Dräger medical
A Dräger and Siemens Company

Instructions for Use

Oxylog 2000 *plus*

Title

WARNING
For a full understanding of the performance characteristics of this device, the user should carefully read this manual before use of the device.

Emergency and Transport Ventilator Software 1.n

Working with these Instructions for Use

The **title of the main chapter** in the header line helps with orientation and navigation.

The **Instructions for Use** combine text and illustrations, providing a comprehensive overview of the system. The information is presented as sequential steps of action, allowing the user to systematically learn how to use the device.

The **text** provides explanations and instructs the user step-by-step in the practical use of the product, with short, clear instructions in easy-to-follow sequences.

1 Consecutive numbers indicate the 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 relevant illustration.

The **illustrations** show the relationship between the text and the device. Elements mentioned in the text are highlighted. Unnecessary details are omitted.

Schematic renderings of screen images guide the user and allow to reconfirm actions performed. The actual screen images differ in lock or in configuration.

A Letters denote elements referred to the text.

Typing conventions

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***.

Trademarks

The Dräger Oxylog® name is a registered trademark of Dräger.

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.

Abbreviations and Symbols

Please refer to "Abbreviations" on page 16 and "Symbols" on page 17 for additional information.

Contents

For Your Safety and that of Your Patients

Strictly follow these Instructions for Use

WARNING

Any use of the medical device requires full understanding and strict observation of all portions of these Instructions for Use. The medical device is only to be used for the purpose specified under "Intended use" on page 10 and in conjunction with appropriate patient monitoring.

Strictly observe all WARNING and CAUTION statements throughout these Instructions for Use and all statements on medical device labels.

Maintenance

WARNING

The medical device must be inspected and serviced regularly by properly trained service personnel.
Repair of the device may also only be carried out by properly trained service personnel.

Dräger Medical recommends that a service contract be obtained with DrägerService and that all repairs also be carried out by them. Dräger Medical recommends that only authentic Dräger Medical repair parts be used for maintenance. Otherwise, the proper functioning of the medical device may be compromised.

Refer to the chapter "Maintenance" on page 95 for additional information.

Accessories

WARNING

Only the accessories indicated on the list of accessories have been tested and approved to be used with the medical device. Accordingly, it is strongly recommended that only these accessories be used in conjunction with the specific medical device. Otherwise, the correct functioning of the medical device may be compromised.

WARNING

Any connected devices, or combination of devices, not complying with the requirements mentioned in these Instructions for Use may compromise the correct functioning of the medical device. Prior to operating the medical device, consult the respective documentation and Instructions for Use of all connected devices or combination of devices.

Not for use in explosion hazard areas

WARNING

This medical device is neither approved nor certified for use in areas where combustible or explosive gas mixtures are likely to occur.

Safe connection with other electrical equipment

WARNING

Electrical connections to equipment, which are not listed in these Instructions for Use, should only be made following consultation with the respective manufacturers. Equipment malfunction may result as well as risk of patient injury.

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 purchase and use of the equipment are restricted to trained professionals, and that certain inherent characteristics of the medical device are known to the trained operator. Instructions, warnings, and caution statements are limited, therefore, largely to the specifics of the Dräger design.

This publication excludes references to various hazards which are obvious to a medical professional and operator 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.

CAUTION
Have a supply of extra batteries available.

Patient monitoring

The operators of the medical device are responsible for choosing appropriate safety monitoring that supplies 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 operator.

Functional safety

The essential performance of the Oxylog 2000 *plus* is defined as:
Accuracy of the delivery of ventilation to the patient or generation of a technical alarm condition.

General WARNINGS and CAUTIONS

The following WARNINGS and CAUTIONS apply to general operation of the device. WARNINGS and CAUTIONS specific to subsystems or particular features appear with those topics in later sections of the manual.

Note on EMC/ESD risk for the device function

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 "Technical Documentation for the Oxylog 2000 plus according to EMC standard IEC/EN 60601-1-2" on page 113.

Portable and mobile RF communications equipment can affect medical electrical equipment.

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

WARNING

Keep a manual resuscitation bag available!

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

WARNING

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

WARNING

For proper ventilation, always consider the dead space of the total ventilation circuit when setting ventilation parameters, especially when applying small tidal volumes.

WARNING

Ventilation with increased oxygen concentrations may be harmful to the patient. Oxygen must be administered by medical professionals only.

Installing accessories

CAUTION

Installations to the basic device must be done in accordance with the Instructions for Use of the basic device. Make sure that the connection is securely fitted onto the basic device system.

Strictly follow the Assembly Instructions and Instructions for Use.

Instructions for Use only available once

CAUTION

Only one copy of the Instructions for Use is included in the clinical package and should therefore be kept in an accessible location for users.

Application

Intended use

The Oxylog® 2000 *plus* is a time-cycled, volume controlled emergency and transport ventilator with pressure support for patients requiring mandatory or assisted ventilation with a tidal volume of 100 mL upwards.

For use by and under the supervision of trained health care professionals.

Indications/Contraindications

For patients requiring a tidal volume of 100 mL upwards.

WARNING

The Oxylog 2000 *plus* ventilator may only be used under the supervision of qualified medical personnel in order to be able to provide immediate corrective action in case of a malfunction.

Environment of use

For use in the following environments:

- Mobile use for emergency patients, for 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

Do not use the equipment in hyperbaric chambers!

The device may malfunction, causing danger to the patient.

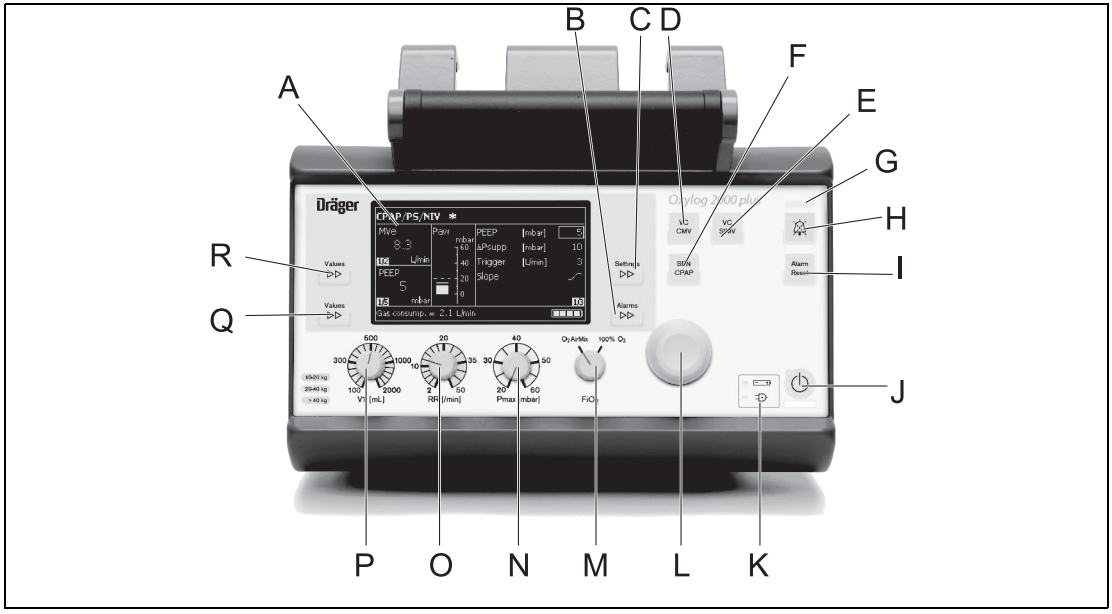
WARNING

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

The device may malfunction, causing danger to the patient.

System Overview

Front panel with all options



A Screen with screen pages for the specific application

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

C Key ***Settings*** ▷▷ for setting other ventilation parameters on the screen

D Key for ventilation modes ***VC-CMV / VC-AC***

E Key for ventilation modes ***VC-SIMV (PS)****

F Key for ventilation modes ***SpnCPAP (PS)****

G Red and yellow lights (LEDs) as alarm indicators

H Key 🔔 to suppress the audible alarm for 2 minutes

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

J Start / Standby key ⏻

K Display symbols for the power supply
- Charge status of the internal battery
- Mains power supply connected

L Central rotary knob for making selections / settings and for confirming these

M Control knob for setting O_2 AirMix or 100% O_2 ***FiO_2***

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

O Control knob for setting the ventilation respiratory rate ***RR***

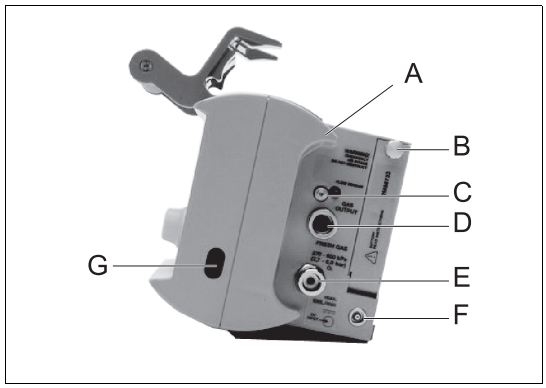
P Control knob for setting the tidal volume ***VT***

Q Key ***Values*** ▷▷ to select the displayed measured values

R Key ***Values*** ▷▷ to select the displayed measured MVe or VTe values

* VC-SIMV/PS and SpnCPAP/PS are optional features.

Side view, right



A Emergency air intake

WARNING
Do not block the emergency air intake. This may result in ventilator malfunction.

B Screw to secure the battery compartment cover

C Gas outlet for flow measuring hoses

D Gas outlet for ventilation hose

E Connector for medical gas hose

F Socket for DC supply

G Window for Infrared Data Association (IrDA) interface

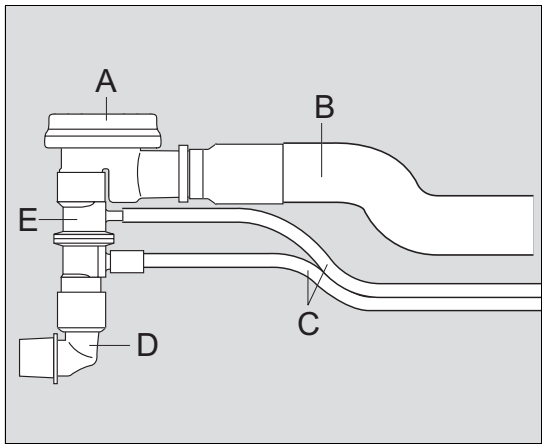
Rear view

A Filter cartridge for intake of ambient air

CAUTION
Do not block the air intake. This may result in ventilator malfunction.

B Rating plate

Reusable hose system



A Breathing valve

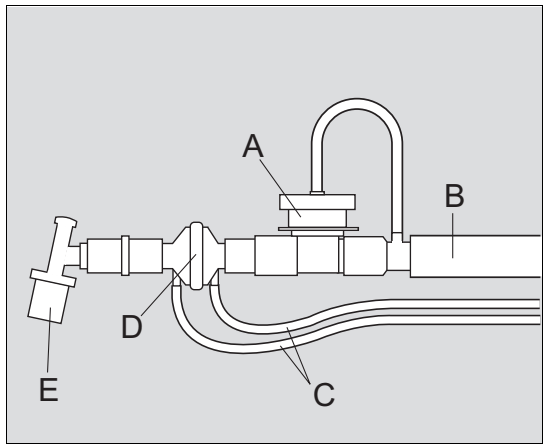
B Ventilation hose

C Flow and pressure measuring hoses

D Angled connector

E Flow sensor

Disposable hose system



A Breathing valve

B Ventilation hose

C Flow and pressure measuring hoses

D Flow sensor

E Angled connector

Available ventilation modes

– **VC-CMV / VC-AC**
Volume Controlled - Controlled Mechanical Ventilation with PEEP.

Volume Controlled - Assist Control with PEEP.

– **VC-SIMV (PS)**
Volume Controlled - Synchronized Intermittent Mandatory Ventilation with PEEP
(Optionally with Pressure Support).
Procedure for weaning patients off the ventilator after they have started spontaneous breathing.

– **SpnCPAP (PS)**
Continuous Positive Airway Pressure
(Optionally with Pressure Support)
Spontaneous breathing with positive airway pressure.

Special modes

In the ventilation mode SpnCPAP, two special modes are available.

– **Apnea Ventilation**
  To switch over automatically to volume-controlled mandatory ventilation if spontaneous breathing stops.
– **NIV**
  For mask ventilation to support non-invasive ventilation of spontaneously breathing patients with leakage compensation.

With monitoring

– Airway pressure Paw.
– Expiratory minute volume MVe.
– Apnea.
– Respiratory rate: High respiratory rate alarm.

Abbreviations

Abbreviation	Explanation
bpm	Breaths per minute
BTPS	Body Temperature, Pressure Saturated Measured values referred to the conditions of the patient's lung, body temperature 37 ^{O}C, airway pressure, water-vapor-saturated gas
C	Lung compliance
EN 794-3	European standard for medical ventilators, Part 3 "Emergency and transport ventilators"
ESD	Electrostatic discharge
ΔPsupp	Positive pressure above PEEP
FiO_2	Fraction of inspiratory oxygen
FRC	Functional Residual Capacity
HME	Heat Moisture Exchange
I:E	Relation inspiratory time to expiratory time
IrDA	Infrared Data Association
MVe	Total expiratory minute volume
MVi	Total inspiratory minute volume
MV_{spon}	Spontaneous minute volume
NIV	Non-invasive ventilation – mask ventilation
O_2 AirMix	Inspiratory gas mixture of O_2 and ambient air.
Paw	Airway pressure
PEEP	Positive end expiratory pressure
PIP	Peak inspiratory pressure
Pinsp	Inspiratory pressure
Pmax	Maximum allowed inspiratory pressure
Pmean	Mean airway pressure
Pplat	Plateau pressure

Abbreviation	Explanation
PS	Pressure Support, pressure assisted spontaneous breathing
RF	Radio Frequency
RR	Respiratory Rate (frequency)
RRapn	Respiratory Rate during apnea ventilation
RRsp	Spontaneous Respiratory Rate
Slope	Speed of which inspiratory flow is reached
SpnCPAP	Continuous Positive Airway Pressure Spontaneous breathing with continuous positive pressure
Tapn	Time for apnea alarm
Te	Expiratory time
Ti	Inspiratory time
Tplat %	Plateau time in % of inspiratory time
Taw	Airway temperature
VC-AC	Volume Controlled Assist Control with PEEP
VC-CMV	Volume Controlled Controlled Mandatory Ventilation
VC-SIMV	Volume Controlled Synchronized Intermittent Mandatory Ventilation
VTapn	Tidal volume during apnea ventilation
VT	Tidal volume
VTe	Expiratory tidal volume
VTi	Inspiratory tidal volume

Symbols

Symbol	Explanation
	Display screen window "Settings"
	Display screen window "Alarms"
	Display screen window measured "Values"
	Suppress audible alarm for 2 minutes
	Acknowledge alarms
	Start / Standby key
	Upper alarm limit only
	Lower alarm limit only
!	Advisory message
!!	Caution message
!!!	Warning message
	Strictly follow the Instructions for Use!
	Type BF applied part (body floating)
	Charge status of the internal battery
	Mains power supply connected
	Battery charge (example: three quarters full)

Symbol	Explanation
	The device complies with UN Regulation no. 10, revision 2 with respect to EMC for use in motor vehicles.
IPX4	Device protected from water sprayed from all directions, limited entrance allowed.
	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
	Consult the instructions for use.
	Indoor use only
	Caution, hot surface!
	Warning, dangerous voltage!
	Do not open!
	Temperature limitations

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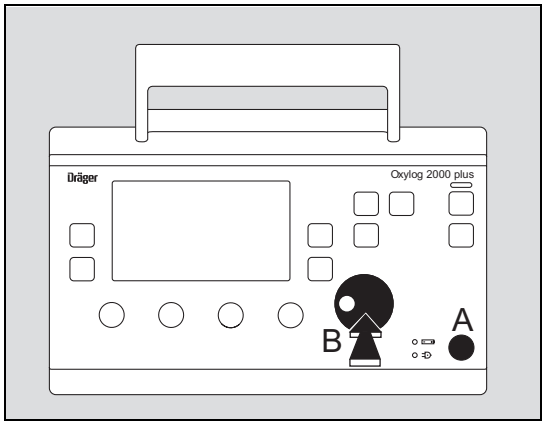
Operating Concept

Switch ON or OFF



Switch ON

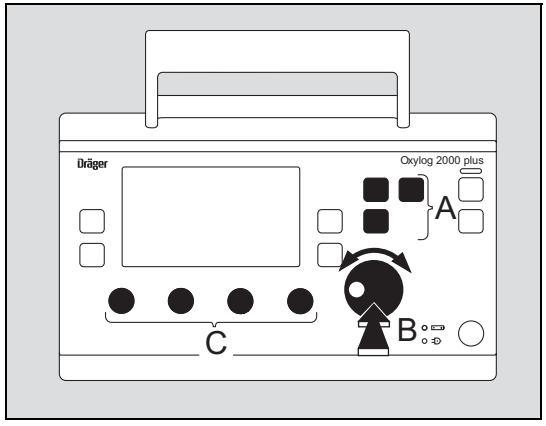
- To switch ON, briefly press the ⏻ key (A).

Switch OFF

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

2 Press the rotary knob (B) to confirm the switch OFF process.

Ventilation controls



A Keys for selecting the ventilation modes:
- **– *VC-CMV* / *VC-AC***
- **– *VC-SIMV* (optional PS)**
- **– *SpnCPAP* (optional PS).**

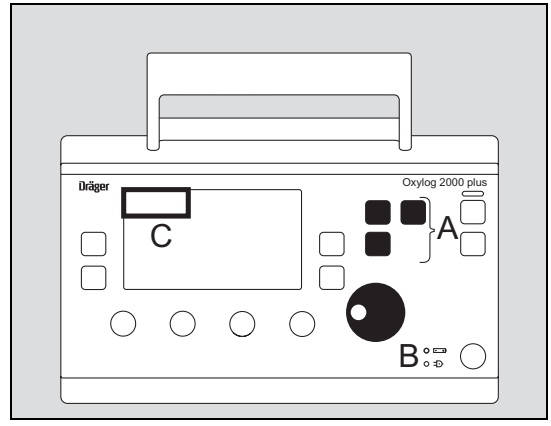
B Rotary knob.

C Ventilation parameter controls
- – Inspiratory tidal volume ***VT*** [mL],
- – Ventilation respiratory rate ***RR*** [/min],
- – Maximum inspiratory pressure ***Pmax*** [mbar],
- – O_2 AirMix or 100% O_2 ***FiO2***.

NOTE

Different ventilation modes and their parameters can be set in the display window via the rotary knob (e.g. Ti, PEEP, ΔPsupp, Pinsp).
- – To select the parameter: turn rotary knob.
- – To activate the parameter: press rotary knob.
- – To set the value: turn rotary knob.
- – To confirm the value: press rotary knob.

