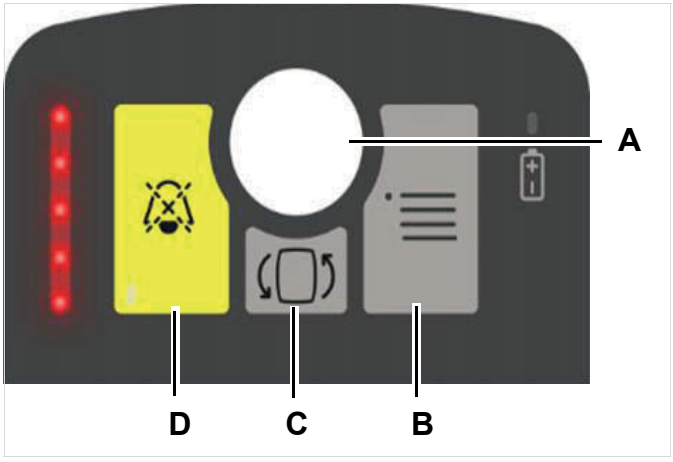
Symbol	Explanation
	Manufacturer
	Date of manufacture
	WEEE label, Directive 2012/19/EU
	Follow the instructions for use
	Warning! Strictly follow these instructions for use
	Attention! (safety sign)
	A class II device with protection against electric shock through additional safety precautions such as double or reinforced insulation and without connection to the protective ground conductor
	AC voltage
	DC voltage
	Mains power

Symbol	Explanation
	DC input
	Charge status of the internal battery
	Battery compartment
	Battery charge (e.g., 3/4 charged)
	Recycle according to the regulations for lithium-ion batteries
	Start/standby key
	Key to silence acoustic alarm signals for 2 minutes
	Start dialog key
	Screen rotation key
	Inlet for ambient air
	Warning: Emergency air inlet. Do not block.
REF	Part number
SN	Serial number
LOT	Lot number
RI	Revision index
	Nominal weight
	Maximum weight
	Keep away from rain
	Keep away from sunlight

Symbol	Explanation
	Non-sterile
	Storage temperature
	Radio transmitter
	Relative humidity
	Atmospheric pressure
	Do not use if package damaged
	Do not reuse
	For indoor use only
	Defibrillation-proof applied part type BF
	Not made with natural rubber latex
	Keep free of oil and grease
	Quantity
	Use by
	Lower alarm limit
	Upper alarm limit
	Slope (steep, medium, flat)
	Patient category ***Adult***
	Patient category ***Child***
	Screenshot
	Bluetooth
	USB port

4 Operating concept

4.1 Control elements



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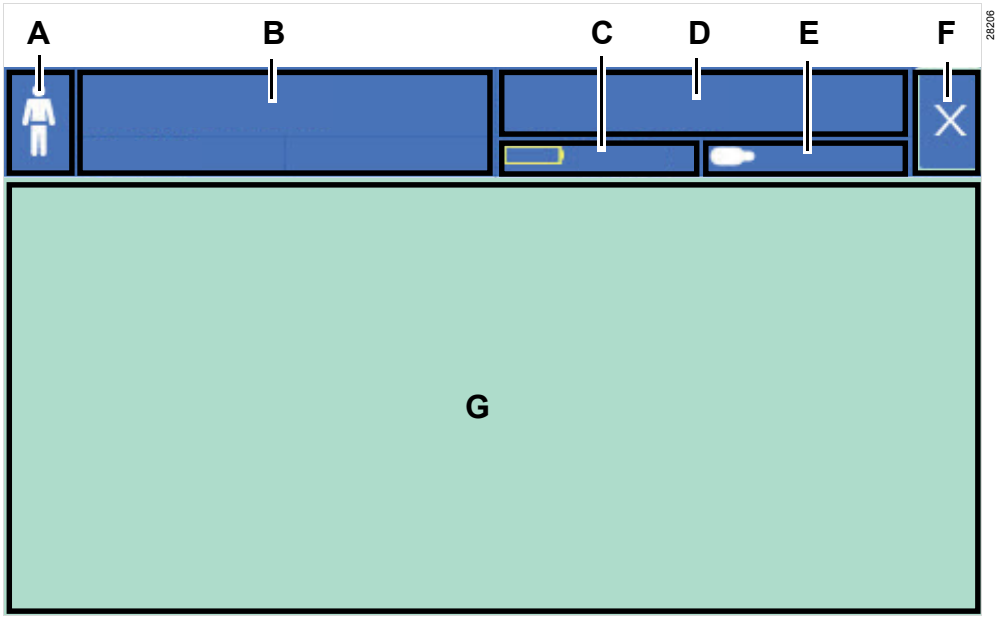
No.	Designation
A	Rotary knob for making selections, changing and confirming settings
B	Start dialog key to return from any dialog to the start dialog
C	Key to rotate the screen orientation by 180°
D	Key to silence acoustic alarm signals for 2 minutes

4.2 Structure of the screen

Screen in operation mode



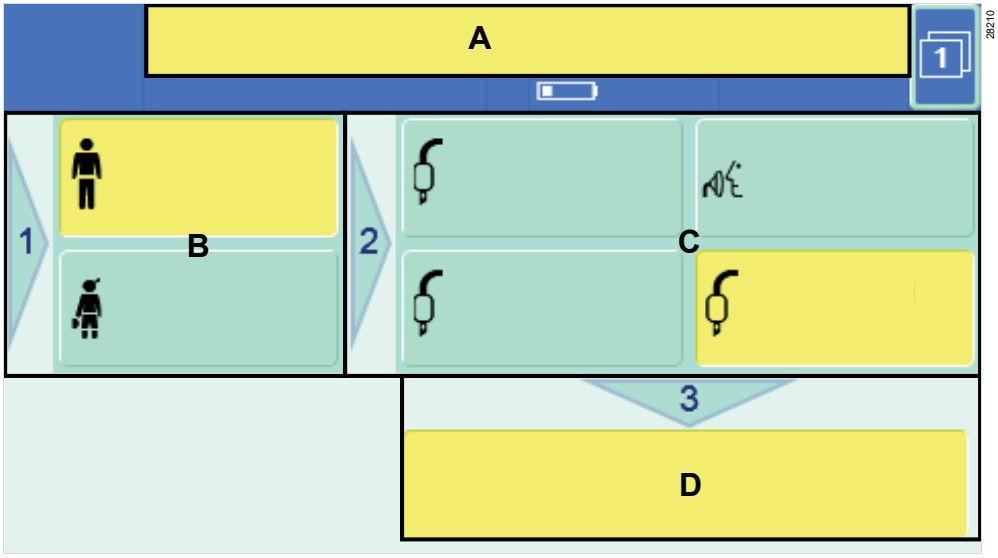
No.	Designation
A	Patient category
B	Ventilation category (***CPR***, ***Ventilation (volume)***, ***Ventilation (pressure)***, ***CPAP***) and ventilation mode (***VC-CMV***, ***VC-AC***, ***VC-SIMV***, ***PC-BIPAP***, ***SPN-CPAP***)
C	Display of power supply and remaining duration of battery operation
D	Oxygen mode (***100 % O_2***, ***O_2/air mix***)
E	Display of current gas consumption
F	Button to switch or exit the dialog
G	Dialog (available: start dialog, configuration dialog, ventilation dialog, service dialog)

Screen in the event of alarms

In the event of alarms, the upper area of B and the entire area of D are used to indicate alarms.

The lower area of B and the entire areas of C and E are used to display additional information, e.g., while adjusting parameters.

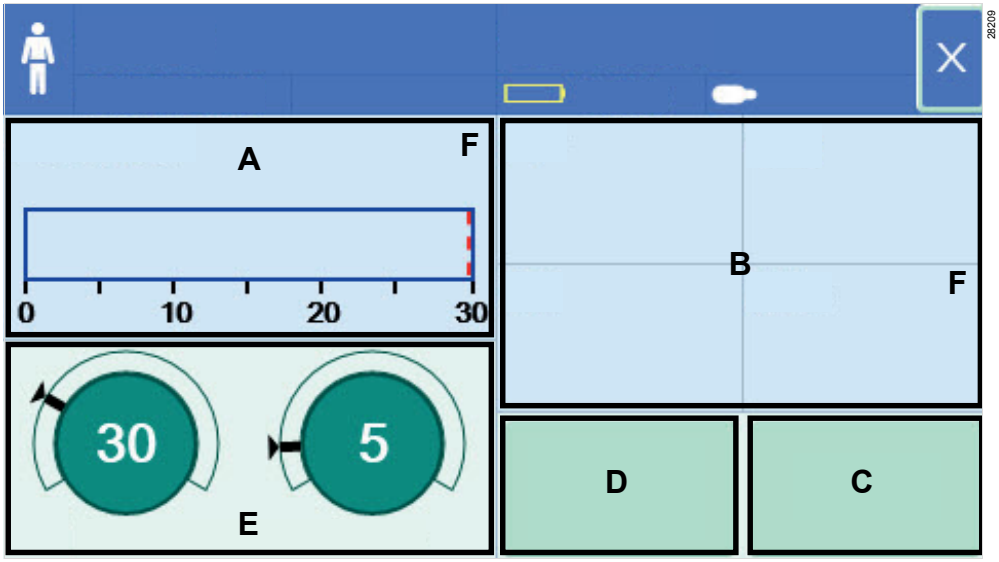
Start dialog in standby mode



No.	Designation
A	Text ***Standby*** and date of last system test or alarm message
B	Step 1: Select the patient category (buttons ***Adult***, ***Child***)
C	Step 2: Select the ventilation category (buttons ***CPR***, ***Ventilation (volume)***, ***Ventilation (pressure)***, ***CPAP***)
D	Step 3: Start ventilation (button ***Start ventilation***)

If the device is in standby mode (e.g., immediately after startup), the date and result of the last system test are displayed in the standby mode area.

Ventilation dialog



No.	Designation
A	Display of pressure bar for ***Paw*** in ***mbar*** or waveforms for ***Paw***, ***Flow***, ***CO2*** (option)
B	Display of measured values for the parameters ***PIP***, ***RR***, ***MVe*** (option), ***VTe*** (option), and ***etCO2*** (option)
C	Button ***Alarm settings*** (For further information, see the following chapter: "Setting alarm limits", page 71)
D	Button ***More settings***
E	Therapy controls for frequently used parameters (depending on the ventilation setting, e.g., ***VT*** and ***RR*** or ***PEEP*** and ***Pmax***). The black triangle indicates the preset parameter value.
F	Toggle symbol. By tapping in a parameter field with this symbol it is possible to change between the possible parameters.

ℹ The device determines ***MVe*** and ***VTe*** values under BTPS conditions.

If the values for ***MVe*** and ***VTe*** cannot be determined due to malfunctions, the inspiratory values ***MVi*** and ***VTi*** are displayed.

4.3 Color concept

Values can be selected by touching the screen, and can be changed and confirmed using the rotary knob.

Colors indicate the availability of functions and settings on therapy controls and buttons.

Color	Example	Meaning
Dark green		Operable element: function activated
Yellow		Selected element: not yet confirmed with rotary knob
Gray		Element not operable

4.4 Selecting and setting

The settings always require confirmation by pressing the rotary knob.

1. Select
   Touch the control element. The color changes to yellow.
2. Set
   Turn the rotary knob to adjust a value.
3. Confirm
   Press the rotary knob to confirm the value. The color changes to dark green.

When the value has been selected and changed, the message ***To confirm the setting, press the rotary knob.*** is also displayed in the notification field. This message starts to flash after a short time.

Canceling the setting or changing procedure

If the parameter shall not be changed (color still yellow), the following options allow the existing settings to be kept:

- Touch the changed parameter again. This resets the parameter selection and change.
- Select a different parameter. This resets the previously selected parameter to its original value.
- Do not press the rotary knob. The value of the parameter resets to the previous setting after a few seconds.
- Touch another area of the touchscreen.

5 Assembly and preparation

5.1 Assembling the main device with carrying system (option)

The carrying system can be used to transport an oxygen cylinder together with the device. This enables the device to be operated directly at the patient's location, independent of a central gas supply.

Requirements for the oxygen cylinder

⚠ WARNING
Risk of patient injury
If the pressure reducer on the oxygen cylinder protrudes beyond the protection bar, it may be damaged or knocked off.

► Place the oxygen cylinder in the carrying system so that the pressure reducer does not protrude beyond the protection bar.

► The oxygen compressed gas hose must not protrude beyond the protection bar, otherwise it may catch on objects.

⚠ WARNING
Risk of patient injury
If the quick-coupling port of the Alduk IV pressure reducer is used, the connection will protrude beyond the standard protection bar.

► Always use the wide protection bar when using the quick-coupling port of the Alduk IV pressure reducer.

ℹ The protection bar on the pressure reducer can be extended by approx. 20 mm (0.8 in) if necessary. Contact DrägerService.

Only oxygen cylinders with the following properties may be used:

– Diameter: 100 to 120 mm (3.9 to 4.7 in)
– Length of cylinder body: 300 to 450 mm (11.8 to 17.7 in)
– Length of valve: 160 to 180 mm (6.3 to 7.1 in)
– Total length: max. 560 mm (22.1 in) (max. 580 mm [22.8 in] with wide protection bar)
– Maximum total weight: 5 kg (11 lb) with pressure reducer

Protection bar variants

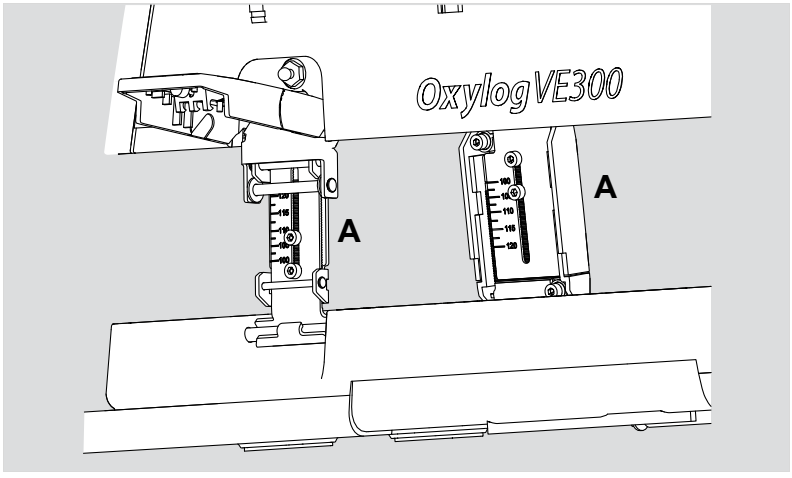
The device may be fitted with the normal protection bar as well as with a wide protection bar.

Standard protection bar

Wide protection bar

Assembly

1. Connect a pressure reducer to the oxygen cylinder or use an oxygen cylinder with a built-in pressure reducer.
2. Open the device closure and open the device.
3. Place the cylinder in the well of the base plate and position the oxygen cylinder so that the pressure reducer is on the side of the bar and the cylinder body is resting on all 4 rubber feet.



33375

4. Adjust the hinge and closure length once to the diameter of the oxygen cylinder:
   Remove the upper screw of the hinge with a hexagon key, remove the protective plate and loosen the 2 screws beneath the plate.
   Set the catch (A) so that the ventilator is resting horizontally on the cylinder, and then re-tighten the screws. Refit the protective plate.
   Loosen the 2 screws of the closure, set the closure to the same scale value as the hinge, and then re-tighten the screws. Make sure that the closures do not wiggle easily when closed and adjust the catch to a lower position if necessary.

⚠ WARNING
Risk of patient injury
A covering on the oxygen cylinder (e.g., a net) prevents sufficient fixation of the oxygen cylinder in the ventilator.

► Make sure that the oxygen cylinder is mounted in the ventilator with no covering over it.

5. Connect the oxygen compressed gas hose to the pressure reducer and the ventilator.
6. Rotate the cylinder so that the pressure reducer and the hose to not protrude beyond the bar.
7. Attach and fasten both closures until they engage audibly.

⚠ WARNING
Risk of patient injury
If the oxygen cylinder is not properly mounted, it may slip out of the carrying system.
► Make sure that the oxygen cylinder is mounted securely in the carrying system.

⚠ WARNING
Risk of patient injury and damage to the device
After the device falls with the carrying system, the closures, hinges and bar may no longer be in proper functioning order to safely hold the oxygen cylinder.
► Check the closures, hinges, and protection bar to ensure functional integrity and replace them if necessary.

5.2 Attaching the accessories bag (option)

1. Pull on the buttons fastened inside the accessories bag.
2. Push the outside openings of the buttons onto the pins on the side of the device.
3. Release the buttons.

5.3 Internal battery

Internal power is provided by means of a removable rechargeable battery. For further information, see the following chapter: "Operating data", page 118.

NOTICE
► To activate: Fully charge the battery before commissioning.

Inserting the battery

1. Remove the battery compartment cover.
2. Insert the battery vertically in the battery compartment with the contacts facing downward until the locking lever on the carrying handle side engages.
3. Fit the battery compartment cover and press it until it engages audible.

Removing the battery

1. Remove the battery compartment cover.
2. Press the locking lever on the carrying handle side.
3. Lift out the battery vertically using the strap.

Changing the battery while ventilation is in progress

⚠ CAUTION
Risk of patient injury
If the battery is replaced with the device switched on and no external power supply connected, the device will interrupt ventilation of the patient.
► If a charged battery is inserted within 30 seconds, ventilation is automatically resumed with the last values and alarm settings.
► After 30 seconds the device starts with the last set values or it needs to be re-started. All ventilation settings and alarm settings are set to the presettings.

1. Remove the battery as described.
2. Insert the battery as described.

5.4 Connecting the power supply

External power supply

To charge the battery and to extend the duration of operation, use either:
– DC/DC converter or
– Power supply unit

For further information, see the following chapter: "Operating data", page 118.

Always position the device so it can be easily disconnected from the external power supply.

⚠ CAUTION
Risk of patient injury
If the external power supply fails and no charged battery is installed, ventilation of the patient will be interrupted.
► Always insert a charged battery.

5.5 External power supply

External power supply with a DC/DC converter

⚠ WARNING
Risk of patient injury and damage to the device
When using the DC/DC converter in damp or wet environments, there is a risk of electric shock and damage to the device.
► The DC/DC converter must be used in dry locations only.

The DC/DC converter must be used to connect the device to on-board power supply, such as in ambulances.

It can be used with the following voltages:
– 12 VDC
– 24 VDC
– 28 VDC

The device cannot use the input voltage outside the range. The on-board power supply must be protected by a suitable 10 to 16 A DC fuse.

Mount the DC/DC converter on a flat wall and make sure that the wall is solid enough to support the bracket. Use all 4 mounting holes (screw size M4).

1. Plug the large connector of the DC/DC converter into the on-board power supply.
2. Plug the small connector into the device's DC socket.
3. Check if the device is connected correctly to the external power source.
   – The LED next to the battery status indicator lights up green when the battery is charged.
   – The LED next to the battery status indicator flashes green when the battery is charging.
   – The LED next to the battery status indicator lights up yellow if the battery is faulty, or no battery is inserted.

External power supply with a power supply unit

⚠ WARNING
Risk of patient injury and damage to the device
When using the power supply unit outdoors, there is a risk of electric shock and damage to the device.

► Do not use the power supply unit outdoors.
► Do not touch the power supply unit and the patient at the same time.

1. Insert the power plug into the power socket.
2. Connect the DC connector to the device's DC socket.
3. Check if the device is connected correctly to the external power source.
   – The LED next to the battery status indicator lights up green when the battery is charged.
   – The LED next to the battery status indicator flashes green when the battery is charging.
   – The LED next to the battery status indicator lights up yellow if the battery is faulty, or no battery is inserted.

To disconnect the ventilator from the power supply, disconnect the power cable from the power socket.

5.6 Connecting the gas supply

Special care must be taken when handling oxygen.

► For further information, see the following chapter: "Use of oxygen", page 13.

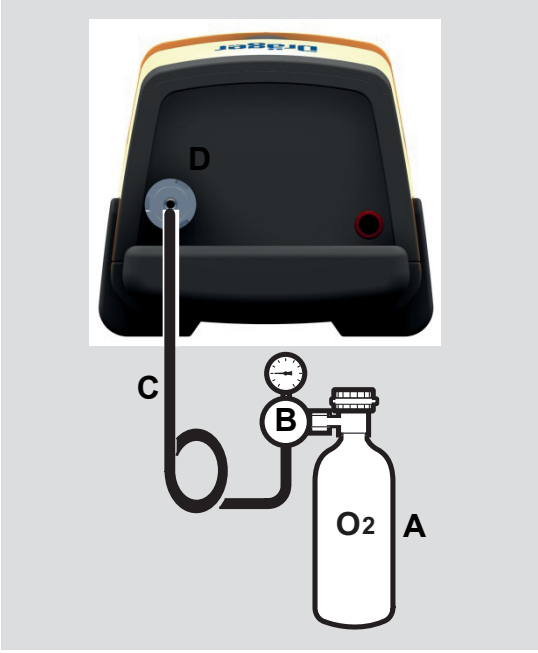
The device can be operated with 100 % and 93 % medical oxygen.

The oxygen concentration in the breathing gas will be reduced when using 93 % oxygen. For further information, see the following chapter: "Device settings", page 81.

The device supports this by allowing the oxygen content display to be configured accordingly.

Connecting an external oxygen cylinder

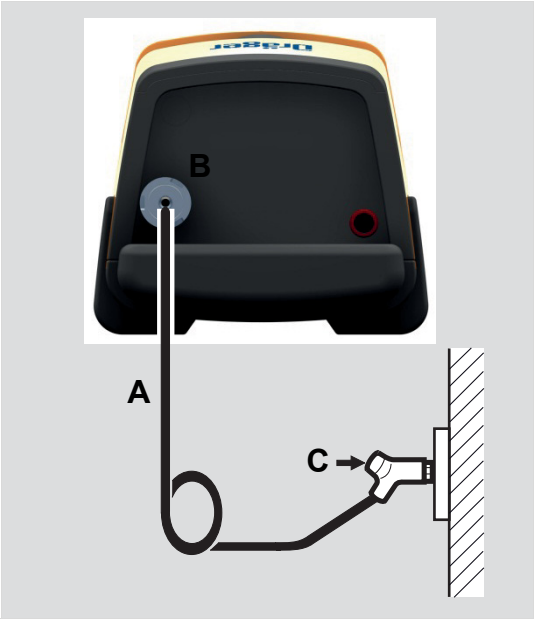
⚠ WARNING
Risk of ventilator malfunction
Components installed in the gas supply line may cause device malfunctions.
► Do not install dosage valves or flowmeters in the device's gas supply line.
► To avoid insufficient oxygen supply during use, always check the oxygen cylinder pressure before use.



