Instructions for use

Oxylog 3000 *plus*

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

Emergency and Transport Ventilator Software 1.n

Typographical Conventions

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.

Any text shown on the screen and any labeling on the device are printed in bold and italics, for example, ***PEEP***, ***Air***, or ***Alarm settings***.

The "greater than" symbol **>** indicates the navigation path in a dialog window, for example, ***System configuration*** > ***Monitoring*** > ***Basic settings***. In this example, ***System configuration*** represents the dialog window title, ***Monitoring*** represents a horizontally aligned tab, and ***Basic settings*** a vertically aligned tab.

Screen reproductions

The reproductions of screen content in the instructions for use can differ from the content actually shown on the screen.

Trademarks

Trademark	Trademark owner
Oxylog®	Dräger
AutoFlow®	Dräger
DrägerService®	Dräger
Sekusept®	Ecolab
BIPAP[1)]	

1) Trademark used under license

Safety information definitions

WARNING
A WARNING statement provides important information about a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
A CAUTION statement provides important information about a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to the user or patient or in damage to the equipment or other property.

NOTE
A NOTE provides additional information intended to avoid inconvenience during operation.

Definition of target groups

For this medical device, users, maintenance personnel, and experts are defined as target groups.

These target groups must have received instruction in the use of the medical device and must have the necessary training and knowledge to use, install, reprocess, maintain, or repair the product.

Dräger emphasizes that the medical device must be used, installed, reprocessed, maintained or repaired exclusively by the defined target groups.

Users

Users are intended operators as defined on page 14 hereof for the use of the medical device in accordance with its intended use.

Maintenance personnel

Maintenance personnel are persons who are responsible to the operating company for the maintenance of the product.

Maintenance personnel are persons authorized to install, reprocess or maintain the medical device.

Experts

Experts are persons who are authorized to perform repair or complex maintenance work on the medical device.

Abbreviations and symbols

For explanations refer to "Abbreviations" on page 23 and "Symbols" on page 24.

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Contents

For Your Safety and that of Your Patients

General safety information

The following WARNING and CAUTION statements apply to general operation of the medical device.

WARNING and CAUTION statements specific to subsystems or particular features of the medical device appear in the respective sections of these instructions for use or in the instructions for use of another product used with this medical device.

Strictly follow these instructions for use

WARNING

Risk of incorrect operation and of incorrect use

Any use of the medical device requires full understanding and strict observation of all sections of these instructions for use. The medical device must only be used for the purpose specified under "Intended use" on page 14.

Strictly observe all WARNING and CAUTION statements throughout these instructions for use and all statements on medical device labels. Failure to observe these safety information statements constitutes a use of the medical device that is inconsistent with its intended use.

Maintenance

WARNING

Risk of medical device failure and of patient injury

The medical device must be inspected and serviced regularly by maintenance personnel. Repair and complex maintenance carried out on the medical device must be performed by experts.

If the above is not complied with, medical device failure and patient injury may occur. Observe chapter "Maintenance".

Dräger recommends that a service contract is obtained with DrägerService and that all repairs are performed by DrägerService. For maintenance Dräger recommends the use of authentic Dräger repair parts.

Accessories

WARNING

Risk when using unauthorized accessories

If unauthorized accessories are used, patients may be put at risk due to malfunctions of the medical device. Only use the medical device together with authorized accessories listed in the current list of accessories.

Connected devices

WARNING

Risk of electric shock and of device malfunction

Any connected devices or device combination not complying with the requirements set out 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.

Safe connection with other electrical equipment

WARNING

Risk of patient injury

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.

Patient safety

The design of the medical device, the accompanying literature, and the labeling on the medical device are based on the assumption that the use of the equipment is restricted to trained professionals, and that certain inherent characteristics of the medical device are known to the trained user. Instructions, warnings, and caution statements are therefore largely limited to the specifics of the Dräger design.

This publication excludes references to various hazards which are obvious to a medical professional and user of this medical device, to the consequences of medical device misuse, and to potentially adverse effects in patients with abnormal conditions.

Medical device modification or misuse can be dangerous.

WARNING

Risk of patient injury

Do not make therapeutic decisions based solely on individual measured values and monitoring parameters.

Patient monitoring

The users of the medical device are responsible for choosing appropriate safety monitoring that provides adequate information on medical device performance and patient condition.

Patient safety may be achieved through a wide variety of means, ranging from electronic surveillance of medical device performance and patient condition, to simple, direct observation of clinical signs.

The responsibility for the selection of the best level of patient monitoring lies solely with the medical device user.

Information on Electromagnetic Compatibility

General information on electromagnetic compatibility (EMC) pursuant to international EMC standard IEC 60601-1-2:

Electromedical devices are subject to special precautionary measures concerning electromagnetic compatibility (EMC) and must be installed and put into operation in accordance with the EMC information. Refer to section "EMC declaration" on page 151.

WARNING

Do not use portable and mobile HF communications equipment, e.g., mobile phones, in the vicinity of the medical device.

Functional safety

The essential performance of the Oxylog 3000 *plus* is defined as:

Appropriate delivery of ventilation to the patient-connection port or generation of an alarm condition.

Appropriate monitoring

CAUTION

Always use a separate SpO_2 monitor for patients who are dependent on an exact O_2 concentration.

The monitoring functionality of the Oxylog 3000 *plus* ensures appropriate monitoring of ventilation therapy. To ensure appropriate monitoring during ventilation, always set alarm limits for the following parameters:

– Airway pressure, Paw

– Expiratory minute volume, MVe

– Respiratory rate (if applicable), RR

– $etCO_2$ (if applicable)

If appropriate alarm limits are not set, alarms may not be triggered in the following cases:

– Acute changes in the patient's condition

– Incorrect settings and faulty handling

– Hose system leakage

Connection to other devices

Device combinations (Dräger devices + Dräger devices or Dräger devices + third-party devices) approved by Dräger (see instructions for use of the individual devices) comply with the following standards:

– IEC 60601-1 (3rd edition)
Medical electrical equipment
Part 1-1: General requirements for safety and essential performance

  – IEC 60601-1-2
  Medical electrical equipment
  Part 1-2: General requirements for safety and essential performance
  Collateral standard: Electromagnetic compatibility – Requirements and tests

  – IEC 60601-1-8
  Medical electrical equipment
  Part 1-8: General requirements for safety
  Collateral standard: General requirements, tests, and guidance for alarm systems in medical equipment and medical electrical systems

– IEC 60601-1 (2nd edition)
Medical electrical equipment
Part 1: General requirements for safety

  – IEC 60601-1-1
  Medical electrical equipment
  Part 1-1: General requirements for safety
  Collateral standard: Safety requirements for medical electrical systems

  – IEC 60601-1-2
  Medical electrical equipment
  Part 1-2: General requirements for safety
  Collateral standard: Electromagnetic compatibility; Requirements and tests

  – IEC 60601-1-4
  Medical electrical equipment
  Part 1-4: General requirements for safety
  Collateral standard: Programmable electrical medical systems

– IEC 60601-1-8
  Medical electrical equipment
  Part 1-8: General requirements for safety
  Collateral standard: General requirements, tests, and guidance for alarm systems in medical electrical equipment and medical electrical systems

If a device combination is not approved by Dräger, proper operation of the devices can be compromised.

The user must ensure that the device combination meets the applicable standards.

Strictly observe instructions for use and assembly instructions of all connected devices.

Product-specific safety information

WARNING

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 case of a malfunction.

The user must not solely rely on the built-in monitoring of the ventilator and must always assume full responsibility for proper ventilation and patient safety in all situations.

WARNING

Keep an manual resuscitator at the ready

If a malfunction is detected in the ventilator and its life-support functions can no longer be guaranteed (such as in case of a power supply failure or interruption in the compressed gas supply), ventilation must be started without delay with an independent ventilator (manual resuscitator) – using PEEP and/or increased inspired O_2 concentration as necessary.

WARNING

Risk of CO_2 rebreathing

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

WARNING

Risk of malfunction

Unauthorized modification of the medical device will result in malfunction.

This medical device must not be modified without the permission of Dräger.

CAUTION

An $etCO_2$ value by itself is insufficient as a basis for medical decisions.

Installing accessories

CAUTION

Installations on the Oxylog 3000 *plus* must be done in accordance with these instructions for use. Make sure that the connections are securely fitted onto the basic unit system.

Strictly follow the assembly instructions and instructions for use.

Only one copy of instructions for use included

CAUTION

Only one copy of the instructions for use is included per device, and it must therefore be kept in an accessible location for users.

Use

Intended use

The Oxylog 3000 *plus* 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 50 mL upwards.

Intended user: 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.

Indications/Contraindications

For patients with tidal volume of 50 mL upwards.

WARNING

The Oxylog 3000 *plus* ventilator must only be used under the supervision of qualified medical personnel in order to provide immediate corrective action in case of a malfunction.

Environment of use

Intended environment of use:

– Mobile use for emergency patients, in both outdoor and indoor environments.

– During transport in ambulances or aircraft, including helicopters.

– In accident and emergency departments.

– When moving ventilated patients around the hospital.

– In the recovery room.

WARNING

Only use the device under the permissible ambient conditions and supply conditions. Otherwise, the device may not be functional and may fail.

WARNING

Do not use the device in hyperbaric chambers.

The medical device may malfunction, causing danger to the patient.

WARNING

Do not use the device in conjunction with magnetic resonance imaging (MRI, NMR, NMI).

The medical device may malfunction, causing danger to the patient.

WARNING

Risk of explosion and fire

This device is neither approved nor certified for use in areas where oxygen concentrations above 25 Vol% or combustible or explosive gas mixtures are likely to occur.

WARNING

In toxic surroundings:

- **The patient must be ventilated with 100 % medical grade oxygen so that toxic constituents do not enter into the breathing gas.**
- **The patient must be immediately transferred to a breathable atmosphere in order to prevent inhalation of toxic air when spontaneous breathing resumes.**

WARNING

In infectious environments:

- **The patient must be ventilated with 100 % medical grade oxygen so that bacteria, viruses, fungi or spores do not enter the breathing gas.**
- **The patient must be immediately transferred to a breathable atmosphere in order to prevent inhalation of infectious air when spontaneous breathing resumes.**

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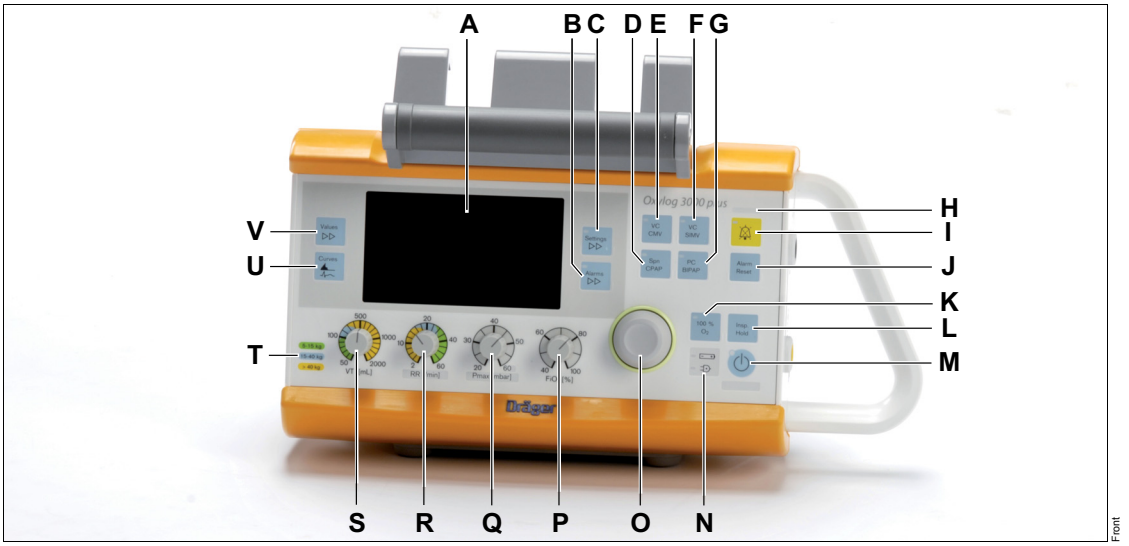
System overview

Basic unit with all options



A Screen with screen pages for the specific application

B ***Alarms*** ▷▷ key for setting and displaying alarm limits

C ***Settings*** ▷▷ key for setting additional ventilation parameters

D Key for setting the ventilation mode ***Spn-CPAP***

E Key for setting the ventilation mode ***VC-CMV / VC-AC***

F Key for setting the ventilation mode ***VC-SIMV***

G Key for setting the ventilation mode ***PC-BIPAP***

H Red and yellow LEDs as alarm indicators

I key for silencing acoustic alarm signals for 2 minutes

J Key ***Alarm Reset*** for acknowledging alarm messages

K ***O2 inhalation*** key for O2 inhalation or ***100 % O2*** key for 100 % O2 application (factory set)

L ***Insp. Hold*** key for initiating a manual inspiration or for extending the current inspiratory time

M Start/Standby key

N Power supply symbols
- Charge status of the internal battery
- External mains power supply

O Rotary knob for making selections, changing and confirming settings

P Control knob for setting the O2 concentration ***FiO2***

Q Control knob for setting the maximum inspiratory pressure ***Pmax***

R Control knob for setting the respiratory rate ***RR***

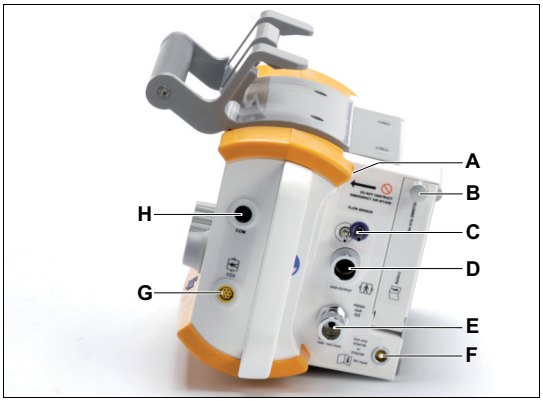
S Control knob for setting the tidal volume ***VT***

T Explanation of color codes for quick pre-setting of ***RR*** and ***VT***

U ***Curves*** Curves key for switching between the pressure, flow, and CO2 (optional) curves in small and large view

V ***Values*** ▷▷ key for switching between screen pages in the measured values window

Side view, right



A Emergency air inlet

CAUTION
Do not block the emergency air inlet

This may result in ventilator malfunction.

B Battery compartment cover fixing screw

C Connectors for the flow measuring lines

D Connector for the breathing hose

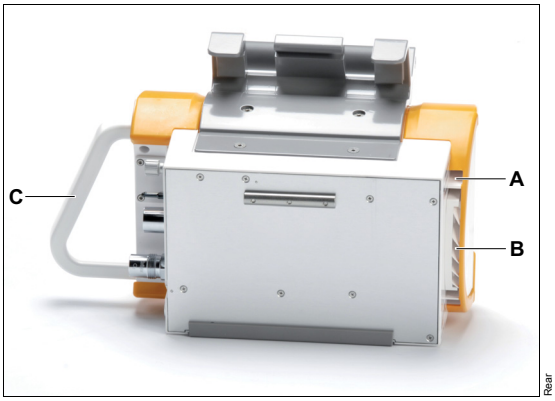
E Connector for the compressed gas hose

F Connector for the DC power supply

G Connector for the CO_2 sensor

H Connector for data communication cable

Rear view



A Ambient air inlet

B Ambient air inlet, with filter element

CAUTION
Do not block the ambient air inlet

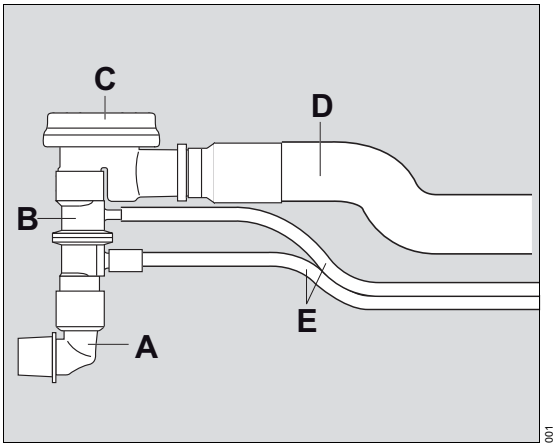
This may result in ventilator malfunction.

C Protection bracket

CAUTION
Do not use the protection bracket as a handle

Tilting the device to a vertical position may lead to airway pressure oscillation.

Reusable breathing circuit for adults



A Angled connector

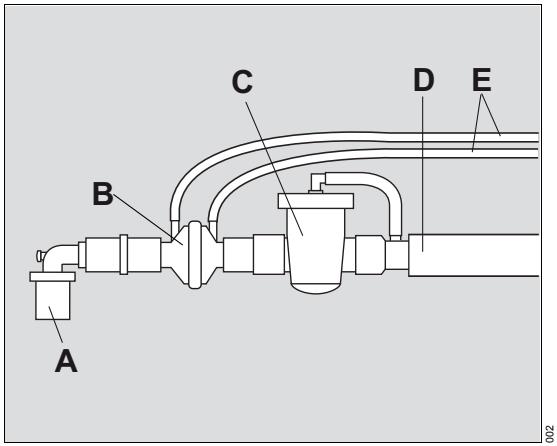
B Flow sensor

C Breathing valve

D Breathing hose

E Flow and pressure measuring lines

Disposable breathing circuit for adults



A Angled connector

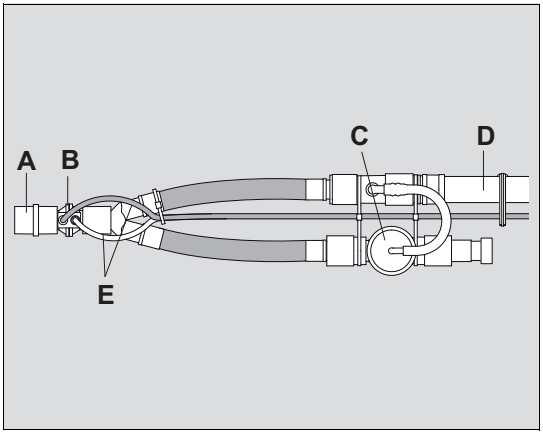
B Flow sensor

C Breathing valve

D Breathing hose

E Flow and pressure measuring lines

Disposable breathing circuit for pediatric patients



A Angled connector

B Flow sensor

C Breathing valve

D Breathing hose

E Flow and pressure measuring lines

Range of functions

Ventilation functions of the Oxylog 3000 *plus*

Ventilation modes:

- Volume-controlled ventilation:
  - VC-CMV / VC-AC,
  - VC-SIMV.
- Pressure-controlled ventilation:
  - PC-BIPAP
- Support of spontaneous breathing:
  - Spn-CPAP

Additional settings for ventilation:

- Pressure Support: in the ventilation modes VC-SIMV, PC-BIPAP, and Spn-CPAP,
- Apnea ventilation: in the ventilation mode SpnCPAP,
- AutoFlow (optional): in the ventilation modes VC-CMV, VC-AC and VC-SIMV.
- NIV: in the ventilation modes: Spn-CPAP (/PS), PC-BIPAP (/PS), VC-CMV / AF, VC-AC / AF, and VC-SIMV / AF.

Special functions:

- Inspiration hold,
- O_2 inhalation (optional), with an inhalation mask – 100 % O_2 (optional)

For a detailed description of the ventilation modes and the additional settings, refer to "Description" on page 155. For abbreviations, see "Abbreviations" on page 23.

NOTE

In these instructions for use the unit of measurement for airway pressure is expressed in [mbar]. However, in some languages the display of the Oxylog 3000 *plus* shows [cmH_2O].

1 [mbar] equals approximately 1 [cmH_2O].

Abbreviations

Abbreviation	Explanation
100 % O_2	100 % O_2 flow
AF	AutoFlow
ATPD	Ambient Temperature and Pressure, Dry (ambient temperature and pressure, dry)
BF	Body Floating
bpm	Breaths per minute
BTPS	Body Temperature and Pressure, Saturated. Measured values referred to the conditions of the patient's lungs, body temperature 37 °C, airway pressure, vapor-saturated gas.
C	Compliance
CO_2	Carbon dioxide
CSM	Customer Service Mode
ΔPsupp	Positive pressure above PEEP
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
etCO_2	Endtidal CO_2 concentration
RR	Respiratory rate
RRapn	Respiratory rate during apnea ventilation
FiO_2	Inspiratory oxygen concentration
FRC	Functional Residual Capacity
RRsp	Spontaneous breathing rate
HME	Heat and Moisture Exchanger (heat and moisture exchanger)
I:E	Ratio of inspiratory time to expiratory time
IPX2	Ingress Protection level 2
IPX4	Ingress Protection level 4
MEDIBUS.X	Dräger communications protocol for medical devices with uniform data definition for all devices

Abbreviation	Explanation
MVe	Total expiratory minute volume
MVespon	Spontaneous breathing portion of the expiratory minute volume
MVi	Total inspiratory minute volume
NIV	Non-invasive ventilation – mask ventilation
O_2	Oxygen
O_2 inhalat.	O_2 inhalation
Paw	Airway pressure
PC-BIPAP	Pressure Controlled – Biphasic Positive Airway Pressure (spontaneous breathing under continuous positive airway pressure with 2 different pressure levels)
PEEP	Positive End-Expiratory Pressure
PIF	Peak Inspiratory Flow
Pinsp	Inspiratory pressure
PIP	Peak Inspiratory Pressure
Pmax	Maximum airway pressure
Pmean	Mean airway pressure
Pplat	Plateau pressure
PS	Pressure Support (pressure-supported spontaneous breathing)
R	Resistance
RF	Radio Frequency
Spn-CPAP	Spontaneous Continuous Positive Airway Pressure (spontaneous breathing with continuous positive pressure level)
SpO_2	Saturation of peripheral oxygen
Tapn	Time before apnea is recognized
Te	Expiratory time
Ti	Inspiratory time
Tplat%	Plateau time in % of inspiratory time

Abbreviation	Explanation
UN	United Nations
VC-AC	Volume-Controlled – Assisted-Controlled ventilation
VC-CMV	Volume Controlled – Controlled Mandatory Ventilation
VC-SIMV.	Volume Controlled – Synchronized Intermittent Mandatory Ventilation
VT	Tidal volume
VTapn	Tidal volume during apnea ventilation
VTe	Expiratory tidal volume
VTi	Inspiratory tidal volume

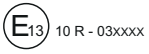
Symbols

Symbol	Explanation
Insp. hold	Key for initiating a manual inspiration or for extending the current inspiratory time
Settings ▷▷	Key for setting additional ventilation parameters
Alarms ▷▷	Key for setting and displaying alarm limits
Values ▷▷	Key for displaying measured values
Curves	Key for switching between the pressure, flow, and CO_2 (optional) curves in small and large view
	Key for silencing acoustic alarm signals for 2 minutes
Alarm Reset	Key for acknowledging alarm messages
	Rotary knob

Symbol	Explanation
	Start / Standby key
	Upper alarm limit
	Lower alarm limit
!	Low-priority alarm message
!!	Medium-priority alarm message
!!!	High-priority alarm message
*	Trigger indicator
	Attention! Consult accompanying documents
	Protection class type BF (Body Floating), defibrillator-proof
	Charge status of the internal battery

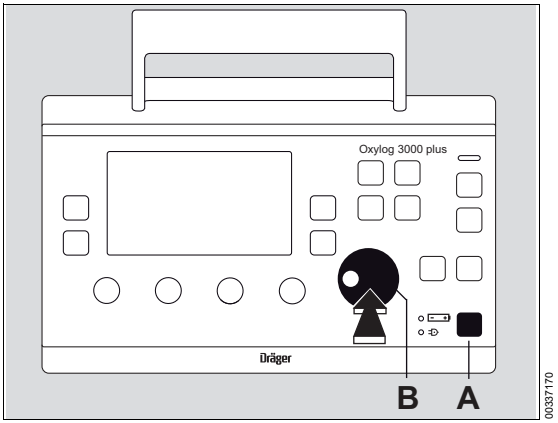
Symbol	Explanation
	Mains power supply connected Battery charge (example: three quarters full)
	Class II equipment, device protected against electric shock with additional safety precautions such as double or reinforced insulations, without protective earthing.
	Do not dispose of the device as municipal waste.
	Manufacturing date
	Manufacturer
	DC input
	Operating instructions
	Warning! Strictly follow these instructions for use
	For dry locations only
	Warning, dangerous voltage!
	Temperature limitations
	Latex free

Symbol	Explanation
	Do not reuse
	Keep oil and grease free
	Non-sterile
	Keep away from sunlight
	For indoor use only
	Do not open
	Prohibition: Do not obstruct the emergency air inlet or the ambient air inlet.
	Pediatric
	Adult
	Slope (steep, medium, flat)
	Quantity
	Do not use if package is damaged
	Ambient pressure

Symbol	Explanation
	Relative humidity
	Part number
	Lot number
	Recycling in accordance with the regulations for lithium-ion batteries.
	UN Regulation No. 10, revision 3 (EMC)

Operating concept

Switching on and off



Switching on

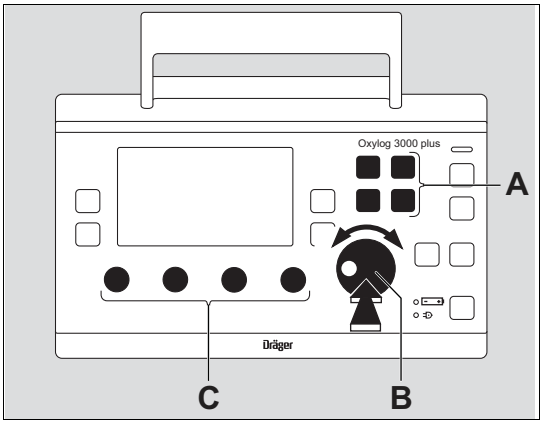
- To switch the device ON, briefly press the key (A).

Switching off

Refer to the "Shutdown" on page 81.

Ventilation controls

Controls for ventilation settings



A Keys for selecting the ventilation modes:

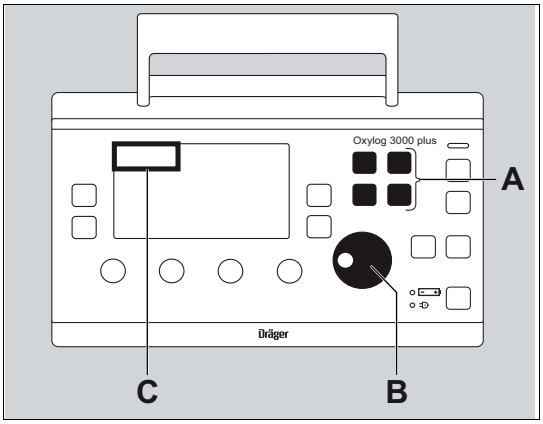
- VC-CMV / VC-AC,
- VC-SIMV,
- Spn-CPAP,
- PC-BIPAP.

B Rotary knob

C Ventilation parameter controls:

- Inspiratory tidal volume ***VT*** [mL],
- Respiratory rate ***RR*** [/min],
- Maximum inspiratory pressure ***Pmax*** [mbar],
- Inspiratory O_2 concentration ***FiO_2*** [%].

Setting ventilation modes



- Press the appropriate ventilation mode key (A) for approximately 3 seconds.

Or

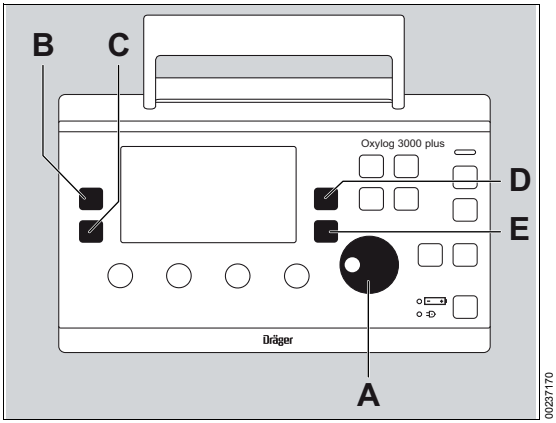
1 Press the appropriate ventilation mode key (A).

2 Press the rotary knob (B) to confirm.

The selected ventilation mode will be activated.

The active ventilation mode is displayed in the upper left corner of the display (C).

Display operating controls



A Rotary knob for making selections, changing and confirming settings.

NOTE

Different parameters can be set on the display via the rotary knob (e. g. Ti, PEEP, ΔPsupp, Pinsp).

– To select the parameter: turn rotary knob.
– To activate the parameter: press the rotary knob.
– To set the value: turn rotary knob.
– To confirm the value: press the rotary knob.

B ***Values*** ▷▷ key for switching between screen pages in the measured values window

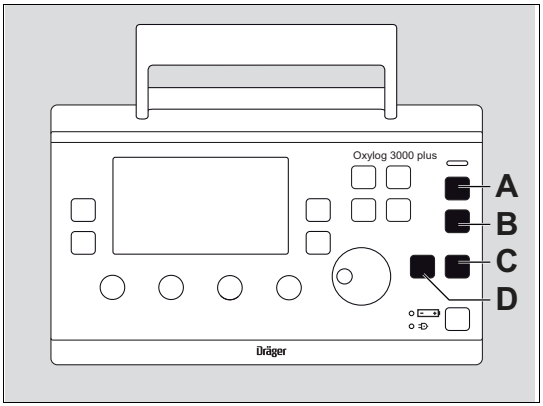
C ***Curves*** Curves key for switching between the pressure, flow, and CO_2 (optional) curves in small and large views

D ***Settings*** ▷▷ key for displaying ventilation parameters (ventilation screen) in the settings window and for switching between screen pages

E ***Alarms*** ▷▷ key for displaying the alarm settings in the alarms window and for switching between screen pages

Additional function keys

Additional keys are positioned on the right side of the front panel:



A Key for silencing acoustic alarm signals for 2 minutes.

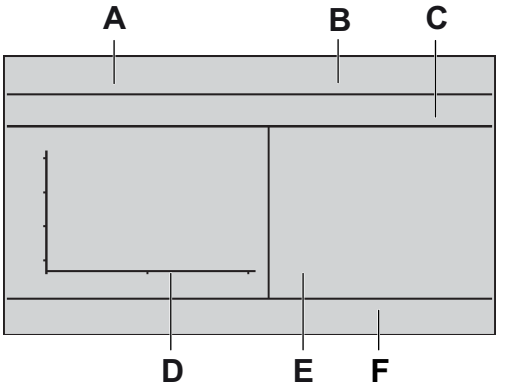
B ***Alarm Reset*** key for acknowledging alarm messages.

C ***Insp. Hold*** key for initiating a manual inspiration or for extending the current inspiratory time.

D ***O_2 inhalation*** key for O_2 inhalation or ***100 % O_2*** key for 100 % O_2 application (factory set).

On-screen window structure

General window structure



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A Ventilation mode field

B Status and alarm messages field

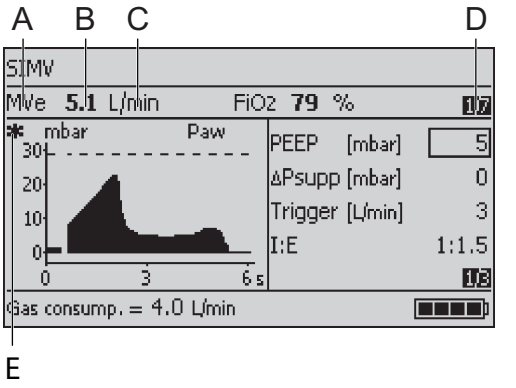
C Measured values window

D Curve window
D and E are combined for a large curve screen.

E Window for settings or alarms

F Information window. For information on the content, refer to "Messages in the information field" on page 118.