Selecting the ventilation mode



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

Or

1 Press the appropriate ventilation mode key (A).

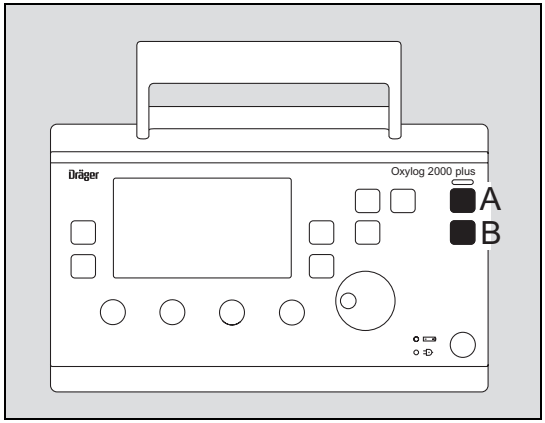
2 Press the rotary knob (B) to confirm. The selected ventilation mode will be activated.

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

Refer to the section "Operation" on page 45 for additional information on ventilation mode setting.

Routine and additional functions keys

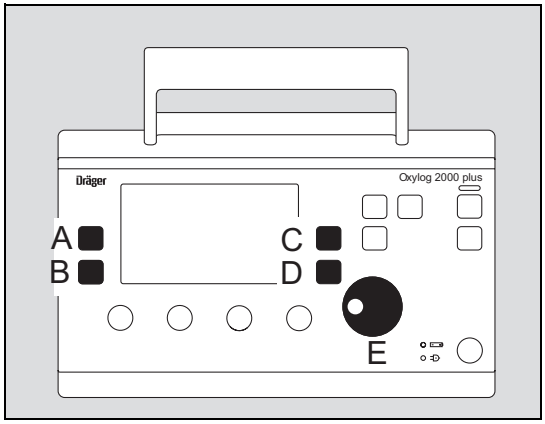
Frequently used keys are positioned on the upper right corner of the front panel:



A key for suppressing the audible alarm for 2 minutes.

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

Display operating controls



A ***Values*** ▷▷ key; to change screen pages in the "Measured Values" window, to display MVe or VTe.

B ***Values*** ▷▷ key; to change screen pages in the "Measured values" window, to display the measured values.

C ***Settings*** ▷▷ key; to change screen pages in the "Setting" window, to set other ventilation parameters.

D ***Alarms*** ▷▷ key; to change screen pages in the "Alarms" window, to set and display the alarm limits.

E Central rotary knob for selecting and confirming options on the display.

Changing screen pages in the windows

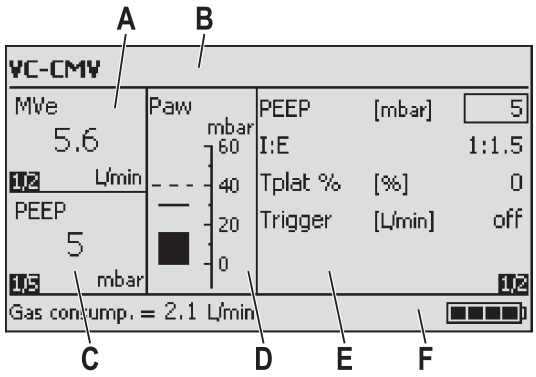
To advance to the next page in a screen window:

Settings and Alarms window:

1 Press the ***Settings*** ▷▷ key to display the settings pages.

2 Press the ***Alarms*** ▷▷ key to display the alarms pages.

Screen window structure



A Measured MVe / VTe window.

B Status and alarm message window.

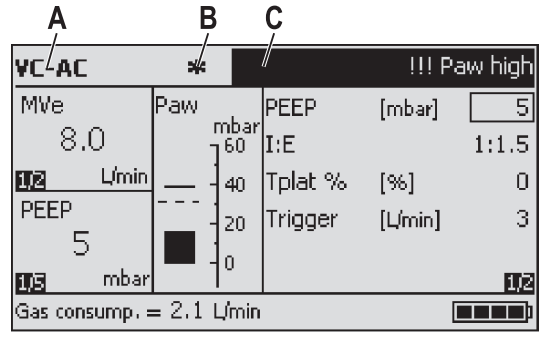
C Measured values window.

D Airway pressure bar graph.

E Settings and alarms window.

F Information window.

Status and alarm messages window

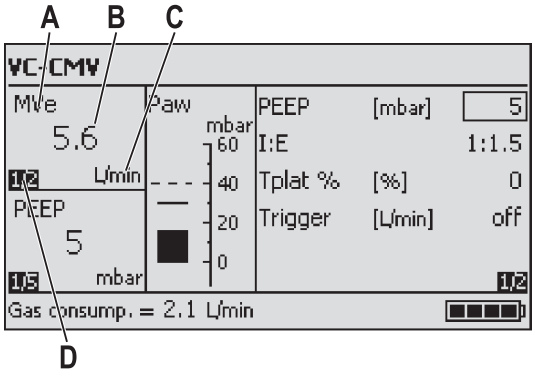


A Ventilation mode.

B Trigger indicator.

C Alarm window.

MVe / VTe window



A Parameter measured.

B Measured value.

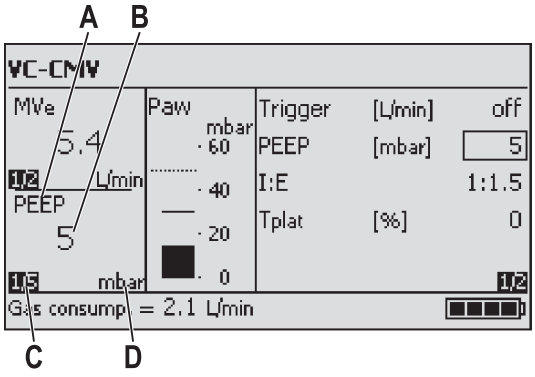
C Unit of measure.

D Page number.

To advance to the next page:

- Press the upper ***Values*** key.

Values window



A Parameter measured.

B Measured value.

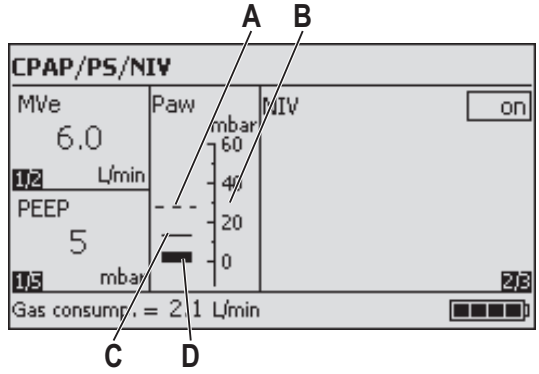
C Page number.

D Unit of measure.

To advance to the next page:

- Press the lower ***Values*** key.

Airway pressure bar graph



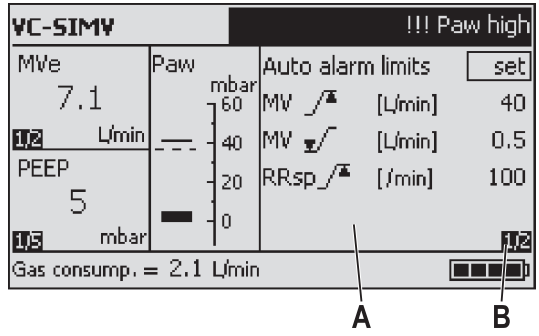
A Pmax alarm setting.

B Unit of measure scale.

C Pressure measurement of the previous breath.

D Pressure measurement of the current breath.

Alarms window



A Menu for alarm limits and alarm parameters. For detailed operating instructions, see "Setting alarm limits" on page 63.

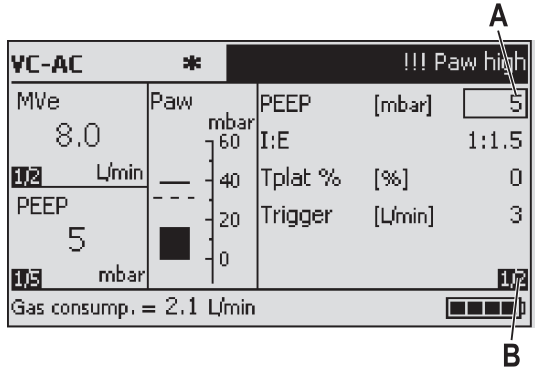
B Page number.

1st page of 2 available pages.

To advance to the next page:

- Press the ***Alarms*** key.

Settings window

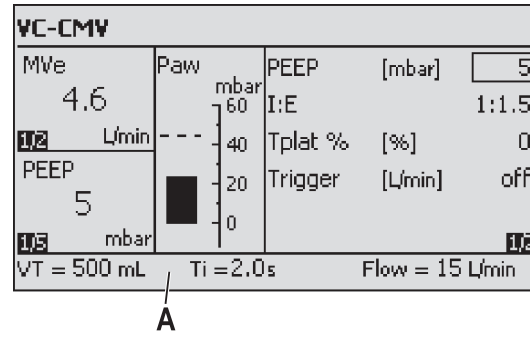


A Menu for setting supplementary ventilation parameters in accordance with the desired ventilation mode:
- I:E
- Ti
- PEEP
- ΔPsupp
- Tapn
- Trigger
- Tplat %
- Slope
- NIV
- Brightness
- RRapn
- VTapn

1st page of 2 available pages.

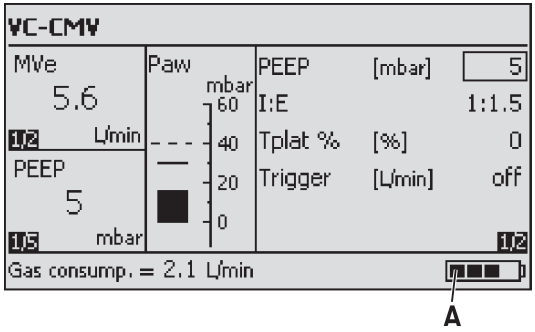
B Page number.

Messages window



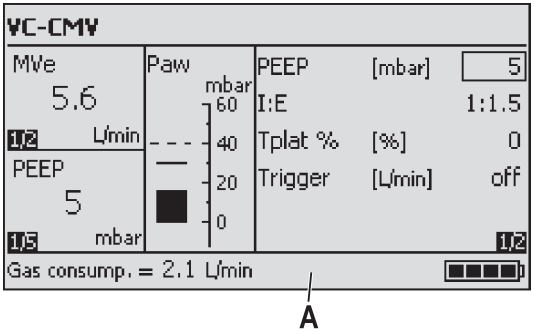
A Numeric values displayed when a control knob is turned.

Battery capacity indicator



A Battery capacity indicator (example: three quarters full).

O_2 consumption



A Actual gas consumption based on current settings.

Assembly

Reusable or disposable hose systems can be used with Oxylog 2000 *plus*. Please refer to the "List of Accessories" section for ordering information.

NOTE
If the type of the hose system used is changed, the device must be reconfigured. Refer to the "Configuration" section for additional information.

Dead space

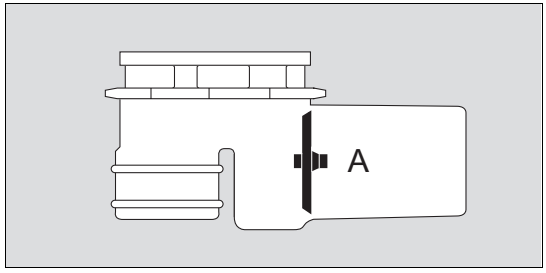
Dead space is an important aspect of ventilation management:
Dead space ventilation is the portion of the respiratory system, in which no significant gas exchange occurs. An increase of the proportion of dead space to alveolar ventilation may lead to an increase of the retention of carbon dioxide by the patient.

Dead space is present as a component of the patient's artificial airway and hose system. If the volume of the mechanical dead space equals or exceeds the volume of alveolar ventilation, the patient may not be able to adequately evacuate carbon dioxide. Therefore, it is important to properly manage the ventilation perfusion ratio to ensure effective elimination of carbon dioxide gases.

Assemble the reusable hose system

– Parts must always be sterilized before use!

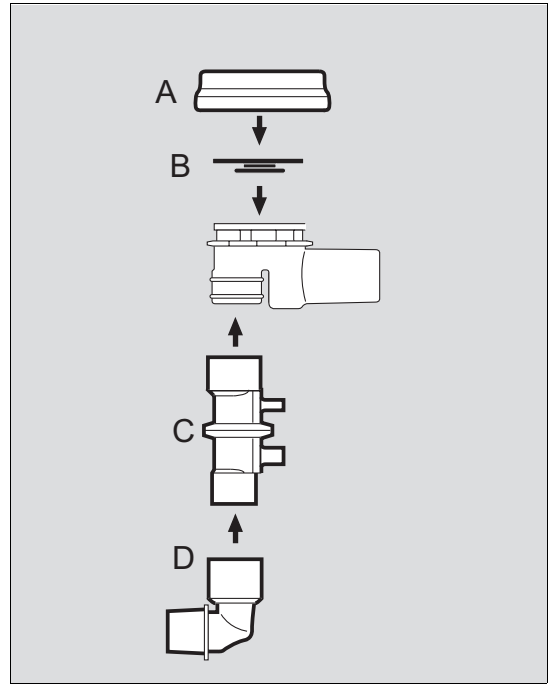
Breathing valve assembly



WARNING

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

Risk of CO_2 rebreathing.



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

2 Fit the cover (A) and turn it approximately 90^{o} clockwise to secure into position.

3 Push the flow sensor (C) into breathing valve. Note the preferred position as indicated by the groove.

4 Connect the angled adaptor (D) to the flow sensor.

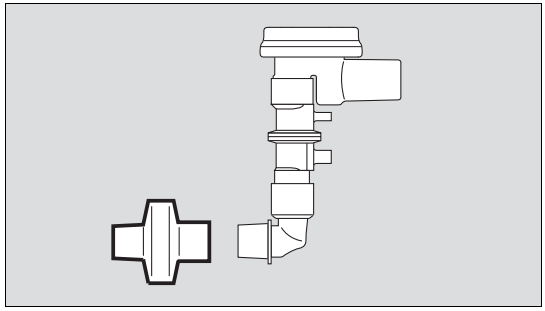
WARNING

Always use an angled adaptor. If the angled adaptor is not used, the minute volume may be measured incorrectly.

When using a bacterial filter or HME

NOTE

When using a bacterial filter or HME, measured flows may deviate from the expiratory flows, as temperature and humidity of the gas are reduced.

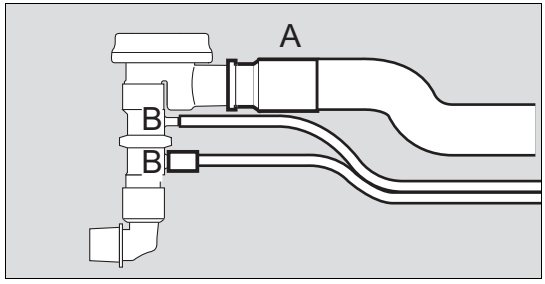


- Connect the bacterial filter or HME to the angled connector.

WARNING

Bacterial filters increase the exhalation resistance and dead space volume of the ventilation system.

Hose connections



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

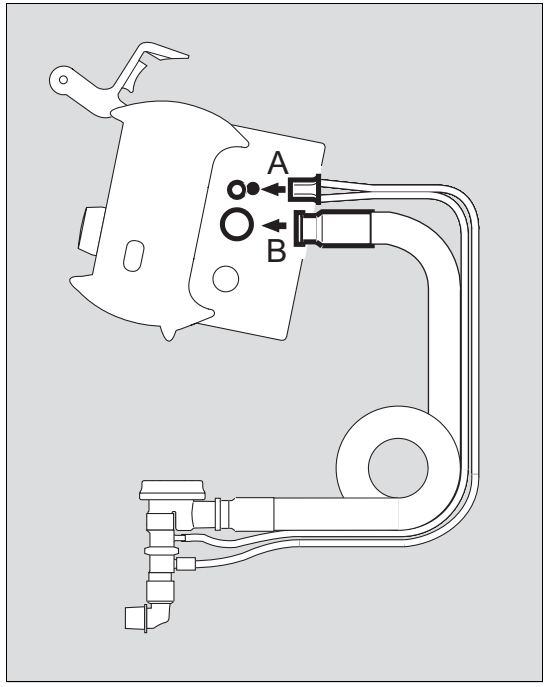
2 Connect the flow measuring hoses (B) to the nozzles on the flow sensor. Note the different diameters.

CAUTION

Do not use electrically conductive hoses!

Risk of electric shock.

This can endanger the patient.



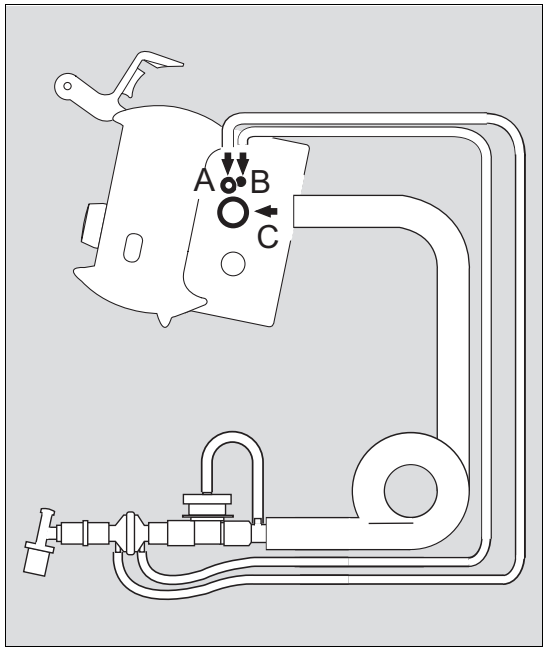
3 Connect the flow measuring (A) hoses to the Oxylog 2000 *plus*.

4 Connect the ventilation hose (B) to the gas output on the Oxylog 2000 *plus*.

Connect the disposable hose system

WARNING

Do not use disposable hose systems other than those on the "List of Accessories". The minute volume may be measured incorrectly and the device may malfunction.



WARNING

Ensure that the flow measuring hoses are correctly positioned, otherwise the volume will be measured incorrectly.

1 Connect the blue flow measuring hose (B) to the blue gas outlet.

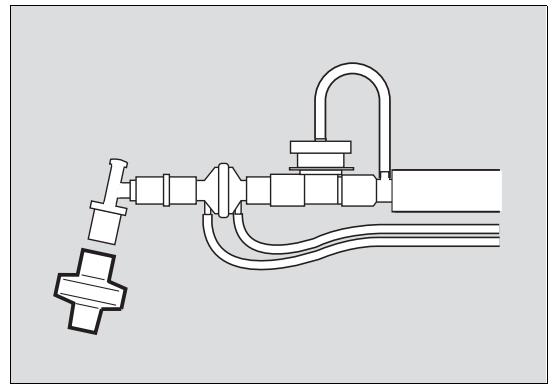
2 Connect the transparent flow measuring hose (A) to the other gas outlet.