30239

1. Connect the pressure reducer (B) to the oxygen cylinder (A).
2. Connect the oxygen compressed gas hose (C) to the standard port (D) on the device.
3. Connect the oxygen compressed gas hose (C) to the pressure reducer (B).
4. Rotate the cylinder valve slowly and open it fully.

Connecting the device to a central gas supply



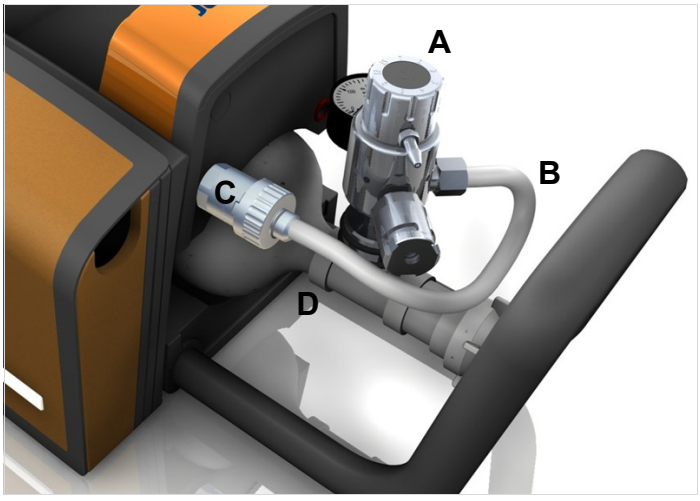
30242

1. Connect the oxygen compressed gas hose (A) to the standard port (B) or to the additional quick-coupling port of the device.
2. Connect the gas probe (C) to the oxygen terminal unit until it locks in place and the oxygen supply is assured.

Connecting the built-in oxygen cylinder

For information on the correct assembly of the main device with carrying system, see page 33.

⚠ WARNING
Risk of ventilator malfunction
Components installed in the gas supply line might cause malfunctions.
- ► Do not install dosage valves or flowmeters in the device's gas supply line.
- ► To avoid insufficient oxygen supply during use, always check the cylinder's oxygen pressure before use.

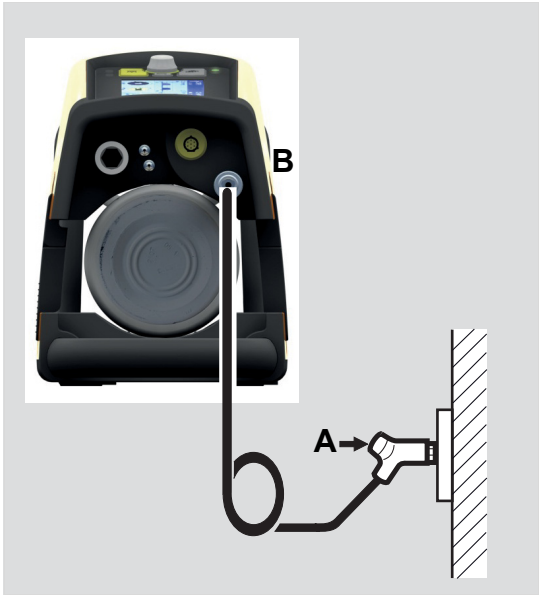


30244

1. Connect the pressure reducer (A) to the oxygen cylinder (D).
2. Connect the oxygen compressed gas hose (B) to the pressure reducer (A).
3. Connect the oxygen compressed gas hose (B) to the device.
4. Hand-tighten the screw fitting (C) on the device.
5. Rotate the cylinder valve slowly and open it fully.

Connecting the device to a central gas supply by the quick-coupling port

To maintain continuous oxygen supply when switching from the built-in oxygen cylinder supply to central gas supply, the device can also be connected to a central gas supply system via the quick-coupling port while the cylinder supply is active.



30248

1. Make sure that the patient is receiving oxygen from the built-in oxygen cylinder.
2. Connect the gas probe of the oxygen compressed gas hose (A) to the oxygen terminal unit.

3. Connect the oxygen compressed gas hose to the device's quick-coupling port (B) until it locks in place and the oxygen supply is assured.
4. Slowly close the valve of the built-in oxygen cylinder.

5.7 Connecting the breathing circuit

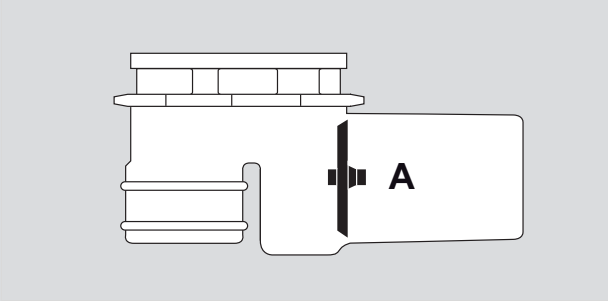
ℹ Sterilize or disinfect all reusable parts before every use. For further information, see the following chapter: "Reprocessing", page 98.

⚠ CAUTION
Risk of patient injury
A bent or twisted breathing hose may put the patient at risk.
► Make sure that the breathing hoses are not bent or twisted.

⚠ CAUTION
Risk of patient injury
A breathing hose that does not correspond to the device settings may put the patient at risk.
► When connecting a breathing hose, make sure that the hose settings in the configuration dialog correspond to the connected hose. For further information, see the following chapter: "Setting the breathing circuit", page 75.

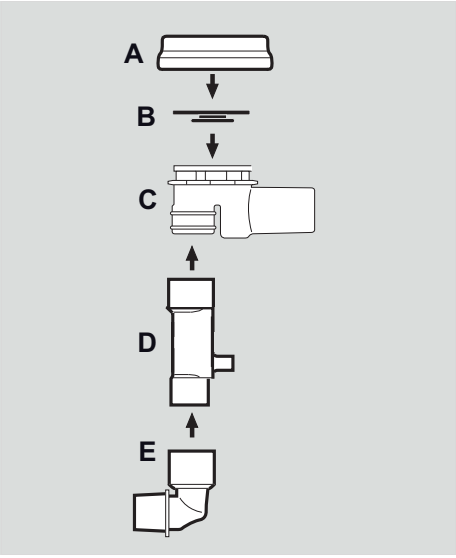
5.7.1 Connecting the reusable breathing circuit for adults

Assembly of the breathing valve



30064

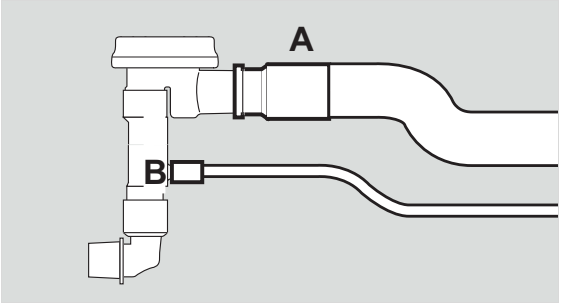
⚠ WARNING
Risk of CO_2 rebreathing
An incorrectly assembled or malfunctioning breathing valve may put the patient at risk.
► Do not remove, damage, or bend the rubber disk (A) in the housing.



30252

1. Place the diaphragm (B) in the breathing valve housing (C). Make sure that it is fitted correctly.
2. Mount the cover (A) and turn it about 60° clockwise until it engages.
3. Push the pressure sensor (D) onto the breathing valve (C). To do so, align the pressure sensor (D) on the breathing valve using the grooves in the pressure sensor.
4. Push the elbow onto the pressure sensor (D).

Connecting the breathing hose and the pressure measuring line

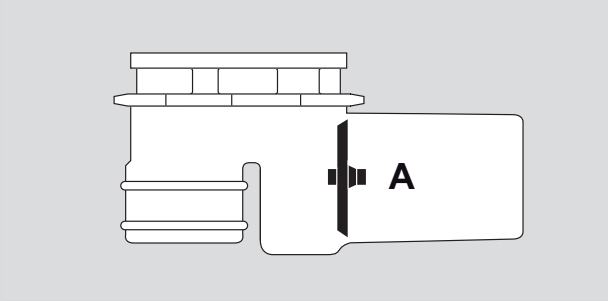


30253

1. Connect the breathing hose (A) to the breathing valve.
2. Connect the pressure measuring line (B) to the connector of the pressure sensor.
3. Connect the pressure measuring line to the device.
4. Connect the breathing hose to the device's gas outlet.

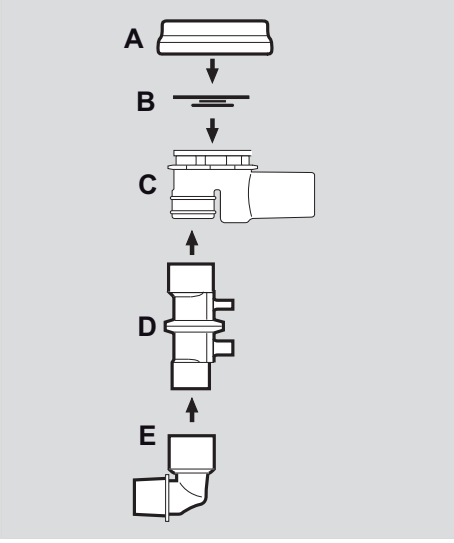
5.7.2 Connecting the reusable breathing circuit for adults (Plus option)

Assembly of the breathing valve



30064

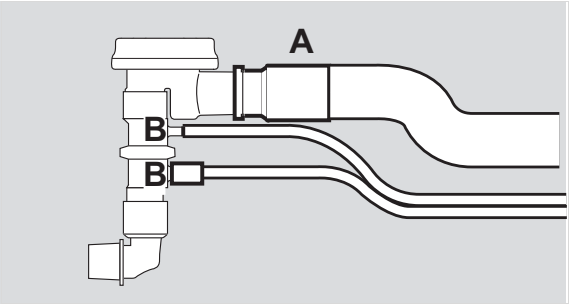
⚠ WARNING
Risk of CO_2 rebreathing
An incorrectly assembled or malfunctioning breathing valve may put the patient at risk.
► Do not remove, damage, or bend the rubber disk (A) in the housing.



30065

1. Place the diaphragm (B) in the breathing valve housing (C). Make sure that it is fitted correctly.
2. Mount the cover (A) and turn it about 60° clockwise until it engages.
3. Push the flow sensor (D) onto the breathing valve (C). To do so, align the flow sensor (D) on the breathing valve (C) using the grooves in the flow sensor.
4. Push the elbow (E) onto the flow sensor (D).

Connecting the breathing hose and the flow measuring lines



1. Connect the breathing hose (A) to the breathing valve.
2. Connect the flow measuring lines (B) to the ports of the flow sensor. When connecting the flow measuring lines, pay attention to the differing diameters of the hoses and connectors and connect them to the correct connector.
3. Connect the flow measuring lines to the device. Correct alignment is indicated by a groove on the connector, which must point away from the breathing hose. If it is incorrectly seated, incorrect values will be displayed.
4. Connect the breathing hose to the device's gas outlet.

5.7.3 Connecting the disposable breathing circuit for adults

Using disposable hoses can reduce the risk of cross-infection. Disposable hoses are shipped clean but non-sterile.

⚠ WARNING
Risk of patient injury
Soiling of the disposable breathing circuit may put the patient at risk.
► Open the packaging of disposable breathing circuits only immediately before use.

1. Connect the pressure measuring line to the device.
2. Connect the breathing hose to the device's gas outlet.

5.7.4 Connecting the disposable breathing circuit for adults (Plus option)

Using disposable hoses can reduce the risk of cross-infection. Disposable hoses are shipped clean but non-sterile.

⚠ WARNING
Risk of patient injury
Soiling of the disposable breathing circuit may put the patient at risk.
► Open the packaging of disposable breathing circuits only immediately before use.

1. Connect the flow measuring lines to the device. Correct alignment is indicated by a groove on the connector, which must point away from the breathing hose. If it is incorrectly seated, incorrect values will be displayed.
2. Connect the breathing hose to the device's gas outlet.

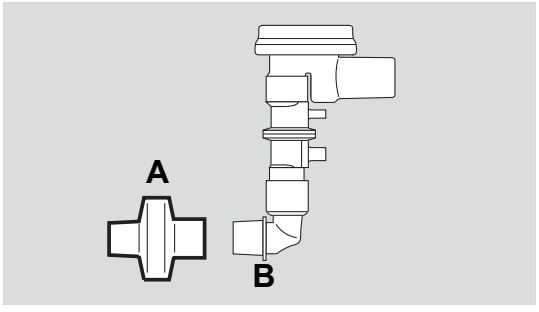
5.8 Connecting bacteria filters, HME, or catheter mounts

⚠ WARNING
Risk of CO_2 rebreathing
Bacteria filters, HMEs, catheter mounts, and masks increase the resistance and dead space of the breathing circuit.
► Note the manufacturer's directions.

When using an HME, the measured flow may deviate from the actual expiratory flow, because temperature and humidity of the breathing gas are reduced.

The flow and volume measurements can be adjusted for use with an HME. For further information, see the following chapter: "Setting the HME correction", page 75.

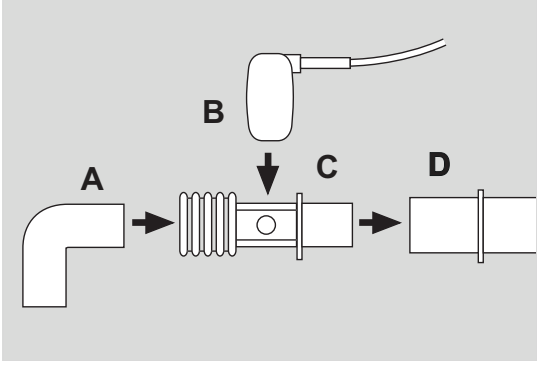
Connect the bacteria filter or HME to the elbow as follows:



30187

- Connect the bacteria filter, HME or catheter mount (A) to the patient port on the breathing circuit (B).

5.9 Connecting the CO_2 sensor and the CO_2 cuvette (option)



30189

1. Disconnect the elbow (A) from the flow sensor or pressure sensor.
2. Connect the CO_2 cuvette (C) to the flow sensor or pressure sensor so that the windows point to the side.
3. Attach the elbow (A) to the CO_2 cuvette (C).
4. Push the CO_2 sensor (B) onto the CO_2 cuvette (C), with the cable toward the device.
5. Connect the CO_2 sensor (B) to the port on the device.

6. Insert the CO_2 sensor cable in the cable clips on the breathing hose.

Alternatively, connect the CO_2 cuvette directly to the patient port of the elbow, without disconnecting the elbow from the flow sensor.

After connecting the CO_2 sensor (mainstream measurement, PGM algorithm, atmospheric pressure compensation) or after a power supply failure, the sensor must warm up for approx. 3 minutes before it is ready for operation. Pay attention to the following during the warm-up phase and at temperatures below 10 °C (50 °F):

– The etCO_2 and CO_2 values may have a reduced accuracy.

The CO_2 sensor cable may be extended with a maximum of one extension cable. For further information, see the following chapter: "List of accessories", page 125.

5.10 Attaching the device to rail systems

The device can be attached to various rail systems or to stretcher bars with diameters up to 35 mm (1.4 in) by means of a rail holder (optional).

– The distance from the stretcher bar or rail to the wall or to a supporting stretcher bar must not exceed 30 mm (1.2 in).

● Attach the device in a suitable position orientated to the patient. The device is held by its own weight.

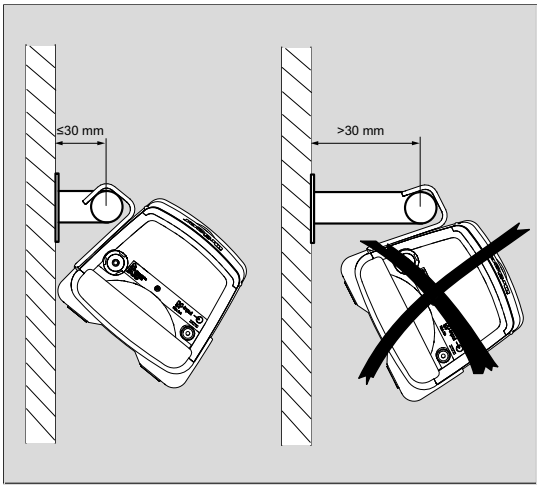
⚠ WARNING

Risk of patient injury and damage to the device

The device might come loose and drop when being transported with the rail holder.

► Observe wall clearance requirements.

► Secure or protect the device by additional means when transporting it.



34113

6 Getting started

6.1 Charging the battery

The battery temperature must be between 0 and 45 °C (32 °F and 113 °F) when charging the battery.

⚠ WARNING
Risk of patient injury
The battery is not charged outside the specified temperature range.
► Observe the permitted temperature when charging the battery. For further information, see the following chapter: "Operating data", page 118.

28174

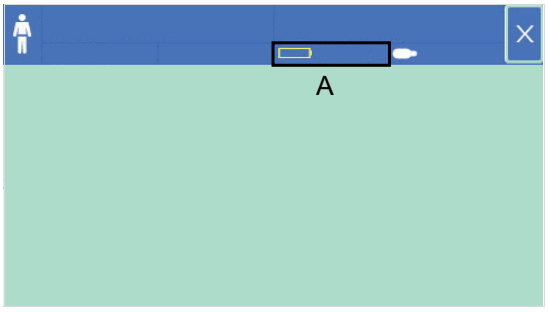
The LED next to the battery symbol (A) lights up when an external power source is connected.

A two-colored indicator (A) lights up to show the current state of battery charge:
– Flashing green: The battery is charging.
– Lit green: The battery is fully-charged.
– Yellow: A battery is not inserted or cannot be charged.

The LED beside the battery symbol remains unlit while the ventilator is being operated by the battery.

An external battery charger connected to the mains power supply can be used to charge an extra battery. For further information, see the following chapter: "List of accessories", page 125.

Display of the battery charge during battery operation



28575

When the device is switched on, the remaining battery charge is displayed in the header bar below the oxygen mode as a symbol, in increments of 25 percent. In addition, the remaining duration of operation (H:MM) is displayed (A). The numeric display appears after a short delay on startup.

– The accuracy of the indicated battery charge may vary depending on the age and condition of the battery.
– When other messages need to be displayed in the notification field, the indicated battery charge will not be visible.
– Additional alarms draw attention to the remaining duration of operation of the battery.

ℹ When an external power source is connected, the battery symbol is joined by a power plug symbol.

6.2 Determining the approximate pneumatic duration of operation

The current gas consumption from the high-pressure supply is displayed in L/min on the device's screen in the field below the oxygen mode. This display is not visible when a message with higher priority is activated or other messages are displayed in the notification field.

⚠ WARNING
Risk of patient injury
If the oxygen supply is insufficient during operation, the patient may be put at risk.
► Before starting operation, check the cylinder pressure on the pressure gauge of the pressure reducer so as to rule out the possibility of insufficient oxygen supply during operation.
► Always have a full replacement oxygen cylinder ready.

Example for oxygen supply:
– Cylinder pressure measured on the pressure gauge of the pressure reducer: 20000 kPa (200 bar)
– Filling volume of the oxygen cylinder: 2.1 L

Oxygen supply: 2.1 L x 20000 kPa = approx. 420 L at ambient pressure

Example or pneumatic duration of operation:
– Ventilation mode: ***VC-CMV***, respiratory rate 12 /min; tidal volume: 0.40 L; oxygen mode: ***100 % O_2***
– Minute volume: 12 /min x 0.40 L = 4.8 L/min
– Displayed average gas consumption of the ventilator: 4.4 L/min

ℹ The displayed value may be smaller than the expected minute volume, as it is not subject to the BTPS correction.

Duration of operation = oxygen supply [L] / displayed average gas consumption [L/min] = 420 L / 4.4 L/min = 95 min

The pneumatic duration of operation is extended when the device is running in ***O_2/air mix*** mode, as it then draws in ambient air.

6.3 Performing the system tests

The device has 2 different system tests:

– System test
– System test with breathing circuit

Both system tests can only be performed in standby mode. In operation mode the buttons to start the system tests are grayed-out, and a relevant advisory message is displayed.

6.3.1 System test

A system test must be performed in the following cases:

– Once a day, e.g., at the start of a shift
– At least every 6 months

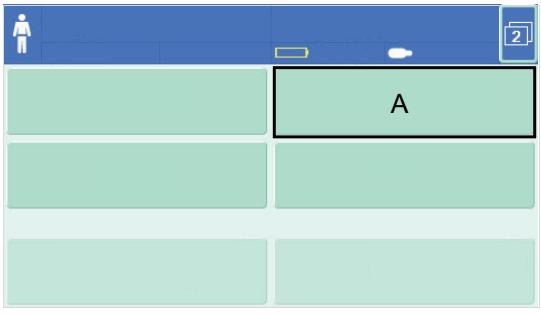
The system test comprises the following single tests:

– Pneumatic test
– Leakage test

The system test takes about 1 minute.

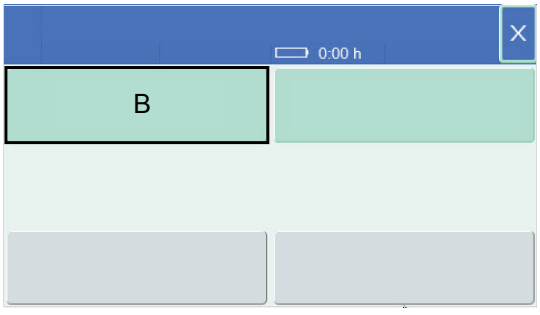
6.3.1.1 Performing the system test

1. To switch the ventilator on, briefly press the start/standby key.
   The ventilator performs an automatic self-test, then the standby screen is displayed.
2. To move to screen 2 of the dialog, touch the button 1 in the top right-hand corner of the screen.



29375

3. Touch the button ***Test & calibration*** (A).



30183

4. Touch the button ***System test*** (B).

ℹ The system test can be canceled at any time by touching the X button in the top right-hand corner of the screen.

5. On screen 1/4 confirm the advisory messages ***1. Make sure that no patient is connected.*** and ***2. Connect the O_2 supply.*** with the ***Next*** button.
6. On screen 2/4 confirm the advisory message ***3. Make sure that the breathing circuit is disconnected.*** with the ***Next*** button.
   The system test is then started. Its progress is indicated by a bar on screen 3/4.
7. When prompted ***Seal the gas outlet.***, seal the device port to which the breathing circuit is to be connected.
   The test result is displayed on screen 4/4.
8. To exit, touch the ***Finish*** button in the bottom right-hand corner of the screen.