Measured values window



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A Parameter measured

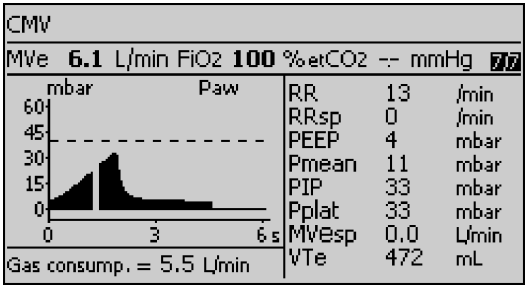
B Measured value

C Unit of measurement

D Measured values (1st page of 7 available pages)
If the CO_2 option is not selected:
1st page of 6 available pages

E Trigger indicator.

The last page shows an overview of all measured values.



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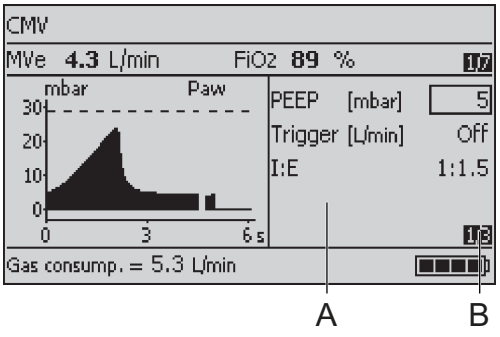
Settings window



05737171

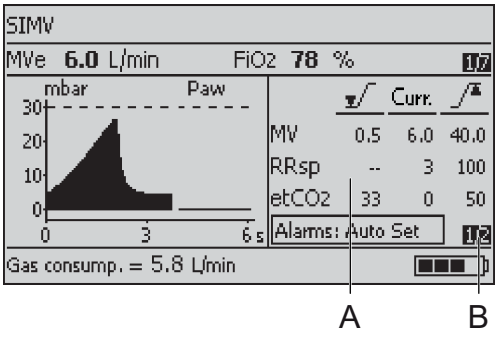
A Menu for setting supplementary ventilation parameters in accordance with the desired ventilation mode.

- AutoFlow (optional)
- Brightness
- CO_2 filter check (optional)
- CO_2 zero calibration (optional)
- CO_2 cuvette type (optional)
- HME correction
- Hose type
- I:E / Ti
- NIV
- PEEP
- Pinsp
- RRapn and VTapn
- Slope
- Tapn
- Tplat
- Trigger
- ⊿Psupp

B Number of pages (1st page of 3 available pages)

- Press **Settings** ▷▷ key.
  The pages are displayed consecutively.

Alarms window



10937171

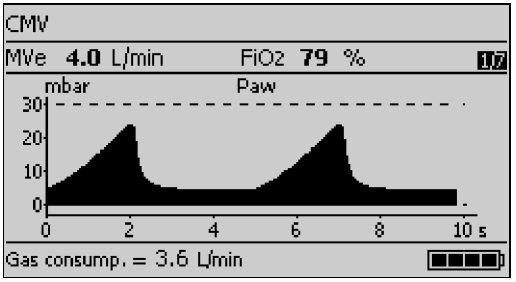
A Menu for alarm limits and alarm parameters. For detailed operating instructions, see "Setting alarm limits" on page 87.

B Number of pages (1st page of 2 available pages)

To advance to the next page:

- Press the ***Alarms*** ▷▷ key.
  The pages are displayed consecutively.

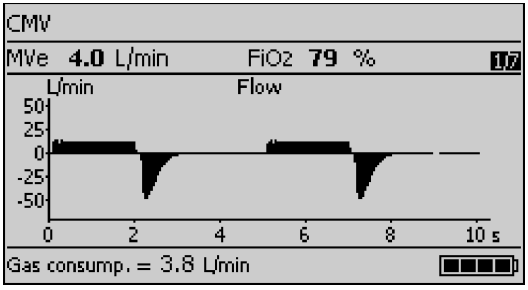
Enlarged view of pressure curve



Curve window showing the airway pressure curve Paw.

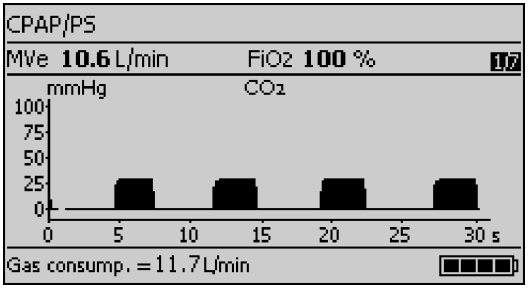
- Press ***Curves*** Curves key multiple times.

Enlarged view of flow curve



Curve window showing the flow curve.

Enlarged view of CO_2 curve



Curve window showing the CO_2 curve.

Assembly

WARNING

Do not use any damaged parts or accessories.

Damaged or deformed parts must be replaced.

WARNING

Electrical connections to equipment, which are not listed in these instructions for use, must only be made following consultation with the respective manufacturers.

Equipment malfunction may result as well as risk of patient injury.

WARNING

All equipment connected to the Oxylog 3000 *plus* must comply with IEC 60601-1-2.

WARNING

Risk of CO_2 rebreathing

Do not combine parts of different breathing circuits, especially for pediatric applications.

WARNING

Always use the angled connector of the breathing circuit.

If the angled connector is not used, the minute volume may be measured incorrectly.

WARNING

Risk of CO_2 rebreathing

Do not use an adult breathing hose for tidal volumes below 100 mL.

CAUTION

Do not use electrically conductive hoses.

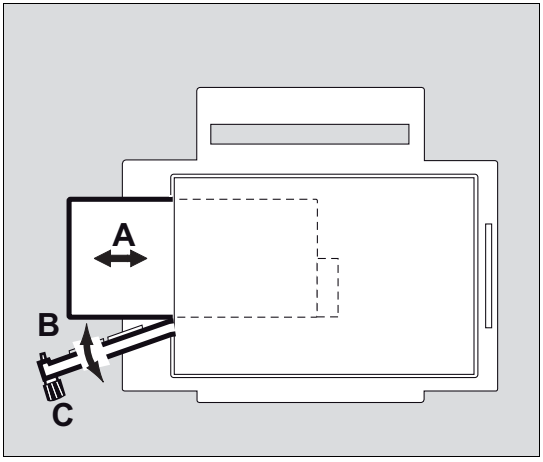
This may endanger the user and may cause damage to the device during defibrillation.

Risk of electric shock.

Internal rechargeable battery

Internal power is provided by means of a removable rechargeable battery. For technical information, refer to "Technical data" on page 139.

Removing the battery



1 Turn the knob (C) on the battery compartment cover (B) counterclockwise to release the cover.

2 Open the battery cover.

3 Remove the battery (A) by pulling the tab.

Checking the charge status of the battery

- Press the button on the rechargeable battery. The charge status is indicated by four LEDs.

Inserting the battery

1 Insert the battery into the battery compartment.

2 Close the battery cover.

3 Tighten the knob by turning it.

CAUTION

The Oxylog 3000 *plus* will interrupt ventilation when the battery is replaced while the device is switched on and the external power supply is not connected. Ventilation will always resume with the last value settings approximately 3 seconds after inserting a recharged battery.

Connecting the power supply

External power supply

To recharge the battery and to extend the operating time, use one of the following:

– DC/DC converter, or

– AC/DC power pack.

For more information refer to page 146.

WARNING

A fully charged battery must always be installed for safety reasons, even when operating from an external power supply.

WARNING

Risk of patient injury

Without a charged battery installed, ventilation will be interrupted in case of an external power supply failure.

It is recommended to have a fully charged spare battery available each time when using the Oxylog 3000 *plus*.

Always position the device so that the external power connector can be easily disconnected from the ventilator.

External power supply

External power supply with DC/DC converter

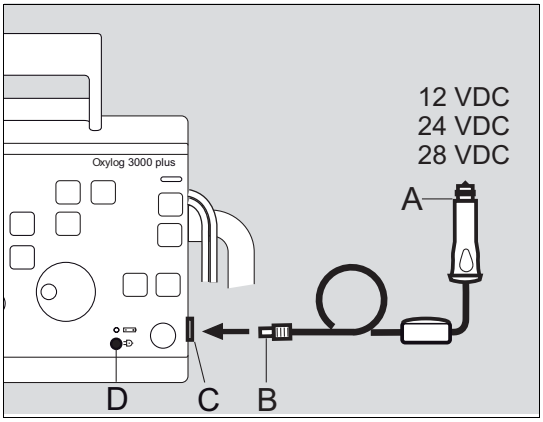
WARNING

The DC/DC converter must be used in dry locations only.

Risk of electric shock and damage to the device.

The DC/DC converter must be used to connect the Oxylog 3000 *plus* to on-board power supply systems, e.g., in ambulances. It can be used with the following voltages: 12 VDC, 24 VDC or 28 VDC. The on-board power supply must be protected by a 10 to 16 A DC fuse.
Outside this range the Oxylog 3000 *plus* cannot use the DC input power.

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



1 Plug the large connector (A) of the DC/DC converter into the on-board supply.

2 Plug the small connector (B) into the DC connector (C) of the Oxylog 3000 *plus*.

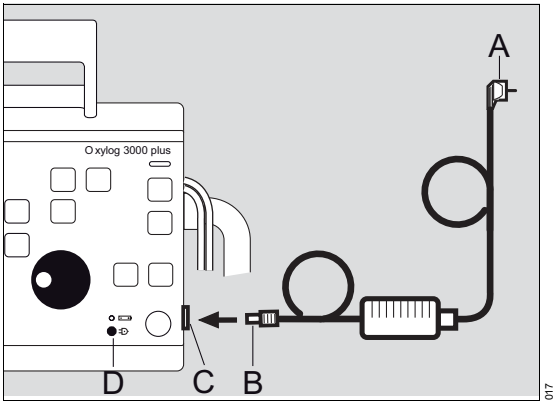
3 When the Oxylog 3000 *plus* is correctly connected to an external power supply, the indicator ⇉ (D) lights up.

External power supply with AC/DC power pack (mains voltage)

WARNING

The AC/DC power pack must not be used outdoors.

Risk of electric shock and damage to the device.



1 Connect the mains plug (A) to the mains outlet.

2 Connect the DC connector (B) to the DC connector (C) of the Oxylog 3000 *plus*.

3 When the Oxylog 3000 *plus* is correctly connected to an external power supply, the indicator ⇉ (D) lights up.

To isolate the ventilator system from mains, disconnect the power cable from the power socket.

Connecting the gas supply

Caution when handling O_2:

WARNING
Risk of explosion

Protect the O_2 cylinder against tipping over. Keep away from excessive heat.

WARNING
Risk of fire

Do not grease or lubricate O_2 fittings, such as cylinder valves and pressure reducers and do not handle with greasy hands.

WARNING
Operate cylinder valves by hand and rotate slowly to prevent the risk of fire or explosion.

Do not use tools.

WARNING
Only use medical grade oxygen.

WARNING
Always provide adequate ventilation in the area where the ventilator is being operated, in order to maintain ambient O_2 concentration below 25 %, to prevent risk of fire.

WARNING
No smoking or open flames.

O_2 enhances combustion of other substances and can intensify fires.

Supply from an O_2 cylinder

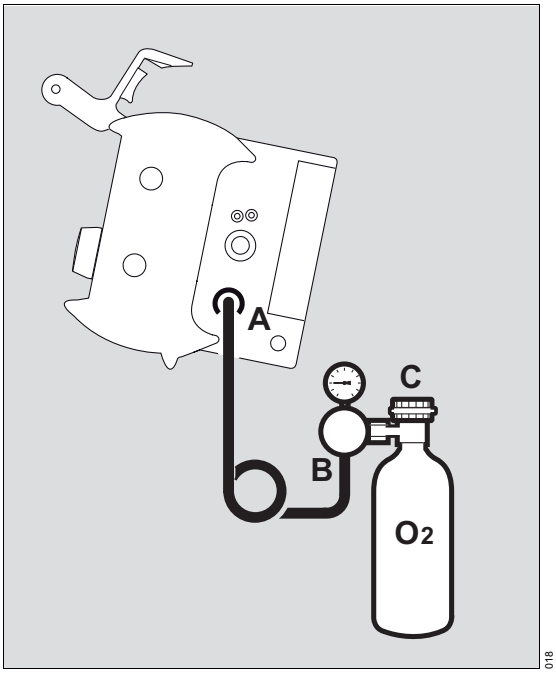
WARNING
Always use gas cylinders and pressure regulators that comply with all applicable regulations.

WARNING
Risk of suffocation

Always use filled O_2 cylinders.

1 Connect the pressure regulator (270 to 600 kPa outlet pressure, 500 kPa nominal pressure) to the O_2 cylinder.

WARNING
Use only a pressure reducer with a blow-off valve at the outlet that limits the outlet pressure to a maximum of 1000 kPa in case of a malfunction, to prevent damage to the ventilator due to excessive O_2 supply pressure on the input.



2 Connect the O2 compressed gas hose (A) to the Oxylog 3000 *plus*.

3 Connect the O2 compressed gas hose to the pressure reducer (B).

4 Rotate the cylinder valve (C) slowly and open fully.

WARNING

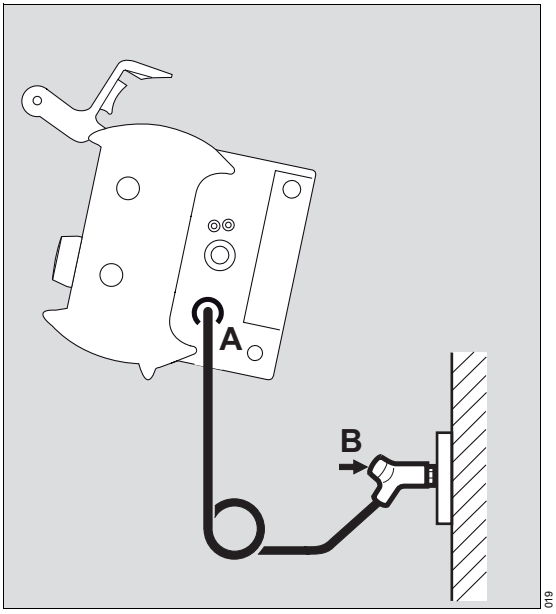
Risk of ventilator malfunction

Do not install flow control valves or flowmeters in the gas supply to the Oxylog 3000 *plus*.

WARNING

Always check the O2 pressure of cylinder before use, to prevent insufficient oxygen supply during use.

O2 supply from a central gas supply system



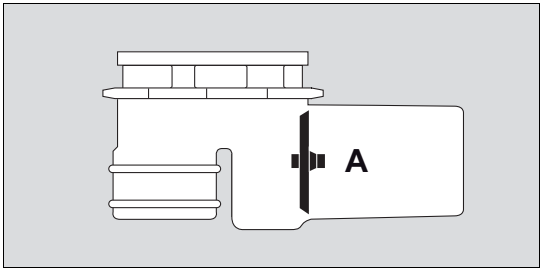
1 Connect the O2 compressed gas hose (A) to the Oxylog 3000 *plus*.

2 Connect the gas probe (B) to the O2 terminal unit until it has properly engaged and the supply of O2 is assured.

Connecting the reusable breathing circuit for adults

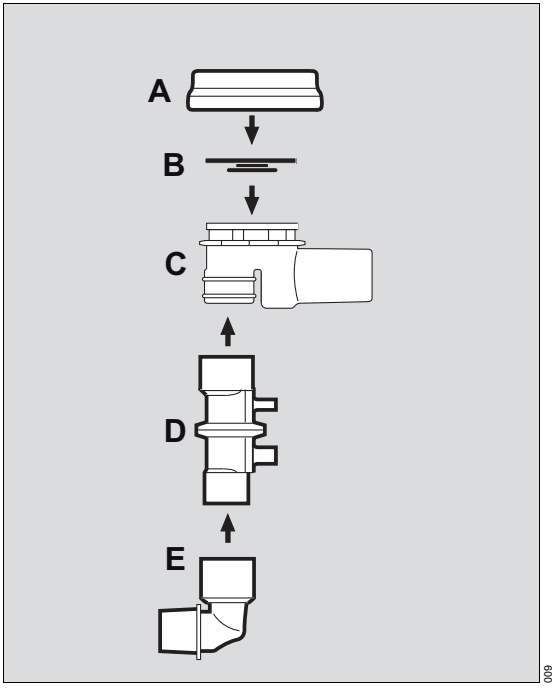
– Sterilize all reusable parts before every use.

Assembling the breathing valve



WARNING
Risk of CO_2 rebreathing

The rubber disk (A) in the housing must not be removed, damaged or bent, otherwise the valve will work incorrectly and may endanger the patient.



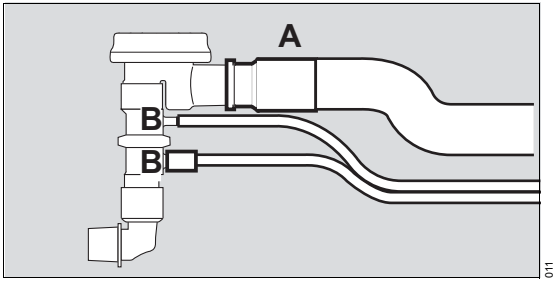
1 Place the diaphragm (B) in the breathing valve housing (C). Ensure that it is inserted correctly.

2 Fit the cover (A) and turn it approximately 60° clockwise to secure into position (a click can be felt).

3 Push the flow sensor (D) onto the breathing valve (C). Note the correct alignment of the parts by the groove in the flow sensor (D) and the notch on the breathing valve (C).

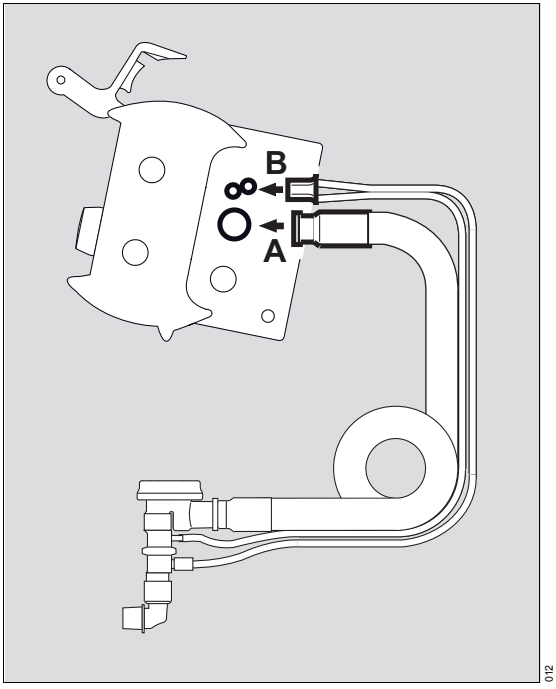
4 Push the angled connector (E) onto the flow sensor (D).

Connecting the breathing hoses and flow measuring lines



1 Connect the breathing hose (A) to the breathing valve.

2 Connect the flow measuring lines (B) to the nozzles of the flow sensor. When connecting the flow measuring lines, pay attention to the differing diameters of the hoses and nozzles and connect them on the correct side.



3 Connect the flow measuring lines (B) to the Oxylog 3000 *plus*. Correct alignment is indicated by a notch on the connector, which must point away from the breathing hose. If it is incorrectly seated, incorrect values will be measured.

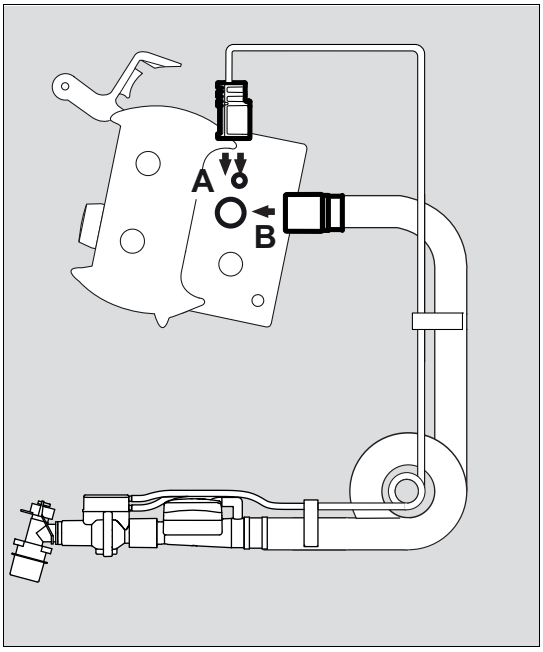
4 Connect the breathing hose (A) to the gas outlet on the Oxylog 3000 *plus*.

When connecting a breathing hose, check that the hose setting in the settings window corresponds to the connected hose.

Connecting the disposable breathing circuit for adults

NOTE

Using a disposable hose may reduce the risk of cross-infection.



1 Connect the flow measuring lines (A) to the Oxylog 3000 *plus*. Correct alignment is indicated by a notch on the connector, which must point away from the breathing hose. If it is incorrectly seated, incorrect values will be measured.

2 Connect the breathing hose (B) to the gas outlet on the Oxylog 3000 *plus*.

When connecting a breathing hose, check that the hose setting in the settings window corresponds to the connected hose.

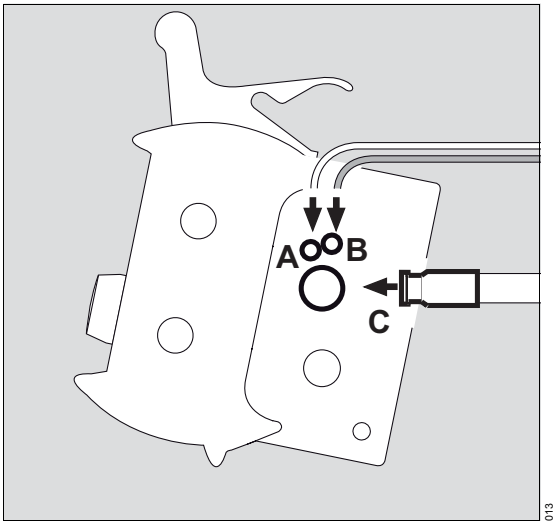
NOTE

Disposable hoses are shipped clean but non-sterile.

Connecting the disposable breathing circuit for pediatric patients

If the ventilation volume is less than 250 mL, use a pediatric breathing circuit.

If the ventilation volume is more than 250 mL, use an adult breathing circuit.



1 Connect the blue flow measuring line (B) to the blue labeled connector.

2 Connect the transparent flow measuring line (A) to the other connector.

3 Connect the breathing hose (C) to the gas outlet on the Oxylog 3000 *plus*.

When connecting a breathing hose, check that the hose setting in the settings window corresponds to the connected hose.

Connecting a bacterial filter or HME

WARNING

Risk of CO_2 rebreathing

Bacterial filters, HMEs and, masks increase the resistance and dead space volume of the breathing circuit. Note the manufacturer's directions.

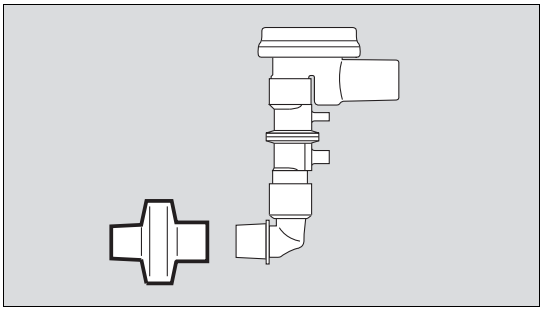
NOTE

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

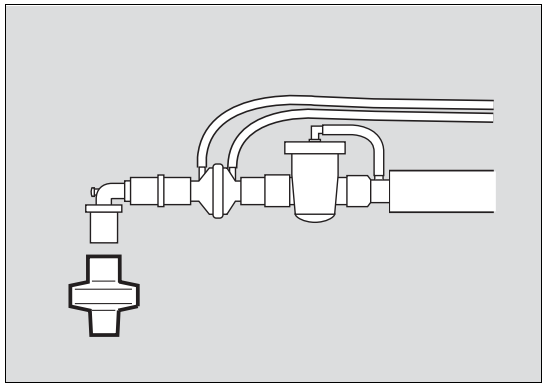
The flow and volume measurements can be corrected for use with an HME. Refer to the "Setting the HME correction" on page 79.

Connect the bacterial filter or HME to the angled connector as follows.

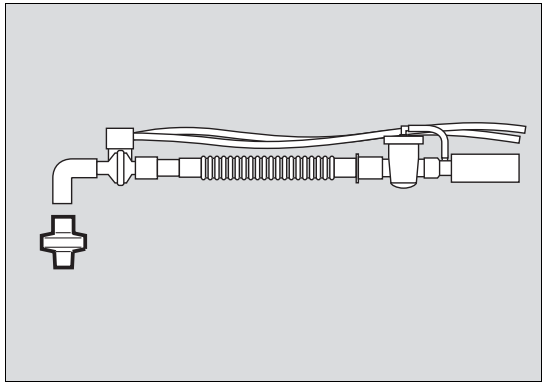
Adult reusable hose



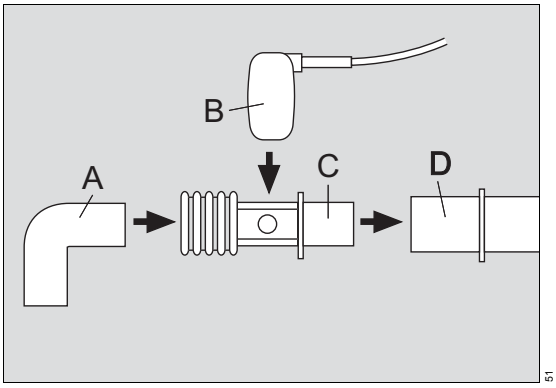
Adult disposable hose



Disposable pediatric hose



Connecting the CO_2 sensor and the cuvette



1 Disconnect the angled connector (A) from the flow sensor (D).

2 Attach the cuvette (C) to the flow sensor (D), with the cuvette windows facing the side.

3 Attach the angled connector (A) to the cuvette (C).

4 Push the CO_2 sensor (B) onto the cuvette (C), with the cable towards the device.

5 Connect the CO_2 sensor to the connector of the Oxylog 3000 *plus*. For the connector location, refer to the section "Side view, right" on page 19.

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

Alternatively, connect the cuvette (C) directly to the patient side of the angled connector (A), without disconnecting the angled connector from the flow sensor (D).

The CO_2 sensor cable can be extended with a maximum of one extension cable. Refer to the "List of accessories" on page 165.

For information on CO_2 zero calibration and filter testing before ventilation, see page 58. For information on CO_2 zero calibration and filter testing during ventilation, see page 91. For information on CO_2 measurement and cuvette type selection, see page 91. For information on CO_2 configuration in Customer Service Mode, see page 103.

Attaching the Oxylog 3000 *plus* to standard rail systems

The Oxylog 3000 *plus* can be hung on various rail systems measuring up to 40 mm diameter by means of a claw.

– Ensure that the rail is completely inserted in the claw.

– To ensure optimal functioning of the claw, a distance of at least 25 mm between rail and wall is required.

WARNING

Risk of property damage and personal injury

Be careful when placing the ventilator on the rail or bed rim.

CAUTION

The Oxylog 3000 *plus* is only held by its own weight when hung on a bar or rail. The Oxylog 3000 *plus* must be secured additionally when being transported, otherwise vibrations may cause accidental dislodgement.

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Preparation

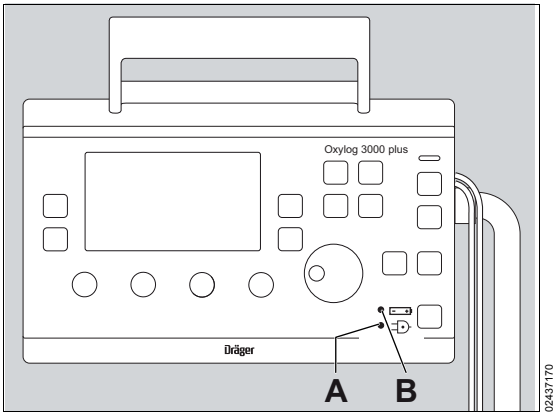
Charging the battery

The actual screen display may differ in appearance or configuration.

NOTE

The ambient temperature must be between 0 and 35 °C when charging the batteries.

When an external supply is available:



1 The green indicator (A) lights up when an external power source is connected.

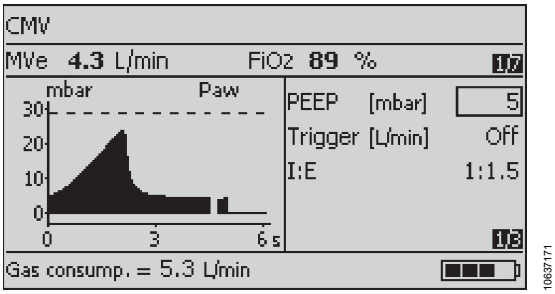
2 A three colored indicator (B) lights up to show the current charge status of the internal battery:

- Green: the battery is fully charged.
- Yellow: the battery is being charged.
- Red: a battery is not inserted or cannot be charged.

– Indicators (A) and (B) remain off while the ventilator is being operated from the internal battery.

An external battery charging station connected to the mains power supply can be used to charge an extra battery. Refer to the "List of accessories" on page 165 for additional information.

Indication of battery capacity in battery operation



The remaining capacity of the battery is indicated by the Oxylog 3000 *plus* in 25 % increments in the lower right section of the information window when power is ON.

As an example, in the above screen the battery is 75 % charged.

– The accuracy of the battery capacity indicator can vary, depending on the age and condition of the battery. Refer to the "Technical data" on page 139 for additional information.

– The capacity indication is overwritten when other messages need to be shown in the Information window.

– Additional alarms can draw attention to the remaining operating time of the battery. Refer to the table "Alarm – Cause – Remedy" on page 110.

For screen brightness during battery operation, refer to "Screen brightness" on page 80.

Determining the approximate pneumatic operating time

Example for supply of O_2:

– Cylinder pressure measured on the manometer of the pressure reducer: 20000 kPa (200 bar)

– Liquid capacity of the O_2 cylinder: 2.1 L

Supply of O_2:
2.1 L × 20000 kPa = approx. 420 L at ambient pressure.

Example for pneumatic operation time:

– VC-CMV mode; frequency: 10 breaths/min, VT = 0.53 L, O_2 = 100 %

– Minute volume = 10 breaths/min x 0.53 L = 5.3 L/min

$$\text{Operation time} = \frac{O_2 \text{ supply [L]}}{(\text{MV} + 0.5^*) \text{ [L/min]}}$$

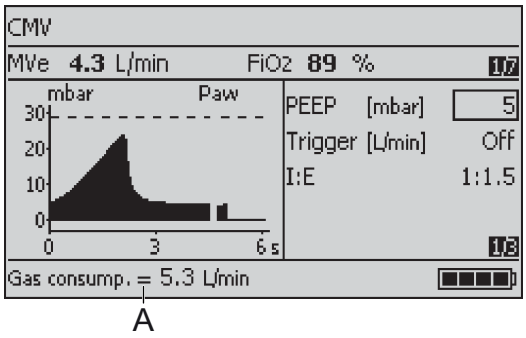
* Average gas consumption of the ventilator: 0.5 L/min

$$\text{Operation time} = \frac{420}{5.8} = \text{approx. 72 minutes}$$

The pneumatic operation time increases when the Oxylog 3000 *plus* operates with an O_2 concentration of less than 100 % O_2, as ambient air is drawn into the device.

The amount of gas from the high-pressure supply, which is currently being consumed, is indicated by the Oxylog 3000 *plus* in the lower left section of the information window in L/min. This display is overwritten when a higher priority message is activated.

Example:



A O_2 consumption = 5.3 L/min

Checking readiness for operation

The device check must be carried out in the following situations:

– Before every use of the device if the breathing hose was changed.

– At least every six months.

The Oxylog 3000 *plus* interrupts the device check if a fault is detected.

The relevant fault is indicated on the screen.

WARNING

The device check must be carried out with the ventilation accessories that will subsequently be used for ventilation. Make no changes afterwards, otherwise there is the risk of inaccurate flow measurement and/or insufficient ventilation.

WARNING

The patient may be endangered if the device check is not completed successfully.