3 Connect the ventilation hose (C) to the gas outlet on the Oxylog 2000 *plus*.

When using a bacterial filter or HME

NOTE

When using a bacterial filter or HME, measured flows may deviate from the expiratory flows, as temperature and humidity of the gas are reduced.



- Connect the bacterial filter or HME.

WARNING

Bacterial filters increase the exhalation resistance and dead space volume of the ventilation equipment.

When changing the ventilation hose system

If the reusable ventilation hose system is to be used instead of a disposable hose system or vice versa:

1 Have the nozzles on the device changed by trained service specialists.

2 Reconfigure the device accordingly. Refer to the "Customer Service Mode" on page 72 for additional information.

Connecting the power supply

The Oxylog 2000 *plus* is designed to operate on power supplies with different voltages.

Internal supply

– With rechargeable battery (specified Smart Battery, refer to the "Technical Data" on page 103 for additional information).

Additional external power supply

To recharge the battery and to extend the electrical operation time.

– DC voltage from the on-board power supply via DC/DC converter or
– with AC/DC power pack

WARNING

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

To have a fully charged battery on hand, refer to the "Getting started" section on page 38 for additional information.

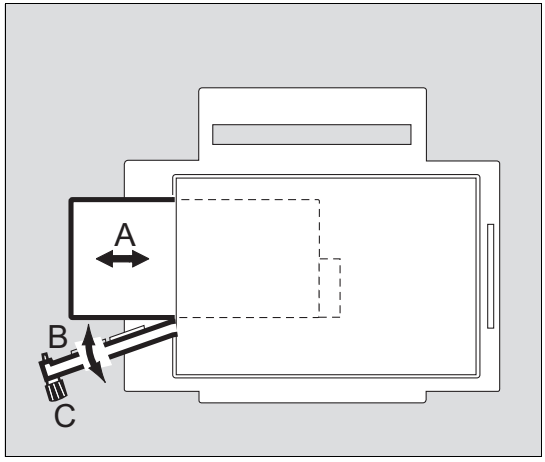
WARNING

Treatment of batteries:
– Do not throw into fire,
– Do not force open,

Danger of bodily injury.

Internal supply with rechargeable battery

Replacing the battery



1 Loosen the screw (C) on the battery compartment cover (B) counterclockwise to release the cover.

2 Remove the battery cover.

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

Checking the charge of the battery

- Press the button on the rechargeable battery. The charge status is indicated as a percentage by LEDs.

Installing the battery

1 Insert a fully charged battery into the battery compartment.

2 Attach the connector at the bottom.

3 Turn the cover upwards.

4 Tighten the screw.

WARNING

The Oxylog 2000 *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 resume with the last values settings approximately 3 seconds after inserting the battery.

NOTE

It is recommended to use fully charged internal batteries.

External power supply with DC/DC converter

WARNING

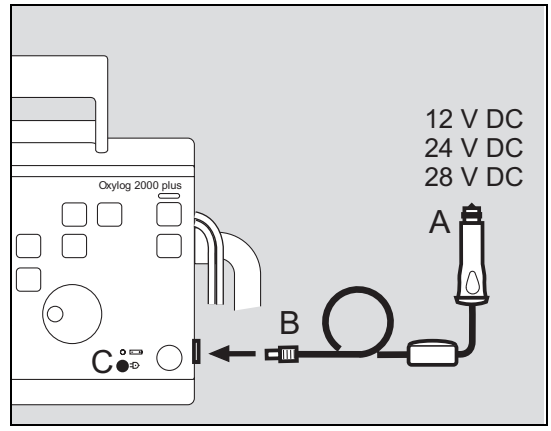
Use only a specified DC/DC converter.

Otherwise the device can malfunction.

Refer to the "List of Accessories" on page 108 for additional information.

The DC/DC converter must be used to connect the Oxylog 2000 *plus* to on-board supplies of different voltages (12 V, 24 V, 28 V DC).
The voltage of the on-board supply may fluctuate, depending on the amount of power required. The supply voltage may fall below or exceed the range permitted by the Oxylog 2000 *plus*. The on-board voltage is converted into a constant DC voltage of approximately 19 V DC by the DC/DC converter:

– When connected to an external power supply (e.g. the on-board power supply of the vehicle), the ventilator must always be connected via the DC/DC converter, refer to the "List of Accessories" on page 123 for additional information.



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 nozzle of the Oxylog 2000 *plus*.

3 When the Oxylog 2000 *plus* is connected to an external supply, the indicator ⇉ (C) lights up and displays the internal battery status.

External power supply from mains power (AC/DC Power pack)

WARNING

Use only a specified AC/DC power pack equipped with a correct mains plug.

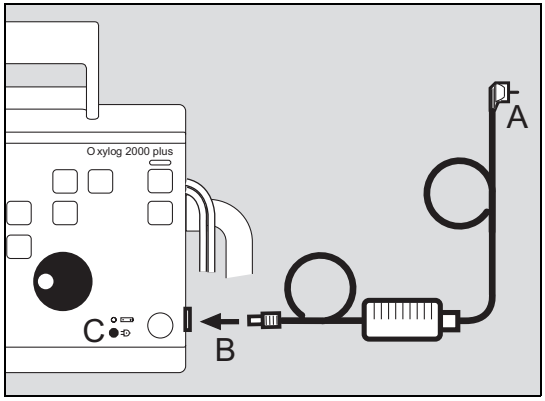
Otherwise the device can malfunction.

Refer to the "List of Accessories" on page 108 for additional information.

WARNING

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

Risk of electric shock or equipment damage.



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

2 Connect the DC plug (B) to the DC outlet on the Oxylog 2000 *plus*.

3 When the Oxylog 2000 *plus* is connected to an external supply, the indicator ⊣⊙ (C) lights up and displays the internal battery status.

Connecting the gas supply

Take care when handling O_2:

WARNING

Secure O_2 cylinders so they cannot fall over and keep away from excessive heat.

Risk of explosion!

WARNING

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

Risk of fire!

WARNING

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

Do not use tools.

WARNING

No smoking or open flames.

O_2 is combustible and can intensity fires.

WARNING

Only use medical grade oxygen that is dry and free from dust and oil.

Contaminated gas can cause device malfunction.

WARNING

Always provide adequate ventilation in order to maintain ambient O_2 concentration < 24%, to prevent risk of fire.

WARNING

Always use extreme caution when using oxygen, to prevent risk of fire.

Supply from an O_2 cylinder

WARNING

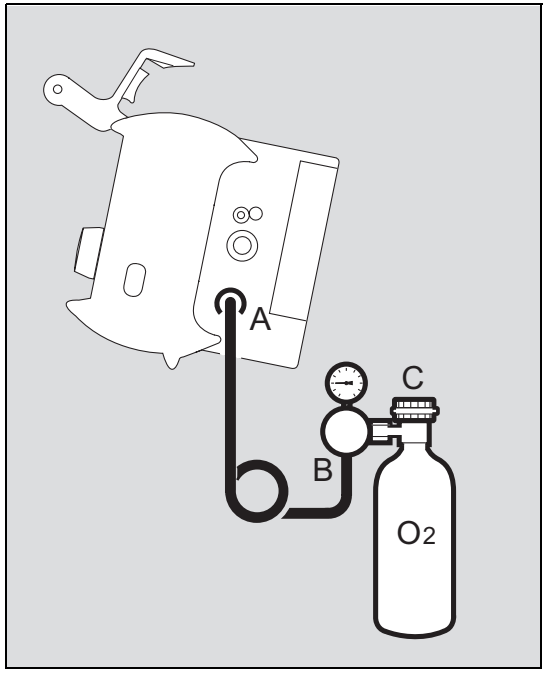
Only use compressed gas cylinders and pressure reducers, which comply with all applicable regulations and have been approved.

1 Use a full O_2 cylinder.

2 Connect the pressure reducer (270 to 600 kPa delivery pressure, 500 kPa nominal pressure) to the O_2 cylinder.

WARNING

Only use a pressure reducer with a relief valve at the outlet to limit the delivery pressure to a maximum of 1000 kPa in case of a malfunction, to prevent damage to the ventilator!



3 Connect the O_2 medical gas hose (A) to the Oxylog 2000 *plus*.

4 Connect the O_2 medical gas hose to the pressure reducer (B).

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

CAUTION

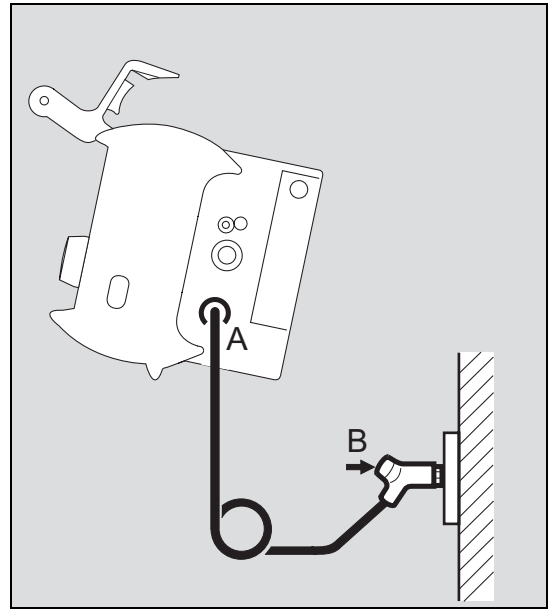
Do not connect flow control valves or flowmeters in the gas supply to Oxylog 2000 *plus*.

The ventilator could malfunction!

WARNING

Always check the O_2 pressure of cylinder before use, to prevent insufficient oxylog supply during use.

Supply from a piped medical gas system



1 Connect the O_2 medical gas hose (A) to the Oxylog 2000 *plus*.

2 Connect the gas hose (B) to the O_2 terminal unit until the supply of O_2 is confirmed.

Hanging the Oxylog 2000 *plus* on standard rail systems

The Oxylog 2000 *plus* can be hung on various rail systems measuring up to 35 mm diameter by means of the 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.

CAUTION

The Oxylog 2000 *plus* is only held by its own weight when hung on a bar or rail. The Oxylog 2000 *plus* must be secured additionally when being transported, otherwise vibrations may cause accidental dislodgement.

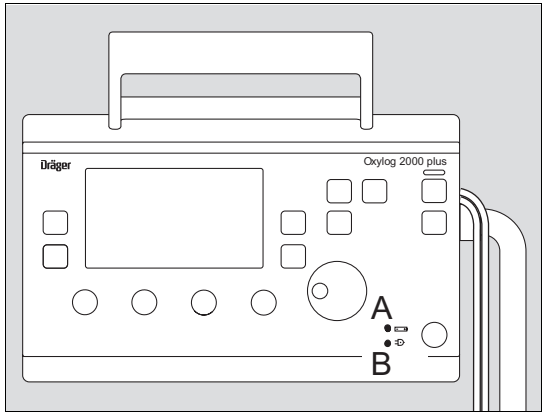
Getting Started

Charging the battery

The actual screen display may differ in appearance or configuration.

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

When an external supply is available:



1 The green lamp (B) lights up when the battery is actively charging.

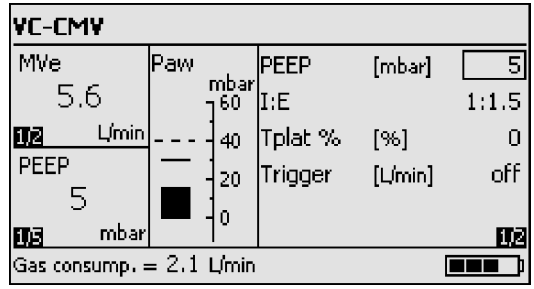
2 A three colored indicator (A) lights up to show the current charge status of the internal battery:

- Green: when the battery has been fully charged.
- Yellow: while the battery is being charged.
- Red: if a battery has not been inserted or a technical failure occurred.

– 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 supply can be used to charge an extra battery. Refer to the "List of Accessories" on page 123 for additional information.

Indication of battery capacity / battery operation



The remaining capacity of the battery is indicated by Oxylog 2000 *plus* in 25% increments in the lower right section of the information window when power is ON:

– when charging from an external power supply,

– as the battery is discharged during operation.

Example: 75% charge

– The accuracy of the battery capacity indicator can vary, depending on the age and condition of the battery. Refer to "Technical Data" on page 103 for additional information.

– The capacity indication is overwritten if higher priority messages are activated.

– Additional alarms can draw attention to the remaining operating time of the battery.

– When operated via the rechargeable battery, the brightness of the ventilator screen is reduced in order to save power.

– The screen brightness is automatically increased to maximum for one minute while settings are being made.

Determining the approximate pneumatic operating time for the Oxylog 2000 *plus*

Example for supply of medical gas:

– Cylinder pressure measured on the pressure gauge of the pressure reducer: 2000 kPa

– Liquid capacity of the O_2 cylinder: 2.1 L

Supply of medical gas:
2.1 L x 2000 kPa = approximately 420 L

Example for pneumatic operation time:

– VC-CMV mode, respiratory rate 10 breaths /min, VT = 1 L, O_2 = 100%

– Minute volume = 10 breaths /min x 1 L = 10 L/min

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

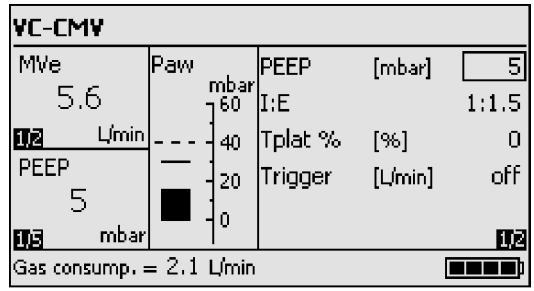
* Calculated with average gas consumption of ventilator: 0.5 L/min

$$\text{Operation time} = \frac{420}{10.5} = \text{approx. 40 minutes}$$

The pneumatic operation time increases when Oxylog 2000 *plus* operates with O_2 AirMix, 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 2000 *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:



O_2 consumption = 2.1 L/min

Checking readiness for operation

– Whenever the ventilator has been serviced or the ventilation hoses changed.

– At the latest every six months.

The following functions are checked with the menu-based test:

– Gas supply present.

– Hose system / breathing valve connected and OK.

– Alarm functions OK.

– Ventilation functions OK.

– Monitor functions OK.

Oxylog 2000 *plus* interrupts the test if a fault is detected.

The relevant fault is indicated on the screen.

WARNING

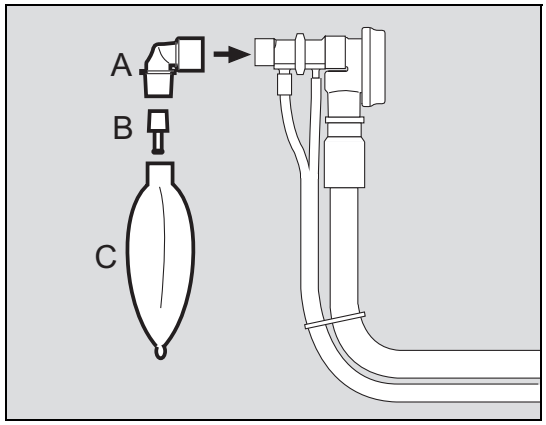
The patient may be endangered if the above device check is not completed.

Perform device check

The device check consists of the following steps.

– Duration is approximately 3 minutes.

Connect the test lung



1 Connect the angled adapter (A) to the breathing valve.

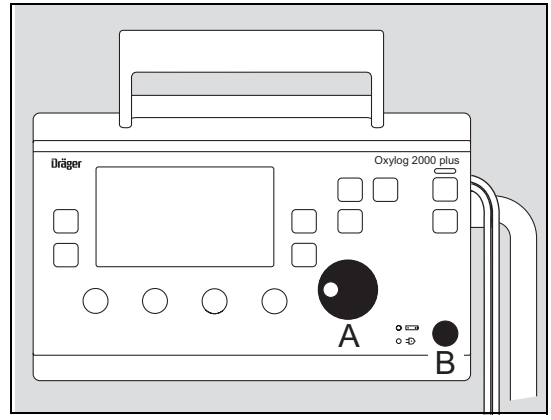
2 Connect the catheter connector (B), diameter 7 mm, to the angled adapter.
The catheter connector simulates the resistance of the airways.

3 Connect the test lung (C).

CAUTION

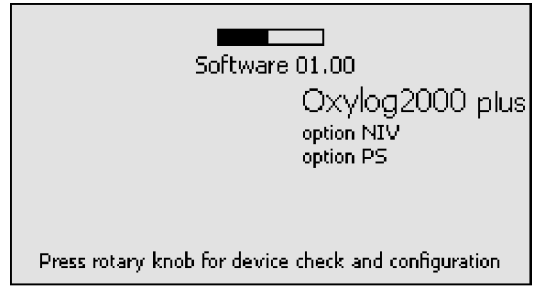
BTPS values of a test lung are not the same as the BTPS values of a patient. The Oxylog 2000 *plus* measures and adapts according to BTPS values of a patient. Therefore, when a test lung is connected, the MVe and VTe indicated on display may differ from the MVe and VTe that is set by the operator.

Switch ON



1 To switch ON briefly press the ⏻ key (B).

The device performs a self-test and the operator is prompted, on the display, to activate the configuration menu or device check:
Press rotary knob for device check and configuration



2 Press the rotary knob (A) to confirm, before the bar is full.

3 Select ***Device check*** in the main menu and confirm.

NOTE:

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

Check connections

1 Ensure that the gas supply has been connected.

2 Ensure that the test lung has been connected.

The Oxylog 2000 *plus* automatically checks if a test lung has been connected. The device check is aborted if a test lung is not detected within one minute.
The check is continued when the test lung is detected.

3 Ensure that the configured hose system has been connected, either

– the disposable hose system

or

– the reusable hose system.

4 Confirm the appropriate hose system. The second page of the device check appears.

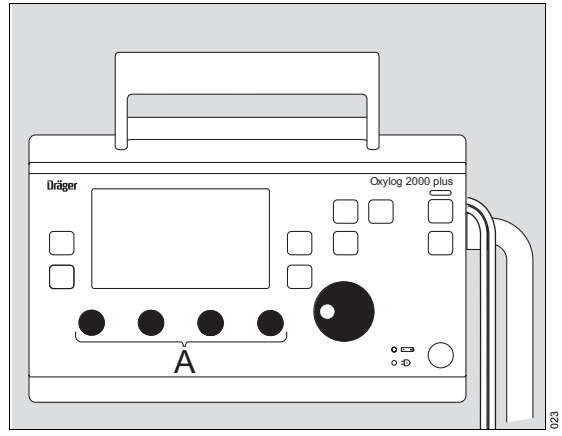
If the wrong hose system has been configured:

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

2 Select the correct hose system. Refer to "Select hose type" on page 74.

3 Restart the device check.

System check



1 Set the controls (A) below the display to the required values.
The Oxylog 2000 *plus* successively activates the audible and visual alarm signals and prompts the operator to acknowledge each signal.