6.3.2 System test with breathing circuit

A system test with breathing circuit must be performed in the following cases:

– After every reprocessing of the breathing circuit
– At least every 6 months

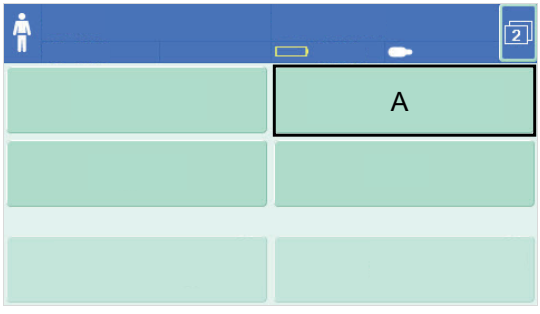
The system test with breathing circuit comprises the following single tests:

– Pneumatic test
– Breathing circuit test
– Leakage test

The system test with breathing circuit takes about 1 minute.

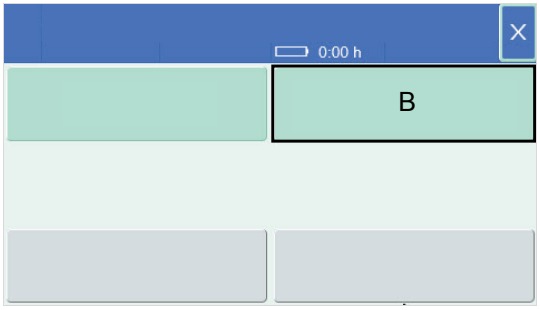
6.3.2.1 Performing the system test with breathing circuit

1. To switch the ventilator on, briefly press the start/standby key.
   The ventilator performs an automatic self-test, then the standby screen is displayed.
2. To move to screen 2 of the dialog, touch the button 1 in the top right-hand corner of the screen.



29375

3. Touch the button ***Test & calibration*** (A).



30184

4. Touch the button ***System test with breathing circuit*** (B).

   The system test with breathing circuit can be canceled at any time by touching the X button in the top right-hand corner of the screen.

5. On screen 1/4 confirm the advisory messages ***1. Make sure that no patient is connected.*** and ***2. Connect the O_2 supply.*** with the ***Next*** button.
6. On screen 2/4 confirm the advisory messages ***3. Connect the appropriate breathing circuit.*** and ***Open the gas outlet.*** with the ***Next*** button.
   The system test with breathing circuit is then started. Its progress is indicated by a bar on screen 3/4.
7. When prompted ***Seal the patient port.***, seal the patient port.
   The test result is displayed on screen 4/4.
8. To exit, touch the ***Finish*** button in the bottom right-hand corner of the screen.

6.3.3 Troubleshooting

⚠ WARNING
Risk of patient injury
If the system test or system test with breathing circuit was not completed successfully, the ventilator is not ready for operation.
► Never use a ventilator that is not ready for operation.

If one of the system tests was not completed successfully:

1. For further information, see the following chapter: "Error messages during the system test", page 97.
2. Contact DrägerService.

6.4 CO_2 zero calibration and CO_2 filter test (option)

The CO_2 zero calibration and the CO_2 filter test only work when the CO_2 option has been installed and the CO_2 sensor is present. The sensor temperature must be between 10 °C and 40 °C (50 °F and 104 °F).

The CO_2 zero calibration and the CO_2 filter test can be performed in standby mode and during ventilation.

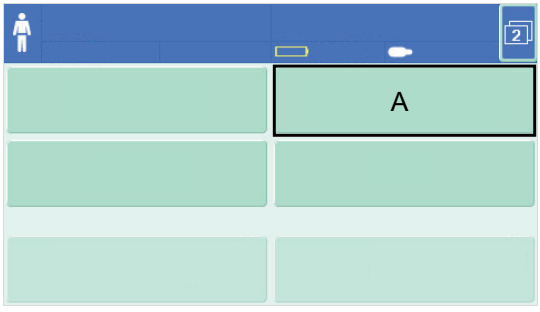
The following tests of the CO_2 sensor are recommended:

Test	Test interval
CO_2 zero calibration	Weekly
CO_2 filter test	Monthly

6.4.1 Performing the CO_2 zero calibration (option)

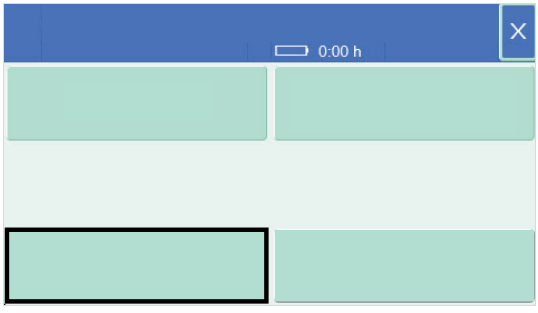
ℹ Do not breathe on the CO_2 sensor during zero calibration, otherwise the procedure may fail or may be performed with an invalid zero value.

1. To switch the ventilator on, briefly press the start/standby key.
   The ventilator performs an automatic self-test, then the standby screen is displayed.
2. Connect the CO_2 sensor to the device.
3. To move to screen 2 of the dialog, touch the button 1 in the top right-hand corner of the screen.



29375

4. Touch the button ***Test & calibration*** (A).

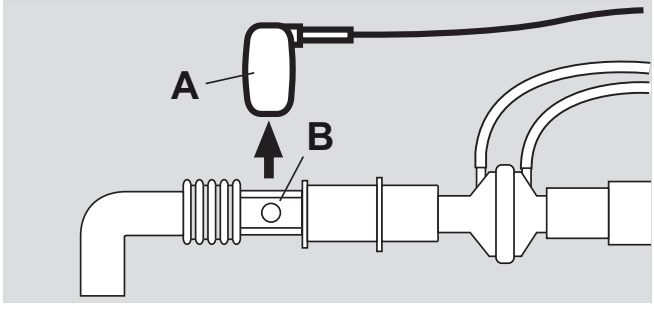


33175

5. Touch the button ***CO_2 zero calibration*** (B).

ℹ The CO_2 zero calibration can be canceled at any time by touching the X button in the top right-hand corner of the screen.

ℹ Shortly after connecting the CO_2 sensor, the zero calibration may take longer (up to 2 minutes).



30254

6. Remove the CO_2 sensor (A) from the CO_2 cuvette (B) of the breathing circuit.

7. On screen 1/3 confirm the advisory message ***Remove the cuvette from the CO_2 sensor.*** with the ***Next*** button.
   The CO_2 zero calibration starts and the message ***Zero calibration of CO_2 sensor in progress...*** is displayed. A bar indicates that the calibration is in progress.
   When the CO_2 zero calibration is completed, a message is displayed indicating the result of the calibration.
8. To exit, touch the ***Finish*** button in the bottom right-hand corner of the screen.
9. Reconnect the CO_2 sensor to the CO_2 cuvette of the breathing circuit.

If CO_2 zero calibration was not successful:

The screen displays the alarm message ***CO_2 zero calibration failed***.

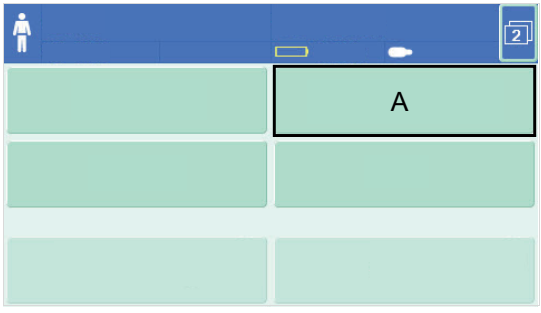
- Repeat the CO_2 zero calibration.

If CO_2 zero calibration is still not successful:

1. Check whether the CO_2 sensor is soiled, and clean the CO_2 sensor if necessary. If the sensor is faulty, replace the sensor.
2. Repeat the CO_2 zero calibration.

6.4.2 Performing the CO_2 filter test (option)

1. To switch the ventilator on, briefly press the start/standby key.
   The ventilator performs an automatic self-test, then the standby screen is displayed.
2. Connect the CO_2 sensor to the device.
3. To move to screen 2 of the dialog, touch the button 1 in the top right-hand corner of the screen.



29375

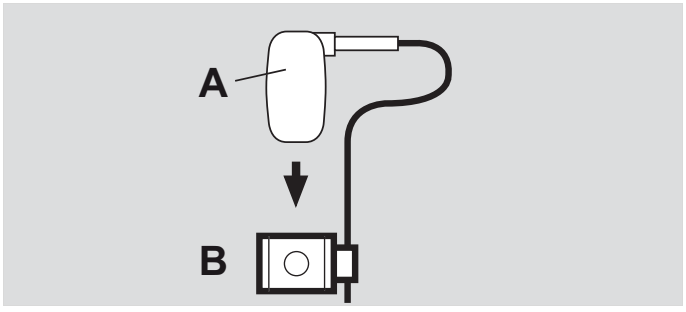
4. Touch the button ***Test & calibration*** (A).

33176

5. Touch the button ***CO_2 filter test*** (B).

ℹ The CO_2 filter test can be canceled at any time by touching the X button in the top right-hand corner of the screen.

ℹ Shortly after connecting the CO_2 sensor, the filter test may take longer (up to 2 minutes).



6. Disconnect the CO_2 sensor (A) from the CO_2 cuvette and connect it to the test filter (B).
7. On screen 1/3 confirm the advisory messages ***1. Remove the cuvette from the CO_2 sensor.*** and ***2. Attach the CO_2 sensor to the test filter.*** with the ***Next*** button.
8. The CO_2 filter test starts and the message ***Filter test of CO_2 sensor in progress...*** is displayed. A bar indicates that the CO_2 filter test is in progress.
9. When the CO_2 filter test is completed, a message is displayed indicating the result.
10. To exit, touch the ***Finish*** button in the bottom right-hand corner of the screen.
11. Reconnect the CO_2 sensor to the CO_2 cuvette.

If the CO_2 filter test was not successful:

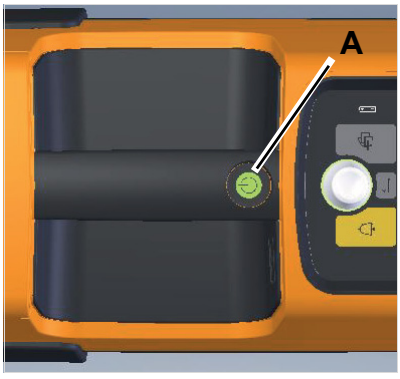
The screen displays the alarm message ***CO_2 filter test failed***. The measured CO_2 value is outside the permissible tolerance range.

1. Check whether the CO_2 sensor or the test filter is soiled, and clean it if necessary.
2. Repeat the CO_2 filter test.

7 Operation

7.1 Switching on the device

⚠ WARNING
Risk of patient injury and device malfunction
Possible health risks for patients and users.
► Use only cleaned and disinfected ventilators that have been successfully checked as being ready for operation. For further information, see the following chapter: "Reprocessing", page 98.
► Do not cover the device (e.g., with a blanket).



28576

To switch the device on:

1. Briefly press the start/standby key (A).

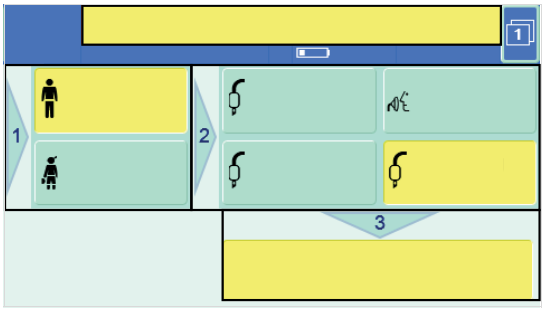
The device briefly displays the startup screen, indicating the device name and the installed software version.

Automatic self-test

Every time it is switched on, the device performs an automatic self-test involving a test of the acoustic alarm signals as well as an internal device test. The device then switches to standby mode.

7.2 Preparing the ventilation mode

The desired ventilation mode is activated by 3 steps from standby mode:



28210

Fig. 1 Selection in 3 steps

– Step 1: Select the patient category
– Step 2: Select the ventilation category
– Step 3: Start ventilation

ℹ The settings in the ventilation category (step 2) are preset but can be adapted. For further information, see the following chapter: "Advanced system setup", page 78.

ℹ The default settings for the patient category ***Child*** correspond to a child weighing approx. 25 to 33 kg (55.1 to 72.8 lb) with a tidal volume of 6 to 8 mL per kilogram of body weight, which corresponds to an age of 7 to 10 years.

ℹ The minimum configurable tidal volume of 100 mL corresponds to a child weighing approx. 13 to 17 kg (28.7 to 37.5 lb) with a tidal volume of 6 to 8 mL per kilogram of body weight, which corresponds to an age of 2 to 4 years.

7.3 Selecting the ventilation mode

The ventilation mode is selected based on the selected ventilation category:

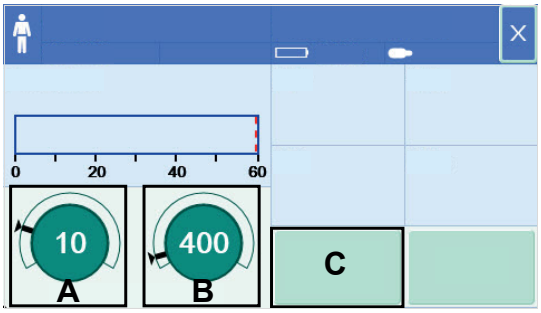
Ventilation category	Prerequisite	Ventilation mode
CPR	None	***VC-CMV***
Ventilation (volume)	None	***VC-CMV/VC-AC***
	Option is activated and if set as default	***VC-SIMV***
Ventilation (pressure)	Option	***PC-BIPAP***
CPAP	None	***SPN-CPAP***
	Option	***SPN-CPAP/PS***

7.3.1 VC-CMV, VC-AC

VC-CMV

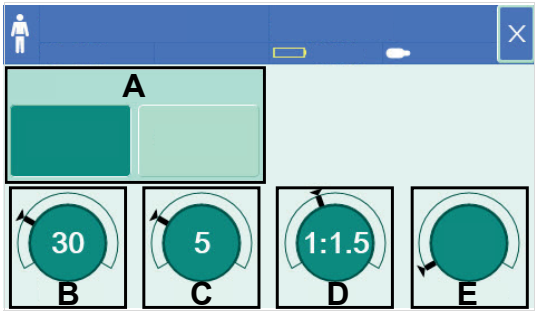
Volume-Controlled - Controlled Mandatory Ventilation

Volume-controlled ventilation with a fixed mandatory minute volume set by the tidal volume ***VT*** and the respiratory rate ***RR***. For patients who are not breathing spontaneously.



28239

1. Adjust the following parameters using the therapy controls:
   A Respiratory rate ***RR***
   B Tidal volume ***VT***
2. Press the ***More settings*** button (C) and adjust the following parameters and settings:



28236

A Inspiratory oxygen concentration FiO2 (***100 % O2*** or ***O2/air mix***)

B Maximum airway pressure ***Pmax***

C Positive end-expiratory pressure ***PEEP***

D Ratio of inspiratory time to expiratory time ***I:E***

E Trigger sensitivity ***Trigger***

When setting the ratio of inspiratory time to expiratory time ***I:E*** the corresponding value ***Ti*** is automatically displayed in the notification field.

VC-AC

Volume-Controlled - Assist Control

For synchronization with the patient's inspiratory efforts. For patients with partial spontaneous breathing.

If a trigger value is set in ventilation mode ***VC-CMV***, the ventilation mode automatically changes to ***VC-AC***.

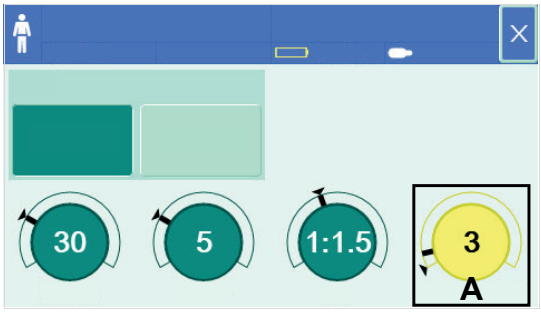
When the trigger sensitivity is activated and set, the mandatory breaths are synchronized with the patient's inspiratory efforts.

A low value corresponds to a high sensitivity. To adapt the trigger sensitivity to the patient, increase the value if triggering is too easy (Autotrigger) and reduce it if triggering is too difficult.

The actual respiratory rate may be higher than the set respiratory rate ***RR***.

Successful patient triggering is briefly indicated by an asterisk (*) in the middle of the waveform field at the top.

Activating and setting the trigger



28237

1. Touch the ***More settings*** button.
2. Select the therapy control ***Trigger*** (A). The therapy control changes color, turning yellow.
3. Set the desired value.
4. Confirm the set value. The therapy control changes color, back to green.

The ventilation mode ***VC-AC*** is displayed on-screen.

ℹ The trigger unit differs depending on the device configuration.

Without Plus option: Trigger [***steps***]
With Plus option: Trigger [***L/min***]

The adaptation of the trigger sensitivity to the patient is independent of the displayed unit, and has the same effect on the trigger with both [***steps***] and [***L/min***].

Deactivating the trigger

1. Touch the ***More settings*** button.
2. Select the therapy control ***Trigger*** (A). The therapy control changes color, turning yellow.
3. Set the value to ***Off*** (therapy control full to left or right).
4. Confirm the setting. The therapy control changes color, back to green.

The ventilation mode ***VC-CMV*** is displayed on-screen again.

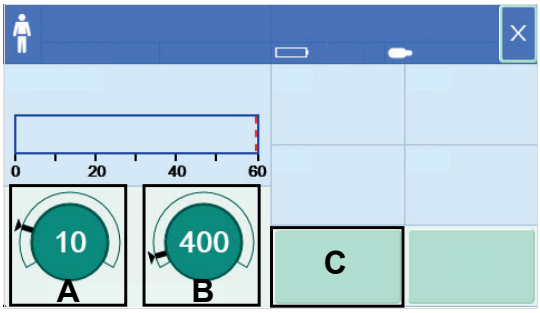
7.3.2 VC-SIMV, VC-SIMV/PS (option)

VC-SIMV

Volume-Controlled - Synchronized Intermittent Mandatory Ventilation

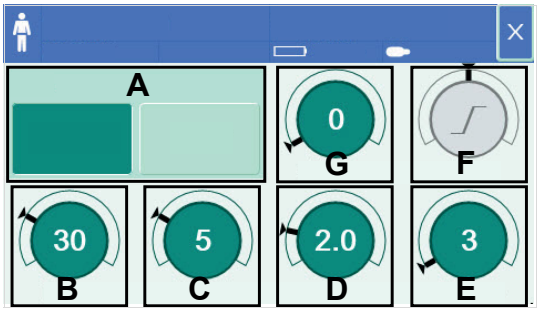
For patients with inadequate spontaneous breathing, or for patients who are to be weaned gradually.

A fixed mandatory minute volume ***MVe*** is set by the tidal volume ***VT*** and the respiratory rate ***RR***. The patient can breathe spontaneously between the mandatory breaths and thus contribute to the total minute volume. Spontaneous breathing can be assisted with PS.



28239

1. Adjust the following parameters using the therapy controls:
   A Respiratory rate ***RR***
   B Tidal volume ***VT***
2. Press the ***More settings*** button (C) and adjust the following parameters and settings:



30161

A Inspiratory oxygen concentration FiO2 (***100 % O2*** or ***O2/air mix***)
B Maximum airway pressure ***Pmax***
C Positive end-expiratory pressure ***PEEP***
D Inspiratory time ***Ti***
E Trigger sensitivity ***Trigger***
F Pressure rise time ***Slope***
G Pressure support ***ΔPsupp***

Successful patient triggering is briefly indicated by an asterisk (*) in the middle of the waveform field at the top.

When setting the respiratory rate ***RR*** or the inspiratory time ***Ti*** the corresponding value ***I:E*** is automatically displayed in the notification field.

VC-SIMV/PS

The following parameters can be adjusted on-screen in addition to the parameters of ventilation mode ***VC-SIMV***:

– Pressure support ***ΔPsupp*** above ***PEEP*** (G)
– Pressure rise time ***Slope*** (F)

The parameter ***Slope*** can only be changed when a value > 0 mbar has been set for ***ΔPsupp***:

– Flat slope = slow pressure rise
– Medium slope = medium pressure rise
– Steep slope = rapid pressure rise

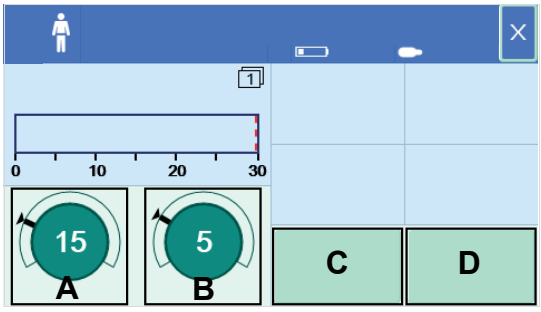
7.3.3 PC-BIPAP (option)

PC-BIPAP

Pressure-Controlled - Biphasic Positive Airway Pressure

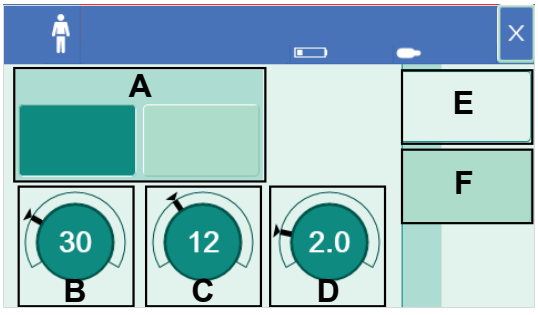
Pressure-controlled ventilation with variable pressure support at CPAP level and the option for spontaneous breathing across the entire respiratory cycle.

For patients without spontaneous breathing and patients with spontaneous breathing up to just before extubation. The patient is gradually weaned through reduction of the mandatory proportion of the total minute volume ***MVe*** and reduction of the pressure support ***ΔPsupp***.