Performing the device check

The device check consists of the following steps:

– Connecting the test lung

– Switching ON the device

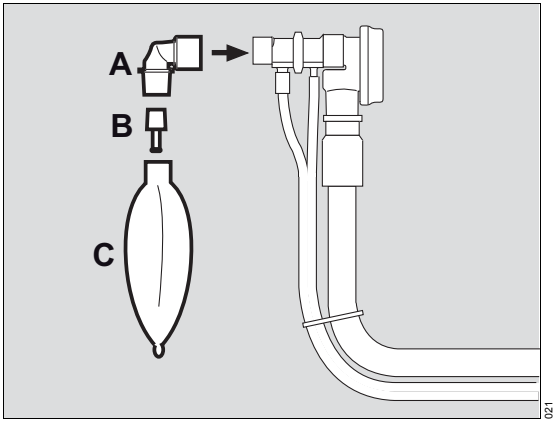
– Checking connections

– System check

– Checking the power supply failure alarm

The duration of the device check is approximately 3 minutes.

Connecting the test lung



1 Make sure that the angled connector (A) is connected to the flow sensor.

2 Connect the connector (B) of the test lung, diameter 7 mm, to the angled connector. The connector simulates the resistance.

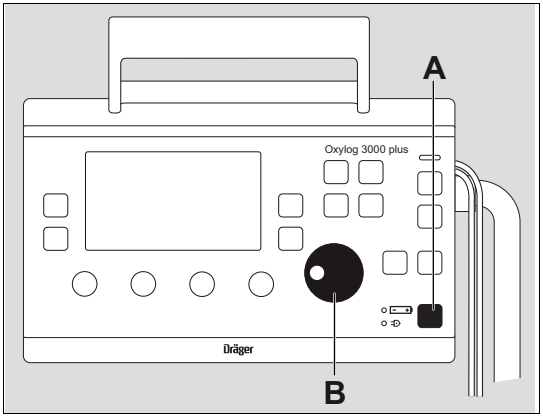
3 Connect the bag (C) of the test lung. Refer to the "List of accessories" on page 165.

NOTE

The Oxylog 3000 *plus* determines MVe and VTe values assuming BTPS conditions, see page 141.

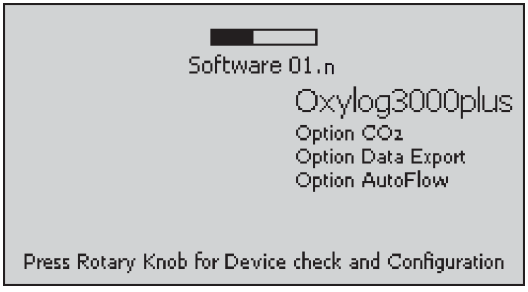
Consequently, the measured values of a patient are not identical to those of a test lung with its expiratory gas in the ATPD (Ambient Temperature and Pressure, Dry) state. Therefore, when a test lung is connected, the MVe and VTe values indicated on the display may differ from the MVe and VTe values set by the user.

Switching ON the device

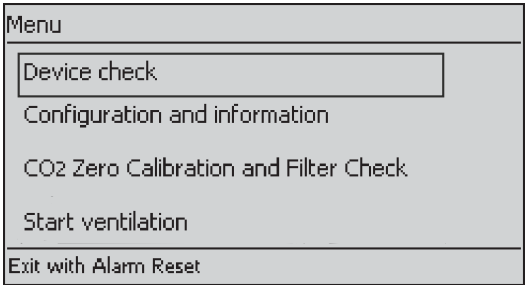


1 To switch the device ON, briefly press the ⏻ key (A).

The device performs a selftest and the user is prompted to activate the configuration menu or device check:
Press rotary knob for device check and configuration



2 Press the rotary knob (B) to confirm, before the progress bar is complete. The start-up screen appears:



3 Select ***Device check*** in the start-up menu and confirm.

NOTE

The device check can be discontinued at any time by pressing the ***Alarm Reset*** key.

NOTE

During device check, the connections (gas supply, hose type) and the system (flow, pressure levels, alarm signals and knobs) are checked.

Checking the connections

1 Ensure that the gas supply has been connected.

2 Select and confirm the appropriate hose type.

3 Ensure that the test lung has been connected.

The Oxylog 3000 *plus* automatically checks if a test lung has been connected. The device check is interrupted if a test lung is not detected within one minute. The check is continued when the test lung is detected.

4 The Oxylog 3000 *plus* automatically checks if the detected hose differs from the selected hose type.

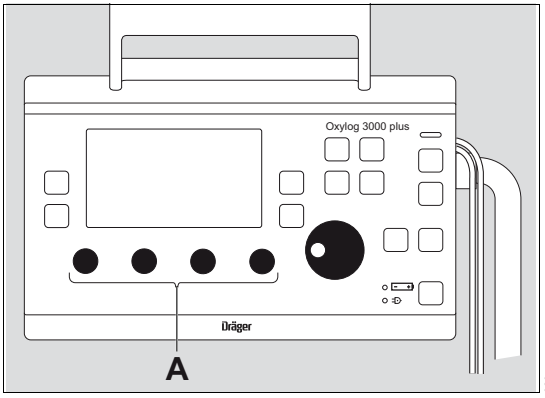
If the wrong hose type is selected:

– Press the ***Alarm Reset*** key to cancel the device check.

– Restart the device check.

– Select the correct hose type.

System check



5 Set the control knobs (A) below the display to the required values.

The Oxylog 3000 *plus* successively activates the audible and optical alarm signals and prompts the user to acknowledge each signal.

6 Confirm the audible and optical alarm signals. The device check continues automatically.

During the automatic test sequence, the Oxylog 3000 *plus* checks the flow, pressure levels and alarm signals. Corresponding sounds are heard.

The progress bar shows the progress made by the check.

The result is displayed on the last page of the device check screens. If all tests are completed successfully, the device will go to the last page. If a test fails, the device will go directly after the failed test to the last page, without performing the other tests.

After confirmation, the system returns to the menu screen.

If the service inspection date has been passed without servicing, the text ***Service date overdue !*** will appear in the window after finishing the device check. In this case the device must be serviced immediately.

High airway pressure and disconnection alarm check

Checking the alarm in case of high airway pressure:

1 Ventilate the test lung in CMV mode.

2 Press the test lung manually, until the airway pressure exceeds the set Pmax.

3 Check if the ***P_{Aw} high*** alarm occurs.

Checking the alarm in case of breathing circuit disconnection:

1 Ventilate the test lung in CMV mode.

2 Disconnect the breathing hose and/or flow measuring lines from the ventilator.

3 Check if an applicable alarm occurs.

Checking the power supply failure alarm

A monthly check of the power supply failure alarm is recommended.

1 Switch the device on.

2 Disconnect the external power supply.

3 Remove the battery to activate the acoustic alarm signal.

4 Listen for the acoustic alarm signal.

NOTE

If no alarm is heard, call DrägerService.

5 When the power supply failure alarm check is completed, re-insert the battery in the battery compartment of the Oxylog 3000 *plus*.

6 Connect the external power supply.

Problem solving

WARNING

The ventilator is ready for operation only after all functional tests have been successfully performed.

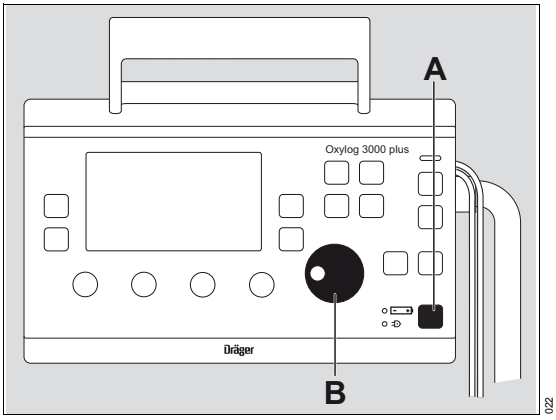
If the device check is not completed successfully:

1 Refer to "Error messages during the device check" on page 120 of the "Problem solving" section.

2 Call DrägerService.

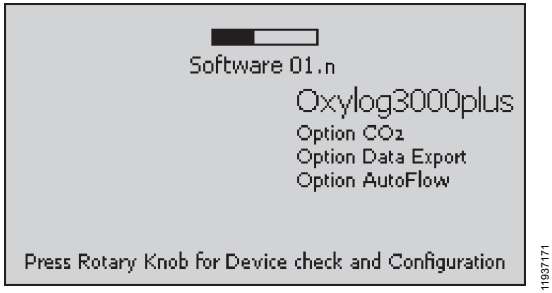
CO_2 zero calibration and filter check before ventilation (optional)

The CO_2 zero calibration and filter check before ventilation only work if the CO_2 option has been installed and the CO_2 sensor is present.

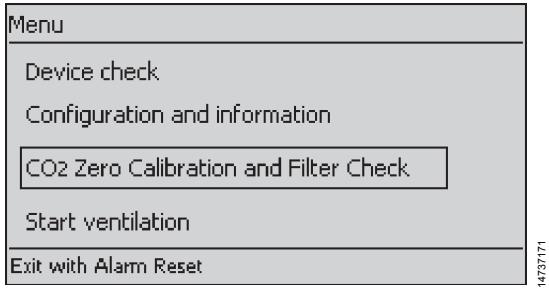


1 To switch the device ON, briefly press the ⏻ key (A).

The device performs a selftest and the user is prompted to activate the configuration menu or device check:
Press rotary knob for device check and configuration



2 Press the rotary knob (B) to confirm, before the progress bar is complete.



3 Select ***CO_2 zero calibration and filter check*** in the start-up menu and confirm.

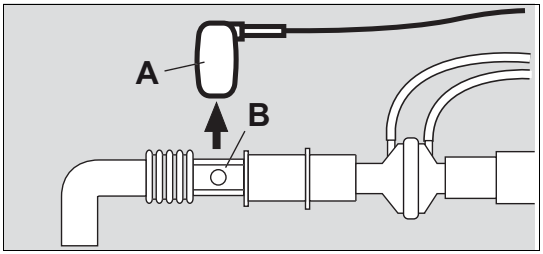
The function ***CO_2 Zero Calibration and Filter check*** is displayed only if the option is available.

NOTE
The CO_2 zero calibration and filter check can be discontinued at any time by pressing the ***Alarm Reset*** key.

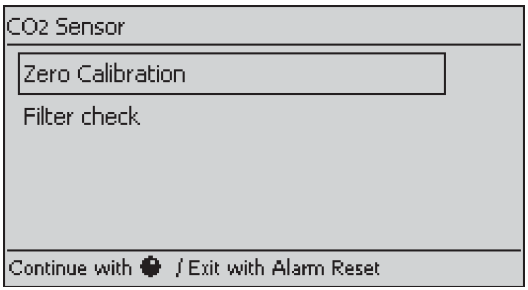
Zero calibration before ventilation

The zero calibration is performed with a clean CO_2 sensor which has been removed from the cuvette!

NOTE
Do not breathe on the CO_2 sensor during zero calibration, otherwise the zero calibration can fail or the zero calibration can pass with an invalid zero value.



1 Remove the CO_2 sensor (A) from the cuvette (B).



2 Select and activate ***Zero calibration***. The screen displays the text ***Remove the sensor from cuvette then press rotary knob***.

3 Confirm. The zero calibration starts and the line displays ***Zero calibration in progress***. After a successful zero calibration, the line briefly displays ***Zero calibration OK***.

4 Press ***Alarm Reset*** to exit.

5 Reconnect the CO_2 sensor to the cuvette.

If zero calibration was not successful:

The Oxylog 3000 *plus* displays the alarm message ***Zero calibration failed***.

- Redo the zero calibration.

If zero calibration is still not possible:

1 Check whether the sensor (A) is soiled and clean it if necessary. If the sensor is defective, replace the sensor.

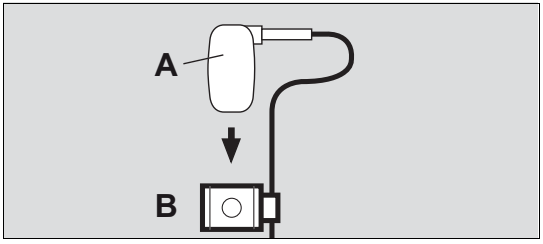
2 Redo the zero calibration.

CO_2 filter check before ventilation

NOTE

Before the CO_2 filter check can be performed, the CO_2 zero calibration must be completed successfully. Otherwise the CO_2 filter check may be outside of the tolerance range.

1 Remove the CO_2 sensor (A) from the cuvette (B).



2 Connect the CO_2 sensor (A) to the test filter (B).

3 Select ***Filter check***.

4 Confirm. The filter check starts and the screen displays ***Filter check in progress***. After a successful filter check, the line briefly displays ***Filter check OK***.

5 Press ***Alarm Reset*** to exit.

6 Reconnect the CO_2 sensor to the cuvette.

If the check was not successful:

The Oxylog 3000 *plus* displays the alarm ***Filter check failed***. The measured CO_2 value is outside the permissible tolerance range.

- Check whether the sensor (A) or test filter (B) is soiled and clean them if necessary. Repeat the CO_2 filter check.

If the check was still not successful:

- Perform the CO_2 gas check, see page 105.

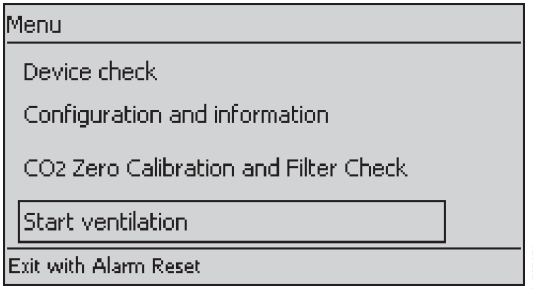
For information on connecting the CO_2 sensor and cuvette, see page 48. For information on CO_2 zero calibration and filter testing during ventilation, see page 91. For information on CO_2 measurement see page 91. For information on CO_2 configuration in Customer Service Mode, see page 103.

Preparation for use after system check, CO_2 zero calibration and CO2 filter check

1 Assemble the Oxylog 3000 *plus* for operation. Refer to the "Assembly" on page 35.

2 Connect to the power supply and gas supply. Refer to "Internal rechargeable battery" on page 37 and "Connecting the gas supply" on page 41.

3 Start the ventilator:



- Select ***Start ventilation*** from the menu and confirm.

Or

- Press the ***Alarm*** **Reset** key.

Operation

Starting operation

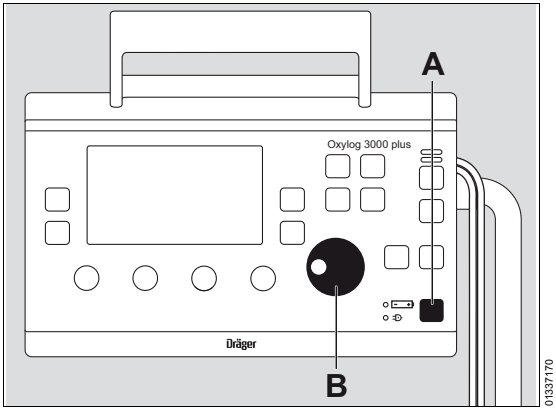
The actual screen display may differ in appearance or configuration.

WARNING

Only use a ventilator that has been cleaned, disinfected and successfully tested to be ready for operation, to prevent a health risk for the patient and user.

Refer to the chapter "Cleaning, Disinfection and Sterilization" on page 121.

Switching ON the device



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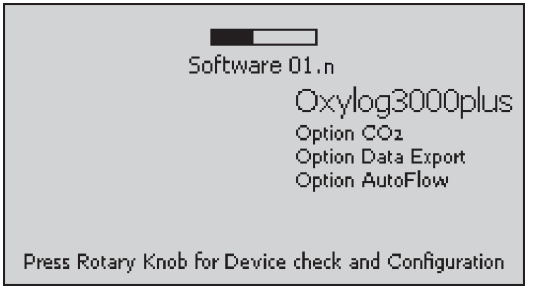
- To switch the device ON, briefly press the ⏻ key (A).



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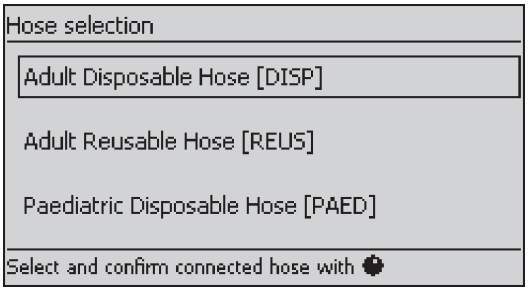
The Oxylog 3000 *plus* performs a selftest. The selftest will be completed in approximately 6 seconds.

During the selftest the start-up screen is briefly displayed. It includes a progress bar indicating the progress of the selftest, the software version, the enabled software options, and the prompt to activate the device check by pressing the rotary knob (B).

If the rotary knob (B) is not pressed during the selftest, the ***hose selection*** page is displayed.



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- Select the connected hose type by turning the rotary knob (B) and confirm by pressing the rotary knob (B).

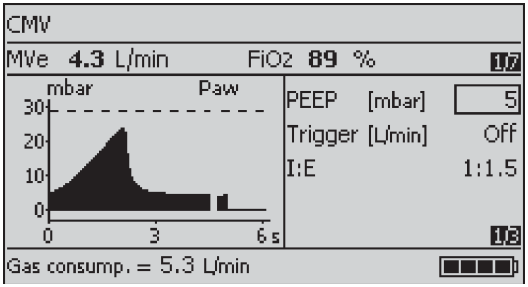
The ventilator now automatically begins ventilation with the default settings.

NOTE

As long as the ***hose selection*** page is shown, the patient is not being ventilated.

NOTE

The menu to select the hose type can be configured. Refer to the "Customer Service Mode" on page 97.



Screen with default settings

The start-up settings can be configured in Customer Service Mode. Refer to the "Setting the start-up settings" on page 98.

Preparing the ventilation mode

Activating the ventilation mode

- Press and hold a ventilation mode key for approximately 3 seconds.

  Or

- Press a ventilation mode key and confirm by pressing the rotary knob.

The new ventilation mode selected is now effective.

For an overview of all ventilation modes, refer to "Range of functions" on page 22. For a detailed explanation on all ventilation modes, refer to "Description" on page 155.

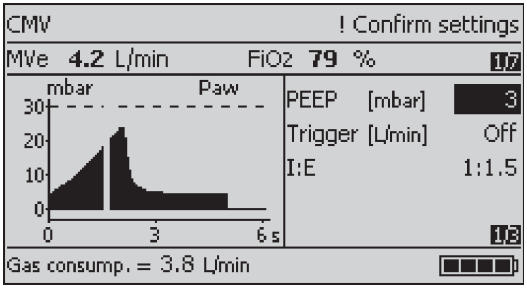
Setting ventilation parameters

- Adjust the relevant control knob below the display.

  Or

- Select, set and confirm a parameter on the display with the rotary knob.

If the changed settings are not confirmed after 5 seconds, the alarm message ***! Confirm settings*** is displayed. If the changed settings are still not confirmed after 10 seconds, the alarm message ***! Settings not confirmed*** is displayed. Ventilation is continued with the previous settings.



If the PEEP setting is increased to above 10 mbar, the message ***Confirm: PEEP > 10 mbar?*** is displayed as a prompt to confirm the change. The PEEP setting can be increased to the desired setting after the message is confirmed with the rotary knob.

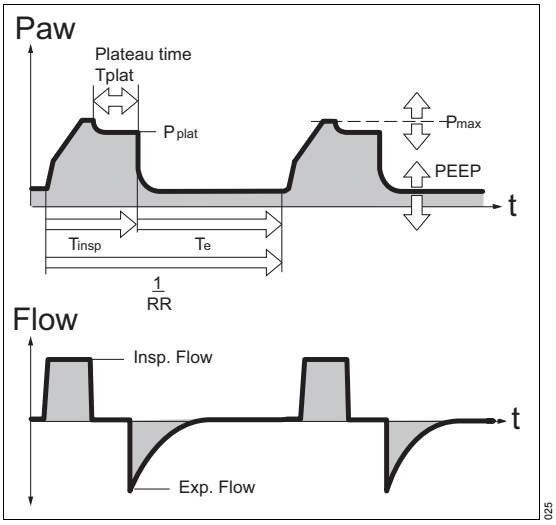
The device can be configured to set ***Ti*** or ***I:E*** as a primary parameter. If ***Ti*** is configured as the primary parameter, ***I:E*** will be shown in the information window when ***Ti*** is selected, and vice versa. This configuration will apply to all ventilation modes. Refer to the "Customer Service Mode" on page 97.

VC-CMV, VC-AC

VC-CMV

Volume **C**ontrolled - **C**ontrolled **M**andatory **V**entilation

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



Set the ventilation pattern with the controls below the display:

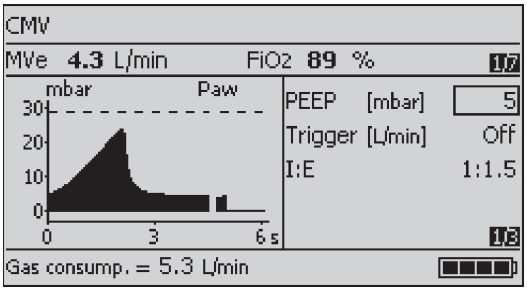
– Tidal volume ***VT***

– Respiratory rate ***RR***
(minimum possible respiratory rate: 5 /min)

– Maximum airway pressure ***Pmax***

– O_2 concentration ***FiO_2***

The following can be set on the display:

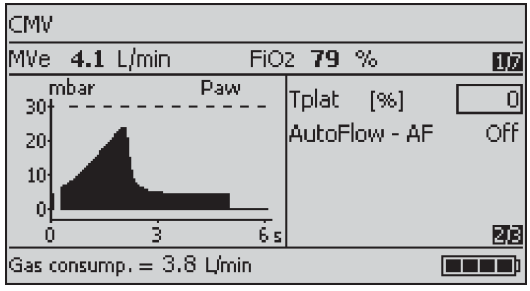


– Positive end-expiratory pressure ***PEEP***

– ***Trigger*** sensitivity

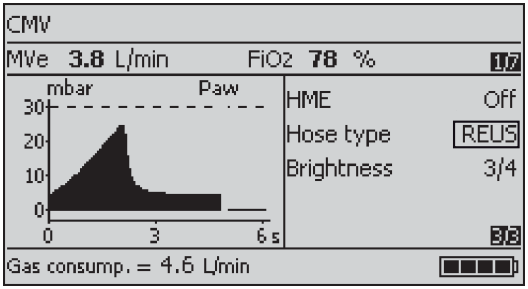
– Ventilation time ratio ***I:E*** or inspiratory time ***Ti***

When setting the respiratory rate ***RR***, tidal volume ***VT*** or ***I:E/Ti***, the associated values for inspiratory flow and ***Ti/I:E*** are automatically displayed in the information window.



– Plateau time ***Tplat*** as a percentage of the inspiratory time

– ***AutoFlow*** (optional)



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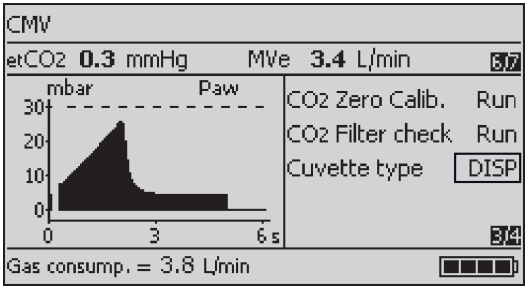
– ***Hose type***

  The selected hose type must match the hose type in use. Otherwise a correct volume measurement cannot be guaranteed.



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– CO_2 cuvette type (optional)

NOTE

The cuvette windows of the reusable cuvette and disposable cuvette have different optical properties. Therefore, the correct cuvette type must be selected in the settings menu. Otherwise the zero point will be shifted by as much as ±8 mmHg CO_2.

VC-AC

VC-AC – **V**olume **C**ontrolled – **A**ssist **C**ontrol

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

NOTE

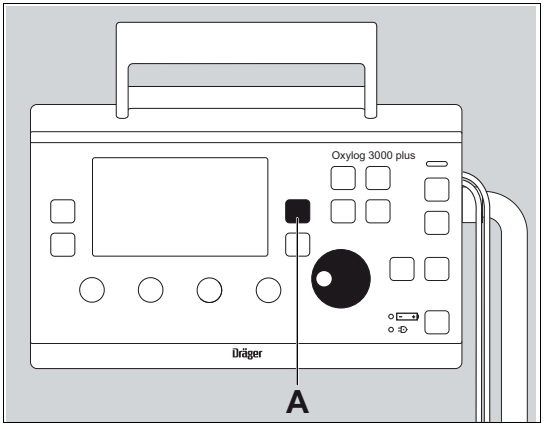
If a trigger value is set in ventilation mode VC-CMV, the ventilation modus changes to VC-AC.

The mandatory breaths are synchronized with the patient's spontaneous inspiratory efforts when the trigger is activated and the trigger sensitivity is set.

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

Successful patient triggering is briefly indicated by an asterisk (*) on the left side of the curve window.

Activating and setting the trigger



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1 Press the ***Settings*** key ▷▷ (A) until the ***Trigger*** parameter is displayed.

2 Select the line ***Trigger*** on the display and then set and confirm the value with the rotary knob. Low value = high sensitivity.

The ventilation mode ***AC*** is shown on the display.

Deactivating the trigger

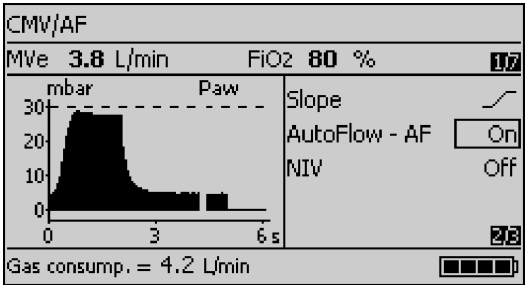
1 Set a value less than 1 L/min or greater than 15 L/min (***off*** is displayed instead of a value).

2 Press the rotary knob to confirm.

The last effective trigger value is adopted by the ventilator when changing from VC-AC to PC-BIPAP or SpnCPAP.

Activating AutoFlow (optional)

The ***AutoFlow-AF*** function can be set for VC-CMV and VC-AC.



When AutoFlow is switched on, the setting ***Tplat*** is no longer valid, and ***Slope*** must be set.

For more information on AutoFlow, refer to "AutoFlow" on page 160.

Cardiopulmonary resuscitation (CPR)

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

The Oxylog 3000 *plus* will try to limit the airway pressure ***Paw*** to the set ***Pmax***, without ending the inspiration prematurely.

However, if due to compressions the airway pressure ***Paw*** exceeds the set ***Pmax*** by 5 mbar, the Oxylog 3000 *plus* cycles to the expiratory phase.

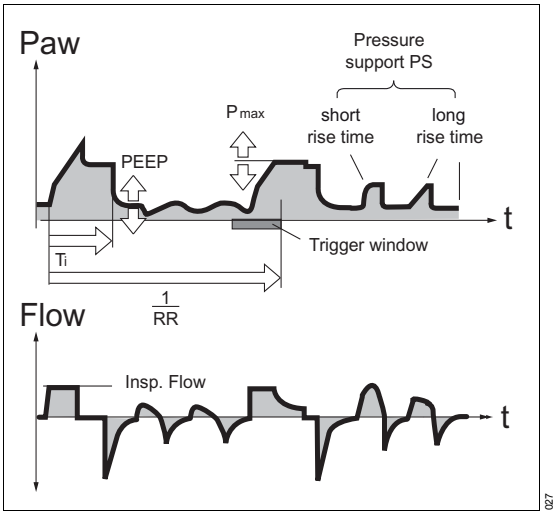
Therefore in general, if ***Pmax*** is set to a higher value, a higher minute volume is possible. However, this increases the intrathoracic pressure and may reduce coronary perfusion.

VC-SIMV, VC-SIMV/PS

VC-SIMV

Volume **C**ontrolled - **S**ynchronized **I**ntermittent **M**andatory **V**entilation

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



A fixed mandatory minute volume ***MV*** 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.

Set the ventilation pattern with the controls below the display:

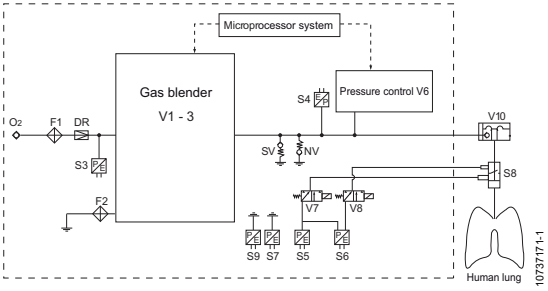
– Tidal volume ***VT***

– Respiratory rate ***RR***
(minimum possible respiratory rate: 2 /min).

– Maximum airway pressure ***Pmax***

– O_2 concentration ***FiO_2***

The following can be set on the display:



– Positive end-expiratory pressure ***PEEP***

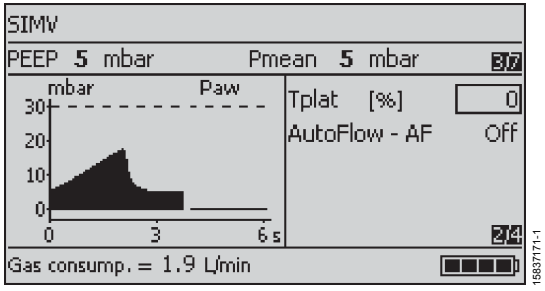
– Pressure Support ***ΔPsupp*** above PEEP

– ***Trigger*** sensitivity

Successful patient triggering is indicated by an asterisk (*) on the left side of the curve window.

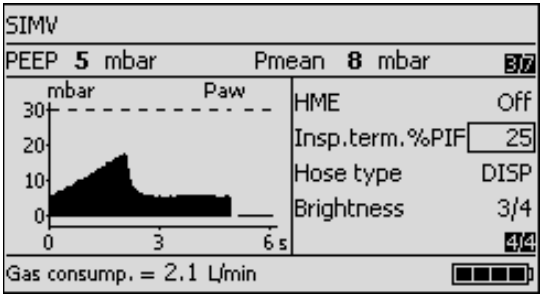
– Ventilation time ratio ***I:E*** or inspiratory time ***Ti***

When setting the respiratory rate ***RR***, tidal volume ***V***T or ***Ti/I:E***, the associated values for inspiratory flow and ***Ti/I:E*** are automatically displayed in the information window.



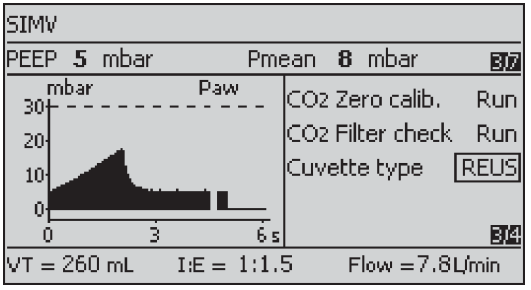
– Plateau time ***Tplat*** as a percentage of the inspiratory time

– ***AutoFlow*** (optional)



– ***Insp.term.%PIF***
  Inspiration termination criteria of pressure supported strokes, as percentage of the peak inspiratory flow (PIF).

– ***Hose type***
  The selected hose type must match the hose type in use. Otherwise a correct volume measurement cannot be guaranteed.



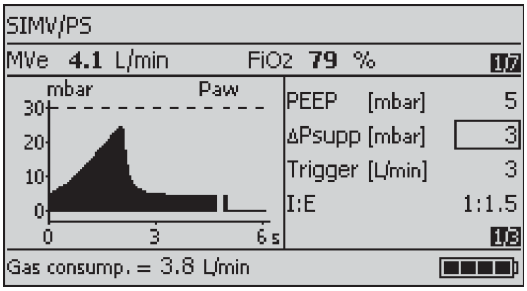
– CO_2 cuvette type (optional)

NOTE

The cuvette windows of the reusable cuvette and disposable cuvette have different optical properties. Therefore, the correct cuvette type must be selected in the settings menu. Otherwise the zero point will be shifted by as much as ±8 mmHg CO_2.