2 Confirm the audible and visual alarm signals. The device check continues automatically.
During the automatic test sequence, the Oxylog 2000 *plus* checks the flow, pressure levels and alarm signals. Corresponding sounds are heard. The bar graph shows the progress made by the check.
The result is displayed on the Oxylog 2000 *plus.*

3 Confirm. The system returns to the menu screen.

A monthly check of the power failure alarm is recommended.

1 Disconnect the external power supply.

2 Remove the battery to activate the audible alarm signal.

3 Listen for the audible alarm.

NOTE:
Contact DrägerService if no alarm is heard.

4 When the power failure alarm test is completed, reinstall the battery into the battery compartment of the Oxylog 2000 *plus*.

Troubleshooting

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 85 of the section "Problem Solving".

2 Check the configuration, please refer to the "Operation" section.

3 Contact your local DrägerService for support.

Preparation for use after system check

1 Assemble the Oxylog 2000 *plus* for operation. Refer to the "Assembly" section.

2 Connect to the power supply and gas supply. Refer to the "Connecting the power supply" section.

3 Start the ventilator:

- Select ***Ventilation*** from the device check and confirm.

Or

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

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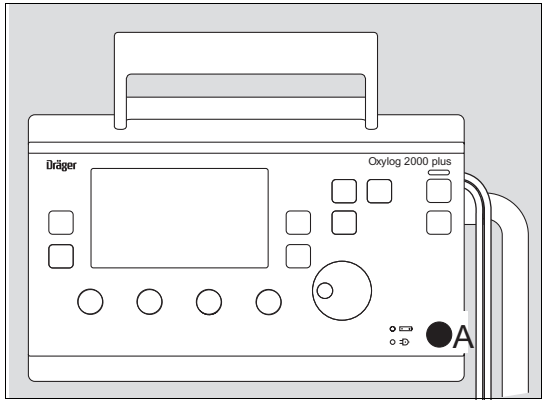
Operation

Starting operation

The actual screen display may differ in appearance or configuration.

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

Switch ON

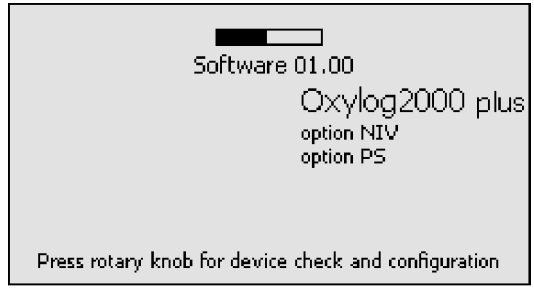


024

- Briefly press the ⏻ key (A).
  The Oxylog 2000 *plus* performs a self-test.
  - The sef-test will be completed in approximately six seconds.

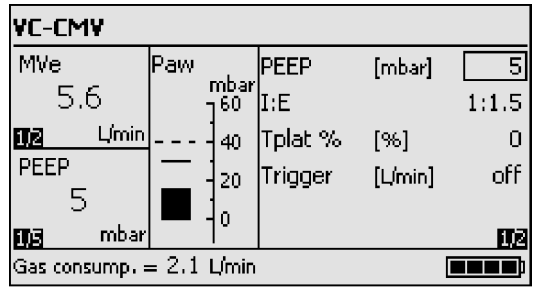
During the self-test, the system briefly displays the starting page with the software version and a prompt for the operator to select the configuration menu, or to activate the device check by pressing the rotary knob.

The bar graph indicates the progress of the self-test.



screen 6

Upon completion of the self-test, the ventilator automatically begins ventilation with the default settings.
The opening display with configured settings is displayed if the central rotary knob is not pressed.



The manufacturer's default settings are:

- Ventilation mode ***VC-CMV.***
- Ventilation time ratio ***I:E*** = 1:1.5.
- Positive end expiratory pressure ***PEEP*** = 5 mbar.
- Plateau time ***Tplat %*** = 0%.
- ***Trigger*** = OFF.

The manufacturer's default settings can be adjusted in Customer Service Mode. Refer to the "Set startup settings" section.

Preparing ventilation mode

To activate the ventilation mode

1 Press and hold the ventilation mode key for approximately 3 seconds.

Or

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

The new ventilation mode selected is now effective.

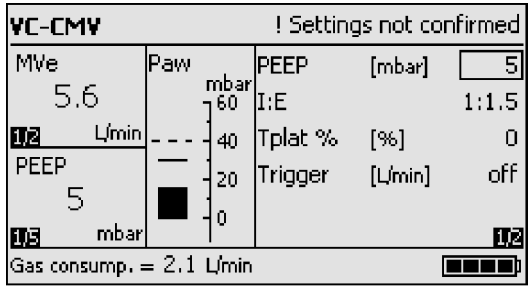
Set ventilation parameters

1 Set the required control below the display.

Or

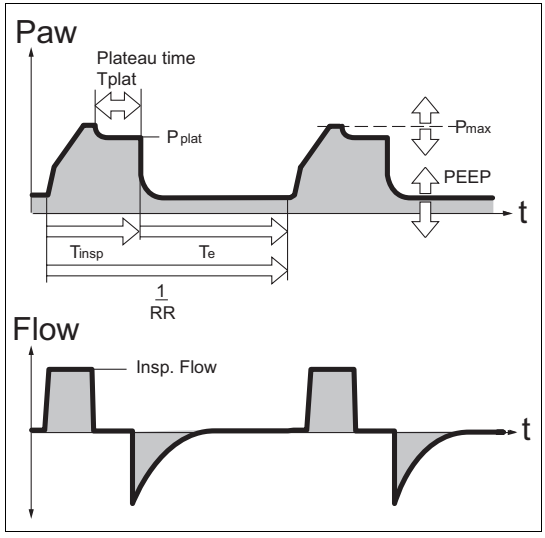
2 Select, set and confirm a parameter on the display with the rotary knob.

The former settings are retained if confirmation is not received within 15 seconds. Attention is drawn to this fact by the advisory message ***! Settings not confirmed***.



When the PEEP-setting is increased above 10 mbar, a message ***Confirm PEEP above 10 mbar?*** will appear to request confirmation of the change. The PEEP setting can be increased to the desired testting after the message is acknowledged with the rotary knob.

VC-CMV / VC-AC



VC-CMV – **V**olume **C**ontrolled - **C**ontrolled **M**echanical **V**entilation.

Volume-controlled ventilation with fixed mandatory minute volume MV, set with tidal volume VT and respiratory rate RR.

WARNING

Only use VC-CMV for patients who are not spontaneously breathing.

Otherwise, the patient may be put at risk by not receiving sufficient ventilation.

Use VC-AC for patients with partial spontaneous breathing.

Set the ventilation pattern with the controls below the display:

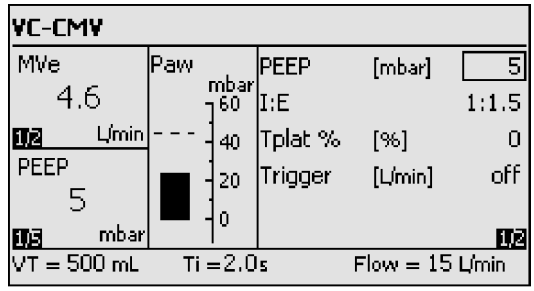
– Tidal volume ***VT***.

– Ventilation respiratory rate ***RR***.
(minimum possible respiratory rate: 5 per min).

– Maximum airway pressure ***Pmax***.

– O_2 setting, O_2 AirMix or 100% O_2 ***FiO2***.

The following can be set on the display:



– Positive end expiratory pressure ***PEEP***.

– Ventilation time ratio ***I:E***.

– Plateau time ***Tplat %***, in % of the inspiration time.

When setting the ventilation respiratory rate RR, tidal volume VT or ventilation time ratio I:E, the associated values for inspiration time Ti and inspiration flow are automatically displayed in the information window.

Trigger (VC-AC)

NOTE
If in VC-CMV the trigger is set »**on**«, the ventilation mode changes into VC-AC.
Refer to the previous section.

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

For synchronisation with the patient's spontaneous breathing efforts.

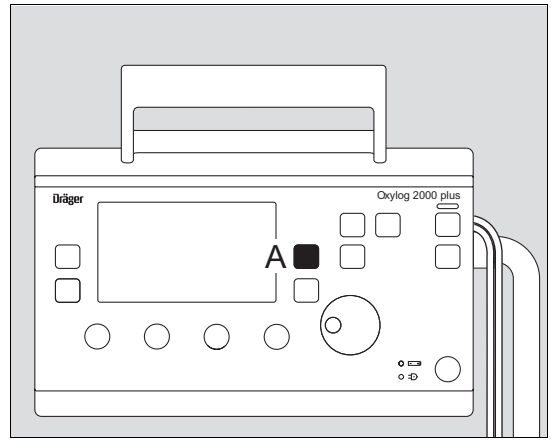
The mandatory ventilation strokes are synchronized with the patient's spontaneous breathing efforts when the trigger is activated and the trigger sensitivity is set.

The actual respiratory rate may be higher than the set ventilation respiratory rate RR in this case.

The trigger can be deactivated if synchronisation with the patient's spontaneous breathing efforts is not desired.

Successful patient triggering is briefly indicated by an asterisk (*) in the middle of the status and alarm message window.

Activating/setting the trigger



1 Press the key ***Settings*** ▷▷ (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. Small value = high sensitivity.

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

Deactivate trigger

1 Set a value less than 3 L/min or greater than 15 L/min (***off*** is displayed instead of a value).

2 Press the rotary knob to confirm.

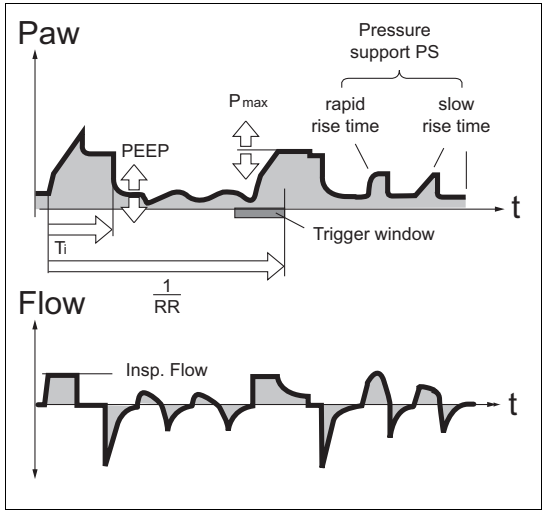
The last effective trigger value is adopted by the ventilator when changing from VC-AC to SpnCPAP.

For heart-lung resuscitation

During heart-lung resuscitation, the airway pressure Paw is limited to the set Pmax value by the Oxylog 2000 *plus*, without ending inspiration prematurely (pressure-limited, nonconstant-volume ventilation when Pmax is reached).

If Pmax is set to a higher value, a higher minute volume is possible.

VC-SIMV (optional PS)



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.

Fixed mandatory minute volume MV is set with tidal volume VT and ventilation respiratory rate RR. The patient can breathe spontaneously between the mandatory ventilation strokes 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:

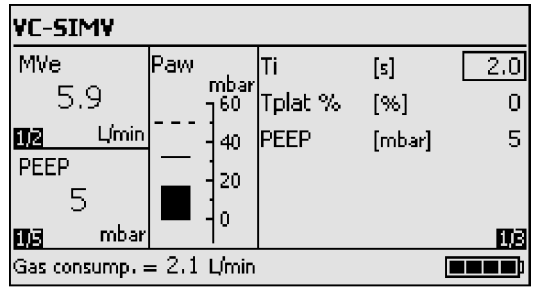
– Tidal volume ***VT***.

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

– Maximum airway pressure ***Pmax***.

– O2 setting ***FiO2***.

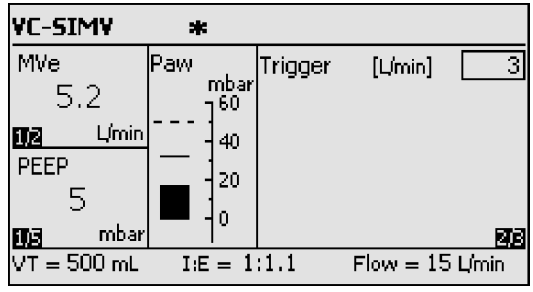
The following are set on the display:



– Inspiration time ***Ti***.

– Plateau time ***Tplat %***, in % of the inspiration time.

– Positive end expiratory pressure ***PEEP***.



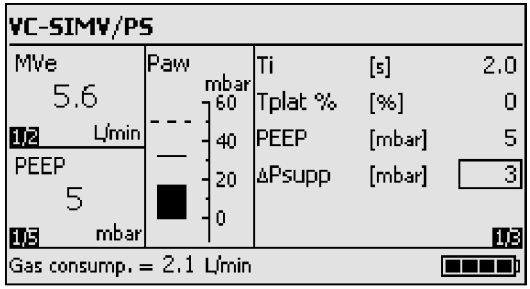
– Sensitivity ***Trigger***.

Successful patient triggering is indicated by an asterisk (*) in the center of the status and alarm message window.

When setting the ventilation respiratory rate RR, tidal volume VT or inspiration time Ti, the associated values for inspiration flow time ratio I:E are automatically displayed in the information window.

Pressure support (optional)

The following can also be set on the display for VC-SIMV / PS:



– Setting on page 1: Pressure support ***ΔPsupp*** above PEEP.

– Setting on page 2: Pressure rise time ***Slope***
  ⌜ steep slope = short pressure rise time
  ⌜ flat slope = long pressure rise time.

SpnCPAP (optional PS)

Continuous **P**ositive **A**irway **P**ressure

WARNING

Only use SpnCPAP for patients with sufficient spontaneous breathing.

Otherwise there is a risk of the patient receiving insufficient ventilation.

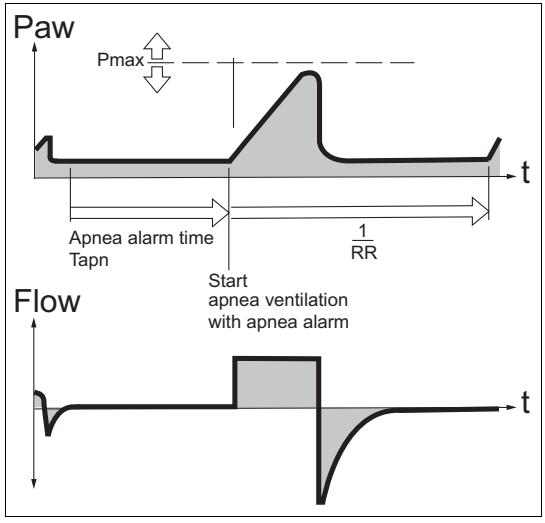
Spontaneous breathing can optionally be assisted with PS and NIV.

Set the ventilation pattern with the controls below the display:

– Maximum airway pressure ***Pmax***.

– O2 setting ***FiO2***.

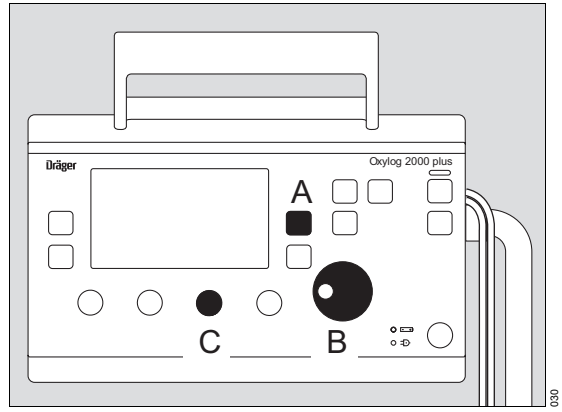
Apnea ventilation



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

When an apnea occurs, the device simultaneously issues an alarm signal and switches to volume controlled ventilation with the parameters respiratory rate ***RRapn***, tidal volume ***VTapn,*** and the maximum airway pressure ***Pmax*** when the apnea time Tapn has been reached. The ventilation time ratio I:E is set to 1:1.5. The plateau time ***Tplat %*** is 0. The patient can breathe spontaneously during apnea ventilation. The mandatory frequency ***RRapn*** remains constant.

Setting apnea ventilation

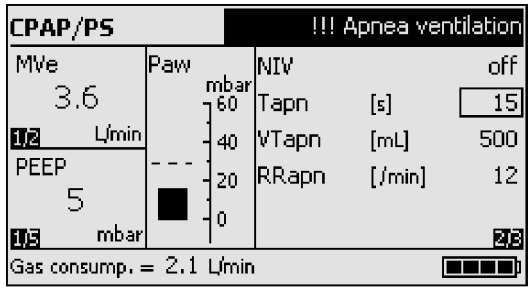


On the display:

1 Press the ***Settings*** ▷▷ key (A) until page 2/3 appears.

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

The parameters RRapn and VTapn, which are required for setting apnea ventilation, are now displayed:



screen 13

3 Set ***RRapn*** and ***VTapn***.

4 Set ***Pmax***. This determines the maximum airway pressure allowed during apnea ventilation.

The ventilation time ratio I:E = 1:1.5 and the plateau time Tplat % = 0 are preset during apnea ventilation.

To switch apnea ventilation OFF

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

To end apnea ventilation

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

The ventilator resumes ventilating with the original mode and parameter settings.

The manufacturer default settings are:

– RRapn = 12 /min

– VTapn = 500 mL

These default settings can be configured. Refer to the "Customer Service Mode" section for additional information.

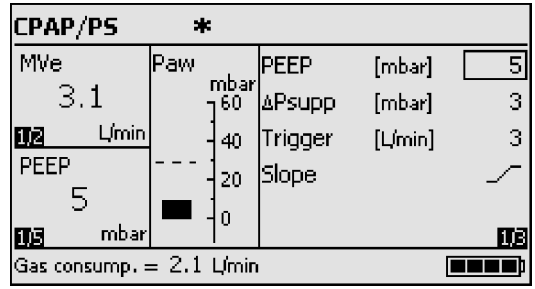
NOTE

Apnea ventilation can only be activated in the ventilation mode SpnCPAP without NIV.

The minimum ventilation required by the patient must be monitored via the lower alarm limit MV.

Pressure support (optional)

The following can additionally be set on the display for SpnCPAP / PS:



screen 12

– Sensitivity ***Trigger*** (for synchronization with the patient's spontaneous breathing efforts). Successful patient triggering is briefly indicated by an asterisk (*) in the middle of the status alarm messages window.

– Pressure support ***ΔPsupp*** above PEEP.

– Pressure rise time ***Slope*** (for pressure support ***ΔPsupp***).

NIV – Non-invasive ventilation Mask ventilation (optional)

NIV can only be activated as a supplementary function in the pressure-controlled ventilation modes SpnCPAP and SpnCPAP / PS. Mask leakages are detected by the device, compensated and included in the measured values for VTe and MVe.

WARNING

If NIV is not activated, measured values for VTe and MVe will be inconsistent if there are leakages during ventilation.

Use of NIV

WARNING

Dead space increases when using masks. Note the mask manufacturer's instructions!

WARNING

Application mode *NIV* may not be activated with intubated patients!

Risk of undetected leaks and inadequate ventilation!

WARNING

Check MV alarm limits after deactivating *NIV* mode!