38283

1. Adjust the following parameters using the therapy controls:
   A Inspiratory pressure ***Pinsp***
   B Positive end-expiratory pressure ***PEEP***
2. Tap the ***More settings*** button (C) to open the settings screens.
3. On the ***Basic settings*** screen (E) adjust the following parameters and settings:

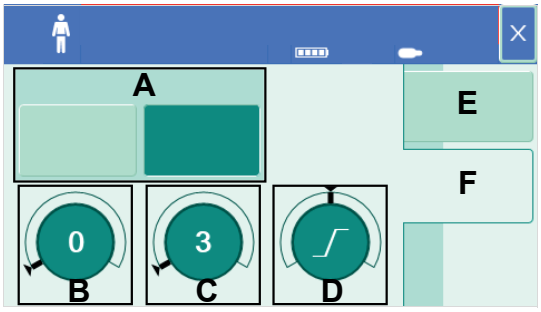


38287

A Inspiratory oxygen concentration ***FiO2*** (***100 % O2*** or ***O2/air mix***)
B Maximum airway pressure ***Pmax***
C Respiratory rate ***RR***
D Inspiratory time ***Ti***

When setting the respiratory rate ***RR*** or the inspiratory time ***Ti*** the corresponding value is automatically displayed in the notification field ***I:E***.

4. On the ***Additional settings*** screen (F) adjust the following parameters and settings:



38292

A Non-invasive ventilation ***NIV*** (***On*** or ***Off***)

B Pressure support ***ΔPsupp***

C Trigger sensitivity ***Trigger***

D Pressure rise time ***Slope***

Successful patient triggering is briefly indicated by an asterisk (*) in the middle of the waveform field at the top.

The pressure rise time ***Slope*** affects the stroke of ***PC-BIPAP*** and the pressure support ***ΔPsupp*** if a value of > 0 mbar is set for ***ΔPsupp***:

– Flat slope = slow pressure rise
– Medium slope = medium pressure rise
– Steep slope = rapid pressure rise

7.3.4 SPN-CPAP, SPN-CPAP/PS (Option)

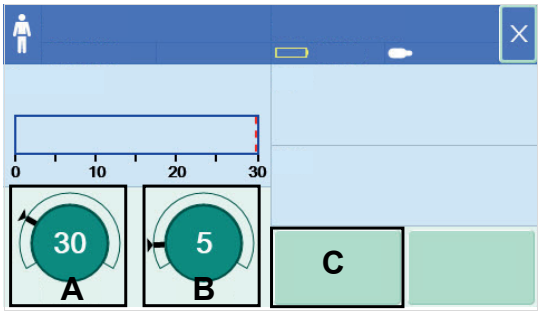
SPN-CPAP

Spontaneous Continuous Positive Airway Pressure

⚠ WARNING
Risk to the patient due to hypoventilation
There is a risk of hypoventilation when using CPAP for patients with insufficient spontaneous breathing.
► Only use CPAP for patients with sufficient spontaneous breathing.

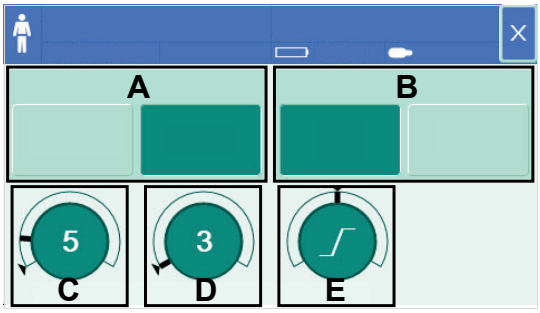
For patients with adequate spontaneous breathing.

If Pressure Support (PS) is not active, the patient's spontaneous breathing is supported only by an increased PEEP.



28241

1. Adjust the following parameters using the therapy controls:
   A Maximum airway pressure ***Pmax***
   B Positive end-expiratory pressure ***PEEP***
2. Press the ***More settings*** button (C) and adjust the following parameters and settings:



28242

A Inspiratory oxygen concentration ***FiO2*** (***100 % O2*** or ***O2/air mix***)
B Non-invasive ventilation ***NIV*** (***On*** or ***Off***)
C Pressure support ***ΔPsupp***
D Trigger sensitivity ***Trigger***
E Pressure rise time ***Slope***

SPN-CPAP/PS

The following parameters can be adjusted on-screen in addition to the parameters of ventilation mode ***SPN-CPAP***:

– Pressure support ***ΔPsupp*** above ***PEEP*** (C)
– Trigger sensitivity ***Trigger*** (D)
– Pressure rise time ***Slope*** (E)

The parameter ***Trigger*** can only be changed when a value > 0 mbar has been set for ***ΔPsupp***.

The parameter ***Slope*** can then be changed:

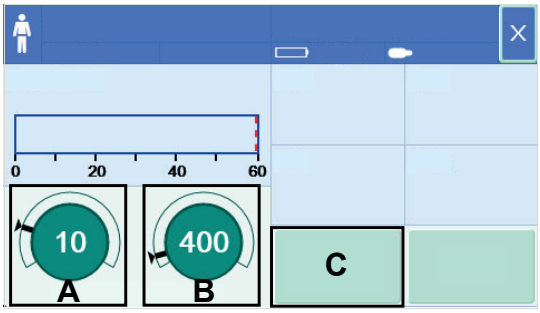
– ***Flat*** = slow pressure rise
– ***Medium*** = medium pressure rise
– ***Steep*** = fast pressure rise

7.3.5 Cardiopulmonary resuscitation (CPR)

⚠ WARNING
Risk of patient injury
In the ventilation category ***CPR*** the minute volume and respiratory rate alarms are not available.
► Only use the ventilation category ***CPR*** for reanimation.

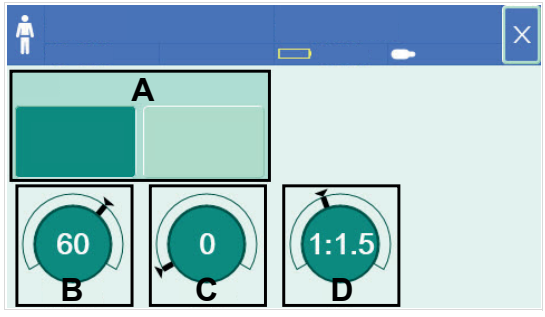
During cardiopulmonary resuscitation, the airway pressure ***Paw*** is increased because of chest compressions.

The airway pressure ***Paw*** is monitored by the device and limited to the set maximum inspiratory pressure ***Pmax***. ***Pmax*** is not exceeded and the inspiration is not ended prematurely.



28239

1. Adjust the following parameters using the therapy controls:
   A Respiratory rate ***RR***
   B Tidal volume ***VT***
2. Press the ***More settings*** button (C) and adjust the following parameters and settings:



28238

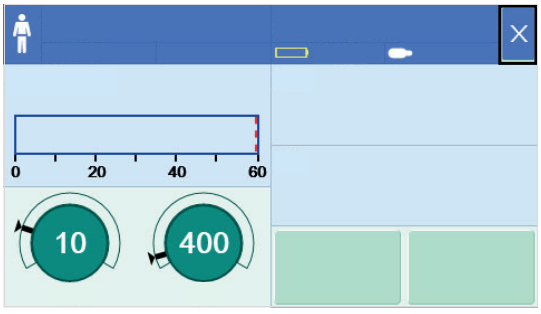
A Inspiratory oxygen concentration FiO2 (***100 % O2*** or ***O2/air mix***)
B Maximum airway pressure ***Pmax***
C Positive end-expiratory pressure ***PEEP***
D Ratio of inspiratory time to expiratory time ***I:E***

7.4 Changing the ventilation mode

It is possible to change the ventilation mode at any time during operation.

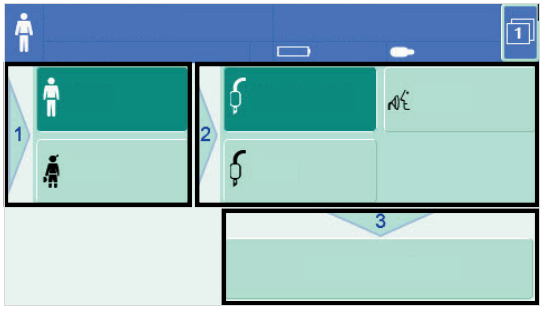
By means of the screen

To go back to the ventilation category selection at any time during operation:



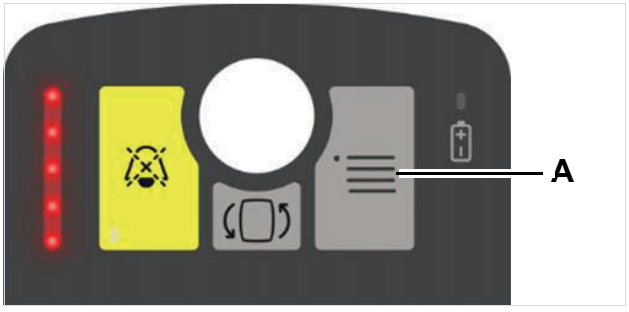
28234

1. Touch the X button.
   The ventilation category selection screen is displayed.
2. Select the desired ventilation category in 3 steps.



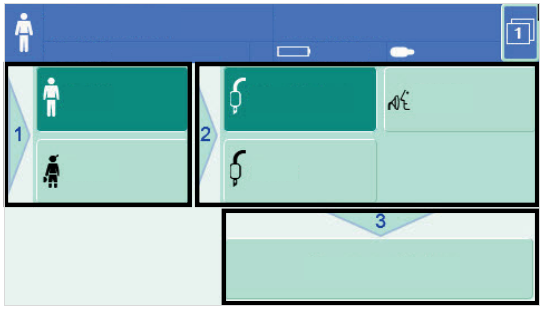
28235

By means of the control panel



28174

1. Touch the (A) key.
2. Select the desired ventilation category in 3 steps.



28235

7.5 Non-invasive ventilation (NIV)

Using NIV

NIV is available for the device in the pressure-controlled ventilation mode ***SPN-CPAP*** or ***SPN-CPAP/PS***. In this ventilation mode ***NIV*** is the default setting.

In the pressure-controlled ventilation mode ***PC-BIPAP NIV*** is also available, but it is not the default setting.

The device automatically adjusts to the requirements of non-invasive ventilation. Mask leakage is detected by the device and compensated for. This means that the leakage for the displayed measured values ***VTe*** and ***MVe*** has already been taken into account. The leakage alarm is not available.

⚠ WARNING
Risk of patient injury
If NIV is not active, leakage during ventilation will corrupt the ***VTe*** and ***MVe*** measured values.
► Special care must be taken when using non-invasive ventilation.
► After activating and deactivating NIV, check the alarm limits for ***MVe***.

⚠ WARNING
Risk of undetected leakage and inadequate ventilation
The leakage alarm is not available when using non-invasive ventilation.
► Make sure that NIV is not activated for intubated patients.

⚠ WARNING
Risk of CO_2 rebreathing
Bacteria filters, HMEs, catheter mounts, and masks increase the resistance and dead space of the breathing circuit.
► Note the manufacturer's directions.

⚠ WARNING
Risk of aspiration
A high airway pressure may lead to aspiration.
► Avoid high airway pressure.

Deactivating NIV

1. In the ventilation mode ***SPN-CPAP*** or ***SPN-CPAP/PS*** touch the ***More settings*** button.
   In the ventilation mode ***PC-BIPAP*** touch the ***More settings*** button followed by the ***Additional settings*** button.
2. For ***NIV***, touch the ***Off*** button and confirm.

The adjunct ***NIV*** is hidden in the on-screen ventilation mode field, and in the ventilation category the mask symbol is replaced by a tube symbol.

Turning NIV back on

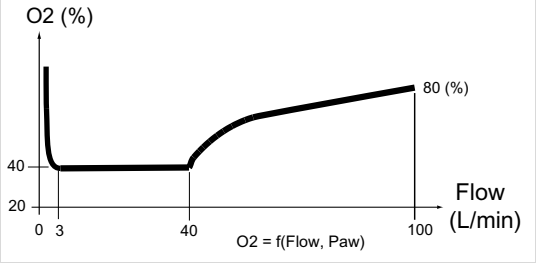
1. In the ventilation mode ***SPN-CPAP*** or ***SPN-CPAP/PS*** touch the ***More settings*** button.
   In the ventilation mode ***PC-BIPAP*** touch the ***More settings*** button followed by the ***Additional settings*** button.
2. For ***NIV***, touch the ***On*** button and confirm.

The adjunct ***NIV*** behind the ventilation mode is displayed again, and in the ventilation category the mask symbol reappears.

7.6 O2/air mix

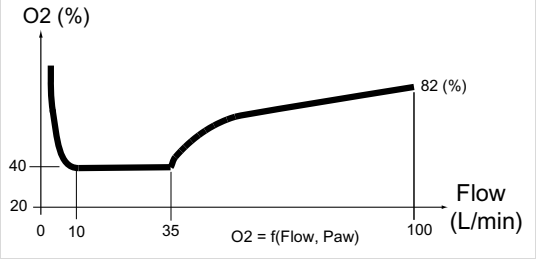
The inspiratory oxygen concentration ***FiO2*** can be set to ***O2/air mix*** independent of the ventilation mode. With ***O2/air mix***, ambient air is drawn in by the injector principle of the device to achieve an FiO2 concentration of approx. 40 %.

However, the O2 concentration which can be realized depends on the mean airway pressure and the inspiratory flow. The O2 concentration can never be below 40 %. This is demonstrated in the following schematic diagrams:



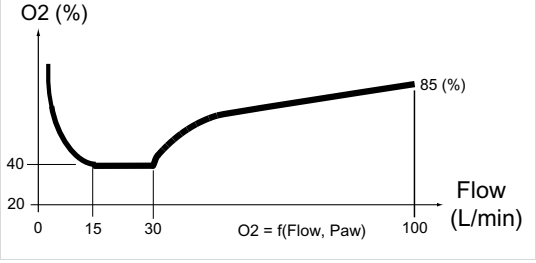
33313

O2 concentration which can be realized at a mean airway pressure of 5 mbar (5 cmH2O)



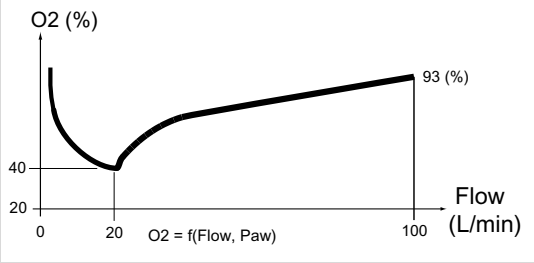
33314

O2 concentration which can be realized at a mean airway pressure of 15 mbar (15 cmH2O)



33315

O2 concentration which can be realized at a mean airway pressure of 30 mbar (30 cmH2O)



33316

O_2 concentration which can be realized at a mean airway pressure of 60 mbar (60 cmH_2O)

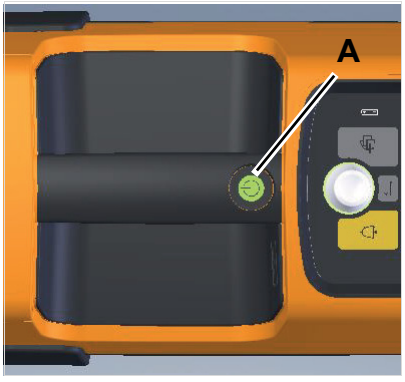
When using 93 % oxygen as the supply gas, the actual O_2 concentration is slightly lower than the indicated values.

⚠ WARNING
Risk of patient injury
Strictly observe the following information regarding toxic and infectious environments:

- ► The patient must be ventilated with an inspiratory oxygen concentration of ***FiO_2 100 % O_2*** or ***93 % O_2*** so that toxic and infectious constituents cannot enter the breathing gas.
- ► The patient must immediately be transferred to a breathable atmosphere in order to prevent inhalation of toxic and infectious air when spontaneous breathing resumes.
- ► Use a bacteria filter.

7.7 Switching to standby mode and turning off the device

After disconnecting the patient, switch the ventilator to standby mode or turn it off.



28576

To switch to standby mode:

1. Press the start/standby key (A) for about 3 seconds.
2. Touch the ***Standby*** button and confirm.

The standby screen is then displayed. For further information, see the following chapter: "Structure of the screen", page 29.

To switch the device off:

1. Press the start/standby key (A) for about 3 seconds.
2. Touch the ***Shut down*** button and confirm.

The prompt ***Device is shutting down...*** is displayed.

Forcing a device shutdown:

1. Press the start/standby key (A) for about 8 seconds.

While the key is held, the ***Forced shutdown*** alarm sounds.

⚠ WARNING
Risk of patient injury
The patient will no longer be ventilated if the start/standby key is held for at least 8 seconds.

► Only force a device shutdown if no patient is connected to the device or the patient no longer needs to be ventilated.

8 Alarms

8.1 Safety information

Position of user relative to alarm system

The alarm system is designed so that the user can recognize alarm messages from a distance of 1 m (39 in).

The specified values for the alarm volume apply to a distance of 1 m (39 in).

8.2 Alarm priorities

The device assigns priorities to the alarms. An alarm always consists of an alarm message and an acoustic alarm signal.

The alarm message is highlighted with the corresponding number of exclamation marks.

!!! = Warning

!! = Caution

! = Note

Warning

High-priority alarm

- The alarm indicator flashes red.
- The alarm message is highlighted by 3 prefixed exclamation marks and a red background.
- The acoustic alarm signal consists of 5 tones, repeated twice about every 6 seconds.

Caution

Medium-priority alarm

- The alarm indicator flashes yellow.
- The alarm message is highlighted by 2 prefixed exclamation marks and a yellow background.
- The acoustic alarm signal consists of 3 tones, repeated about every 8 seconds.

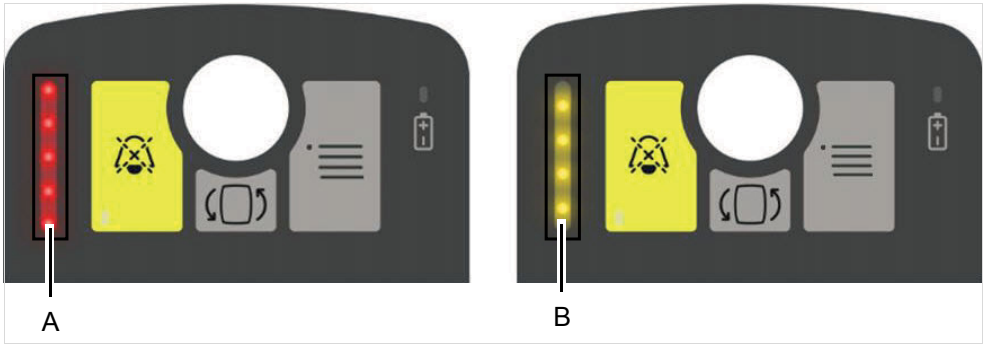
Note

Low-priority alarm

- The advisory message is highlighted by a prefixed exclamation mark and a cyan-colored background.
- The acoustic alarm signal consists of 2 tones, sounded only once.

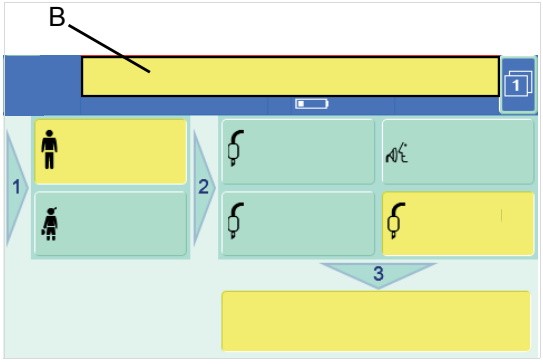
8.3 Alarm indication

In the event of an alarm, the following optical and acoustic alarm signals are generated simultaneously:



29398

– The LED flashes red (A) when a high-priority alarm is active and yellow (B) when a medium-priority alarm is active.



29399

– The alarm message is displayed in the middle of the screen at the top, and is color-highlighted (B). When several alarms are active simultaneously, the alarm with the highest priority is displayed.
– The acoustic alarm signal sounds.

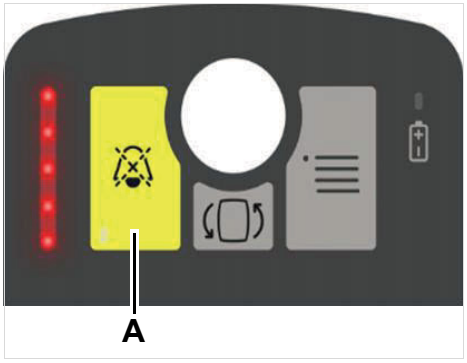
When an alarm is triggered by a measured value, the measured value in question also lights up red or yellow according to the alarm priority.

When the cause of an alarm has been eliminated, the acoustic alarm signal stops and the alarm message disappears.

All active alarms and the alarm history can be viewed in the logbook. For further information, see the following chapter: "Logbook", page 86

8.3.1 Silencing acoustic alarm signals

⚠ WARNING
Risk of alarms being not heard
The use of the alarm silence key may cause alarms to go unnoticed.
► Regularly check the screen for alarm messages.



- Touch the (A) key.

The alarm indicator remains active and all current acoustic alarm signals are silenced for about 2 minutes. The LED in the yellow key field remains lit during this time.

New alarms with a higher priority than that of the silenced alarms override the alarm tone suppression and, thus, are indicated by a one-time acoustic alarm signal.

After the 2 minutes, all acoustic alarm signals are reactivated and the LED in the yellow key field goes out.

ℹ To be notified of new acoustic alarm signals during the alarm silencing, the 2-minute alarm suppression must be reset.

To cancel the silencing before the 2 minutes elapse:

- Press key (A) again.

8.3.2 In the event of a power failure

In the event of a power failure, ventilation, volume measurement and alarms do not operate. An acoustic alarm signal sounds to indicate the power failure.

Spontaneous breathing can continue through the emergency air inlet.

- Immediately start ventilating the patient with an independent manual ventilation device (breathing bag) using ***PEEP*** and/or an increased inspiratory oxygen concentration as necessary.