VC-SIMV/PS

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



– Setting on page 1: Pressure Support ***ΔPsupp*** above PEEP

– Setting on page 2: Pressure rise time ***Slope*** (condition: ***ΔPsupp*** > 0 mbar)

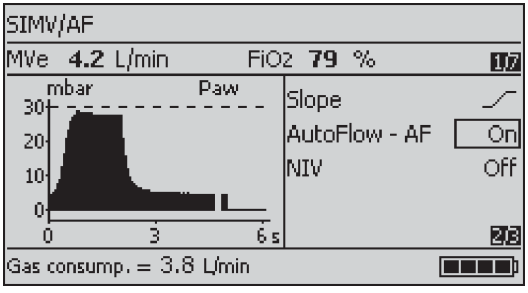
  Flat slope = slow pressure rise

  Medium slope = medium pressure rise

  Steep slope = rapid pressure rise

Setting AutoFlow (optional)

The ***AutoFlow-AF*** function can be set for VC-SIMV and SIMV/PS.



When AutoFlow is switched on, the setting ***Tplat*** is no longer valid, and ***Slope*** must be set.

For more information on AutoFlow, refer to "AutoFlow" on page 160.

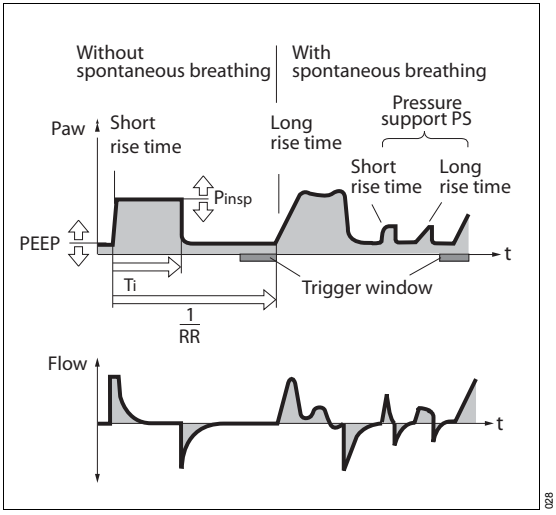
PC-BIPAP, PC-BIPAP/PS

PC-BIPAP

Pressure **C**ontrolled – **B**iphasic **P**ositive **A**irway **P**ressure

Pressure-controlled ventilation combined with spontaneous breathing throughout the respiratory cycle and variable Pressure Support at CPAP level.

For patients without spontaneous breathing and spontaneously breathing patients until shortly before extubation. The patient is weaned by gradually reducing the mandatory portion of the total minute volume ***MV*** and by reducing the Pressure Support ***ΔPsupp***.



The mandatory portion of the total minute volume MV is set via the inspiratory pressure ***Pinsp***, the positive endexspiratory pressure ***PEEP*** and the respiratory rate ***RR***.

Refer to the description on page 159 for details.

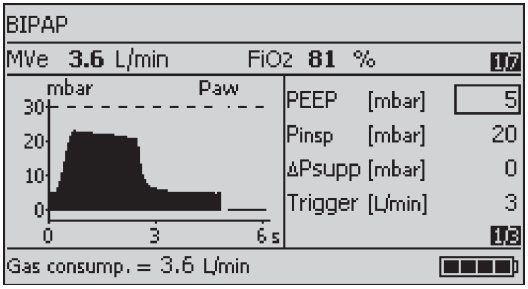
Set the ventilation pattern with the controls below the display:

– Respiratory rate ***RR***

– Maximum airway pressure ***Pmax***

– O_2 concentration ***FiO_2***

The following can be set on the display:

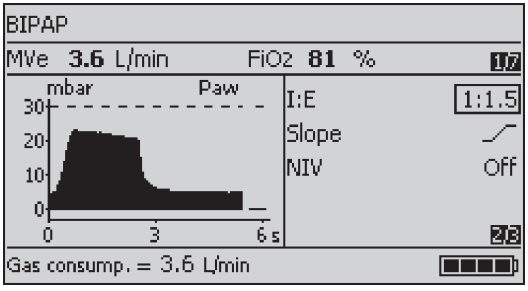


– Positive end-expiratory pressure ***PEEP***

– Inspiratory pressure ***Pinsp***

– Pressure Support ***ΔPsupp*** above PEEP

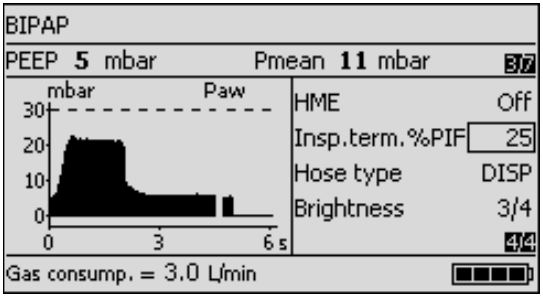
– ***Trigger*** sensitivity
Successful patient triggering is indicated by an asterisk (*) on the left side of the curve window.



– Ventilation time ratio ***I:E*** or inspiratory time ***Ti***

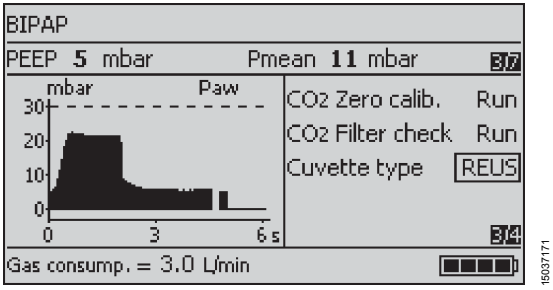
– Pressure rise time ***Slope*** (effective for the PC-BIPAP stroke and Pressure Support ***ΔPsupp***)

– ***NIV*** – non-invasive ventilation
Refer to "Non-invasive ventilation (NIV)" on page 75.



– ***Insp.term.%PIF***
  Inspiration termination criteria of pressure supported strokes, as percentage of the peak inspiratory flow (PIF).

– ***Hose type***
  The selected hose type must match the hose type in use. Otherwise a correct volume measurement cannot be guaranteed.

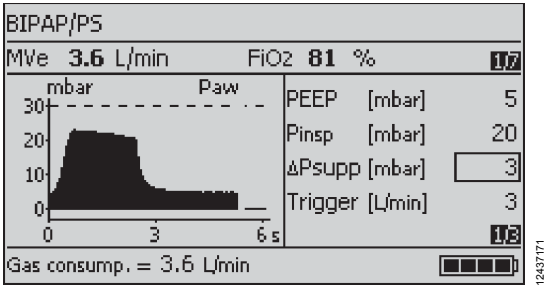


– CO_2 cuvette type (optional)

NOTE
The cuvette windows of the reusable cuvette and disposable cuvette have different optical properties. Therefore, the correct cuvette type must be selected in the settings menu. Otherwise the zero point will be shifted by as much as ±8 mmHg CO_2.

PCBIPAP/PS

The following parameters can be adjusted on-screen in addition to the parameters of ventilation mode PC-BIPAP:



– Setting on page 1: Pressure Support ***ΔPsupp*** above PEEP

– Setting on page 2: Pressure rise time ***Slope***

  Flat slope = slow pressure rise

  Medium slope = medium pressure rise

  Steep slope = rapid pressure rise

Spn-CPAP, Spn-CPAP/PS

SpnCPAP

Spo**n**taneous **C**ontinuous **P**ositive **A**irway **P**ressure

For patients with sufficient spontaneous breathing.

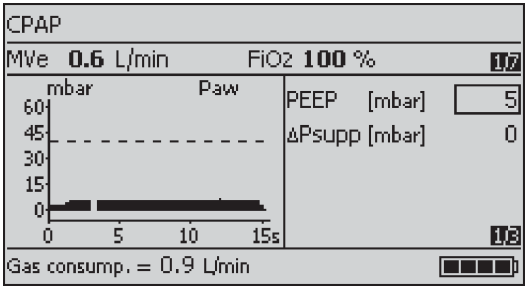
If Pressure Support (PS) is not active, the patient's spontaneous breathing is supported only by an increased PEEP.

Set the ventilation pattern with the controls below the display:

– Maximum airway pressure ***Pmax***

– O2 concentration ***FiO2***

The following can be set on the display:



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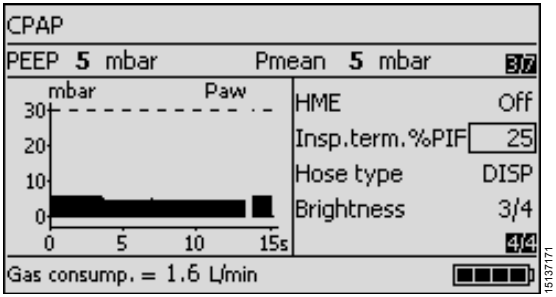
– Positive end-expiratory pressure ***PEEP***

– Pressure Support ***ΔPsupp*** above PEEP

– ***NIV***– non-invasive ventilation
Refer to "Non-invasive ventilation (NIV)" on page 75.



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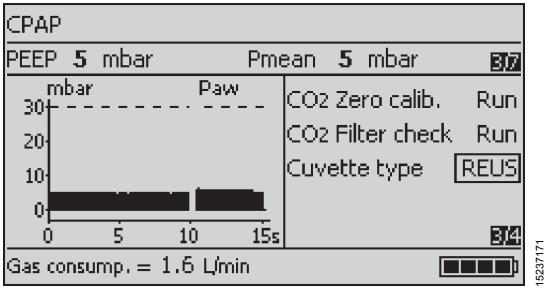
– ***Insp.term.%PIF***
Inspiration termination criteria of pressure supported strokes, as percentage of the peak inspiratory flow (PIF).

– ***Hose type***
The selected hose type must match the hose type in use. Otherwise a correct volume measurement cannot be guaranteed.



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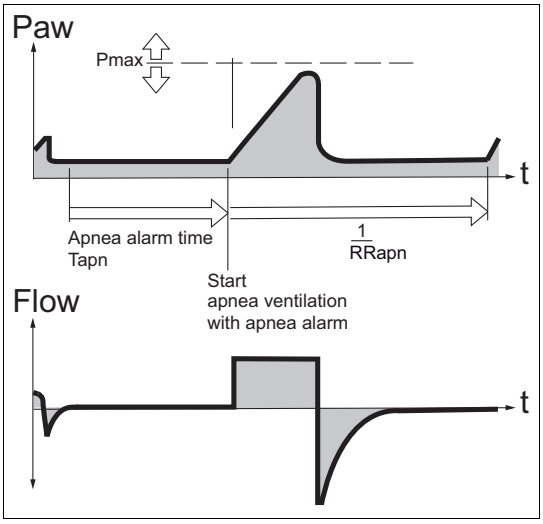
– CO2 cuvette type (optional)

NOTE

The cuvette windows of the reusable cuvette and disposable cuvette have different optical properties. Therefore, the correct cuvette type must be selected in the settings menu. Otherwise the zero point will be shifted by as much as ±8 mmHg CO2.

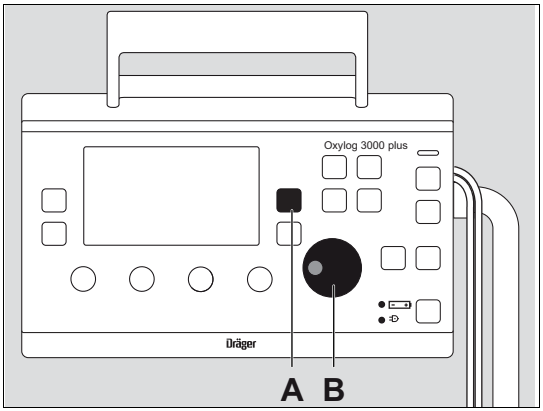
Apnea ventilation



Apnea ventilation is only applicable when using the Spn-CPAP mode. In the event of an apnea, the ventilator will automatically activate volume-controlled mandatory ventilation (VC-CMV).

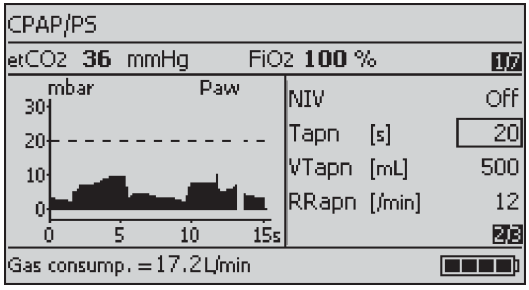
When an apnea occurs, the device issues an alarm signal and, when the alarm time ***Tapn*** has been reached, starts volume-controlled ventilation with the parameters respiratory rate ***RRapn***, tidal volume ***VTapn***, and the maximum airway pressure ***Pmax***. The ventilation time ratio I:E = 1:1.5 and the plateau time ***Tplat =*** 0 are preset during apnea ventilation.

Setting apnea ventilation



1 Set ***Tapn*** with the rotary knob (B) to a value between 15 and 60 seconds.

The parameters ***RRapn*** and ***VTapn*** required for setting apnea ventilation are displayed.



2 Set ***RRapn*** and ***VTapn***.

3 Set ***Pmax*** to set the maximum permissible airway pressure during apnea ventilation.

Ending apnea ventilation

- Press the ***Alarm Reset*** key.

The ventilator is again ventilating with the previous settings in ventilation mode Spn-CPAP.

Deactivating apnea ventilation

- Set ***Tapn*** to OFF.

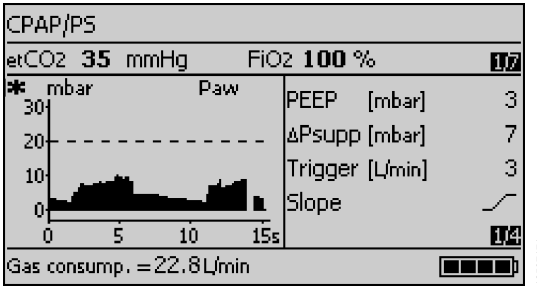
NOTE

Apnea ventilation can only be activated in ventilation mode Spn-CPAP without NIV.

The minimum minute volume required by the patient must be monitored via the lower alarm limit MVe ▼/‾ .

Spn-CPAP/PS

If ***ΔPsupp*** is set to a value above 0 mbar, the following parameters can be adjusted on-screen in addition to those for Spn-CPAP:



– ***Trigger*** sensitivity
  Successful patient triggering is indicated by an asterisk (*) on the left side of the curve window.
– Pressure rise time ***Slope*** (effective for Pressure Support ***ΔPsupp***)

Cardio-pulmonary Resuscitation (CPR)

Refer to the "Cardiopulmonary resuscitation (CPR)" on page 67.

Non-invasive ventilation (NIV)

Use of NIV

NIV can only be activated as a supplementary function in the ventilation modes Spn-CPAP (/PS), PC-BIPAP (/PS), VC-CMV / AF, VC-AC / AF and VC-SIMV / AF. The Oxylog 3000 *plus* automatically adjusts to the requirements of non-invasive ventilation. Mask leakages are detected by the device and compensated for. Therefore, the displayed measured values VTe and MVe include the leakage. The leakage alarm is inactive.

WARNING

If NIV is not active, leakage during ventilation will corrupt the VTe and MVe measured values.

WARNING

Risk of undetected leakage and inadequate ventilation

Ensure that NIV is not activated for intubated patients.

WARNING

Risk of CO_2 rebreathing

Bacterial filters, HMEs and masks increase the resistance and dead space volume of the breathing circuit. Note the manufacturer's directions.

WARNING

Check MVe alarm limits after deactivating NIV mode.

WARNING

Risk of aspiration

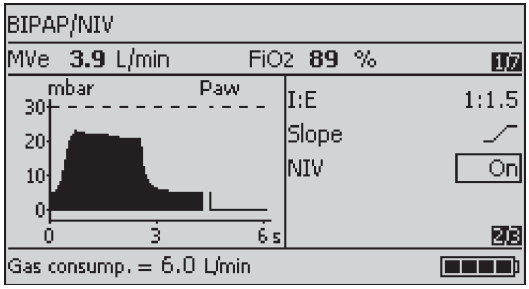
Avoid high airway pressure.

To switch on NIV

1 Select ***NIV off***.

2 Select ***NIV on*** and confirm.

– The suffix ***NIV*** appears in the ventilation mode field.



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WARNING

Risk of inadequate ventilation

The minimum minute volume required by the patient must be monitored via the lower alarm limit MVe .

NOTE

Apnea ventilation is not possible when NIV is active.

Special functions

Manual inspiration/Inspiration hold

The Manual inspiration/Inspiration hold function will either initiate a new manual breath or extend the inspiratory phase of the current breath by up to 15 seconds.

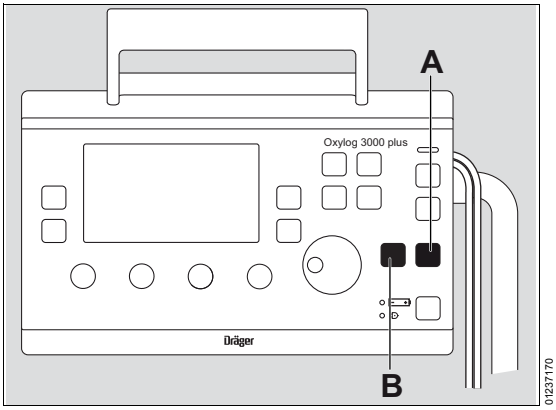
The pattern of the manually started breath corresponds with the set ventilation mode.

This function is not available for:

– Spn-CPAP without PS

– O_2 inhalation (optional)

Activating Manual inspiration/Inspiration hold



- Press the ***Insp. Hold*** (A) key for the desired inspiratory time.

100 % O_2 (optional)

To apply 100 % O_2 for 3 minutes regardless of the momentarily set value.

- Briefly press key ***100 % O_2*** (B).
  Its indicator lights up for 3 minutes.

After the 3 minutes, or when the ***100 % O_2*** key is pressed again, the ventilator continues ventilation with the current set O_2 value. The indicator dims.

O_2 inhalation (optional)

WARNING

The O_2 inhalation function is not a ventilation mode.

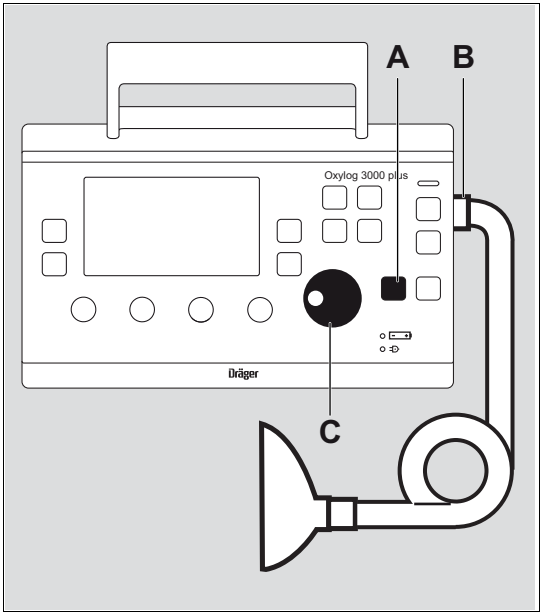
It may only be used for patients with spontaneous breathing who receive a constant O_2 flow of between 0 and 15 L/min via a mask.

If a tracheal stenosis or other obstruction occurs, the flow is interrupted by the ventilator for 5 seconds at an airway pressure of 30 mbar and the airway pressure is reduced to 0 mbar.
The ***!!! Paw high*** alarm is active.

NOTE

The options 100 % O_2 and O_2 inhalation are mutually exclusive.

Activating O_2 inhalation



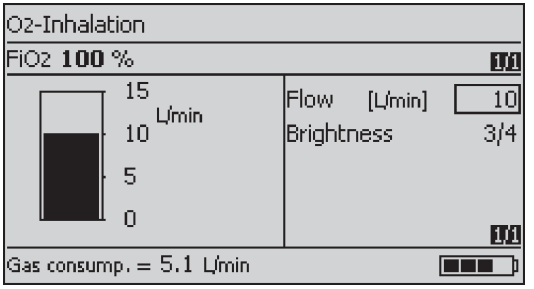
1 Connect the inhalation mask via the hose to the device (B).

2 Press and hold key ***O_2 inhalation*** (A) for approx. 3 seconds.

   O_2 inhalation is performed with the previously effective setting.

3 Set and confirm the required O_2 flow via the rotary knob (C).

Display (example):

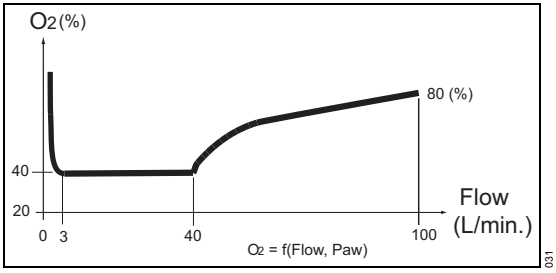


O_2 concentration by "O_2 blending"

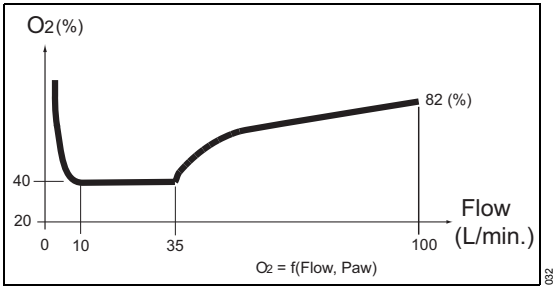
The FiO_2 can be set between 40 % and 100 % O_2 independently of the ventilation mode. To generate the set inspiratory O_2 concentration, ambient air is drawn in using the injector principle.

However, the O_2 concentration which can be realized depends on the mean airway pressure and the inspiratory flow. The O_2 concentration can never be lower than 40 %.

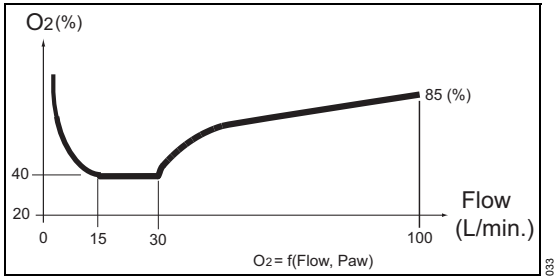
This is shown in the following schematic illustrations:



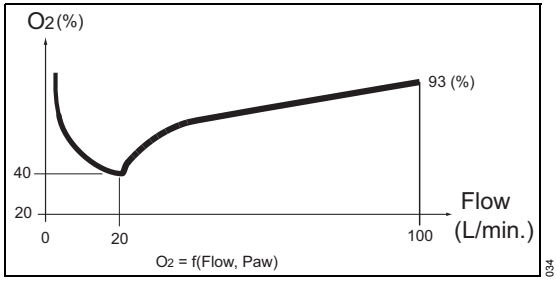
O_2 concentration at a mean airway pressure of 5 mbar



O_2 concentration at a mean airway pressure of 15 mbar



O_2 concentration at a mean airway pressure of 30 mbar



O_2 concentration at a mean airway pressure of 60 mbar

The O_2 concentration is a calculated value. It is not measured by an internal O_2 sensor.

If the Oxylog 3000 *plus* is unable to reach the set O_2 concentration, the user is prompted to correct the setting by the message ***Check settings: FiO_2***.

- Correct setting by control ***FiO_2***.

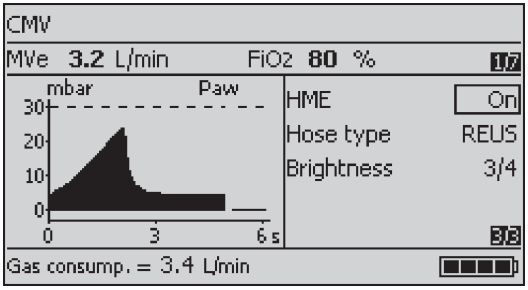
When the O_2 concentration has been set, the value will be displayed after approximately 30 seconds.

When patients are breathing spontaneously, the achievable O_2 concentration will depend on the profile of the inspiratory flow.

Setting the HME correction

The temperature and moisture influence of the HME (heat and moisture exchanger) have an effect on the flow measurement. The Oxylog 3000 *plus* can compensate for the presence of an HME.

- When using HME, select, set and confirm ***HME – On*** in the Settings window with the rotary knob.



When ***HME – ON*** is selected, the flow sensor expects an expiratory gas temperature of 35 °C and a relative humidity of 0 %.

When ***HME – Off*** is selected, the flow sensor expects an expiratory gas temperature of 37 °C and a relative humidity of 100 %.

Calibration

The pressure and flow sensors are automatically calibrated by the device at regular intervals without interrupting ventilation.

The saved calibration values are retained even when the device is switched OFF.

The CO_2 sensor must be calibrated manually if the required CO_2 value is not reached during the CO_2 gas check.

For information on calibration of the CO_2 sensor, refer to "Customer Service Mode" on page 97.

Screen brightness

The screen brightness level can be set on the last page of the settings menu, from level 1/4 to 4/4.

During battery operation, when no controls have been set for a period longer than one minute, the screen will automatically be dimmed (power save mode).

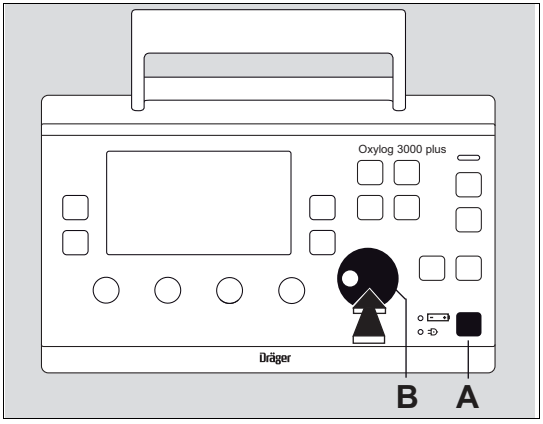
The screen brightness level in power save mode can be adjusted in Customer Service Mode. Refer to the "Customer Service Mode" on page 97.

Alarm volume

The alarm volume can be set on the last page of the alarm menu, from level 1/4 to 4/4.

Shutdown

After disconnecting the patient, switch off the ventilator.



1 To switch the device OFF, hold down the ⏻ key (A) for approximately 3 seconds.

Ventilation is now stopped and a high-priority alarm is issued.
This alarm can be silenced with the 🔕 key.

2 Either:

- Press the rotary knob (B) to confirm switch off.

Or

- Press the ⏻ key (A) to resume ventilation with the previous settings.

NOTE

When the device is switched OFF, the battery is still being charged if the device is connected to an external power source.

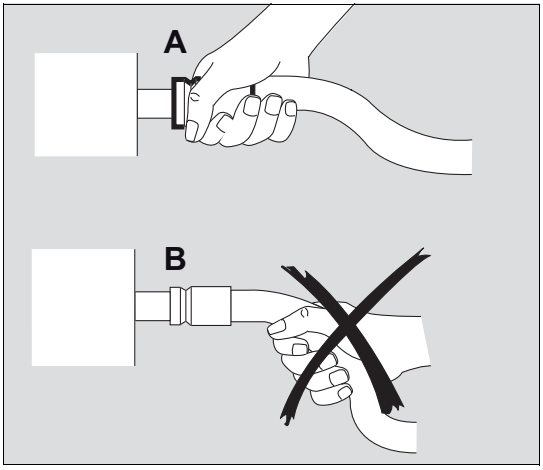
3 With gas supply from an O_2 cylinder:
Close the cylinder valve.

With gas supply from the pipeline gas supply system:
Disconnect the high-pressure connection from the source.

WARNING

The cylinder valve must be closed completely to avoid gas flow leakage by the device.

4 Disconnect the breathing hose.



CAUTION

When disconnecting the breathing hose from the device, always grip the sleeve (A) and never the corrugations (B).

If this is not done, the corrugations or hose may be torn from the sleeve.

This page has been left blank intentionally.

Alarms

Safety information

Position of user relative to alarm system

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

The specified alarm tone volumes apply to a distance of 1 m (39 in) at normal ambient sound volume.

WARNING

Risk when failing to hear alarms

The alarm volume must be adapted to the surroundings (see page 80), and the user must stay within hearing range of the acoustic alarm signal.

This allows for rapid detection of the alarm and appropriate response.

WARNING

Pay special attention in environments where the surrounding noise interferes with hearing the maximum alarm volume of the device (e.g. in a helicopter).

Alarm priorities

The actual screen display may differ in appearance or configuration.

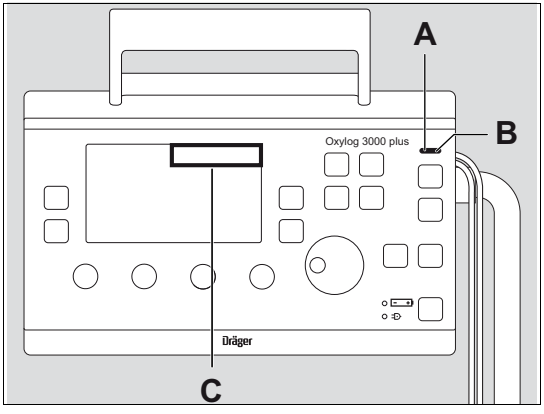
The Oxylog 3000 *plus* assigns priorities to alarms. The alarm message is highlighted with the corresponding number of exclamation marks. Also, different acoustic alarm signals are generated for the various alarm priorities.

!!! = Warning

!! = Caution

! = Note

For information on how to remedy alarm causes, refer to the table "Alarm – Cause – Remedy" on page 110.



Warning

An alarm of high priority

- The alarm indicator (B) flashes red.

Warnings are preceded by three exclamation marks and displayed in inverted form (C).

Example: !!! Apnea ventilation

- The Oxylog 3000 *plus* generates a 5-tone acoustic alarm signal that is repeated twice about every 7 seconds.

Caution

An alarm of medium priority
- The alarm indicator (A) flashes yellow.

Caution messages are preceded by two exclamation marks.

Example: ***!! No int. battery?***

- The Oxylog 3000 *plus* generates a 3-tone acoustic alarm signal that is repeated about every 20 seconds.

Advisory

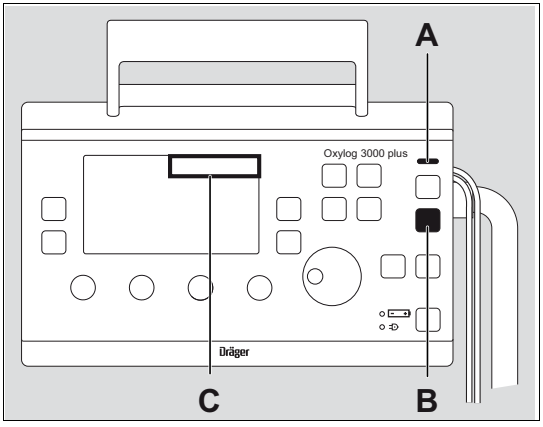
An alarm of low priority
- The yellow alarm indicator (A) lights up.

Advisory messages are preceded by one exclamation mark.

Example:
! Settings not confirmed

- The Oxylog 3000 *plus* generates a 2-tone acoustic alarm signal that sounds only once.

Alarm indication



In case of an alarm, the following visual and acoustic alarm signals are generated:

– The indicator (A) flashes red or yellow, or lights up yellow.

– The alarm message appears on the upper right corner of the screen (C). In addition, alarm tones are issued.

When the cause of an alarm has been remedied, the acoustic alarm signal stops.
The alarm message remains on-screen, however, until the user acknowledged the message with the **Alarm Reset** key or the message is overwritten by a new alarm.

- Press the ***Alarm Reset*** key (B).
  The alarm message is no longer displayed.

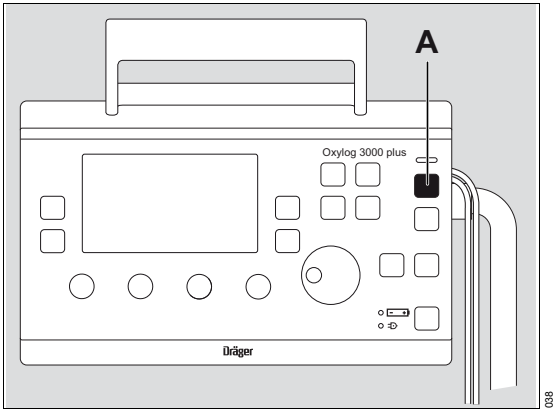
NOTE
Oxylog 3000 *plus* has no distributed alarm system. Data transfer via the data port using the MEDIBUS.X protocol is no substitute for regular checking of the monitoring on the device's display.