WARNING

Avoid high airway pressure.

Risk of aspiration!

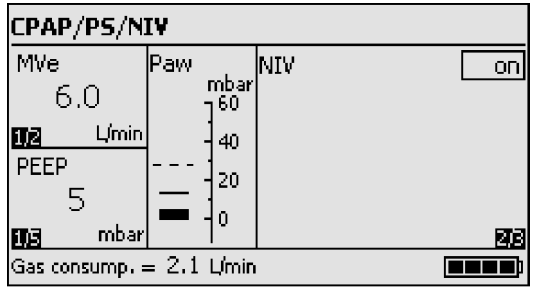
To switch on NIV

1 Press the ***Settings*** ▷▷ key until display page 2/3 appears.

2 Activate the line ***NIV off***.

3 Select ***NIV on*** and confirm.

– The supplement NIV appears in the upper section of the display.



Oxylog 2000 *plus* automatically adjusts to the requirements of mask ventilation. Leakage flows are compensated automatically and the leakage alarm is inactive.

WARNING

Set the lower alarm limit *MV*▼ according to the minimum ventilation required for the patient.

Otherwise, there is a risk of the patient receiving insufficient ventilation.

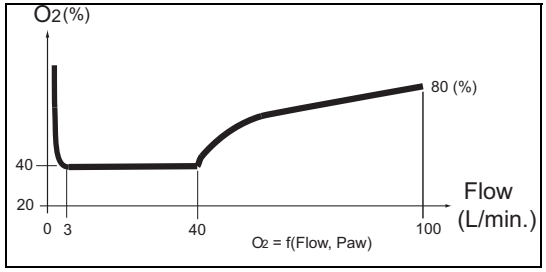
Apnea ventilation is not permitted by the ventilator when NIV is active.

O_2 AirMix or 100% O_2

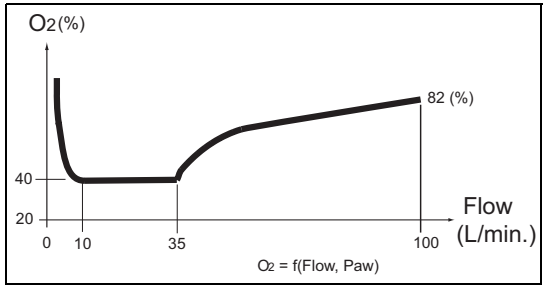
The FiO_2 concentration can be set to O_2 AirMix or 100% O_2, regardless of the ventilation mode.

When set to O_2 AirMix the injector principle of the Oxylog 2000 *plus* will draw in ambient air, to realize an FiO_2 concentration of approximately 40%.

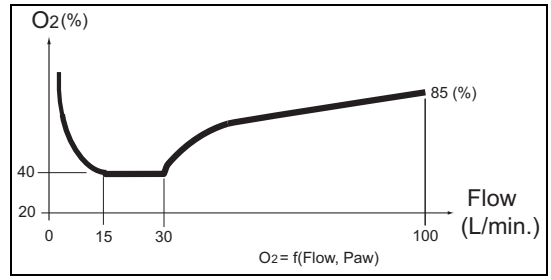
However, the O_2 concentration, which can be realized depends on the mean airway pressure and the inspiratory flow. The O_2 concentration can never be lower than 40%. This is shown in the following graphics:



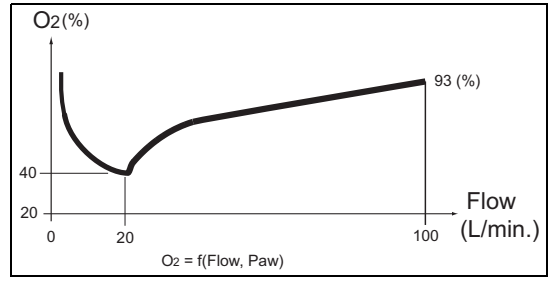
O_2 concentration which can be realized at a Pmean of 5 mbar.



O_2 concentration which can be realized at a Pmean of 15 mbar.



O_2 concentration which can be realized at a Pmean of 30 mbar.



O_2 concentration which can be realized at a Pmean of 60 mbar.

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

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

WARNING

In toxic surroundings:

- **The patient must be ventilated with 100% O_2 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.**

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.

Screen brightness

The screen brightness levels can be set on the last page of the ***Settings*** menu, from level 1/4 to 4/4:

– The setting ***Brightness*** is active in both mains and battery operation when adjusting the settings on the ventilator.

– The setting ***Brightness*** is active during battery operation, when no controls have been set for a period longer than one minute.

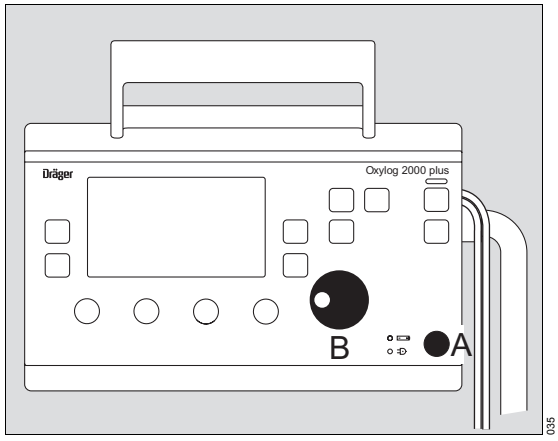
Volume loudness

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

Shutdown

– After disconnecting the patient

Switch the ventilator OFF:



1 Press the key ⏻ (A) for approximately 3 seconds. The yellow lamp flashes and ventilation is terminated by the device.

2 Press the rotary knob (B) to acknowledge the alarm ***!!! Confirm device OFF with rotary knob.***

When O_2 is supplied from a cylinder:

3 Close the cylinder valve.

WARNING

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

When medical gas is supplied from the pipeline system:

4 Disconnect the high pressure connection from the source.

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Alarms

Types of alarms

The actual screen display may differ in appearance or configuration.

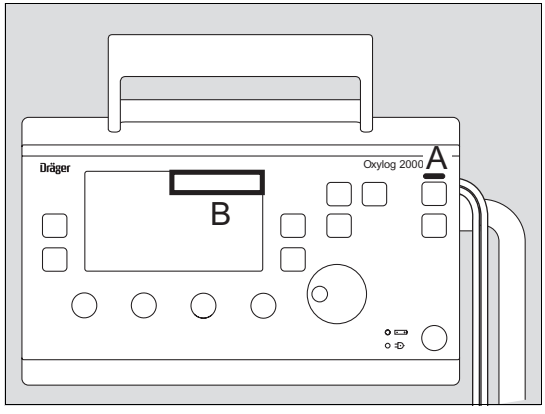
Oxylog 2000 *plus* assigns a priority to the alarm message. This message highlights the text with the appropriate number of exclamation marks and generates different tone sequences for the respective alarms.

!!! = Warning

!! = Caution

! = Advisory

Refer to the list "Alarm – Cause – Remedy" on page 79 for information on how to remedy the faults.



Warning

An alarm with high priority

- The alarm LED (A) flashes in red.

Warnings are highlighted by three exclamation marks and displayed in inverted form (B).

Example: !!! Apnea
The Oxylog 2000 *plus* generates a sequence of five tones, which sound twice and are repeated approximately every 7 seconds.

Caution

An alarm of medium priority.

- The alarm LED (A) flashes yellow.

Caution messages are highlighted by two exclamation marks.

Example: ***!! No int. battery ?***
Oxylog 2000 *plus* generates a three-tone sequence, which is repeated approximately every 20 seconds.

Advisory

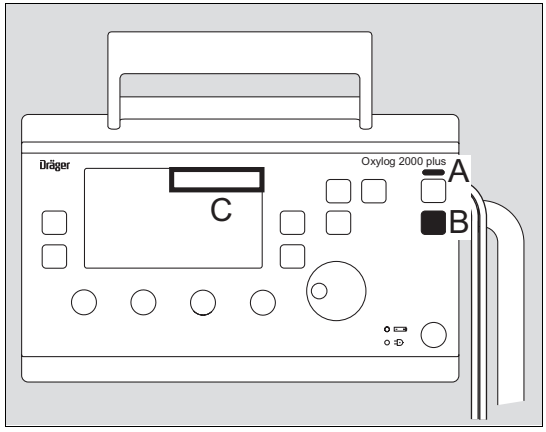
An alarm of low priority.

- The yellow alarm LED (A) lights up.

Advisory messages are identified by one exclamation mark.

Example:
! Settings not confirmed
Low-priority alarm.
The Oxylog 2000 *plus* generates a two-tone alarm sequence, which sounds only once.

In the event of an alarm



- The LED (A) flashes red or yellow.
  Or
- The alarm message appears on the right of the status and alarm message window (C).

When the fault has been remedied the alarm tone is cancelled.
Alarms which have been remedied remain on the display and can be acknowledged (reset):

1 Press the ***Alarm Reset*** key (B).
The alarm message is removed from the display.

Every alarm which has been remedied, but not acknowledged, will be overwritten by a new alarm or advisory message.

Suppress alarm tones

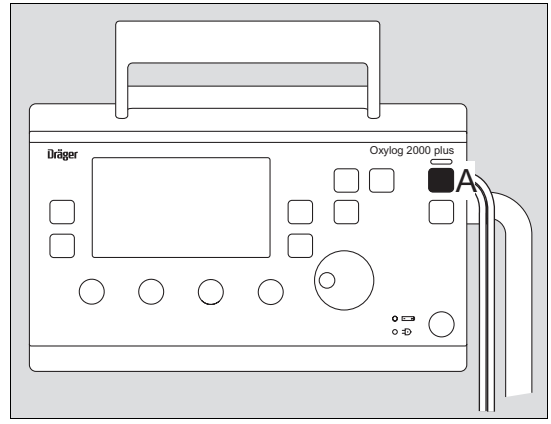
WARNING

Check the display regularly for alarm messages when the alarm tones are silenced.

Otherwise, alarms can be missed.

NOTE

Alarm tones are suppressed for a maximum of 2 minutes.



1 Press the key (A).
The yellow LED lights up and all alarm tones are suppressed for approximately 2 minutes.
Alarm tones are resumed by the device after these 2 minutes.

CAUTION

To be notified of new audible alarms, the 2 minutes alarm silence must be reset.

NOTE

The loudness of alarm tones can be adjusted.
Refer to section "Volume loudness" on page 56.

If alarm tones are to be heard again before the 2 minutes have expired:

2 Press the key (A) again and its LED goes out.

In the event of a gas failure

CAUTION

In the event of a gas failure, the Oxylog 2000 *plus* cannot continue ventilation and issues the alarm ***!! Supply pressure low***.

Immediately start ventilating the patient with an independent manual ventilation device (resuscitation bag) using PEEP and/or increased inspiratory oxygen concentration where appropriate.

In the event of an internal power failure

WARNING

In the event of an internal power failure, automatic ventilation, volume measurement and alarms do not operate!

An audible alarm goes off to indicate the internal power failure.

Spontaneous breathing can continue through the emergency air intake.

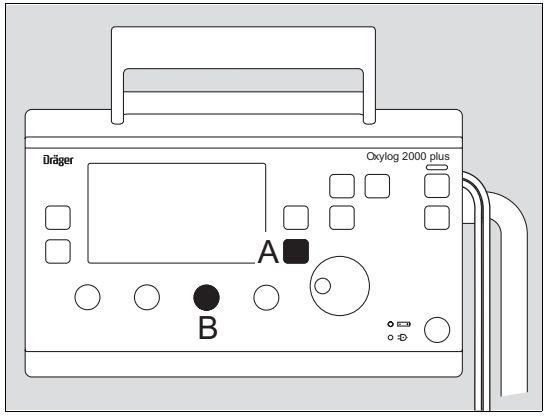
Immediately start ventilating the patient with an independent manual ventilation device (resuscitation bag) using PEEP and/or increased inspiratory oxygen concentration where appropriate.

Setting alarm limits

CAUTION
Set alarm values carefully.
Extreme alarm values can render the alarm system useless.

Upper alarm limit for Paw
Pressure limitation with Pmax

Regardless of the set ventilation mode, the airway pressure is controlled by the ventilator and limited to the set maximum inspiratory pressure Pmax. Pmax appears in the pressure bar graph as a dashed line.
When this dashed line is reached, Oxylog 2000 *plus* issues a ***!!! Paw high*** alarm. The volume-controlled stroke is terminated (ventilation with nonconstant volume).



1 Set the maximum airway pressure Pmax via the ***Pmax*** control (B).

The airway pressure is limited when Pmax is reached; inspiration will not be terminated prematurely.

Lower alarm limit for Paw

A lower alarm limit need not be set for the airway pressure Paw. Oxylog 2000 *plus* automatically generates an alarm when it no longer detects a pressure difference of more than 5 mbar between inspiratory and expiratory pressure.

To set alarm limits for MV and RRsp

2 Press the key ***Alarms*** ▷▷ (A).
Display example ***Alarms*** screen with variable alarm limits.
▼/ = lower alarm limit.
/▲ = upper alarm limit.

Alarm		Range
MV	/▲	2 to 41 L/min
MV	▼/	0.5 to 40 L/min
RRsp	/▲	10 to 100 /min

Example: Setting the upper alarm limit for MV.

1 Select and activate the line ***MV*** /▲ on the display.
2 Set and confirm the value.

WARNING
Set the lower alarm limit *MV*▼/ according to the minimum ventilation required for the patient.

Otherwise, there is a risk of the patient receiving insufficient ventilation.

Setting alarm limits automatically

WARNING

After using the function *Auto alarm limits*: check if the new alarm limits are appropriate for the patient.
Risk of hypoventilation.

The function ***Auto alarm limits*** sets the alarm limits on the basis of the following actual measured values at the time of activation:
MV : Measured value MV +2 L/min
MV : Measured value MV –2 L/min
RRsp : Measured value RRsp +5/min, with a minimum of 10/min.
This automatic selection of alarm limits is performed only once, when confirmed, via the rotary knob. The alarm limits refer to the current measured values for MV and RRsp.

Monitoring

Displaying the airway pressure

The actual screen display may differ in appearance or configuration.

The airway pressure is displayed in a bar graph indicator on the display.

Refer to the "Operating concept" section on page 24 for additional information.

Displaying MVe and VTe

MVe and VTe are displayed in the measured MVe / VTe window.

Refer to the "Operating concept" section on page 24 for additional information.

To switch between the values:

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

Displaying O_2 values

The O_2 concentration can be displayed in the measured values window.

NOTE

This value is a calculated value, based on the measured air intake and total flow. It is not based on a measurement by an O_2 sensor!

When the O_2 AirMix – 100% O_2 switch has been changed, the calculated value will be updated after approximately 30 seconds.

Refer to "Values window" on page 24 for additional information.

Displaying other measured values

Additional measured values are displayed in the measured values window.

Refer to the "Operating concept" section on page 24 for additional information.

To switch between the values:

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

In the values window five different values can be displayed.

These five values can be selected out of eight measured values options, in any desired order. Refer to "Abbreviations" on page 16. These options are:

– O_2

– RR

– RRsp

– PEEP

– Pmean

– PIP

– Pplat

– MVe_{spon}

The five values displayed in the measured values window can be configured in the customer service mode. Refer to the "Set the measured values display window" on page 75 for additional information.

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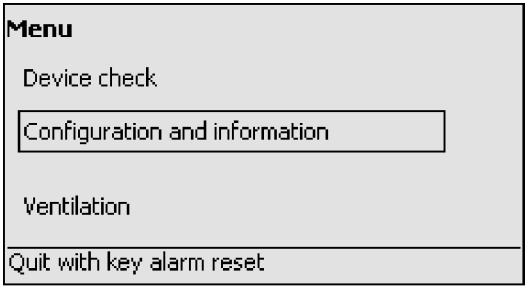
Configuration

Set configuration parameters / display information

The actual screen display may differ in appearance or configuration.

1 Switch the Oxylog 2000 *plus* ON. Press the ⏻ key.
The device performs a self-test and the operator is prompted to enter the configuration menu or device check:
Press rotary knob for device check and configuration.

2 Press the rotary knob and confirm.
The main menu is then displayed:



Select and confirm ***Configuration and information***.

Displaying configuration and information

– The settings made via the "Configuration" are retained after the ventilator is switched OFF.

– Configuration can be cancelled by pressing the ***Alarm reset*** key or by startup of ventilation.

The following settings can be made for the application concerned via ***Configuration and information***:

– Language

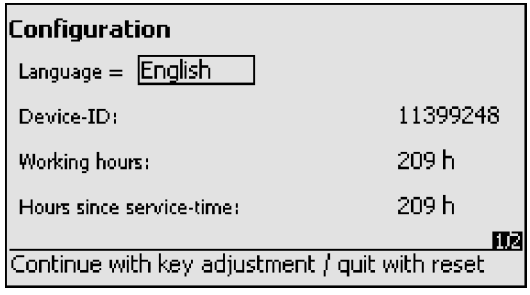
The following ventilator data can be displayed via ***Configuration and information***:

– 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.



screen 16

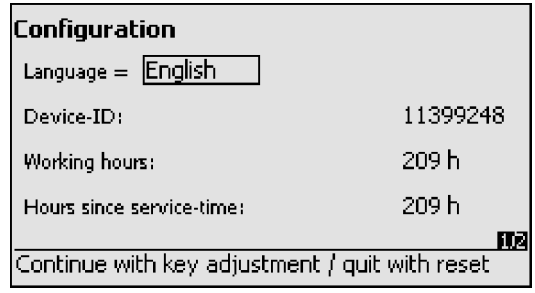
3 Select and confirm ***Configuration and information***.

Set language

1 Press the key ***Settings*** ▷▷ to select the menu ***Configuration and information*** 1/2 .

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

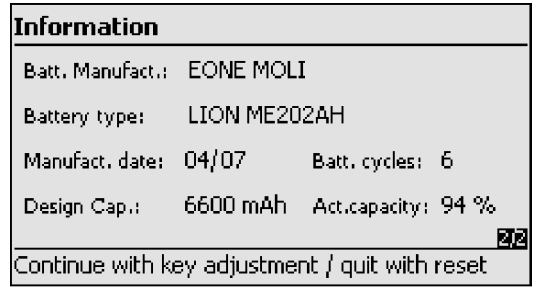
3 Select the language and confirm.
The new language selected is effective immediately.



screen 16

Display the battery type

- Press the key ***Settings*** ▷▷ to select the menu ***Configuration and information*** 2/2 .
The performance data of the inserted battery are displayed on the device.



screen 17

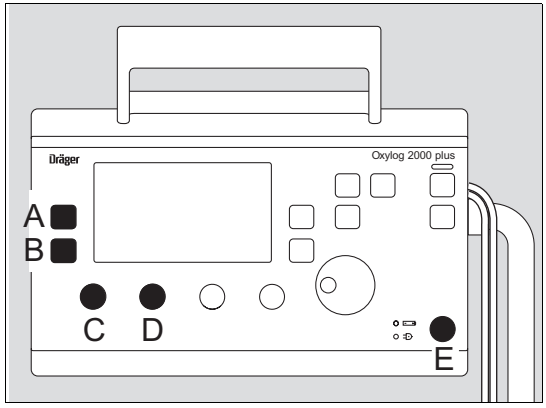
Customer Service Mode

WARNING
Ventilation is not possible in customer service mode.