8.4 Setting alarm limits

Alarm limits can be set for the following parameters:

– Airway pressure ***Paw***
– Respiratory rate ***RR***

– Minute volume ***MVe*** (option)
– End-tidal CO_2 concentration ***etCO2*** (option)

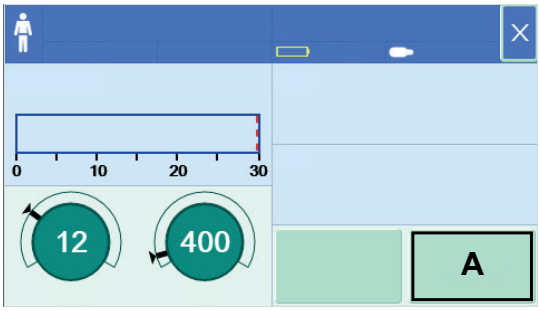
Upper alarm limit for Paw

The airway pressure ***Paw*** is monitored by the ventilator and limited to the set maximum inspiratory pressure ***Pmax***. The airway pressure is limited when ***Pmax*** is reached; inspiration will not be terminated prematurely. ***Pmax*** appears in the pressure bar as a dashed line. As soon as this dashed line is surpassed by 5 mbar, the device sounds the alarm ***Airway pressure high***.

Lower alarm limit for Paw

The ventilator automatically generates an alarm if the difference between the inspiratory pressure and expiratory pressure is too low.

To set the alarm limits for ***RR***, ***MVe*** (option) and ***etCO2*** (option):



28579

1. In operation mode, touch the ***Alarm settings*** button (A).

28580

2. The following settings can be made depending on the selected options:
   – For the respiratory rate ***RR***: Upper alarm limit (B)
   – For the minute volume ***MVe***: Upper alarm limit (B) and lower alarm limit (D)
   – For end-tidal CO_2 concentration ***etCO2*** if the CO_2 sensor cable is connected: Upper alarm limit (B) and lower alarm limit (D)

   The current value is displayed between the alarm limits (C).

Further settings:

– Alarm volume ***Alarm volume*** (E)
  This enables the alarm volume to be in a range from 25 % to 100 %. The minimum volume level can be set, see page 81. This setting then applies to all alarms.
– Automatic setting ***Autoset*** (F)
  This enables the upper and lower alarm limits to be set automatically. This applies to all parameters.

Setting the alarm limits automatically

The ***Autoset*** function sets the alarm limits on the basis of the actual measured values at the time of activation. The automatic setting of the alarm limits is performed only once, when confirmed with the rotary knob.

The autoset alarm limits are based on the actual measured values as follows:

– For ***MVe high***: Measured value +30 % or +2 L/min, whichever is greater
– For ***Expiratory minute volume low***: Measured value –20 % or –0.5 L/min, whichever is greater
– For ***RR high***: measured value +5 /min with a minimum of 10 /min

The automatic alarm limits for ***etCO2*** are based on the actual measured value for ***etCO2*** as follows:

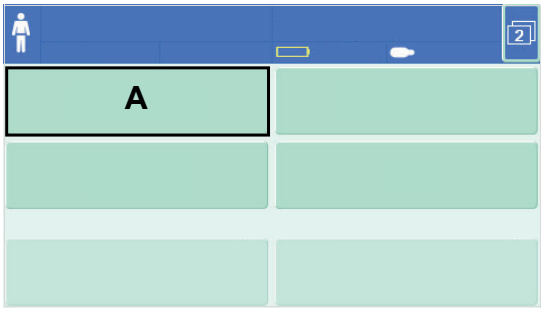
Lower alarm limit [mmHg]	**Current measured value [mmHg]**	**Upper alarm limit [mmHg]**
Unchanged	<15	Unchanged
Measured value –5	15 to 35	Measured value +15
Measured value –7	35 to 45	Measured value +10
Measured value –10	>45	Measured value +5

Lower alarm limit [kPa] or [Vol%]	**Current measured value [kPa] or [Vol%]**	**Upper alarm limit [kPa] or [Vol%]**
Unchanged	<2.0	Unchanged
Measured value –0.7	2.0 to 4.7	Measured value +2.0
Measured value –0.9	4.7 to 6.0	Measured value +1.3
Measured value –1.3	>6.0	Measured value +0.7

9 Configuration

9.1 Setting configuration parameters

To access the configuration dialog:



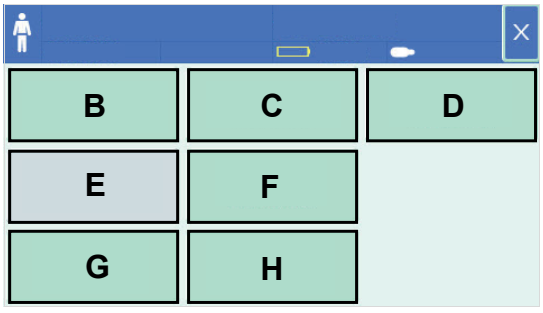
28582

Standby mode

1. To move to screen 2 of the dialog, touch the button 1 in the top right-hand corner of the screen.
2. Touch the button ***System setup*** (A).

Operation mode

1. To access the screen where the ventilation mode can be selected, touch the X button in the top right-hand corner of the ventilation dialog.
   Alternatively: Press the start dialog key on the control panel.
2. To move to screen 2 of the dialog, press button 1 in the top right-hand corner of the screen.
3. Touch the button ***System setup*** (A).



28683

In the configuration dialog the following information can be displayed and changed:

- ***Screen brightness*** (B)
  - 25 %, 50 %, 75 %, 100 %
- ***Breathing circuit*** (C)
  - ***Disposable***, ***Reusable***
- ***HME*** (D)
  - ***On***, ***Off***
- ***Ventilation (volume)*** (E) (option)
  - ***VC-CMV***, ***VC-SIMV***
- ***CO_2 cuvette*** (F) (option)
  - ***Disposable***, ***Reusable***

- ***Bluetooth*** (G) (option)
  - ***On***, ***Off***
- ***Screenshots*** (H) (option)
  - ***On***, ***Off***

9.2 Adjusting the screen brightness

The screen brightness can be adjusted in a range from 25 % to 100 %.

To adjust the screen brightness:

- Touch the ***Screen brightness*** button (B), select the desired screen brightness (25 %, 50 %, 75 % or 100 %) and confirm.

9.3 Setting the breathing circuit

The breathing circuit can be set for the use of disposable or reusable breathing circuits.

To set the breathing circuit:

- Press the ***Breathing circuit*** button and select and confirm the breathing circuit used (***Disposable*** or ***Reusable***).

9.4 Setting the HME correction

The temperature and moisture of the HME (heat and moisture exchanger) have an effect on the flow measurement. The device can compensate for the presence of an HME.

To set the HME correction:

- Touch the ***HME*** button, set the desired value (***On*** or ***Off***), and confirm the setting.

9.5 Setting the ventilation mode for the ventilation category "Ventilation (volume)"

Prerequisite: The Plus option is activated.

The ventilation mode for the ventilation category ***Ventilation (volume)***, which is used as default in standby mode, can be set here. The options are ***VC-CMV*** and ***VC-SIMV***.

To set the ventilation mode:

- Touch the ***Ventilation (volume)*** button, set the desired mode, and confirm the setting.

ℹ The ventilation mode can also be changed while ventilation is performed.

9.6 Setting the CO_2 cuvette type (option)

The device can be set for the use of disposable or reusable CO_2 cuvettes.

To set the CO_2 cuvette type:

- Touch the ***CO_2 cuvette*** button, set the desired cuvette type (***Disposable*** or ***Reusable***), and confirm the setting.

9.7 Using the Bluetooth function (option)

Activating Bluetooth

The device can be connected with another suitable receiver via Bluetooth.

To activate the Bluetooth function:

- Touch the ***Bluetooth Off*** button, set to ***Bluetooth On*** and confirm the setting.

The Bluetooth PIN for connecting with another receiver is displayed below the ventilation category for 15 seconds.

Then, the Bluetooth symbol appears below the ventilation category to indicate that the function is active.

Connecting an external device

ℹ Operating systems that use Bluetooth may not all be compatible with one another.

1. Activate the Bluetooth function on both devices.
2. Start the connection from an external device (coupling).
3. In the external device, enter the PIN displayed in the notification field of the ventilator. The devices are then coupled automatically.

After the devices are coupled, the ventilator automatically sends a patient log file in CSV format.

This patient log file contains the following information:

– Events
– Settings
– Measured values for the current ventilation (device is ventilating) or
– Measured values for the last ventilation (device is in standby mode)

Alternatively, after coupling, measured values, waveforms, alarms, and settings can be transferred in real time using the MEDIBUS.X protocol.

MEDIBUS.X is a software protocol for the transfer of data between Oxylog VE300 and an external medical or non-medical device (e.g., patient monitors or computers for data management systems).

⚠ WARNING
Risk due to incorrectly transferred data
All data that are sent via the device's MEDIBUS.X interface to other devices may be incorrect or incomplete when displayed there. Consequently, they are used only for information purposes.

► Do not use data displayed on other devices for diagnostic or therapeutic decisions.

► Do not use data displayed on other devices for patient monitoring or device monitoring.

For more information, refer to "MEDIBUS.X, Rules and Standards for Implementation" (90 52 607) and "MEDIBUS.X, Profile Definition for Data Communication V1.n" (90 52 608).

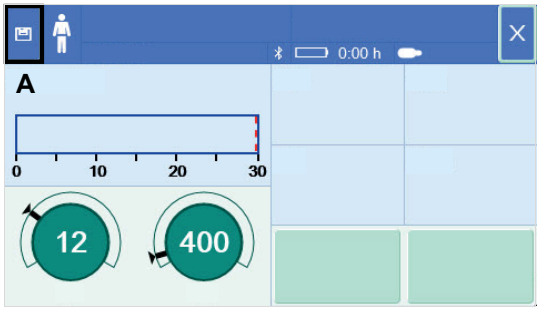
9.8 Activating the screenshot function (option)

The screenshot function can be used to take a screenshot of every screen. Screenshots are saved in the internal memory of the device.

To activate the screenshot function:

- Touch the ***Screenshots Off*** button, set to ***Screenshots On***, and confirm the setting.

A button to take a screenshot (A) appears in the top left corner of the screen, to the left of the patient category symbol.



33188

To take a screenshot:

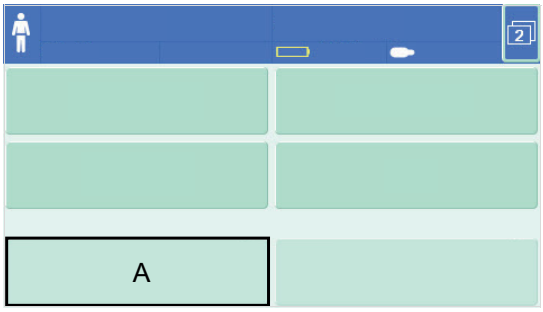
- Press the screenshot button (A).

The screenshot is taken automatically and the ***Screenshot saved*** message is displayed briefly below the ventilation category to confirm that the screenshot has been saved.

The saved screenshots can be exported using the USB port.

9.9 Advanced system setup

To access the advanced system setup:



29387

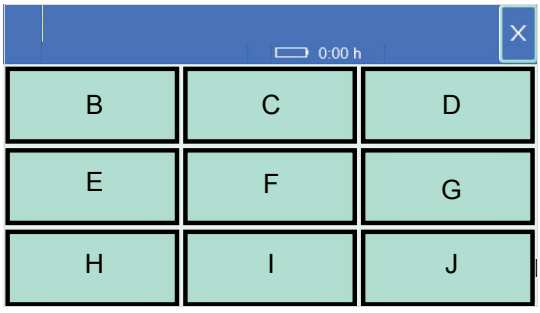
Standby mode

1. To move to screen 2, touch the button 1 in the top right-hand corner of the screen.
2. Touch the button ***Advanced system setup*** (A).

Operation mode

During ventilation the ***Advanced system setup*** button is grayed out.

The following screens are intended for service personnel, and are password-protected to prevent unauthorized adjustment. For further information, see the following chapter: "Password", page 128.



33059

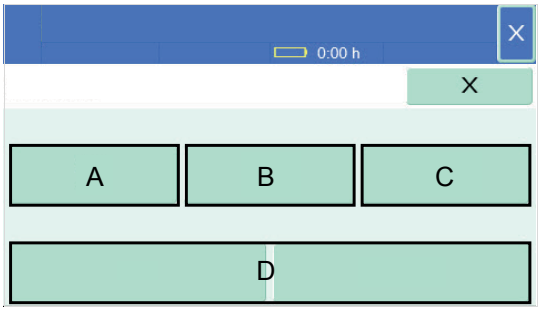
In the advanced system setup the following settings can be displayed and changed:

- ***Language*** (B)
- ***Date*** (C)
- ***Time*** (D)
- ***Demo mode*** (E)
  - ***On***, ***Off***
- ***Export data*** (F) (option)
- ***Change password*** (G)
- ***Device settings*** (H)
- ***Ventilation settings*** (I)
- ***Restore factory settings*** (J)

9.9.1 Language

Here any of the languages programmed into the system can be selected. When the new language is confirmed, the device switches to it immediately.

9.9.2 Date



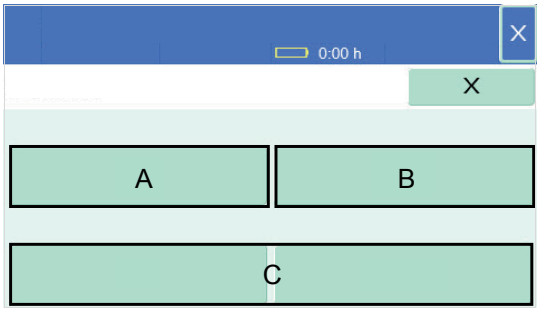
29388

Here the system date of the device can be set.

- ***Day*** (A)
- ***Month*** (B)
- ***Year*** (C)
- ***OK*** and ***Cancel*** buttons (D) to save or cancel the date setting.

ℹ ***Day***, ***Month*** and ***Year*** must each be confirmed individually with the rotary knob. Then all the settings must be confirmed with ***OK***, or can be discarded with ***Cancel***.

9.9.3 Time



29389

Here the system time of the device can be displayed and set.

- ***Hours*** (A)
- ***Minutes*** (B)
- ***OK*** and ***Cancel*** (C) buttons to save or cancel the time setting.

ℹ ***Hours*** and ***Minutes*** must each be confirmed individually with the rotary knob. Then all the settings must be confirmed with ***OK***, or can be discarded with ***Cancel***.

9.9.4 Demo mode

Demo mode disables BTPS correction so that correct values are displayed when demonstrating a device on a test lung.

⚠ WARNING
Risk of patient injury
The demo mode changes the tidal volume.
► Never activate demo mode while a patient is connected.

Here the device demo mode can be activated and deactivated.

9.9.5 Exporting data (option)

Here the following data can be exported as a log file to a USB flash drive for analysis and documentation purposes:

– System tests
– Screenshots
– Patient log files

The exported data can be read with common programs.

To export log files:

1. Touch the ***Export data*** button.
2. Connect a USB flash drive.
   The device automatically detects the USB flash drive and transfers the saved data to it.
   A successful transfer is confirmed with the message ***Export successfully completed.***
3. Touch the ***Finish*** button to complete the export and remove the USB flash drive.

⚠ WARNING
Risk of patient injury and damage to the device
Do not connect a USB cable to the USB port. The voltage may cause damage to the device or harm the patient.
► Only connect USB flash drives to the USB port.

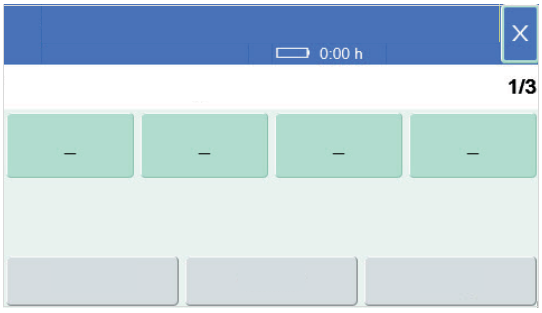
9.9.6 Changing the password

Here the password for the advanced system setup can be changed.

⚠ WARNING
Unauthorized access to the system setup
If the password is not changed, unauthorized individuals have access to the system setup and can change important settings.
► Change the preset password before the ventilator is used for the first time.

To change the password:

1. Touch the ***Change password*** button.



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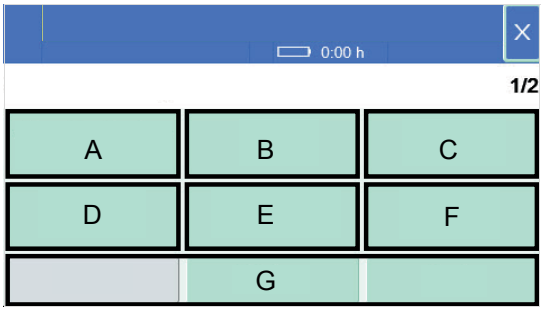
2. Enter the new four-digit code. Touch the relevant buttons, set the new digits, and confirm.
3. After entering all of the digits, touch the ***Next*** button.
4. Enter the password again.

On the last dialog page the change of the password is confirmed with the ***Password changed.*** message. If both entries of the new password were not identical, the ***Password not changed.*** error message is displayed.

9.9.7 Device settings

Here the system settings with which the device starts up can be specified.

The device settings are spread across two dialog pages:



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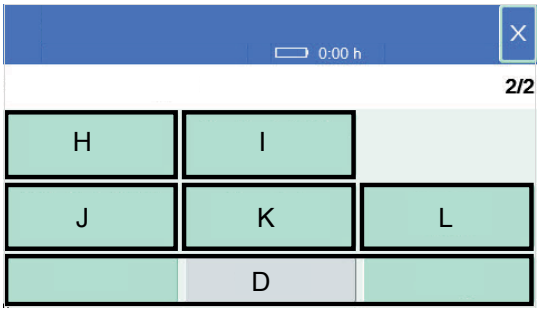
On dialog page 1/2 the following device settings can be displayed and changed:

- ***Breathing circuit*** (A)
  - ***Disposable***, ***Reusable***
- ***HME*** (B)
  - ***On***, ***Off***
- ***Pressure unit*** (C)
  - ***cmH2O***, ***mbar***
- ***CO2 cuvette*** (D)
  - ***Disposable***, ***Reusable***
- ***Gas supply*** (E)
  - ***100 % O2***, ***93 % O2***
- ***CO2 unit*** (F)
  - ***mmHg***, ***Vol%***, ***kPa***

– Buttons ***Back***, ***Next*** and ***Finish*** (G) for navigating within the dialog.



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On dialog page 2/2 the following system settings can be displayed and changed:

– ***Alarm volume*** (H)
  – 25 %, 50 %, 75 %, 100 %
– ***Min. alarm volume*** (I)
  – 25 %, 50 %, 75 %, 100 %
– ***Screen brightness*** (J)
  – 25 %, 50 %, 75 %, 100 %
– ***Screenshots*** (K)
  – ***On***, ***Off***
– ***Bluetooth*** (L)
  – ***On***, ***Off***
– Buttons ***Back***, ***Next*** and ***Finish*** (D) for navigating within the dialog.

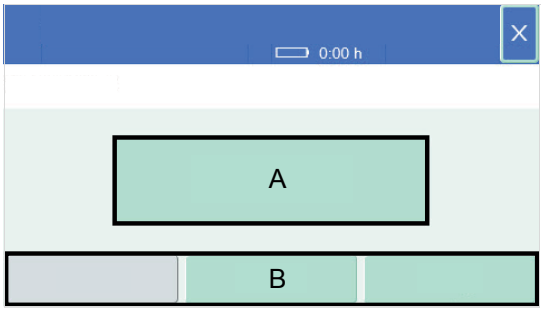
9.9.8 Ventilation settings

Here the ventilation settings with which the device starts up can be specified.

⚠ WARNING
Risk of patient injury
When using several ventilators in the same environment of use, the ventilation settings must be the same on all ventilators to prevent risk of patient injury.

► Make sure that all ventilators have the same ventilation settings and alarm settings.

Start mode can be selected on the first two dialog pages of the ventilation settings.



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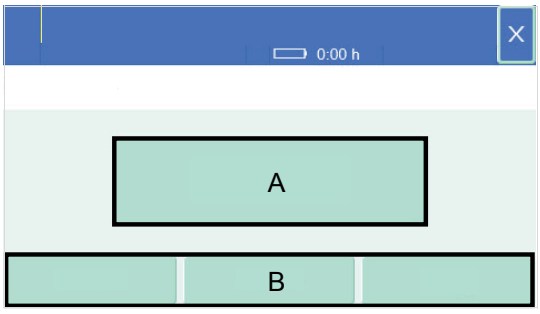
On the first dialog page:

– ***Ventilation category*** (A)
  – ***CPR***, ***SPN-CPAP***, ***Ventilation (volume)***, ***Ventilation (pressure)***
– Buttons ***Back***, ***Next*** and ***Finish*** (B) navigate within the dialog.



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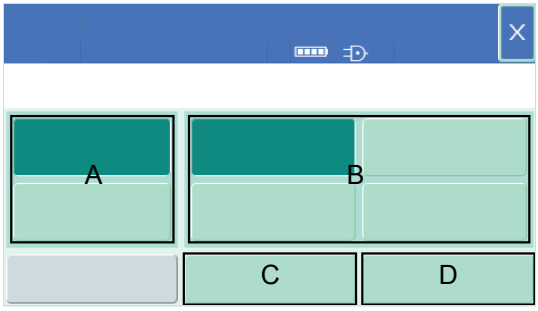
On the second dialog page:

– ***Ventilation (volume)*** (A)
  – ***VC-CMV/VC-AC***, ***VC-SIMV***, ***VC-SIMV/PS***
– Buttons ***Back***, ***Next*** and ***Finish*** (B) navigate within the dialog.

The following dialog pages of the ventilation settings are dependent on the selected ventilation category and the selected ventilation mode.

The sequence to access the preset values is always as follows:

1. Select the patient category (***Adult*** or ***Child***) (A).
2. Select the ventilation category (***CPR***, ***Ventilation (volume)***, ***Ventilation (pressure)*** or ***CPAP***) (B).
3. Use ***Next*** (C) to navigate to the next dialog page.



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4. Select ***Ventilation (volume) VC-CMV/VC-AC*** or ***VC-SIMV/PS*** (option).
5. Use ***Next*** (C) to navigate to the next dialog page.
   Depending on the selected settings, the ventilation settings can now be set on up to 3 dialog pages.
6. Touch the ***Finish*** (D) button to apply and save the set values.