Silencing acoustic alarm signals

WARNING

Risk of alarms being unnoticed

Check the display regularly for alarm messages when the acoustic alarm signals are silenced.



- Press the key (A).
  The alarm indicator remains active and all current acoustic alarm signals are silenced for about 2 minutes. Alarms with a higher priority override the alarm tone suppression, meaning they are indicated by an acoustic signal.
  All alarm tones are resumed by the device after these 2 minutes.

NOTE

To be notified of new acoustic alarm signals, the 2 minutes alarm silencing must be reset.

To cancel the silencing before the 2 minutes elapse:

- Press the key (A) again.

In case of power supply failure

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

Spontaneous breathing can continue through the emergency air inlet.

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

Setting alarm limits

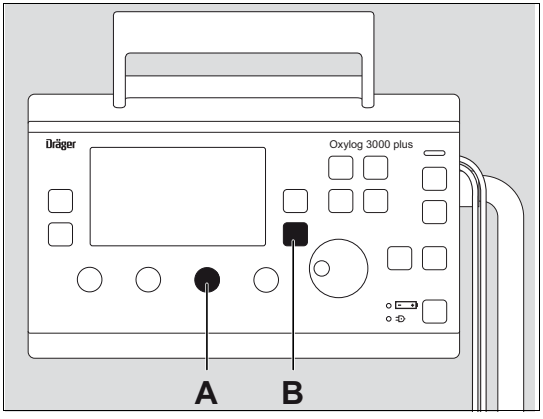
WARNING
Set alarm limits carefully.

Extreme limit settings may render the alarm system useless.

Upper alarm limit for Paw

Regardless of the set ventilation mode, 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. For more details refer to "Cardiopulmonary resuscitation (CPR)" on page 67.

Pmax appears in the pressure curve as a dashed line. When this dashed line is reached, the Oxylog 3000 *plus* issues a ***!!! Paw high*** alarm.



- Set the maximum airway pressure Pmax via the ***Pmax*** control (A).

Lower alarm limit for Paw

The Oxylog 3000 *plus* automatically generates an alarm if the difference between the inspiratory pressure and the expiratory pressure is 5 mbar or less for more than 20 seconds.

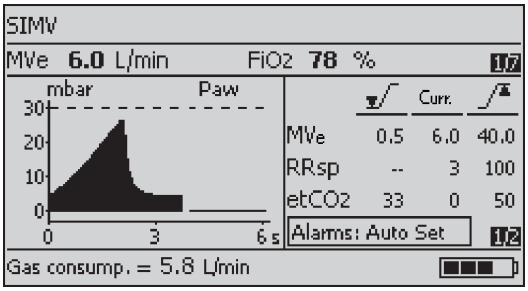
Alarm limits for MVe, RRspon and optionally etCO2

WARNING
Risk of inadequate patient ventilation

The minimum minute volume required by the patient must be monitored via the lower alarm limit MVe ▼⌜ .

1 Press the key ***Alarms*** ▷▷ (B).

Display (example):



2 Select and activate the low alarm limit ▼⌜ or the upper alarm limit ⌞▲ for ***MVe***, **RRspon** or ***etCO2*** on the display.

3 Set and confirm the value.

If the CO2 sensor cable is disconnected, the etCO2 alarm limits are not visible.
If the CO2 sensor cable is disconnected and then reconnected, the previously set alarm limits will still be valid.

For the alarm limit ranges refer to "Alarm limit ranges" on page 142.

Setting alarm limits automatically

WARNING

Risk of hypoventilation

After using the function *Alarms: Autoset*, check if the new alarm limits are appropriate for the patient.

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

1 Press the key ***Alarms*** ▷▷ (B).

2 Select and activate the line ***Alarms: Autoset*** on the display.

3 Press the rotary knob to confirm ***Alarms: Autoset*** or press the ***Alarm Reset*** key to leave the settings unchanged.

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

Alarm		Setting
MVe	▼/	Measured value –20 % with a minimum of 0.5 L/min. At less than 0.5 L/min the limit remains unchanged.
MVe	/▲	Measured value +30 % or +2 L/min, whichever is smaller.
RRsp	/▲	Measured value +5/min with a minimum of 10/min.
$etCO_2$		Based on the current value

The $etCO_2$ ▼/ / ▲ auto alarm limits are based on the actual $etCO_2$ value 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

Monitoring

Displaying curves

The curve window can display the airway pressure curve ***Paw***, the flow curve or the CO_2 curve (optional). Refer to the "On-screen window structure" on page 32.

To display a different curve:

- Press the ***Curves*** 

key.

Displaying measured values

Measured values are displayed in the measured values window.

To switch between the values:

- Press the ***Values*** ▷▷ key: the next value pair is displayed on the screen.

The following values can be displayed:

– MVe
– FiO_2
– f
– VTe
– PEEP
– Pmean
– PIP
– Pplat
– MVespon
– RRspon
– $etCO_2$

When the CO_2 sensor is connected to the ventilator, the $etCO_2$ value will be shown automatically in the measured values window.

The values are shown in pairs; the pairs of values can be configured as required. Refer to the "Customer Service Mode" on page 97.

CO_2 measurement (optional)

CO_2 measurement only works when the CO_2 option has been installed and the CO_2 sensor is connected.

1 Connect the CO_2 sensor and the cuvette (refer to "Connecting the CO_2 sensor and the cuvette" on page 48).

2 Select the cuvette type in the settings menu (refer to "Selecting the cuvette type").

The following will be activated:

– Curve window: CO_2 curve

– Measured values window: the parameter ***etCO2*** will automatically be displayed.

– Alarm window: ***etCO2 high*** and ***etCO2 low*** alarms

For more information on curves and measured values: refer to "Enlarged view of CO_2 curve" on page 34.

For more information on configuring measured value pairs: refer to "Customer Service Mode" on page 97.

For connecting the CO_2 sensor and cuvette, see page 48. For information on CO_2 zero calibration and filter testing before ventilation, see page 58. For information on CO_2 configuration in Customer Service Mode, see page 103.

Selecting the cuvette type

NOTE

The cuvette windows of the reusable cuvette and disposable cuvette have different optical properties. Therefore, the correct cuvette type must be selected in the settings menu. Otherwise the zero point will be shifted by as much as ±8 mmHg CO_2.

To select the cuvette type (reusable or disposable):

1 Press the ***Settings*** ▷▷ key.

2 Select and activate the line ***Cuvette type***.

3 Select the cuvette type and confirm.

NOTE

If a wrong cuvette type is selected, the Oxylog 3000 plus displays the alarm ***!!! Check cuvette type***.

Checking the CO_2 sensor during ventilation

The following checks of the CO_2 sensor are recommended:

Check	Interval
CO_2 zero calibration	Weekly
CO_2 filter check	Monthly

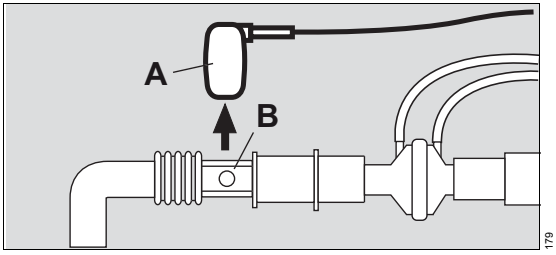
Performing zero calibration during ventilation

The zero calibration is performed with a clean CO_2 sensor that has been removed from the cuvette!

NOTE

Do not breathe on the CO_2 sensor during zero calibration, otherwise the zero calibration can fail or the zero calibration can pass with an invalid zero value.

1 Connect the CO_2 sensor and wait at least 3 minutes for the CO_2 sensor to complete its warm-up phase.



2 Remove the CO_2 sensor (A) from the cuvette (B).

3 Press the ***Settings*** ▷▷ key.

4 Select and activate the line ***CO_2 Zero Calib – Run***. The screen displays the text ***Remove the sensor from cuvette then press rotary knob***.

5 Confirm. The zero calibration starts and the line displays ***Busy***.
Note the possible warm-up time. During zero calibration, ventilation settings can be changed. After a successful zero calibration, the line briefly displays ***Pass***.

6 Attach the CO_2 sensor (A) back to the cuvette (B).

If zero calibration was not successful:

The Oxylog 3000 *plus* displays the alarm ***!!! CO_2 Zero calib. failed***.

- Redo the zero calibration.

If zero calibration is still not possible:

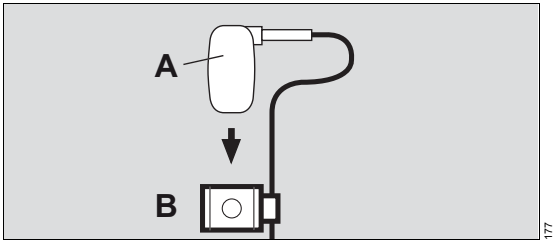
1 Check whether the sensor (A) is soiled and clean it if necessary. If the sensor is defective, replace the sensor.

2 Redo the zero calibration.

Checking the CO_2 filter during ventilation

NOTE

Before the CO_2 filter check can be performed, the CO_2 zero calibration must be completed successfully. Otherwise the CO_2 filter check may be outside of the tolerance range.



1. Remove the CO_2 sensor from the cuvette.
2. Connect the CO_2 sensor (A) to the test filter (B).
3. Press the ***Settings*** ▷▷ key.
4. Select and activate the line ***CO_2 Filter check – Run***.
5. Confirm. The filter check starts and the line displays ***Busy***.
   During the filter check, ventilation settings can be changed.
   After a successful filter check, the line briefly displays ***Pass***.
6. Attach the CO_2 sensor (A) back to the cuvette.

If the check was not successful:

The Oxylog 3000 *plus* displays the alarm ***!!! CO_2 Filter check failed***. The measured CO_2 value is outside the permissible tolerance range.

- Check whether the sensor (A) or test filter (B) is soiled and clean them if necessary. Repeat the CO_2 filter check.

If the check is again not successful:

- Perform the CO_2 gas check, see page 105.

Data communication (optional)

WARNING

Risk due to incorrectly transmitted data

All data sent to other devices via the MEDIBUS.X interface of the device may be displayed incorrectly or incompletely. They are therefore 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 or device monitoring.

With the data communication option, measured values, curves, alarms, and settings can be transferred using the MEDIBUS.X-protocol.

MEDIBUS.X is a software protocol for the transfer of data between the Oxylog 3000 *plus* and an external medical or non-medical device (e.g., patient monitors or computers for data management systems).

The combination of the Oxylog 3000 *plus* and an external device must comply with IEC/EN 60601-1 and IEC/EN 60601-1-2.

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).

Connecting an external device

1 Connect the external device to the data communication cable 57 05 301.

2 Connect the data communication cable to the Oxylog 3000 *plus*.

Serial port

The port for the data communication cable corresponds to an RS232 interface according to EIA RS-232 (CCITT V.24/V.28)

Requirements for the electrical properties of connected devices and networks

The serial port is only suitable for connecting devices or networks which have a maximum nominal voltage of 24 VDC on the network end and which comply with one of the following standards:

– IEC 60950-1: Ungrounded SELV circuits

– IEC 60601-1 (from 2nd edition): Touchable secondary circuits

Connections to IT networks

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 by the hospital's IT officer according to the standard IEC 80001-1 (Risk management for IT networks with medical devices). On the basis of the results, appropriate measures have to be 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

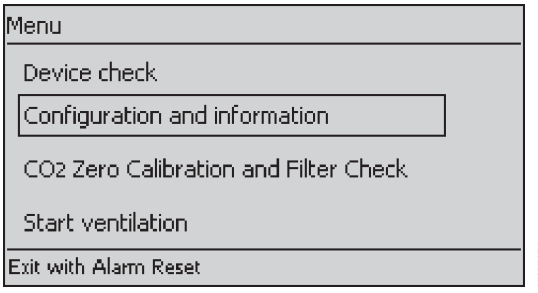
Configuration

Displaying configuration and information

The actual screen display may differ in appearance or configuration.

1 To switch the device ON briefly press the ⏻ key. The device performs a selftest and the user is prompted to activate the configuration menu or device check:
Press rotary knob for device check and configuration.

2 Press the rotary knob to confirm, before the progress bar is complete.
The start-up menu is then displayed:



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3 Select ***Configuration and Information*** and confirm.

The settings made in the ***Configuration*** window are retained after the ventilator is switched OFF.

Configuration can be canceled by pressing the ***Alarm reset*** key.

The following data can be displayed in the ***Configuration*** and ***Information*** windows:

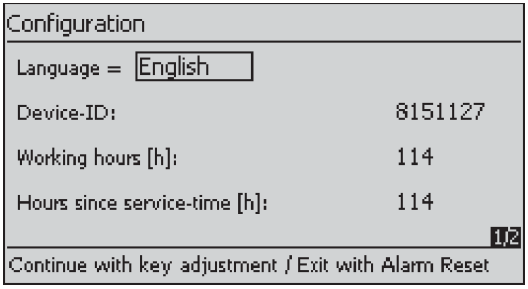
– ***Language***
– Identification No. (***Device ID***)
– Total hours of operation (***Working hours***)
– Hours of operation since the last inspection and maintenance (***Hours since service time***)
– Battery type and battery capacity.

Language

1 Press the key ***Settings*** ▷▷ to select the menu ***Configuration***.

2 Select and activate the line ***Language***.

3 Select the language and confirm.
The new language selected is effective immediately.



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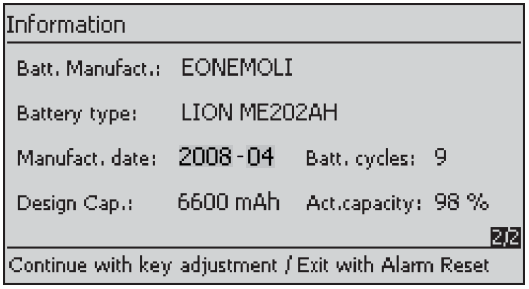
Battery type

- Press the key ***Settings*** ▷▷ to select the menu ***Information***.
The performance data of the inserted battery are displayed on the device.



screen 17

Customer Service Mode

NOTE

Ventilation is not possible when the device is in Customer Service Mode.

NOTE

The following screens are only intended for maintenance personnel and qualified specialists, and are protected against unauthorized adjustment.

For more information regarding access, see page 173.

In Customer Service Mode, the ventilator performs function tests, outputs status information and permits configuration of parameter settings.
The display language in Customer Service Mode is English. It cannot be changed.

001	Set startup settings.	Configure start-up settings, restore manufacturer's default settings.
002	Hose/cuvette start-up settings.	Select which breathing circuit and CO_2 cuvette type to use.
003	Set date and time.	Set date and time.
004	Set measured values display window.	Configure the layout of measured values in the measured values window or restore manufacturer's default settings.
005	Enter activation code.	Enter the activation code for options.
006	Test buttons and potentiometer.	Check for correct functioning of keys and controls.
007	Test loudspeaker, buzzer, LEDs and display.	Check for correct functioning of loudspeaker, buzzer, LEDs and display.
008	Display battery and supply data.	Display of battery data and state of charge.
009	Check safety valve.	Checking of the safety valve.
010	Display info logbook.	Calibration logbook and technical errors in chronological sequence.
011	Display user logbook.	Logbook of operating phases, ventilator settings and alarms.
012	Display maintenance and service contact information.	Display the maintenance schedule and contact information for maintenance personnel.
013	CO_2 sensor.	Check or calibrate the CO_2 sensor.
019	Acoustic alarm configuration	Set the minimum alarm volume and alarm tone type.

Setting the start-up settings

The ranges of the settings are:

Parameter	Range of settings
Ventilation mode (Ventilation mode)	
Trigger (Trigger)	0 (OFF) 1 to 15 L/min
PEEP (PEEP)	0 to 20 mbar
I:E or Ti (I:E or Ti)	Configurable I:E or Ti
I:E (I:E)	1:100 to 50:1
Ti (Ti)	0.2 to 10.0 s
Tplat (Tplat)	0 to 50 %
ΔPsupp (ΔPsupp)	0 to 35 mbar
Slope (Slope)	FLAT, MEDIUM, STEEP (FLAT, MEDIUM, STEEP)
Pinsp (Pinsp)	3 to 55 mbar
O_2 flow (O_2 flow)	0 to 15 L/min
NIV (NIV)	ON, OFF (ON, OFF)
Tapn (Tapn)	0 (OFF) to 60 s
VTapn (VTapn	250 to 2000 mL
VTapn (ped.) (VTapn (ped.))	50 to 250 mL
RRapn (RRapn)	12 to 60 /min
RRapn (ped.) (RRapn (ped.))	12 to 60 /min
MVe-high alarm (MVe-high alarm)	2.0 to 41 L/min
MVe-low alarm (MVe-low alarm)	0.5 to 40 L/min
RR high (RR high)	10 to 100 /min
HME correction (HME correction)	ON, OFF (ON, OFF)
AutoFlow (AutoFlow)	ON, OFF (ON, OFF)
Brightness-min* (Brightness-min*)	1/4 to 4/4
Brightness (Brightness)	1/4 to 4/4
Alarm volume (Alarm volume)	1/4 to 4/4
$etCO_2$-high alarm ($etCO_2$-high alarm)	1 to 100 mmHg
$etCO_2$-low alarm ($etCO_2$-low alarm)	0 to 100 mmHg
CO_2 unit (CO_2 unit)	mmHg, kPa or Vol%
Hose type (Hose type)	Adult disposable (Adult disposable) Adult reusable (Adult reusable) Pediatric disposable (Pediatric disposable)
Cuvette type (Cuvette type)	Disposable (Disposable) Reusable (Reusable)

* Brightness-min: screen brightness level in power save mode. Refer to the "Screen brightness" on page 80.

The default settings are:

Parameter	Default setting
Ventilation mode (Ventilation mode)	VC-CMV
Trigger (Trigger)	0 L/min at VC-CMV, VC-AC and 3 L/min at VC-SIMV, SpnCPAP, PC-BIPAP
PEEP (PEEP)	5 mbar
I:E or Ti (I:E or Ti)	I:E
I:E (I:E)	1.0:1.5
Ti (Ti)	2.0 s
Tplat (Tplat)	0 %
ΔPsupp (ΔPsupp)	0 mbar
Slope (Slope)	MEDIUM (MEDIUM)
Pinsp (Pinsp)	20 mbar
O_2 flow (O_2 flow)	10 L/min
NIV (NIV)	OFF (OFF)
Tapn (Tapn)	0 s (when switched on minimum of 15 s)
VTapn (VTapn	500 mL
VTapn (ped.) (VTapn (ped.))	100 mL
RRapn (RRapn)	12 /min
RRapn (ped.) (RRapn (ped.))	27 /min

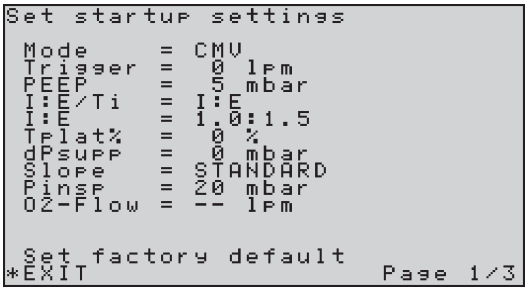
Parameter	Default setting
MVe-high alarm (MVe-high alarm)	40.0 L/min
MVe-low alarm (MVe-low alarm)	0.5 L/min
RRsp-high alarm (RRsp-high alarm)	100 /min
HME correction (HME correction)	OFF (OFF)
AutoFlow (AutoFlow)	OFF (OFF)
Brightness-min* (Brightness-min*)	1/4
Brightness (Brightness)	3/4
Alarm volume (Alarm volume)	3/4
etCO2-high alarm (etCO2-high alarm)	50 mmHg
etCO2-low alarm (etCO2-low alarm)	33 mmHg
CO2 unit (CO2 unit)	mmHg
Hose type (Hose type)	Adult disposable (Adult disposable)
Cuvette type (Cuvette type)	Disposable (Disposable)

* Brightness-min: screen brightness level in power save mode. Refer to the "Screen brightness" on page 80.

WARNING

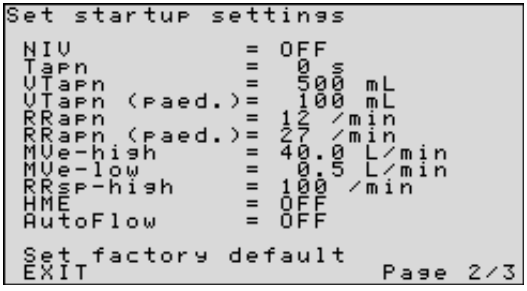
A potential hazard may exist if different start-up alarm settings are configured for the same or similar equipment in any single area, e. g. an emergency department.

The start-up settings for the parameters are displayed on the screen when the ventilator is switched ON. The settings can be adjusted.



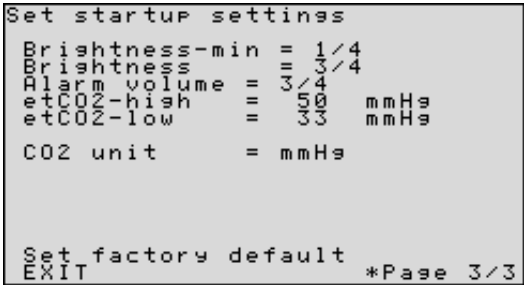
Advance to the second page:

1 Select the ***Page*** (Page) line and confirm with the rotary knob.

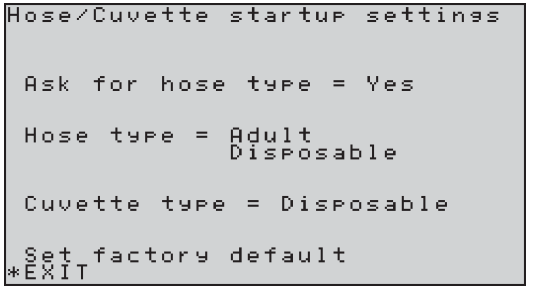


Restore default settings:

2 Select and confirm line ***Set factory default*** (Set factory default).



Configuring the start-up settings for the breathing hose and cuvette



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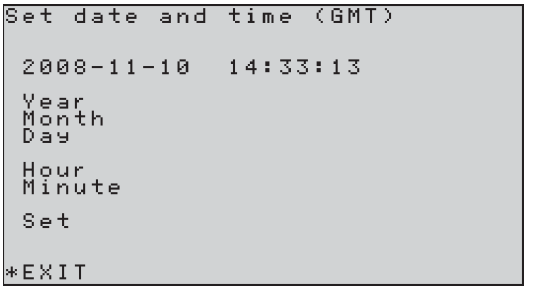
– Ask for hose type = Yes (Ask for hose type = Yes): When switching on the device, prior to ventilation, the user is first prompted to select the hose type.
– Ask for hose type = No (Ask for hose type = No): When switching on the device, it directly starts ventilating after the selftest, with the start-up settings for the breathing hose type.
– Hose type (Hose type): Current start-up setting for the breathing hose (Adult Reusable, Adult Disposable or Pediatric Disposable).
– Cuvette type (optional) (Cuvette type (optional)): Current start-up setting for the CO_2 cuvette type (Reusable or Disposable).

Setting the date and time

The date and time can be set.



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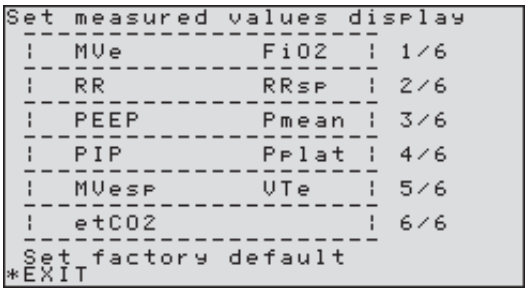
1 Set the current date and time with the positions Year, Month, Day, Hour and Minute (Year, Month, Day, Hour and Minute) and confirm.
2 Confirm date and time with **Set** (Set).

Configuring the measured values windows

In the measured values window, 6 pairs of different values can be displayed. On the 7th page of the Settings window, an overview of all measured values will be displayed.



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The arrangement of measured value pairs on the individual pages of the measured values window can be varied. $etCO_2$ is optional.

NOTE

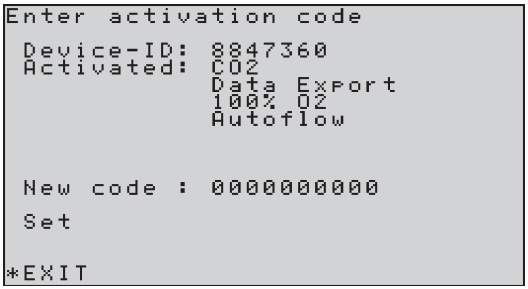
It is advisable to display the FiO_2 value during ventilation.

Each measured value can be freely selected in any position and is only displayed at that position.

To define the 11 values displayed:

- Start configuration on page 1/6 and continue through to 6/6.

Activating options



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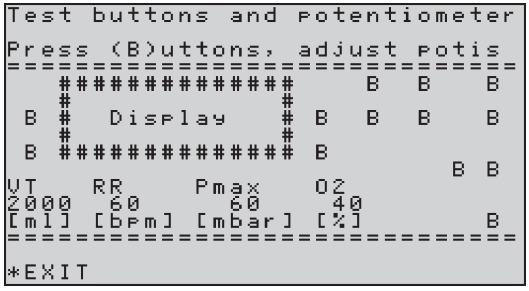
The activation codes for options can be entered. The activated options are then displayed.
For the possible options, refer to "List of accessories" on page 165.

Checking keys and control knobs



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The operating elements on the front panel are displayed schematically on the screen.

– Display = screen
– B = buttons

To test the control knobs, set the following values:

– ***VT*** to 500 mL
– ***RR*** to 20/min
– ***Pmax*** to 40 mbar
– ***FiO2*** to 40 %

These settings are displayed on the screen.

To test the buttons:

1 Briefly press the corresponding button.
The associated letter on the screen changes from "B" to "X". If the button has an indicator, it will be illuminated by the device. If there are buttons without an indicator, the yellow warning indicator will light up on the device.

NOTE

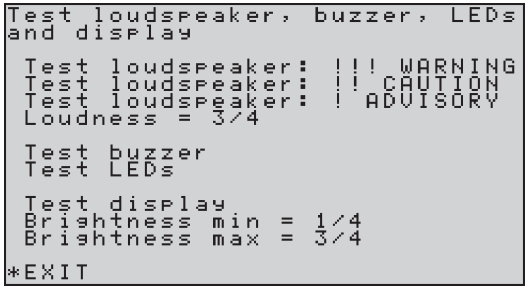
If you press the ⏻ key for longer than 3 seconds, the ventilator switches OFF.

The function of the rotary knob is not included in the test.

Checking the loudspeaker, buzzer, LEDs and display

To test the loudspeaker, buzzer, all LEDs and the display:

1 Select the required test.



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2 Confirm the selection by pressing the rotary knob. The requested function is tested by the device.

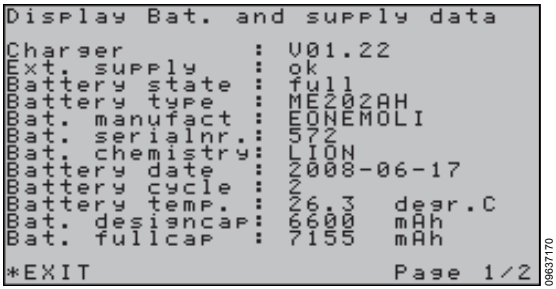
To test the screen display (Test display).

3 Turn the rotary knob; various test cards are displayed.

The selected test remains active until the rotary knob is pressed again.

Displaying power supply data

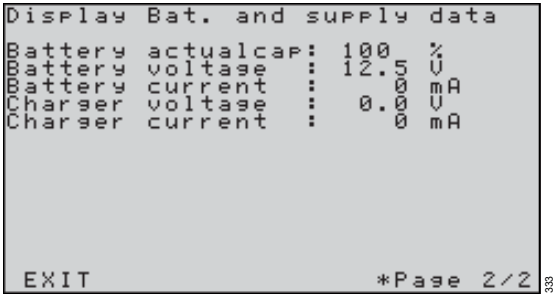
The parameters of the rechargeable battery and the status of the external power supply are displayed.
Display (example):



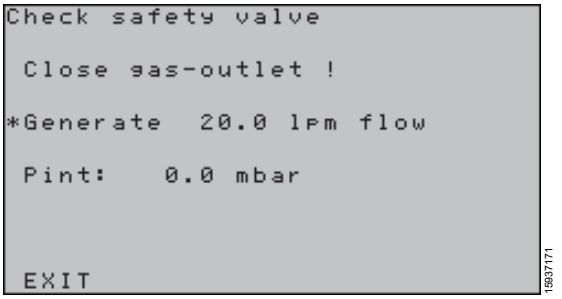
Advance to the second page:

- Select line ***Page*** (Page), confirm and turn the rotary knob.

Display (example):



Checking the safety valve



For safety inspection, a flow can be generated to test the safety valve.

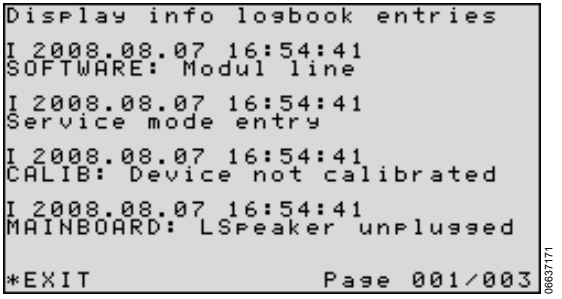
Displaying the technical logbook

Any technical errors and/or special occurrences, such as activation of a software option, completion of the device check and device calibration, are listed in chronological sequence.

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

A maximum of 570 logbook entries can be displayed on the screen. When the capacity of the logbook is reached, the oldest entries are overwritten.

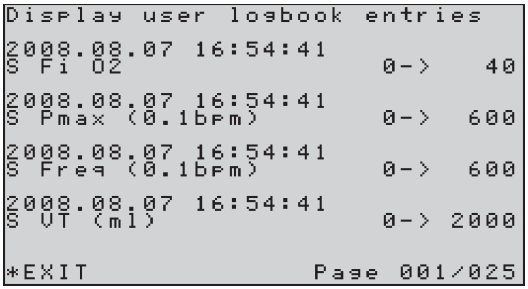
Display (example):



To advance to the next page:

- Select line ***Page*** (Page), confirm and turn the rotary knob.

Displaying the user logbook



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The operational phases (including switching the device off and on) with the device settings and the time are listed in chronological order.

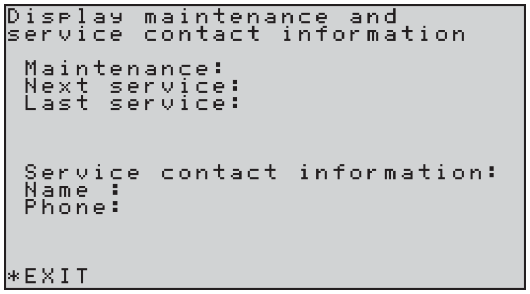
The entries in the logbook cannot be deleted and are retained when the device is switched on and off or after a power supply failure.

A maximum of 935 logbook entries can be displayed on the screen. When the capacity of the logbook is reached, the oldest entries are overwritten. For alarms, only the occurrence of the alarm condition is recorded.

To advance to the next page:

- Select line ***Page*** (Page), confirm and turn the rotary knob.