In customer service mode, the ventilator performs function tests, outputs status information and permits configuration of parameter settings. Displays in customer service mode appear in English and cannot be changed to any other language.

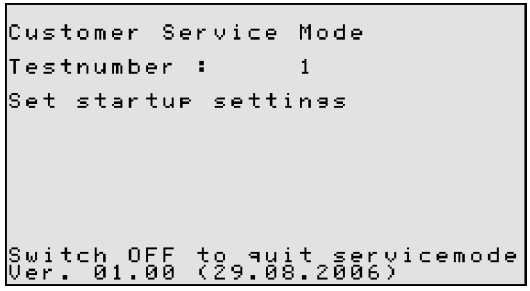
001	Set startup settings.	Configure start-up settings, restore manufacturer's default settings.
002	Select hose type.	Determine which ventilation hose system is used (reusable or disposable hose system).
003	Set date and time (Greenwich Mean Time GMT).	Set date and time.
004	Set measured values display 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 accu and supply data.	Display battery data and condition of the supply voltage.
009	Display actual technical errors.	Display any active technical errors.
010	Display error and info logbook.	Calibration logbook and technical errors in chronological order.
011	Display settings logbook.	Logbook of operating phases and ventilator settings.
012	Display language text.	Display screen texts in two selectable languages.

To enter customer service mode



0040

1 Turn controls (C) and (D) ***VT*** and ***RR*** all the way to the right.
2 Switch ON (E) the device (briefly press ⏻ key) and simultaneously press and hold the ***Values*** ▷▷ key (A) and the ***Values*** ▷▷ key (B) until the main ***Customer Service Mode*** menu appears.
3 Set the number of the required test in the main menu with the central rotary knob.



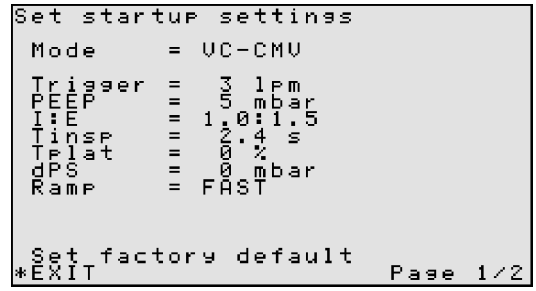
11737170.tiff

4 Activate test = press rotary knob.

Settings in customer service mode

1 Select the required function with the cursor (asterisk).
   – To select the parameter: turn the rotary knob.
   – To activate the parameter: press the rotary knob.
   – To set the value: turn the rotary knob.
   – To confirm the value: press the rotary knob.

To exit the parameter settings menu



screen 19

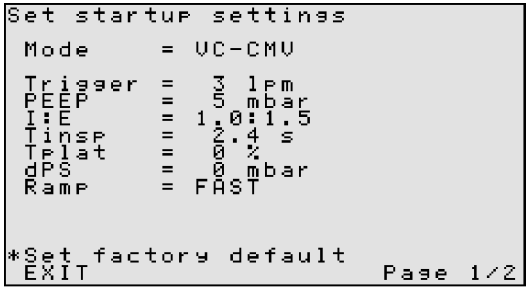
1 Select the line ***EXIT***.
2 Press the rotary knob and confirm.
The set values are saved and remain effective whenever ventilation is started after switching ON.

Set startup settings

Range of the settings:

Parameter	Range
Trigger	0 (OFF) 3 to 15 L/min
PEEP	0 to 20 mbar
I:E	3:1 to 1:4
Ti	0.2 to 10.0 s
Tplat %	0 to 50%
ΔPsupp	0 to 35 mbar
Slope	SLOW, STANDARD, FAST
NIV	ON, OFF
Tapn	0 (OFF), 15 to 60 s
VTapn	50 to 2000 mL
RRapn	12 to 60 bpm
MV-high	2.0 to 41 L/min
MV-low	0.5 to 40 L/min
RR	10 to 100 bpm
Loudness	1/4 to 4/4
Brightness	1/4 to 4/4

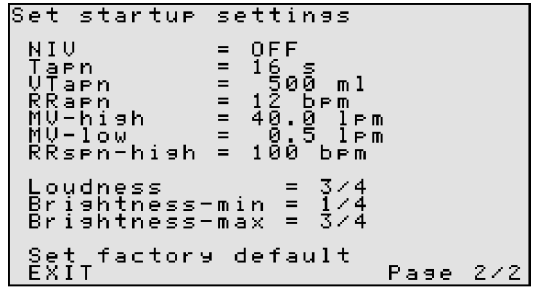
The default settings for the parameters are displayed on the screen when the ventilator is switched ON. The settings can be adjusted.



screen 20

Advance to the second page:

1 Select the line ***Page***, confirm and turn rotary knob.

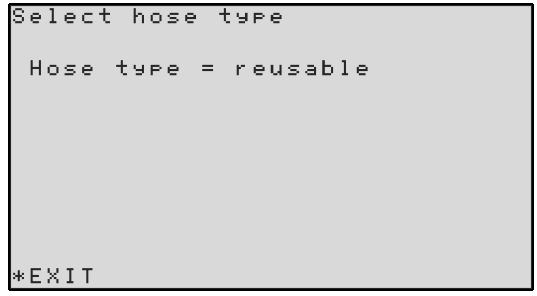


screen 21

To restore the manufacturer's defaults:

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

Select hose type

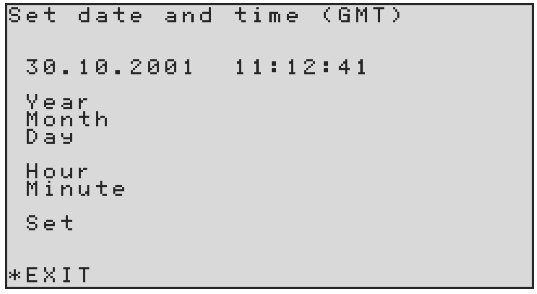


screen 24

The type of ventilation hose (reusable or disposable hose system) can be configured. The gas output sockets for the flow measuring hoses must correspond to the hose type system selected.

Set date and time

The date and time can be set.



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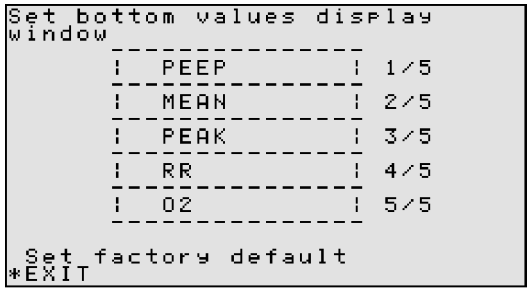
1 Set the current date and time with the positions Year, Month, Day, Hour and Minute and confirm.

2 The date and time can be confirmed with »**Set**«.

Set the measured values display window

In the measured values window five different values can be displayed.



screen 32

These five values can be selected out of a total of eight measured values, in any desired order. These are:

– O_2
– RR
– RRsp
– PEEP
– Pmean
– PIP
– Pplat
– MV_{espon}

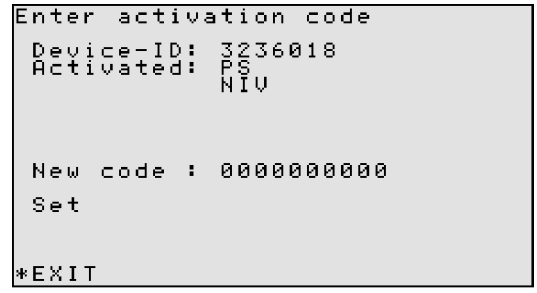
NOTE

It is recommended that you have the O_2 value as a displayed value.

To define the five values to be displayed:

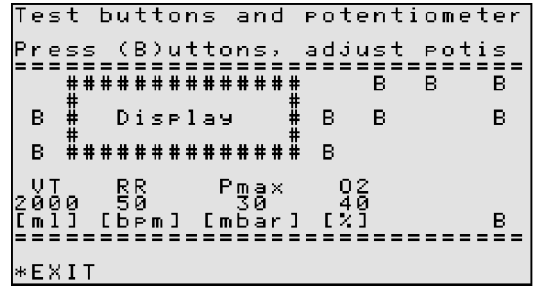
- Start configuration on page 1/5 and continue through to 5/5.

Enter activation code



The activation codes for options can be entered. The activated options are then displayed.

Test buttons and potentiometer



screen 25

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

– Display = screen
– B = buttons

Set the controls accordingly for the test:

– ***VT*** to 500 mL

– ***RR*** to 20 /min

– ***Pmax*** to 40 mbar

– ***FiO2*** to O2 AirMix

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 LED, it will be illuminated by the device. If there are buttons without LED, the yellow warning LED will light up on the device.

2 Briefly press the ⏻ key.
The ventilator switches OFF if it is pressed for longer than 3 seconds.

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

Test loudspeaker, buzzer, LEDs and display

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

1 Select the required test

```
Test loudspeaker, buzzer, LEDs
and display

 Test loudspeaker: !!! WARNING
 Test loudspeaker: !! CAUTION
 Test loudspeaker: ! ADVISORY
 Loudness = 3/4

 Test buzzer
 Test LEDs

 Test display
 Brightness min = 1/4
 Brightness max = 3/4

*EXIT
```

2 Start the test. Each 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.

Display accu (battery) and supply data

The parameters of the replaceable battery and the status of the external power supply are displayed.

Display (example):

```
Display accu and supply data

Charger          : V00.86
Ext. supply      : ok
Accu state       : charge
Accu type        : ME202AF
Accu manufact    : EONE MOLI
Accu serialnr.   : 40
Accu chemistry   : LION
Accu date        : 24.03.2001
Accu cycle       : 5
Accu designcap   : 5400 mAh
Accu fullcap     : 5302 mAh
Accu actualcap   :  74 %

*EXIT                    Page 1/2
```

1 Advance to the second page:

2 Select the line ***Page***, confirm and turn rotary knob.

Display (example):

```
Display accu and supply data

Accu voltage     : 12.4 V
Accu current     : 1477 mA
Charg. voltage   : 12.6 V
Charg. current   : 1500 mA









 EXIT                    *Page 2/2
```

Display actual technical error

Momentarily active technical errors are displayed with the error number and a brief description.
Display (example):

```
Display actual technical error

H  04-0027
POTI: FREQ unplugged
H  04-0026
POTI: VT unplugged
H  04-0028
POTI: PMAX unplugged
H  04-0029
POTI: O2 unplugged




*EXIT
```

Display error and info 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 order.
Display (example):

```
Display error and info logbook

I  00-0000 31.10.2001 07:35:51
INFO: Device test successfull

I  00-0000 31.10.2001 07:28:36
INFO: Valve V1 calibrated

I  00-0000 31.10.2001 07:27:58
INFO: Valve V2 calibrated

I  00-0000 31.10.2001 07:27:26
INFO: Valve V3 calibrated

*EXIT              Page 001/009
```

Advance to the next page:

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

Display settings logbook

```
Display settings logbook

Power-ON : 26.09.2007 11:09:13
Mode = VC-CMV
Trig.= 3 lpm     VT   = 2000 ml
PEEP = 5 mbar    RR = 50 bpm
I:E  = 1:1.5     O2   = 40 %
Tplat= 0 %       Pmax = 30 mbar


MVspn-Alarms= 0.5 .. 40 lpm
RRspn-Alarm  = 100 bpm
Brightness   = 1/4 .. 3/4
Loudness     = 3/4
*EXIT                Page 001/305
```

screen 24

The operating phases with ventilator settings and time are listed in chronological order.

Advance to the next page:

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

Display language text

```
Display language text

 Language 1: English
 Language 2: Deutsch

 !!! Paw high

 !!! Atemwegsdruck hoch


 EXIT              *Page 004/030
```

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Alarm messages and advisory messages are displayed by the ventilator in the selected display languages – one text per page.

Advance to the next page:

1 Select line ***Page***, confirm and turn the rotary knob.

Choose another language:

2 Select line ***Language 1*** or ***Language 2***, confirm and turn the rotary knob.

Exit customer service mode

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

To switch ventilation ON:

2 Briefly press the key ⏻.

To switch OFF:

3 Press the rotary knob.

Problem Solving

Alarm - Cause - Remedy

Oxylog 2000 *plus* classifies alarm messages according to three priority levels and identifies these accordingly with the aid of exclamation marks:

Warning	**!!!**	High priority alarm message
Caution	**!!**	Medium priority alarm message
Advisory	**!**	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 window

	Alarm	Cause	Remedy	Alarm Rank
!!!	***Apnea***	Spontaneous breathing by the patient has failed, or disconnection.	Ventilate in VC-CMV mode. Ensure that hose connections are tight.	6
		Faulty flow sensor.	Replace flow sensor.	
!!!	***Apnea ventilation (only for SpnCPAP)***	The ventilator has automatically switched over to mandatory ventilation after detecting an apnea (only in SpnCPAP mode).	Check ventilation mode. Return to original ventilation mode: Press the ***Alarm Reset*** key.	5
!!	***Charge int. battery***	Oxylog 2000 *plus* draws its power from the internal battery due to the absence of an external DC supply. Only a few minutes of operating time remain (approximately 10 minutes).	The ventilator must immediately be reconnected to the mains supply, an onboard DC supply or a fully charged battery.	16
!!	***Check settings flow***	The flow resulting from the settings for "Tidal volume ***VT*** per unit time" is not possible.	Change tidal volume ***VT*** or inspiratory time ***Ti*** or ventilation time ratio ***I:E***.	14

	Alarm	Cause	Remedy	Alarm Rank
!!	***Check settings time***	The expiration time resulting from the settings for ***RR*** and ***I:E*** or ***Ti*** is not possible.	Change ***RR*** or ***I:E*** or ***Ti***.	13
!!!	***Confirm device OFF with rotary knob***	Key ⏻ has been pressed for 3 seconds.	To switch OFF: confirm. To continue ventilation, press key ⏻ again.	---
!!!	***Device failure***	Technical defect.	Contact your local DrägerService for additional support.	1
!!	***Flow measurement inop***	Measurement hoses for flow measurement hoses kinked, disconnected or leaking.	Ensure flow measurement hoses are connected correctly.	23
		Flow sensor defective.	Replace flow sensor.	
		Technical defect.	Contact your local DrägerService for additional support – restricted operation is now possible.	
!!	***Gas delivery failure***	Technical defect.	Contact your local DrägerService for additional support – restricted operation is now possible.	20
!!	***High respiratory rate***	Patient breathes at a high spontaneous rate.	Check patient's condition, check ventilation pattern, correct alarm limit ***RRsp*** if necessary.	15
!!	***Int. battery charging inop***	Technical defect.	Contact your local DrägerService for additional support – restricted operation is now possible.	17
!!!	***Int. battery discharged***	The operating time for operation with the internal battery has expired and an external DC supply has not been connected.	The ventilator must immediately be reconnected to a mains supply, an on-board DC supply or a fully charged battery.	2
!!	***Int. battery in use***	Oxylog 2000 *plus* draws its power from the internal battery due to the absence of an external DC supply.	Press the ***Alarm Reset*** key to confirm the alarm.	12
!!	***Key failed***	Technical defect.	Contact your local DrägerService for additional support – restricted operation is now possible.	19

	Alarm	Cause	Remedy	Alarm Rank
!!!	***Leakage*** ***(not in NIV)***	The measured expiratory tidal volume VTe is approximately 40% lower than the inspiratory value.	Repair leaks in hose system and possibly in the tube. Check placement of lower sentence. Use new flow measuring hoses.	9
		Faulty flow sensor.	Replace flow sensor.	
		The ventilator may not function properly.	Contact your local DrägerService for additional support.	
!!	***Loss of data***	Technical defect.	Contact your local DrägerService for additional support – restricted operation is now possible.	21
!!	***Loudspeaker inop***	Technical defect.	Contact your local DrägerService for additional support – restricted operation is now possible.	22
!!!	***MV high***	The upper alarm limit for the minute volume MV has been exceeded.	Check patient's condition, check ventilation pattern, adjust alarm limits if necessary.	8
		Faulty flow sensor.	Replace flow sensor.	
		The ventilator may not function properly.	Contact your local DrägerService for additional support.	
!!!	***MV low***	The minute volume MV has dropped below its lower alarm limit.	Check patient's condition, check ventilation pattern, adjust alarm limits if necessary.	7
		Leak in exhalation system.	Ensure connections in exhalation system are tight.	
		Faulty flow sensor.	Replace flow sensor.	
		The ventilator may not function properly.	Contact your local DrägerService for additional support.	
!!	***No int. battery ?***	Internal battery not installed, faulty or wrong battery installed.	Fit battery or confirm alarm or change internal battery.	24
!	***No int. battery ?***	Internal battery not installed, faulty or wrong battery installed.	Advisory message, is displayed continuously when confirmed. Change internal battery.	25
!	***No int. battery charging***	Internal battery cannot be charged.	Press the ***Alarm Reset*** key to confirm the alarm. Change internal battery.	26

	Alarm	Cause	Remedy	Alarm Rank
!!!	***Paw high***	The alarm limit Pmax for the airway pressure has been reached. Patient "fights" the ventilator, coughing.	Check patient's condition, check ventilation pattern, adjust alarm limits if necessary.	3
		Ventilation hose kinked, or obstructed.	Check hose system, breathing valve and tube.	
!!!	***Paw low***	No pressure difference >5 mbar between inspiration and expiration or set pressure level is not achieved. Leak in cuff.	Inflate cuff and check for leaks.	4
		Leakage or disconnection.	Check hose system for leaking connections. Ensure that the breathing valve has been installed correctly.	
!!	***Paw measurement inop***	Fault in flow measurement hoses.	Ensure hose system for loose connections. Ensure flow measurement hoses are connected correctly.	18
		Technical defect.	Contact your local DrägerService for additional support – restricted operation is now possible.	
!	***Self test OK***	The device has been switched on and the self-test completed successfully.	The message can be confirmed or it will be cancelled automatically with the next message.	28
!!	***Set correct FiO_2***	The control knob for setting O_2 AirMix or 100% O_2 is set in a middle position.	Set the Control knob in the right or left position.	10
!	***Settings not confirmed***	Parameters have been changed on the screen but not confirmed.	Press the rotary knob to confirm the parameter changes.	27
!!	***Supply pressure low***	Supply pressure <270 kPa.	Ensure that supply pressure exceeds 270 kPa.	11

Messages in the information window

(Numerical examples)

Message	Cause	Explanation/Remedy
RR = 12 per min or VT = 800 mL I : E = 1 : 1.5 Flow = 15 L/min	Change in Ti, RR or VT in ventilation mode VC-SIMV.	
RR = 12 per min or VT = 800 mL Ti = 0.7 s Flow = 35 L/min	Change in I/E, RR or VT in ventilation mode VC-CMV, VC-AC.	
I : E = 1 : 1.5 Ti = 2 s	Change in Ti.	
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	Standard display in information window for the current gas consumption.	
 (Battery capacity)	Standard display in information window for the current battery capacity.	
Psupp = 22 mbar	Change in ΔPsupp or PEEP.	Psupp is the absolute pressure resulting from PEEP + ΔPsupp.