The preset parameter values are listed in the following table:

	RR **[/min]**	***V*** **[mL]**	***I:E***	***Ti*** **[s]**	***PEEP*** **[mbar]**	***Pmax*** **[mbar]**	***ΔP-supp*** **[mbar]**	***Trigger***	***Slope***	***O2/air mix***
Adult - Ventilation (volume) - VC-CMV/VC-AC	12	400	1:1.5	-	5	30	-	0	-	***100 % O2***
Adult - Ventilation (volume) - VC-SIMV	12	400	-	2.0	5	30	0	3	***Medium***	***100 % O2***
Adult - Ventilation (pressure) - PC-BIPAP	12	-	-	2.0	5	30 ***Pinsp*** 20	0	3	***Medium***	***100 % O2***
Adult - CPAP - SPN-CPAP	-	-	-	-	5	30	-	-	-	***O2/air mix***
Adult - CPAP - SPN-CPAP/PS	-	-	-	-	5	30	0	3	***Medium***	***O2/air mix***
Adult - CPR - VC-CMV	10	400	1:1.5	-	0	60	-	-	-	***100 % O2***
Child - Ventilation (volume) - VC-CMV/VC-AC	20	200	1:1.5	-	5	25	-	0	-	***100 % O2***
Child - Ventilation (volume) - VC-SIMV	20	200	-	1.2	5	25	0	3	***Medium***	***100 % O2***
Child - Ventilation (pressure) - PC-BIPAP	20	-	-	1.2	5	25 ***Pinsp*** 15	0	3	***Medium***	***100 % O2***
Child - CPAP - SPN-CPAP	-	-	-	-	5	25	-	-	-	***O2/air mix***
Child - CPAP - SPN-CPAP/PS	-	-	-	-	5	25	0	3	***Medium***	***O2/air mix***
Child - CPR - VC-CMV	10	200	1:1.5	-	0	40	-	-	-	***100 % O2***

The preset alarm setting values are listed in the following table:

Patient category	**Alarm limit**	**Value**
Adult	***MVe low*** - ***MVe high***	3 - 10 L/min
	RR high	30 /min
	etCO2 low - ***etCO2 high***	30 - 50 mmHg / 4.0 - 6.7 kPa / 4.0 - 6.7 Vol%
	etCO2 low - ***etCO2 high*** (only ***CPR***)	0 - 99 mmHg / 0 - 13.2 kPa / 0 - 13.2 Vol%

Patient category	Alarm limit	Value
Child	***MVe low*** - ***MVe high***	2 - 8 L/min
	RR high	35 /min
	etCO2 low - ***etCO2 high***	30 - 50 mmHg / 4.0 - 6.7 kPa / 4.0 - 6.7 Vol%
	etCO2 low - ***etCO2 high*** (only ***CPR***)	0 - 99 mmHg / 0 - 13.2 kPa / 0 - 13.2 Vol%

The preset alarm volume values are listed in the following table:

Preset value for	Value
Alarm volume	75 %
Minimum alarm volume	25 %

9.9.9 Restoring factory settings

All values set by the user will be overwritten by the factory settings. This cannot be undone.

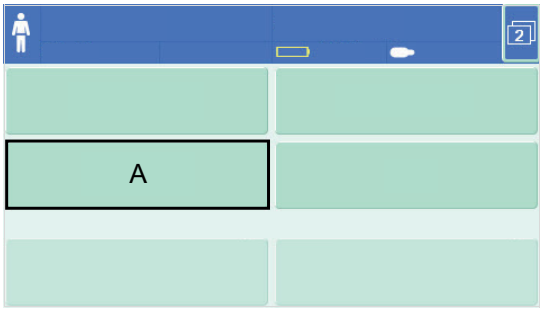
To restore the factory settings:

- Touch the ***Restore factory settings*** button and confirm.

10 Logbook and system information

10.1 Logbook

To access the logbook:



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Standby mode

1. Touch the button 1 in the top right-hand corner of the screen to go to screen 2.
2. Touch the button ***Logbook*** (A).

Operation mode

1. To access the start dialog, touch the X button in the top right-hand corner of the ventilation dialog.
   Alternatively: Press the start dialog key on the control panel.
2. Then touch the button 1 in the top right-hand corner of the screen to go to screen 2.
3. Touch the button ***Logbook*** (A).

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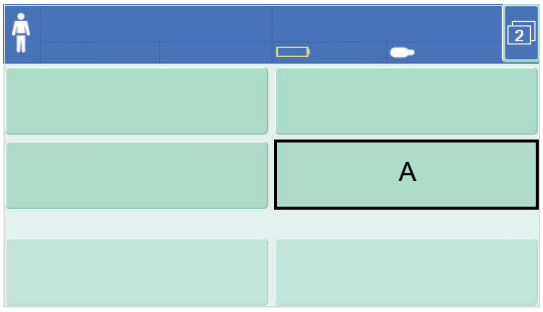
The logbook displays all events, alarms, and the switching off of the device in chronological order. The most recent entry is at the top. Earlier events and alarms can be displayed using the arrow keys.

A maximum of 400 logbook entries is visible. When the capacity of the logbook is reached, the oldest entries are overwritten. For alarms, the presence of an alarm condition and the removal of this condition is recorded. Alarms are displayed in the color corresponding to their priority and the removal of the alarm condition is displayed in gray.

The entries in the logbook cannot be deleted and are preserved even after the device is switched off and on or after a power supply failure.

10.2 System information

To access the system information:



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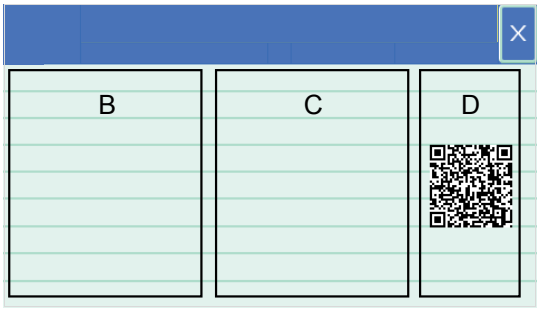
Standby mode

1. Touch the button 1 in the top right-hand corner of the screen to go to screen 2.
2. Touch the button ***System information*** (A).

Operation mode

1. To access the start dialog, touch the X button in the top right-hand corner of the ventilation dialog.
   Alternatively: Press the start dialog key on the control panel.
2. Touch button 1 in the upper right-hand corner of the screen to go to screen 2.
3. Touch the button ***System information*** (A).



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The system information is displayed in 2 columns in this screen.

– Left-hand column (B): ***Serial number***, ***Software version***, ***Device ID***, options, and ***Date/time***
– Right-hand column (C): Values for the parameters listed in the left-hand column, information and options enabled on the device.

In addition the QR code (D) is displayed, which can be read with a corresponding end device. The resulting link leads to the product web page of the device.

11 Troubleshooting

11.1 Alarm – Cause – Remedy

The alarm messages are displayed in the message field of the header bar in hierarchical order.

The priorities of the alarm messages are indicated by different background colors.

In the "Messages in the alarm message field" table, the priorities of the alarm messages are also indicated by exclamation marks.

Alarm priority	Exclamation marks	Color
High	!!!	Red
Medium	!!	Yellow
Low	!	Cyan

In order to classify the alarms within an alarm priority, internal priorities are specified in the table below. The lower the number, the higher the priority.

The alarm messages are listed in the following table. If an alarm occurs, the table helps to identify causes and remedies. The different causes and remedies should be worked through in the order listed until the alarm has been resolved.

Some alarms appear in this table several times with different priorities because their priority may change under certain conditions.

11.2 Messages in the alarm message field

Alarm priority	Alarm	Cause	Remedy	Internal priority
!!!	***Airway pressure high***	The upper alarm limit for the airway pressure has been reached. The patient breathes against the ventilator or coughs.	Check the patient's condition; check ventilation settings. Correct the alarm limits if necessary.	9 8
		The breathing circuit is kinked or obstructed.	Check the breathing circuit, the breathing valve, and the tube.	
!	***Alarm setting not confirmed***	The changed alarm setting has not been confirmed with the rotary knob.	Check the alarm setting. If necessary, adjust and confirm it with the rotary knob.	48

Alarm priority	Alarm	Cause	Remedy	Internal priority
!!!	***Ambient pressure low***	The device measures an ambient pressure below the permissible ambient pressure.	Move the device to an environment with higher air pressure.	15
		Technical fault.	Disconnect the device from the patient and continue ventilation immediately using another ventilator. Contact DrägerService.	
!!!	***Apnea***	The patient stopped to breathe spontaneously or is disconnected from the device.	Check the patient's condition.	12
			Ventilate in ***VC-CMV*** mode.	
			Ensure that the hose connections are tight.	
!!!	***Battery discharged***	The battery is discharged and no external power supply is connected.	The ventilator must immediately be connected to the external power supply or an onboard power supply, or a fully-charged battery must be installed.	7
!	***Battery inspection due***	The scheduled service interval for the battery has expired.	Replace the battery. Contact DrägerService.	51
!!	***Battery low***	The device draws its power from the battery due to the absence of an external power supply. There is only a duration of operation of approximately 15 minutes remaining in the battery.	The ventilator must immediately be connected to the external power supply or an onboard power supply, or a fully-charged battery must be installed (ventilation stops while the battery is installed).	39
!	***Battery not detected***	The battery is not installed or faulty, or a wrong battery is installed.	Insert or replace the battery.	42
!	***Battery temperature high***	The battery temperature is above the maximum operating temperature.	Move the device to a cooler environment.	40
!	***Battery temperature low***	The battery temperature is below the minimum operating temperature.	Move the device to a warmer environment.	41

Alarm priority	Alarm	Cause	Remedy	Internal priority
!!!	***Check breathing circuit***	Incorrect flow values have been detected.	Check the breathing circuit.	6
			Test the configured breathing circuit type.	
!!	***Check measuring lines***	The measuring lines for flow or pressure measurement are kinked, disconnected, or leaking.	Make sure that the flow or pressure measuring lines are connected correctly.	19
		The flow sensor is faulty.	Replace the flow sensor.	
		Technical fault.	Disconnect the device from the patient and continue ventilation immediately using another ventilator. Contact DrägerService.	
!	***Check settings***	The current settings have been lost during the use of saved device settings.	Check the patient's condition. Check the settings.	46
!!	***CO_2 calibration failed***	The sensor reports a calibration error.	Unplug the CO_2 sensor from the device and plug it back in.	31
			Perform the zero calibration. Perform the CO_2 filter test.	
!!	***CO_2 cuvette soiled***	The sensor or the cuvette windows are soiled.	Clean the sensor and the cuvette windows or replace the cuvette.	26
			Perform the zero calibration.	
!!	***CO_2 filter test failed***	The sensor reports a CO_2 filter test error.	Perform the zero calibration.	32
			Do not breathe onto the CO_2 sensor during the zero calibration.	
			Clean the CO_2 test filter or the CO_2 sensor.	
			Repeat the CO_2 filter test.	
!!	***CO_2 filter test required***	The offset of the CO_2 sensor is outside the tolerance range.	Perform the CO_2 zero calibration and the CO_2 filter test.	29

Alarm priority	Alarm	Cause	Remedy	Internal priority
!!	***CO_2 sensor disconnected***	The CO_2 sensor was disconnected during operation.	In the ***Alarm settings*** dialog, touch the ***Reset CO_2 alarm*** button.	23
			Reconnect the CO_2 sensor if necessary.	
!!	***CO_2 sensor faulty***	The CO_2 sensor has a hardware failure.	Replace the CO_2 sensor.	24 25
!!	***CO_2 sensor temperature high***	The temperature of the CO_2 sensor is above the operating temperature.	Move the CO_2 sensor to a cooler environment.	28
!!	***CO_2 sensor windows soiled***	The sensor window or the cuvette windows are soiled.	Clean the sensor window and cuvette windows, or replace the cuvette. Perform zero calibration.	27
!!	***CO_2 zero calibration failed***	An error during the zero calibration of the CO_2 sensor occurred.	Repeat the zero calibration. Do not breathe onto the CO_2 sensor during the zero calibration.	30
		The sensor windows are soiled.	Clean the CO_2 sensor windows.	
		The CO_2 sensor has a hardware failure.	Replace the CO_2 sensor.	
!!	***CO_2 zero calibration required***	The zero point of the CO_2 sensor is outside the tolerance range.	Perform the CO_2 zero calibration and the CO_2 filter test.	33
!	***Demo mode active***	The product test mode is activated.	Turn off product test mode.	50
!!!	***Device failure***	Technical fault.	Disconnect the device from the patient and continue ventilation immediately using another ventilator. Contact DrägerService.	2
!!	***Device malfunction***	Technical fault with a minor impact on ventilation.	To continue ventilation with this device, continuously monitor the patient. Perform the system test. Contact DrägerService.	38

Alarm priority	Alarm	Cause	Remedy	Internal priority
!	***Device malfunction***	Technical fault that is not related to the patient settings.	To continue ventilation with this device, continuously monitor the patient. Perform the system test. Contact DrägerService.	45
!!!	***Device temperature high***	The device temperature is above the maximum operating temperature.	Move the device to a cooler environment.	13
!!!	***Device temperature low***	The device temperature is below the minimum operating temperature.	Move the device to a warmer environment.	14
!!!	***Device temperature very high***	The device temperature is well above the maximum operating temperature.	Urgently move the device to a cooler environment.	3
!!	***etCO2 high***	The end-tidal CO_2 concentration is above the upper alarm limit.	Check the patient's condition. Check the alarm limits. Adjust the alarm limit if necessary.	34
!!	***etCO2 low***	The end-tidal CO_2 concentration is below the lower alarm limit.	Check the patient's condition. Check the alarm limits. Adjust the alarm limits if necessary.	35
!!!	***Expiratory minute volume high***	The minute volume ***MVe*** is above the upper alarm limit.	Check the patient's condition, check the ventilation settings, adjust the alarm limits if necessary.	17
		The flow sensor is faulty.	Replace the flow sensor.	
		Technical fault.	Disconnect the device from the patient and continue ventilation immediately using another ventilator. Contact DrägerService.	

Alarm priority	Alarm	Cause	Remedy	Internal priority
!!!	***Expiratory minute volume low***	The minute volume ***MVe*** is below the lower alarm limit.	Check the patient's condition, check the ventilation settings, adjust the alarm limits if necessary.	16
		There is leakage in the breathing circuit.	Make sure that the connections in the breathing circuit are tight.	
		The flow sensor is faulty.	Replace the flow sensor.	
		Technical fault.	Disconnect the device from the patient and continue ventilation immediately using another ventilator. Contact DrägerService.	
!!!	***Expiratory pressure high***	The breathing valve or the breathing circuit is obstructed.	Check the patient's condition. Check the breathing valve and the breathing circuit.	10
		The expiratory resistance is increased.	Check the bacteria filter or the HME filter and replace it if necessary.	
		Technical fault.	Disconnect the device from the patient and continue ventilation immediately using another ventilator. Contact DrägerService.	
!!!	***Forced shutdown***	The start/standby key has been continuously pressed for a few seconds.	Release the start/standby key or press it briefly.	1
		Technical fault.	Disconnect the device from the patient and continue ventilation immediately using another ventilator. Contact DrägerService.	

Alarm priority	Alarm	Cause	Remedy	Internal priority
!!	***Insp. pressure not reached***	The set pressure level is not achieved or the differential pressure between inspiration and expiration is too low. There is leakage in the cuff.	Inflate the cuff and check it for leakage.	21 22
		Leakage or disconnection.	Check the breathing circuit for leaking connections. Ensure that the breathing valve has been installed correctly.	
!!!	***Leakage*** (not in NIV)	The measured expiratory tidal volume ***VTe*** is approximately 50 % lower than the inspiratory tidal volume ***VTi***.	Eliminate leakage in the breathing circuit and/or on the patient port. Use a new breathing circuit.	18
		The flow sensor is faulty.	Replace the flow sensor.	
		Technical fault.	Disconnect the device from the patient and continue ventilation immediately using another ventilator. Contact DrägerService.	
!	***Loudspeaker faulty***	Technical fault.	To continue ventilation with this device, continuously monitor the device functions. Contact DrägerService.	44
!!!	***O_2 supply pressure high***	The supply pressure is above 8000 mbar (8000 cmH_2O).	Make sure that the supply pressure is below 8000 mbar (8000 cmH_2O). Disconnect the device from the patient and continue ventilation immediately using another ventilator.	5

Alarm priority	Alarm	Cause	Remedy	Internal priority
!!!	***O2 supply pressure low***	The supply pressure is below 1800 mbar (1800 cmH_2O).	Make sure that the supply pressure is above 1800 mbar (1800 cmH_2O). Disconnect the device from the patient and continue ventilation immediately using another ventilator.	4
!!!	***Patient disconnected***	The device has detected the disconnection of the breathing circuit.	Check the connectors of the breathing circuit.	11
!!	***Respiratory rate high***	The patient breathes at a high spontaneous respiratory rate.	Check the patient's condition, check the ventilation settings, adjust the alarm limit if necessary.	36
!	***Secondary loudspeaker faulty***	Technical fault.	To continue ventilation with this device, continuously monitor the device functions. Contact DrägerService.	43
!	***Selection not confirmed***	The selection ***Standby*** or ***Shut down*** has not been confirmed with the rotary knob.	Check the setting. If necessary, repeat the selection and confirm it with the rotary knob.	47
!	***Service date reached***	The scheduled service date has been missed.	Contact DrägerService.	52
!	***Setting not confirmed***	The changed setting has not been confirmed with the rotary knob.	Check the setting. If necessary, adjust and confirm it with the rotary knob.	49
!!	***VT not reached - leakage***	The set tidal volume ***VT*** was not reached.	Check the breathing circuit for leakage.	20
!!	***VT not reached - pressure***	The set tidal volume could not be applied because the set pressure limitation was reached.	Check the patient's condition. Check the value for ***Pmax*** and adjust as necessary.	37

11.3 Messages in the notification field

Message	Cause	Explanation/Remedy
Bluetooth PIN:	The Bluetooth function was activated.	Display of the PIN that must be used as the code by an external Bluetooth device.
I:E or ***Psupp*** or ***Ti***	A ventilation parameter is adjusted.	The additional parameter is displayed as help. Set the desired value for the ventilation parameter and confirm with the rotary knob.
Maximum flow reached, check I:E	The flow resulting from the setting of the tidal volume ***VT*** relative to ***Ti*** or ***I:E*** is not achievable.	Change tidal volume ***VT*** or inspiratoy time ***Ti*** or breathing time ratio ***I:E*** or respiratory rate ***RR***.
PEEP > 10? Confirm with rotary knob.	***PEEP*** is set to a value below 10 mbar (10 cmH_2O).	To confirm the message, press the rotary knob, then set the desired target value and confirm again with the rotary knob.
Pinsp ≥ PEEP + 3	***Pinsp*** or ***PEEP*** is changed.	Set ***Pinsp*** > ***PEEP*** +3 mbar.
Pmax ≥ PEEP + ΔPsupp	When adjusting ***PEEP*** or ***ΔPsupp***, the upper limit ***Pmax*** is reached.	Select the settings so that the sum of ***PEEP*** and ***ΔPsupp*** is below ***Pmax***.
Pmax ≥ Pinsp	***Pmax*** or ***Pinsp*** is changed.	Set ***Pmax*** > ***Pinsp***.
RR too high, check Ti	The inspiratory and/or expiratory times resulting from the settings for ***RR*** and ***I:E*** or ***Ti*** are not achievable.	Change ***Ti***, ***I:E***, or ***RR***.
Screenshot saved	The screenshot symbol was touched.	The screenshot was saved in the internal device memory.
Ti too high, check RR	The inspiratory and/or expiratory times resulting from the settings for ***RR*** and ***I:E*** or ***Ti*** are not achievable.	Change ***Ti***, ***I:E***, or ***RR***.
To confirm the alarm setting, press the rotary knob.	An alarm limit is adjusted.	Press the rotary knob to confirm.
To confirm the selection, press the rotary knob.	Ventilation is stopped.	Press the rotary knob to confirm.
To confirm the setting, press the rotary knob.	A ventilation parameter is adjusted.	Press the rotary knob to confirm.

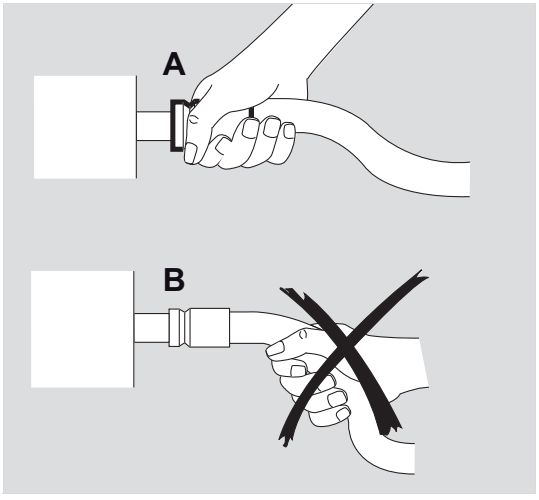
11.4 Error messages during the system test

Message	Cause	Explanation/Remedy
Test failed during gas outlet test.	The gas outlet was not fully opened.	Fully open the gas outlet when prompted during the system test. Contact DrägerService.
Test failed during leakage test.	Leakage has occurred.	Seal the gas outlet more tightly when prompted during the system test. Contact DrägerService.
Test failed during patient port test.	The patient port was not fully opened.	Fully open the patient port when prompted during the system test. Contact DrägerService.
Test failed.	The sensor reports a CO_2 filter test error.	Perform the zero calibration.
		Do not breathe onto the CO_2 sensor during the zero calibration.
		Clean the CO_2 test filter and the CO_2 sensor.
		Repeat the filter test.
	A malfunction of the pneumatic components has occurred.	Contact DrägerService.
Test failed. Check breathing circuit type.	The detected hose type does not match the selected hose type.	Select a different hose type. Connect a different hose type.
Test failed. Check breathing circuit.	An error occurred during the breathing circuit test.	Check the measuring lines. Check the breathing circuit and the connections.
		Replace the breathing circuit.
Zero calibration failed.	The CO_2 sensor has a hardware failure.	Replace the CO_2 sensor.
	The sensor windows are soiled.	Clean the CO_2 sensor windows.
	An error during the zero calibration of the CO_2 sensor occurred.	Repeat the zero calibration.
		Do not breathe onto the CO_2 sensor during the zero calibration.

12 Reprocessing

12.1 Disassembly

Removing the breathing hose from the device



33412

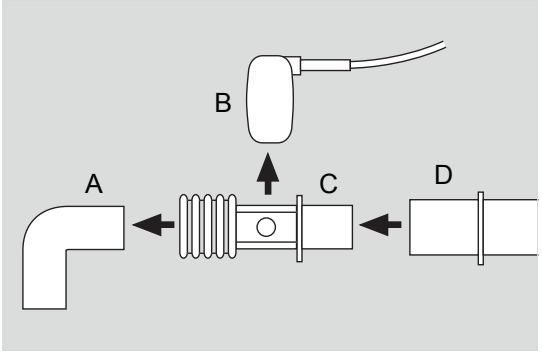
⚠ CAUTION

Damage to the device

The breathing hose may tear or be damaged if it is removed incorrectly.