Displaying contact details for maintenance and service



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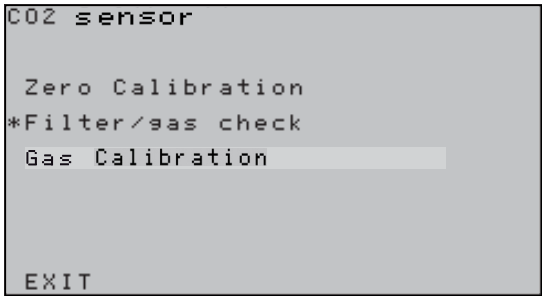
The maintenance schedule and contact details for maintenance personnel are displayed. The message ***Service date overdue !*** (Service date overdue !) is shown if service is needed.

Checking and calibrating the CO_2 sensor



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Prerequisite: The CO_2 option is activated. The following actions can be selected:

- Zero Calibration (Zero Calibration);
- Filter/gas check (Filter/gas check);
  - Filter check (Filter check);
  - Gas check (Gas check);
- Gas Calibration (Gas Calibration);
  - Start gas calibration (Start gas calibration);
  - Reset to factory defaults (Reset to factory defaults)

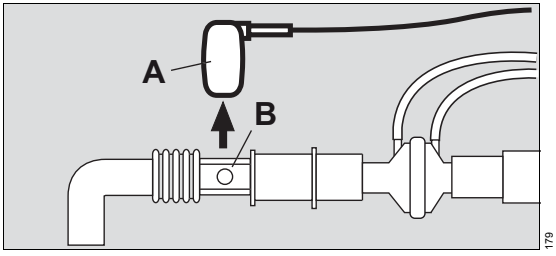
Performing zero calibration

NOTE

Do not breathe on the CO_2 sensor during zero calibration, otherwise the zero calibration can fail or the zero calibration can pass with an invalid zero value.

1 Connect the CO_2 sensor to the ventilator. Wait at least 3 minutes for the CO_2 sensor to complete its warm-up phase.

2 Remove the CO_2 sensor (A) from the cuvette (B).



3 Open page ***CO_2 sensor*** (CO_2 sensor), select the line ***Zero calibration*** (Zero calibration) and confirm. The screen displays the text ***Remove sensor from cuvette*** (Remove sensor from cuvette).

4 Confirm with the rotary knob. The Oxylog 3000 *plus* performs the zero calibration and displays the message ***Zero calibration in progress*** (Zero calibration in progress).

If zero calibration was successful:

After approx. 5 seconds the Oxylog 3000 *plus* confirms with the message ***Zero calibration successful*** (Zero calibration successful).

If zero calibration was not successful:

The Oxylog 3000 *plus* displays the alarm message ***Zero calibration failed*** (Zero calibration failed).

- Redo the zero calibration.

If zero calibration is still not possible:

1 Check whether the sensor (A) is soiled and clean it if necessary. If the sensor is defective, replace the sensor.

2 Redo the zero calibration.

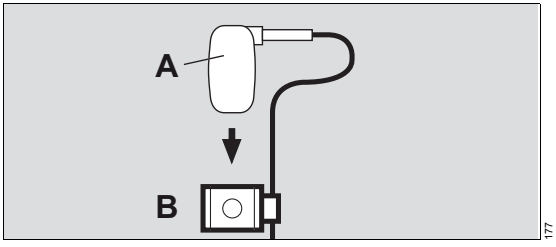
Performing the CO_2 filter check

NOTE

Before the CO_2 filter check can be performed, the CO_2 zero calibration must be completed successfully. Otherwise the CO_2 filter check may be outside of the tolerance range.

1 Open page ***CO_2 sensor*** (CO_2 sensor), select the line ***Filter/gas check*** (Filter/gas check) and then the line ***Filter check*** (Filter check) and confirm. The screen displays the text: ***Place sensor on test filter*** (Place sensor on test filter).

2 Remove the CO_2 sensor from the cuvette and attach the CO_2 sensor (A) to the test filter (B) of the sensor cable.



3 Confirm with the rotary knob. The Oxylog 3000 *plus* performs the filter check and displays the message ***Filter check in progress*** (Filter check in progress).

If the check was successful:

The Oxylog 3000 *plus* displays the message ***Filter check successful*** (Filter check successful). The measured CO_2 value is within the permissible tolerance range.

If the check was not successful:

The Oxylog 3000 *plus* displays the alarm message ***Filter check failed*** (Filter check failed). The measured CO_2 value is outside the permissible tolerance range.

- Check whether the sensor (A) or test filter (B) is soiled and clean them if necessary. Repeat the CO_2 filter check.

If the check was still not successful:

- Perform the CO_2 gas check.

Performing the CO_2 gas check

Perform the CO_2 gas check if the required CO_2 value is not reached during the CO_2 filter check.

NOTE

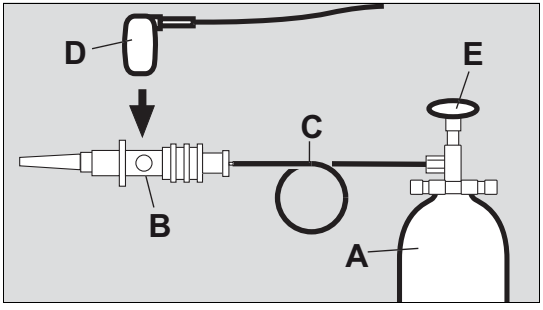
Before the CO_2 gas check can be performed, the CO_2 zero calibration must be completed successfully. Otherwise the CO_2 gas check may be outside of the tolerance range.

NOTE

For the CO_2 gas check use only a test gas composed of CO_2 and N_2.

Otherwise values other than ±0.5 Vol% CO_2 may be displayed.

1 Use the reusable cuvette from the calibration set.



2 Connect the test gas cylinder (A) and the cuvette (B) of the calibration set to the hose (C).

3 Fit the CO_2 sensor (D) on the cuvette (B) of the calibration set and connect the CO_2 sensor to the ventilator.

4 Open the page ***CO_2 sensor*** (CO_2 sensor), select the line ***Filter/gas check*** (Filter/gas check) and then the line ***Gas check*** (Gas check) and confirm. The display now shows ***Turn on test gas*** (Turn on test gas).

5 Read the CO_2 concentration of the test gas from the test gas cylinder (A).

6 Open the test gas cylinder (E) and set the test gas flow to 0.1 L/min. Select ***CONTINUE*** (CONTINUE) and confirm with the rotary knob.

7 The Oxylog 3000 *plus* displays the CO_2 concentration ***Measured CO_2 value*** (Measured CO_2 value).

8 About 1 minute after setting the test gas flow, check if the displayed CO_2 value matches the CO_2 concentration specified on the test gas cylinder (tolerance: ±0.2 Vol%).

9 Close the test gas cylinder.

If the measured CO_2 value is outside the permitted tolerance, the CO_2 sensor must be recalibrated with test gas.

CO_2 calibration with test gas

The CO_2 sensor must be calibrated if the required CO_2 value is not reached during the CO_2 gas check.

NOTE

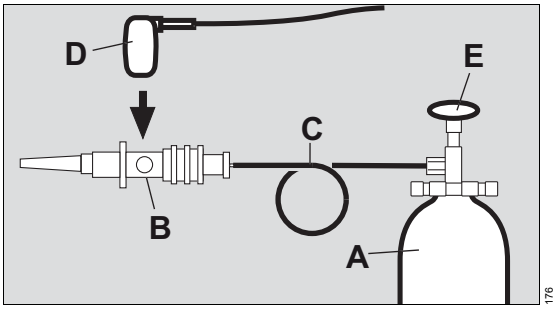
Before the CO_2 calibration with test gas can be performed, the CO_2 zero calibration must be completed successfully. Otherwise the CO_2 calibration with test gas may be outside of the tolerance range.

NOTE

For the calibration use only a test gas composed of CO_2 and N_2.

Otherwise values other than ±0.5 Vol% CO_2 may be displayed.

1 Use the reusable cuvette from the calibration set.



2 Connect the test gas cylinder (A) and the cuvette (B) of the calibration set to the hose (C).

3 Fit the CO_2 sensor (D) on the cuvette (B) of the calibration set and connect the CO_2 sensor to the ventilator.

4 Open the page ***CO_2 sensor*** (CO_2 sensor), select the line ***Gas calibration*** (Gas calibration) and then ***Start gas calibration*** (Start gas calibration) and confirm.

5 Enter the CO_2 test gas concentration in the line ***Set gas conc.*** (Set gas concentration) with the rotary knob and confirm. This value can be found on the test gas cylinder (A).

6 Select the line ***Start gas calibration*** (Start gas calibration) and confirm with the rotary knob. The display now shows ***Turn on test gas*** (Turn on test gas).

7 Open the test gas cylinder (E) and set the test gas flow to 0.1 L/min.

8 About 1 minute after setting this test gas flow, select ***CONTINUE*** (CONTINUE) and confirm with the rotary knob.

The Oxylog 3000 *plus* starts the calibration of the CO_2 sensor and displays the progress and result of the calibration in the message field.

9 Close the test gas cylinder.

If calibration was successful:

The Oxylog 3000 *plus* displays the message ***Calibration successful*** (Calibration successful).

If calibration was not successful:

The Oxylog 3000 *plus* displays the message ***Calibration failed*** (Calibration failed).

If calibration failed, the following causes are possible:

Cause	Remedy
The entered CO_2 concentration does not match the value on the test gas cylinder (A).	Check the entered CO_2 concentration.
The test gas cylinder is empty.	Use a new test gas cylinder.
The CO_2 sensor is defective.	Replace the CO_2 sensor.

- Repeat the calibration of the CO_2 sensor.

Resetting the calibration of the CO_2 sensor

If problems occurred during calibration, the sensor can be reset to the factory default values.

- Open page ***CO_2 sensor*** (CO_2 sensor), select the line ***Gas calibration*** (Gas calibration) and then the line ***Reset to factory default*** (Reset to factory default) and confirm.

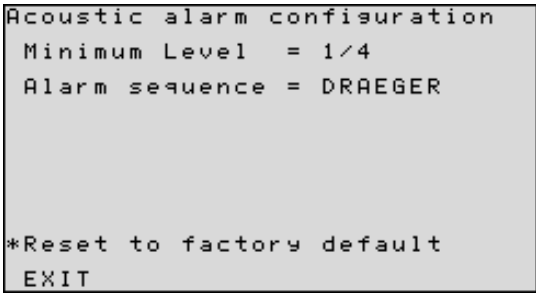
The factory-set calibration value is effective again after approx. 5 seconds.

- Perform a correct calibration of the CO_2 sensor as soon as possible.

If the calibration was unsuccessful, the previously valid calibration remains effective.

For connecting the CO_2 sensor and cuvette, see page 48. For information on CO_2 zero calibration and filter testing before ventilation, see page 58. For information on CO_2 zero calibration and filter testing during ventilation, see page 91. For information on CO_2 measurement see page 91.

Setting the minimum alarm volume



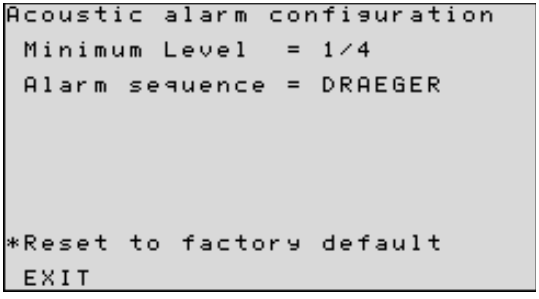
1 Select the ***Minimum Level*** (Minimum Level) line and confirm.

2 Select the minimum alarm volume by turning the rotary knob and confirm.

NOTE

The user cannot set an alarm volume below the set minimum alarm volume.

Setting the alarm tone type



1 Select the ***Alarm sequence*** (Alarm sequence) line and confirm.

2 Select the alarm tone type ***DRAEGER*** or ***IEC*** by turning the rotary knob and confirm.

NOTE

The user cannot change the preset alarm tone type.

Exiting Customer Service Mode

1 Press the key ⏻ for approximately 3 seconds; the indicator flashes yellow.

To turn ventilation on:

2 Briefly press the key ⏻.

Procedure to switch off the device:

3 Press the rotary knob.

Customer service manual

For further information on the Oxylog 3000 *plus*, refer to the Service Manual (can be ordered through DrägerService).

Problem solving

Alarm – Cause – Remedy

The Oxylog 3000 *plus* prioritizes alarms and identifies them accordingly by means of exclamation marks:

!!!	**Warning**	High-priority alarm message
!!	**Caution**	Medium-priority alarm message
!	**Note**	Low-priority alarm message

In the following table, the alarm messages are listed in alphabetical order. 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 cause of the alarm has been resolved.

When multiple alarms occur, they are displayed according to their alarm rank, as illustrated in the table below. A lower number has a higher rank.

Messages in the alarm message field

	Alarm	Cause	Remedy	Rank
!!!	***Apnea***	Spontaneous breathing by the patient has failed, or disconnection.	Check patient condition. Ventilate in VC-CMV mode. Ensure that hose connections are tight.	9
		Faulty flow sensor.	Replace the flow sensor.	
!!!	***Apnea ventilation*** (only for CPAP)	The ventilator has automatically switched over to mandatory ventilation after detecting an apnea (only in Spn-CPAP mode).	Check patient condition. Check ventilation settings To return to the original ventilation mode: Press the ***Alarm Reset*** key.	8
!!	***Charge int. battery***	The Oxylog 3000 *plus* draws its power from the internal battery due to the absence of an external power supply. There are only approximately 10 minutes of operating time remaining in the internal battery.	The ventilator must immediately be reconnected to the mains power supply or an onboard power supply, or a fully charged battery must be installed (ventilation stops while installing the battery).	33

	Alarm	Cause	Remedy	Rank
!!!	***Check cuvette type***	An incorrect CO_2 cuvette type is selected.	Select correct cuvette type.	22
		Cuvette or sensor soiled.	Clean cuvette or sensor, or replace cuvette.	
		Zero point of the CO_2 sensor is outside the tolerance range.	Perform the zero calibration.	
		Inspiratory CO_2 concentration high.	Check patient status and ventilation.	
!!!	***Check measuring lines***	The flow measuring lines are connected incorrectly.	Connect the flow measuring lines correctly.	10
!	***Check settings FiO_2***	The set FiO_2 concentration cannot be achieved with the set flow.	Adjust inspiratory flow or FiO_2 concentration (in accordance with measured value).	44
!!	***Check settings: flow***	The flow resulting from the settings for tidal volume ***VT*** relative to ***Ti*** or ***I:E*** is not achievable (specified range 4 to 100 L/min).	Change tidal volume ***VT*** or inspiratory time ***Ti*** or ventilation time ratio*I:E*, plateau time ***Tplat***, or respiratory rate ***RR***.	30
!!	***Check settings: time***	The inspiratory and / or expiratory time resulting from the settings for ***RR*** and ***I:E*** or ***Ti*** are not possible.	Change ***RR*** or ***I:E*** or ***Ti***.	29
!!	***Clean the CO_2 cuvette***	The sensor or cuvette window is soiled.	Clean sensor and cuvette window or replace cuvette.	21
			Perform the zero calibration.	
!!	***CO_2 Filter check failed***	The sensor reports a filter check failure.	Perform the zero calibration.	24
			Do not breathe on the CO_2 sensor during the filter check.	
			Clean CO_2 test filter or CO_2 sensor.	
			Perform the CO_2 gas check.	
!!	***CO_2 sensor?***	The connector of the CO_2 sensor was removed during operation.	Reinsert the connector.	20
		The CO_2 sensor has a hardware failure.	Replace the CO_2 sensor.	

	Alarm	Cause	Remedy	Rank
!!	***CO_2 Zero calib. failed***	Zero calibration of the CO_2 sensor failed.	Redo the zero calibration.	23
			Do not breathe on the CO_2 sensor during zero calibration.	
		The sensor window is soiled.	Clean the CO_2 sensor window.	
		The CO_2 sensor has a hardware failure.	Replace the CO_2 sensor.	
!!!	***CO_2 Zero calib. request***	Zero point of the CO_2 sensor is outside the tolerance range.	Perform the zero calibration.	25
!	***Confirm settings***	Changed setting has not been confirmed with the rotary knob.	Confirm the change of setting by pressing the rotary knob.	45
!!!	***Continuous high pressure***	Breathing valve or breathing circuit obstructed.	Check patient condition. Check breathing valve and breathing circuit.	5
		Increased expiratory resistance.	Check bacterial/HME filter. Replace it if necessary.	
		Technical defect.	Disconnect the patient from the device and continue ventilation without delay using another ventilator. Call DrägerService.	
!!	***Control knob faulty (FiO_2)***	Technical defect.	Ventilation is continued with last settings. Check patient condition and ventilation. Contact DrägerService.	19
!!	***Control knob faulty (Pmax)***	Technical defect.	Ventilation is continued with last settings. Check patient condition and ventilation. Contact DrägerService.	17
!!	***Control knob faulty (RR)***	Technical defect.	Ventilation is continued with last settings. Check patient condition and ventilation. Contact DrägerService.	16
!!	***Control knob faulty (VT)***	Technical defect.	Ventilation is continued with last settings. Check patient condition and ventilation. Contact DrägerService.	18

	Alarm	Cause	Remedy	Rank
!!!	***Device failure***	Technical defect.	Disconnect the patient from the device and continue ventilation without delay using another ventilator. After pressing ***Alarm Reset*** the device will directly display further failure information in the "Customer Service Mode" menu. Call DrägerService.	1
!!!	***Display inop***	Technical defect.	Disconnect the patient from the device and continue ventilation without delay using another ventilator. Call DrägerService.	40
!!	***$etCO_2$ high***	The upper alarm limit for endtidal CO2 concentration has been exceeded.	Check patient condition.	26
			Check alarm limits.	
			Adjust the alarm limit, if necessary.	
!!	***$etCO_2$ low***	The lower alarm limit for endtidal CO2 concentration has been exceeded.	Check patient condition.	27
			Check alarm limits.	
			Adjust the alarm limit, if necessary.	
!!	***Flow measurement inop***	Measurement lines for flow measurement kinked, disconnected or leaking.	Ensure flow measuring lines are connected correctly.	39
		Faulty flow sensor.	Replace the flow sensor.	
		Technical defect.	Disconnect the device from the patient and continue ventilation without delay using another ventilator. Call DrägerService.	
!!	***High respiratory rate***	Patient breathes at a high spontaneous rate.	Check patient condition, check ventilation pattern, correct alarm limit ***RRsp*** if necessary.	31
!!	***Int. battery charging inop***	The internal battery is not being charged due to a battery failure.	Change internal battery. Call DrägerService.	34
		The internal battery is not being charged due to a device malfunction.	Continuous ventilation with this device is only possible with an external power source. Call DrägerService.	

	Alarm	Cause	Remedy	Rank
!!!	***Int. battery discharged***	The operating time for operation with the internal battery has expired and an external power supply has not been connected.	The ventilator must immediately be reconnected to the mains power supply or an onboard DC supply, or a fully charged battery must be installed.	2
!!	***Int. battery in use***	During ventilation, when the external power source has been disconnected, the internal battery becomes the main power source. When starting ventilation while using the internal battery this alarm will not be issued.	Connect an external power supply. Press the ***Alarm Reset*** key to confirm the alarm.	28
!!	***Key failed***	A key is pressed for longer than 30 seconds.	Press keys only briefly.	35
		Technical defect.	To continue ventilation with this device, check the ventilation settings and continuously monitor the device functions. Call DrägerService.	
!!!	***Leakage*** (not in NIV)	The measured expiratory tidal volume VT is approximately 40 % lower than the inspiratory value.	Repair leakages in breathing circuit and/or patient connection. Use a new breathing circuit.	15
		Faulty flow sensor.	Replace the flow sensor.	
		Technical defect.	Disconnect the patient from the device and continue ventilation without delay using another ventilator. Call DrägerService.	
!!	***Loss of data***	No logbook data or clock available. Actual settings will be lost in case of a power loss.	Ventilation functions are not affected. Call DrägerService.	37
!!	***Loudspeaker inop***	Technical defect.	To continue ventilation with this device, continuously monitor the device functions. Call DrägerService.	38

	Alarm	Cause	Remedy	Rank
!!!	***MVe high***	The upper alarm limit for the minute volume MVe has been exceeded.	Check patient condition, check ventilation pattern, correct alarm limits if necessary.	14
		Faulty flow sensor.	Replace the flow sensor.	
		Technical defect.	Disconnect the patient from the device and continue ventilation without delay using another ventilator. Call DrägerService.	
!!!	***MVe low***	The minute volume MVe has dropped below its lower alarm limit.	Check patient condition, check ventilation pattern, correct alarm limits if necessary.	13
		Leakage in breathing circuit.	Ensure that connections in breathing circuit are tight.	
		Faulty flow sensor.	Replace the flow sensor.	
		Technical defect.	Disconnect the patient from the device and continue ventilation without delay using another ventilator. Call DrägerService.	
!	***No int. battery charging***	Internal battery cannot be charged due to a faulty battery or too hot or cold environment.	Press the ***Alarm Reset*** key to confirm the alarm. Change internal battery.	43
!!	***No int. battery?***	Internal battery not installed, faulty or wrong battery installed.	Fit battery or press the ***Alarm Reset*** key to confirm the alarm or change internal battery.	41
!	***No int. battery?***	Internal battery not installed, faulty or wrong battery installed.	Advisory message, is displayed continuously when confirmed. Fit battery or change internal battery.	42
!!	***Only 100 % O_2 to patient***	Technical defect.	Independent of the set ***FiO_2***, the device supplies 100 % O_2 to the patient. Other ventilation functions remain unchanged. Call DrägerService.	36
!!!	***Paw high***	The alarm limit ***Pmax*** for the airway pressure has been reached. Patient "fights" the ventilator, coughing.	Check patient condition, check ventilation pattern, correct alarm limits if necessary.	4
		Breathing hose kinked, or obstructed.	Check breathing circuit, breathing valve, and tube.	

	Alarm	Cause	Remedy	Rank
!!!	***Paw low***	The set pressure level is not achieved or no pressure difference >5 mbar between inspiration and expiration. Leakage in cuff.	Inflate cuff and check for leakages.	7
		Leakage or disconnection.	Check breathing circuit for leakage. Ensure that the breathing valve has been installed correctly.	
!!!	***Paw measurement inop***	Defect in flow measuring lines.	Check breathing circuit for loose connections. Ensure that the flow measuring lines are connected correctly.	6
		Technical defect.	Disconnect the patient from the device and continue ventilation without delay using another ventilator. Call DrägerService.	
!!!	***Reselect hose type***	The detected hose type is not the same as the selected hose type.	Change hose type setting.	11
			Connect a different hose type.	
		Faulty flow sensor.	Replace the flow sensor.	
!	***Settings not confirmed***	Changed setting has not been confirmed with the rotary knob.	Redo the setting change.	47
!!!	***Supply pressure low***	Supply pressure <1800 mbar.	Ensure that supply pressure exceeds 1800 mbar. Disconnect the patient from the device and continue ventilation without delay using another ventilator.	3
!!	***VT high for hose***	The measured ***VT*** is above 250 mL while using a pediatric breathing hose.	Set a lower VT or press the ***Alarm Reset*** key to confirm the alarm.	12
		An incorrect hose connected.	Use another hose or press the ***Alarm Reset*** key to confirm the alarm.	
!	***VT high for hose***	The measured ***VT*** is above 250 mL while using a pediatric breathing hose.	Advisory message, is displayed continuously when confirmed. Set a lower VT.	46
		An incorrect hose connected.	Advisory message, is displayed continuously when confirmed. Use another hose.	

	Alarm	Cause	Remedy	Rank
!!	***VT low, pressure limit***	During ***AutoFlow*** additional pressure is necessary to achieve the set tidal volume ***VT***. (Pressure is limited to Pmax –5 mbar.)	Check patient condition. Check ventilation settings	32

Additional messages in the alarm message field

	Message	Cause	Remedy
	Self test OK	The device has been switched on and the selftest completed successfully.	The message disappears utomatically after approximately 15 seconds.

Messages in the information field

The numeric values below are examples.

Message	Unit[1)]	Cause	Explanation/Remedy
Confirm PEEP above 10 mbar ?		PEEP >10 mbar has been set but not confirmed.	The required setting of PEEP >10 mbar is only possible when confirmed via the rotary knob.
Gas consumption = 10 L/min		Default display for current gas consumption.	
 (Battery capacity)		Default display for current battery capacity.	
REUS = Adult reusable hose DISP = Adult disposable hose PAED = Pediatric disposable hose		Explanation of abbreviation, when selecting the hose type in the Settings window.	
Select and confirm hose with rotary knob.		Breathing hose type has not been confirmed.	Select and confirm.
REUS = Reusable Cuvette DISP = Disposable Cuvette		Explanation of abbreviation, when selecting the CO_2 cuvette type in the Settings window.	
Press Rotary Knob for Autoset / Exit with Alarm Reset		Activation of ***Alarms: Autoset***, refer to "Setting alarm limits" on page 87.	After pressing the rotary knob the new alarm limits will be set.
Remove sensor from cuvette then press Rotary Knob		Activation of ***CO_2 zero calibration***, refer to "CO_2 measurement (optional)" on page 91.	After removal of the CO_2 sensor from the cuvette and pressing the rotary knob, the zero calibration will proceed. Cancel by pressing ***Alarm Reset***.
Place sensor on reference filter, press rotary knob		Activation of ***CO_2 filter check***, refer to "CO_2 measurement (optional)" on page 91.	After mounting the test filter and pressing the rotary knob, the filter check will start. Cancel by pressing ***Alarm Reset***.
Pinsp>=PEEP + 3 mbar		PEEP + 3 mbar > Pinsp	Set Pinsp > PEEP + 3 mbar.

Message	Unit[1)]	Cause	Explanation/Remedy
Psupp = 22 mbar		Change in ∆Psupp or PEEP.	Psupp is the absolute pressure resulting from PEEP + ∆Psupp.
VT = 400 mL or RR = 12 /min Ti= 1.5 s Flow = 15 L/min	I:E	Change in VT or RR, in ventilation mode VC-CMV, VC-AC or VC-SIMV.	
VT = 400 mL or RR = 12 /min I:E= 1 : 1.5 Flow = 15 L/min	Ti		
RR = 12 /min Ti= 1.5 s Te = 9.5 s	I:E	Change in RR, in ventilation mode PC-BIPAP.	
RR = 12 /min I:E= 1 : 1.5 Te = 9.5 s	Ti		
Ti= 1.5 s Flow = 15 L/min	I:E	Change in I:E, Ti or Tplat , in ventilation mode VC-CMV, VC-AC or VC-SIMV. Or change in RRapn or VT, in ventilation mode Spn-CPAP.	
I:E= 1.5:1 Flow = 15 liters per minute	Ti		
Ti= 1.5 s Te = 9.5 s	I:E	Change in I:E or Ti, in ventilation mode PC-BIPAP.	
I:E= 1 : 1.5 Te = 9.5 s	Ti		

1) Unit I:E or Ti is configurable. Refer to the "Customer Service Mode" on page 97.

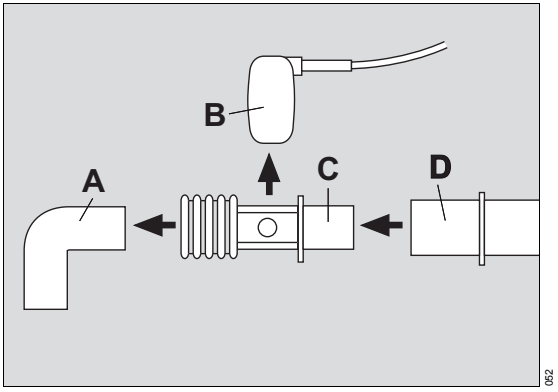
Error messages during the device check

Message	Cause	Explanation/Remedy
System leakage	Leakage in breathing circuit and/or in test lung.	Check breathing hoses, breathing valve, flow sensor and test lung for leakage and replace as necessary.
	Internal leakage in system	Call DrägerService.
No test lung	Test lung not connected or major leakage.	Connect test lung. Check breathing hoses, breathing valve, flow sensor and test lung for leakage and replace as necessary.
Breathing valve inop	Breathing valve has malfunctioned.	Check correct condition of breathing valve including diaphragm and rubber disc; fit a new breathing valve if necessary or use a new disposable breathing circuit.
Pressure measurement inop	The breathing circuit has not been connected correctly.	Connect breathing circuit correctly.
	Pressure measurement is not possible.	Call DrägerService.
PEEP-valve inop	Internal leakage in system	Check breathing hoses, breathing valve, flow sensor and test lung for leakage and replace as necessary.
	Device defective	Call DrägerService.
Patient flow measurement inop	Flow measurement implausible	Replace the flow sensor. Call DrägerService.
Hose Detection inop	The device check failed on the hose detection.	Connect a different breathing hose or select a different hose type.
Detected hose differs from selected hose	The hose that is detected differs from the selected hose type, or flow measuring lines incorrectly positioned.	Connect a different breathing hose or select a different hose type.
Check measuring lines	The flow measuring lines are incorrectly connected.	Connect the flow measuring lines correctly.

Cleaning, Disinfection and Sterilization

Disassembly

Disassembling the CO_2 sensor and CO_2 cuvette



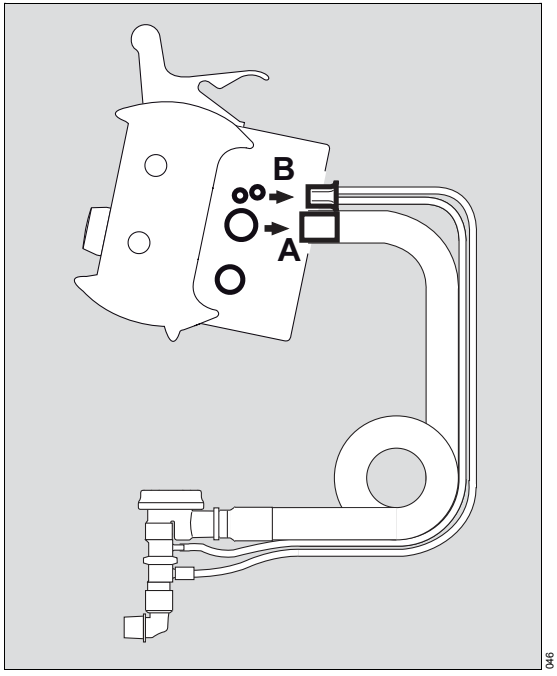
1 Disconnect the CO_2 sensor connector from the device.

2 Remove the CO_2 sensor (B) from the CO_2 cuvette (C).

3 Remove the CO_2 cuvette (C) from the flow sensor (D).

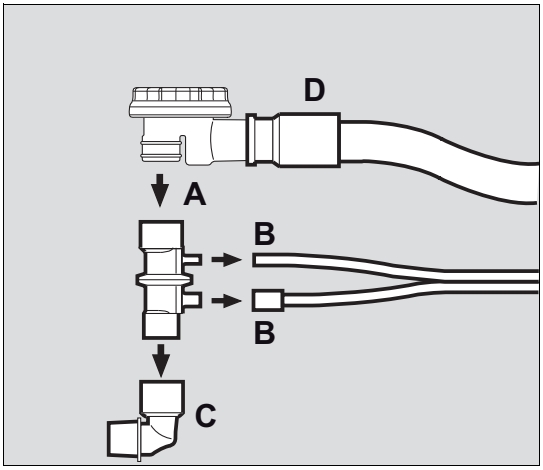
4 Remove the angled connector (A) from the cuvette (C).

Disassembling the reusable breathing circuit for adults



1 Disconnect the breathing hose (A) from the expiratory port.

2 Detach the flow measuring lines (B) from the connectors.



3 Disconnect the flow sensor (A) from the breathing valve.

4 Carefully detach the flow measuring lines (B) from the flow sensor.
Pull the flow measuring lines straight off the connectors.