Error messages during the device check

Message	Cause	Explanation/Remedy
No communication control- / charge-board	Device defective	Contact your local DrägerService for additional support.
System leakage	Leak in ventilation hose system and/or test lung.	Check hoses, breathing valve, flow sensor and test lung for leaks and replace if necessary.
No test lung	Test lung not connected or mayor leakage	Connect test lung. Check hoses, breathing valve, flow sensor and test lung for leaks and replace if necessary.
Breathing valve inop	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.
Pressure measurement inop	The ventilation hose system has not been connected correctly.	Connect ventilation system correctly.
	Pressure measurement is not possible.	Contact your local DrägerService for additional support.
PEEP-valve inop	Internal leak in system	Check hoses, breathing valve, flow sensor and test lung for leaks and replace if necessary.
	Device defective	Contact your local DrägerService for additional support.
Patient flow measurement inop	Flow measurement implausible	Replace flow sensor. Contact your local DrägerService for additional support.

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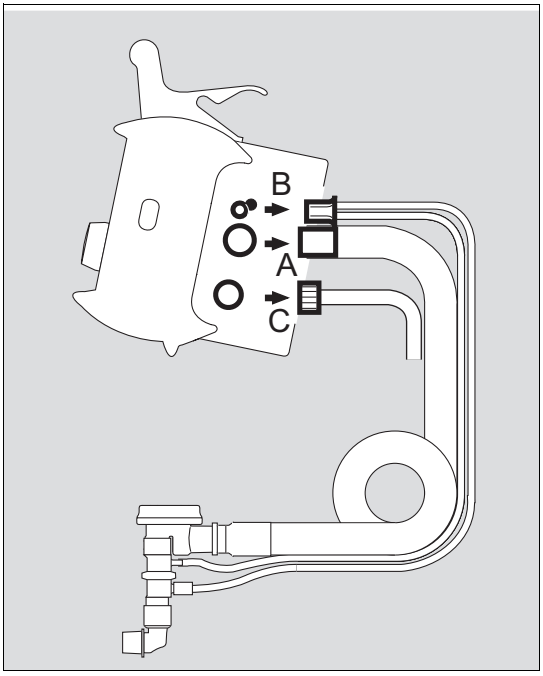
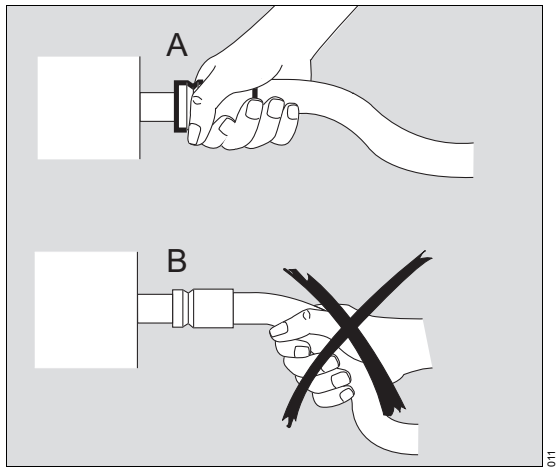
Cleaning, Disinfection and Sterilization

Disassembly

Disassemble the reusable hose system

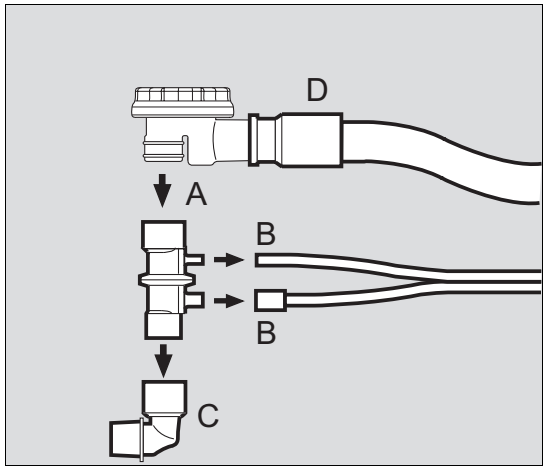




WARNING

When disconnecting the ventilation hose, always grip the sleeve (A) and not the corrugations (B)!
If this is not done, the corrugations or hose may be torn from the sleeve.

1. Disconnect the ventilation hose (A) from the gas output.
2. Disconnect the flow measuring hoses (B) from the nozzles.
3. Disconnect the medical gas hose (C) from the Oxylog 2000 *plus*.



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

WARNING

Do not twist or use force when disconnecting the flow measuring hoses from the flow sensor nozzles. This can damage the flow sensor.

5 Carefully detach the flow measuring hoses (B) from the flow sensor.
Pull in the axial direction of the hose nozzles.

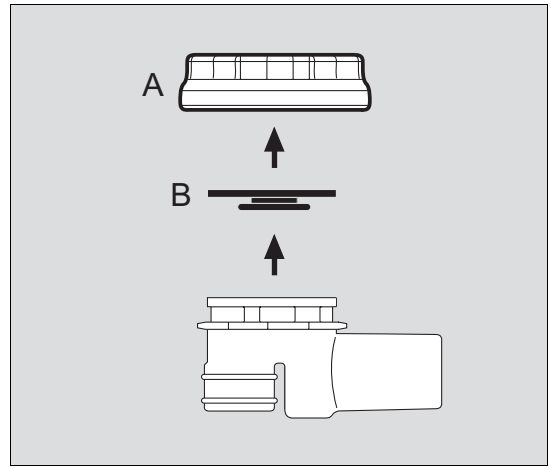
6 Detach the angled connector (C) from the flow sensor.

WARNING

Do not allow any objects to enter the flow sensor to prevent risk of malfunctions.
Do not purge with compressed air. The wind vane inside may be damaged and cause measuring errors!

7 Detach the ventilation hose (D) from the breathing valve.

Breathing valve, disassembly



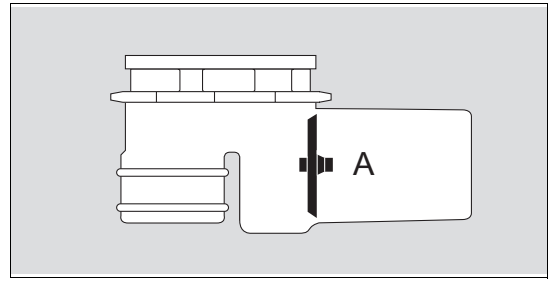
8 Turn the cover (A) about 90° counterclockwise to unlock the cover.

9 Remove the silicone diaphragm (B).

WARNING

Do not disassemble breathing valve any further.

Do not allow any objects to enter the housing of the breathing valve to prevent risk of malfunctions!
Do not damage the silicone diaphragm and other parts.

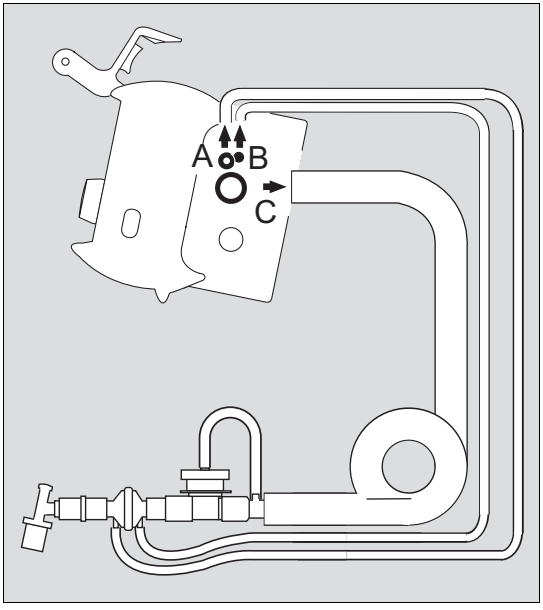


WARNING

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

Risk of CO_2 rebreathing.

Remove the disposable hose system



1 Disconnect flow measuring hoses (A and B).

2 Disconnect the ventilation hose (C).

3 Correctly dispose of the complete disposable hose system. Refer to the chapter "Disposal" on page 99.

CAUTION

The disposable hose system must not be sterilized: it cannot withstand high temperatures and may be damaged!

Reprocessing procedure

– Clean breathing valve, flow sensor, angled adapter and ventilation hoses of the reusable hose system after use.

– Always exchange the disposable hose system after use on a patient.

– The disposable hose system must always be disposed of correctly. Refer to the chapter "Disposal" on page 99.

– Clean the ventilator and medical gas hoses with a disposable cloth if heavily soiled.

– Replace the disposable hose system in case of contamination by e.g. vomitus or coughing.

– Clean the reusable hose system in case of contamination by e.g. vomitus or coughing.

WARNING

Always follow hospital/EMS procedures for handling equipment contaminated with body fluids.

WARNING

Always follow local regulations governing the disposal of infectious waste and materials contaminated with body fluids to prevent the risk of infection.

Cleaning and disinfecting

To ensure material compatibility, use disinfectants based on:
– aldehydes
– alcohols
– quaternary ammonia compounds.

CAUTION

Disinfectants based on:
– compounds containing alkylamine
– compounds containing phenol
– compounds releasing halogen
– strong organic acids
– compounds releasing oxygen

may cause damage, which is not always immediately apparent, to materials, particularly those used for the breathing valve, flow sensor and angled connector.

CAUTION

Sterilization of the ventilator itself with ethylene oxide (EtO) is not recommended.

WARNING

Always follow accepted hospital/EMS procedures for disinfecting equipment contaminated with body fluids (protective clothing, eyewear, etc.).

Users in the Federal Republic of Germany are recommended to use only disinfectants on the current DGHM list (DGHM: German Society for Hygiene and Microbiology).
The following disinfectants on the DGHM list are recommended:
– Dismozon pur
– Incidur
– Sekusept Powder
– Trichlorol
The DGHM list (published by: mhp-Verlag, Wiesbaden) also specifies the active ingredient in each disinfectant. Disinfectants based on the active ingredients aldehydes, alcohols or quaternary ammonia compounds are recommended for users in those countries in which the DGHM list is not available.

Disinfecting by wiping

Ventilator and medical gas hose:

– Follow the manufacturer's instructions. Remove heavy soiling with a disposable cloth first.

WARNING

Do not allow any liquid to enter the ventilator or medical gas hose!

Risk of malfunction.

Bath disinfection for reusable hose system

Disassembled parts of the breathing valve, flow sensor, ventilation hose and flow measuring hoses:

WARNING

Follow the manufacturer's instructions. Agitate parts thoroughly in the solution. Do not clean with a hard brush!

WARNING

Do not allow any objects to enter the breathing valve or flow sensor!

Risk of malfunction.

WARNING

Rinse parts thoroughly with distilled water. Disinfectant residues can cause the rubber disc to become jammed in the breathing valve!

WARNING

Allow to dry completely. The breathing valve and flow measuring hoses may not function correctly if water remains in these parts!

Sterilizing the reusable hose system

– Disassemble the breathing valve, flow sensor and angled connector. When disassembling the breathing valve from the flow sensor, pull in a straight line.
Do not rotate the parts, as this may damage the flow sensor. Dismantle the breathing valve.

– The disassembled parts of the breathing valve, the flow sensor, the angled connector, the flow measuring hoses and the ventilation hose can be sterilized in hot steam at 134 ^{o}C in accordance with EN 285 (Sterilization – Steam sterilization – Large-scale sterilization) for at least 3 minutes, up to 10 minutes.

– The hose system can be sterilized up to a 100 times.

– Sterilization for longer than 10 minutes is permissible, but will decrease the service life of the hose system.

After care

– Reassemble, refer to the "Assembly" section for information.

– Connect to the power supply and gas supply, refer to the "Assembly" section for information.

– Check readiness for operation, refer to the "Assembly" section for information.

Note service life of the hose system

The parts of the breathing valve, the flow sensor, the angled connector, the flow measuring hoses and the ventilation hose are resistant to the recommended disinfectants and to the temperatures occurring during sterilization.

However, every disinfection and sterilization cycle also means wear on the parts concerned.
For this reason, the parts must be examined for cracks and permanent deformation after the cleaning procedure.

NOTE

Damaged or deformed parts must be replaced.

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Maintenance

Maintenance intervals

Inspection	examination of actual condition.
Service	measures to maintain specified condition.
Repair	measures to restore specified condition.
Maintenance	inspection, service, and repair, where necessary.
Preventive Maintenance	maintenance measures at regular intervals.

CAUTION

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

CAUTION

Have the ventilator inspected and serviced at regular two-year intervals.

Keep a record on all preventive maintenance.

WARNING

Clean and disinfect the device or device parts before each maintenance step – and also when returning for repair to prevent risk of infection.

Task	Frequency	Performed by
Replace dust filter.[1)]	Every two years.	Trained service personnel.
Replace internal battery.	– Every two years – When the battery no longer remains charged for the specified operating time[2)].	Trained service personnel.
Device inspection and maintenance.	Every two years.	Trained service personnel.

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

In case of ventilator failure

CAUTION

Never operate a ventilator if it has suffered physical damage or does not seem to operate properly. In this case, always refer servicing to factory trained and authorized personnel.

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Disposal

Safety information

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, it may not be disposed of at municipal collection points for electrical and electronic equipment waste. Dräger Medical has authorized a company to collect and dispose of this device. To initiate take-back or for further information, visit us on the Internet at www.draeger-medical.com and navigate to the DrägerService area, where you will find a link to "WEEE". If you do not have access to our website, contact your local Dräger Medical Organization.

Disposal of batteries

WARNING
Risk of explosion! Do not throw in fire.

Risk of corrosion! Do not open using force.

The medical device battery contains pollutant substances.
The applicable local regulations for battery disposal must be observed in all countries.

Disposal of the medical device

When disposing of the medical device:

– Consult the relevant waste disposal company for appropriate disposal.

– Observe the applicable local regulations.

Disposal of the disposable hose system

Always follow local regulations governing the disposal of disposable hose systems according to established hospital/EMS procedures.

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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
Atmospheric pressure	570 to 1200 hPa
Relative humidity	5 to 95%

During storage and transportation

Ventilator without replaceable battery, with reusable hose system

Temperature	–40 to 75 °C
Atmospheric pressure	570 to 1200 hPa
Relative humidity	5 to 95%

Disposable hose system

Temperature	–20 to 70 °C
Atmospheric pressure	570 to 1200 hPa
Relative humidity	30 to 50%

Replaceable battery

Temperature	–20 to 35 °C
Atmospheric pressure	570 to 1200 hPa
Relative humidity	5 to 95%

Settings

Ventilation modes		VC-CMV, VC-AC, VC-SIMV, SpnCPAP, Optional: Pressure support for VC-SIMV and SpnCPAP.
Ventilation frequency RR		2 to 50 /min ±1 /min (VC-SIMV) 5 to 50 /min ±1 /min (VC-CMV, VC-AC) 12 to 50 /min ±1 /min for apnea ventilation.
Ventilation time ratio I:E (VC-CMV, VC-AC)		1:4 to 3:1
Inspiration time Ti (VC-SIMV, VC-SIMV / PS)		0.2 to 10 s
Inspiration tidal volume VT		0.1 to 2.0 L, BTPS[1)]
	Accuracy of Setting	±15% of set value or ±25 mL, whichever is greater.
O_2 concentration		100 vol.% (No-AirMix) or approximately 40 vol.% (O_2 AirMix).
Positive end expiratory pressure PEEP		0 to 20 mbar ±2 mbar, no negative pressure.
Trigger sensitivity (flow trigger)		3 to 15 L/min
Pressure support ΔPsupp		0 to 35 mbar (relative to PEEP) ±2 mbar
	Rise time for pressure support	slow (1 s), standard (0.4 s), fast (0 s).

1) BTPS
Body Temperature, Pressure, Saturated.
Measured values referred to the conditions of the patient's lungs, body temperature 37 ^{o}C, airway pressure, water-vapor-saturated gas.

Performance data

Control principle		Time-cycled, volume-constant, pressure supported.
Maximum inspiratory flow		100 L/min[1)]
Device compliance		
	with 1.5 m ventilation hose	≤ 1 mL/mbar
	with 3 m ventilation hose	≤ 2 mL/mbar
Inspiration resistance		≤ 6 mbar at 60 L/min ≤ 4 mbar at 30 L/min ≤ 2 mbar at 5 L/min
Expiration resistance		≤ 6 mbar at 60 L/min ≤ 4 mbar at 30 L/min ≤ 2 mbar at 5 L/min
Dead space including flow sensor		approximately 35 mL (reusable hose system). approximately 33 mL (disposable hose system).
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 at approximately 80 mbar.
Patient connection		22 mm ISO conical connector.

1) At service pressures >350 kPa.
The maximum inspiratory flow is reduced to 80 L/min at service pressures <350 kPa and to 39 L/min at service pressures <280 kPa.

Measured value display

Airway pressure measurement

	Range	0 to 99 mbar
	Resolution	1 mbar
	Accuracy	±2 mbar
Maximum airway pressure		PIP
Positive end expiratory pressure		PEEP
Mean airway pressure		Pmean
Plateau pressure		Pplat

Flow measurement

Minute volume MVe

	Range	0 to 99 L/min, BTPS
	Resolution	0.1 L/min
	Accuracy	±15% of measured value, or ±1 L/min, whichever is greater.

Tidal volume VTe

	Range	0 to 5000 mL, BTPS
	Resolution	1 mL
	Accuracy	±15% of measured value, or ±25 mL, whichever is greater.

Frequency measurement

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

Pressure Bar graph

	Airway pressure Paw	–7 to 60 mbar

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 level drops below the lower alarm limit.
	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. Or If the set pressure level is not attained.

Apnea alarm time Tapn

Alarm		When respiratory activity is no longer detected.
	Range of settings	15 to 60 s, can be set in 1 s increments.

Operating data

Power supply

Power supply		
	Input voltage Oxylog 2000 *plus*	19 V ±0.5 V DC
	With DC/DC converter	12 / 24 / 28 V DC
Current consumption		
	With battery charge	2.1 A
	Operating time with fully charged internal battery without mains supply for "typical" ventilation	approximately 4 hours
Battery type		Lithium ion battery
Charging times		approximately 5 hours The specified charging time applies when recharging the battery completely after it has been depleted.
Permissible ambient temperature during charging		0 ^{O}C to 35 ^{O}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 ^{O}C. The criteria for the warnings ***!!! Int. battery discharged*** and ***!! Charge int. battery*** are therefore based on measurement of the battery voltage. The capacity indicated at this moment may differ from the actual capacity of the internal battery.
	Battery storage time	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).