► Always hold the sleeve (A), never the folds (B), when removing the breathing hose from the device.

Disassembling the CO_2 sensor and the CO_2 cuvette (option)

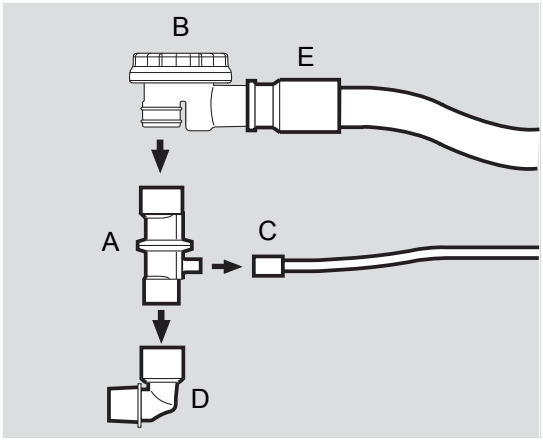


30172

1. Unplug the CO_2 sensor connector from the device.
2. Remove the CO_2 sensor (B) from the CO_2 cuvette (C).
3. Remove the CO_2 cuvette (C) from the flow or pressure sensor (D).
4. Remove the elbow (A) from the cuvette (C).

Disassembling the reusable breathing circuit for adults

1. Disconnect the breathing hose from the device.
2. Disconnect the pressure measuring line from the device port.

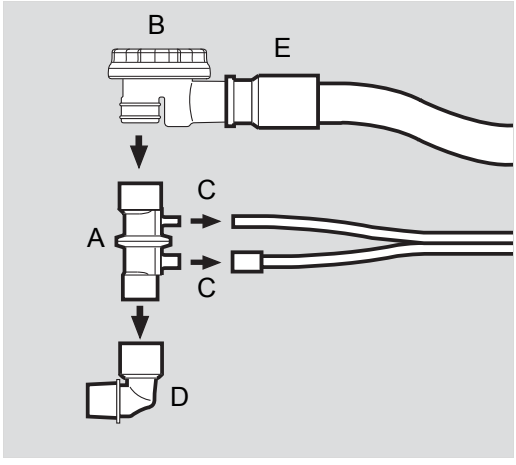


33250

3. Disconnect the pressure sensor (A) from the breathing valve (B).
4. Carefully disconnect the pressure measuring line (C) from the pressure sensor (A).
5. Disconnect the elbow (D) from the pressure sensor (A).
6. Disconnect the breathing hose (E) from the breathing valve (B).

Disassembling the reusable breathing circuit for adults (Plus option)

1. Disconnect the breathing hose from the device.
2. Disconnect the flow measuring line or pressure measuring line from the device ports.



30171

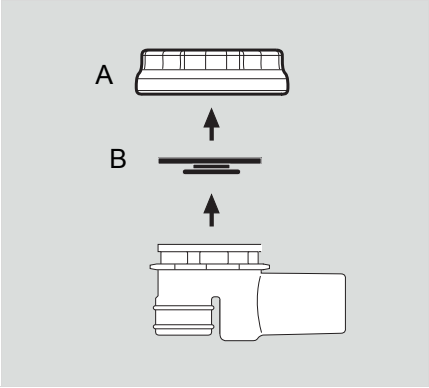
3. Disconnect the flow sensor (A) from the breathing valve (B).
4. Carefully and evenly disconnect the flow measuring line or the pressure measuring line (C) from the flow sensor (A).

⚠ CAUTION
Damage to the device
The flow sensor may be damaged when disconnecting the flow measuring line or the pressure measuring line from the flow sensor ports.

► Never twist the flow measuring line or the pressure measuring line and do not exert force on them.

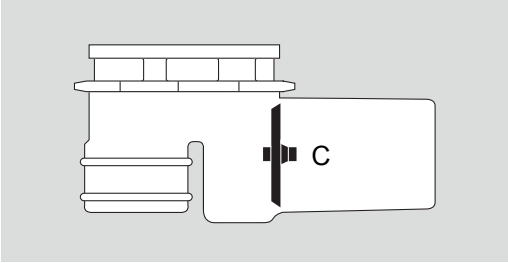
5. Disconnect the elbow (D) from the flow sensor (A).
6. Disconnect the breathing hose (E) from the breathing valve (B).

Disassembling the breathing valve



30169

1. Turn the cap (A) about 90° counterclockwise to detach it.
2. Remove the silicone diaphragm (B).



30170

⚠ WARNING
Risk of CO_2 rebreathing
An incorrectly assembled or malfunctioning breathing valve may put the patient at risk.
► Do not remove, damage, or bend the rubber disk (C) in the housing.

Removing the disposable breathing circuit for adults

1. Disconnect the breathing hose from the device.
2. Disconnect the pressure measuring line from the device.
3. Correctly dispose of the complete disposable breathing circuit. For further information, see the following chapter: "Disposal", page 109.

Removing the disposable breathing circuit for adults (Plus option)

1. Disconnect the breathing hose from the device.
2. Disconnect the flow measuring line from the device.
3. Correctly dispose of the complete disposable breathing circuit. For further information, see the following chapter: "Disposal", page 109.

12.2 Information on reprocessing

The instructions for reprocessing meet the requirements of ISO 17664.

12.2.1 Information on disinfectants

Use disinfectants that are nationally approved and are suitable for the respective reprocessing procedure.

12.3 Safety information

⚠ WARNING
Risk due to inappropriately reprocessed products
Reusable products must be reprocessed, otherwise there is an increased risk of infection.

- ► Observe the hygiene regulations and reprocessing regulations of the healthcare facility.
- ► Observe national hygiene regulations and reprocessing regulations.
- ► Use validated procedures for reprocessing.
- ► Reprocess reusable products after every use.
- ► Observe the manufacturer's instructions for cleaning agents, disinfectants and reprocessing devices.

⚠ WARNING
Risk of patient injury
Disposable products have been developed, tested, and manufactured for single use only. Disposable products must not be reused, reprocessed, or sterilized.

- ► Reuse, reprocessing, or sterilization may lead to a failure of the accessory and may cause injury to the patient.

⚠ CAUTION
Risk due to faulty products
Signs of wear, e.g., cracks, deformation, discoloration, or peeling, may occur with reprocessed products.

- ► Check the products for signs of wear and replace them if necessary.

12.4 Classification for reprocessing

12.4.1 Classification of medical devices

Medical devices and their components are classified according to the way they are used and the resulting risk.

Classification	Definition
Non-critical	Components that come into contact with intact skin only
Semi-critical	Components that carry breathing gas or come into contact with mucous membranes or pathologically altered skin
Critical	Components that penetrate skin or mucous membranes or come into contact with blood

12.4.2 Classification of device-specific components

The entire device must be reprocessed. Observe the following classification and the instructions for use for the components.

Classification	Device-specific components
Non-critical	The entire device and all components that can be disassembled (e.g., the accessories bag, CO_2 sensor, O_2 hose)
Semi-critical	Breathing valve, flow sensor, pressure sensor, breathing hose with measuring lines, elbow, CO_2 cuvette
Critical	-

12.5 Recommendations for reprocessing

12.5.1 Validated reprocessing procedure

The effectiveness of the reprocessing procedures listed has been validated by independent laboratories that are certified to the standard ISO 17025.

At the time of validation, the following reprocessing procedures showed good material compatibility and effectiveness:

Manual cleaning and disinfection

Components	Product name	Manufacturer	Contact time	Concentration
Breathing valve, hoses, and pressure sensor	Neodisher LM2	Dr. Weigert	20 minutes	2 %
Flow sensor	Sekusept Powder Classic	Ecolab	15 minutes	4 %
Breathing valve, hoses, pressure sensor, and flow sensor	Korsolex Extra	Bode Chemie	30 minutes	3 %

Machine cleaning and thermal disinfection

Process step	Product name	Manufacturer	Contact time	Temperature
Machine cleaning	Neodisher MediClean	Dr. Weigert	At least 5 minutes	40 to 60 °C (104 to 140 °F)
Machine disinfection (thermal)	-	-	10 minutes	93 °C (199 °F)

Surface disinfection

Components	Product name	Manufacturer	Contact time	Concentration
Device, O_2 hoses, accessories bag, belt	Dismozon Plus	Bode Chemie	15 minutes	1.6 %

12.5.2 Surface disinfectant

At the time of the test, the surface disinfectants listed in the following table showed good material compatibility. They can be used in addition to the surface disinfectants listed in the section "Recommendations for reprocessing".

The manufacturers of the surface disinfectants have verified at least the following spectra of activity:

– Bactericidal
– Yeasticidal
– Virucidal or virucidal against enveloped viruses

Observe the specifications of the surface disinfectant manufacturers.

Other surface disinfectants are used at one's own risk.

Class of active ingredient	Surface disinfectant	Manufacturer
Chlorine-releasing agents	Actichlor plus	Ecolab
	BruTab 6S	Brulin
	Clorox Professional Disinfecting Bleach Cleaner	Clorox
	Dispatch Hospital Cleaner Disinfectant Towels with Bleach	
	Klorsept 17	Medentech
Oxygen-releasing agents	Descogen Liquid	Antiseptica
	Descogen Liquid r.f.u.	
	Dismozon plus	Bode Chemie
	Dismozon pur	
	Oxycide	Ecolab USA
	Perform	Schülke & Mayr
	Virkon	DuPont
Quaternary ammonium compounds	Mikrozid sensitive liquid[1)]	Schülke & Mayr
	Mikrozid sensitive wipes[1)]	
	Mikrozid alcohol free liquid[1)]	
	Mikrozid alcohol free wipes[1)]	
	acryl-des[1)]	
Aldehydes	Buraton 10 F	Schülke & Mayr

1) Virucidal against enveloped viruses

Dräger states that oxygen-releasing agents and chlorine-releasing agents may cause color change in some materials. Color change does not indicate that the product is not functioning correctly.

12.6 Reprocessing the non-critical components

12.6.1 Surface disinfection with cleaning

⚠ WARNING
Risk due to penetrating liquid
Penetrating liquid may cause the following:

– Damage to the device
– Electric shock
– Device malfunctions

► Ensure that no liquid penetrates the device.

1. Remove soiling immediately. Use a cloth dampened with disinfectant to remove soiling.
2. Perform surface disinfection.
3. After the product has been exposed to the disinfectant for the specified contact time, remove residual disinfectant.
4. Wipe with a cloth dampened with water (preferably drinking-water quality). Allow the product to dry.
5. Check the product for visible soiling. Repeat steps 1 to 5 if necessary.
6. Check the product for visible damage and replace if necessary.

12.7 Reprocessing list

The instructions of the hospital's infection control officer shall prevail and must be observed by the user.

Components	Surface disinfection with cleaning	Manual cleaning followed by disinfection by immersion	Machine cleaning with thermal disinfection	Steam sterilization	Recommended reprocessing intervals
Device and O_2 hoses	Yes	No	No	No	After every patient / if soiled
Reusable breathing circuit	No	Yes	Yes	Yes	After every patient / if soiled
CO_2 sensor	Yes	No	No	No	After every patient / if soiled
Reusable cuvette of the CO_2 sensor	No	Yes	Yes	Yes	After every patient / if soiled
Test filter for CO_2 sensor	Yes	No	No	No	After every patient / if soiled

Components	Surface disinfection with cleaning	Manual cleaning followed by disinfection by immersion	Machine cleaning with thermal disinfection	Steam sterilization	Recommended reprocessing intervals
Accessories bag	Yes	No	No	No	If soiled
Carrying strap	Yes	No	No	No	If soiled

12.8 Assembly

– Reassemble the device using the information in section "Assembly and preparation" on page 33 as a guide.
– Connect to the power supply and gas supply using the information in section "Assembly and preparation" on page 33 as a guide.
– Check readiness for operation using the information in section "Getting started" on page 47 as a guide.

13 Service

13.1 Safety information

⚠ WARNING
Risk due to inappropriately reprocessed products
The product may be contaminated with infectious agents.
► Before service is performed and before the product is sent back for repair, reprocess the product in accordance with the chapter "Reprocessing".

⚠ WARNING
Risk if service is not performed regularly
Wear and material fatigue on the components may lead to device failure and malfunctions.
► Perform service activities at the specified intervals.

⚠ WARNING
Risk if service is not performed properly
Personal injury and property damage may occur if service is not performed properly.
► Service must be performed by those target groups that are assigned to the particular measure.

⚠ WARNING
Risk when the housing is being opened
Under the housing there are live electrical components, which may cause an electric shock.
► The housing may only be opened by those target groups that are assigned to that particular measure.

13.2 Definition of service terminology

Concept	Definition
Service	All measures (inspection, maintenance, repair) intended to maintain or restore the functional integrity of a product
Inspection	Measures intended to determine and assess the current state of a product
Maintenance	Regular specified measures intended to maintain the functional integrity of a product
Repair	Measures intended to restore the functional integrity of a product after a failure

13.3 Inspection

Measure	Interval	Target group
Inspection and safety check (Oxylog VE300 and CO_2 sensor)	Every 2 years	Service personnel

Designation applies to the Federal Republic of Germany; corresponds to the “Recurring safety inspection” in the Federal Republic of Austria.

Safety checks

Safety checks are not a substitute for maintenance, which includes the preventive replacement of wearing parts as specified by the manufacturer.

Performing the safety checks

1. Check that the respective instructions for use are present.
2. Observe the instructions for use and check that all components and accessories needed to use the product are present.
3. Check that the product is in good condition:
   – All labels are complete and legible
   – There is no visible damage
4. Check the electrical safety in accordance with the IEC 62353 standard.
5. Check the safety equipment:
   – Functioning of the safety valve: max. pressure 90 mbar (90 cmH_2O)
   – Functioning of the emergency air valve
   – Functioning in the event of a failure of the external power supply
   – Check of the second alarm channel
   – Monitoring of the supply pressure and the tightness of the compressed gas port with the standard connector
   – Display of the high airway pressure alarm message
   – Display of the breathing circuit error alarm message
   – Check of the power supply displays
6. Perform the system test with the breathing circuit as described in the instructions for use.
7. Check the flow dosage.
8. Check flow measurement.

13.4 Maintenance

Component	Interval	Measure	Target group
Dust filter	Every 2 years	Replace[1)]	Service personnel
Battery	– Every 2 years – When the battery's duration of operation is no longer reached[2)]	Replace	Service personnel

1) The dust filter can be treated as household waste.
2) For more information on the duration of operation, see the "Technical Data" chapter.

⚠ CAUTION
Risk of patient injury
Soiling caused by dust may compromise the functional integrity of the device.
► Do not use the ventilator without a dust tilter.

13.5 Repair

Dräger recommends that all repairs are carried out by DrägerService and that only original Dräger parts are used.

13.6 Technical documentation

The technical documentation, which is available upon request, contains additional information on Oxylog VE300 (incl. the service menu password).

13.7 In the event of a device error or device malfunction

⚠ WARNING
Risk of patient injury
Never operate a ventilator if it has suffered physical damage or seems to be working incorrectly.

► In this case, always have maintenance performed by specialized service personnel.

14 Disposal

14.1 Disposal of the product

At the end of its useful life, dispose of the product in accordance with the applicable legal provisions.

For countries subject to the EU (European) Directive 2012/19/EU

This device is subject to EU Directive 2012/19/EU (WEEE). In order to comply with its registration according to this directive, this device may not be disposed of at municipal collection points for waste electrical and electronic equipment. Dräger has authorized a company to collect and dispose of this device. To initiate collection or for further information, visit Dräger on the Internet at www.draeger.com. Use the Search function with the keyword "WEEE" to find the relevant information. If access to Dräger's website is not possible, contact the local Dräger organization.

14.2 Disposal of the rechargeable battery

⚠ WARNING
Risk of explosion and of chemical burns
Improper handling of batteries can result in explosions and chemical burns.
► Do not throw batteries into fire or open them by force.

The medical device battery contains pollutant substances.

The following applies in the Federal Republic of Germany: End consumers are required under the Batteriegesetz [battery act] to return batteries that contain pollutant substances to the distributor or to a collection point managed by the public authorities responsible for waste management. The battery installed in the device must therefore be removed before disposal of the device. Observe the applicable laws and regulations for battery disposal.

14.3 Disposal of the breathing circuit and the CO_2 cuvettes

At the end of its useful life, dispose of the product in accordance with the applicable legal provisions.

15 Technical data

15.1 Safety information

⚠ WARNING
Risk of patient injury and damage to the device
The device may not function properly or may fail outside the specified ambient and supply conditions.
► Only use the device under the specified ambient and supply conditions.

15.2 Device specifications

Dimensions (W x H x D)

Main device	399 x 153 x 160 mm (15.7 x 6.0 x 6.3 in)
Main device, with carrying system	607 x 228-251 x 166 mm (23.9 x 9.0-9.9 x 6.5 in)
Power supply unit	150 x 37 x 64 mm (5.9 x 1.5 x 2.5 in)
DC/DC converter	160 x 34 x 59 mm (6.3 x 1.3 x 2.3 in)

Weight

Main device, without battery	approx. 3.3 kg (7.3 lb)
Main device, with battery	approx. 3.6 kg (7.9 lb)
Main device, with carrying system, with battery and bag	approx. 5.6 kg (12.4 lb)
Nominal weight with carrying system, battery, bag, 2-liter oxygen cylinder, pressure reducer and breathing circuit	10 kg (22.1 lb)
Permitted total weight	13 kg (28.7 lb)
Power supply unit	approx. 0.6 kg (1.3 lb)
DC/DC converter	approx. 0.6 kg (1.3 lb)

Screen

Technology	TFT color screen
Size	4.3 in
Resolution	480 x 272 pixels

External ports

USB	2.0 Only connect passive storage media, i.e. devices that do not have a separate power supply.

Wireless data transfer

Bluetooth	2.1
Supported logs	Serial Port Profile (MEDIBUS.X)
	Object Push Profile (patient log file)

Sound-pressure level

Average sound pressure level Leq(A) (free-field measurement at a distance of 1 m in accordance with ISO 3744 and during typical ventilation)	≤45 dB(A)
Sound pressure level L(A) of the alarm signals (measured in accordance with IEC 60601-1-8)	approx. 47 to 83 dB(A) depending on alarm priority

Electromagnetic compatibility (EMC)

Complies with the standards IEC 60601-1-2, EN 794-3 (36,101) 10 V/m, ISO 10651-3 (36,202,2,1) 30 V/m and UN Regulation No. 10, revision 3, with respect to EMC for use in motor vehicles (equivalent to European Commission Directive 2004/104/EC)

Complying with the industry standard RTCA DO-160G with respect to EMC for use in aircraft and helicopters

Classification according to Directive 93/42/EEC

Class IIb

UMDNS code

Universal Medical Device Nomenclature System - nomenclature for medical devices	18-098

GMDN code

Global Medical Device Nomenclature	36289

Classification according to IEC 60601-1

Breathing circuit (disposable or reusable), including CO_2 sensor, endotracheal tube or mask	Type BF (body floating, defibrillation-proof)

Degree of protection of the ventilator

IP34; device is splash-protected from all directions and protected against solid foreign bodies >2.5 mm (0.1 in)

Degree of protection of the CO_2 sensor

IP64

Defibrillation recovery time

0 seconds

15.3 Ambient conditions

During operation

Temperature (device)	–20 to +50 °C (–4 to +122 °F)
Temperature (power supply unit)	0 to +50 °C (+32 to +122 °F)
Permissible operating temperature during charging	0 to +45 °C (+32 to +113 °F)
Ambient pressure (device)	620 to 1100 hPa (8.99 to 15.95 psi)
	Automatic ambient pressure compensation within this pressure range
Height above sea level	up to 4000 m (13123 ft)
Ambient pressure (power supply unit)	700 to 1060 hPa (10.15 to 15.37 psi)
Relative humidity	5 to 95 % (without condensation)

During storage and transportation

Ventilator without battery, with reusable breathing circuit

Temperature	–40 to +70 °C (–40 to +158 °F)
Ambient pressure	620 to 1100 hPa (8.99 to 15.95 psi)
Relative humidity	5 to 95 % (without condensation)
Time required for the device temperature to rise from the minimum storage temperature to the minimum operating temperature	40 minutes
Time required for the device temperature to rise from the maximum storage temperature to the maximum operating temperature	66 minutes

Disposable breathing circuit

Temperature	–20 to +50 °C (–4 to +122 °F)
Ambient pressure	570 to 1200 hPa (8.27 to 17.40 psi)
Relative humidity	5 to 95 % (without condensation)

Battery	
Temperature	–20 to +50 °C (–4 to +122 °F) (preferred long-term storage temperature <35 °C [<95 °F])
Ambient pressure	620 to 1100 hPa (8.99 to 15.95 psi)
Relative humidity	5 to 95 % (without condensation)
Compressed gas hose (Alduk pressure reducer to device port)	
Temperature	–30 to +55 °C (–22 to +131 °F)
Ambient pressure	620 to 1100 hPa (8.99 to 15.95 psi)
Relative humidity	5 to 95 % (without condensation)

15.4 Settings

Using the therapy controls the values can be adjusted without loss of accuracy. The controlled parameters pressure, flow and volume can only be applied with the accuracy of the corresponding measured value.