CAUTION

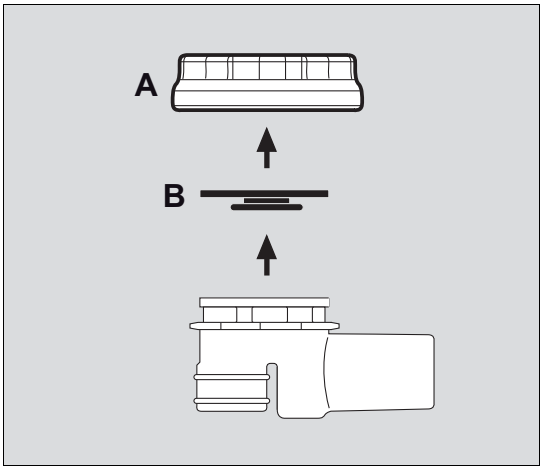
Do not twist or use force when disconnecting the flow measuring lines from the flow sensor nozzles.

Otherwise the flow sensor may be damaged.

5 Detach the angled connector (C) from the flow sensor.

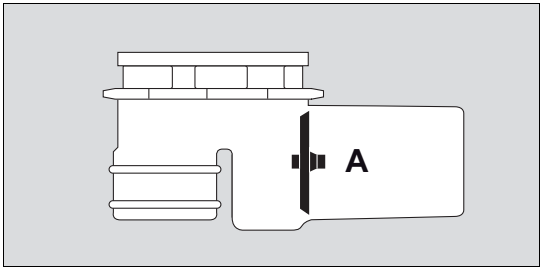
6 Detach the breathing hose (D) from the breathing valve.

Disassembling the breathing valve



7 Turn the cover (A) about 90° counterclockwise to unlock it.

8 Remove the silicone diaphragm (B).

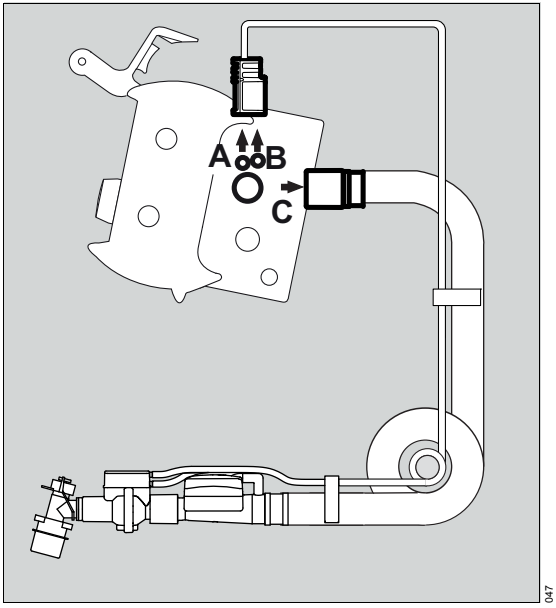


WARNING

Risk of CO_2 rebreathing

The rubber disk (A) in the housing must not be removed, damaged or bent, otherwise the valve will not work properly and will endanger the patient.

Removing the disposable breathing circuit for adults



1 Disconnect flow measuring lines (A and B).

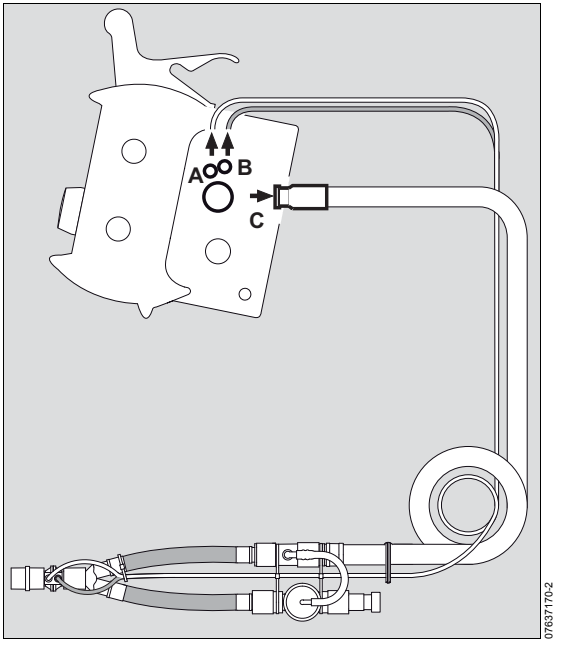
2 Disconnect the breathing hose (C).

3 Correctly dispose of the complete disposable breathing circuit. Refer to the chapter "Disposal" on page 137.

CAUTION

The disposable breathing circuit must not be cleaned, disinfected or sterilized: it cannot withstand high temperatures and may be damaged.

Removing the disposable breathing circuit for pediatric patients



1 Disconnect flow measuring lines (A and B).

2 Disconnect the breathing hose (C).

3 Correctly dispose of the complete disposable breathing circuit. Refer to the chapter "Disposal" on page 137.

CAUTION

The disposable breathing circuit must not be cleaned, disinfected or sterilized: it cannot withstand high temperatures and may be damaged.

Information on reprocessing

CAUTION

Risk of infection

The device must be cleaned and disinfected after every use, to prevent possible infection.

Wear protective clothing, eye protection etc. while carrying out reprocessing.

- Observe the hospital hygiene regulations.
- Reprocess the device after every patient.

The reprocessing recommendations do not exempt staff from the obligation to adhere to the hygiene requirements and directives on occupational health and safety relating to the reprocessing of medical devices.

- To ensure the professional reprocessing of medical devices, the recommendations provided by the Robert Koch Institute in "Demands on Hygiene in Reconditioning Medical Devices" must be followed.

WARNING

Single-use articles have been developed, tested and manufactured for single use only. Disposable products must not be reused, reprocessed, or sterilized. Reuse, reprocessing or sterilization can lead to a failure of the accessories and cause injuries to the patient.

Reprocessing procedure

For the reprocessing list, refer to section "Reprocessing list" on page 129.

Classification of medical devices

For reprocessing, the medical devices and components are classified by their way of application and the risk resulting from it:

– Non-critical medical devices: Surfaces accessible to the user, e. g. device surfaces, cables

– Semicritical medical devices: Parts conducting breathing gas, e.g. breathing hoses, masks

Referring to its reprocessing, this medical device belongs to the group of non-critical medical devices.

Non-critical medical devices

Testing of procedures and agents

The cleaning and disinfection of medical devices has been tested with the following procedures and agents. The following agents showed good material compatibility and effectiveness at the time of the test:

Manual cleaning:

– For device surfaces:
Neoform MED AF by Dr. Weigert
(concentration: 2 %)

Manual disinfection and simultaneous cleaning

- Use disinfectants that are approved nationally and are suitable for the reprocessing procedure being applied.

Class of active ingredient	Product name	Manufacturer
Chlorine-releasing agents	Actichlor® plus	Ecolab
	Klorsept® 17	Medentech
	BruTab 6S	Brulin
Oxygen-releasing agents	Descogen® Liquid	Antiseptics
	Descogen® Liquid	
	Dismozon® plus	Bode chemie
	Dismozon® pur	
	Oxycide®	Ecolab USA
	Perform®	Schülke & Mayr
	Virkon®	DuPont
Quarternary ammonium compounds	Mikrozid® sensitive liquid[1)]	Schülke & Mayr
	Mikrozid® sensitive wipes[1)]	
Aldehydes	Buraton® 10 F	Schülke & Mayr

1) Virucidal against enveloped viruses

Dräger recommends using a surface disinfectant from the list above. Other disinfectants are used at own risk.

Dräger points out that oxygen- and chlorine-releasing agents may cause color change in some materials. This is not an indication that the product is not functioning correctly.

At the time of validation, the disinfectants listed above showed material compatibility.

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.

Carry out manual cleaning and disinfection

- Remove dirt immediately with a wipe soaked in disinfectant.

WARNING

Penetrating liquid may cause malfunction of or damage to the device, which may endanger the patient. Only wipe-disinfect items and make sure no liquids penetrate into the device.

1 Carry out surface disinfection.

2 After contact time, remove disinfectant residues.

Semicritical medical devices

Testing of procedures and agents

The cleaning and disinfection of medical devices has been tested with the following procedures and agents. The following agents showed good material compatibility and effectiveness at the time of the test:

Manual cleaning:

– For the breathing valve and hoses:
Neodisher LM2 by Dr. Weigert
(concentration: 2 %)

– Flow sensor:
Sekusept Powder classic by Ecolab
(concentration: 4 %)

Manual disinfection:

– Korsolex extra by Bode Chemie
(concentration: 3 %)

Machine cleaning and disinfection:

Neodisher Forte MediClean from Dr. Weigert
(for thermal disinfection at 93 °C (199 °F) for 10 minutes)

Manual cleaning

Manual cleaning should preferably be carried out under running water or with commercially available cleaning agents based on mild alkaline compounds.

Carry out manual cleaning

1. Wash off visible soilings under running water. Using an ultrasound cleaner improves cleaning results.
2. Use cleaning agents in accordance with manufacturer's specifications. Make sure that all surfaces to be cleaned can be efficiently reached.
   - Place parts bubble-free into the solution for approx. 20 minutes.
   - Agitate all parts thoroughly in the solution at the beginning and at the end of the storage. Brush all parts of the breathing valve.
   - When rinsing hoses, let the solution flow through the entire hose by lifting and lowering it.
   - Rinse the connectors of the flow sensor and the red rubber disc several times with the solution, e. g., by using a syringe.
   - Squeeze the silicone diaphragm several times in the solution.
3. Rinse items under running water until cleaning agent residue is no longer discernible.
4. Inspect items for visible soiling and damage. If necessary, repeat manual cleaning.

Manual disinfection

Manual disinfection should preferably be carried out with disinfectants based on aldehydes or quarternary ammonia compounds.

Observe the applicable country-specific listings for disinfectants. The list of the German Association for Applied Hygiene (Verbund für Angewandte Hygiene VAH) applies in German-speaking countries.

The composition of the disinfectant is the responsibility of the manufacturer and can change over time.

Strictly observe the manufacturer's information on the disinfectant.

Carry out manual disinfection

1. Disinfect items by immersing bubble-free for approx. 30 minutes.
2. Carry out manual cleaning as described in step 2 of "Carry out manual cleaning" on page 127.
3. After contact time, rinse items under running water until disinfectant residue is no longer discernible.
4. Inspect items for visible soiling and damage. If necessary, repeat manual disinfection.
5. Thoroughly shake out residual water. Allow items to dry thoroughly.

Machine cleaning and disinfection

Use washer-disinfector in accordance with EN ISO 15883, preferably with a cart for anesthesia and ventilation accessories, for automatic cleaning and disinfection. Use mildly alkaline or enzymatic (with neutral pH) cleaning agent. Strictly observe the manufacturer's information on the cleaning agent.

Carry out machine cleaning and disinfection

1. Strictly observe instructions for use of washer-disinfector.
2. Position items so that all interior spaces are completely flushed and water can drain off freely.
   - Connect hoses to suitable nozzle of the carriage in the washer-disinfector and place them evenly.

  - Connect breathing valve (without cover and silicone diaphragm) with a short breathing hose (e.g., 35 cm silicone breathing hose, order no. 2165619) to a suitable nozzle of the carriage in the washer-disinfector.

3 Use suitable cleaning agent.

4 Select suitable program (preferably anesthesia program).

  - Cleaning must be carried out at 40 °C to 60 °C (104 °F to 140 °F) for at least 5 minutes.
  - Thermal disinfection must be carried out at 80 °C to 95 °C (176 °F to 203 °F) and with corresponding contact time.

5 Carry out final rinsing with deionized water.

6 Immediately remove items from the washer-disinfector.

7 Inspect items for visible soiling and damage. If necessary, repeat program or carry out manual cleaning and disinfection.

8 Allow items to dry thoroughly.

Visual inspection

Inspect all items for damage and wear, e.g. cracking, embrittlement or pronounced hardening, and residual soiling.

CAUTION

Even accessories designed to be reused have a limited service life. Handling and reprocessing can increase wear and markedly shorten service life (e.g., disinfectant residues can attack the material more intensely during autoclaving). If signs of wear become visible, such as cracks, deformation, discoloration, peeling, etc., affected accessories must be replaced.

Sterilization

Sterilization frees living microorganisms from semicritical medical devices and removes residual water from the interior spaces of its items.

- Only sterilize cleaned and disinfected items.

Use a vacuum steam sterilizer (in accordance with DIN EN 285), preferably with fractional vacuum.

The recommended sterilization temperature and time is 134 °C for 5 minutes.

CAUTION

Do not sterilize parts in ethylene oxide.

Ethylene oxide may diffuse into the parts and cause damage to health.

Reprocessing list

Applicable to non-infectious patients.

The list contains approximate values only. The instructions of the hospital's infection control officer shall prevail and must be observed by the user!

Components which can be reprocessed	**Recommended reprocessing intervals**	**Machine cleaning and disinfection**	**Manual**		**Sterilization**
			Cleaning	**Disinfection**	
Oxylog 3000 *plus* unit and O_2 hoses	Per patient / if soiled	No	Outside only	Outside only	No
Reusable breathing circuit	Per patient / if soiled	Yes	Possible	Possible	Yes
CO_2 sensor	Per patient / if soiled	No	Outside only	Outside only	No
Reusable cuvette of the CO_2 sensor	Per patient / if soiled	Yes	Yes	Yes	Yes
Test filter for CO_2 sensor	If soiled	No	Yes	Yes	No

Assembling parts

– Reassemble, refer to "Assembly" on page 35 for information.

– Connect to the power supply and gas supply, refer to "Assembly" on page 35 for information.

– Check readiness for operation, refer to "Preparation" on page 51 for information.

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Maintenance

Maintenance intervals of Oxylog 3000 *plus*

Definition of Maintenance Concepts

This chapter describes the maintenance measures required to maintain the proper functioning of the medical device. Maintenance measures must be performed by the personnel responsible.

Carry out maintenance procedures only when no patient is connected to the device.

Keep a record on all maintenance procedures carried out.

CAUTION
In order to avoid malfunctioning of the device, maintenance must be carried out by properly trained maintenance personnel.

WARNING
Risk of infection

Users, maintenance personnel and trained experts may become infected with pathogenic germs.

Disinfect and clean device or device parts before any maintenance measures and also before returning the medical device for repair.

WARNING
Risk of electric shock

Current-carrying components are located under the cover.

- **Do not remove the cover.**
- **Maintenance measures must be performed by the personnel responsible. Dräger recommends DrägerService to perform these measures.**

Concept	Definition
Maintenance	Appropriate measures intended to retain the functional integrity of a medical device.
Inspection	Measures intended to determine and assess the actual state of a medical device
Preventive maintenance	Repeated indicated measures intended to retain the functional integrity of a medical device.
Repair	Measures intended to restore the functional integrity of a medical device after the failure of a device function

Inspection

Inspections must be carried out regularly according to the following guidelines and within the specified intervals.

Checks	Interval	Personnel responsible
Inspection and safety checks[1)]	Every 2 years	Maintenance personnel

1) 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 no substitute for preventive maintenance measures (including preventive replacement of wear parts) as identified by the manufacturer.

WARNING

Risk of medical device failure

If safety checks are not performed on a regular basis, the proper operation of the medical device can be compromised.

Perform safety checks at the indicated intervals.

Scope

1 Check the accompanying documents:

- Instructions for use present.

2 Check components and accessories for completeness according to the supplied instructions for use when the product is ready for operation.

3 Check that the device combination is in good condition:

- Labels complete and legible.
- No damage.

4 Check electrical safety:

- In accordance with IEC 62353.

5 Check safety functions:

- Correct functioning of the safety valve: max pressure 90 mbar.
- Correct functioning of the emergency air valve.
- Correct functioning of the mains supply failure alarm.
- Monitoring of the supply pressure.
- Check the high airway pressure alarm.
- Check the breathing circuit integrity alarm.
- Check the proper functioning of the power indicators.

6 When operating in a helicopter, make a visual check of the contacts to the battery and replace them as necessary.

7 Perform a device check according to the instructions for use.

Preventive maintenance

WARNING

Risk of faulty components

Device failure is possible due to wear or material fatigue of the components.

To maintain the proper operation of all components, this device must undergo inspection and preventive maintenance at specified intervals.

WARNING

Risk of electric shock

Before performing any maintenance work, disconnect all electrical connectors and gas connectors from power supply and gas supply.

Maintenance schedule

Component	Interval	Task	Personnel responsible
Dust filter	Every 2 years	Replace[1)]	Maintenance personnel
Internal rechargeable battery	– Every 2 years – When the battery no longer remains charged for the specified operating time[2)]	Replace	Users
Device	Every 2 years	Inspection and preventive maintenance	Maintenance personnel

1) The dust filter can be treated as household waste.
2) Refer to "Technical Data" section for battery operating time.

Repair

For repairs, Dräger recommends engaging DrägerService and using original Dräger parts.

In case of ventilator failure

WARNING

Never operate a ventilator if it has suffered physical damage or does not seem to operate properly.

In this case, always engage factory trained or authorized expert personnel to service the device.

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Disposal

Disposing of the medical device

When disposing of the medical device:

- Have the medical device appropriately disposed of by the responsible waste disposal company.
- Observe the applicable laws and regulations.

For countries subject to the EU Directive 2002/96/EC

This device is subject to EU Directive 2002/96/EC (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.

Disposal instructions

Disposing of the medical device and power supplies

When disposing of the medical device:

– Consult the responsible waste disposal company for appropriate disposal.

Observe the applicable laws and regulations.

Disposing of non-rechargeable batteries

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. Do not force batteries open.

- Do not recharge batteries.

The medical device battery contains pollutant substances.

Observe the applicable laws and regulations for battery disposal.

Disposing of the breathing circuits and the CO_2 cuvettes

Always follow local regulations governing the disposal of breathing circuits and CO_2 cuvettes in accordance with applicable hospital/emergency service standards.

Technical data

WARNING
Do not use the device outside the specified environmental and supply conditions, as the device may not operate according to its specifications and may become inoperative.

Ambient conditions

During operation

Temperature	–20 to +50 °C
Ambient pressure	570 to 1200 hPa
Ambient pressure for CO_2 sensor	570 to 1100 hPa
Automatic atmospheric pressure compensation within this pressure range	
Altitude	up to 4600 m
Ambient pressure for AC/DC power pack	700 to 1200 hPa
Temperature	0 to 50 °C
Altitude	up to 3000 m
Relative humidity	5 to 95 % (no condensation)

During storage and transportation

Ventilator without replaceable battery, with reusable breathing circuit

Temperature	–40 to +75 °C
Ambient pressure	570 to 1200 hPa
Ambient pressure for CO_2 sensor	115 to 1100 hPa
Relative humidity	5 to 95 % (no condensation)
Time required from maximum/minimum storage temperature to reach operating conditions	60 minutes

Adult and pediatric breathing circuits, disposable

Temperature	–20 to +50 °C
Ambient pressure	570 to 1200 hPa
Relative humidity	5 to 95 % (no condensation)

Replaceable battery

Temperature	–20 to +50 °C (preferred long-time storage temperature <30 °C)
Ambient pressure	570 to 1200 hPa
Relative humidity	5 to 95 % (no condensation)

Settings

Ventilation modes		VC-CMV, VC-AC, VC-SIMV, VC-SIMV/PS, Spn-CPAP, Spn-CPAP/PS, PC-BIPAP, PC-BIPAP/PS Optional: AutoFlow for VC-CMV, VC-AC and VC-SIMV (/PS)
Respiratory rate RR		2 to 60/min (VC-SIMV, PC-BIPAP) 5 to 60/min (VC-CMV, VC-AC) 12 to 60/min for apnea ventilation
Ventilation time ratio I:E		1:100 to 50:1
Inspiratory time Ti		0.2 to 10 s
Tidal volume VT		0.05 to 2.0 L, BTPS Measured values referred to the conditions of the patient's lungs, body temperature 37 °C, airway pressure, water-vapor-saturated gas.
	Accuracy of setting	±15 % of the set value or ±25 mL, whichever greater (adult breathing hose). ±15 % of the set value or ±15 mL, whichever greater (pediatric breathing hose).
Inspiratory pressure Pinsp		PEEP +3 to +55 mbar
O_2 concentration		40 to 100 Vol%
	Accuracy of setting	±10 Vol%. The actual value depends on the inspiratory flow[1)] and mean airway pressure.
Positive end-expiratory pressure PEEP		0 to 20 mbar, no negative pressure.
Trigger sensitivity (flow trigger)		1 to 15 L/min

Pressure support ΔPsupp		0 to 35 mbar (relative to PEEP)
	Pressure rise time for pressure support	slow (1 s), standard (0.4 s), fast.
	Inspiration termination of pressure supported strokes, as a percentage of peak inspiratory flow (PIF) (***Insp.term.%PIF***)	5 to 50 %

Alarm limit ranges

Alarm	Alarm limit range
MVe ⌐▲	2 to 41 L/min
MVe ▼¬	0.5 to 40 L/min
RRspon ⌐▲	10 to 100/min
etCO2 ⌐▲	1 to 100 mmHg / 0.1 to 13.3 kPa / 0.1 to 13.3 Vol%
etCO2 ▼¬	0 to 100 mmHg / 0 to 13.3 kPa / 0 to 13.3 Vol%

1) see O2 concentration, page 78

Performance characteristics

Control principle		Time-cycled, volume-constant, pressure-controlled
Maximum inspiratory flow		100 L/min[1)]
Device compliance		
	with adult breathing hose, 1.5 m	≤1 mL/mbar
	with adult breathing hose, 3 m	≤2 mL/mbar
	with pediatric breathing hose, 1.9 m	≤0.7 mL/mbar
Inspiratory and expiratory resistance of the device with adult breathing circuit		≤6 mbar at 60 L/min
		≤4 mbar at 30 L/min
		≤2 mbar at 5 L/min
Inspiratory and expiratory resistance of the device with pediatric breathing circuit		≤5 mbar at 30 L/min
		≤2 mbar at 5 L/min

Nominal flow	Disposable breathing circuit for adults, 1.5 m	Inspiratory 21 L/min at 2 mbar Expiratory 10 L/min at 2 mbar
	Disposable breathing circuit for adults, 3.0 m	Inspiratory 20 L/min at 2 mbar Expiratory 10 L/min at 2 mbar
	Reusable breathing circuit for adults, 1.5 m	Inspiratory 22 L/min at 2 mbar Expiratory 16 L/min at 2 mbar
	Reusable breathing circuit for adults, 3.0 m	Inspiratory 21 L/min at 2 mbar Expiratory 15 L/min at 2 mbar
	Disposable breathing circuit for pediatric patients	Inspiratory 12 L/min at 2 mbar Expiratory 7 L/min at 2 mbar
Dead space including flow sensor, but excluding accessories such as filter, HMEs and CO_2 cuvette		Approx. 35 mL[2)] (reusable breathing circuit for adults) Approx. 30 mL[2)] (disposable breathing circuit for adults) Approx. 15 mL[2)] (Disposable breathing circuit for pediatric patients)
Dead space of CO_2 cuvette		Approx. 4 mL (CO_2 cuvette) Approx. 1.5 mL (CO_2 cuvette for pediatric patients))
Supplementary functions		
	Demand valve	Opens the breathing system upon failure of the gas supply, permits spontaneous breathing with ambient air.
	Relief valve	Opens the breathing system in case of device malfunction at approximately 80 mbar.
Patient connection		22 mm ISO conical connector

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

Measured values and curves display

Airway pressure measurement

Range	0 to 100 mbar
Resolution	1 mbar
Accuracy	±(2 mbar + 2 % of measured value)

Flow measurement

Minute volume MVe

Range	0 to 99 L/min, BTPS
Resolution	0.1 L/min
Accuracy	±15 of measured value, or ±0.4 L/min, whichever is greater.

Tidal volume VTe

Range	0 to 5000 mL, BTPS
Resolution	1 mL
Accuracy	±15 % of the measured value or ±20 mL, whichever greater (adult breathing hose). ±15 % of the measured value or ±15 mL, whichever greater (pediatric breathing hose).

CO_2 measurement

Range	0 to 120 mmHg / 0 to 15.8 Vol% / 0 to 16.0 kPa
Resolution	1 mmHg / 0.1 Vol% / 0.1 kPa
Total system response time	200 ms

Frequency measurement

Range	0 to 99/min
Resolution	1/min
Accuracy	±1/min

Curve display

Airway pressure Paw (t)	–10 to 100 mbar
Flow (t)	–120 to 120 L/min
CO_2	–5 to 120 mmHg / –1 to 16 Vol% / –1 to 16 kPa

Monitoring

Expiratory minute volume MVe

Alarm, upper alarm limit		When the upper alarm limit has been exceeded.
	Range of settings	2 to 41 L/min
Alarm, lower alarm limit		When the lower alarm limit has been violated.
	Range of settings	0.5 to 40 L/min

Airway pressure, Paw

Alarm, upper alarm limit		When value Pmax is exceeded.
	Range of settings	20 to 60 mbar
Alarm, lower alarm limit		When the pressure difference between inspiratory and expiratory phases is less than 5 mbar for at least 20 seconds. Or When the set pressure value is not attained within 10 seconds.

Apnea alarm time Tapn

Alarm		When respiratory activity is no longer detected.
	Range of settings	15 to 60 s

Apnea

Alarm	When no respiratory phase change has been detected for >12 seconds and Tapn is off.

Rate, RRsp

Alarm, upper alarm limit		> 25 seconds above the set value
	Range of settings	10 to 100/min

Leakage

Alarm	Only with NIV off in VC modes: When VTe <60 % of VTi over the last 25 seconds or 8 respiratory cycles

Data communication (option)

Exported data	Measured values Curves Alarms Alarms settings User settings For the data communication protocol contact your local DrägerService.
Baud rate	19200
Data bits	8
Parity	Even
Stop bit	1

Operating data

Power supply

Power supply		
	Oxylog 3000 *plus* Input voltage	24 V ±6 VDC
	Power supplies (AC/DC power pack and DC/DC converter) are specified as part of the Oxylog 3000 *plus*.	
Power consumption		
	With battery charging	maximum 2.4 A at 19 VDC
	Operating time with a new and fully charged internal battery without mains power supply	
	– in typical ventilation without CO_2 sensor, reduced display brightness	Approx. 9.5 hours
	– in typical ventilation	Approx. 7.5 hours
Battery type		Lithium ion battery
Charging time		Approx. 4 hours
		The specified charging time applies when recharging the battery to a level of approx. 90 % after it has been depleted. Charging of a completely depleted battery is only possible when the ventilator is switched OFF.

Permissible ambient temperature during charging		0 °C to 35 °C
Indication of battery capacity		In 25 % increments
Accuracy of the capacity indication		The indicated capacity is determined by the battery itself. The accuracy depends on the type and manufacturer and may deteriorate with frequent partial discharge and during operation in extreme temperatures. The internal battery is only reconditioned after being discharged completely and recharged at room temperature 25 °C. Consequently, the criteria for the ***!!! Int. battery discharged*** and ***!! Charge int. battery*** alarm messages are derived from the measurement of the battery voltage. The capacity indicated at this moment may differ from the actual capacity of the internal battery.
	Battery storage duration	The internal battery must always be removed from the ventilator for storage and recharged completely after 12 months at the latest (e. g. in the external battery charging station). To maintain the ideal charging capacity, the battery should be stored with a charge of 40 to 50 %.
AC/DC power pack	Protection class (as defined in IEC 60601-1)	Class II
	Degree of protection	IP22
	Input	100 to 240 V~ / 50 to 60 Hz / 1.0 A
	Output	19 V ±0,5 V / 4.47 A (–20 °C to 40 °C) / 3.5 A (40 °C to 50 °C)
		To isolate the ventilator system from mains, disconnect the power cable from the power socket.
		The intended use of the AC/DC power pack is in stationary situations (e.g. in hospitals or fire stations).
DC/DC converter	Protection class	IP42
	Temperature range	–20 °C to +50 °C
	Input	12 / 24 / 28 VDC; 5 A / 2.5 A / 2.1 A
	Output	19 V ±0.5 V / 2.6 A
		The intended use of the DC/DC converter is in vehicles.

Gas supply

	From a central gas supply system or from an O_2 cylinder.
O_2 supply pressure	270 kPa to 600 kPa at 100 L/min
Supply gas	Medical oxygen
Connector for O_2 supply	either: NIST[1] to EN 739 / ISO5359, or DISS[2] to CGA V5-1989, or N-F[3] S90-116
	WARNING **Only use medical grade oxygen.**
Gas cylinders and pressure reducers	**WARNING** **Only use compressed gas cylinders and pressure reducers, which comply with all applicable regulations and have been approved.**
Pressure reducer	Must have a blow-off valve on the output side to limit the outlet pressure to approximately 1000 kPa in the event of a fault.
Gas consumption for internal control	Average 0.5 L/min
Accuracy of gas consumption indication	15 % or ±1 L/min, whichever is greater.

1) NIST = Non-Interchangeable Screw-Threaded
2) DISS = Diameter Index Safety Systems
3) N-F = Norme française

Device specifications

Sound pressure level of typical ventilation		<45 dB (A) at a distance of 1 m.
Sound pressure level of alarm signals		52 to 67 dB (A) at a distance of 1 m.
Dimensions (W × H × D)		
	Basic unit	294 × 188 × 179 mm (without handle and protection bracket)
	Protection bracket	75 mm (in addition to the width of the basic unit)
	AC/DC power pack	150 × 37 × 64 mm
	DC/DC converter	160 × 35 × 60 mm
Weight		
	Basic unit without internal battery	Approx. 5.3 kg

	Basic unit with internal battery	Approx. 5.8 kg
	AC/DC power pack	Approx. 0.6 kg
	DC/DC converter	Approx. 0.6 kg
Center of gravity (basic unit)		
	Width from left	152 mm
	Height from bottom	83 mm
	Depth from rear	82 mm
Display		
	Technology	Electroluminescence (EL)
	Pixels	240 x 128
	Visible area	108 x 56 mm
Electromagnetic Compatibility (EMC)		Complies with IEC 60601-1-2, EN 794-3 (36,101), ISO 10651-3 (36,202,2,1) and UN Regulation No. 10 (for the power supply unit), with respect to EMC for use in motor vehicles, equivalent to European Commission Directive 2004/104/EC. Complies with RTCA DO-160 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		18 – 098
Protection class, breathing circuits (disposable or reusable), including CO_2 sensor, endotracheal tubes, or masks		Type BF (body floating, defibrillation-proof)
Protection class against ingress of liquids		IPX4, device is splashproof from all directions
Protection class of the CO_2 sensor		IP64
Defibrillation recovery time		0 s

Materials used

Housing, Oxylog 3000 *plus*	Acrylonitrile styrene acrylate/polycarbonate (ASA/PC)
	Thermoplastic Copolyester Elastomer (TPC)
Housing, AC/DC power pack	Polycarbonate (PC)
Housing, DC/DC converter	Polycarbonate (PC)
Touch sensitive keypad on ventilator	Polyester film

NOTE

All Dräger breathing hoses are made without use of natural rubber latex.

Reusable breathing circuit for adults

Breathing hose, flow measuring lines	Silicone rubber
Housing of flow sensor, breathing valve	Polysulfone (PSU)
Vane in flow sensor	Stainless steel
Diaphragms in breathing valve	Silicone rubber

Disposable breathing circuit for adults

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

Disposable breathing circuit for pediatric patients

Breathing hose	Ethylene Vinyl Acetate (EVA)
Non-return valve	Housing: Polypropylene (PP) Membrane: silicone rubber
Breathing valve	Housing: Polypropylene (PP) Membrane: silicone rubber
Flow sensor housing	Methacrylate-Acrylonitrile Butadiene Styrene (MABS)
Patient connection	Polycarbonate (PC)

	Y-piece	Polycarbonate (PC)
	Vane in flow sensor	Polyethylene terephthalate (PET)
	Connectors	Polypropylene (PP) and Polycarbonate (PC)
CO_2 sensor		
	Housing	Polysulfone
	Cable	Polyurethane
CO_2 cuvette		
	Disposable	K-Resin® SBC
	Reusable	Polysulfone (PSU) with sapphire windows

EMC declaration

General Information

The EMC conformity of the Oxylog 3000 *plus* includes the use of following external cables, transducers and accessories:

- AC/DC power pack
- DC/DC converter
- All-round Wall Holder
- Equipment holder
- Carrying bag
- Quick Power Connector
- Carrying System
- CO_2 sensor
- CO_2 extension cable
- Data communication cable

This device was tested for electromagnetic compatibility using accessories from the list of accessories. Other accessories may only be used if they do not compromise the electromagnetic compatibility. The use of non-compliant accessories may result in increased electromagnetic emissions or decreased electromagnetic immunity of the device.