AC/DC power pack

Temperature range	–20 °C to 50 °C
Protection class to EN 60601	Class II, the earthing is used for EMC purposes.
Input	100 to 240 V~/ 50 to 60 Hz / 0.6 - 0.3 A
Output	19 V ±0.5 V / 2.1 A

DC/DC converter

Temperature range	–20 °C to 50 °C
Input	12 / 24 / 28 V DC / 9 A
Output	19 V ±0.5 V / 2.1 A

Gas supply

From a pipeline system or from a medical gas cylinder.

O_2 service pressure	270 kPa to 600 kPa maximum 100 L/min
Supply gas	Medical oxygen.
O_2 inlet connection	either: NIST[1] to EN 739, or DISS[2] to CGA V5-1989, or N-F[3] S90-116

WARNING

Only use medical grade oxygen that is dry and free from dust and oil.

Contaminated gas can cause device malfunction.

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 vent valve on the output side to limit the delivery 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 Thread Connection
2) DISS = Diameter Index Safety Systems
3) N-F = French standard

Device specifications

Noise pressure		<45 dB (A) for typical ventilation at a distance of 1 m.
Dimensions (W x H x D)		
	Basic unit	285 x 184 x 175 mm (without handle)
	AC/DC power supply	161 x 63 x 118 mm
	DC/DC converter	162 x 42 x 69 mm
Weight		
	Basic unit without internal battery	approximately 4.9 kg
	Basic unit with internal battery	approximately 5.4 kg
	AC/DC power pack	approximately 0.8 kg
	DC/DC converter	approximately 0.4 kg
Electromagnetic compatibility (EMC).		EN 60601-1-2, EN 794-3 (36.101) 10 V/m, ISO 10651-3 (36.202.2.1) 30 V/m and UN Regulation nr. 10, revision 2, with respect to EMC for use in motor vehicles. E4 10 R-02 XXXX
Classification according to Directive 93/42/EEC.		Class IIb
UMDNS-Code Universal Medical Device Nomenclature System.		18 – 098
Protection class, ventilation hose systems (disposable or reusable).		Type BF (body floating).
Type of protection against ingress of liquids.		IPX4

Materials used

Housing, Oxylog 2000 *plus.*	Acrylonitrile styrene acrylate/polycarbonate (ASA/PC).
Housing, AC/DC power pack.	Acrylonitrile butadiene styrene/polycarbonate (ABS/PC).
Housing, DC/DC converter.	Polycarbonate (PC).
Touch sensitive keypad on ventilator.	Polyester film.

NOTE

All Dräger ventilation hoses are latex-free.

Reusable hose system.

Ventilation hose, flow measuring hoses.	Silicone rubber.
Flow sensor housing, breathing valve.	Polysulphone (PSU).
Vane in flow sensor.	Stainless steel.
Diaphragms in breathing valve.	Silicone rubber.

Disposable hose system.

Ventilation hose.	Polyethylene (PE).
Non-return valve.	Synthetic resin.
Breathing valve.	Polyethylene (PE).
Flow sensor housing.	Polymethyl methacrylate (PMMA).
Film in flow sensor.	Polyester.
Adapter.	Silicone rubber.
Patient connection.	Polypropylene (PP).

Display

Technology.	Electro-luminescence (EL).
Pixels.	240 x 128
Visible area.	108 x 56 mm

Technical Documentation for the Oxylog 2000 *plus* according to EMC standard IEC/EN 60601-1-2

General Information

The EMC conformity of the Oxylog 2000 *plus* includes the use of following external cables, transducers and accessories:

AC/DC power pack 100 - 240 V / 50 - 60 Hz
DC/DC Converter
All-round Wall holder
Carrying System

Refer to the "List of Accessories" on page 123 for additional information.

Additionally, accessories may be used, which do not affect EMC compliance, if no other reasons contradict the use of them. The non-observance may result in increased emissions or decreased immunity of the Oxylog 2000 *plus*.

The Oxylog 2000 *plus* should not be used adjacent to or stacked with other equipment; if adjacent or stacked use is inevitable, the Oxylog 2000 *plus* should be observed to verify normal operation in the configuration in which it will be used.

Electromagnetic Emissions

Electromagnetic Emissions		
The Oxylog 2000 *plus* is intended for use in the electromagnetic environment specified below. The user of the Oxylog 2000 *plus* should make sure that it is used in such an environment.		
Emissions	**Compliance according to**	**Electromagnetic environment**
RF emissions (CISPR 11)	Group 1	The Oxylog 2000 *plus* uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
	Class B	The Oxylog 2000 *plus* is suitable for use in all establishments including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions (IEC 61000-3-2)	Class A	
Voltage fluctuations / flicker (IEC 61000-3-3)	Complies	

Electromagnetic Immunity

Electromagnetic Immunity			
This Oxylog 2000 *plus* is intended for use in the electromagnetic environment specified below. The user of the Oxylog 2000 *plus* should make sure that it is used in such an environment.			
Immunity against	**IEC 60601-1-2 test level**	**Compliance level (of the Oxylog 2000 *plus*)**	**Electromagnetic environment**
electrostatic discharge, ESD (IEC 61000-4-2)	contact discharge: 6 kV air discharge: 8 kV	8 kV 15 kV	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
electrical fast transients / bursts (IEC 61000-4-4)	– power supply lines: 2 kV – longer input / output lines: 1 kV	– 2 kV – N/A	– Mains power quality should be that of a typical commercial or hospital environment. – No input/output lines.

Immunity against	**IEC 60601-1-2 test level**	**Compliance level (of the Oxylog 2000 *plus*)**	**Electromagnetic environment**
surges on AC mains lines (IEC 61000-4-5)	common mode: 2 kV differential mode: 1 kV	2 kV 1 kV	Mains power quality should be that of a typical commercial or hospital environment.
power frequency magnetic field 50/60 Hz (IEC 61000-4-8)	3 A/m	N/A	Test is not necessary because the Oxylog 2000 *plus* is not likely to be sensitive to magnetic field disturbances, such as CRT monitors or hall elements.
voltage dips and short interruptions on AC mains input lines (IEC 61000-4-11)	dip >95%, 0.5 periods dip 60%, 5 periods dip 30%, 25 periods dip >95%, 5 seconds	N/A	No voltage dips or short interruptions, since a fully charged battery must be installed for safety reasons, even when operating from an external supply.
radiated RF (IEC 61000-4-3)	80 MHz - 2,5 GHz: 10 V/m	30 V/m	Recommended separation distance from portable and mobile RF transmitters with transmission power PEIRP to the Oxylog 2000 *plus* including its lines: 1.84 m * ✓ PEIRP (X1)
RF coupled into lines (IEC 61000-4-6)	150 kHz - 80 MHz: 10 V within ISM bands, 3 V outside ISM bands (X2)	10 V 10 V	Recommended separation distance from portable and mobile RF transmitters with transmission power PEIRP to the Oxylog 2000 *plus* including its lines: 1.84 m * ✓ PEIRP (X1)

I

Information regarding separation distances (IEC 60601-1-2, tables 205 and 206).

X1) For PEIRP the highest possible "equivalent isotropic radiated power" of the adjacent RF transmitter has to be inserted (value in Watt). Also in the vicinity of equipment marked with the symbol  interference may occur. Field strengths from fixed, portable or mobile RF transmitters at the location of the Oxylog 2000 *plus* should be less than 3 V/m in the frequency range from 150 kHz to 2.5 GHz and less than 1 V/m above 2.5 GHz.

X2) ISM bands in this frequency range are: 6.765 MHz - 6.795 MHz, 13.553 MHz - 13.567 MHz, 26.957 MHz - 27.283 MHz, 40.66 MHz - 40.70 MHz.

Recommended separation distances

Recommendated separation distances between portable and mobile RF-Telecommunication devices and the Oxylog 2000 *plus.*

The table below gives examples of the most common devices. If a device is not listed, do as follows:

1 Check the product manual of the device for the energy (W) and the frequency (GHz) values that the device transmits.

2 In the table below, search for the energy (W) value of the device in the PEIRP (W) column.

3 On the correct table row, search for the distance that corresponds to the frequency of the device.

– If the frequency is between 150 kHz to 2.5 GHz, use the 3 V/m distance column.

– Otherwise, use the 1 V/m distance column.

Recommended separation distances between portable and mobile RF-Telecommunication devices and the Oxylog 2000 *plus*			
maximum PEIRP (W)	**3 V/m distance (m)**	**1 V/m distance (m)**	**Examples**
0.001	0.06	0.17	
0.003	0.10	0.30	
0.010	0.18	0.55	e.g. Garage door openers
0.030	0.32	0.95	e.g. WLAN 5250 / 5775 (Europe)*
0.100	0.58	1.73	e.g. WLAN 2440 (Europe), Bluetooth*
0.200	0.82	2.46	e.g. WLAN 5250 (not in Europe)*
0.250	0.91	2.75	e.g. DECT devices*
1.000	1.83	5.48	e.g. GSM 1800- / GSM 1900- / UMTS- mobiles, WLAN 5600 (not in Europe)*
2.000	2.60	7.78	e.g. GSM 900 mobiles*
3.000	3.16	9.49	

Information regarding separation distances (IEC 60601-1-2, tables 205 and 206).

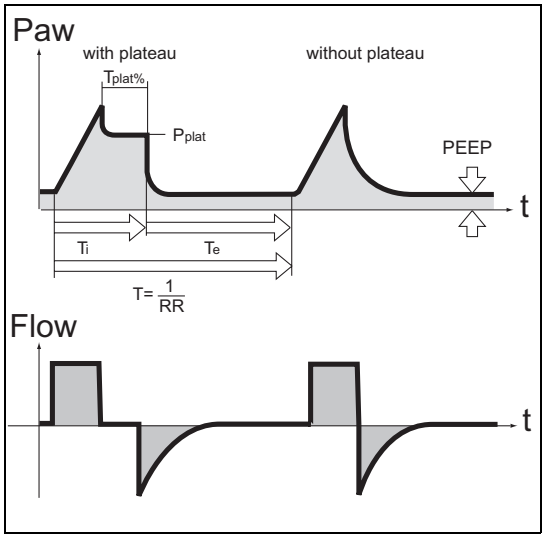
* Telecommunication devices. For the correct type, check the product manual of the device.

Principles of Operation

Ventilation modes

VC-CMV

Volume-**C**onstant **M**andatory **V**entilation stroke



The ventilation pattern is specified by the settings for tidal volume VT, respiratory rate RR, ventilation time ratio I:E and PEEP.

At the end of the flow phase, the expiration valve remains closed until the end of the inspiration time Ti. This phase, the inspiratory pause, can be identified as the plateau Pplat.

VC-AC

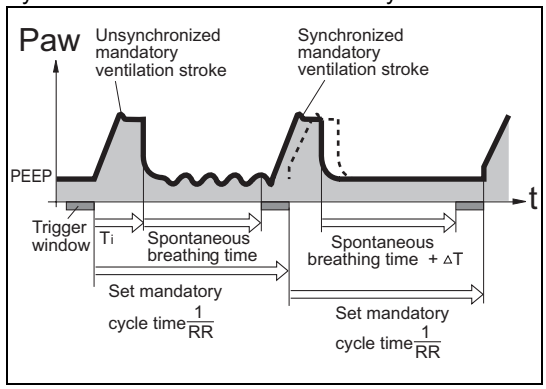
Assisted ventilation with continuous positive airway pressure.

The mandatory ventilation stroke begins when the patient reaches an inspiratory flow corresponding at least to the set flow trigger.

The current ventilation respiratory rate may be greater than the set respiratory rate for the same trigger.

VC-SIMV

Synchronized **I**ntermittent **M**andatory **V**entilation



Combination of mandatory ventilation and spontaneous breathing

VC-SIMV enables the patient to breathe spontaneously in regular prescribed cycles, with the mechanical mandatory ventilation strokes providing a minimum ventilation during the remaining cycles.

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 ventilation pattern results from the ventilation parameters of the tidal volume VT, respiratory rate RR and inspiration time Ti.

To prevent the mandatory ventilation stroke from being applied during spontaneous expiration, the flow trigger of the ventilator ensures that the ventilation stroke is triggered in synchrony with the patient's spontaneous inspiratory effort within a "trigger window".

The trigger window is 5 seconds long. If the expiration times are less than 5 seconds, the trigger window covers the entire expiration time minus a minimum expiration time of 500 ms.

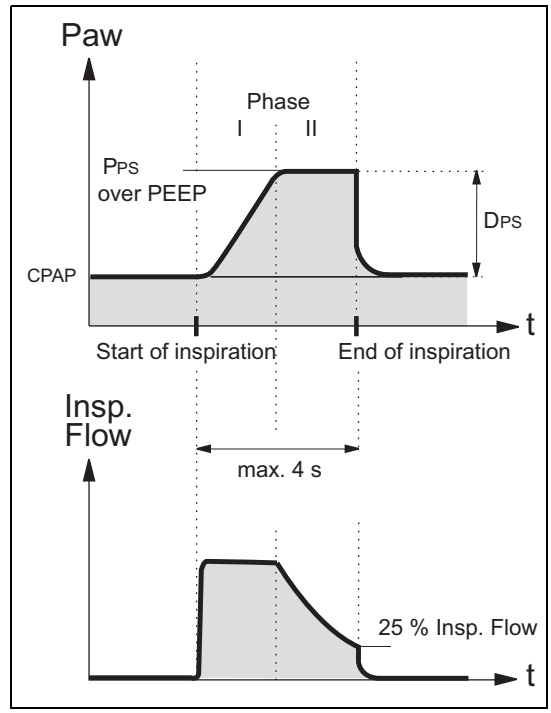
Since the synchronization of the mandatory ventilation stroke reduces the effective VC-SIMV time, which would result in an undesirable increase in effective respiratory rate, Oxylog 2000 *plus* prolongs the subsequent spontaneous breathing time by the missing time difference ΔT – thus preventing an increase in SIMV respiratory rate. The respiratory rate parameter RR remains constant. This parameter, in combination with the tidal volume VT, sets the minimum ventilation.

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

In the course of progressively weaning the patient from artificial ventilation, the ventilation respiratory rate RR is further reduced while the spontaneous breathing time is increased, so that the required total minute volume is increasingly supplied by spontaneous breathing.

PS (optional)

Pressure **S**upport



Pressure support for insufficient spontaneous breathing.

The device takes over part of the inhalation function, with the patient maintaining control of spontaneous breathing.

The SpnCPAP system supplies the spontaneously breathing patient with breathing gas, even if the inspiration effort is weak.

The pressure support of the PS system is started: when the spontaneous inspiration flow reaches the set value of the flow trigger, or at the latest when the spontaneous inspired volume exceeds 25 mL.

The device then produces an increase in pressure up to the preselected PS pressure ΔPsupp above PEEP, which is adjustable to the breathing requirement of the patient.

The time for this pressure increase (***Slope***) is adjustable:

– In case of rapid increase in pressure, the Oxylog 2000 *plus* supports the insufficient spontaneous breathing of the patient with a high peak flow.

– In case of slow increase in pressure, the Oxylog 2000 *plus* begins gently with regular inspiratory flow. The patient has to take over more breathing effort.

With the patient adjusted pressure increase and the pressure ΔPsupp above PEEP, the patient's own breathing activity defines the required inspiration flow.

PS is terminated:

– when the inspiration flow returns to zero during phase I, i.e. when the patient exhales or fights the ventilator.

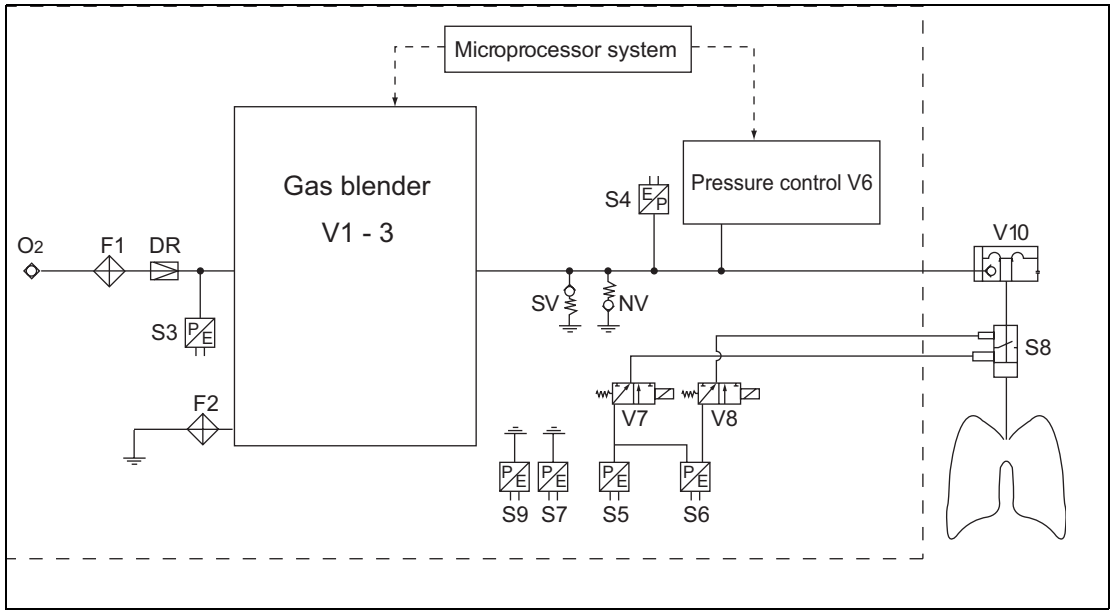
  Or

– when the inspiration flow in phase II falls below 25% of the inspiration flow previously supplied (and thus ΔPsupp above PEEP is reached).

  Or

– after 4 seconds if the two other criteria have not come into operation.

Functional description



The variable pneumatic actuators in the Oxylog 2000 *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 regulator DR. Ambient air is taken in via filter F2 as required. The supply pressure is monitored by pressure sensor S3.

Inspiration

Gas blender V1-3 delivers the variable inspiration 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, Oxylog 2000 *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 inspiration 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 inspiration 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.

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.

List of Accessories

Part name	Part No.
Workstation	
Oxylog 2000 *plus*	57 05 080
Basic unit	
Oxylog 2000 *plus*	57 05 081
Accessories required for operation	
Power supply:	
AC/DC power pack 100-240 V/50-60 Hz	2M 86 730
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 68 160
DC/DC converter	2M 86 731
Lithium ion battery	2M 86 733

Part name	Part No.
Reusable hose system, comprising:	
– Reusable hose system, 1.5 m	84 12 068
– Reusable hose system, 3 m	84 12 913
– Breathing valve	84 12 001
– Flow sensor	84 12 034
– Angled connector	84 12 235
Disposable ventilation hose, 1.5 m	57 02 871
Disposable ventilation hose, 1.5 m (set of 5)	57 03 041
Conversion kit Reusable (nozzle kit)	ME 05 133
Conversion kit Disposable (nozzle kit)	ME 05 134
Connecting 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
Options	
Pressure support (PS)	57 05 161
Non-invasive ventilation (NIV)	57 05 083

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These Instructions for Use only apply to **Oxylog 2000 *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 0344
Directive 93/42/EEC
concerning Medical Device

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