Ventilation modes		***VC-CMV***, ***VC-AC***, ***SPN-CPAP*** Optional: ***VC-SIMV/PS***, ***PC-BIPAP/PS***, ***SPN-CPAP/PS***
Respiratory rate ***RR***		
	Adult	2 to 30 /min (***VC-SIMV***, ***PC-BIPAP***) 5 to 30 /min (***VC-CMV***, ***VC-AC***)
	Child	2 to 50 /min (***VC-SIMV***, ***PC-BIPAP***) 10 to 50 /min (***VC-CMV***, ***VC-AC***)
Maximum airway pressure ***Pmax***		20 to 60 mbar (20 to 60 cmH_2O)
Ratio of inspiratory time to expiratory time ***I:E***		1:4 to 4:1
Inspiratory time ***Ti***		0.3 to 10 s
Tidal volume ***VT***		
	Adult	0.3 to 2.0 L, BTPS
	Child	0.1 to 0.4 L, BTPS
		Measurements referred to conditions of the patient's lungs, body temperature 37 °C (98.6 °F), ambient pressure, water vapor saturated gas.
	Accuracy	±20 % of the setting
O_2 concentration		***100 % O_2*** and ***O_2/air mix*** The actual value depends on the inspiratory flow and the mean airway pressure.
Inspiratory pressure ***Pinsp***		***PEEP*** +3 to +55 mbar
Positive end-expiratory pressure ***PEEP***		0 to 20 mbar (0 to 20 cmH_2O)
Trigger sensitivity (flow trigger)		Off or 3 to 15 L/min

Trigger sensitivity (pressure trigger)	Off or 3 to 15 steps
Pressure support ***ΔPsupp***	0 to 35 mbar (0 to 35 cmH_2O) (relative to ***PEEP***)
Pressure rise time for pressure support	slow (1 s), standard (0.4 s), fast (<0.4 s)

15.5 Performance data

Control principle		Time-cycled, volume-constant, pressure-supported
Maximum inspiratory flow		100 L/min[1)]
Compliance of the device		
	with breathing hose, 1.5 m	<1.5 mL/mbar (1.5 mL/cmH_2O)
	with breathing hose, 3.0 m	<2 mL/mbar (2 mL/cmH_2O)
Inspiratory resistance with breathing circuit		
	Adult	≤5 mbar (5 cmH_2O) at 60 L/min
	Child	≤3 mbar (3 cmH_2O) at 30 L/min
Expiratory resistance with breathing circuit		
	Adult	≤6 mbar (6 cmH_2O) at 60 L/min
	Child	≤4 mbar (4 cmH_2O) at 30 L/min
Inspiratory resistance during device failure		
	Adult	≤6 mbar (6 cmH_2O) at 30 L/min
	Child	≤4 mbar (4 cmH_2O) at 15 L/min
Expiratory resistance during device failure		
	Adult	≤4 mbar (4 cmH_2O) at 30 L/min
	Child	≤3 mbar (3 cmH_2O) at 15 L/min
Dead space including flow sensor, but excluding accessories such as filter, HMEs and CO_2 cuvette		approx. 35 mL (reusable breathing circuit for adults)[2)] approx. 35 mL (disposable breathing circuit for adults)[2)]
Dead space of CO_2 cuvette		approx. 4 mL
Resistance of CO_2 cuvette		<1.2 mbar (<1.2 cmH_2O) at 60 L/min ≤0.4 mbar (≤0.4 cmH_2O) at 30 L/min
Supplementary functions		
	Emergency air valve	Opens the breathing system upon failure of the gas supply, permits spontaneous breathing with ambient air
	Safety valve	Opens the breathing system in the event of device malfunction to approximately 80 mbar (80 cmH_2O)

Patient port	22 mm ISO conical connector

1) At supply pressure >350 kPa (50.76 psi).
   The maximum inspiratory flow is reduced to 80 L/min at supply pressures <350 kPa (50.76 psi) and to 39 L/min at supply pressures <280 kPa (40.61 psi).
2) When using an accessory with a female connector, add 2 mL to the breathing circuit dead space.

15.6 Displayed measured values

The specified accuracy only applies for the specified display range.

Airway pressure measurement

Display range	0 to 100 mbar (0 to 100 cmH_2O)
Resolution	1 mbar (1 cmH_2O)
Accuracy	±(2 mbar [2 cmH_2O] + 8 % of measured value)

Flow measurement

Minute volume MVe

Display range	0 to 100 L/min, BTPS
Resolution	0.1 L/min
Accuracy	±20 % of measured value or ±0.4 L/min, whichever greater

Tidal volume VTe

Display range	0 to 5000 mL, BTPS
Resolution	1 mL
Accuracy	±20 % of the measured value or ±20 mL, whichever greater (adult breathing hose)

CO_2 measurement (option)

Measurement principle	Mainstream system
Display range	0 to 100 mmHg / 0 to 13.2 Vol% / 0 to 13.3 kPa
Resolution	1 mmHg / 0.1 Vol% / 0.1 kPa
Accuracy	Automatic ambient pressure compensation No later than 3 minutes after switching on: Reusable cuvette: –20 to +40 °C: < ±(0.44 kPa + 8 % relative) (–4 to +104 °F: < ±[3.3 mmHg + 8 % relative]) +40 to +50 °C: < ±0.60 kPa + 5 % relative) (+104 to +122 °F: < ±[4.5 mmHg + 5 % relative])

		Disposable cuvette: NOTE: Measurement uncertainty increases at temperatures <0 °C (+32 °F). –20 to -10 °C: < ±(0.7 kPa + 22 % relative) (–4 to +14 °F: < ±[5.3 mmHg + 22 % relative]) –10 to 0 °C: < ±(0.44 kPa + 13 % relative) (+14 to +32 °F < ±[3.3 mmHg + 13 % relative]) 0 to +40 °C: < ±(0.44 kPa + 8 % relative) (+32 to +104 °F: < ±[3.3 mmHg + 8 % relative]) +40 to +50 °C: < ±(0.60 kPa + 5 % relative) (+104 to +122 °F: < ±[4.5 mmHg + 5 % relative])
	Total system response time	200 ms

Respiratory rate measurement

	Display range	0 to 99 /min
	Resolution	1 /min
	Accuracy	±1 /min

Waveform display

	Airway pressure Paw (t)	0 to 90 mbar (0 to 90 cmH_2O)
	Flow (t)	-150 to 150 L/min
	CO_2	0 to +100 mmHg / 0 to +15 Vol% / 0 to +15 kPa

15.7 Monitoring

Expiratory minute volume *MVe* (option)

Alarm, upper alarm limit		If the upper alarm limit has been exceeded
	Setting range	2 to 60 L/min
Alarm, lower alarm limit		If the value has fallen below the lower alarm limit.
	Setting range	0.5 to 40 L/min
	Alarm delay	40 seconds after the start of ventilation

Airway pressure *Paw*

Alarm, upper alarm limit		If the value Pmax has been exceeded by +5 mbar (+5 cmH_2O)
	Setting range	20 to 60 mbar (20 to 60 cmH_2O)
Alarm, lower alarm limit		If the differential pressure between inspiratory and expiratory phases is too low.

Apnea

Alarm	If no breathing phase change is detected for >15 seconds

Respiratory rate *RR*

Alarm, upper alarm limit		If the upper alarm limit has been exceeded
	Setting range	10 to 99 /min
	Alarm delay	30 seconds after the start of ventilation

End-tidal CO_2 concentration *etCO_2* (option)

Alarm, upper alarm limit		If the upper alarm limit has been exceeded
	Setting range	5 to 99 mmHg / 0.5 to 13.2 kPa / 0.5 to 13.2 Vol%
	Alarm delay	30 seconds after connection and calibration
Alarm, lower alarm limit		If the value has fallen below the lower alarm limit.
	Setting range	0 to 94 mmHg / 0 to 12.7 kPa / 0 to 12.7 Vol%
	Alarm delay	30 seconds after the start of ventilation, connection and calibration

Leakage

Alarm	Only with Plus option in VC modes and deactivated NIV in CPAP: If VTe <45 % of VTi
Alarm delay	30 seconds after the start of ventilation

Disconnection

Alarm	If a disconnection of the breathing circuit is detected
Alarm delay	30 seconds after the start of ventilation

Battery

Alarm	For low and discharged battery
Alarm delay	≤1 minute after the device start or after disconnection of the power supply

Data communication (option)

Exported data	Measured values Waveforms Alarm messages Alarm settings User settings System test information Screenshots For the data communication protocol contact DrägerService.
Alarm delay	<500 ms from detection of the alarm condition to the signal output

15.8 Operating data

Power supply

Input voltage	19 V +5/–3 VDC Power supplies (power supply unit and DC/DC converter) are specified as part of the Oxylog VE300.
Duration of operation	With a new and fully-charged battery without external power supply: – 8 hours for typical ventilation (VC-CMV, RR = 12 /min, VT = 500 mL, PEEP = 5 mbar (5 cmH_2O), I:E = 1:2) – 9 hours (without CO_2 sensor and at reduced screen brightness)
Power consumption	During charging: max. 2.0 A at 19 VDC During typical ventilation: max. 0.8 A at 19 VDC
Battery type	Lithium-ion battery
Charging time	Approx. 5 hours The specified charging time applies when recharging the battery completely after it has been depleted.

Power supply unit

Protection class (as defined in IEC 60601-1)	Class II
Degree of protection	IP22
Input	100 to 240 V~ / 50/60 Hz / 1.0 A
Output	19 V / 4.47 A (0 to +40 °C [32 to +104 °F]) / 3.57 A (+40 to +50 °C [+104 to 122 °F]) To disconnect the ventilator from the power supply, disconnect the power cable from the power socket.

	The power supply unit is intended for indoor use only (e.g., in hospitals or fire stations).
Fuses F1 and F2	T2.5 AH / 250 V~
DC/DC converter	
Protection class (as defined in IEC 60601-1)	Class II
Degree of protection	IP 42
Input	12 / 24 / 28 VDC; 5 A / 2.5 A / 2.1 A
Output	19 V / 2.6 A
	The intended use of the DC/DC converter is in vehicles.
Fuse	Type: FP1 MINI Style PCB Voltage: 32 VDC / 10 A Breaking capacity: 1000 A / 32 VDC Operating speed: fast-acting
Gas supply	
	From a central gas supply system or an oxygen cylinder
Oxygen supply pressure	270 to 690 kPa (39.16 to 100.08 psi)
Supply gas	Medical oxygen, oxygen 93 %
Connection to the oxygen supply	either: NIST (Non-Interchangeable Screw-Threaded) as per EN 739 / ISO 5359 or
	DISS (Diameter Index Safety Systems) as per CGA V5-1989 or
	NF (Norme française) S90-116
	Specific quick-coupling port

15.9 Materials used

Housing	
Device	Acrylonitrile styrene acrylate/polycarbonate (ASA/PC), thermoplastic copolyester elastomer (TPC)
Base plate of the carrying system	Polyamide (PA)
Power supply unit	Polycarbonate (PC)
DC/DC converter	Polycarbonate (PC)
Reusable breathing circuit	
Breathing hose	Silicone rubber
Housing of flow sensor	Polysulfone (PSU)

Vane in flow sensor	Stainless steel
Diaphragm in breathing valve	Silicone rubber

Disposable breathing circuit

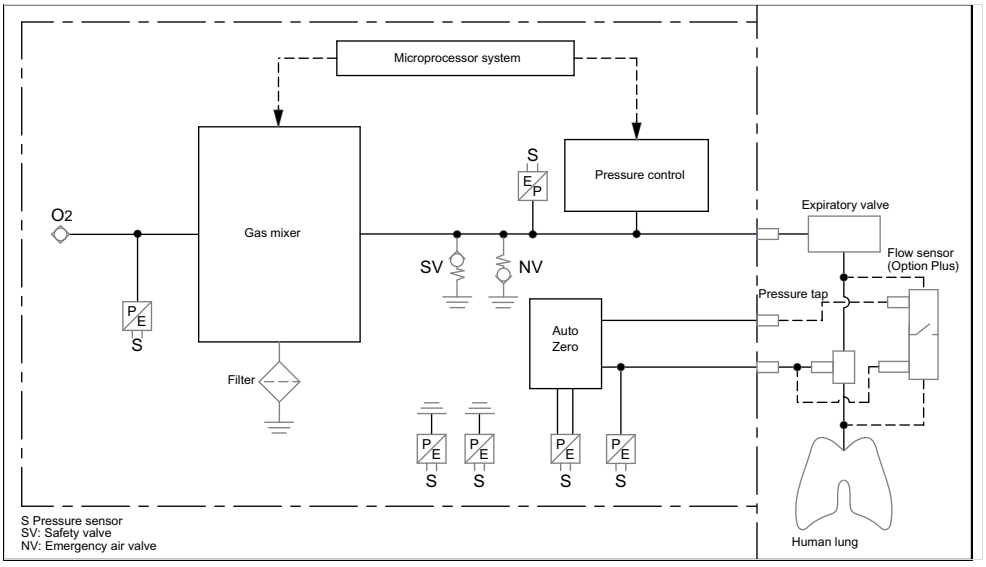
Breathing hose	Polyethylene (PE)
Non-return valve	Polypropylene (PP), silicone rubber
Breathing valve	Polypropylene (PP), silicone rubber
Housing of flow sensor	Polymethyl methacrylate (PMMA)
Vane in flow sensor	Polyester
Patient port	Polyethylene (PE), Polypropylene (PP), K-Resin®, Thermoplastic Polyether Elastomer (TPE)

NOTICE

► All Dräger breathing hoses are not made with natural rubber latex.

15.10 Pneumatic diagram

The various pneumatic actuators of Oxylog VE300 are controlled by the microprocessor system via digitized electrical signals.



15.11 EMC Declaration

15.11.1 General information

This device was tested for electromagnetic compatibility using accessories from the list of accessories.

⚠ WARNING
Risk of patient injury and device malfunction
The use of accessories which are not included in the list of accessories as well as converters and cables which are not sold by Dräger as spare parts may increase electromagnetic emissions and compromise the immunity of the device.

- ► Only use the accessories, converters, and cables indicated by the manufacturer.
- ► Other accessories may only be used if they do not compromise the electromagnetic compatibility.

⚠ WARNING
Risk of patient injury and device malfunction
If the device is used in the direct vicinity of other devices, patients may be harmed or the device may be damaged.

- ► Only use the device in the direct vicinity of other devices if Dräger has approved this device arrangement.
- ► If no approval has been given by Dräger, ensure that this device functions correctly in the desired arrangement before use.
- ► Observe the other devices' instructions for use.

15.11.2 Electromagnetic environment

This device may only be used in environments specified in section "Environment of use" on page 8.

Emissions	**Compliance**
Radiated emissions	Class B, group 1 (30 MHz to 1 GHz)
Conducted emissions	Class B, group 1 (150 kHz to 30 MHz)

Immunity against	**Test level and required electromagnetic environment**
Electrostatic discharge (ESD) (IEC 61000-4-2)	Contact discharge: ±8 kV
	Air discharge: ±15 kV
Electrical fast transients (bursts) (IEC 61000-4-4)	Power cable: ±2 kV
	Longer signal input lines/output lines: ±1 kV
Surge on AC mains lines (IEC 61000-4-5)	Phase conductor voltage – phase conductor: ±1 kV
	Phase conductor voltage – protective ground conductor: ±2 kV
Magnetic fields at mains frequency (IEC 61000-4-8)	50 Hz: 30 A/m

Immunity against	Test level and required electromagnetic environment
Voltage dips and short interruptions on AC mains input lines (IEC 61000-4-11)	Voltage dips of 30 % to 100 %, 8.3 ms to 5 s, different phase angles
Radiated high-frequency disturbances (IEC 61000-4-3)	80 MHz to 2.5 GHz: 30 V/m 2.5 GHz to 2.7 GHz: 10 V/m The CO_2 sensor with RI ≤15 has a lower compliance level (20 V/m) but will fail in safe mode.
Conducted radio frequency (IEC 61000-4-6)	150 kHz to 80 MHz: 3 V, ISM bands: 10 V
Electromagnetic fields in the vicinity of wireless communication devices	Diverse frequencies from 380 MHz to 5800 MHz: 9 V/m to 28 V/m

15.11.3 Recommended separation distances from wireless communication devices

To ensure that the functional integrity of this device is maintained, there must be a separation distance of at least 1.0 m (3.3 ft) between this device and wireless communication devices.

15.12 Emission of high-frequency energy

15.12.1 Bluetooth

This medical device is equipped with a Bluetooth module for wireless communication. Changes or modifications to the Bluetooth module may only be carried out by experts.

This medical device has been designed and manufactured so that emission limit values for high-frequency energy are not exceeded. These limit values are incorporated in international safety standards such as IEC 60601-1-2 and standards for radio equipment such as EN 300328, and have been defined by regulatory authorities.

The Bluetooth module of this medical device complies with Part 15 of the FCC regulations and Industry Canada license-exempt RSS standards. Operation is subject to the following 2 conditions:

1. This medical device does not cause any harmful interference.
2. The medical device will not suffer damage when receiving interference, including interference causing undesired operating conditions.

Changes or modifications that are not expressly approved by Dräger may void the user's authority to operate the device.

Dräger hereby declares that this medical device and the radio equipment is in compliance with Directive 2014/53/EU.

The complete EU Declaration of Conformity can be viewed at the following web address: http://www.draeger.com/doc-radio

Communication devices in accordance with IEEE 802.15.1:

– 2400 to 2483.5 MHz
– FHSS (frequency-hopping spread spectrum) limited to 2.5 mW EIRP

See the instructions for use of the wireless devices for further details.

15.13 Connections to IT networks

In an IT network, data can be exchanged by means of wired or wireless technologies. An IT network can be any data interface (e.g., RS232, LAN, USB, printer interface, Bluetooth) that is described in standards and conventions.

During operation, this device can exchange information with other devices by means of IT networks and supports the following functions:

– Display of waveforms and parameter data
– Signaling of alarms
– Saving
– Transferring device settings
– Access to logbooks

Connecting this device to a network that incorporates other devices or making subsequent changes to that network can lead to new risks for patients, users, and third parties. Before the device is connected to the network or the network is changed, these risks must be identified, analyzed, and evaluated, and appropriate measures taken.

Examples of subsequent changes to the network:

– Changing the network configuration
– Removing devices from the network
– Adding new devices to the network
– Performing upgrades or updates on devices that are connected to the network

15.13.1 Information about connecting to an IT network

15.13.1.1 Prerequisites

This device must only be connected to the network by service personnel. The IT representative of the hospital must be consulted in advance.

The following documents must be observed:

– Accompanying documents of this device
– Descriptions of the network
– Description of the network-based alarm systems

Dräger recommends complying with IEC 80001-1 (risk management for IT networks with medical devices).

15.14 Open-source software

Dräger devices that use software may use open-source software, depending on their setup. Open-source software may be subject to different terms of license. Additional information regarding the open-source software used in this device is available at the following web page:

www.draeger.com/opensource

16 List of accessories

16.1 List of accessories

Part name	Order number
Main device	57 90 200
Additionally available hardware equipment:	
Carrying system, standard bar	
Carrying system, wide bar	
Rail holder	
Software options (Plus, pressure support, data export, CO_2, PC ventilation)	57 05 500
Carrying strap	57 90 320
Accessories bag	57 90 317
Device holder	57 90 230
Carrying system holder	57 90 231
Adapter, Weinmann, LIFE-BASE	57 90 471
Adapter, all-round wall holder	57 90 472
Lithium-ion battery	57 90 224
DC/DC converter	57 04 799
Power supply unit	57 90 808
Battery charger	57 90 223
Power supply unit holder for standard rail	MC 00 155
Power cable:	
Germany	18 24 481
Denmark	18 68 950
United Kingdom	18 44 369
Australia	18 51 705
Switzerland	18 44 377
USA	18 41 793
China	18 59 706
Thailand	18 68 160
Brazil	18 75 523
Israel	18 69 833
Saudi Arabia	18 68 152
Argentina	18 86 274
CO_2 sensor	68 71 950
Reusable CO_2 cuvette, adults	68 70 279
Disposable CO_2 cuvette, adults	MP 01 062
Extension cable MCable CO_2	68 72 159

Part name	Order number
Gas supply system	57 04 500
Filter & HME:	
Filter/HME TwinStarTM 55	MP 01 805
Filter/HME TwinStarTM 25	MP 01 815
Filter/HME TwinStarTM 90	MP 01 800
Filter/HME TwinStarTM 65A	MP 01 810
Filter/HME TwinStar HEPA	MP 01 801
Filter SafeStarTM 55	MP 01 790
Filter SafeStarTM 80	MP 01 785
Filter SafeStarTM 60A	MP 01 795
Filter CareStarTM 30	MP 01 770
Filter CareStarTM 45	MP 01 755
Filter CareStarTM 40A	MP 01 765
Catheter mounts:	
ErgoStar CM 40	MP 01 840
ErgoStar CM 45	MP 01 845
ErgoStar CM 50	MP 01 850
ErgoStar CM 55	MP 01 855
NIV masks:	
NIV face mask ClassicStar SE, single-patient use, size S	MP 01 573
NIV face mask ClassicStar SE,single-patient use, size M	MP 01 574
NIV face mask ClassicStar SE, single-patient use, size L	MP 01 575
NIV face mask NovaStar SE, reusable, size S	MP 01 579
NIV face mask NovaStar SE, reusable, size M	MP 01 580
NIV face mask NovaStar SE, reusable, size L	MP 01 581
Breathing hose sets and accessories:	
Breathing hose with 1 measuring line, reusable, 1.5 m	MP 01 390
Breathing hose with 1 measuring line, reusable, 3.0 m	MP 01 391
Breathing hose with 2 measuring lines, reusable, 1.5 m (Plus option)	84 12 068
Breathing hose with 2 measuring lines, reusable, 3.0 m (Plus option)	84 12 913
Breathing circuit VentStar Oxylog VE300, disposable, 1.5 m, 5 pcs.	MP 01 370
Breathing circuit VentStar Oxylog VE300, disposable, 3.0 m, 5 pcs.	MP 01 371
Breathing circuit VentStar Oxylog VE300, disposable, 1.5 m, 5 pcs. (Plus option)	57 03 041
Breathing circuit VentStar Oxylog VE300, disposable, 3.0 m, 5 pcs. (Plus option)	MP 00 335

Part name	Order number
Connector, pressure measurement, reusable	MP 01 372
Flow sensor, reusable (Plus option)	84 12 034
Elbow, reusable (with and without Plus option)	84 12 235
Breathing valve, reusable (with and without Plus option)	84 12 001
Test lung	84 03 201
Dräger USB flash drive	84 16 347

17 Password

17.1 Password protection

The following areas are password-protected in order to prevent unauthorized adjustment:

– ***Advanced system setup***
– ***Service menu***

ℹ The ***Service menu*** area is accessible only to service personnel. The user cannot make any changes here. For additional information on the service menu, see page 108.

Area	Password
Advanced system setup	4623

⚠ WARNING
Unauthorized access to the system setup
If the password is not changed, unauthorized individuals have access to the system setup and can change important settings.

► Change the preset password before the ventilator is used for the first time. For further information, see the following chapter: "Changing the password", page 80

If the password has been lost, contact DrägerService.

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These instructions for use are provided for customer information only and are only updated or exchanged upon customer request.

CE 0123

Directive 93/42/EEC concerning medical devices

CE 0678

Directive 1999/5/EC on radio and telecommunication equipment

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