This device may be used in the direct vicinity of other devices only if Dräger has approved this device arrangement. If no approval has been given by Dräger, it must be ensured that this device functions correctly in the desired arrangement before use. The instructions for use for the other devices must be followed.

Electromagnetic environment

This device may only be used in environments specified in section "Environment of use" on page 14.

Emissions	Compliance
Radiated emissions	Class B, group 1 (30 MHz to 1 GHz)
Conducted emissions	Class B, group 1 (150 kHz to 30 MHz)
Harmonic emissions (IEC 61000-3-2)	Class A
Voltage fluctuations / flicker (IEC 61000-3-3)	Fulfilled

Immunity against	Test level and required electromagnetic environment
Electrostatic discharge (ESD) (IEC 61000-4-2)	Contact discharge: ±8 kV
	Air discharge: ±15 kV
Fast transient electrical disturbances (bursts) (IEC 61000-4-4)	Power cable: ±2 kV
	Longer signal input lines/output lines: ±1 kV
Impulse voltages (surges) (IEC 61000-4-5)	Voltage, external conductor – external conductor: ±1 kV
	Voltage, external conductor – protective ground conductor: ±2 kV
Magnetic fields at mains frequency (IEC 61000-4-8)	50 Hz: 30 A/m
Voltage dips and short interruptions in the supply voltage (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)	26 MHz to 1 GHz: 30 V/m (ISO 10651-3) 80 MHz to 2 GHz: 10 V/m (EN 794-3) 80 MHz to 2.7 GHz: 3 V/m
Conducted high-frequency disturbances (IEC 61000-4-6)	150 kHz to 80 MHz: 3 V, ISM bands: 6 V
Electromagnetic fields in the vicinity of wireless communication devices	Various frequencies from 385 MHz to 5785 MHz: 9 V/m to 28 V/m

Recommended separation distances from wireless communication devices

WARNING

Risk due to electromagnetic disturbance

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 disturbances. 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 of this device is fulfilled.

Maintain an adequate distance between this device and other medical electrical equipment.

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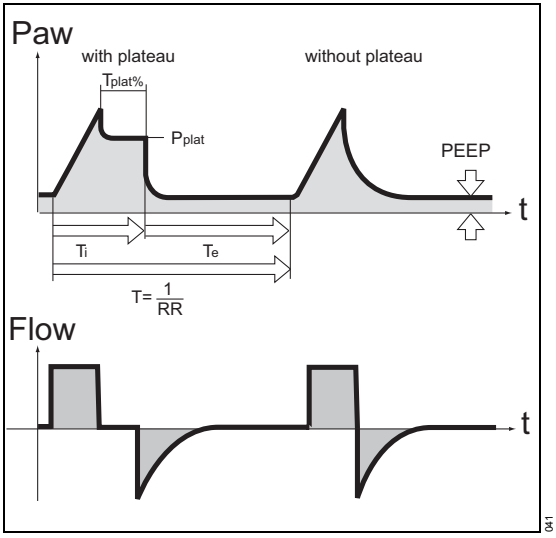
Description

Ventilation modes

VC-CMV

Volume **C**ontrolled –**C**ontrolled **M**andatory **Ventilation**



In this mode only mandatory volume controlled strokes are delivered to the patient. The ventilation pattern is specified by the settings for tidal volume ***VT***, respiratory rate ***RR***, ventilation time ratio ***I:E*** or inspiratory time ***Ti*** and ***PEEP***.

At the end of the flow delivery phase, the expiratory valve remains closed until the end of the inspiratory time. This phase, the inspiratory pause, can be identified as the plateau ***Tplat*** and is defined as a percentage of the inspiratory time.

VC-AC

Volume **C**ontrolled – **A**ssist **C**ontrol

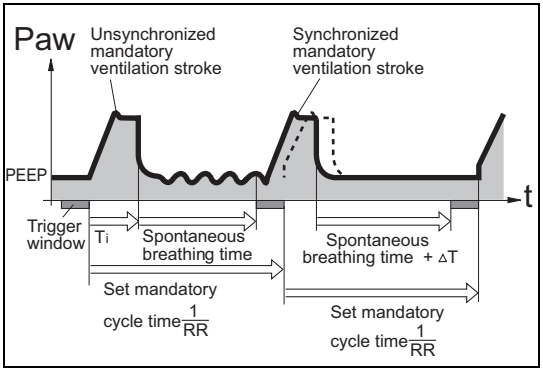
Assisted ventilation with continuous positive airway pressure.

VC-AC provides volume controlled strokes. These strokes can be synchronized with the patient's spontaneous breathing. The mandatory ventilation pattern is specified as VC-CMV, but the mandatory breath begins when the patient reaches an inspiratory flow corresponding at least to the set flow trigger.

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

VC-SIMV

Volume **C**ontrolled – **S**ynchronized **I**ntermittent **M**andatory **V**entilation



VC-SIMV provides a combination of mandatory ventilation and spontaneous breathing. It enables the patient to breathe spontaneously, with the mechanical mandatory breaths providing minimum ventilation. The minimum ventilation is controlled by the two set values of the tidal volume ***VT*** and respiratory rate ***RR*** and is determined from the product of VT x RR.

The mandatory ventilation pattern results from the ventilation parameters of the tidal volume ***VT***, respiratory rate ***RR***, ventilation time ratio ***I:E*** or inspiratory time ***Ti*** and plateau time ***Tplat***. To prevent the mandatory breath from being applied during spontaneous expiration, the flow trigger of the ventilator ensures that the breath is triggered in synchrony with the patient's spontaneous inspiratory effort within a fixed time window during expiration.

The trigger window has a duration of 5 seconds. If the expiratory time is less than 5 seconds, the trigger window covers the entire expiratory time minus a minimum expiratory time of 500 ms.

Since the synchronization of the mandatory breath reduces the spontaneous breathing time, which would result in an undesirable increase in respiratory rate, the Oxylog 3000 *plus* prolongs the spontaneous breathing time of the subsequent breath by the difference ΔT - thus preventing an increase in SIMV frequency. The respiratory rate ***RR*** remains constant.

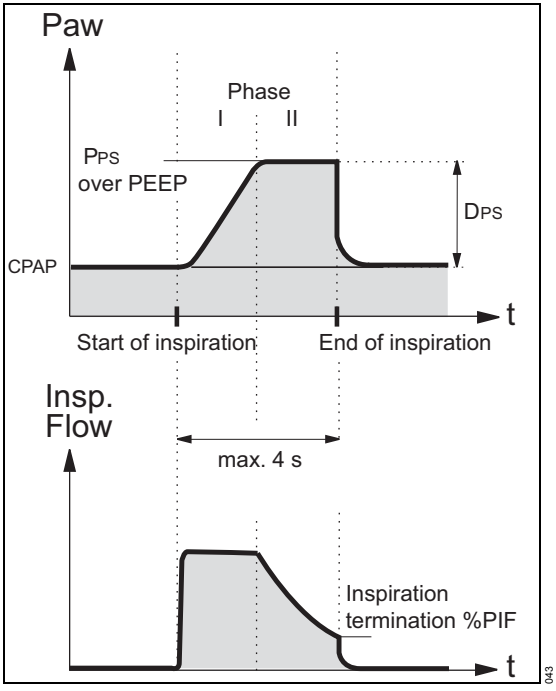
The respiratory rate ***RR*** and tidal volume ***VT*** set the minimum ventilation –, as in VC-CMV and VC-AC.

During the spontaneous breathing phases, the patient can be assisted with pressure by Pressure Support PS.

Generally the number of mandatory breaths is reduced in the course of weaning the patient off ventilation. This increases the spontaneous breathing time, so that the required total minute volume MV is increasingly supplied by spontaneous breathing.

PS

Pressure **S**upport (Pressure support)



Pressure Support for insufficient spontaneous breathing.

PS can be used in combination with VC-SIMV, PC-BIPAP and Spn-CPAP. With PS the device supports the inspiration. The patient has control of the spontaneous respiratory rate. During PS strokes, the spontaneously breathing patient is supplied with breathing gas, even if the inspiratory effort is weak.

The Pressure Support is started when the spontaneous inspiratory flow reaches the set flow trigger level. The device then increases the airway pressure up to the preselected pressure ***ΔPsupp*** above ***PEEP***, which is adjustable to the condition of the patient.

The are three settings for the rate of pressure increase (slope):

– Steep slope: The pressure rises rapidly, meaning the Oxylog 3000 *plus* supports spontaneous breathing with a high initial flow.

– Flat slope: The pressure rises slowly, meaning the Oxylog 3000 *plus* supports spontaneous breathing with a low initial flow. In this case greater inspiratory effort by the patient may be required.

– Medium slope: It is also possible to choose a setting between a high and low initial flow.

The slope and the ***ΔPsupp*** above ***PEEP*** and the patient's own breathing activity define the inspiratory flow.

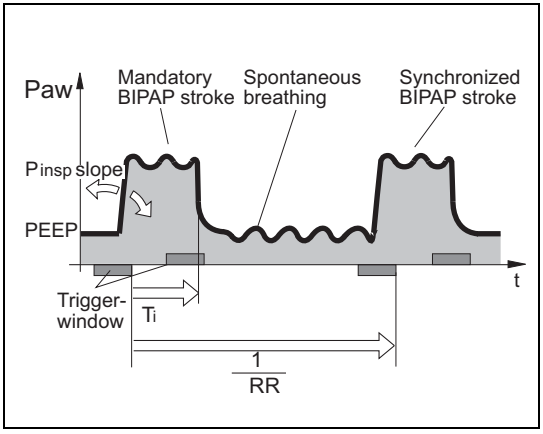
PS is terminated:

– When after 100 ms the inspiratory flow falls below the set inspiration termination criterion as percentage of the peak inspiratory flow (***Insp.term.%PIF***) (and thus ***ΔPsupp*** above ***PEEP*** is reached), or

– After 4 seconds, if the previous criterion has not been fulfilled.

PC-BIPAP

Pressure **C**ontrolled – **B**iphasic **P**ositive **A**irway **P**ressure



The PC-BIPAP ventilation mode is a pressure controlled / time-cycled ventilation mode, in which the patient can always breathe spontaneously. PC-BIPAP can be described as a time-cycled alternation between two CPAP levels.

The constant option of spontaneous breathing allows the transition from controlled ventilation to independent spontaneous breathing to take place smoothly during the weaning phase, without requiring any change of the ventilation mode. To adapt easily to the patient's spontaneous breathing pattern, the changeover from inspiratory pressure level to expiratory pressure level and visa versa, are synchronized with the patient's spontaneous breathing.

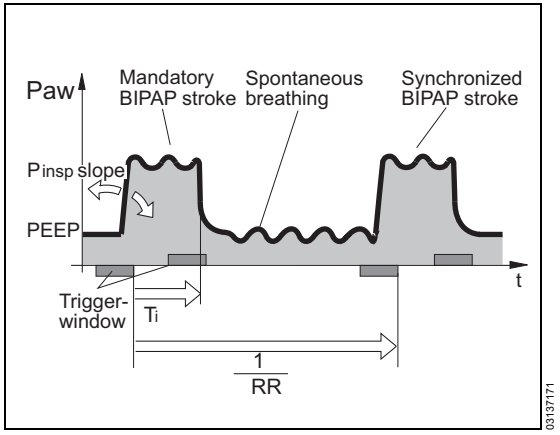
The rate of the changeover is kept constant, even when synchronization occurs via a trigger window. This smooth adaptation to the patient's spontaneous breathing requires less sedation. This means that the patient returns to spontaneous breathing more rapidly.

As in all pressure-controlled ventilation modes, the patient is not prescribed a fixed tidal volume VT. The tidal volume VT results principally from the pressure difference between ***PEEP*** and ***Pinsp*** and from the lung compliance. An increase in this pressure difference will cause an increased tidal volume VT.

The measured expiratory tidal volume ***VTe*** must be used to set the required difference between ***PEEP*** and ***Pinsp***.

Changes in lung compliance and in the airway, as well as active 'fighting' by the patient can lead to changes in tidal volume VT. This is a desired effect in this ventilation mode. Because the tidal volume VT and the resulting minute volume MV are not constant, the alarm limits for minute volume MVe must be set with care.

Setting PC-BIPAP



As with VC-SIMV, the time pattern is set using the basic setting parameters respiratory rate ***RR*** and ventilation time ratio ***I:E*** or inspiratory time ***Ti***.

The lower pressure level is set with the ***PEEP***, while the upper pressure level is set with ***Pinsp***.

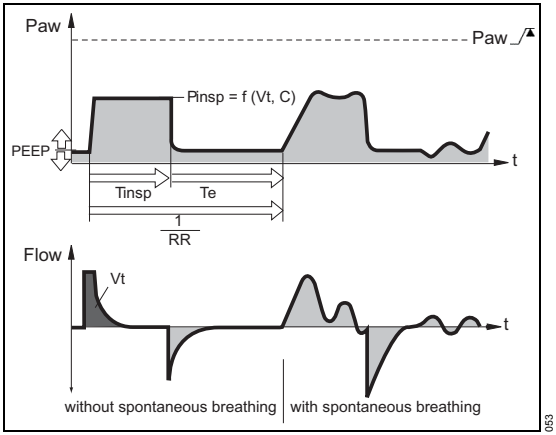
When switching over from VC-SIMV to PC-BIPAP, the time pattern remains unchanged, but the ***Pinsp*** needs to be set.

The steepness of the increase from the lower pressure level to the upper pressure level is controlled by the ***Slope*** setting.

During the lower pressure level phase, spontaneous breathing can be assisted by Pressure Support PS. The steepness of the pressure increase to ***ΔPsupp*** above ***PEEP*** is also controlled by the ***Slope*** setting.

Weaning from controlled ventilation to fully spontaneous breathing is achieved by a gradual reduction of inspiratory pressure ***Pinsp*** and/or the respiratory rate ***RR***.

AutoFlow



AutoFlow (AF) delivers the set tidal volume ***VT*** using a decelerating flow pattern to achieve the lowest peak airway pressure possible. The Oxylog 3000 *plus* determines the pressure required to deliver the set tidal volume ***VT*** based on lung characteristics such as resistance and compliance relationships, and the patient's spontaneous breathing demand.

When the patient inhales, the Oxylog 3000 *plus* delivers additional inspiratory flow.

The maximum inspiratory pressure in AutoFlow is limited to:

– 5 mbar below Pmax.

The patient's current condition must be considered when setting ***Pmax***, to avoid the possibility of causing lung damage if the airway pressure increases. Always set ***Pmax*** carefully in order to limit the airway pressure in case of a reduced compliance.

If the set tidal volume ***VT*** cannot be achieved and the maximum inspiratory pressure is reached, the alarm ***VT low, pressure limit*** is generated.

The minimum inspiratory pressure in AutoFlow is limited to:

– 5 mbar above ***PEEP*** for non-triggered breaths;

– 0.1 mbar above ***PEEP*** for triggered breaths.

Typically, the selected inspiratory time ***Ti*** is much longer than the lung filling time. The inspiratory pressure ***Pinsp*** corresponds to the minimum value calculated from the tidal volume VT and compliance C of the lungs. The inspiratory flow is automatically controlled, so that there is no pressure peak caused by the resistances of the tube and the airways. With AutoFlow, the inspiratory flow will adjust a maximum of 3 mbar breath to breath.

If the tidal volume ***VT*** is reached (inspiratory flow = 0), before the inspiratory time ***Ti*** has fully elapsed, the Oxylog 3000 *plus* ensures that the patient can breathe during the remaining inspiratory time.

If the patient breathes during mandatory inspiration, the inspiratory pressure remains constant for this breath. Only the inspiratory and the expiratory flow are adapted to the patient's demand. The applied tidal volume may differ from the set tidal volume ***VT*** for spontaneous generated breaths, but on average a constant tidal volume is maintained.

The Oxylog 3000 *plus* terminates an AutoFlow breath if the tidal volume delivered to the patient is 30 % greater than the set tidal volume ***VT***.

Set the ***MVe high*** and ***MVe low*** alarm limits so that an alarm is triggered if the flow is too high or too low.

During AutoFlow the flow curve in the curve window supplies additional information: If the set inspiratory time ***Ti*** is shorter than the lung filling time the flow curve will display that inspiratory flow has not returned to baseline at the end of the inspiratory phase. In this case evaluate the condition of the patient to determine the cause of the extended inspiratory time ***Ti*** in order to further reduce the peak pressure. This effect can also be due to a build-up of secretions. In this situation, the inspiratory pressure is limited by the Oxylog 3000 *plus* as described above. If, as a result, the set tidal volume ***VT*** can no longer be completely delivered, the alarm ***VT low, pressure limit*** is generated.

The inspiratory flow rise from the ***PEEP*** level to the inspiratory level can be even more closely adapted to the needs of the patient by means of the pressure rise time ***Slope***.

Start up behavior of AutoFlow

When activating the AutoFlow function, the Oxylog 3000 *plus* applies a volume-controlled breath using a constant inspiratory flow rate for the duration of the inspiratory time Ti. The peak airway pressure generated from this breath will determine the inspiratory pressure for the AutoFlow function.

If no suitable pressure can be determined for this breath or the volume cannot be applied, the following occurs:

– A pressure controlled breath is applied with an inspiratory pressure of 5 mbar above the set ***PEEP***. The applied volume is measured and determines an initial target pressure to achieve the set tidal volume ***VT***.

– The next breath is applied using an inspiratory pressure that corresponds to 75 % of this first target pressure. The Oxylog 3000 *plus* measures the applied volume again and determines the subsequent target pressure to reach the set volume.

– The next breath is applied with this target pressure.

The inspiratory pressure of the subsequent breaths is adjusted until the set tidal volume ***VT*** is reached.

In the event of a hose disconnected alarm, this start-up behavior is repeated.

Dead space

Dead space is an important aspect of ventilation management:
Dead space is the portion of the respiratory system in which no significant gas exchange occurs. An increase in the proportion of dead space to alveolar ventilation may lead to increased CO_2 retention by the patient.

Dead space is present as a component of the patient's artificial airway and breathing circuit. If the dead space volume corresponds to, or exceeds, the volume of the alveolar ventilation, the patient may possibly not exhale sufficient carbon dioxide. It is therefore important to take correct account of the dead space volume in the breathing circuit of the Oxylog 3000 *plus*.

Determining cycle time, inspiratory time and expiratory time

The basis for determining the cycle time (total time for a respiratory cycle) during mandatory breaths is the set respiratory rate (***RR***). This is complemented with the set inspiratory time (***Ti***) or the set ventilation time ratio ***(I:E***).

NOTE
Values for ***Ti*** or ***I:E*** can be configured in Customer Service Mode, refer to "Customer Service Mode" on page 97.

However, in case of conflicting settings the ventilator will determine the cycle time, Ti and Te in the following order:

– If the set time ***Ti*** is too short for the ventilator to deliver the set tidal volume ***VT***, the duration of ***Ti*** is automatically increased. If the resulting ***Ti*** exceeds the cycle time, the cycle time is automatically increased. Note: This applies only to volume-controlled ventilation modes.

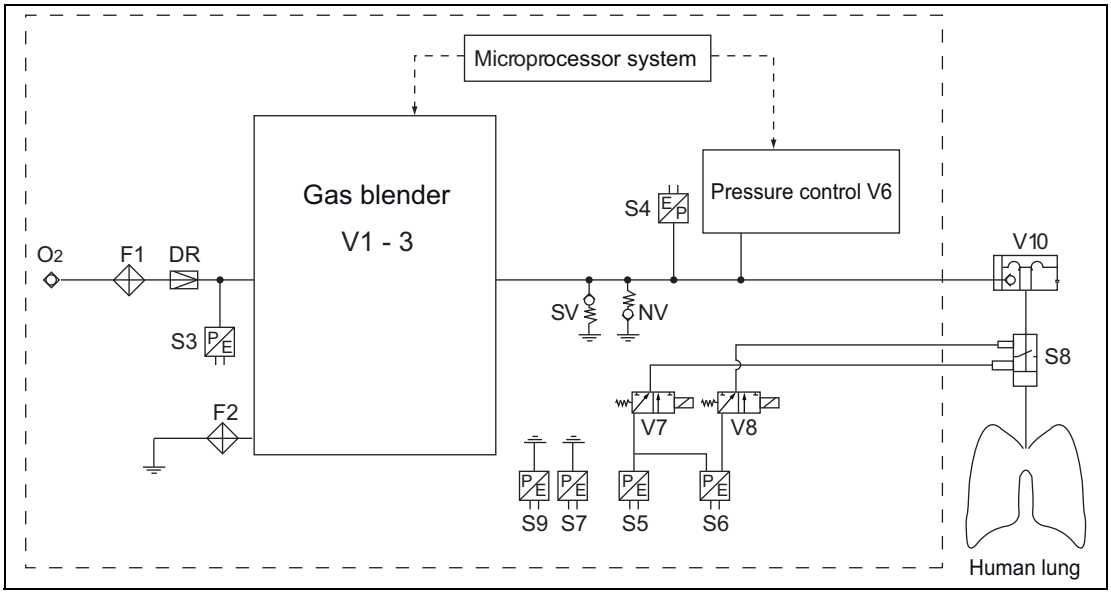
– If the set time ***Ti*** exceeds the cycle time, the duration of ***Ti*** is automatically adapted to the cycle time.

– The expiratory time ***Te*** is at least 0.5 s. if the ***Te*** no longer fits in the cycle time (owing to a long ***Ti***), the cycle time is automatically increased.

These rules are also applicable when the ventilator is configured to set ***I:E*** instead of ***Ti***.

In case of conflicting settings, the alarm message ***!! Check settings: time*** or ***!! Check settings: flow*** is issued to notify the user to change the settings.

Functional description



The various pneumatic actuators in the Oxylog 3000 *plus* are controlled by the microprocessor system via digitized electrical signals.

Gas supply

The supply gas O_2 is purified by filter F1 and adjusted to a constant pressure by pressure reducer DR. Ambient air is drawn in through filter F2 as required. The supply pressure is monitored by pressure sensor S3.

Inspiration

Gas blender V1-3 delivers the variable inspiratory flow as a mixture of supply gas O_2 and ambient air in accordance with the ventilation mode and required O_2 concentration. The tidal volume is applied regardless of ambient pressure (absolute pressure sensors S7 and S9) under patient conditions BTPS for volume-controlled breathing; the applied tidal volume corresponds with that set for BTPS, taking into account the ambient pressure. In this way, the Oxylog 3000 *plus* meters and measures roughly 10 % less volume in operation with a test lung (dry gas at room temperature).

Expiration

During volume-controlled inspiration, Pressure Control V6 closes the inspiratory canal and controls the PEEP pressure during expiration or reduces the pressure in the inspiratory hose to control the PS, Pinsp or Pmax pressure when the target values are reached. Breathing valve V10 on the patient side, which is indirectly controlled by V6, seals off against atmospheric air during inspiration and adjusts the required patient pressure during expiration by controlling the pressure in the inspiratory hose. The measured value of the airway pressure sensor S5 on the patient side serves as a set point for pressure regulation.

Safety

In the event of a fault, gas blender V1-3 closes and Pressure Control V6 opens to the atmosphere. The pneumatic demand valve NV (spontaneous breathing) opens in the presence of negative pressure. The pneumatic relief valve SV (set to approximately 80 mbar) opens in the presence of excess pressure.

Software

The software is developed according to the internal software development process and will be subjected to code inspections, integration tests and system tests.

When an error has been detected the device will fail in a fail safe mode.

Monitoring

The flow measured on the patient side by S8 is transmitted to the internal electronic pressure difference sensor S6 as a differential pressure signal. The measured monitoring values of the tidal volume, minute volume and respiratory rate are derived from the measured expiratory flow. The inspiratory flow signal is used for detection of the flow trigger. System leakages can be identified from the balance of inspiratory and expiratory tidal volumes (e. g. leakage alarm, NIV).

Airway pressure measurement on the patient side supplies the Paw values for the airway pressure on the display via S5, as well as for the derived measured values PEEP, PIP, Pplat, Pmean. The plausibility of this airway pressure measurement on the patient side is monitored by a redundant internal airway pressure measurement in the ventilator via S4 in the inspiratory duct.

CO_2 measurement

CO_2 is measured by a mainstream system based on absorption measurement. A light source generates a spectrum and two light detectors record the characteristic absorption spectrum and supply electrical signals that change with the CO_2 concentration. These signals are then evaluated and displayed. Heating the CO_2 sensor probe prevents condensation.

When the CO_2 sensor is connected or had a power supply failure, it will first complete its warm-up phase (approximately 3 minutes). During warm-up:

– etCO2 and CO2 values may have a reduced accuracy;

– Zero calibration and filter check remain on hold;

– The alarm ***!!! Check cuvette type*** is inactive.

List of accessories

Part name	Order number
Accessories required for operation	
Power supply:	
AC/DC power pack 100-240 V/50-60 Hz	57 90 808
Available power cables:	
– Germany and Europe	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
– Brazil	18 75 523
– Thailand	18 68 160
Isolated DC/DC converter	57 04 799
Lithium ion battery	2M 86 733
Breathing hose sets and accessories	
Breathing hose set, with flow measuring line, 1.5 m	84 12 068
Breathing hose set, with flow measuring line, 3 m	84 12 913
Breathing valve	84 12 001
Flow sensor	84 12 034
Angled connector	84 12 235
VentStar Oxylog disposable breathing circuit for adults, 1.5 m, 5 pc.	57 03 041
VentStar Oxylog disposable breathing circuit for adults, 3 m, 5 pc.	MP 00 335
VentStar Oxylog disposable breathing circuit for pediatric patients, 1.9 m, 5 pc.	57 04 964

Part name	Order number
Masks	
NovaStar NIV mask:	
Size S	MP 01 579
Size M	MP 01 580
Size L	MP 01 581
ClassicStar mask:	
Size S	MP 01 573
Size M	MP 01 574
Size L	MP 01 575
ComfortStar mask (20 pieces):	
Size 3, children	MP 01 513
Size 4, S	MP 01 514
Size 5, M	MP 01 515
Size 6, L	MP 01 516
LiteStar mask (30 pieces):	
Size 3, children	MP 01 503
Size 4, S	MP 01 504
Size 5, M	MP 01 505
Size 6, L	MP 01 506
Headgear straps for masks	
Headgear strap, disposable, fabric, S	MP 01 559
Headgear strap, disposable, fabric, L	MP 01 560
Headgear strap, disposable, rubber, S	MP 01 561
Headgear strap, disposable, rubber, L	MP 01 562
Breathing system filters/HME	
TwinStar (filter - HME combination, 50 pieces):	
90 mL	MP 01 800

Part name	Order number
65 mL	MP 01 810
55 mL	MP 01 805
25 mL	MP 01 815
CareStar (electrostatic filter, 50 pieces):	
45 mL	MP 01 755
40 mL	MP 01 765
30 mL	MP 01 770
HME filter SafeStar (mechanical HEPA filter, 50 pieces):	
55 mL	MP 01 790
60 mL	MP 01 795
80 mL	MP 01 785
Oxygen gas cylinders	
O_2 cylinder, 2 liters, 200 bar, G3/4 cylinder connection	B1 02 05
O_2 cylinder, 2 liters, 200 bar, Pin Index cylinder connection	B1 02 08
Connection hoses	
Gas Supply System	57 04 500
Special accessories	
Equipment holder	2M 86 900
Battery Charger	2M 86 729
All-round Wall Holder	57 04 216
Carrying System	2M 86 975
Test lung	84 03 201
Data communication cable, 0.8 m	57 05 301
Trolley	57 90 150
Options	
CO_2 measurement	57 05 331
Real time data export	57 05 332
AutoFlow	57 05 333
O_2 inhalation	57 05 329
100 % O_2	57 05 330

Part name	Order number
CO_2 measurement	
CO_2 sensor (revision index 04 and higher)	68 71 950
Extension cable for CO_2 sensor, 90 cm	68 72 159
Reusable CO_2 cuvette (adults)	68 70 279
Reusable CO_2 cuvette (pediatric)	68 70 280
Disposable CO_2 cuvette (adult)	MP 01 062
Disposable CO_2 cuvette (pediatric)	MP 01 063
Calibration set	8412710
Test gas bottle 5 Vol% CO_2 (replacement bottle for calibration set)	6850435

Index

I

L

M

N

O

P

R

S

T

V

W

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Accessing Customer Service Mode

Accessing Customer Service Mode

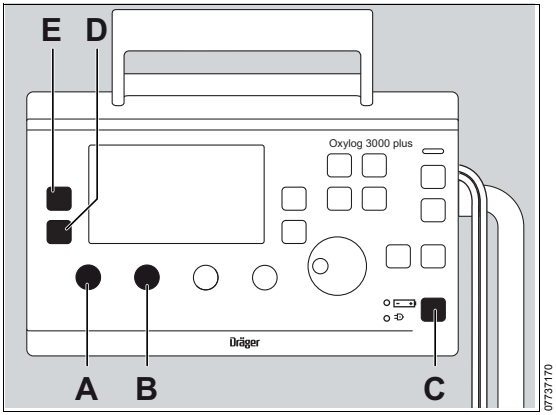
Switching on Customer Service Mode

The following description is only intended for maintenance personnel and trained experts, so as to prevent unauthorized adjustment. The access description is given on the next page of the instructions for use.

Cut out the section containing the access description and store it in a secure location where no unauthorized persons can access it.

If the cutout containing the access description has been removed, ask your device manager how to make changes in Customer Service Mode.

Accessing Customer Service Mode Oxylog 3000 *plus* SW 1.n

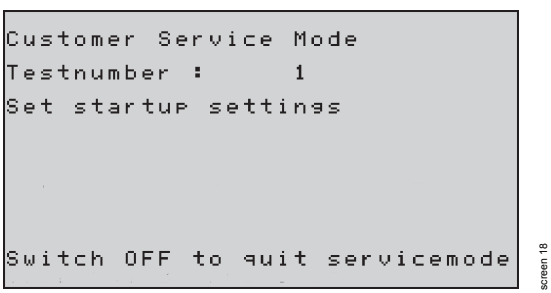


1 Ensure that ventilation is OFF.

2 Turn controls ***VT*** (A) and ***RR*** (B) all the way to the right.

3 Press the Start/Standby key ⏻ (C) to switch the device on. Press and hold down the ***Curves*** Curves (D) and ***Values*** ▷▷ (E) keys simultaneously until the main menu of the ***Customer Service Mode*** is displayed.

4 In the main menu, set the number of the required test with the rotary knob.



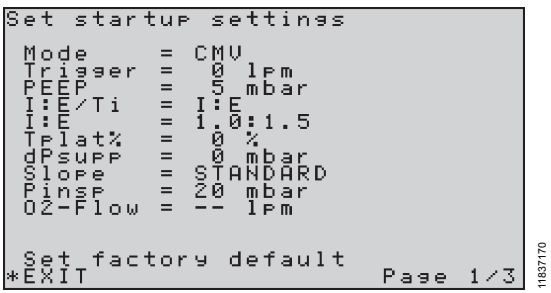
5 Press the rotary knob to activate the test.

Settings in Customer Service Mode

6 Select the required function with the cursor (asterisk).

- To select the parameter: turn rotary knob.
- To activate the parameter: Press the rotary knob.
- To set the value: turn rotary knob.
- To confirm the value: Press the rotary knob.

To exit the parameter settings menu



1 Select the line ***EXIT***.

2 Press the rotary knob to confirm.
The set values are saved as default settings and remain effective.

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These instructions for use only apply to **Oxylog 3000 *plus* SW 1.n**.
with the Serial No.:
If no Serial No. has been filled in by Dräger, these instructions for use are provided for general information only and are not intended for use with any specific machine or device.
This document is provided for customer information only, and will not be updated or exchanged without customer request.

CE 0123
Directive 93/42/EEC
concerning medical devices

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